Mound Basin
Groundwater Sustainability Plan

MoundBasin

GROUNDWATER SUSTAINABILITY AGENCY

October 20, 2021

Mound Basin Groundwater Stability Plan

Prepared for

MoundBasin
GROUNDWATER SUSTAINABILITY AGENCY

Mound Basin Groundwater Sustainability Agency

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Executive Summary [§354.4(a)]

§354.4 General Information. *Each Plan shall include the following general information:*

(a) *An executive summary written in plain language that provides an overview of the Plan and description of groundwater conditions in the basin.*

Introduction

The State of California enacted the Sustainable Groundwater Management Act (SGMA), effective January 1, 2015, to mandate comprehensive sustainable groundwater resources management. SGMA provides a statewide framework for groundwater management by locally formed Groundwater Sustainability Agencies (GSAs). The Mound Basin Groundwater Sustainability Agency (MBGSA) was formed in 2017 to satisfy the requirement for a GSA to fully cover the Mound Basin (DWR Basin 4-004.03) (Basin).

MBGSA was formed pursuant to a joint exercise of powers agreement (JPA) between three local public agencies overlying the Basin: the City of San Buenaventura, the County of Ventura, and the United Water Conservation District (United) (Figure 2.1-01). The City of San Buenaventura is a local municipality that exercises water supply, water management, and land use authority within the city's boundaries. The County of Ventura exercises water management and land use authority on a portion of the land overlying the Mound Basin. See Figure 2.1-03 for land use information. United was formed in 1950 under the State of California's Water Conservation District Law of 1931 and is organized as a governmental special district. United does not produce water from the Basin but is authorized to engage in groundwater replenishment of the Basin.

MBGSA is governed by a five-member board comprising one director appointed by each member public agency (City of San Buenaventura, the County of Ventura, and United) and two stakeholder directors representing agricultural and environmental interests. Except for the two industrial well owners, all groundwater users in the Basin have direct representation in the SGMA process by virtue of a director on the MBGSA Board of Directors. MBGSA was designated as the exclusive GSA for the Basin by the State on September 30, 2017. Following submittal of an initial notification on September 17, 2018, MBGSA developed this Groundwater Sustainability Plan (GSP) to comply with SGMA's statutory and regulatory requirements and initiated planning by engaging with stakeholders and holding public meetings pursuant to an adopted Stakeholder Engagement Plan.

The goal of this GSP is to sustainably manage the groundwater resources of the Mound Basin for the benefit of current and anticipated future beneficial users of groundwater and the welfare of the general public who rely directly or indirectly on groundwater. This GSP describes the approach to achieve and maintain a sustainable groundwater resource free of undesirable results pursuant to the SGMA, while establishing long-term reliability no later than 20 years from GSP adoption through implementation.

The content of this GSP includes administrative information, description of the Basin setting, development of quantitative sustainable management criteria (SMC) that consider the interests of all beneficial uses and users of groundwater, identification of projects and management actions and monitoring networks that will ensure the Basin is demonstrably managed in a sustainable manner no later than the 20-year sustainability timeframe (2042) and for the duration of the entire 50-year planning and implementation horizon (2072).

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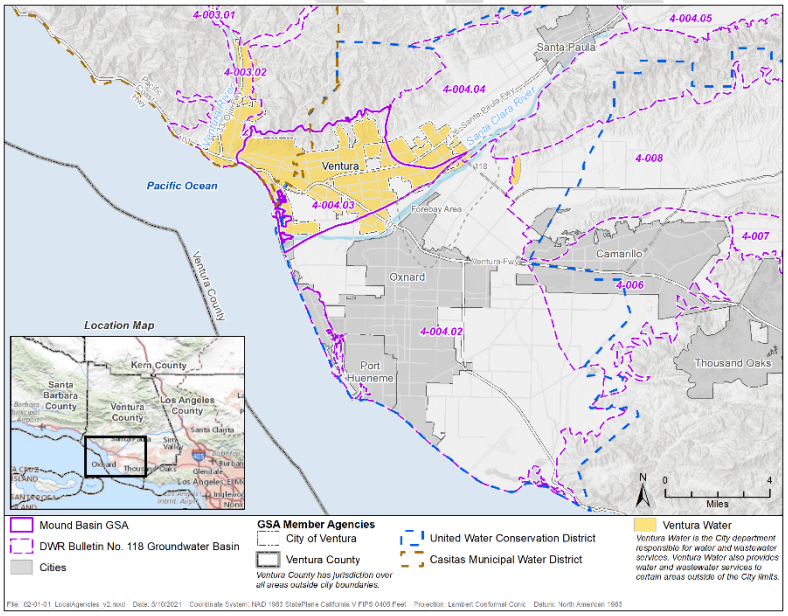
This GSP is organized following California Department of Water Resources (DWR) guidance documents (DWR, 2016a):

- Section 1 - Introduction to Plan Contents
- Section 2 - Administrative Information
- Section 3 - Basin Setting
- Section 4 - Sustainable Management Criteria
- Section 5 - Monitoring Networks
- Section 6 - Projects and Management Actions
- Section 7 - Plan Implementation
- Section 8 - References and Technical Studies

ES-1. Plan Area, Land Use, and Water Sources.

The Mound Basin is in western Ventura County along the Pacific coastline, including the City of Ventura (officially San Buenaventura). The Basin is within the Santa Clara River Valley watershed and includes the Santa Clara River estuary and floodplain at the southwestern corner, where the river discharges into the Pacific Ocean.

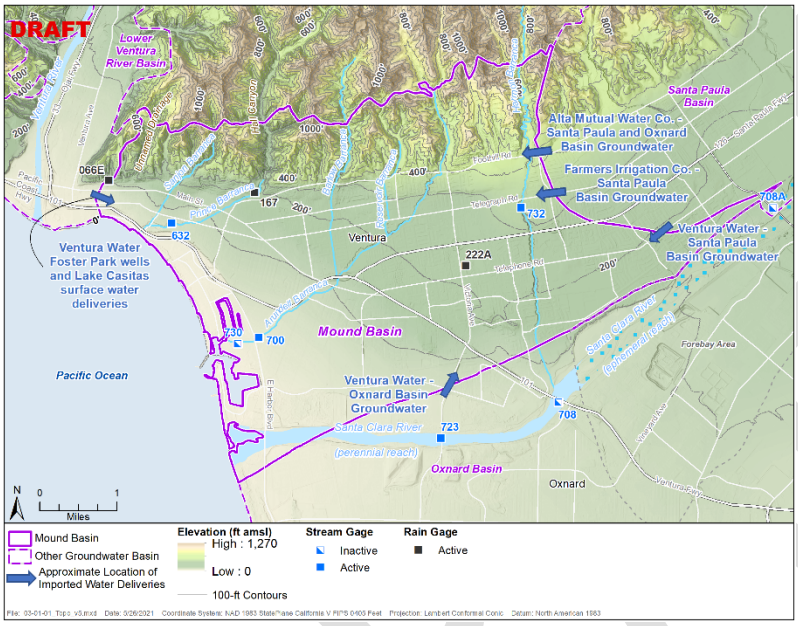
The geographic area covered by this GSP and managed by MBGSA includes the entire Mound Basin (DWR Basin No. 4-004.03), as defined by DWR Bulletin No. 118, "California's Groundwater," Update 2020 (DWR, 2021a). Adjacent basins are Oxnard Subbasin (No. 4-004.02) to the south, Santa Paula Subbasin (No. 4-004.04) to the east, and Lower Ventura River Subbasin (4-003.02) to the west.



Land use in the Basin is dominated by developed areas of the City of Ventura, including low-density residential, commercial, public/ institutional, and industrial land use designations. Agricultural land use occupies three separate areas of farmland in the eastern and southwestern portions of the Basin, and open space covers the remaining upland areas in the northern portion of the Basin. The principal land use planning agencies in the Basin include the City of Ventura (within the City limits) and County of Ventura (unincorporated areas outside of the City limits).

The beneficial uses of groundwater extracted from the principal aquifers of Mound Basin include municipal, industrial, and agricultural water supply corresponding to the land use categories above. There

are no active or recently active domestic wells in the Basin. Beneficial uses for the shallow, non-principal groundwater include the groundwater-dependent ecosystem (GDE) associated with groundwater in the Shallow Alluvial Deposits and instream flow uses in interconnected reaches of the Santa Clara River and estuary (interconnected with groundwater in the Shallow Alluvial Deposits). However, these beneficial uses are not impacted by groundwater extraction because there is no groundwater extraction from the Shallow Alluvial Deposits and groundwater extraction from principal aquifers (Mugu and Hueneme aquifers) does not materially influence shallow groundwater levels or surface water flows (see Appendix G for explanation).



The beneficial users for the principal aquifers of Mound Basin include the City of Ventura, industrial users (two as of 2021), and agricultural users (22 active wells as of 2021). There are currently no active domestic well users within the Basin or private water companies; drinking water supply within the Basin is provided exclusively by the City of Ventura.

Other sources of water supply for the Basin include groundwater extracted from City of Ventura wells located in the adjacent Santa Paula and Oxnard Basins and from the Upper Ventura River Basin (not an immediately adjacent basin), and surface water imported from the Ventura River Watershed, which is purchased from Casitas Municipal Water District (MWD). Although Mound Basin groundwater is an important source of water supply for the communities located within the Basin, the communities are not considered to be "dependent" on Mound Basin groundwater because it is only one component of the City's water supply portfolio. In contrast, agricultural beneficial users are heavily dependent on groundwater extracted from the Mound Basin as they currently do not have an alternative water supply.

ES-2. Basin Setting and Groundwater Conditions

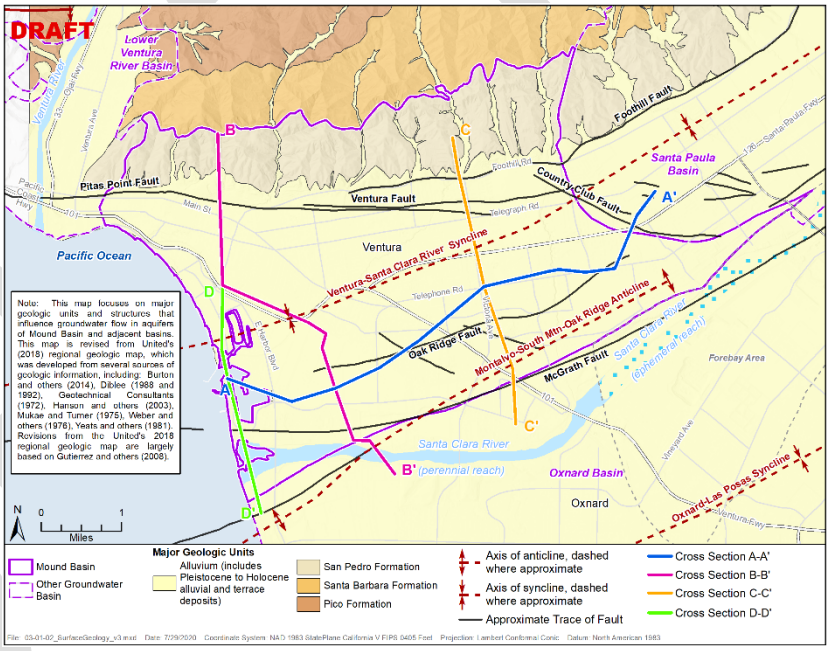
The topography of Mound Basin consists largely of gently south-sloping coastal plain, coastal and alluvial terraces, and alluvial fans. Hills rising to approximately 1,000 feet above mean sea level (ft msl) are present along the northern margin of the Basin in which one of the principal aquifers of the Basin outcrops and is recharged. Several small perennial stream channels originate in the canyons above the Basin and trend south and southwest within the Basin, either discharging into the Santa Clara River to the south or the Pacific Ocean to the west.

The Mound Basin is within the tectonically active Transverse Ranges geomorphic province of California, characterized by mountain ranges and valleys with an east-west orientation. Structurally, Mound Basin occurs within an elongate, complex syncline referred to as the Ventura structural basin, which trends east to west (Yeats et al., 1981). Near the coast, sediments were deposited on a wide delta complex that

formed at the terminus of the Santa Clara River, with a total stratigraphic thickness reportedly exceeding 55,000 ft (Sylvester and Brown, 1988).

The geologic units (strata) in the Basin, which contain groundwater, include (from youngest/shallowest to oldest/deepest):

- Recent (active) stream-channel deposits along the present course of the Santa Clara River and its tributaries;
- Holocene-age alluvial fan deposits, which cover most of the Mound Basin surface;
- Stream terrace deposits adjacent to the Santa Clara River;
- Undifferentiated older alluvium of Pleistocene age; and
- Semi-consolidated sand, gravel, and clay deposits of the San Pedro Formation of late Pleistocene age.



Structurally, the Mound Basin is generally bounded on the east by the Country Club Fault system, which offsets the aquifers and impedes groundwater flow from the Santa Paula Basin into the Mound Basin. To the northwest, the Basin boundary is the hydraulic divide between Mound Basin and Lower Ventura River Subbasin.

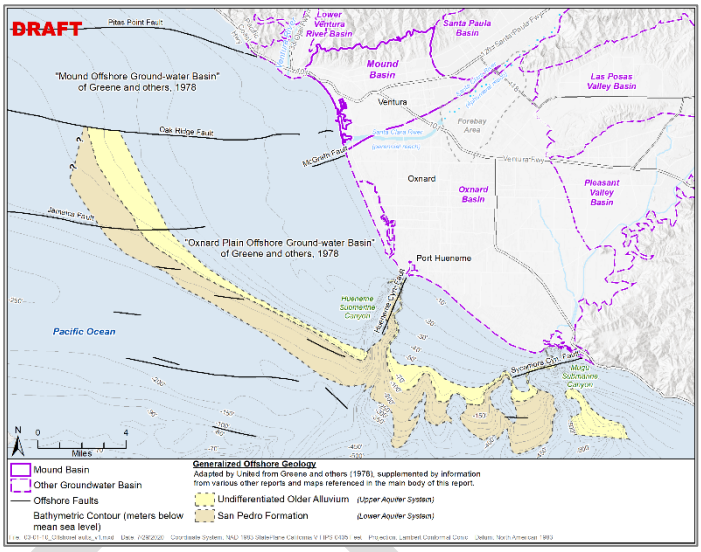
The western boundary is the Pacific Ocean shoreline; however, the primary aquifers crop out on the continental shelf approximately 10 miles offshore. The northern boundary is defined by the contact of the San Pedro Formation (the deepest freshwater-bearing formation in the Basin) with the underlying Santa Barbara Formation. The southern boundary is approximately aligned with the axis of the Montalvo-South Mountain-Oak Ridge Anticline and the McGrath Fault. The bottom of the Basin is defined by the base of fresh water, corresponding with the base of the San Pedro Formation.

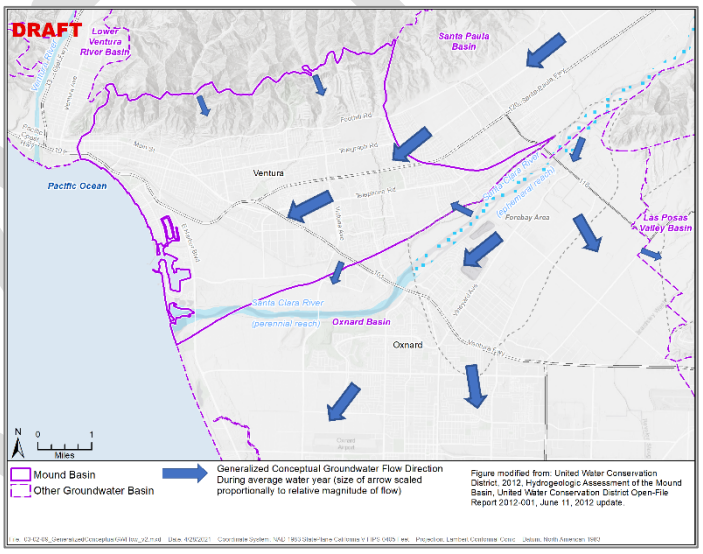
The aquifers in Mound Basin consist of layers and lenses of relatively coarse-grained, permeable sediments (primarily sand and gravel) deposited within unconsolidated alluvium and the underlying, semi-consolidated San Pedro Formation (Figure 3.1-04). Aquitards present between the aquifers in Mound Basin consist of layers of poorly permeable fine-grained sediments (primarily silt and clay, Figure 3.1-04). Distinct Hydrostratigraphic Units (HSUs) were identified using geophysical methods by United (2018), and

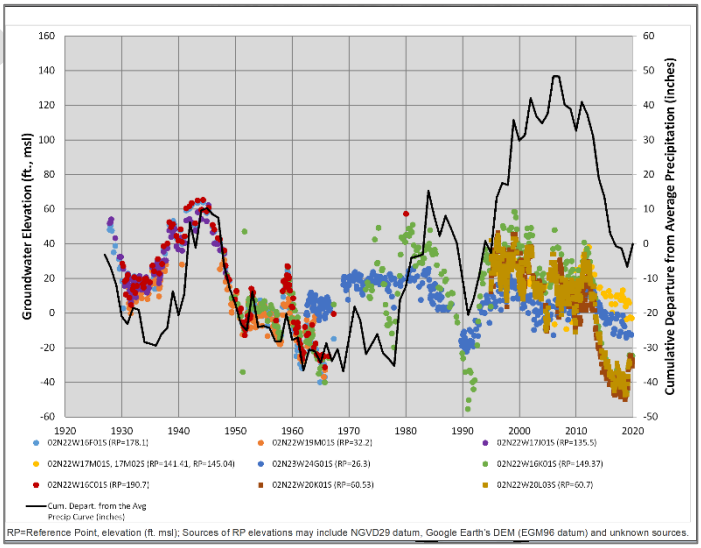
consist of the Shallow Alluvial Deposits, fine-grained Pleistocene deposits, Mugu, Hueneme, and Fox Canyon aquifers (and the aquitards between these aquifers). The Mugu and Hueneme aquifers are considered principal aquifers and are managed by this GSP. The Shallow Alluvial Deposits and fine-grained Pleistocene deposits do not meet the SGMA definition of a principal aquifer to "store, transmit, and yield significant or economic quantities of groundwater…", and the Fox Canyon Aquifer does not have material groundwater extractions; therefore, they are not considered principal aquifers in the GSP and will not be managed at this time.

Importantly, the principal aquifers extend approximately 10 miles offshore to the edge of the continental shelf, where they crop out and are exposed to seawater. The principal aquifers are believed to be protected from seawater between the shoreline and the continental shelf outcrops by the fine-grained stratigraphic units that overlie them. Modeling performed for this GSP indicates that seawater will not migrate from the aquifer outcrops to the shoreline within the 50-year SGMA period. However, there is a risk that seawater could enter the aquifers though nearshore short circuit pathways along faults or stratigraphic windows in the fine-grained stratigraphic units. This risk is considered in the GSP.

Groundwater flow directions within Mound Basin are generally from the east to west and are generally parallel with the Santa Clara River within the eastern portion of the Basin, and toward the Oxnard Basin in the southwestern portion of the Basin. A small groundwater flow component from the uplands to the north flows to the south is driven by recharge in the hills.







Measured groundwater levels in the Mound Basin have historically risen and fallen consistent with the rainfall patterns and have not exhibited evidence of chronic lowering. Groundwater storage has fluctuated similarly, with no long-term reduction and no reports of land subsidence effects or seawater intrusion historically.

The natural groundwater quality in the principal aquifers is not ideal but is beneficially used by municipal and agricultural users across the Basin. Regional Water Quality Control Board (RWQCB) Water Quality Objectives (WQOs) exist for sulfate, boron, chloride, and total dissolved solids (TDS) and are generally met, although some exceptions exist. The natural groundwater quality is generally better in the Mugu Aquifer as compared to the Hueneme Aquifer, which has more frequent exceedances of RWQCB WQOs. These constituents appear to be relatively stable at most Mound Basin wells having long-term groundwater quality records. The dissolved constituents are derived from natural sources, and groundwater extraction does not appear to be correlated with common ion chemistry concentrations; however, there is a risk that lower groundwater levels could locally induce migration of poor-quality groundwater from shallow water-bearing units into the Mugu Aquifer. Nitrate concentrations in groundwater are generally low. It is noted that several wells exhibit anomalously high nitrate concentrations that are believed to be the result of well construction or well deterioration issues that have created conduits for poor-quality water to enter the well from shallow water-bearing units. Lastly, migration of contaminant plumes is not an issue because there are none identified in the Basin at present.

Surface bodies in the Mound Basin include the Santa Clara River and its estuary and several smaller, ephemeral streams (barrancas). The Santa Clara River has perennial baseflow within its reach that spans the Mound Basin. The perennial baseflow is fed by shallow groundwater and tile drain discharges from the Mound and Oxnard Basins. The barrancas are ephemeral and flow in response to storm events and, hence, may only be transiently interconnected with shallow groundwater. Despite the interconnection with shallow groundwater occurring within the Shallow Alluvial Deposits, there is no depletion of interconnected surface water in the Basin because there are no groundwater extractions from the Shallow Alluvial Deposits and groundwater in the principal aquifers is physically separated from the surface water bodies by several hundred feet of fine-grained materials. In addition, numerical modeling simulations that varied extraction rates in the principal aquifers did not show any significant impact to shallow groundwater levels or Santa Clara River flows (Appendix G). No GDEs have been identified in the Basin that rely on groundwater from a principal aquifer.

ES-3. Water Budget

The groundwater flow model was used to quantify and evaluate the water budgets for the historical, current, and projected conditions, including the evaluation of uncertainty due to climate change (United, 2021a).

Surface water enters and leaves Mound Basin via the Santa Clara River and several smaller barrancas where they cross the Basin's boundaries primarily as storm flows. Surface water is also imported into the Basin via pipeline from Casitas MWD (Ventura Water, 2020b).

The primary sources of recharge to the Mound Basin groundwater system are underflow from the Santa Paula Basin, areal recharge (the sum of infiltration of precipitation, Municipal and Industrial (M&I) return flows, and agricultural irrigation return flows), and mountain-front recharge. Stream channel recharge is a minor component. Depending on groundwater level conditions, groundwater can flow into the Mound

Basin from the Oxnard Basin; however, there has historically been a net outflow from the Mound Basin to the Oxnard Basin. The primary groundwater outflow is groundwater extraction for beneficial use, although underflow to the Oxnard Basin can be a significant outflow at times. Discharge from the Shallow Alluvial Deposits (not a principal aquifer) along the lower, gaining reach of the Santa Clara River; via tile drains installed under farmland adjacent to the river; and via evapotranspiration are minor components. The change in storage for the Basin is a function of imbalances between inflows and outflows. In years when inflow (recharge) exceeds outflow (discharge) the volume of groundwater in storage increases, and vice versa. The average reduction in groundwater storage during the historical period (water years 1985-2015), current period (water years 2015-2019), and the baseline future projection, are 469 acre-feet per year (AF/yr), 147 AF/yr, and -84 AF/yr, respectively. The negative value for the baseline future projection indicates that the Basin is projected to have surplus inflows. Climate change and potential land use and population changes were evaluated and are not expected to materially impact the future water budget.

Modeling results for the future projection periods indicate that the projected inflow and outflows will be approximately balanced during the 20-year GSP implementation period and that the minimum thresholds for the sustainability indicators will not be exceeded. Therefore, an estimate of the sustainable yield is approximately equal to the projected extraction rates (approximately averaging 7,900 to 8,200 AF/yr), depending on climate change assumptions. It is recognized increasing extraction rates above these amounts could increase underflow from adjacent basins, thereby increasing the sustainable yield of the Mound Basin. However, this could impact sustainable management of the adjacent Santa Paula and/or Oxnard basins and is, therefore, not included in the sustainable yield estimate at this time.

Table ES-1. Summary of Average Water Budget Components (acre-feet/year).

	Mugu	Hueneme	Entire Basin
Historical (1986-2015)			
Total in	3,287	7,612	20,291
Total out	-3,462	-7,758	-20,768
Change in Storage	175	138	469
Current (2016-2019)			
Total in	4,050	7,029	12,278
Total out	-4,057	-7,252	-12,425
Change in Storage	7	224	147
Projected (Implementation Period 2022-2041)			
Total in	4,579	5,847	19,342
Total out	-4,592	-5,727	-19,355
Change in Storage	13	-120	13

ES-4. Sustainable Management Criteria

The SMC were developed using the best available science and information for the Basin. MBGSA characterized undesirable results and established minimum thresholds, measurable objectives, and interim milestones for each applicable sustainability indicator:

1. Chronic lowering of groundwater levels (Section 4.4)

2. Reduction in groundwater storage (Section 4.5)
3. Seawater intrusion (Section 4.6)
4. Degraded water quality (Section 4.7)
5. Land subsidence (Section 4.8)

The sixth sustainable management criterion, depletion of interconnected surface water, is not applicable in the Basin because surface water is not interconnected with groundwater in the principal aquifers.

The process for developing SMC for this GSP began with developing a deliberate process for SMC development that was reviewed by the MBGSA Board of Directors in June 2020, followed by adoption of a sustainability goal in September 2020. These actions were performed intentionally up front to guide SMC development. SMC development then consisted of the MBGSA Board of Directors and stakeholders reviewing SMC proposals prepared by staff. Written proposals were provided in the form of staff reports and presentations at numerous Board of Directors meetings, which included information on SGMA requirements, relevant information from the Basin Setting section, and results of additional analyses completed to support SMC development. Meeting summaries (minutes) were posted on the MBGSA website and two GSP workshops were held to address the SMC. Outreach was performed throughout the SMC development process to encourage input on the proposed SMC, including GSP newsletters, e-mails to the interested parties list, social media posts, telephone communications with stakeholders, updates at the Santa Clara River Watershed Committee, public notices, and a bilingual bill stuffer in the City of Ventura's consumer water bills.

A key part of the SMC development process is defining undesirable results (GSP Emergency Regulations §354.26(a)). The process for defining undesirable results consisted of multiple steps:

1. First, potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other effects were evaluated and described qualitatively.
2. The qualitative statement on potential effects was then translated and quantified into minimum thresholds at specific monitoring network sites (existing and proposed).
3. Lastly, a combination of minimum threshold exceedances representing undesirable results (when significant and unreasonable effects occur on any of the sustainability indicators) in the Basin was established.

For this GSP and pursuant to GSP Emergency Regulations §354.28(d), groundwater elevations are used as a proxy for the depletion of groundwater storage and land subsidence sustainability indicators.

Chronic Lowering of Groundwater Levels: Historically, measured and modeled future groundwater levels indicate no chronic lowering of groundwater levels has or will occur in the Basin. The qualitative description of undesirable results is chronic lowering of groundwater levels that causes a significant number of wells in the Basin to no longer be capable of being operated as designed for the confined aquifers of the Mound Basin. The results of analyzing groundwater levels, well data, and the groundwater model results indicate that groundwater levels could decline by a considerable amount below historical low levels in many areas of the Basin before a significant and unreasonable depletion of supply would occur. The analysis results for the groundwater supply depletion water level thresholds are supported by the lack of reported pumping problems during historical periods of lowered groundwater levels. However, the groundwater supply depletion water level thresholds can be hundreds of feet lower in elevation than

historical low groundwater levels (especially for the Hueneme Aquifer), while for others they can be similar in elevation. Groundwater levels cannot decline significantly below historical low levels without creating risk for subsidence undesirable results. For these reasons, the minimum threshold for the chronic lowering of groundwater levels is set at the historical low levels. The combination of minimum threshold exceedances that is deemed to cause significant and unreasonable effects in the Basin for chronic lowering of groundwater levels is minimum threshold exceedances in 50% of the groundwater level monitoring sites in either principal aquifer. This combination is intended to indicate significant and unreasonable effects are widespread in either principal aquifer. The measurable objective was set based on the reasonable margin of operational flexibility and was determined to be groundwater levels following wet phases that are sufficiently high to prevent groundwater levels from dropping below the minimum thresholds during a subsequent drought phase.

***Reduction in Groundwater Storage*:** The reduction in groundwater storage sustainability indicator is measured as the "total volume of groundwater that can be withdrawn from the basin without causing conditions that may lead to undesirable results." (GSP Emergency Regulations §354.28 (c)(2)). The minimum threshold is set for the extraction rate not to exceed the sustainable yield (i.e., 8,200 AF/yr) for the Basin, which is the rate that is anticipated to cause water levels to go below the historical low. The reduction of groundwater storage measurable objective is 90% of the sustainable yield (i.e., 7,400 AF/yr), based on professional judgement and to account for uncertainty in the sustainable yield estimate.

***Seawater Intrusion*:** Available data indicate that seawater has not been present in the onshore portions of the principal aquifers to date. In addition, the Mound Basin principal aquifers may only be exposed to seawater where they crop out on the continental shelf edge, approximately 10 miles offshore, greatly reducing the likelihood that seawater can find a near-shore path for intrusion into the principal aquifers. Groundwater model particle tracking results suggest that the most seawater has moved is in the Hueneme Aquifer, an average of approximately 0.5 miles from the offshore subcrop (approximately 10 miles from the shoreline) toward the shoreline during the past 100 years. The criteria used to define when and where the effects of the groundwater conditions cause undesirable results is based on the qualitative description of undesirable result, which is seawater intrusion extending east of Harbor Boulevard into areas with current or anticipated future beneficial uses. This means that the chloride concentrations should be maintained below a concentration indicative of seawater intrusion impacts at monitoring sites along Harbor Boulevard. Therefore, the minimum threshold of 150 milligrams per liter (mg/L) is used at monitoring sites along Harbor Boulevard, which is consistent with the degraded water quality sustainability indicator minimum threshold for chloride. The measurable objectives are also set consistent with the degraded water quality sustainability indicator measurable objectives for chloride.

***Degraded Water Quality*:** Groundwater quality in the Mound Basin is marginal due to natural geochemical processes, and groundwater extraction does not appear to have exacerbated these natural processes historically. Occurrences of elevated sulfate, TDS, and nitrate concentrations appear to be related to well construction/condition issues that facilitate intrusion of very poor-quality water from the shallow groundwater system into these wells, as opposed to being an indicator of regional water quality degradation in the principal aquifers. Potential future increases in Mugu Aquifer extraction rates could locally induce downward migration of very poor-quality water from the shallow groundwater system into the Mugu Aquifer, which could lead to undesirable results. The effects of groundwater conditions deemed to cause undesirable results is considered to occur when all representative monitoring wells in a principal aquifer exceed the minimum threshold concentration for a constituent for two consecutive years. The

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minimum thresholds and measurable objectives for degraded water quality were developed by considering existing water quality standards (drinking water regulations and RWQCB Basin Plan WQOs, and historically measured concentrations). The minimum thresholds are based on RWQCB WQOs except in cases where concentrations have historically exceeded the WQO. The measurable objectives are based on preserving existing water quality consistent with upper consumer acceptance levels for drinking water (which trigger treatment requirements) or toxicity levels for crops, in cases where concentrations have historically exceeded these levels.

***Land Subsidence*:** No land subsidence due to groundwater extraction has been documented historically in the Mound Basin, which is considered to have a low estimated potential for inelastic land subsidence. Numerical modeling for the water budget suggests that future groundwater levels will remain above historical low levels, which would prevent inelastic subsidence due to groundwater extraction; however, groundwater levels could decline below historical levels and trigger inelastic land subsidence if actual future conditions differ significantly from those assumed in the projected water budget analysis. Undesirable results are any inelastic land subsidence caused by groundwater extraction in the Coastal Area of the Basin (i.e., areas located west of Harbor Boulevard). The minimum threshold is important in the Coastal Area because land subsidence here would exacerbate coastal hazards associated with sea level rise and/or impacts to the City of Ventura's sewer mains along Harbor Boulevard. Undesirable results could also occur outside of the Coastal Area if enough subsidence occurred to substantially interfere with surface land uses. Due to data coverage gaps and other factors, interferometric synthetic aperture radar (InSAR[1]) monitoring was not considered a reliable method for measuring land subsidence in the western half of the Mound Basin; therefore, groundwater levels were chosen as a proxy minimum threshold, and were set at the historical low groundwater levels to prevent measurable inelastic land subsidence due to groundwater extraction. Any combination of minimum threshold exceedances that include >50% of wells in the western half of the Basin would be considered as potentially leading to undesirable results. This combination is intended to indicate significant and unreasonable effects are widespread in the western half of the Basin. For the eastern half of the Basin, InSAR data are considered adequate to monitor for land subsidence when coupled with continuous global positioning system (GPS) data to filter out tectonic downwarping. Therefore, any exceedances of minimum thresholds in the eastern area will prompt the review of InSAR data to evaluate indications of subsidence rates (due to groundwater extraction) of ≥0.1 ft/yr that leads to cumulative subsidence of 0.6 ft or more. The less conservative minimum threshold for the eastern area was selected based on literature review of subsidence case studies. The measurable objectives for the western half of the Basin are identical to the chronic lowering of groundwater levels measurable objective, and for the eastern half they are equal to the minimum threshold.

ES-5. Monitoring Networks

The GSP Emergency Regulations require monitoring networks be developed to collect data of sufficient quality, frequency, and spatial distribution to characterize groundwater and related surface water conditions (if applicable) in the Basin; evaluate changing conditions that occur during implementation of the GSP; and for implementation of the SMC for the Basin. Monitoring networks should accomplish the following (§354.34(b)):

[1] Interferometric Synthetic Aperture Radar (InSAR) measures the spatial extent and magnitude of changes in the land surface associated with fluid extraction and natural hazards (e.g., earthquakes).

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- **Demonstrate Progress toward Achieving Measurable Objectives Described in the GSP**: The five sustainability indicators discussed above are applicable but have already met the corresponding measurable objectives historically and are expected to meet them going forward. Therefore, the focus of this objective for the Mound Basin is to demonstrate continued compliance with the measurable objectives as opposed to progress toward meeting the measurable objectives.
- **Monitor Impacts to the Beneficial Uses and Users of Groundwater**: The uses and users described in the introduction could be impacted by degradation of water quality, seawater intrusion, and declining groundwater levels and storage (which are an important causative factor in land subsidence). Monitoring groundwater levels and quality can indicate trends that could precede land subsidence or seawater intrusion, as well as trends that could affect operation and associated costs of production wells. Under this guidance, appropriate monitoring sites in Mound Basin are in the southern portion where all the Basin's active water supply wells are located and groundwater levels are known to fluctuate. Monitoring in the northern part of the Basin is low priority due to the lack of beneficial uses.
- **Monitor Changes in Groundwater Conditions Relative to Measurable Objectives and Minimum Thresholds**: This will be accomplished using groundwater level and groundwater quality monitoring. Quarterly groundwater level monitoring and annual groundwater quality sampling frequencies are considered adequate for the Basin, due to the relatively slow rate of groundwater movement.
- **Quantify Annual Changes in Water Budget Components**: The available monitoring data for the Basin will be input to United's flow model for calculating future annual changes in subsurface water budget components and change in storage. Surface flows in the Santa Clara River are measured daily by the Ventura County Watershed Protection District (VCWPD) at flow-gaging station "723 - Santa Clara River at Victoria Ave" located outside of the Basin. Data from this station are available online and can be downloaded annually to update this surface water component of the Mound Basin water budget (VCWPD, 2021). MBGSA intends to continue using data from these existing sources as input to United's model, which will in turn be used periodically to quantify changes in water budget components. At present, this GSP does not contemplate development of a new monitoring network or modification of existing monitoring networks to obtain data regarding groundwater extraction, imported water, or recharge quantities because it is MBGSA's opinion that these water budget components are currently adequate for sustainable management of the Basin.

Groundwater levels and water quality are monitored in approximately 20 wells across the Basin by United; Ventura Water (i.e. the City of Ventura's water department) monitors two active water supply wells in the Basin, and VCWPD monitors three wells (currently or formerly used for agricultural and industrial water supply) in the Basin. VCWPD is the California Statewide Groundwater Elevation Monitoring (CASGEM) monitoring entity for the Basin.

Consistent with GSP Emergency Regulations §354.34(e), the groundwater level and quality monitoring networks that will be utilized are based primarily on existing monitoring sites that are monitored by United and VCWPD. The existing monitoring networks in the Basin have been used for several decades to collect information to demonstrate short-term, seasonal, and long-term trends in groundwater and related

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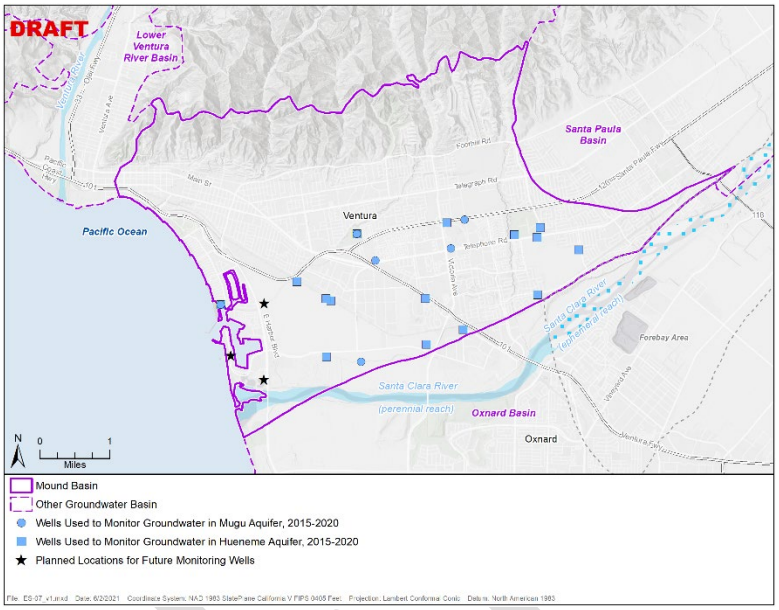

surface water conditions. The monitoring networks include features for the collection of data to monitor the groundwater sustainability indicators applicable to the Basin. Additional monitoring sites will be added to implement the SMC for seawater intrusion (two new monitoring wells located near Harbor Boulevard). The additional monitoring sites will also help refine the hydrogeologic conceptual model (HCM) and improve the numerical model. A third monitoring site is proposed along the shoreline to provide a second site for early detection of seawater intrusion. A final decision whether to construct this third well will be made during GSP implementation, based on available funding and monitoring results from new Harbor Boulevard monitoring wells. Lastly, MBGSA will seek opportunities to enhance the monitoring networks by instrumenting and sampling additional existing wells in the Basin if and when opportunities to do so arise.

InSAR is the best available method for measuring the rate and extent of land subsidence over large areas, such as a groundwater basin. As described above, InSAR is unreliable for the western half of the Basin, so groundwater elevations will be used as a proxy to detect and monitor the potential onset of inelastic land subsidence that may result from future groundwater extractions in the Basin (i.e., if groundwater elevations decline below historical low levels). To ensure the best available data is used for monitoring land subsidence, InSAR data will be utilized when groundwater levels are below historical lows in the eastern half of the Basin. If InSAR coverage and other data issues are resolved in the future, MBGSA will update the GSP to utilize InSAR measurements for the western half of the Basin.

Pursuant to section §352.6, monitoring data will be stored in MBGSA's Data Management System (DMS). Data will be transmitted to DWR with the GSP, annual reports, and GSP updates electronically on the forms provided by DWR.

ES-6. Projects and Management Actions

The 50-year future modeling projections developed for the projected water budget suggest that the measurable objectives for the applicable sustainability indicators will be met without the need for projects or management actions. However, several management actions are included to help prevent problems from developing and to respond to potential changing conditions in the Basin. The management actions include:

- Coordinate with the County of Ventura to identify and address improperly constructed or abandoned wells that create conduits for migration of poor-quality water from shallow water-bearing units into the principal aquifers. Grant funding will be pursued to address any improperly constructed or abandoned wells that are identified.

- Coordinate with County of Ventura to review the County well permit ordinance and modify, if necessary, to ensure the future wells are properly sealed to prevent migration of poor-quality water from shallow water-bearing units into the principal aquifers.
- Develop a contingency plan to address unexpected land subsidence.
- Develop a contingency plan to address unexpected seawater intrusion.
- Partner with the City of Ventura and United to collect interim shallow groundwater data to further assess the hydraulic connection between the Santa Clara River flows and groundwater in Shallow Alluvial Deposits with groundwater extraction from the deeper principal aquifers.

ES-7. Plan Implementation

The estimated costs for the GSP implementation include annual costs for ongoing activities and estimated costs for one-time activities that are scheduled to occur within the first five-year GSP assessment period. The estimated total cost of the GSP Implementation over the 20-year planning horizon is [$7,002,188]. The total estimated cost through the first five-year assessment is [$1,937,618]. The cost is based on the best available information at the time of Plan preparation and submittal. It represents the MBGSA's current understanding of Basin conditions and the current roles and responsibilities of the MBGSA under SGMA.

Funding for GSP implementation will be obtained from groundwater extraction fees charged to groundwater users in the Basin, and grants. This funding approach has been used since the MBGSA's formation and will be reevaluated over time as the GSP implementation progresses. The Site A monitoring well planned is being funded by DWR's Technical Support Services (TSS) grant program. MBGSA will continue to pursue funding from state and federal sources to support GSP planning and implementation.

Implementation of the GSP requires robust administrative and financial structures, with adequate human resources to ensure compliance with SGMA. The activities associated with the GSP implementation are:

1. Agency administration,
2. Preparing annual reports,
3. Monitoring groundwater levels and quality and land subsidence,
4. Maintaining the Basin DMS,
5. Updating the groundwater model,
6. Constructing new monitoring wells,
7. Developing contingency plans,
8. Performing ongoing stakeholder outreach and engagement, and
9. Assessing/updating the GSP every 5 years.

MBGSA will likely continue to address its human resources needs through contracts with consultants and United.

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GSP reporting will occur on an annual basis, with reports for the preceding water year due to DWR by April 1. Periodic evaluations (every five years) and GSP amendments (if needed) will be submitted to DWR by at least every five years (2027, 2032, 2037, and 2042). The proposed monitoring wells are scheduled for construction in 2021, 2026, and 2032, but it is noted that site identification, access agreements, and permitting will take place in the years immediately preceding construction.

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Definitions of Key SGMA Terms

California Water Code

Sec. 10721

Unless the context otherwise requires, the following definitions govern the construction of this part:

(a) Adjudication action means an action filed in the superior or federal district court to determine the rights to extract groundwater from a basin or store water within a basin, including, but not limited to, actions to quiet title respecting rights to extract or store groundwater or an action brought to impose a physical solution on a basin.

(b) Basin means a groundwater basin or subbasin identified and defined in Bulletin 118 or as modified pursuant to Chapter 3 (commencing with Section 10722).

(c) Bulletin 118 means the department's report entitled California's Groundwater: Bulletin 118 updated in 2003, as it may be subsequently updated or revised in accordance with Section 12924.

(d) Coordination agreement means a legal agreement adopted between two or more groundwater sustainability agencies that provides the basis for coordinating multiple agencies or groundwater sustainability plans within a basin pursuant to this part.

(e) De minimis extractor means a person who extracts, for domestic purposes, two acrefeet or less per year.

(f) Governing body means the legislative body of a groundwater sustainability agency.

(g) Groundwater means water beneath the surface of the earth within the zone below the water table in which the soil is completely saturated with water, but does not include water that flows in known and definite channels.

(h) Groundwater extraction facility means a device or method for extracting groundwater from within a basin.

(i) Groundwater recharge or recharge means the augmentation of groundwater, by natural or artificial means.

(j) Groundwater sustainability agency means one or more local agencies that implement the provisions of this part. For purposes of imposing fees pursuant to Chapter 8 (commencing with Section 10730) or taking action to enforce a groundwater sustainability plan, groundwater sustainability agency also means each local agency comprising the groundwater sustainability agency if the plan authorizes separate agency action.

(k) Groundwater sustainability plan or plan means a plan of a groundwater sustainability agency proposed or adopted pursuant to this part.

(l) Groundwater sustainability program means a coordinated and ongoing activity undertaken to benefit a basin, pursuant to a groundwater sustainability plan.

(m) In-lieu use means the use of surface water by persons that could otherwise extract groundwater in order to leave groundwater in the basin.

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(n) Local agency means a local public agency that has water supply, water management, or land use responsibilities within a groundwater basin.

(o) Operator means a person operating a groundwater extraction facility. The owner of a groundwater extraction facility shall be conclusively presumed to be the operator unless a satisfactory showing is made to the governing body of the groundwater sustainability agency that the groundwater extraction facility actually is operated by some other person.

(p) Owner means a person owning a groundwater extraction facility or an interest in a groundwater extraction facility other than a lien to secure the payment of a debt or other obligation.

(q) Personal information has the same meaning as defined in Section 1798.3 of the Civil Code.

(r) Planning and implementation horizon means a 50-year time period over which a groundwater sustainability agency determines that plans and measures will be implemented in a basin to ensure that the basin is operated within its sustainable yield.

(s) Public water system has the same meaning as defined in Section 116275 of the Health and Safety Code.

(t) Recharge area means the area that supplies water to an aquifer in a groundwater basin.

(u) Sustainability goal means the existence and implementation of one or more groundwater sustainability plans that achieve sustainable groundwater management by identifying and causing the implementation of measures targeted to ensure that the applicable basin is operated within its sustainable yield.

(v) Sustainable groundwater management means the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results.

(w) Sustainable yield means the maximum quantity of water, calculated over a base period representative of long-term conditions in the basin and including any temporary surplus that can be withdrawn annually from a groundwater supply without causing an undesirable result.

(x) Undesirable result means one or more of the following effects caused by groundwater conditions occurring throughout the basin:

(1) Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon. Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and groundwater recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods.

(2) Significant and unreasonable reduction of groundwater storage.

(3) Significant and unreasonable seawater intrusion.

(4) Significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies.

(5) Significant and unreasonable land subsidence that substantially interferes with surface land uses.

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(6) Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water.

(y) Water budget means an accounting of the total groundwater and surface water entering and leaving a basin including the changes in the amount of water stored.

(z) Watermaster means a watermaster appointed by a court or pursuant to other law.

(aa) Water year means the period from October 1 through the following September 30,

inclusive.

(ab) Wellhead protection area means the surface and subsurface area surrounding a water well or well field that supplies a public water system through which contaminants are reasonably likely to migrate toward the water well or well field.

Official California Code of Regulations

Title 23. Waters

Division 2. Department of Water Resources

Chapter 1.5. Groundwater Management

Subchapter 2. Groundwater Sustainability Plans

Article 2. Definitions

23 CCR § 351

§ 351. Definitions.

The definitions in the Sustainable Groundwater Management Act, Bulletin 118, and Subchapter 1 of this Chapter, shall apply to these regulations. In the event of conflicting definitions, the definitions in the Act govern the meanings in this Subchapter. In addition, the following terms used in this Subchapter have the following meanings:

(a) “Agency” refers to a groundwater sustainability agency as defined in the Act.

(b) “Agricultural water management plan” refers to a plan adopted pursuant to the Agricultural Water Management Planning Act as described in Part 2.8 of Division 6 of the Water Code, commencing with Section 10800 et seq.

(c) “Alternative” refers to an alternative to a Plan described in Water Code Section 10733.6.

(d) “Annual report” refers to the report required by Water Code Section 10728.

(e) “Baseline” or “baseline conditions” refer to historical information used to project future conditions for hydrology, water demand, and availability of surface water and to evaluate potential sustainable management practices of a basin.

(f) “Basin” means a groundwater basin or subbasin identified and defined in Bulletin 118 or as modified pursuant to Water Code 10722 et seq.

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(g) “Basin setting” refers to the information about the physical setting, characteristics, and current conditions of the basin as described by the Agency in the hydrogeologic conceptual model, the groundwater conditions, and the water budget, pursuant to Subarticle 2 of Article 5.

(h) “Best available science” refers to the use of sufficient and credible information and data, specific to the decision being made and the time frame available for making that decision, that is consistent with scientific and engineering professional standards of practice.

(i) “Best management practice” refers to a practice, or combination of practices, that are designed to achieve sustainable groundwater management and have been determined to be technologically and economically effective, practicable, and based on best available science.

(j) “Board” refers to the State Water Resources Control Board.

(k) “CASGEM” refers to the California Statewide Groundwater Elevation Monitoring Program developed by the Department pursuant to Water Code Section 10920 et seq., or as amended.

(l) “Data gap” refers to a lack of information that significantly affects the understanding of the basin setting or evaluation of the efficacy of Plan implementation, and could limit the ability to assess whether a basin is being sustainably managed.

(m) “Groundwater dependent ecosystem” refers to ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface.

(n) “Groundwater flow” refers to the volume and direction of groundwater movement into, out of, or throughout a basin.

(o) “Interconnected surface water” refers to surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted.

(p) “Interested parties” refers to persons and entities on the list of interested persons established by the Agency pursuant to Water Code Section 10723.4.

(q) “Interim milestone” refers to a target value representing measurable groundwater conditions, in increments of five years, set by an Agency as part of a Plan.

(r) “Management area” refers to an area within a basin for which the Plan may identify different minimum thresholds, measurable objectives, monitoring, or projects and management actions based on differences in water use sector, water source type, geology, aquifer characteristics, or other factors.

(s) “Measurable objectives” refer to specific, quantifiable goals for the maintenance or improvement of specified groundwater conditions that have been included in an adopted Plan to achieve the sustainability goal for the basin.

(t) “Minimum threshold” refers to a numeric value for each sustainability indicator used to define undesirable results.

(u) “NAD83” refers to the North American Datum of 1983 computed by the National Geodetic Survey, or as modified.

(v) “NAVD88” refers to the North American Vertical Datum of 1988 computed by the National Geodetic Survey, or as modified.

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(w) “Plain language” means language that the intended audience can readily understand and use because that language is concise, well-organized, uses simple vocabulary, avoids excessive acronyms and technical language, and follows other best practices of plain language writing.

(x) “Plan” refers to a groundwater sustainability plan as defined in the Act.

(y) “Plan implementation” refers to an Agency's exercise of the powers and authorities described in the Act, which commences after an Agency adopts and submits a Plan or Alternative to the Department and begins exercising such powers and authorities.

(z) “Plan manager” is an employee or authorized representative of an Agency, or Agencies, appointed through a coordination agreement or other agreement, who has been delegated management authority for submitting the Plan and serving as the point of contact between the Agency and the Department.

(aa) “Principal aquifers” refer to aquifers or aquifer systems that store, transmit, and yield significant or economic quantities of groundwater to wells, springs, or surface water systems.

(ab) “Reference point” refers to a permanent, stationary and readily identifiable mark or point on a well, such as the top of casing, from which groundwater level measurements are taken, or other monitoring site.

(ac) “Representative monitoring” refers to a monitoring site within a broader network of sites that typifies one or more conditions within the basin or an area of the basin.

(ad) “Seasonal high” refers to the highest annual static groundwater elevation that is typically measured in the Spring and associated with stable aquifer conditions following a period of lowest annual groundwater demand.

(ae) “Seasonal low” refers to the lowest annual static groundwater elevation that is typically measured in the Summer or Fall, and associated with a period of stable aquifer conditions following a period of highest annual groundwater demand.

(af) “Seawater intrusion” refers to the advancement of seawater into a groundwater supply that results in degradation of water quality in the basin, and includes seawater from any source.

(ag) “Statutory deadline” refers to the date by which an Agency must be managing a basin pursuant to an adopted Plan, as described in Water Code Sections 10720.7 or 10722.4.

(ah) “Sustainability indicator” refers to any of the effects caused by groundwater conditions occurring throughout the basin that, when significant and unreasonable, cause undesirable results, as described in Water Code Section 10721(x).

(ai) “Uncertainty” refers to a lack of understanding of the basin setting that significantly affects an Agency's ability to develop sustainable management criteria and appropriate projects and management actions in a Plan, or to evaluate the efficacy of Plan implementation, and therefore may limit the ability to assess whether a basin is being sustainably managed.

(aj) “Urban water management plan” refers to a plan adopted pursuant to the Urban Water Management Planning Act as described in Part 2.6 of Division 6 of the Water Code, commencing with Section 10610 et seq.

(ak) “Water source type” represents the source from which water is derived to meet the applied beneficial uses, including groundwater, recycled water, reused water, and surface water sources

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identified as Central Valley Project, the State Water Project, the Colorado River Project, local supplies, and local imported supplies.

(al) “Water use sector” refers to categories of water demand based on the general land uses to which the water is applied, including urban, industrial, agricultural, managed wetlands, managed recharge, and native vegetation.

(am) “Water year” refers to the period from October 1 through the following September 30, inclusive, as defined in the Act.

(an) “Water year type” refers to the classification provided by the Department to assess the amount of annual precipitation in a basin.

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Acronyms and Abbreviations

AF	acre-foot/acre-feet
AF/yr	acre-feet per year
Alta MWC	Alta Mutual Water Company
Association	Santa Clara River Protection Association
Basin	Mound Basin
bgs	below ground surface
BMP	best management practices
CALVEG	Classification and Assessment with Landsat of Visible Ecological Groupings
CASGEM	California Statewide Groundwater Elevation Monitoring
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
cfs	cubic feet per second
County	County of Ventura
DAC	Disadvantaged Community
DDW	Department of Drinking Water, State of California
DMS	Data Management System
DTSC	Department of Toxic Substances Control
DWR	Department of Water Resources, State of California
ENSO	El Nino/Southern Oscillation
ET	evapotranspiration
FCGMA	Fox Canyon Groundwater Management Agency
FICO	Farmers Irrigation Company
ft	foot/feet
ft/d	feet per day
ft/yr	feet per year
GDE	groundwater-dependent ecosystem
GIS	geographic information system
GPS	Ground Positioning System
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
HCM	hydrogeologic conceptual model
Hopkins	Hopkins Groundwater Consultants
HSU	hydrostratigraphic unit
HVPAA	Hillside Voter Participation Area Act, City of Ventura

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iGDE	indicators of groundwater-dependent ecosystem
InSAR	interferometric synthetic aperture radar
IRWMP	Integrated Regional Water Management Plan
JPA	joint exercise of powers agreement
LAS	Lower Aquifer System
LUST	Leaking Underground Storage Tank
M&I	Municipal and Industrial
MBAWG	Mound Basin Agricultural Water Group
MBGSA	Mound Basin Groundwater Sustainability Agency
MCL	maximum contaminant level
MCLR	maximum contaminant level range
mg/L	milligrams per liter
mi^2	square miles
mm	millimeter/millimeters
msl	above mean sea level
MWD	Municipal Water District
NAVD88	North American Vertical Datum of 1988
NC	Natural Communities
NCCAG	Natural Communities Commonly Associated with Groundwater
NRCS	Natural Resources Conservation Service
PDO	Pacific Decadal Oscillation
RMSE	root mean square error
RWQCB	Regional Water Quality Control Board
RWQCB-LA	Regional Water Quality Control Board, Los Angeles region
SCAG	Southern California Association of Governments
SDAC	Severely Disadvantaged Communities
SEP	Stakeholder Engagement Plan
SGMA	Sustainable Groundwater Management Act
SMC	Sustainable Management Criteria
SOAR	Save Open Space and Agricultural Resources
SSP&A	S.S. Papadopulos & Associates, Inc.
SWP	State Water Project
SWRCB	State Water Resources Control Board
TDEM	time domain electromagnetic
TDS	total dissolved solids
TNC	The Nature Conservancy
TSS	Technical Support Services

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UAS	Upper Aquifer System
United	United Water Conservation District
USDA	United States Department of Agriculture
USGS	United States Geological Survey
VCWPD	Ventura County Watershed Protection District
Ventura Water	a City of Ventura department for water supply
VWRF	Ventura Water Reclamation Facility
WQO	Water Quality Objective
WRF	Water Reclamation Facility
WWTP	Wastewater Treatment Plant

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1.0 Introduction to Plan Contents [Article 5 §354]

§354 Introduction to Plan Contents. *This Article describes the required contents of Plans submitted to the Department for evaluation, including administrative information, a description of the basin setting, sustainable management criteria, description of the monitoring network, and projects and management actions.*

In 2014, the State of California enacted the Sustainable Groundwater Management Act (SGMA). This law requires groundwater basins in California that are designated as medium or high priority be managed sustainably. Satisfying the requirements of SGMA generally requires five basic activities:

1. Form one or multiple Groundwater Sustainability Agency(s) (GSAs) to fully cover the basin;
2. Develop one or more Groundwater Sustainability Plan(s) (GSPs) that fully cover the basin;
3. Implement the GSP to achieve sustainable groundwater management;
4. Annual reporting to the California Department of Water Resources (DWR); and
5. Prepare and submit a written assessment of the GSP at least every five years to DWR and amend the GSP as necessary.

Mound Basin Groundwater Sustainability Agency (MBGSA) was formed in 2017 to satisfy the requirement for a GSA to fully cover the Mound Basin (DWR Basin 4-004.03) (Basin). MBGSA was designated as the exclusive GSA for the Basin by the State on September 30, 2017. MBGSA developed this document to fulfill the GSP requirements for the Basin. This GSP provides administrative information, describes the Basin setting, develops quantitative sustainable management criteria (SMC) that consider the interests of all beneficial uses and users of groundwater, and identifies projects and management actions and monitoring networks that will ensure the Basin is demonstrably managed in a sustainable manner within the 20-year sustainability timeframe (2042) and for the duration of the entire 50-year planning and implementation horizon (2072).

Following submittal of an initial notification on September 17, 2018 (Appendix A), MBGSA developed this GSP to comply with SGMA's statutory and regulatory requirements. As such, the GSP uses the terminology set forth in these requirements (see e.g. Water Code §10721 and 23 CCR §351) which is oftentimes different from the terminology utilized in other contexts (e.g. past reports or studies, past analyses, judicial rules or findings). The definitions from the relevant statutes and regulations are provided in the section titled "Definitions of Key SGMA Terms."

The GSP includes all of the required elements of the GSP Emergency Regulation organized into eight sections plus appendices as follows:

- **Section 1 - Introduction to Plan Contents** provides an overview of SGMA and the plan contents.
- **Section 2 - Administrative Information** provides information about the GSA, a description of the Plan area, and a summary of information relating to notification and communication by the Agency with other agencies and interested parties.
- **Section 3 - Basin Setting** describes the hydrogeologic conceptual model (HCM) of the Basin, current and historical groundwater conditions, the Basin water budget, and designated management areas within the Basin.

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- **Section 4 - Sustainable Management Criteria** describes the Basin sustainability goal and the SMC developed for each of the applicable SGMA sustainability indicators. The applicable sustainability indicators for the Basin are Chronic Lowering of Groundwater Levels, Reduction of Groundwater Storage, Seawater Intrusion, Degraded Water Quality, and Land Subsidence. The Depletions of Interconnected Surface Water sustainability indicator is not applicable to the Basin.
- **Section 5 - Monitoring Networks** describes the monitoring networks that will be utilized to characterize groundwater and surface water conditions in the Basin, evaluate changing conditions that occur through implementation of the Plan, and demonstrate sustainable management.
- **Section 6 - Projects and Management Actions** describes projects and management actions included in the GSP to meet the sustainability goal for the Basin in a manner that can be maintained over the planning and implementation horizon.
- **Section 7 - Plan Implementation** describes steps to implementation, plan implementation costs, and plan funding.
- **Section 8 - References and Technical Studies**: provides a list of references and technical studies relied upon by the GSA in developing the Plan.

Appendices provide supporting information referred to in the GSP:

- MBGSA's Initial Notification to DWR for the GSP is provided in Appendix A.
- This GSP meets regulatory requirements established by the DWR as shown in Appendix B, the Elements of the Plan table.
- The formation of MBGSA Pursuant to Water Code §10723.8 is provided in Appendix C.
- The plan for MBGSA's engagement with stakeholders is provided in Appendix D.
- A list of public meetings held with MBGSA pursuant to §354.10 is provided in Appendix E.
- Comments and responses regarding the GSP pursuant to §354.10 are provided in Appendix F.
- Appendix G provides supplemental information regarding the Shallow Alluvial Deposits and the Santa Clara River in relation to the principal aquifers of the Basin.
- Areas Containing Indicators of Potential Groundwater-Dependent Ecosystems (iGDEs) are mapped in Appendix H.
- Minimum Thresholds and Measurable Objectives associated with time-series plots of modeled versus observed groundwater level are provided in Appendix I.
- Minimum Thresholds and Measurable Objectives associated with time-series plots of water quality data are provided in Appendix J.
- The approach to estimating annual change in storage for the Basin in provided in Appendix K.
- The Data Management System (DMS) documentation is provided in Appendix L.

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2.0 Administrative Information [Article 5, SubArticle 1]

§354.2 Introduction to Administrative Information. *This Subarticle describes information in the Plan relating to administrative and other general information about the Agency that has adopted the Plan and the area covered by the Plan.*

Section 2 describes information relating to administration and other general information about MBGSA and the area covered by the GSP.

2.1 Agency Information [§354.6]

This section describes the MBGSA and its authority in relation to the SGMA. MBGSA is the exclusive GSA for Mound Basin (Department of Water Resources Basin 4-004.03), located in western Ventura County (Figures 2.1-01 and 2.1-02)

MBGSA was formed in 2017, pursuant to a joint exercise of powers agreement (JPA) between three local public agencies overlying the Basin: the City of San Buenaventura, the County of Ventura, and the United Water Conservation District (United) (Figure 2.1-01). The City of San Buenaventura is a local municipality that exercises water supply, water management, and land use authority within the city's boundaries. The County of Ventura exercises water management and land use authority on a portion of the land overlying the Mound Basin. See Figure 2.1-03 for land use information. United was formed in 1950 under the State of California's Water Conservation District Law of 1931 and is organized as a governmental special district. United does not produce water from the Basin, but is authorized to engage in groundwater replenishment of the Basin.

Per §10723.8(a) of the California Water Code, MBGSA gave notice to DWR of its decision to form a GSA for the Basin on June 28, 2017. Copies of the information required pursuant to Water Code §10723.8 for GSA Formation, updated as appropriate, is provided in Appendix C. MBGSA was designated as the exclusive GSA for the Basin by the State on September 30, 2017.

2.1.1 Name and Mailing Address [§354.6(a)]

§354.6 Agency Information. *When submitting an adopted Plan to the Department, the Agency shall include a copy of the information provided pursuant to Water Code Section 10723.8, with any updates, if necessary, along with the following information:*

(a) *The name and mailing address of the Agency.*

- GSA Name: Mound Basin Groundwater Sustainability Agency
- GSA Mailing Address: P.O. Box 3544, Ventura, CA 93006-3544

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2.1.2 Organization and Management Structure [§354.6(b)]

§354.6 Agency Information. *When submitting an adopted Plan to the Department, the Agency shall include a copy of the information provided pursuant to Water Code Section 10723.8, with any updates, if necessary, along with the following information:*

***(b)** The organization and management structure of the Agency, identifying persons with management authority for implementation of the Plan.*

MBGSA is governed by a five-member board comprised of one director appointed by each member public agency (City of San Buenaventura, the County of Ventura, and United) and two stakeholder directors representing agricultural and environmental interests. MBGSA contracts with Bondy Groundwater Consulting, Inc. (Bryan Bondy), who serves as the Agency's Executive Director and GSP Plan Manager. MBGSA contracts with member agency United for financial and administrative support. The Executive Director manages day-to-day operations of the Agency, while Board Members vote on actions of the MBGSA. The Board of Directors is MBGSA's decision-making body. Further information about MBGSA's organization and management structure can be found in the MBGSA JPA and MBGSA Bylaws, which are included in Appendix C.

2.1.3 Plan Manager and Contact Information [§354.6(c)]

§354.6 Agency Information. *When submitting an adopted Plan to the Department, the Agency shall include a copy of the information provided pursuant to Water Code Section 10723.8, with any updates, if necessary, along with the following information:*

***(c)** The name and contact information, including the phone number, mailing address and electronic mail address, of the plan manager.*

- Mound Basin GSA Executive Director: Bryan Bondy, PG, CHG
- Phone Number: (805) 212-0484
- Email: bryan@moundbasingsa.org
- Mailing Address: P.O. Box 3544, Ventura, CA 93006-3544
- Website: www.moundbasingsa.org

2.1.4 Legal Authority [§354.6(d)]

§354.6 Agency Information. *When submitting an adopted Plan to the Department, the Agency shall include a copy of the information provided pursuant to Water Code Section 10723.8, with any updates, if necessary, along with the following information:*

***(d)** The legal authority of the Agency, with specific reference to citations setting forth the duties, powers, and responsibilities of the Agency, demonstrating that the Agency has the legal authority to implement the Plan.*

MBGSA has legal authority to perform duties, exercise powers, and accept responsibility for managing groundwater sustainably within the Mound Basin. MBGSA's legal authority comes from the SGMA, the JPA signed by MBGSA member agencies, and the MBGSA Bylaws. The JPA and bylaws are included in Appendix C. These laws and agreements, taken together, provide the necessary legal authority for the MBGSA Board to carry out the preparation and implementation of the Basin's GSP. Figures 2.1-01 and 2.1-02 show the extent of the GSP plan area, along with the jurisdictional boundary of each of the Member

Agencies of MBGSA's JPA. Figure 2.1-01 demonstrates that the entire Basin is covered by MBGSA. Therefore, MBGSA has the legal authority to implement this GSP throughout the entire plan area.

Each of the Member Agency is a local agency eligible to become a GSA (Water Code §10723(a). The Member Agencies are described below.

City of San Buenaventura

The City of San Buenaventura (usually referred to as Ventura), located on the shore of the Pacific Ocean in western Ventura County, was founded as a Spanish mission in 1782 and incorporated as a town in 1866 and is the county seat of Ventura County. The City administers land use within its municipal boundaries and is the largest land use jurisdiction within the Basin. Ventura Water (a City of Ventura department for water supply) provides retail potable water service with the City limits and portions of unincorporated Ventura County that meet the City's policy for water connections outside City limits (Municipal Code Section 22.110.055). The City's potable water supply is derived from a variety of sources, including Mound Basin groundwater. Sources located outside of Mound Basin include groundwater extracted from the adjacent Santa Paula and Oxnard Basins, subsurface water from the Ventura River (Upper Ventura River Valley Basin), and Lake Casitas (Casitas Municipal Water District [MWD]). The City also provides recycled water from the Ventura Water Reclamation Facility (VWRF). The City operates its water supply system by utilizing a conjunctive use operating procedure. The City relies more heavily on surface water sources (such as the Ventura River and Lake Casitas) during wet years while letting groundwater sources rest. During dry years, when the surface water sources are reduced, the City relies more heavily on groundwater sources to meet demands. Conjunctive use of groundwater sources is limited by the requirement to maintain long-term production from the groundwater basins within their safe or operational yield. Conjunctive use also requires treatment and blending ratios to meet water quality goals. The City also has an entitlement from the California State Water Project (SWP) of 10,000 acre-feet per year (AF/yr). To date the City has not received any of this water because there are no existing facilities to get the water directly into the City's distribution system. However, the City is currently working on the design of the State Water Interconnection Project that will enable the City to receive its State Water allocation through a connection to Calleguas MWD. Construction of the Project is expected to begin in 2022.

United Water Conservation District

In 1925, the founding organization of today's United Water Conservation District, the Santa Clara River Protection Association (Association), was formed to protect the runoff of the Santa Clara River from being exported outside the watershed. This effort was successful, and in 1927, the Association was reorganized into the Santa Clara Water Conservation District by vote of the county residents. In 1950, the voters approved the formation of the District under the State Water Conservation Act of 1931, as the United Water Conservation District, to recognize the projected population growth within the District and the need for a reliable water source. The Santa Clara Water Conservation District was then dissolved and the assets transferred to the District. This allowed the District to issue bonds in order to raise funding for construction of the Santa Felicia Dam, creating Lake Piru and other conservation facilities. The District is divided into seven divisions and is governed by an elected seven-member Board of Directors, serving four-year staggered terms.

The District covers approximately 214,000 acres in central Ventura County, California. The District's mission is to manage, protect, conserve, and enhance the water resources of the District and produce a reliable and sustainable supply of groundwater for the reasonable and beneficial use of all users. The District accomplished its mission by constructing, maintaining, and operating facilities along the Santa Clara River and its tributaries to replenishment to groundwater basins within its service area, including the Mound Basin.

Ventura County

The County of Ventura (County) was founded in 1873 and has a total area of 2,208 square miles. The County does not provide water service but does permit and regulate groundwater wells and staffs the Ventura County Watershed Protection District (VCWPD), which participates in countywide planning and management efforts on a variety of water resource programs, including water quality, storm water management, and flood control.

2.2 Description of Plan Area [§354.8]

This section provides a description of the Plan area, including a summary of jurisdictional areas and existing water-resources monitoring and management programs in Mound Basin.

2.2.1 Summary of Jurisdictional Areas and Other Features [§354.8(a)(1),(a)(2),(a)(3),(a)(4),(a)(5), and (b)]

§354.8 Description of Plan Area. *Each Plan shall include a description of the geographic areas covered, including the following information:*

(a) *One or more maps of the basin that depict the following, as applicable:*

- ***(1)*** *The area covered by the Plan, delineating areas managed by the Agency as an exclusive Agency and any areas for which the Agency is not an exclusive Agency, and the name and location of any adjacent basins.*
- ***(2)*** *Adjudicated areas, other Agencies within the basin, and areas covered by an Alternative.*
- ***(3)*** *Jurisdictional boundaries of federal or state land (including the identity of the agency with jurisdiction over that land), tribal land, cities, counties, agencies with water management responsibilities, and areas covered by relevant general plans.*
- ***(4)*** *Existing land use designations and the identification of water use sector and water source type.*
- ***(5)*** *The density of wells per square mile, by dasymetric or similar mapping techniques, showing the general distribution of agricultural, industrial, and domestic water supply wells in the basin, including de minimis extractors, and the location and extent of communities dependent upon groundwater, utilizing data provided by the Department, as specified in Section 353.2, or the best available information.*

(b) *A written description of the Plan area, including a summary of the jurisdictional areas and other features depicted on the map.*

The geographic area covered by this GSP and managed by MBGSA includes the entire Mound Basin (DWR Basin No. 4-004.03), as defined by DWR Bulletin No. 118, "California's Groundwater," Update 2020 (DWR, 2021a). The extent of Mound Basin is shown on Figures 2.1-01 and 2.1-02. The Mound Basin is bordered by the Oxnard Subbasin (DWR Basin No. 4-004.02) to the south and the Santa Paula Subbasin (DWR Basin

No. 4-004.04) to the east. The Oxnard Subbasin is managed by the Fox Canyon Groundwater Management Agency (FCGMA) pursuant to pre-SGMA legislation and SGMA. The Santa Paula Subbasin is adjudicated.

Figure 2.1-01 also delineates the jurisdictional boundaries of Ventura County, the City of San Buenaventura (Ventura), and other agencies with water management responsibilities in Mound Basin (specifically, United and Casitas MWD). Three of the four overlying agencies (Ventura County, City of Ventura, and United) are Member Agencies of the MBGSA JPA, as detailed in Section 2.1. More information about the water resource management roles of these agencies is provided in Section 2.2.2. There are no adjudicated areas located within the Mound Basin. State and Federal Land within the Mound Basin includes two State Beaches (San Buenaventura State Beach and McGrath State Beach [California Department of Parks and Recreation]) and The Channel Islands National Park Visitors Center (Department of Interior) (Figure2.1-03). The Mound Basin lies within the traditional tribal territory of the Chumash; however, there are no tribal trust lands located within the Basin.

Land use planning agencies in the Basin include the City of Ventura (within the City limits) and County of Ventura (unincorporated areas outside of the City limits) (Figure 2.1-03). The City of Oxnard overlies a very small area in the southwestern corner of the Basin and has land use planning jurisdiction there, although most of this area overlaps with McGrath State Beach (Figure 2.1-03). The Basin is covered by the general plans of the above-listed entities. Further details concerning land use are provided in Section 2.2.3.

The City of Ventura occupies much of the land area in Mound Basin and the single largest existing land use in the Basin (in terms of area) is low-density residential, as shown on Figure 2.1-03. Inspection of Figure 2.1-03 indicates that commercial, public/institutional, industrial, and related municipal land use designations also occupy much of Mound Basin. The water use sector for these land use designations is collectively referred to in this GSP as “municipal and industrial” (M&I). Sources of water for the M&I sector in Mound Basin include local groundwater extracted from City of Ventura wells in the Basin, groundwater extracted by the City of Ventura from the adjacent Santa Paula and Oxnard basins and from the Upper Ventura River Basin (not an immediately adjacent basin), and surface water imported from the Ventura River Watershed, which is purchased from Casitas MWD. Details regarding sources and volumes of water used by the M&I and other sectors in Mound Basin is provided in Section 3.1.4.4.

Another water use sector and land use designation in Mound Basin is agricultural, which occupies three separate areas of farmland in the eastern and southwestern portions of Mound Basin (Figure 2.1-03). Sources of water for the agricultural sector in Mound Basin include local groundwater extracted from wells in the Basin and groundwater extracted from the adjacent Santa Paula and Oxnard basins.

The third major land use designation in Mound Basin is open space, consisting largely of undeveloped land in the Hillside Protection Area (Figure 2.1-03) in the foothills of the northern part of the Basin. Very little water is applied to land designated as open space in Mound Basin, although small quantities of water from the M&I sector may be applied to orchards, residential landscaping, and parks along the margins and within the open space-designated area.

Figure 2.2-04 shows the density of wells per square mile and locations of known agricultural and M&I water supply wells in the Basin. There are no known de minimis extractors in the Mound Basin. The communities within the Basin are partially dependent upon groundwater from the Mound Basin. The City of Ventura supplies water to the communities within the Basin and has a diverse water supply portfolio

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that includes groundwater and surface water supplies from outside of the Basin. Although Mound Basin groundwater is an important source of water supply for the communities located within the Basin, the communities are not considered to be "dependent" on Mound Basin groundwater because it is only one component of the City's water supply portfolio.

2.2.2 Water Resources Monitoring and Management Programs [§354.8(c) and (d)]

2.2.2.1 Existing Water Resource Monitoring Programs [§354.8(c) and (d)]

§354.8 Description of Plan Area. *Each Plan shall include a description of the geographic areas covered, including the following information:*

(c) *Identification of existing water resource* ***monitoring*** *and management programs, and description of any such programs the Agency plans to incorporate in its monitoring network or in development of its Plan. The Agency may coordinate with existing water resource monitoring and management programs to incorporate and adopt that program as part of the Plan.*

(d) *A description of how existing water resource* ***monitoring*** *or management programs may limit operational flexibility in the basin, and how the Plan has been developed to adapt to those limits.*

Existing water resources monitoring programs are listed in Table 2.2-01.

The water resources monitoring programs that have significant relevance to this GSP are the United, Ventura Water, and VCWPD groundwater resource monitoring programs. Details regarding groundwater monitoring locations (i.e., wells) and parameters monitored by these agencies/programs are provided in Section 5. In summary, United monitors groundwater quality and/or elevations in 20 wells across Mound Basin, while Ventura Water monitors their two active M&I water supply wells in the Basin, and VCWPD variably monitors two to four wells (currently or formerly used for agricultural and industrial water supply) in the Basin. VCWPD is the California Statewide Groundwater Elevation Monitoring (CASGEM) monitoring entity for the Basin. VCWPD compiles the groundwater level data gathered by Ventura County staff with that gathered by other agencies and uploads the data to the CASGEM website in accordance with CASGEM program requirements. VCWPD will continue in this role and provide data consistent with the CASGEM program. The MBGSA plans to continue coordinating with these other programs/agencies to obtain groundwater elevation and quality data to support GSP development, monitoring, and annual reporting, as detailed in Section 5.

As described in more detail in Sections 3.1 and 3.3, surface water is not diverted for beneficial uses from surface water bodies located within the Mound Basin. VCWPD monitors rainfall and surface water flow in selected streams (barrancas) in Mound Basin, as described in more detail in Sections 3.1, 3.2, and 3.3. VCWPD also monitors surface water flow in the Santa Clara River in the Oxnard Basin approximately 1.5 miles upstream from Mound Basin, as described in Sections 3.2 and 3.3. The City of Ventura monitors surface water quality in the Santa Clara River Estuary, pursuant to the discharge permit for the VWRF.

The existing water resource monitoring programs do not limit operational flexibility in the Basin.

2.2.2.2 Existing Water Resource Management Programs [§354.8(c) and (d)]

> ***§354.8 Description of Plan Area.*** *Each Plan shall include a description of the geographic areas covered, including the following information:*
>
> ***(c)*** *Identification of existing water resource monitoring and* ***management programs****, and description of any such programs the Agency plans to incorporate in its monitoring network or in development of its Plan. The Agency may coordinate with existing water resource monitoring and management programs to incorporate and adopt that program as part of the Plan.*
>
> ***(d)*** *A description of how existing water resource monitoring or* ***management programs*** *may limit operational flexibility in the basin, and how the Plan has been developed to adapt to those limits.*

Existing water resources management programs within the Basin are listed in Table 2.2-02. The key existing water resource management programs are described below.

City of Ventura Urban Water Management Plan and Related Planning Programs

The City's Urban Water Management Plan (Kennedy/Jenks Consultants, 2021a) describes their existing and planned sources of water supply and demand, as well as their water management programs. The City's 2020 Comprehensive Water Resources Report (Ventura Water, 2020b) provides updated information and projections on impacts of the City's water resources management program. Another related planning document is the City's Water Shortage Event Contingency Plan (Kennedy/Jenks Consultants, 2021b), which identifies actions to be taken during the various stages of a water shortage. The City's Urban Water Management Plan and related documents contain certain elements that reduce the likelihood of exceedances of the City's Mound Basin groundwater extraction projections used in the development of this GSP:

- **Demand Management Measures**: Existing and planned water conservation measures within the City of Ventura have resulted in reductions in M&I water use in Mound Basin, as described in Section 3.3. This reduced demand has been incorporated into the projections for future water use in Mound Basin in this GSP.
- **Recycled Water Reuse**: The City currently distributes approximately 564 AF/yr of treated recycled water for landscape and golf course irrigation (Kennedy/Jenks Consultants, 2021a). The City is currently in the planning phases for the proposed VenturaWaterPure Project, which includes additional diversion of tertiary treated effluent to a new Advanced Water Purification Facility for potable reuse. The future water supply that will be provided by the VenturaWaterPure Project is projected to be 2,800 AF/yr after 2025 and 4,000 AF/yr after 2030 (Ventura Water, 2020b; Kennedy/Jenks Consultants 2021a).
- **State Water Interconnection Project**: The City has a 10,000 AF/yr allocation from the California SWP. To date, the City has not constructed the improvements necessary to receive direct delivery of its allocation. Ventura Water is pursuing the State Water Interconnection Project with Calleguas MWD, Casitas MWD, and United. The projected available water supply for SWP water delivered by the State Water Interconnection Project is estimated to be 2,075-10,000 AF in 2025 and 0-10,000 AF in 2030 (Ventura Water, 2020b).
- **Water Shortage Event Contingency Plan (Kennedy/Jenks Consultants, 2021b)**: This plan provides criteria for when and how voluntary and mandatory water use restrictions are implemented during droughts or other emergency occurred that limited availability of water

supply within the City's service area. The project will reduce the potential for increased City demand for Mound Basin groundwater.

The City of Ventura's Urban Water Management Plan (Kennedy/Jenks, 2021b) and related planning programs do not limit operational flexibility in the Basin.

Casitas MWD Urban Water Management and Agricultural Water Management Plan

Casitas MWD's 2020 update to its Urban Water Management and Agricultural Water Management Plan (Casitas MWD, 2021) describes their existing and planned sources of water supply and demand, as well as their water management programs. Casitas MWD provides surface water to the City of Ventura, some of which is imported to Mound Basin. Similar to the City of Ventura's Urban Water Management Plan, the Casitas MWD plan includes descriptions of their water-resource management programs, including:

- Water shortage contingency planning.
- Demand management measures.
- Planned expansion of their portfolio of water supplies (including imports from the California SWP).

Elements of Casitas MWD's Urban Water Management and Agricultural Water Management Plan were used to inform development of the City of Ventura's 2020 Comprehensive Water Resources Report (Ventura Water, 2020b), which in turn was used to project future water use in Mound Basin in this GSP.

Watersheds Coalition of Ventura County Integrated Regional Water Management Plan

The Integrated Regional Water Management Plan (IRWMP) prepared by the Watersheds Coalition of Ventura County (2019) includes several "resource management strategies" that have the potential to directly or indirectly affect water resources management in Ventura County, including the Santa Clara River Watershed and Mound Basin. Some of the management strategies listed in the IRWMP that could potentially affect water-resources management by the MBGSA include the following:

- **Reduce Water Demand**: Includes a list of agricultural water efficiency best-management practices (BMPs) for agriculture and notes that urban water use efficiency practices and standards are implemented by urban water suppliers in Urban Water Management Plans.
- **Improve Operational Efficiency and Transfers**: Summarizes the effects of conveyance projects (for importing water from other areas or within Mound Basin), system reoperation, and water transfers.
- **Increase Water Supply**: Describes the benefits of conjunctive-use projects, desalination of seawater or brackish water, precipitation enhancement, municipal recycled water use, surface storage.
- **Increase Water Supply**: Describes several actions or policies that can improve water quality, including drinking water treatment and distribution, groundwater and aquifer remediation, matching water quality to use, pollution prevention, salt and salinity management, and urban storm water runoff management.

- **Practice Resources Stewardship**: Provides definitions for, and summarizes benefits of, the following activities: agricultural lands stewardship, ecosystem restoration, forest management, land use planning and management, sediment management, and watershed management.
- **People and Water**: Describes approaches for engaging the public in water-resources management, including economic incentives, outreach and engagement, "water and culture," and water-dependent recreation.
- **Other Strategies**: Summarizes potential future sources of supply or strategies for improving water-resources management, including crop idling for water transfers, "dewvaporation" for atmospheric pressure desalination, fog collection, irrigated land retirement, "rainfed agriculture," snow fences (at higher elevations in the Santa Clara River watershed), and "waterbag" transport/storage technology (towing water by ship from other coastal regions in inflatable bladders).

These IRWMP management strategies are not anticipated to limit operational flexibility.

2.2.2.3 Conjunctive-Use Programs [§354.8(e)]

§354.8 Description of Plan Area. *Each Plan shall include a description of the geographic areas covered, including the following information:*
(e) *A description of conjunctive use programs in the basin.*

The City of Ventura's surface water imports to Mound Basin from Casitas MWD comprise a conjunctive-use program, as described in the Ventura Water (2020b) Comprehensive Water Resources Report:

> *"The City (of Ventura) operates its water supply system by utilizing a conjunctive use operating procedure. The City relies more heavily on surface water sources (such as the Ventura River and Lake Casitas) during wet years while letting groundwater sources rest. During dry years, when the surface water sources are reduced, the City relies more heavily on groundwater sources to meet demands. Conjunctive use of groundwater sources is limited by the requirement to maintain long-term production from the groundwater basins within their safe or operational yield. Conjunctive use also requires treatment and blending ratios to meet water quality goals."*

More detail regarding quantities and sources of Ventura Water's surface water use in Mound Basin is provided in Section 3.1 and 3.3. According to the Ventura Water (2020b) Comprehensive Water Resources Report, the City intends to continue their conjunctive use of surface water and groundwater into the foreseeable future. This conjunctive-use program has been incorporated into the projections for future water supply and demand in Mound Basin in this GSP.

United operates a conjunctive-use program in the Forebay area of the Oxnard Basin, adjacent to Mound Basin (Figure 2.1-02) consisting of artificial recharge of 60,000 to 70,000 AF/yr of surface water diverted from the Santa Clara River, followed by groundwater extraction by United and other groundwater users (United, 2018). As described in Section 3.3, artificial recharge by United during high-rainfall years raises groundwater levels in Oxnard Basin sufficiently to induce substantial volumes of groundwater underflow

from Oxnard Basin to Mound Basin. This conjunctive-use program has been incorporated into the projected water budget for Mound Basin in this GSP (Section 3.3).

2.2.3 Land Use/General Plans

The Basin is dominated by residential, commercial, and industrial land uses located within incorporated areas of the City of Ventura and collectively accounts for approximately 58% of Basin land acreage (Figure 2.1-03). Residential uses vary between large rural parcels with few impervious surfaces to suburban and urban residential parcels associated with higher development densities and surrounded by more impervious surfaces, wider roads, and more sidewalks. Open space accounts for approximately 13% of Basin land acreage. The key area open space that is relevant to this GSP is the hillsides along the northern part of the Basin where the principal aquifers receive recharge (Figure 3.1-11). Agricultural land accounts for approximately 1,972 acres of the Basin (approximately 14% of the Basin land area) (Figure 2.1-03). Agricultural land is not located in any key Basin recharge areas.

2.2.3.1 Land Use and General Plans Summary [§354.8(f)(1),(f)(2), and (f)(3)]

§354.8 Description of Plan Area. *Each Plan shall include a description of the geographic areas covered, including the following information:*

(f) *A plain language description of the land use elements or topic categories of applicable general plans that includes the following:*

(1) *A summary of general plans and other land use plans governing the basin.*

(2) *A general description of how implementation of existing land use plans may change water demands within the basin or affect the ability of the Agency to achieve sustainable groundwater management over the planning and implementation horizon, and how the Plan addresses those potential effects.*

(3) *A general description of how implementation of the Plan may affect the water supply assumptions of relevant land use plans over the planning and implementation horizon.*

California state law requires that cities and counties prepare and adopt a "comprehensive long-term general plan for the physical development of the county or city" and that "elements and parts [of the plan] comprise an integrated, internally consistent and compatible statement of policies for the adopting agency" (California Government Code, §65300 and §65300.5). Among the required elements of the plan is the conservation, development, and utilization of water developed in coordination with groundwater agencies such as MBGSA (California Government Code, §65302[d][1]).

All existing general plans and future updates undergo an analysis of environmental impacts under the California Environmental Quality Act (CEQA). In addition, all discretionary projects proposed within the Oxnard Subbasin under municipal, County, and/or state jurisdiction are required to comply with CEQA. In 2019, the Governor's Office of Planning and Research released an update to the CEQA Guidelines that included a new requirement to analyze projects for their compliance with adopted GSPs. Specifically, the applicable significance criteria include the following:

- Would the program or project substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?
- Would the program or project conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?

Therefore, to the extent general plans allow growth that could have an impact on groundwater supply, such projects would be evaluated for their consistency with adopted GSPs and for whether they adversely impact the sustainable management of the Basin. Under CEQA, potentially significant impacts identified must be avoided or substantially minimized unless significant impacts are unavoidable, in which case the lead agency must adopt a statement of overriding considerations.

The following sections contain a description of the land use plans that are applicable to sustainable groundwater management planning within the Mound Basin, a discussion of the consideration given to the land use plans, and an assessment of how the GSP may affect those plans. The plans included were selected as the plans with the most salient information relating to sustainable management. General plans are considered applicable to the GSP to the extent that they may change water demands within the Mound Basin or affect the ability of the GSA to achieve sustainable groundwater management over the planning and implementation horizon.

General Plans applicable to the Mound Basin are the City of Ventura General Plan (City of Ventura, 2005) and the Ventura County General Plan (County of Ventura, 2020). Most of the Basin falls within incorporated areas of the City of Ventura (Figure 2.1-01). The unincorporated areas within the Basin include mostly agricultural land use and open space that fall under the County of Ventura's General Plan, although the agricultural areas also fall within the planning area addressed in the City of Ventura's General Plan. A small area (0.5 square miles) of the Basin falls within the City of Oxnard's planning area, but implementation of this general plan (City of Oxnard, 2014) is expected to have a negligible effect on GSP implementation in the Mound Basin.

In addition to the General Plans, it is important to understand that the agricultural land and open space in the Basin lies is subject to the City of Ventura and County of Ventura Save Open Space and Agricultural Resources (SOAR) voter initiatives currently approved through 2050 (SOAR, 2015). The SOAR initiatives require a majority vote of the people to rezone unincorporated open space, agricultural, or rural land for development. In addition to the SOAR initiatives, the City of Ventura Hillside Voter Participation Area Act (HVPAA), also approved through 2050, requires voter approvals for development or the extension of City urban services into the hillsides. The existence of the SOAR and HVPPA make it very unlikely that a material change in land use will occur during the foreseeable future. Because agricultural land and open space is not expected to convert to other uses, it is assumed that there is little potential for new development that could impact basin recharge or water demands. These assumptions will be revisited during each five-year GSP assessment.

2005 Ventura General Plan

The current version of the City of Ventura's General Plan was adopted in 2005 (City of Ventura, 2005), which has a planning horizon of 2025. The City of Ventura launched the first phase to update its General Plan in November 2020.

Most of the Basin falls within the incorporated limits of the City of Ventura, which consists of predominantly residential, commercial, and industrial land uses (Figure 2.1-03). Present City policy does not include specific growth targets and instead promotes a "Smart Growth" approach that emphasizes creating a "well-planned and designed community" and preserving open space and farmland. The plan calls for measured and appropriate growth in Ventura by prioritizing areas appropriate for additional development based on community values and infrastructure potential. Importantly, the plan emphasizes

an "Infill First" strategy to help avoid sacrificing farmland and sensitive areas in hillsides, which lie predominantly at the edges of the City. Most growth is anticipated to occur within the existing City limits in the "Infill" areas. The development potential within the remainder of the City is very limited. Growth in open space and agricultural areas is unlikely to occur given the City's General Plan policies and the involvement of groups such as SOAR and HVPPA.

As of December 2019, there are 47 infill development projects that are either approved or under construction. The estimated water demand for these projects is 921 AF/yr, and these demands are included into City's forecasts cited elsewhere in this GSP. Going forward, development is not expected to impact water demand for groundwater in the Mound Basin because the City's Water Rights Dedication and Water Resource Net Zero Fee Ordinance and Resolution ("Net Zero Policy") adopted June 6, 2016, requires all new and intensified development to offset the demand associated with its impact on the City's potable water system.

Offsets can take the form of water rights dedication (i.e. transfer existing rights to extract groundwater from the Mound Basin or the adjacent Oxnard or Santa Paula basins) or payment of a fee that funds development of new City water supplies. Future water supplies include VenturaWaterPure (potable reuse of advanced treated tertiary treated effluent from the VWRF and an interconnection with Calleguas MWD that will allow the City to access its 10,000 AF/yr Table A entitlement from the California SWP. Infill development is expected to have a very small impact on groundwater because the total area with infill potential is small, infill areas are not located in the principal recharge area of the Basin, and because the General Plan includes a policy to helps maintain groundwater recharge:

- Action 5.16: Require new developments to incorporate storm water treatment practices that allow percolation to the underlying aquifer and minimize offsite surface runoff utilizing methods such as pervious paving material for parking and other paved areas to facilitate rainwater percolation and retention/detention basins that limit runoff to pre-development levels.

Approximately 556 acres of agricultural lands within the Basin is located within the City's sphere of influence in the eastern part of the Basin (approximately 4% of the Basin land area) (Figure 2.1-01). Another 1,267 acres of agricultural land within the Basin is located outside of the City's sphere of influence in the western part of the Basin (approximately 9% of the Basin land area) (Figure 2.1-01).

The City of Ventura's General Plan (City of Ventura, 2005) includes numerous elements that discourage development of agricultural land:

- **Policy 3C**: Maximize use of land in the city before considering expansion
- **Action 3.14**: Utilize infill, to the extent possible
- **Policy 3D**: Continue to preserve agricultural and other open space lands within the City's Planning Area
- **Action 3.20**: Pursuant to SOAR, adopt development code provisions to "preserve agricultural and open space lands as a desirable means of shaping the City's internal and external form and size, and of serving the needs of the residents.

The key area open space that is relevant to this GSP is the hillsides along the northern part of the Basin where the principal aquifers receive recharge (Figure 3.1-11). The hillsides open space lies predominantly

outside of the incorporated limits of the City and the City's sphere of influence (Figure 2.1-01). Nonetheless, the City's General Plan includes numerous elements that discourage development in this area:

- **Policy 1B**: Increase the area of open space protected from development impacts.
- **Action 1.12**: Update the provisions of the Hillside Management Program as necessary to ensure protection of open space lands.
- **Action 1.13**: Recommend that the City's Sphere of Influence boundary be coterminous with the existing City limits in the hillsides in order to preserve the hillsides as open space.
- **Action 1.14**: Work with established land conservation organizations toward establishing a Ventura hillsides preserve.
- **Action 1.15**: Actively seek local, State, and federal funding sources to achieve preservation of the hillsides.

As mentioned earlier, the existence of the SOAR and HVPPA make it very unlikely that a material amount of open space or agricultural land will be developed during the foreseeable future. Because agricultural land and open space is not expected to convert to other uses, it is assumed that there is little potential for new development in these areas that could impact basin recharge or water demands. These assumptions will be revisited during each five-year GSP assessment.

County of Ventura 2040 General Plan

The Ventura County 2040 General Plan (County of Ventura, 2020) applies to the County as a whole and includes area-specific plans for distinct unincorporated areas.

The key recharge area that is relevant to this GSP is the open space on the hillsides along the northern part of the Basin where the principal aquifers receive recharge (Figure 3.1-11). The hillsides open space lies predominantly outside of the incorporated limits of the City and the City's sphere of influence and is included in the Ventura County 2040 General Plan (Figure 2.1-01). The Ventura County 2040 General Plan also applies to the approximate 1,267 acres of agricultural land located outside of the City and its sphere of influence in the western part of the Basin (Figure 2.1-01). Although these open space and agricultural areas are located outside of the City's sphere of includes, any future development would very likely involve annexation to the City. The County's General Plan includes numerous elements that discourage development in the open space and agricultural areas and/or continued viability of agricultural activities on agricultural land.

Guiding Principle - Land Use and Community Character: Direct urban growth away from agricultural, rural, and open space lands, in favor of locating it in cities and unincorporated communities where public facilities, services, and infrastructure are available or can be provided.

Guiding Principle - Conservation and Open Space: Conserve and manage the County's open spaces and natural resources, including soils, water, air quality, minerals, biological resources, scenic resources, as well as historic and cultural resources.

Guiding Principle - Agriculture: Promote the economic vitality and environmental sustainability of Ventura County's agricultural economy by conserving soils/land while supporting a diverse and globally competitive agricultural industry that depends on the availability of water, land, and farmworker housing.

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WR-6: To sustain the agricultural sector by ensuring an adequate water supply through water efficiency and conservation.

WR-6.1 - Water for Agricultural Uses: The County should support the appropriate agencies in their efforts to effectively manage and enhance water quantity and quality to ensure long-term, adequate availability of high quality and economically viable water for agricultural uses, consistent with water use efficiency programs.

WR-6.2 Agricultural Water Efficiency: The County should support programs designed to increase agricultural water use efficiency and secure long-term water supplies for agriculture.

WR-6.3 Reclaimed Water Use: The County should encourage the use of reclaimed irrigation water and treated urban wastewater for agricultural irrigation in accordance with federal and state requirements in order to conserve untreated groundwater and potable water supplies.

from the Ventura County 2040 General Plan

The Ventura County 2040 General Plan includes a Saticoy Area Plan for the unincorporated community of Saticoy located at the southeastern "tip" of the Basin (Figure 2.1-03). Saticoy is already largely developed (residential and industrial); thus, the Saticoy Area Plan focuses on redevelopment aspects. Saticoy's water service is provided by the City of Ventura. Thus, City of Ventura water supply policies apply in Saticoy, meaning that any new or intensified development would be required to be water neutral. The Saticoy Area overlaps with a very small area of the Basin and is not located in a key recharge area. Based on the foregoing, land use planning in the Saticoy Area will not have a significant impact in this GSP.

The Ventura County 2040 General Plan (County of Ventura, 2020) includes numerous elements designed to facilitate coordinated planning with MBGSA, maintain groundwater recharge, protect groundwater quality, and conserve groundwater resources.

WR-1: To effectively manage water supply by adequately planning for the development, conservation, and protection of water resources for present and future generations.

WR-1.1 - Sustainable Water Supply: The County should encourage water suppliers, groundwater management agencies, and groundwater sustainability agencies to inventory and monitor the quantity and quality of the county's water resources, and to identify and implement measures to ensure a sustainable water supply to serve all existing and future residents, businesses, agriculture, government, and the environment.

WR-1.2 - Watershed Planning: The County shall consider the location of a discretionary project within a watershed to determine whether or not it could negatively impact a water source. As part of discretionary project review, the County shall also consider local watershed management plans when considering land use development.

WR-1.3 - Portfolio of Water Sources: The County shall support the use of, conveyance of, and seek to secure water from varied sources that contribute to a diverse water supply portfolio. The water supply portfolio may include, but is not limited to, imported water, surface water, groundwater, treated brackish groundwater, desalinated seawater, recycled water, and storm water where economically feasible and protective of the environmental and public health.

WR-1.4 - State Water Sources: The County shall continue to support the conveyance of, and seek to secure water from, state sources.

WR-1.5 - Agency Collaboration: The County shall participate in regional committees to coordinate planning efforts for water and land use that is consistent with the Urban Water Management Planning Act, Sustainable Groundwater Management Act, the local Integrated Regional Water Management Plan, and the Countywide National Pollutant Discharge Elimination System Permit (storm water and runoff management and reuse).

WR-1.6 - Water Supplier Cooperation: The County shall encourage the continued cooperation among water suppliers in the county, through entities such as the Association of Water Agencies of Ventura County and the Watersheds Coalition of Ventura County, to ensure immediate and long-term water needs are met efficiently.

WR-1.7 - Water Supply Inter-Ties: The County shall encourage the continued cooperation among water suppliers in the county, through entities such as Association of Water Agencies of Ventura County and the Watersheds Coalition of Ventura County, to establish and maintain emergency inter-tie projects among water suppliers.

WR-1.9 - Groundwater Basin Use for Water Storage: Where technically feasible, the County shall support the use of groundwater basins for water storage.

WR-1.10 - Integrated Regional Water Management Plan: The County shall continue to support and participate with the Watersheds Coalition of Ventura County in implementing and regularly updating the Integrated Regional Water Management Plan.

WR-1.11 - Adequate Water for Discretionary Development: The County shall require all discretionary development to demonstrate an adequate long-term supply of water.

WR-1.12 - Water Quality Protection for Discretionary Development: The County shall evaluate the potential for discretionary development to cause deposition and discharge of sediment, debris, waste and other pollutants into surface runoff, drainage systems, surface water bodies, and groundwater. The County shall require discretionary development to minimize potential deposition and discharge through point source controls, storm water treatment, runoff reduction measures, best management practices, and low impact development.

WR-1.14 - Discretionary Development and Conditions of Approval: Golf Course Irrigation: The County shall require that discretionary development for new golf courses shall be subject to conditions of approval that prohibit landscape irrigation with water from groundwater basins or inland surface waters identified as Municipal and Domestic Supply or Agricultural Supply in the California Regional Water Quality Control Board's Water Quality Control Plan unless:

1. The existing and planned water supplies for a Hydrologic Area, including interrelated Hydrologic Areas and Subareas, are shown to be adequate to meet the projected demands for existing uses as well as reasonably foreseeable probable future uses within the area; and
2. It is demonstrated that the total groundwater extraction/recharge for the golf course will be equal to or less than the historic groundwater extraction/recharge for the site as defined in the County Initial Study Assessment Guidelines.

Further, where feasible, reclaimed water shall be utilized for new golf courses.

WR-2: To implement practices and designs that improve and protect water resources.

WR-2.1 - Identify and Eliminate of Sources of Water Pollution: The County shall cooperate with Federal, State and local agencies in identifying and eliminating or minimizing all sources of existing and potential point and non-point sources of pollution to ground and surface waters, including leaking fuel tanks, discharges from storm drains, dump sites, sanitary waste systems, parking lots, roadways, and mining operations.

WR-2.2 - Water Quality Protection for Discretionary Development: The County shall evaluate the potential for discretionary development to cause deposition and discharge of sediment, debris, waste, and other contaminants into surface runoff, drainage systems, surface water bodies, and groundwater. In addition, the County shall evaluate the potential for discretionary development to limit or otherwise impair later reuse or reclamation of wastewater or storm water. The County shall require discretionary development to minimize potential deposition and discharge through point source controls, storm water treatment, runoff reduction measures, best management practices, and low impact development.

WR-2.3 - Discretionary Development Subject to CEQA Statement of Overriding Considerations – Water Quality and Quantity: The County shall require that discretionary development not significantly impact the quality or quantity of water resources within watersheds, groundwater recharge areas or groundwater basins.

WR-3: To promote efficient use of water resources through water conservation, protection, and restoration.

WR-3.1 - Non-Potable Water Use: The County shall encourage the use of non-potable water, such as tertiary treated wastewater and household graywater, for industrial, agricultural, environmental, and landscaping needs consistent with appropriate regulations.

WR-3.2 - Water Use Efficiency for Discretionary Development: The County shall require the use of water conservation techniques for discretionary development, as appropriate. Such techniques include low-flow plumbing fixtures in new construction that meet or exceed the California Plumbing Code, use of graywater or

reclaimed water for landscaping, retention of storm water runoff for direct use and/or groundwater recharge, and landscape water efficiency standards that meet or exceed the standards in the California Model Water Efficiency Landscape Ordinance.

WR-3.3 - Low-Impact Development: The County shall require discretionary development to incorporate low impact development design features and best management practices, including integration of storm water capture facilities, consistent with County's Storm water Permit.

WR-3.4 - Reduce Potable Water Use: The County shall strive for efficient use of potable water in County buildings and facilities through conservation measures, and technological advancements.

WR-4: To maintain and restore the chemical, physical, and biological integrity and quantity of groundwater resources.

WR-4.1 - Groundwater Management: The County shall work with water suppliers, water users, groundwater management agencies, and groundwater sustainability agencies to implement the Sustainable Groundwater Management Act (SGMA) and manage groundwater resources within the sustainable yield of each basin to ensure that county residents, businesses, agriculture, government, and the environment have reliable, high-quality groundwater to serve existing and planned land uses during prolonged drought years.

WR-4.2 - Important Groundwater Recharge Area Protection: In areas identified as important recharge areas by the County or the applicable Groundwater Sustainability Agency, the County shall condition discretionary development to limit impervious surfaces where feasible and shall require mitigation in cases where there is the potential for discharge of harmful pollutants within important groundwater recharge areas.

WR-4.3 - Groundwater Recharge Projects: The County shall support groundwater recharge and multi-benefit projects consistent with the Sustainable Groundwater Management Act and the Integrated Regional Water Management Plan to ensure the long-term sustainability of groundwater.

WR-4.4 - In-Stream and Recycled Water Use for Groundwater Recharge: The County shall encourage the use of in-stream water flow and recycled water for groundwater recharge while balancing the needs of urban and agricultural uses, and healthy ecosystems, including in-stream waterflows needed for endangered species protection.

WR-4.5 - Discretionary Development Subject to CEQA Statement of Overriding Considerations – Water Quantity and Quality: The County shall require that discretionary development shall not significantly impact the quantity or quality of water resources within watersheds, groundwater recharge areas or groundwater basins.

WR-4.7 - Discretionary Development and Conditions of Approval – Oil, Gas, and Water Wells: The County shall require that discretionary development be subject to conditions of approval requiring proper drilling and construction of new oil, gas, and water wells and removal and plugging of all abandoned wells on-site.

WR-4.8 - New Water Wells: The County shall require all new water wells located within Groundwater Sustainability Agency (GSA) boundaries to be compliant with GSAs and adopted Groundwater Sustainability Plans (GSPs).

WR-5: To protect and, where feasible, enhance watersheds and aquifer recharge areas through integration of multiple facets of watershed-based approaches.

WR-5.1 - Integrated Watershed Management: The County shall work with water suppliers, Groundwater Sustainability Agencies (GSAs), wastewater utilities, and storm water management entities to manage and enhance the shift toward integrated management of surface and groundwater, storm water treatment and use, recycled water and conservation, and desalination.

WR-5.2 - Watershed Management Funding: The County shall continue to seek funding and support coordination of watershed planning and watershed-level project implementation to protect and enhance local watersheds.

WR-7.1 - Water for the Environment: The County shall encourage the appropriate agencies to effectively manage water quantity and quality to address long-term adequate availability of water for environmental purposes, including maintenance of existing groundwater-dependent habitats and in-stream flows needed for riparian habitats and species protection.

from the Ventura County 2040 General Plan

City of Oxnard 2030 General Plan

A small area (0.5 square miles) in the southwestern corner the Basin lies within the City of Oxnard's planning boundary (Figure 2.1-01) (City of Oxnard, 2014). This area consists of the last approximately 1 mile of the Santa Clara River, including its estuary. This area is designated "Resource Protection" and "Recreation" (a small area lies within the McGrath State Beach). Due to the very small area and the land use designations, it is very unlikely that the land use in this area will change or that groundwater wells would be drilled. Based on the foregoing, it appears this area will not have a material impact on this GSP; and, for this reason, the City of Oxnard's General Plan is not discussed further in this GSP.

2.2.3.1.1 How Land Use Plans May Impact Water Demands and Sustainable Groundwater Management

This GSP is not anticipated to be impacted by the City of Ventura or County of Ventura land use plans. The general plans already include policies that protect the key recharge area in the Basin (open space in the hillsides along the northern part of the Basin). Open space in the key recharge area is further protected from development by SOAR and HVPPA. Development allowed pursuant to the general plans will not create new demands for Mound Basin groundwater because growth will likely occur within the City of Ventura (within incorporated area or through annexation), making it subject to the City's Net Zero Policy. The Net Zero Policy requires that new water demands for development projects be met by a dedication of an existing water right (i.e. transfer existing rights to extract groundwater from the Mound Basin or the adjacent Oxnard or Santa Clara basins) or payment of a fee that funds development of new City water supplies. Future City of Ventura water supplies under development include VenturaWaterPure (potable reuse of advanced treated tertiary treated effluent from the VWRF) and an interconnection with Calleguas MWD that will allow the City to access its 10,000 AF/yr Table A entitlement from the California SWP.

2.2.3.1.2 How Sustainable Groundwater Management May Affect Water Supply Assumptions of Land Use Plans

This GSP is not anticipated to impact land use plans by the City or County of Ventura because the estimated sustainable yield of the Basin is sufficient to supply planned groundwater extraction in the Basin, and any new water demands resulting from development will be offset pursuant to the City of Ventura's Net Zero Policy by dedication of an existing water right (i.e. transfer existing rights to extract groundwater from the Mound Basin or the adjacent Oxnard or Santa Clara basins) or payment of a fee that funds development of new City water supplies. In short, land use planning for the Mound Basin is not constrained by the Mound Basin sustainable yield.

The GSP will not impact land use plans elements that address recharge areas because the key recharge area is open space in the hillsides along the northern part of the Basin that is already protected from development by City of Ventura and County of Ventura General Plan policies, SOAR, and HVPPA.

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2.2.3.1.3 *Impact of Land Use Plans Outside of Basin on Sustainable Groundwater Management [§354.8(f)(5)]*

> **§354.8 Description of Plan Area.** *Each Plan shall include a description of the geographic areas covered, including the following information:*
> ***(f)*** *A plain language description of the land use elements or topic categories of applicable general plans that includes the following:*
> ***(5)*** *To the extent known, the Agency may include information regarding the implementation of land use plans outside the basin that could affect the ability of the Agency to achieve sustainable groundwater management.*

Land use planning for the areas immediately surrounding Mound Basin is addressed in the Ventura County 2040 General Plan (County of Ventura, 2020), described in Section 2.2.3.1. This GSP is not anticipated to be impacted by the County of Ventura 2040 General Plan for the same reasons described in Section 2.2.3.1.1.

2.2.3.2 Well Permitting [§354.8(f)(4)]

> **§354.8 Description of Plan Area.** *Each Plan shall include a description of the geographic areas covered, including the following information:*
> ***(f)*** *A plain language description of the land use elements or topic categories of applicable general plans that includes the following:*
> ***(4)*** *A summary of the process for permitting new or replacement wells in the basin, including adopted standards in local well ordinances, zoning codes, and policies contained in adopted land use plans.*

Water well permits are obtained from the Ventura County Groundwater Section, a division of Ventura County Public Works Department. Water well permits are issued pursuant to the requirements of Ventura County Water Well Ordinance No. 4468. The Ventura County Groundwater Section oversees compliance with County Water Well Ordinance No. 4468 which is inclusive of California's Water Well Standards Bulletins 74-9, 74-81, and 74-90. The Ventura County Groundwater Section monitors and enforces these standards by requiring drilling contractors with a valid C-57 license to submit permit applications for the construction, modification, reconstruction (i.e., deepening), or destruction of any well within their jurisdiction and through inspections. Pursuant to the County of Ventura 2040 General Plan (County of Ventura, 2020), Ventura County Groundwater Section will review the MBGSA's GSP and related resolutions and ordinances to ensure the compliance with MBSGA requirements prior to issuing a water well permit within the boundary of the Mound Basin.

In addition to County Water Well Ordinance 4468, the County of Ventura 2040 General Plan includes the following policies on well permitting:

- **WR-4.7 - Discretionary Development and Conditions of Approval – Oil, Gas, and Water Wells**: The County shall require that discretionary development be subject to conditions of approval requiring proper drilling and construction of new oil, gas, and water wells and removal and plugging of all abandoned wells on-site.
- **WR-4.8 - New Water Wells**: The County shall require all new water wells located within Groundwater Sustainability Agency (GSA) boundaries to be compliant with GSAs and adopted Groundwater Sustainability Plans (GSPs).

2.2.4 Additional Plan Elements [§354.8(g)]

§354.8 Description of Plan Area. *Each Plan shall include a description of the geographic areas covered, including the following information:*

(g) *A description of any of the additional Plan elements included in Water Code Section 10727.4 that the Agency determines to be appropriate.*

GSP Emergency Regulations [§354.8(g) allows GSAs to include certain "additional plan elements" in the GSP, including:

(a) Control of saline water intrusion.

(b) Wellhead protection areas and recharge areas

(c) Migration of contaminated groundwater.

(d) A well abandonment and well destruction program.

(e) Replenishment of groundwater extractions.

(f) Activities implementing, opportunities for, and removing impediments to, conjunctive use or underground storage.

(g) Well construction policies.

(h) Measures addressing groundwater contamination cleanup, groundwater recharge, in-lieu use, diversions to storage, conservation, water recycling, conveyance, and extraction projects.

(i) Efficient water management practices, as defined in §10902 , for the delivery of water and water conservation methods to improve the efficiency of water use.

(j) Efforts to develop relationships with state and federal regulatory agencies.

(k) Processes to review land use plans and efforts to coordinate with land use planning agencies to assess activities that potentially create risks to groundwater quality or quantity.

(l) Impacts on groundwater-dependent ecosystems (GDEs).

MBGSA determined that the following additional plan elements are appropriate to include in this GSP:

- (d) Well Destruction Program: MBGSA will seek to destroy improperly abandoned or constructed wells that act as conduits for migration of poor-quality water from shallow water-bearing units into the principal aquifers. This additional plan element is included in the groundwater quality protection measures management action, which is described in Section 6.5.
- (g) Well Construction Policies: MBGSA will coordinate with the County of Ventura to ensure new wells are properly constructed to prevent migration of poor-quality water from shallow water-bearing units into the principal aquifers. This additional plan element is included in the groundwater quality protection measures management action, which is described in Section 6.5.
- (j) Efficient water management practices, as defined in §10902 , for the delivery of water and water conservation methods to improve the efficiency of water use: MBGSA will seek

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opportunities to encourage, promote, and support efforts to increase agricultural water use efficiency.

- (k) Processes to review land use plans and efforts to coordinate with land use planning agencies to assess activities that potentially create risks to groundwater quality or quantity: MBGSA will coordinate with the City of Ventura concerning its General Plan update initiated in November 2020. MBGSA will participate in future general plan updates by the County of Ventura and City of Ventura.

2.3 Notice and Communication [§354.10]

Mound Basin is a relatively small basin with only 26 active wells extracting an average of approximately 6,300 AF/yr. Twenty-two wells supply agricultural beneficial users who formed the Mound Basin Agricultural Water Group (MBAWG) to provide organized input on the GSP. MBAWG selects the Agricultural Stakeholder Director on the MBGSA Board of Directors and the Agency's Stakeholder Engagement Plan (SEP) (Appendix D) specifically charges the Agricultural Stakeholder Director with engaging the Basin's agricultural users of groundwater and representing their interests before the Agency. The remaining wells supply municipal and industrial uses, chiefly the City of Ventura, which has a Director seat on the MBGSA Board of Directors. Thus, all the groundwater users in the Basin except the two industrial well owners have direct representation in the SGMA process by virtue of a director on the MBGSA Board of Directors. There are no active or recently active domestic wells in the Basin. All potable water in the Basin, including that used by disadvantaged communities (DACs) is supplied by the City of Ventura.

In addition to the high degree of direct stakeholder representation on the MBGSA Board of Directors, the MBGSA found it important to develop and implement a SEP to seek, encourage, and consider as much public input on the GSP as possible and to ensure compliance with SGMA requirements (Appendix D). The SEP is tailored to the specific stakeholder landscape of the Basin. The SEP encourages the active involvement of individual stakeholders and stakeholder organizations and other interested parties in the development and implementation of the GSP for the Mound Basin (Appendix D). The SEP was designed and developed to ensure compliance with Water Code §10723.2, which requires GSA to "consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing groundwater sustainability plans." The SEP identifies stakeholders, stakeholder outreach and engagement methodologies, opportunities for integration with other overlapping local programs and planning processes, and the public meeting process used by the GSA. The SEP guides notice and communication activities during GSP development and will continue to serve as a guide during GSP implementation. The following subsections provide a summary of information relating to notification and communication by MBGSA with other agencies and interested parties, as required by the GSP Emergency Regulations.

2.3.1 Beneficial Uses and Users [§354.10(a)]

§354.10 Notice and Communication. *Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:*

(a) *A description of the beneficial uses and users of groundwater in the basin, including the land uses and property interests potentially affected by the use of groundwater in the basin, the types of parties representing those interests, and the nature of consultation with those parties.*

Water Code §10723.2 requires MBGSA to consider the interests of all beneficial uses and users of groundwater within the Basin. These interests are listed below with a description of the nature of MBGSA's consultation with them.

- **Holders of Overlying Groundwater Rights:**
  - **Agricultural Users**: There are agricultural users of groundwater operating on land overlying the Basin. To account for these users' interests, the Agency designated a seat on its five-member governing board to be filled by an Agricultural Stakeholder Director. The Agricultural Stakeholder Director is appointed from nominations received by MBAWG or the Ventura County Farm Bureau. The Agricultural Stakeholder Director is responsible for engaging the Basin's agricultural users of groundwater and representing their interests before the Agency.
  - **Domestic Well Owners**: No domestic wells were identified during development of the GSP, as confirmed by the County of Ventura, the local well permitting agency. The lack of domestic wells is likely due to the availability of potable water from Ventura Water (City of Ventura) and the significant expense required to drill a domestic water supply well to the depth required to reach a principal aquifer in Mound Basin. Available data suggest that shallow groundwater above the principal aquifers is not suitable for potable use (Figures 3.1-21 and -22). For these reasons, it is not anticipated that domestic wells will be drilled in the future.
  - **Industrial Users**: Two industrial wells have been identified in the Basin: Saticoy Lemon Association (lemon-packing facility cooperative) and Ivy Lawn Cemetery Association. Given Saticoy Lemon Association's ties to agriculture, the Agricultural Stakeholder Director is responsible for engaging this stakeholder. The Executive Director is responsible for engaging Ivy Lawn Memorial Park and met with its Board on February 19, 2020.
  - **Other Users**: The County of Ventura operates a well for landscape irrigation at the County Government Center. The County is represented on the Agency's Board of Directors.
- **Municipal Well Operators:** The Agency is a JPA created by three local public agencies. One of the Agency's signatory members, the City of San Buenaventura, operates municipal wells within the Basin and is represented on the Agency's Board of Directors.
- **Public Water Systems:**
  - Ventura Water (City of San Ventura) operates a public water system serving residents and business within and surrounding the City. The City of San Buenaventura is a signatory member to the JPA Agreement forming the Agency and is represented on the Agency's Board of Directors.
  - Casitas MWD is a wholesale water agency that provides a portion of the potable water supplied by Ventura Water within the Basin. Casitas MWD's service area overlaps with a western portion of the Basin. However, Casitas MWD does not operate any facilities in the Basin because Ventura Water's connection to Casitas MWD is located several miles north of the Basin.

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- **Local Land Use Planning Agencies:**
  - The County of Ventura has land use planning authority on unincorporated land overlying the Basin (Figure 2.1-01). The County is a signatory member to the MBGSA JPA Agreement and is represented on the Agency's Board of Directors.
  - The City of Ventura has land use planning authority on incorporated land overlying the Basin (Figure 2.1-01). The City is a signatory member to the MBGSA JPA Agreement and is represented on the Agency's Board of Directors.
  - The City of Oxnard has land use planning authority over a small (0.5 square miles) area in the southwestern corner the Basin (Figure 2.1-01). This area consists of the last approximately 1 mile of the Santa Clara River, including its estuary. This area is designated "Resource Protection" and "Recreation" (a small area lies within the McGrath State Beach). Due to the very small area and the land use designations, it is very unlikely that the land use in this area will change or that groundwater wells would be drilled. Thus, MBGSA concluded that the land use planning by the City of Oxnard will not have a material impact on this GSP.

- **Environmental Users of Groundwater:** There are several environmental organizations dedicated to preserving and maintaining environmental values operating within the boundaries of the Basin. To account for these users' interests, the Agency designated a seat on its five-member governing board to be filled by an Environmental Stakeholder Director. The Environmental Stakeholder Director is appointed from nominations received from local environmental nonprofit organizations supportive of the Basin's groundwater sustainability. The Environmental Stakeholder Director is responsible for engaging stakeholders within the Basin and representing environmental interests before the Agency.
  - Environmental beneficial uses in the Basin include instream flow uses in interconnected reaches of the lower Santa Clara River and its Estuary and the associated GDE identified as GDE Area 11. However, these beneficial uses are not impacted by groundwater extraction because there is no groundwater extraction from the shallow groundwater units (a.k.a. Shallow Alluvial Deposits) and groundwater extraction from principal aquifers (Mugu and Hueneme aquifers) does not materially influence shallow groundwater levels or surface water flows (see Appendix G for explanation).
- **Surface Water Users:** There are no permitted or licensed surface water diversions in the Basin. Instream beneficial uses are described in the preceding bullet.
- **The Federal Government:** Not applicable because there is no federal land within the Basin.
- **California Native American Tribes:** The Mound Basin lies within the traditional tribal territory of the Chumash; however, there are no tribal trust lands located within the Basin. The Agency ensured that a representative of overlying California Native American tribes was on the Agency's interested parties list, in order to receive notices of all Agency meetings and other stakeholder involvement opportunities.
- **Disadvantaged Communities:** There are no domestic wells, community water supply wells, or mutual water companies serving water to DACs or Severely Disadvantaged Communities (SDACs) in the Basin. The City of Ventura (Ventura Water) serves the areas indicated by DWR as

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DACs and SDACs. As the water supplier for DACs/SDACs in the Basin, the City represented DAC/SDAC interests through its participate on the MBGSA Board of Directors. In addition, direct outreach to DACs/SDACs was accomplished via Ventura Water bill stuffers and newsletters, including materials provided in Spanish.

- **Entities listed in §10927 that Monitor and Report Groundwater Elevations:**
  - The County of Ventura is the designated CASGEM entity for the Basin. The County is a signatory member to the JPA Agreement forming the Agency and represented on the Agency's Board of Directors.
  - United performs monitoring in the Basin and shares the data it collects with the County and MBGSA. United is a signatory member to the JPA Agreement forming the Agency and is represented on the Agency's Board of Directors.

2.3.2 Public Meetings [§354.10(b)]

§354.10 Notice and Communication. *Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:*
(b) *A list of public meetings at which the Plan was discussed or considered by the Agency.*

A list of public meetings is included as Appendix E.

2.3.3 Public Comments [§354.10(c)]

§354.10 Notice and Communication. *Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:*
(c) *Comments regarding the Plan received by the Agency and a summary of any responses by the Agency.*

Public comments and responses are included as Appendix F.

2.3.4 Communication [§354.10(d)]

2.3.4.1 Decision-Making Process [§354.10(d)(1)]

§354.10 Notice and Communication. *Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:*
(d) *A communication section of the Plan that includes the following:*
(1) *An explanation of the Agency's decision-making process.*

The JPA that created MBGSA requires the GSA to hold public meetings at least quarterly that are noticed and meet all of the requirements of the Ralph M. Brown Act for transparency in California government. To hold a valid meeting the MBGSA must have a quorum of the Board of Directors, which consists of an absolute majority of directors plus one director. With these requirements in mind, the MBGSA:

- Holds board meetings on a regular schedule (no less frequently that quarterly);

- Provides written notice of meetings with meeting agenda and meeting material available at least 72 hours prior to regular meetings;
- Sends email meeting reminders to MBGSA's interested parties list; and
- Posts meeting agendas on https://www.moundbasingsa.org/ and at the meeting location prior to the meeting, as required by law.

MBGSA agendas include general public comments at the beginning of each board meeting. General comments allow community members to raise any groundwater-related issue that is not on the agenda. Public comment time is also given prior to a vote on all agenda items to ensure public opinion can be incorporated into MBGSA Board of Director decisions.

The MBGSA Board directs the Executive Director to fulfill the various requirements of SGMA. To do this, the Executive Director, with support from consultants and United staff, provides the Board with research and recommendation memos, work plans, technical summaries, budgets, and other work products as required to carry out board decisions. Most MBGSA decisions require an affirmative vote of a minimum of three Directors. There are certain matters that come before the MBGSA Board of Directors that require a unanimous vote of all Directors on first reading. If unanimity is not obtained on the first reading of the matter, the Board shall continue a final vote on the matter during a second reading approved by an affirmative vote of a minimum of three (3) Directors, and only if at least one (1) of the affirmative votes is by the City of San Buenaventura's Director or the Agricultural Stakeholder Director. Matters requiring the special voting provisions include of any of the following:

- Annual budget and amendments thereto;
- GSP for the Basin or any amendments thereto;
- Adoption of groundwater extraction fees or charges;
- Adoption of any taxes, fees, or assessments subject to Proposition 218; or
- Any stipulation to resolve litigation concerning groundwater rights within, or groundwater management for, the Basin.

2.3.4.2 Public Engagement [§354.10(d)(2) and (d)(3)]

§354.10 Notice and Communication. *Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:*

(d) *A communication section of the Plan that includes the following:*

(2) *Identification of opportunities for public engagement and a discussion of how public input and response will be used.*

(3) *A description of how the Agency encourages the active involvement of diverse social, cultural, and economic elements of the population within the basin.*

MBGSA uses a variety of methods create opportunities for public engagement and obtain public input for consideration in GSP development and implementation. These methods are presented in the MBGSA SEP (Appendix D) and include:

- **Stakeholder Directors:** The MBGSA Board of Directors includes two stakeholder directors, one each for environmental and agricultural interests. Pursuant to the SEP, the stakeholder directors are responsible for actively obtaining input from their respective stakeholder constituencies and communicating that input to the MBGSA Board and Executive Director for consideration.
- **Direct Engagement by MBGSA Staff:** The Executive Director met or spoke directly with stakeholders during the GSP process, including Ivy Lawn Memorial Park (industrial well operator), City of Ventura, United, and members of MBAWG.
- **MBGSA Board Meetings:** Regular and Special meetings of the MBGSA Board of Directors provided opportunities for the public to engage with the Board, Executive Director, and consultants and provide direct input. The public is welcomed to comment at each meeting and the MBGSA Board regularly incorporates public suggestions into its deliberations and the decisions it makes during Board meetings. Meeting notes are kept by the Clerk of the Board and submitted to the MBGSA Board for approval. All meeting minutes and notes are collected on the MBGSA Website along with supporting agendas, packets, and presentation materials.
- **GSP Workshops:** MBGSA has held several public workshops to provide in depth discussion of the GSP and obtain stakeholder feedback. The workshops include polls to help facilitate public input on key issues and identify which outreach methods are most effective. Public input received during the GSP Workshops is reviewed with MBGSA Board of Directors during subsequent Board meetings prior to making decisions.
- **Online Comment Form:** MBGSA's website includes a comment submission form. The on-line form provides a convenient method for anyone to provide input on the GSP. All comments received via the website were compiled into a table and considered prior to GSP adoption. All comments submitted on-line were responded to in writing (Appendix F).
- **Contact with Staff:** The public is welcomed to contact MBGSA Executive Director or Clerk of the Boards and may do so via telephone, e-mail, or website inquiry (https://www.moundbasingsa.org/contact-us/).

MBGSA uses a variety of methods to inform stakeholders and encourage the active involvement of diverse social, cultural, and economic elements of the population within the groundwater pursuant to Water Code §10727.8(a). These methods are presented in the MBGSA SEP (Appendix D) and include:

- **Statement Describing the Manner in which Interested Parties May Participate in the Development and Implementation of the Groundwater Sustainability Plan (Water Code §10727.8(a)):** The statement was prepared and posted to DWW's SGMA Portal as part of filing a notice of intent to DWR of the MBGSA decision to develop a GSP for the Basin on September 17, 2018. The statement is included, provided in Appendix A, and was developed into the MBGSA SEP (Appendix D).
- **Development and Maintenance of an Interest Parties List:** MBGA developed an interest parties list prior to electing to become a GSA pursuant to Water Code §10723.8(a)(4) and maintained that list after becoming as GSA pursuant after to Water Code §10723.4. The interested parties list is used it to send e-mail meeting notices, agendas, newsletters, and updates.

- **Public Notices:** In accordance with Water Code §10723(b), §10730(b)(1), and §10728.4, MBGSA published public notices in accordance with Government Code §6066 prior to electing to be a GSA, before imposing or increasing groundwater extraction fees, and before adopting the GSP.
- **MBGSA Website:** The MBGSA website provides SGMA and agency information, includes meeting information, meeting materials, and links to meeting agendas and packets. The website provides links to agency resource materials, maps, newsletters, presentation materials, and meeting recordings.
- **Facebook:** The MBGSA Facebook page is used to push meeting notices and other information.
- **Periodic Newsletters:** MBGSA issues periodic newsletters concerning MBGSA status and activities.
- **Existing Outreach Venues:** MBGSA uses the Member Agencies existing outreach networks to provide regular updates about the GSP Development and, going forward, GSP implementation. This includes information via email newsletters, websites, bill inserts, and social media.
- **Santa Clara River Watershed Committee:** The Executive Director provides MBGSA updates during Santa Clara River Watershed Committee meetings and requests publication of MBGSA workshop notices via the Committee's email network.
- **Direct outreach to Public, including DACs/SDACs**: Ventura Water bill stuffers and newsletters about the MBGSA and GSP process were sent to every potable water user in the Basin, including materials provided in Spanish.

Public input was used to help shape the GSP development. The input was also used to develop content for MBGSA meetings, newsletters, and website content. MBGSA public meetings were designed to encourage input, discussion, and questions. Because the Basin and number of stakeholders is small, the meetings provided ample opportunity for everyone to provide comments and ask questions.

Examples of how public input helped shape the GSP include:

- During the development of the GSP water budget, outreach to the City of Ventura was performed to learn about the City's planned well replacements and planned future groundwater extraction rates. The City's planning estimated were incorporated into the planning process.
- During the development of the GSP water budget, outreach to MBAWG was performed to develop estimates of anticipated future agricultural cropping and groundwater extraction rates. MBAWG's estimates were incorporated into the planning process.
- During the analysis of potential land use change, outreach to MBAWG was performed to obtain input about the potential for development of agricultural land in the Basin. MBAWG's input on this topic was incorporated into the planning process.
- During development of SMC for the land subsidence sustainability indicator, outreach to the City of Ventura was performed to obtain input on critical infrastructure that could be potential impacted by land subsidence. The City provided information about the susceptibility of its sewer main that became a key factor in establishing the SMC for the land subsidence sustainability indicator.

- In addition to the above-described examples, input received from MBAWG and Ivy Lawn Memorial Park about costs helped focus the agency on ensuring the GSP is fit-for-purpose for the Basin and only includes aspects absolutely necessary to maintain sustainable conditions in the Basin.

2.3.4.3 Progress Updates [§354.10(d)(4)]

§354.10 Notice and Communication. *Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:*
(d) *A communication section of the Plan that includes the following:*
(4) *The method the Agency shall follow to inform the public about progress implementing the Plan, including the status of projects and actions.*

MBGSA will continue to follow its adopted SEP to inform the public about progress implementing the GSP, including the status of projects and actions.

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3.0 Basin Setting [Article 5, SubArticle 2]

§354.12 Introduction to Basin Setting. *This Subarticle describes the information about the physical setting and characteristics of the basin and current conditions of the basin that shall be part of each Plan, including the identification of data gaps and levels of uncertainty, which comprise the basin setting that serves as the basis for defining and assessing reasonable sustainable management criteria and projects and management actions. Information provided pursuant to this Subarticle shall be prepared by or under the direction of a professional geologist or professional engineer.*

This section describes the information about the characteristics and current conditions of Mound Basin that provide the basis for defining and assessing reasonable SMC, projects, and management actions. As required under §10733.2 of the California Water Code, this section was prepared by a professional geologist and includes subsections that describe the HCM, current and historical groundwater conditions, a water balance, and management areas within Mound Basin based on best available data and information available for Mound Basin at the time of preparation of this GSP.

Most of the information presented in this section is derived from the following sources, which synthesize and summarize and add to historical scientific studies and information:

- "Hydrogeologic Assessment of Mound Basin—United Water Conservation District Open-File Report 2012-01" (United, 2012);
- "Ventura Regional Groundwater Flow Model and Updated Hydrogeologic Conceptual Model: Oxnard Plain, Oxnard Forebay, Pleasant Valley, West Las Posas, and Mound Groundwater Basins—Open-File Report 2018-02" (United, 2018); and
- "Preliminary Hydrogeological Study—Mound Basin Groundwater Conditions and Perennial Yield Study" (Hopkins, 2020).

In addition to the above-listed studies, well construction, groundwater elevation, and groundwater quality data collected by United, VCWPD, and others were relied upon and have been compiled into the MBGSA DMS.

3.1 Hydrogeologic Conceptual Model [§354.14]

§354.14 Hydrogeological Conceptual Model.
(a) Each Plan shall include a descriptive hydrogeologic conceptual model of the basin based on technical studies and qualified maps that characterize the physical components and interaction of the surface water and groundwater systems in the basin.

This section provides a descriptive HCM of the Basin based on technical studies and qualified maps that characterize the physical components and interaction of the surface water and groundwater systems in Mound Basin, to the extent such characterization is possible based on existing best available data and information.

3.1.1 Regional Hydrology

Topography, surface water bodies, and imported water sources and points of delivery in Mound Basin are described below.

3.1.1.1 Topography [§354.14(d)(1)]

§354.14 Hydrogeological Conceptual Model.
(d) Physical characteristics of the basin shall be represented on one or more maps that depict the following:
(1) Topographic information derived from the U.S. Geological Survey or another reliable source.

Topography of Mound Basin is shown on Figure 3.1-01. The topography of Mound Basin consists largely of gently south-sloping coastal plain, coastal and alluvial terraces, and alluvial fans. The Santa Clara River floodplain and estuary occupies the southwest corner of the Basin, and moderately sloping hills rising to 1,000 feet above mean sea level (ft msl) are present along the northern margin of the Basin. Several small stream channels originate in the canyons above the Basin and trend south and southwest within the Basin, forming incised drainage features labeled "barrancas" (Spanish for "gullies") on United States Geological Survey (USGS) topographic maps of the region. The barrancas typically have a vertical relief in the range of 10 to 30 ft.

3.1.1.2 Surface Water Bodies [§354.14(d)(5)]

§354.14 Hydrogeological Conceptual Model.
(d) Physical characteristics of the basin shall be represented on one or more maps that depict the following:
(5) Surface water bodies that are significant to the management of the basin.

Surface water bodies within the Mound Basin include the Santa Clara River, its estuary, and the Pacific Ocean (Figure 3.1-01). In addition, three barrancas (Sanjon, Arundell, and Harmon) tributary to the Santa Clara River in Mound Basin are shown on Figure 3.1-01. The barrancas typically only flow in response to precipitation events. No springs or seeps are shown on USGS topographic maps within or adjacent to the boundaries of Mound Basin.

3.1.1.3 Imported Water [§354.14(d)(6)]

§354.14 Hydrogeological Conceptual Model.
(d) Physical characteristics of the basin shall be represented on one or more maps that depict the following:
(6) The source and point of delivery for imported water supplies.

Sources and approximate points of delivery of imported water supplies used in Mound Basin are shown on Figure 3.1-01. Three water purveyors import water into Mound Basin: Alta Mutual Water Company (Alta MWC), Farmers Irrigation Company (FICO), and the City of Ventura (Ventura Water), as follows:

- Alta MWC conveys approximately 200 AF/yr on average of groundwater extracted from its wells located in the Santa Paula and Oxnard Basins to farms in the eastern Mound Basin (B. Bondy of Alta MWC, personal communication, April 2020).

- FICO conveys approximately 1,000 AF/yr on average of groundwater extracted from its Santa Paula Basin wells to farms in the eastern Mound Basin (United, 2017a).
- Ventura Water imports water for municipal supply from several sources outside of Mound Basin, as follows (quantities of water reported below are averages for the period from 2015 to 2020 [Ventura Water, 2020a]):
  - Ventura Water extracts approximately 2,700 AF/yr of groundwater from its Saticoy wells in the Santa Paula Basin and supplies that water to portions of the City overlying both the Mound and Santa Paula Basins. Ventura Water has stated that the specific quantity of imported water from this source distributed to each basin is variable and cannot be precisely determined. However, estimating based on the area occupied by the City of Ventura in Santa Paula Basin and typical water use per acre for developed land in the region, it appears that most of the groundwater extracted from Santa Paula Basin by Ventura Water may be used within Santa Paula Basin, and the quantity of groundwater imported by the City of Ventura to Mound Basin is a relatively small portion of the 2,700 AF/yr total extracted.
  - Ventura Water extracts approximately 3,500 AF/yr of groundwater from its "Golf Course" well field in the Oxnard Basin for blending and distribution throughout its service area.
  - Ventura Water obtains approximately 5,000 AF/yr of water from the Ventura River watershed (sources include water from Casitas MWD and Ventura Water's facilities at Foster Park) for blending and distribution throughout its service area.
- Jam Mutual Water Company (agricultural) and several ranches straddle the basin boundary shared with the Oxnard Basin. It is assumed that small quantities of groundwater move across the basin boundary within these entities/parcels. The details of water movement across the basin boundary within these entities/parcels is not known.

3.1.2 Regional Geology [§354.14(b)(1) and (d)(2)]

§354.14 Hydrogeological Conceptual Model.
(b) *The hydrogeologic conceptual model shall be summarized in a written description that includes the following:*
(1) The regional geologic and structural setting of the basin including the immediate surrounding area, as necessary for geologic consistency.
(d) *Physical characteristics of the basin shall be represented on one or more maps that depict the following:*
(2) Surficial geology derived from a qualified map including the locations of cross-sections required by this Section.

This subsection describes the regional geologic and structural setting of Mound Basin. The groundwater basins of the Santa Clara River Valley, including Mound Basin, are within the Transverse Ranges geomorphic province of California, characterized by mountain ranges and valleys (basins) that are oriented east-west rather than the typical northwest-southeast trend common in the adjacent Peninsular and Coastal Ranges geomorphic provinces. Structurally, Mound Basin occurs within an elongate, complex syncline referred to as the Ventura structural basin, which trends east to west (Yeats et al., 1981). The province is tectonically active today as a result of transpressional stress related to right-lateral movement

along the San Andreas Fault, where the North American tectonic plate contacts the Pacific plate. This transpressional stress occurring in the Transverse Ranges results in ongoing uplift of the adjacent mountains while the basins continue to flex downward (deepen).

The Ventura structural basin is filled with sediments that were deposited in both marine and terrestrial settings (Yeats et al., 1981). Near the coast, sediments were deposited on a wide delta complex that formed at the terminus of the Santa Clara River. The total stratigraphic thickness of these marine and terrestrial deposits in the Ventura structural basin reportedly exceeds 55,000 ft (Sylvester and Brown, 1988). Surface exposures of the major rock units and structural features in the vicinity of Mound Basin are shown in a simplified manner on Figure 3.1-02 and are discussed below. A geologic map that shows more details of the shallow surficial sediments (including landslides, stream terraces, alluvium in active stream channels, artificial fill, alluvial fans, and other near-surface deposits) prepared by the California Geological Survey (Gutierrez et al., 2008) is provided on Figure 3.1-03.

Geologic units (strata) in Mound Basin that may contain freshwater aquifers or aquitards are classified from youngest (top) to oldest (bottom as follows):

- Recent (active) stream-channel deposits along the present course of the Santa Clara River and its tributaries;
- Holocene -age alluvial fan deposits, which cover most of the Mound Basin;
- Stream terrace deposits adjacent to the Santa Clara River;
- Undifferentiated older alluvium of Pleistocene age; and
- Semi-consolidated sand, gravel, and clay deposits of the San Pedro Formation (also referred to as the Saugus Formation and/or Las Posas Formation by some researchers, most recently by Gutierrez et al., 2008), of late Pleistocene age.

Stratigraphic relationships are shown conceptually on Figure 3.1-04. The classification approach shown on Figure 3.1-04 is based largely on hydrogeologic characteristics (United, 2018). Other researchers have divided these deposits in other, equally valid ways, based on geomorphological or other characteristics (e.g., Mukae and Turner, 1975; Dibblee, 1992; USGS, 2003a; Hopkins, 2020). For example, Hopkins Groundwater Consultants, Inc. (Hopkins), mapped the subsurface geologic formations through Mound Basin based upon 10 cross-sections. Cross-sections showing the subsurface geometry of these units are shown on Figures 3.1-05 through 3.1-08.

Older (and typically deeper) strata than those listed above typically are poorly permeable or contain water that is too brackish or saline for municipal or agricultural uses. These strata include (following the descriptions of Burton et al., 2011):

- Sandstone, siltstone, and shale of the Santa Barbara Formation (Yerkes, 1987), of early Pleistocene age. This unit was mapped as the “Mudpit Claystone Member of the Pico formation” by Dibblee (1988, 1992), but several more recent investigations, including those by Burton et al. (2011), the USGS (2003a), and United (2012, 2018), refer to this unit as the Santa Barbara Formation.
- Marine siltstones, sandstones, and conglomerates of the Pico Formation, of Pliocene or early Pleistocene age.

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- Marine shales of the Sisquoc and the Monterey Formation, both of Miocene age, which underlie the Pico Formation at depth.

Within the Ventura structural basin, the trend of many (but not all) geologic structures is east-northeast to west-southwest, consistent with regional structural trends (Figure 3.1-02). The Country Club, Oak Ridge, and McGrath (sometimes referred to as Montalvo) faults have previously been identified as significantly limiting or diverting groundwater flow (John F. Mann Jr. & Associates, 1959; Mukae and Turner, 1975; Weber et al., 1976). In general, the older (deeper) geologic units show greater displacement across these faults than the younger (shallower) units. Therefore, groundwater flow in the deeper aquifers can typically be expected to be more disrupted across faults than groundwater flow in shallow aquifers.

Similar to faults in the Ventura structural basin, the axes of major folds (anticlines and synclines) in the sedimentary strata tend to be oriented approximately east-northeast to west-southwest (Figure 3.1-02). The axis of the Ventura-Santa Clara River syncline trends through Mound Basin in an east-west direction, plunging gradually to the west. The Montalvo-South Mountain-Oak Ridge Anticline is approximately parallel to the Ventura-Santa Clara River Syncline and is located near the southern boundary of Mound Basin (Geotechnical Consultants, 1972). Some workers also place a parallel fault at the location of the Montalvo-South Mountain-Oak Ridge Anticline (John F. Mann Jr. & Associates, 1959; Fugro West, 1996). Folding in the Ventura structural basin is ongoing, with older strata (including those that comprise deep aquifers) being more deformed than younger strata (including shallow aquifers). The limbs of these folds are gently dipping within most of the freshwater-bearing strata in Mound Basin and adjacent Oxnard Basin (United, 2018). Therefore, it is unlikely that the folds themselves have a notable direct impact on groundwater flow. However, changes in strata thickness (which affects transmissivity), outcrop area (which affects where recharge occurs), and other hydraulic properties of strata can potentially be indirectly influenced by fold geometry.

3.1.3 Soil Characteristics [§354.14 (d)(3)]

§354.14 Hydrogeological Conceptual Model.
(d) *Physical characteristics of the basin shall be represented on one or more maps that depict the following:*
(3) Soil characteristics as described by the appropriate Natural Resources Conservation Service soil survey or other applicable studies.

The hydrologic characteristics of soils in Mound Basin were downloaded from the Natural Resources Conservation Service (NRCS) online database (NRCS, 2020). Relevant soil information available from the NRCS for groundwater sustainability planning purposes includes soil infiltration capacity, which is shown on Figure 3.1-09. Most of the soils in Mound Basin are reported to have low to very low infiltration rates (Groups C and D, respectively). However, moderate-infiltration-rate soils are reportedly present in an approximately 1-mile-wide band oriented east-to-west along the axis of the Basin (Figure 3.1-09). Smaller areas of high-infiltration-rate soils are reportedly present near the Santa Clara River, Harmon Barranca, and in some of the canyons in the foothills in the north part of Mound Basin.

Some clay-rich soils within the Holocene and Pleistocene alluvial deposits present in Mound Basin may be of sufficiently low vertical permeability to allow the formation of thin, discontinuous lenses or layers of shallow, “perched” groundwater above the primary saturated zone of the Shallow Alluvial Deposits (described in the next subsection of this GSP), which is supported by the presence of tile drainage systems.

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Municipal and agricultural return flows contribute substantial quantities of infiltrating water at land surface in Mound Basin, supplementing natural recharge of precipitation (discussed in more detail in Sections 3.1.4.2 and 3.3). When the rate of infiltration exceeds the ability of silt and clay lenses and layers to allow the water to pass through them, small saturated zones can develop in the soil. Groundwater in perched zones typically moves laterally to better-draining soils, where it can then resume its downward infiltration, or it may migrate laterally to nearby depressions in the topography, where it seeps out at land surface, evaporates, or is transpired by vegetation.

3.1.4 Principal Aquifers and Aquitards [§354.14(b)(4)(A)]

§354.14 Hydrogeological Conceptual Model.
(b) *The hydrogeologic conceptual model shall be summarized in a written description that includes the following:*
(4) Principal aquifers and aquitards, including the following information:
(A) Formation names, if defined.

Strata with distinct hydrogeologic characteristics are referred to as hydrostratigraphic units (HSUs). Aquifers have traditionally been defined as those HSUs that are capable of yielding appreciable quantities of groundwater to wells or springs. The SGMA defines "principal aquifers" as "aquifers or aquifer systems that store, transmit, and yield significant or economic quantities of groundwater to wells, springs, or surface water systems." Aquitards, on the other hand, are poorly permeable HSUs that impede groundwater movement (typically in the vertical direction) and generally do not yield appreciable quantities of groundwater to wells or springs.

The aquifers in Mound Basin consist of layers and lenses of relatively coarse-grained, permeable sediments (primarily sand and gravel) deposited within unconsolidated alluvium and the underlying, semi-consolidated San Pedro Formation (Figure 3.1-04). Aquitards present between the aquifers in Mound Basin consist of layers of poorly permeable fine-grained sediments (primarily silt and clay, Figure 3.1-04).

In Mound Basin, distinct HSUs were identified by United (2018) during their recent update of the HCM for the region. United (2018) observed that electrical-log "signatures" of the Mugu, Hueneme, and Fox Canyon aquifers (and the aquitards between these aquifers) observed in wells in the Oxnard Basin are often recognizable north of the McGrath Fault (Figure 3.1-02). The HSUs are generally grouped into three major "aquifer systems" as follows (from shallow to deep): the Shallow Alluvial Deposits, the Upper Aquifer System (UAS), and the Lower Aquifer System (LAS). Figure 3.1-04 shows the names and relationships between HSUs in Mound Basin, together with their corresponding geologic formations and ages. Details regarding the aquifers and aquitards within each aquifer system are provided below.

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3.1.4.1 Physical Properties of Aquifers and Aquitards

3.1.4.1.1 Basin Boundary (Vertical and Lateral Extent of Basin) [§354.14(b)(2),(b)(3), and (c)]

§ 354.14 Hydrogeological Conceptual Model.

(b) *The hydrogeologic conceptual model shall be summarized in a written description that includes the following:*

(2) Lateral basin boundaries, including major geologic features that significantly affect groundwater flow.

(3) The definable bottom of the basin.

(c) The hydrogeologic conceptual model shall be represented graphically by at least two scaled cross-sections that display the information required by this section and are sufficient to depict major stratigraphic and structural features in the basin.

The lateral boundaries of Mound Basin determined by DWR (2019) are defined as follows:

- **East:** The eastern boundary is defined by the western jurisdictional boundary of the Santa Paula Basin stipulated judgment (adjudication), as approved by DWR (2019) pursuant to a formal Basin Boundary Modification. This jurisdictional boundary is approximately aligned with the Country Club Fault system (Figure 3.1-02). The Country Club Fault system offsets the aquifers (see cross-section A-A', Figure 3.1-05) and impedes groundwater flow from the Santa Paula Basin into the Mound Basin.
- **Northwest:** The northwestern boundary is defined by the hydraulic divide between Mound Basin, Lower Ventura River Subbasin (Figure 3.1-01).
- **West:** The western boundary is the Pacific Ocean shoreline. However, it should be noted that the UAS and LAS in Mound Basin extend approximately 10 miles offshore under the Pacific Ocean west of the shoreline, where they are mapped as cropping out on the continental shelf, as shown on Figure 3.1-10. The submarine outcrops may be covered with fine-grained marine sediments, such as silt and clay (Greene et al., 1978) that would tend to impede interaction of seawater with fresh water from the aquifers. Although DWR has delineated the western boundary of Mound Basin at the shoreline, the offshore portions of the principal aquifers of Mound Basin are in all likelihood capable of storing and transmitting significant quantities of fresh groundwater that has migrated westward from inland recharge areas. Because DWR (2019) does not include this offshore area within the boundaries of Mound Basin, it is not included in calculations of area of Mound Basin or volumes of groundwater in storage in each aquifer. However, it must be emphasized that fresh groundwater can flow within the aquifers of Mound Basin either to or from the offshore areas without impediment, and groundwater flowing eastward (landward) across this boundary should not be assumed to consist of seawater.
- **North:** The northern boundary is defined by the contact of the San Pedro Formation (the deepest freshwater-bearing formation in the Basin) with the underlying Santa Barbara Formation (Figure 3.1-02; the Santa Barbara Formation is mapped as the "Mudpit Claystone Member of the Pico formation" by Dibblee [1988, 1992]). The northern boundary of Mound Basin is at the northern edge of cross-section B-B', where the Fox Canyon Aquifer basal aquitard is in contact with the Santa Barbara Formation (Figure 3.1-06).

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- **South:** The southern boundary is defined by the northern jurisdictional boundary of the FCGMA, which also serves as boundary between the Mound and Oxnard basins, as approved by DWR (2019) pursuant to a formal Basin Boundary Modification. This jurisdictional boundary is approximately aligned with the axis of the Montalvo-South Mountain-Oak Ridge Anticline and the McGrath Fault (Figure 3.1-02), which were understood at the time of formation of the FCGMA (early 1980s) to be the approximate northern limit of the Oxnard Basin.

The "bottom" of the Basin is defined by the effective base of fresh water as described by Mukae and Turner (1975), which they mapped as the base of the San Pedro Formation. The lowermost strata of the San Pedro Formation have also been referred to as the Las Posas Sand (Dibblee, 1988, 1992). In Mound Basin, the San Pedro Formation overlies poorly permeable siltstone and shale of the Santa Barbara Formation (where present) and the Pico Formation (note: some investigators, including Dibblee [1988, 1992]) include portions of the Santa Barbara Formation in the Pico Formation). The depth to these units varies from as little as 0 ft below ground surface (bgs) along the northern basin boundary to approximately 2,400 ft bgs along the axis of the Ventura-Santa Clara River syncline, as shown on cross-sections A-A' through D-D' (Figures 3.1-05 through 3.1-08).

3.1.4.1.2 Groundwater Flow Barriers [§354.14(b)(4)(C)]

§354.14 Hydrogeological Conceptual Model.
(b) *The hydrogeologic conceptual model shall be summarized in a written description that includes the following:*
(4) *Principal aquifers and aquitards, including the following information:*
(C) Structural properties of the basin that restrict groundwater flow within the principal aquifers, including information regarding stratigraphic changes, truncation of units, or other features.

Geologic structures in Mound Basin affect groundwater flow within the aquifers to varying degrees. The most common example is where upward or downward apparent displacement (throw) of aquifer materials across a fault plane disrupts an aquifer's lateral continuity. Such an offset can impede groundwater flow through the aquifer along the fault plane. In Mound Basin, faulting has caused greater displacement (and correspondingly greater potential to impede groundwater flow) in the aquifers of the LAS, which are older (and thus have undergone more faulting and folding) than the aquifers of the UAS. The following subsections describe the primary structures that are believed to impact groundwater flow.

Country Club Fault

The trace of the Country Club Fault forms a northwest-trending arc approximately corresponding with the eastern boundary of Mound Basin adjacent to Santa Paula Basin (Figure 3.1-02). It is a steeply dipping (almost vertical) reverse fault with some left-lateral displacement (Turner, 1975). United's (2012, 2018) inspection of electrical logs for oil wells in the area indicate a displacement of 1,600 to 1,800 ft, with the southwest wall displaced upward relative to the northeast wall (Figure 3.1-05), consistent with the offset reported by previous investigators (Fugro West, 1996; Geotechnical Consultants, 1972). Review of electrical logs for wells in the area suggests that only a portion of the low-permeability Santa Barbara Formation has been uplifted against the San Pedro Formation (which contains the Hueneme and Fox Canyon aquifers). With aquifers of the San Pedro Formation present on both sides of the Country Club Fault above the displaced Santa Barbara Formation, the Country Club Fault is not considered to be a

complete barrier to groundwater flow. The fault is not believed to extend upward through the undifferentiated younger alluvium (Geotechnical Consultants, 1972). Consistent with the above geologic information, previous investigators, including USGS (2003a) and United (2018), have noted a consistently steeper hydraulic gradient along the fault at the boundary between Mound Basin and Santa Paula Basin, compared with more gentle hydraulic gradients elsewhere within these basins. Such a steepening of hydraulic gradients is common along faults that impede groundwater flow. To calibrate its groundwater flow model for this area, United (2018) applied a conductance of 0.00001 square ft per day to the Country Club Fault, indicating it is a significant impedance to groundwater flow.

Oak Ridge and McGrath Faults

The Oak Ridge and McGrath Faults trend east-northeast to west-southwest in the southern Mound Basin (Figure 3.1-02). As noted by Yerkes et al. (1987), these faults are buried and known only from subsurface data in this area. Yerkes et al. (1987) describe two pressure ridges in Mound Basin as isolated, elongate northwest-trending structural uplifts. These ridges are described as compressional features and are compatible with left-lateral slip along the adjacent Oak Ridge Fault. Their existence suggests a significant strike-slip component along the Oak Ridge Fault as well as a reverse fault uplift on the south side.

Based on review of electrical logs, United (2012) determined that vertical displacement of approximately 700 ft of vertical displacement occurs along the McGrath Fault, with the up-thrown side on the south. This offset has juxtaposed the low-permeability Santa Barbara Formation against the lower section of the San Pedro Formation (Figures 3.1-06). Another notable feature is the significant difference in San Pedro Formation thickness across the McGrath Fault shown on cross-section B-B' (Figure 3.1-06). The younger deposits overlying the San Pedro Formation (Mugu Aquifer and Shallow Alluvial Deposits), do not appear to have been offset to the same degree as the LAS by either the McGrath or Oak Ridge faults (Figures 3.1-06 and 3.1-07). Calibration of groundwater flow models for the area (USGS, 2003a; United, 2018) required incorporating the Oak Ridge and McGrath faults as horizontal flow barriers, consistent with the concept that these faults restrict flow to some degree. In its regional groundwater flow model, United (2018) found that assigning a conductance to these faults of 0.0001 square ft per day resulted in an acceptable calibration.

Ventura, Pitas Point, and Foothill Faults

The Ventura and Foothill faults trend east to west in the northern part of Mound Basin (Figure 3.1-02). The Pitas Point Fault is the westerly, offshore (mostly) extension of the Ventura Fault (Greene et al., 1978). The Ventura and Pitas Point Faults are reverse faults that dip to the north at a high angle; upward movement of the north side of the fault likely contributed to formation of the foothills in the north part of Mound Basin (Yerkes at al., 1987). The Foothill Fault is included in a USGS database of Quaternary faults (Burton et al., 2011), and an inferred fault is shown in approximately the same location by Yerkes et al. (1987). It is also shown on the geologic map included in the Hopkins (2020) report for Mound Basin. United (2012) hypothesized that the Foothill Fault is a reverse fault that dips to the north, similar to the Ventura and Pitas Point Faults.

As a result of vertical offset of the San Pedro Formation along the Ventura, Pitas Point, and Foothill Faults ranging from tens to hundreds of feet (Figures 3.1-06 and 3.1-07), it is inferred that these faults impede groundwater flow in the aquifers to some degree because, as shown on cross-section B-B' (Figure 3.1-06) the faulting disrupts the lateral continuity of the aquifers and juxtaposes different HSUs across the fault

plane. However, no groundwater monitoring wells are located north and south of these faults to detect groundwater elevation changes across them that would allow estimation of conductance across the faults. Neither the USGS (2003a) nor United (2018) modeled these faults as horizontal flow barriers due to lack of data to support calibration of the barrier effect of these faults.

3.1.4.1.3 Hydraulic Properties [§354.14(b)(4)(B)]

§354.14 Hydrogeological Conceptual Model.
(b) *The hydrogeologic conceptual model shall be summarized in a written description that includes the following:*
(4) *Principal aquifers and aquitards, including the following information:*
(B) Physical properties of aquifers and aquitards, including the vertical and lateral extent, hydraulic conductivity, and storativity, which may be based on existing technical studies or other best available information.

This subsection provides a written description of the physical properties of the aquifers and aquitards within Mound Basin, including estimates of their lateral extent, thickness, hydraulic conductivity, and storativity. The lateral and vertical extents of the aquifers and aquitards are depicted on cross-sections A-A' through D-D' (Figures 3.1-05 through 3.1-08). At the time of writing of this GSP, no aquifer test results for hydraulic conductivity or storativity were found in available references. However, well information collected over the past several decades by United (now included in the MBGSA's DMS) from well completion reports includes 10 specific-capacity measurements obtained at water supply and monitoring wells in Mound Basin, which were considered when United (2018) calibrated its numerical groundwater flow model of the region.

For basin-wide estimates of hydraulic conductivity and storativity for each aquifer in Mound Basin, this GSP relies on United's calibrated flow model for the region, which was constructed in 2018 (United, 2018), then expanded and recalibrated in 2020 (United, 2021a). The United model is considered the best available information concerning aquifer and aquitard properties. These estimates are summarized in Table 3.1-01. However, it is recognized that on a local scale, hydraulic conductivity can vary by orders of magnitude over short distances, and there may be areas in Mound Basin where hydraulic conductivity is higher or lower than the values shown on Table 3.1-01.

Shallow Alluvial Deposits

The Shallow Alluvial Deposits in Mound Basin primarily consist of Holocene alluvial fan deposits (USGS, 2003b, 2003c, 2004) deposited by streams emanating from mountain canyons to the north. These deposits are composed of moderately to poorly sorted interbedded sandy clay with some gravel (USGS, 2003b, 2003c, 2004). The Shallow Alluvial Deposits are present in most areas of Mound Basin, except on the hillsides along the northern flank of the Basin (United, 2018). The alluvial fan deposits that comprise the Shallow Alluvial Deposits consist of stream terrace deposits and active wash deposits along the Santa Clara River where the alluvial fan deposits are absent (Figure 3.1-03). The stream terrace deposits include point bar and overbank deposits that consist of poorly sorted clayey sand and sandy clay with gravel (USGS 2003b). The HCM indicates thickness of the Shallow Alluvial Deposits range from less than 50 ft along the margins of Mound Basin to more than 100 ft in the central portion of the Basin (Figures 3.1-05 through 3.1-08) (United, 2018). The Shallow Alluvial Deposits are unconfined across Mound Basin (United, 2012, 2018).

Since 1979, when reporting of groundwater extraction from wells was mandated within United's service area, no extraction has been reported from the Shallow Alluvial Deposits for water supply in Mound Basin (pumping data for water supply wells are included in the Mound Basin DMS), likely due to insufficient saturated thickness and/or poor water quality. The Shallow Alluvial Deposits are not considered a "principal aquifer" at this time for the purpose of groundwater sustainability planning. The analysis and justification for not considering the Shallow Alluvial Deposits as a principal aquifer under SGMA for this GSP is presented in Appendix G.

Based on calibration of its regional groundwater flow model, United (2021a) estimated the horizontal hydraulic conductivity of the Shallow Alluvial Deposits to be 200 feet per day (ft/d) in Mound Basin, and the vertical hydraulic conductivity to be 20 ft/d. The specific yield of the Shallow Alluvial Deposits in the groundwater flow model is 15% (United, 2021a). These values do not apply to localized stream terrace deposits along the Santa Clara River where shallow groundwater interconnects with the Santa Clara River and GDEs are present (i.e. GDE Area No. 11). The presence of tile drains on agricultural lands situated on the stream terrace deposits (Figures 2.1-03 and 3.1-09) suggests that the stream terrace deposits are poorly permeable and, therefore, are not considered to be an aquifer, but may contain perched groundwater zones.

Hydrostratigraphic data, groundwater level data, groundwater quality data, and numerical modeling results demonstrate that shallow groundwater levels within the Shallow Alluvial Deposits and interconnected surface water of the Santa Clara River and its estuary are not materially influenced by extraction from the principal aquifers (please see Appendix G for details).

Upper Aquifer System

The UAS in Mound Basin consists of fine-grained Pleistocene deposits (which behaves as an aquitard) and the Mugu Aquifer. Each of these HSUs is described in more detail below.

Fine-Grained Pleistocene Deposits

United (2018) reports the presence of fine-grained Pleistocene deposits in Mound Basin, consisting primarily of a thick sequence of clays and silts, with sparse interbeds or lenses of sand and gravel. These deposits are stratigraphically equivalent to the Oxnard Aquifer of the Oxnard Basin, but do not yield significant quantities of groundwater in Mound Basin. This HSU has been logged to depths of 350 to 600 ft (typically 100 to 400 ft thick) in a number of wells in Mound Basin (Figures 3.1-05 through 3.1-08). Along the Oxnard Basin boundary these deposits abut or interfinger with the Oxnard Aquifer. Because of its fine-grained nature, this HSU generally is poorly permeable and is rarely targeted for groundwater production; therefore, few data are available regarding its hydraulic parameters. It is possible that sand and gravel layers or lenses in this HSU could contain modest volumes of fresh groundwater.

Based on calibration of its regional groundwater flow model, United (2021a) estimated the horizontal hydraulic conductivity of the fine-grained Pleistocene deposits to be 0.01 ft/d, typical of an aquitard rather than an aquifer, and vertical hydraulic conductivity to be 0.001 ft/d. The specific yield and storage coefficient for this unit were estimated by United (2021a) to be approximately 5% and 0.001 (dimensionless), respectively. This HSU acts as a confining unit for the Mugu Aquifer in Mound Basin, except along the northern margin of the Basin where the San Pedro Formation (which includes the Hueneme and Fox Canyon aquifers) is exposed at land surface and, therefore, is unconfined.

Mugu Aquifer

The Mugu Aquifer consists of marine and non-marine sands and gravels with interbedded silt and clay that lie below the fine-grained Pleistocene deposits and unconformably overlie the San Pedro Formation (Figures 3.1-05 through 3.1-08). Thickness of the Mugu Aquifer in Mound Basin is variable, ranging from approximately 100 to 425 ft, based on borehole geophysical logs reviewed by United (2018). The Mugu Aquifer is generally thickest along the northeast-southwest axis of the Basin, and thins to the north, where it pinches out south of the northern basin boundary. The Mugu Aquifer also thins (to approximately 200 ft) in the south toward the boundary with the Oxnard Basin. Several water supply wells in Mound Basin are screened in the Mugu Aquifer, as it is generally the first aquifer encountered when drilling that yields significant quantities of acceptable-quality groundwater.

Based on calibration of its regional groundwater flow model, United (2021a) estimated the horizontal hydraulic conductivity of the Mugu Aquifer to be 100 ft/d in Mound Basin, and vertical hydraulic conductivity to be 10 ft/d. The specific yield and storage coefficient used in the model (United, 2021a) were approximately 15% where unconfined (along the northern basin margin) and 0.001 (dimensionless) where confined (throughout most of the Basin), respectively.

As described in more detail in Section 3.1.4.4, the Mugu Aquifer stores, transmits, and yields significant or economic quantities of groundwater to wells; therefore, it is considered a "principal aquifer" of Mound Basin.

Lower Aquifer System

The LAS in Mound Basin includes the Hueneme and Fox Canyon aquifers, as well as the aquitards present between each aquifer. These aquifers and aquitards consist of relatively coarse- and fine-grained strata, respectively, of the San Pedro Formation, which is Pleistocene in age. The LAS, being older than the UAS, has undergone more faulting and folding. It has also been eroded, creating an unconformity that separates the UAS from the LAS (Turner, 1975). Except near the northern margin of Mound Basin, the LAS is overlain unconformably by the UAS. The San Pedro Formation crops out in the foothills near the northern boundary of the Basin, attaining a maximum thickness of 2,300 ft in this region (Geotechnical Consultants, 1972). In this area, the aquifers of the San Pedro Formation are not overlain by confining units, and, therefore, are unconfined. The aquifers of the LAS are isolated from each other vertically by relatively low-permeability silt and clay layers called the "Hueneme-Fox Canyon Aquitard." The base of the LAS is considered to be the base of fresh water (Mukae and Turner, 1975). Beneath the LAS lie older sedimentary rocks that are generally considered to contain brackish to saline water or to be poorly transmissive (Mukae and Turner, 1975) and are not used for water supply in Mound Basin. More details regarding each aquifer and aquitard comprised by the LAS are provided below.

Mugu-Hueneme Aquitard

The upper portion of the LAS in Mound Basin (immediately below the Mugu Formation) consists of poorly permeable sediments with relatively high silt and clay content. This unit is referred to by United (2018) as the Mugu-Hueneme Aquitard. Electrical logs for oil and water wells in the region show that this aquitard is present throughout most of Mound Basin between the Mugu and Hueneme aquifers, except along the northern margin of the Basin where this unit has been uplifted by the Ventura-Pitas Point Fault and eroded away. Thickness of this aquitard ranges from approximately 100 ft at the northern margins of the Basin to 200 ft near the center of the Basin (Figures 3.1-05 through 3.1-08).

Based on calibration of its regional groundwater flow model, United (2021a) estimated the horizontal hydraulic conductivity of the Mugu-Hueneme Aquitard to be approximately 0.01 ft/d in Mound Basin, and vertical hydraulic conductivity to be 0.001 ft/d. The specific yield for the Mugu-Hueneme Aquitard in Mound Basin in the model is 5% where unconfined (along the northern basin margin), and the storage coefficient is 0.0005 (dimensionless) where confined (throughout most of the Basin).

Hueneme Aquifer

A series of interbedded, water-bearing sands in the upper approximately two-thirds of the San Pedro Formation comprise the Hueneme Aquifer (United, 2018). Structural complexities have resulted in thinning of these beds in the southern part of Mound Basin (south of the Oak Ridge and McGrath faults), compared to the central axis of Mound Basin (Figures 3.1-06 and 3.1-07). In the central and northern parts of the Basin, resistivity-log signatures indicate some lithologic differences in this unit compared to its lithology in the Oxnard Basin; specifically, some of the coarse-grained strata of the Hueneme Aquifer thin or become increasingly lenticular in the northward direction (United, 2012). However, thick (up to 1,000 ft) sections of the Hueneme Aquifer (or time-equivalent strata) do occur in Mound Basin, as oil well electrical logs interpreted by United (2012) indicate variable amounts of coarse-grained (permeable) materials. Borehole geophysical (resistivity) logs reviewed by United (2018) indicate the Hueneme Aquifer is generally thickest (typically 1,000 ft) along the northeast-southwest axis of the Basin, becoming thinner (200 to 600 ft) along the northern and southern basin boundaries. Most of the water supply wells in Mound Basin are screened primarily or entirely in the Hueneme Aquifer.

Based on calibration of its regional groundwater flow model, United (2021a) estimated the horizontal hydraulic conductivity of the Hueneme Aquifer to be 20 ft/d throughout Mound Basin, and vertical hydraulic conductivity to be 2 ft/d. The specific yield for the Hueneme Aquifer in Mound Basin in the model is 10% where unconfined (along the northern basin margin), and the storage coefficient is 0.005 (dimensionless) where confined (throughout most of the Basin).

As described in more detail in Section 3.1.4.4, the Hueneme Aquifer stores, transmits, and yields significant or economic quantities of groundwater to wells; therefore, it is considered a “principal aquifer” of Mound Basin.

Hueneme-Fox Canyon Aquitard

Below the Hueneme Aquifer, laterally extensive deposits of silt and clay of the San Pedro Formation up to approximately 100 ft thick (Figures 3.1-05 through 3.1-08) with interbeds of sand and gravel form an aquitard between the Hueneme and Fox Canyon aquifers throughout Mound Basin. This HSU is referred to by United (2018) as the Hueneme-Fox Canyon Aquitard.

Based on calibration of its regional groundwater flow model, United (2021a) estimated the horizontal hydraulic conductivity of the Hueneme-Fox Canyon Aquitard to be 0.01 ft/d in most of Mound Basin, and vertical hydraulic conductivity to be 0.001 ft/d. The specific yield for the Mugu-Hueneme Aquitard in Mound Basin in the model is 5% where unconfined (along the northern basin margin), and the storage coefficient estimated to be 0.0005 (dimensionless) where confined (throughout most of the Basin).

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Fox Canyon Aquifer

Lower portions of the San Pedro Formation consist principally of sand and gravel zones with variable thicknesses of interstratified clay and silt (United, 2018). In a northerly direction across Mound Basin, these coarser-grained water-bearing strata are somewhat lenticular and generally become thinner (John F. Mann Jr. & Associates, 1959; Geotechnical Consultants, 1972), similar to the Hueneme Aquifer. The sand and gravel zone located at or near the base of the San Pedro Formation is known as the Fox Canyon Aquifer in the Oxnard Basin, and United (2012, 2018) extends that nomenclature for this HSU to Mound Basin as well. Electrical-log data and outcrops near the base of the San Pedro Formation in the foothills on the north side of Mound Basin do not indicate the same aquifer thickness or sediment coarseness as observed at the location in Fox Canyon on the south flank of South Mountain, 11 miles southeast of Mound Basin (Geotechnical Consultants, 1972; United, 2012). However, the distinct borehole resistivity-log signature of the Fox Canyon Aquifer is discernible across Mound Basin and adjacent areas (United, 2012). The Fox Canyon Aquifer commonly occurs at depths greater than 1,000 ft in Mound Basin and is not targeted for groundwater supply (United, 2012), with the exception of two active water supply wells that are screened partly in the Fox Canyon Aquifer and partly in the overlying Hueneme Aquifer (Table 3.1-02).

Borehole resistivity logs reviewed by United (2018) indicate that the Fox Canyon Aquifer in Mound Basin is typically 400 to 600 ft thick (Figures 3.1-05 through 3.1-08). However, as discussed above, the coarser-grained layers that comprise the main water-producing zones of the Fox Canyon Aquifer thin and become more lenticular in a northerly direction across Mound Basin, as shown on the resistivity logs on Figures 3.1-06 and 3.1-07. In the Oxnard Basin, John F. Mann Jr. & Associates (1959) further divided the Fox Canyon Aquifer into a “main” (sometimes called “upper”) member and a “basal” member (at the base of the San Pedro Formation), separated by a 50-ft-thick aquitard consisting primarily of fine-grained sediments. United (2018) incorporated this subdivision of the Fox Canyon Aquifer into their regional groundwater flow model. No water supply wells in Mound Basin are screened to the depth needed to reach the basal Fox Canyon Aquifer; therefore, the hydraulic characteristics of this unit are uncertain.

Based on calibration of its regional groundwater flow model, United (2021a) estimated the horizontal hydraulic conductivity of the main Fox Canyon Aquifer to be 10 ft/d in most of Mound Basin, and vertical hydraulic conductivity to be 1 ft/d. The specific yield for the main Fox Canyon Aquifer in Mound Basin in the model is 10% where unconfined (along the northern basin margin), and the storage coefficient is 0.005 (dimensionless) where confined (throughout most of the Basin). Identical hydraulic parameters are assumed for the basal Fox Canyon Aquifer (United, 2021a).

Owing to the lack of wells screened in the Fox Canyon Aquifer, it does not meet the SGMA definition of a principal aquifer because it does not currently (and has not, historically) “store, transmit, and yield significant or economic quantities of groundwater to wells, springs, or surface water systems” in Mound Basin. If future water supply wells are screened in the Fox Canyon Aquifer, then this designation should be reconsidered as part of the required periodic GSP update process.

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3.1.4.2 Groundwater Recharge and Discharge Areas [§354.14(d)(4)]

§354.14 Hydrogeological Conceptual Model.
(d) Physical characteristics of the basin shall be represented on one or more maps that depict the following:
(4) Delineation of existing recharge areas that substantially contribute to the replenishment of the basin, potential recharge areas, and discharge areas, including significant active springs, seeps, and wetlands within or adjacent to the basin.

Multiple sources of groundwater recharge (water that enters an underlying groundwater system from land surface) occur in Mound Basin (United, 2018), including:

- Infiltration of precipitation—Most infiltration of precipitation recharges the Shallow Alluvial Deposits, although some infiltration of precipitation occurs in outcrops of the Hueneme and Fox Canyon aquifers in the foothills in the northern part of Mound Basin.
- Mountain-front recharge—For this report, the term "mountain-front recharge" refers to infiltration of runoff from the foothills north of Mound Basin, where many of the small drainages in Mound Basin have watersheds that extend northward beyond the basin boundary. Both United (2018) and the USGS (2003a) computed monthly runoff in each of these small catchment areas based on rainfall and incorporated infiltration of this runoff into aquifers as a recharge component in their regional numerical models. Infiltration of this runoff is assumed to occur within a short distance (2,000 ft) south of the basin boundary, where the Hueneme and Fox Canyon aquifers are exposed at land surface. In Mound Basin, infiltration of this runoff recharges the Hueneme and Fox Canyon aquifers. To simplify the input to United's (2021a) regional groundwater flow model, all areal recharge (as well as mountain-front recharge) in the northern foothills of Mound Basin was simulated to infiltrate the Hueneme Aquifer. This simplification should not significantly affect the aquifer-specific groundwater budgets discussed in Section 3.3, because recharge entering the Hueneme Aquifer is allowed to flow vertically to the Fox Canyon Aquifer in the model if a downward hydraulic gradient is present between the aquifers. If the model is updated in the future such that the model grid is refined (smaller grid cells) in the northern foothills, apportionment of areal recharge between the Hueneme and Fox Canyon aquifers can potentially be revised to better reflect the outcrop area of each aquifer.
- M&I return flows—This term refers to water applied for landscape irrigation, leaked water from water supply and wastewater pipelines, and storm water that is collected in detention basins or other facilities and allowed to infiltrate into the ground. Most of these return flows recharge the Shallow Alluvial Deposits, but some may contribute to recharge of the Hueneme Aquifer and Fox Canyon Aquifer in the foothills in the north part of Mound Basin, where residential development exists on the hillsides.
- Agricultural return flows— This term refers to water applied for agricultural irrigation (in addition to rainfall) that infiltrates deeper than the root zone of crops. Some "excess" irrigation of farmland is required to leach salts from shallow soil, and some irrigation inefficiencies occur due to the variability in irrigation application and soil infiltration capacity. These infiltrating return flows may be intercepted by perched zones in near-surface soil horizons or continue downward to the uppermost aquifer, which in most of Mound Basin is the Shallow Alluvial Deposits. However, some return flows in the foothills in the north part of Mound Basin may contribute to recharge of the Hueneme Aquifer and Fox Canyon Aquifer, where avocado and other orchards are present in areas where these aquifers are present at or near land surface.

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- Stream-channel recharge—This term refers to infiltration of surface water flows in "losing" reaches of major streams (excluding areas of mountain-front recharge as described above). The quantity of recharge occurring in the narrow channels of the barrancas in Mound Basin, most of which only flow briefly following storm events, is so small as to be considered by United (2018) to be indistinguishable from areal recharge of agricultural and M&I return flows. The Santa Clara River is the only major stream in Mound Basin, and the reach of the Santa Clara River in Mound Basin is considered to usually be the site of groundwater discharge, rather than recharge (Stillwater Sciences, 2011; United, 2018). However, the lower Santa Clara River in the area of its estuary is reported to fluctuate from gaining to losing cycles as water levels rise and fall in response to breaching of the barrier sand at the mouth of the river (Stillwater Sciences, 2011). When the elevation of surface water in the estuary rises (following closure of the barrier bar), some of the rising water infiltrates (recharges) the shallow deposits adjacent to the river. Then, typically in the following winter or spring, a large storm will produce sufficient flows in the river that it will breach the barrier bar and cause rapid decline of surface water levels in the estuary, causing groundwater in the adjacent shallow deposits to discharge back into the river over a sustained period.

Areas where these sources of recharge occur in Mound Basin are shown on Figure 3.1-11, and further discussion of the nature and quantities of these sources of recharge are discussed in Section 3.3. In addition to the types of recharge (from land surface) listed above, subsurface inflow of groundwater also occurs in Mound Basin as a result of groundwater underflow from adjacent basins (United, 2018), as discussed in Section 3.3.

Within Mound Basin, groundwater discharge occurs from the Shallow Alluvial Deposits along the lower, gaining reach of the Santa Clara River (area 11 on Figure 3.1-11), and via tile drains installed under farmland adjacent to the river, as noted on Figure 3.1-11. These areas of groundwater discharge in Mound Basin are shown on Figure 3.1-11, and their quantities are discussed in Section 3.3. As noted in Section 3.1.1.2, no springs or seeps are shown on USGS topographic maps within or adjacent to the boundaries of Mound Basin. In addition to the types of discharge listed above, extraction of groundwater also occurs in Mound Basin at water supply wells, as discussed in Section 3.1.4.4.

3.1.4.3 Groundwater Quality [§354.14(b)(4)(D)]

§354.14 Hydrogeological Conceptual Model.
(b) *The hydrogeologic conceptual model shall be summarized in a written description that includes the following:*
(4) *Principal aquifers and aquitards, including the following information:*
(D) General water quality of the principal aquifers, which may be based on information derived from existing technical studies or regulatory programs.

Available groundwater quality data and existing technical studies were reviewed to understand the age, major-ion chemistry, and spatial and temporal trends in key groundwater quality indicator constituents, such as total dissolved solids (TDS), sulfate, chloride, and nitrate, in the principal aquifers of Mound Basin.

Groundwater quality data are available from wells screened in three HSUs in Mound Basin: the fine-grained Pleistocene deposits, Mugu Aquifer, and Hueneme Aquifer. Maps of recent (2017) concentrations

of the key indicator constituents and time-series graphs of historical concentrations detected at selected wells are shown on Figures 3.1-12 through 3.1-25. Water quality data for 2017 (VCWPD, 2021) were selected for these maps because 2017 was the most recent year when a relatively large number of Mound Basin wells were sampled; fewer wells were sampled in 2018 by VCWPD due to staffing issues. The major-ion chemistry of the HSUs is shown using stiff diagrams on Figures 3.1-21 through Figure 3.1-23. Comparison of the stiff diagrams reveals that groundwater in the fine-grained Pleistocene deposits has a very different chemistry than groundwater in the principal aquifers (Mugu and Hueneme aquifers). Groundwater in the fine-grained Pleistocene deposits is 3 to 5 times more mineralized and has a different major-ion signature than groundwater in the Mugu and Hueneme aquifers. The degree of mineralization and major-ion chemistry in the Mugu and Hueneme aquifers are similar, with Hueneme Aquifer groundwater generally being slightly more mineralized. One exception is the shallow, dedicated monitoring well at Community Park (CWP-510), which is screened in the upper Hueneme Aquifer and has major-ion chemistry that bears similarities to the fine-grained Pleistocene deposits (Figure 3.1-23). The dramatic difference between groundwater chemistry in the fine-grained Pleistocene deposits versus the Mugu and Hueneme aquifers is explained by different geochemical processes operative in the shallow HSUs versus the deeper, principal aquifers. S.S. Papadopulos & Associates, Inc. (SSP&A, 2020) concluded that groundwater in the principal aquifers appears to be similar in composition to regional groundwater in other local basins; in contrast, shallow groundwater is additionally influenced by reactions with local aquifer minerals, principally gypsum and perhaps other evaporites that do not appear to be present in the principal aquifers.

SSP&A (2020) further concluded that there is no significant evidence for interactions between groundwater in the principal aquifers and shallow groundwater (CWP-510 is included here) or deeper, mineralized water. SSP&A (2020) also concluded that groundwater at the sample locations in the Basin is at least 1,000 years old. These conclusions together suggest that vertical movement of water percolating from land surface is not a major source of recharge to the principal aquifers, except where they are exposed at land surface in the northern portion of the Basin.

Groundwater quality in each of the principal aquifers, as discussed further below, is relatively stable at many Mound Basin wells having long-term groundwater quality records, consistent with the conclusion by previous investigators that natural causes are the primary source of elevated concentrations of dissolved constituents in groundwater.

The Basin Plan of the Regional Water Quality Control Board (RWQCB), Los Angeles region (RWQCB-LA) establishes groundwater quality “objectives” (WQOs) as “the allowable limits or levels of water quality constituents or characteristics which are established for the reasonable protection of beneficial uses of water or the prevention of nuisance within a specific area” (RWQCB-LA, 2019). The WQOs for Mound Basin are shown in Table 3.1-03.

Mugu Aquifer

Maximum TDS, sulfate, chloride, and nitrate concentrations detected in 2017 at five wells screened in the Mugu Aquifer (including wells with screens that extend above or below the Mugu Aquifer) were reported to or obtained by United (Figures 3.1-12 through 3.1-15). Four of these five wells are located along the west-southwest to east-northeast axis of the Basin, and one is located in the southeast quadrant of the Basin. Also shown on Figures 3.1-12 through 3.1-15 are water quality data at wells in adjacent areas of

the Oxnard and Santa Paula basins, as they may provide some insight to groundwater quality along the southern and eastern margins of Mound Basin.

The maximum TDS concentrations detected in 2017 at wells screened in the Mugu Aquifer in Mound Basin ranged from 880 to 3,040 milligrams per liter (mg/L) (Figure 3.1-12). The two highest TDS concentrations were detected at wells 02N22W07P01S (near the intersection of U.S. Highway 101 and State Highway 126, in the central portion of Mound Basin) and well 02N22W08G01S (near the intersection of State Highway 126 and Victoria Avenue, also in the central portion of Mound Basin). The TDS concentrations detected at these wells are not considered representative of Mugu Aquifer groundwater quality. After excluding the unrepresentative results, the range of maximum TDS concentrations measured in the remaining three wells is 880 to 1,420 mg/L (Figure 3.1-12). For comparison and as shown in Table 3.1-03, the RWQCB-LA WQO for TDS in confined aquifers of the lower Santa Clara River basins (including Mound Basin) is 1,200 mg/L (RWQCB-LA, 2013). The California Division of Drinking Water (DDW) lists a "recommended secondary" maximum contaminant level (MCL) range (MCLR) for TDS in public water supplies of 500 mg/L.

The maximum sulfate concentrations detected in 2017 at wells screened in the Mugu Aquifer in Mound Basin ranged from 312 to 1,550 mg/L (Figure 3.1-13). Similar to TDS, the two highest TDS concentrations were detected at wells 02N22W07P01S and well 02N22W08G01S, in the central portion of the Basin. Similar to TDS, the sulfate results from these wells are not considered representative of Mugu Aquifer groundwater quality. After excluding the unrepresentative results, the range of maximum sulfate concentrations measured in the remaining three wells is 312 to 698 mg/L (Figure 3.1-13). The RWQCB-LA's applicable WQO for sulfate (Table 3.1-03) in Mound Basin is 600 mg/L (RWQCB-LA, 2013). The DDW-recommended secondary MCLR for sulfate in public water supplies is 250 mg/L. DDW also lists an "upper secondary" MCLR for sulfate in public water supplies of 500 mg/L.

The maximum chloride concentrations detected in wells screened in the Mugu Aquifer in Mound Basin ranged from 45 to 138 mg/L (Figure 3.1-14). Similar to TDS and sulfate, the two highest TDS concentrations were detected at wells 02N22W07P01S and well 02N22W08G01S, in the central portion of the Basin. Similar to TDS and sulfate, the chloride results from these wells are not considered representative of Mugu Aquifer groundwater quality. After excluding the unrepresentative results, the range of maximum chloride concentrations measured in the remaining three wells is 45 to 76 mg/L (Figure 3.1-14). The RWQCB-LA's applicable WQO for chloride (Table 3.1-03) in Mound Basin is 150 mg/L (RWQCB-LA, 2013). DDW's recommended secondary MCLR for chloride in public water supplies is 250 mg/L and DDW's upper MCLR for chloride in public water supplies is 500 mg/L.

The maximum nitrate as (as nitrate [NO_3]) concentrations detected in 2017 at wells screened in the Mugu Aquifer in Mound Basin ranged from less than the detection limit (0.4 mg/L) to 64.6 mg/L (Figure 3.1-15). Nitrate concentrations are occasionally reported by laboratories in equivalent weight as nitrogen; in this GSP, nitrate results reported as nitrogen have been recalculated to equivalent concentrations as NO_3, unless otherwise noted. Similar to the other common dissolved constituents noted above, the highest nitrate concentrations in the Mugu Aquifer in 2017 were detected at wells 02N22W07P01S and well 02N22W08G01S, in the central portion of the Basin. Similar to TDS, sulfate, and chloride, the nitrate concentrations in these wells are anomalously high compared to other Mugu Aquifer wells in the Basin, suggesting influence of shallow groundwater through a possibly compromised well seal or well casing. Nitrate concentrations were below the detection limit at two of the three remaining (representative) wells

in the Mugu Aquifer and 8.4 mg/L at well 02N22W09K01S (Figure 3.1-15). The RWQCB-LA's applicable WQO for nitrate (as NO_3) in Mound Basin is 45 mg/L (RWQCB-LA, 2013). Similarly, DDW lists a "primary" MCL for nitrate in public water supplies of 45 mg/L (as NO_3).

Figures 3.1-20 through 3.1-25 show times series of measured historical TDS, chloride, and sulfate in selected wells in Mound Basin, including three wells screened in the Mugu Aquifer. At Well 02N23W14K01S, which is screened in both the Mugu and Hueneme aquifers, TDS exceeded the WQO of 1,200 mg/L for the Basin from the early 1930s to 1957. However, for the rest of the period of historical record (from the mid-1960s through the early 1980s), TDS concentrations at well 02N23W14K01S remained below the current WQO, with the exception of two samples from the late 1960s. Sulfate concentrations measured at the same well have been below the current WQO of 150 mg/L from the early 1930s through the last sample taken in the early 1980s, with the exception of one sample from the early 1960s that appears to be an outlier. Chloride concentrations measured at the same well have been below the WQO of 150 mg/L from the early 1930s through the last sample taken in the early 1980s, with the exception of one sample (also from the early 1960s) that appears to be an outlier. TDS, chloride, and sulfate concentrations at other wells (Figure 3.1-21 and 3.1-22) have been at or below the WQO throughout the available period of record from 1995 through 2020, with the exception of three detections of TDS above the WQO of 1,200 mg/L prior to 2010. TDS, sulfate, and chloride concentrations have been below the RWQCB-LA WQOs for the entire period of record at Marina Park and Camino Real Park monitoring wells 02N23W15J02S and 02N22W07M02S, screened in the Mugu Aquifer (Figures 3.1-21 and 3.1-22).

Measured historical boron concentration slightly exceeded the Basin WQO in October of 2013 at only one well (02N22W07P01S). The average boron concentration measured at Well 02N22W07P01S over the available period of record of 2000 to 2017 was 0.71 mg/L. The one-time exceedance was likely due to the major drought that occurred in 2013. It is also noted that this well has consistently had anomalously high concentrations of common constituents, suggesting influence of shallow groundwater within this well, possibly through a compromised well seal or well casing; therefore, boron results from this well are considered non-representative of the Mugu Aquifer. All the samples taken after October 2013 at the same well had concentrations less than the Basin WQO and did not show any specific trend.

Hueneme Aquifer

Maximum TDS, sulfate, chloride, and nitrate concentrations detected in 2017 at nine wells screened in the Hueneme Aquifer (including wells with screens that extend above or below the Hueneme Aquifer) were reported to or obtained by United (Figures 3.1-16 through 3.1-19). Five of these nine wells are located along the west-southwest to east-northeast axis of the Basin, and four are located in the southeast quadrant of the Basin. Figures 3.1-21 through 3.1-25 show concentrations of TDS, sulfate, and chloride over time at selected wells with historical data available in Mound Basin, including six wells screened in the Hueneme Aquifer. It is noted that wells 02N23W13K03S, 02N22W08F01S, and 02N22W09L04S exhibit anomalously high concentrations of TDS, sulfate, chloride, and nitrate, suggesting influence of shallow groundwater, possibly through a compromised well seal or well casing. Thus, the elevated concentrations of TDS, sulfate, and chloride reported for these wells should not be considered representative of Hueneme Aquifer groundwater quality.

The maximum TDS concentrations detected in 2017 at wells screened in the Hueneme Aquifer in Mound Basin ranged from 1,060 to 6,390 mg/L (Figure 3.1-16). The highest TDS concentration was detected at

monitoring well 02N22W09L04S, in the southeast quadrant of the Basin. As stated above, the TDS result from this well and two others are not considered representative of Hueneme Aquifer groundwater quality. After excluding the unrepresentative results, the range of maximum TDS concentrations measured in the remaining six wells is 1,060 to 1,420 mg/L (Figure 3.1-16). Four of the six representative wells have TDS concentrations below the RWQCB-LA WQO and two are above.

The maximum sulfate concentrations detected in 2017 at wells screened in the Hueneme Aquifer in Mound Basin ranged from 412 to 3,620 mg/L (Figure 3.1-17). Similar to TDS in the Hueneme Aquifer, the single highest sulfate concentration was detected at monitoring well 02N22W09L04S, in the southeast quadrant of the Basin. As stated above, the sulfate result from this well and two others are not considered representative of Hueneme Aquifer groundwater quality. After excluding the unrepresentative results, the range of maximum sulfate concentrations measured in the remaining six wells is 412 to 698 mg/L (Figure 3.1-17). Five of the six representative wells have sulfate concentrations below the RWQCB-LA WQO and one is above.

The maximum chloride concentrations detected in 2017 at wells screened in the Hueneme Aquifer in Mound Basin ranged from 67 to 181 mg/L (Figure 3.1-18). Similar to TDS and sulfate in the Hueneme Aquifer, the single highest chloride concentration was detected at monitoring well 02N22W09L04S, in the southeast quadrant of the Basin. As stated above, the chloride result from this well and two others are not considered representative of Hueneme Aquifer groundwater quality. After excluding the unrepresentative results, the range of maximum chloride concentrations measured in the remaining six wells is 67 to 86 mg/L (Figure 3.1-18). All six representative wells have chloride concentrations below the RWQCB-LA WQO.

The maximum nitrate concentrations detected in 2017 at wells screened in the Hueneme Aquifer in Mound Basin ranged from less than the laboratory detection limit (0.4 mg/L) to 136 mg/L (Figure 3.1-19). Similar to the other common dissolved constituents detected in the Hueneme Aquifer, the single highest nitrate concentration in the Hueneme Aquifer was detected at monitoring well 02N22W09L04S, in the southeast quadrant of the Basin. It is noted that the nitrate concentrations in this well (together with well 02N23W13K03S) are anomalously high compared to other Hueneme Aquifer wells in Mound Basin, suggesting influence of shallow groundwater, possibly through a compromised well seal or well casing. Nitrate concentrations were below the detection limit at five wells in the Hueneme Aquifer in Mound Basin (Figure 3.1-19).

Municipal water supply well 02N22W08F01S (Victoria 2) is one of the few wells in Mound Basin where increasing trends are clearly discernible in past (1995 to 2006) TDS and sulfate concentrations (Figure 3.1-24). This well has three screened intervals (580 to 640; 900 to 940; and 1,060 to 1,180 ft bgs) in the Hueneme Aquifer. As noted above, concentrations of these constituents are anomalously high, suggesting a potential influence of an overlying HSU on water quality at these wells, possibly through a compromised well seal or well casing. As groundwater production increased from this well in the 1990s, TDS concentrations increased from approximately 1,000 mg/L to approximately 1,500 mg/L by 2006. Concentrations have since stabilized and have not increased further. The cause of the groundwater quality changes at this well is currently unknown. It is noted that all other wells screened in the Hueneme Aquifer with historical water quality data exhibit generally stable trends for all constituents (Figures 3.1-21 through 3.1-25).

Measured historical boron concentrations have exceeded the Basin WQO at five wells screened in the Hueneme Aquifer. The maximum measured boron concentrations at these wells ranged from 1.05 to 1.30 with the exception of one well (02N23W24G01S), which only had reported data during the 1950s. The reported concentrations at Well 02N23W24G01S show that boron was 7.0 mg/L in October 1953, whereas the rest of the reported concentrations at the same well were below 0.59 mg/L. The 7.0 mg/L reported for October 1953 appears to be an outlier and thus should not be considered. Boron concentrations at the remaining four wells screened in the Hueneme Aquifer show boron concentrations below the Basin WQO for the entire period of record with the exception of one or two samples from one well (02N22W08F01S); these results are not typical of the record of sampling data, which are consistently below the WQO.

3.1.4.4 Primary Beneficial Uses [§354.14(b)(4)(E)]

§354.14 Hydrogeological Conceptual Model.
(b) *The hydrogeologic conceptual model shall be summarized in a written description that includes the following:*
(4) *Principal aquifers and aquitards, including the following information:*
(E) Identification of the primary use or uses of each aquifer, such as domestic, irrigation, or municipal water supply.

The primary uses of each principal aquifer in Mound Basin (Mugu and Hueneme) are reflected in the extraction records that are reported to United (and included in the MBGSA DMS). Importantly, there are no active or recently active domestic wells in the Basin. Recent (as of 2019) extraction records for groundwater in Mound Basin reported to United include agricultural water supply (at 22 wells) and M&I water supply (at 4 wells). In 2019, 2,873 AF (45% of the total of 6,319 AF of groundwater extracted from Mound Basin) was used for agriculture, and 3,446 AF (55% of the total) was used for M&I purposes. The locations of all 26 water supply wells active in Mound Basin in 2019 and relative volumes of groundwater extracted by each well are shown on Figure 3.1-26. The quantities of groundwater extracted for agricultural and M&I uses from the principal aquifers underlying Mound Basin during the past 40 years (1980 through 2019) are shown on Figures 3.1-27 through 3.1-29. None of the wells active in 2019 were reportedly used for domestic supply, likely due to the availability of potable water from Ventura Water and the significant expense required to drill a domestic water supply well to the depth required to reach a principal aquifer in Mound Basin. The following subsections provide more detail regarding the primary uses of groundwater extracted from each principal aquifer in Mound Basin.

Shallow Alluvial Deposits

No wells extract groundwater from the Shallow Alluvial Deposits in the Basin.

Mugu Aquifer Extraction

Five active wells are screened solely in the Mugu Aquifer and one active well is believed to produce water primarily from the Mugu Aquifer, despite possibly being screened partly in the Hueneme Aquifer (Table 3.1-02). In 2019, five of these six wells supplied 948 AF of groundwater for agricultural use, which was approximately 15% of the total extracted from Mound Basin that year. The remaining well supplied 1,740 AF of groundwater for M&I use, which was approximately 28% of the total extracted from Mound Basin in 2019.

Hueneme Aquifer Extraction

Ten active wells are screened solely in the Hueneme Aquifer and one active well is believed to produce water primarily from the Hueneme Aquifer, despite possibly being screened partly in the Mugu Aquifer (Table 3.1-02). In 2019, three of these wells supplied 1,706 AF of groundwater for M&I use, which was approximately 27% of the total extraction from Mound Basin. The remaining eight wells supplied 1,129 AF of groundwater for agricultural use, which was approximately 18% of the total extracted from Mound Basin in 2019.

Extraction from Wells Screened Across Multiple Aquifers

Four active water supply wells are screened in (and are assumed to withdraw significant quantities of groundwater from) both the Mugu and Hueneme aquifers; all groundwater extracted from these wells is used for agricultural purposes (Table 3.1-02). In 2019, a total of 134 AF was extracted from these wells, which was approximately 2% of the total extracted from Mound Basin that year.

Two active water supply wells are screened in both the Hueneme and Fox Canyon aquifers; the water extracted from these wells is used for agricultural purposes (Table 3.1-02). In 2019, a total of 191 AF was extracted from this well, which was about 3% of the total quantity of groundwater extracted from Mound Basin that year. Due to the generally higher hydraulic conductivity and transmissivity of the Hueneme Aquifer in Mound Basin compared to the Fox Canyon Aquifer, most of the groundwater extracted from these wells likely was derived from the Hueneme Aquifer.

Extraction from Wells with Unknown Screened Intervals

The depths of the screened intervals for three active water supply wells in Mound Basin have not been reported. The water extracted from these wells is used for agricultural purposes (Table 3.1-02). In 2019, a total of 472 AF was extracted from these wells, which was approximately 7% of the total extracted from Mound Basin that year.

Other Beneficial Uses

In addition to groundwater production from the principal aquifers, discharge of small quantities of groundwater from the Shallow Alluvial Deposits to the lower reach of the Santa Clara River in Mound Basin may contribute to GDEs. This potential beneficial groundwater use is further described in Section 3.2.7 and Appendix G.

3.1.5 Data Gaps and Uncertainty [§354.14(b)(5)]

§354.14 Hydrogeological Conceptual Model.
(b) *The hydrogeologic conceptual model shall be summarized in a written description that includes the following:*
(5) Identification of data gaps and uncertainty within the hydrogeologic conceptual model.

The discussion of data gaps and uncertainty within the HCM of Mound Basin is provided below, organized according to the HCM elements listed in the GSP Emergency Regulations.

Topography [§354.14(d)(1)]

No data gaps or significant uncertainties were identified.

Surface Water Bodies [§354.14(d)(5)]

No data gaps or significant uncertainties were identified.

Imported Water [§354.14(d)(6)]

No data gaps or significant uncertainties were identified.

Regional Geology and Structural Setting [§354.14(b)(1),(d)(2)]

No data gaps or significant uncertainties were identified.

Soil Characteristics [§354.14(d)(3)]

No data gaps or significant uncertainties were identified.

Vertical and Lateral Extent of Mound Basin [§354.14(b)(2),(b)(3),(c)]

The precise location, orientation, and hydraulic impact of the Basin-bounding McGrath Fault (south boundary) and Country Club Fault (east boundary) are not known precisely because they do not offset surficial units within the Basin. However, the south and east boundaries are jurisdictional and thus do not depend on precise knowledge of the fault locations. Going forward, MBGSA will work with the adjacent basin institutions (Santa Paula Basin Technical Advisory Committee and FCGMA), as well as United, to improve the understanding of the location and hydraulic barrier effects of the Basin-bounding faults, when opportunities arise.

With regard to the western Basin boundary, it is defined as the Pacific Ocean shoreline, of which the location is known with certainty. From a purely hydraulic perspective, the western Basin boundary is more appropriately considered to be the location where the principal aquifers are exposed to seawater. The principal aquifers of Mound Basin are believed to extend up to approximately 10 miles offshore under the Pacific Ocean west of the shoreline, to the location where they are mapped as cropping out on the continental shelf edge, as shown on Figure 3.1-10. However, it is unknown if the aquitards that separate the principal aquifers from the seafloor have been eroded away or otherwise compromised by faulting or folding between the shoreline and the continental shelf edge. This is a very significant uncertainty in the HCM that directly impacts management relative to the seawater intrusion sustainability indicator.

The vertical extent (definable bottom) of the Basin is known only from a relatively small number of oil well logs. This is because few wells tap the deepest freshwater aquifer and none fully penetrate it. The uncertainty in the vertical extent of the Basin is not considered a significant data gap or uncertainty in the HCM because there is little, if any, groundwater extracted from the deepest freshwater aquifer.

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Groundwater Flow Barriers [§354.14(b)(4)(C) and (c)]

The prior discussion of uncertainty concerning the location, orientation, and hydraulic impact of the Basin-bounding faults (McGrath and Country Club Faults) also applies to this part of the HCM.

In addition, the hydraulic impact of Pitas Point, Ventura, and Foothill faults, located in the northern portion of the Basin, are uncertain. These faults have uplifted the principal aquifers in the northern portion of the Basin, exposing them at land surface. Given the significant offset of the principal aquifers and the juxtaposition of different HSUs across the fault plane, it can be inferred that these faults likely impede groundwater flow in the principal aquifers to some degree. There are no groundwater monitoring wells located north and immediately south of these faults to detect groundwater elevation change across the faults. Neither the USGS (2003a) nor United (2018) regional groundwater flow models incorporated these faults as horizontal flow barriers because of this lack of data. This is considered a significant uncertainty in the HCM because MBGSA's knowledge of groundwater flow directions is largely derived from United's groundwater model (2021a), which currently assumes no impedance of flow from the principal aquifer outcrops north of these faults. If these faults impede flow, the groundwater flow directions and water budget for Mound Basin derived from the groundwater flow model might be significantly different. MBGSA will work with United to test alternative model calibrations that consider varying degrees of potential barrier effects of these faults to evaluate uncertainty in groundwater flow directions and water budget and the resulting impact on Basin management decisions.

Formation Names and Hydraulic Properties [§354.14(b)(4)(A), (b)(4)(B)]

The lateral and vertical extents of the Basin HSUs are well established, except for the bottom of the deepest freshwater aquifer, as discussed above.

As noted in Section 3.1.4, no aquifer tests have been reported in the literature. The best available information for aquifer and aquitard hydraulic properties in Mound Basin is from the calibrated regional groundwater flow model (United, 2018). Use of model-derived hydraulic properties values is considered appropriate and, therefore, the lack of aquifer tests results is not considered a significant data gap or uncertainty at this time. Going forward, MBGSA will work with well owners in the Basin to conduct aquifer tests when opportunities arise, such as when new or replacement wells are constructed.

Groundwater Recharge and Discharge Areas [§354.14(d)(4)]

No data gaps or significant uncertainties were identified; however, as described above, the degree of hydraulic connectivity of the principal aquifer outcrops in the northern part of Mound Basin with the remainder of the Basin (south of the Ventura, Pitas Point, and Foothills faults) is uncertain.

Water Quality [§354.14(b)(4)(D)]

Groundwater in the principal aquifers in the northern and western portions of Mound Basin has not been sampled in recent years (and in some areas, it has never been sampled) for water quality analysis. No wells currently are known to exist that can be used to obtain samples in these areas. However, there is no groundwater production in these portions of the basins, so this is not considered to be a significant data gap or uncertainty in the HCM.

Primary Beneficial Uses [§354.14(b)(4)(E)]

No data gaps or significant uncertainties were identified.

3.2 Groundwater Conditions [§354.16]

This subsection provides a description of current and historical groundwater conditions in the principal aquifers of the Mound Basin, based on best available information. Groundwater conditions during the past 10 years, and particularly from 2015 to present, are the primary focus of this subsection, although historical data are also discussed where such data provide relevant information about long-term trends in groundwater conditions. Additional details regarding historical groundwater conditions in Mound Basin and the vicinity in the first half of the 20th century are provided by Mukae and Turner (1975) and John F. Mann Jr. & Associates (1959). In addition, USGS (2003a) estimated groundwater levels and movement throughout the region from the 1890s to the early 1990s, based on data synthesis and modeling. United and other local agencies have been collecting groundwater elevation and groundwater quality data from wells in Mound Basin and adjacent basins since the 1920s. United maintains a comprehensive, up-to-date database of groundwater elevations in Mound Basin, incorporating selected data from the VCWPD and other sources that supplement the data collected by United. Therefore, the source of most of the data relied upon in this subsection is United's database, supplemented with additional data from the City of Ventura, the County of Ventura, and other agencies as appropriate. All of the above-described data have been incorporated into the MBGSA DMS.

3.2.1 Groundwater Elevations [§354.16(a)]

Maps of groundwater elevation data combined with hydrographs showing changes in groundwater elevations over time can help illustrate groundwater occurrence and movement in an aquifer system. Groundwater elevation data are available for nearly 60 wells located within Mound Basin. However, not all of these wells are being monitored at present. The distribution of wells is heavily skewed towards the southern half of the Basin, with relatively few wells existing in the northern half of the Basin (north of Highway 126). As noted in Section 3.1, faults near the southern and eastern boundaries of the Basin affect groundwater movement. Therefore, groundwater level data from adjacent areas of the Oxnard and Santa Paula basins are also presented in this section to help define lateral gradients along the eastern and southern boundaries of Mound Basin.

3.2.1.1 Groundwater Elevation Contours [§354.16(a)(1)]

> **§354.16 Groundwater Conditions.** *Each Plan shall provide a description of current and historical groundwater conditions in the basin, including data from January 1, 2015, to current conditions, based on the best available information that includes the following:*
>
> ***(a)*** *Groundwater elevation data demonstrating flow directions, lateral and vertical gradients, and regional pumping patterns, including:*
>
> ***(1) Groundwater elevation contour maps depicting the groundwater table or potentiometric surface associated with the current seasonal high and seasonal low for each principal aquifer within the basin.***

The contouring of groundwater levels in Mound Basin is complicated by the sparse data, particularly in the northern portion of the Basin. Groundwater level measurements obtained from wells screened in the

Mugu and Hueneme aquifers (the principal aquifers in Mound Basin) during 2012 and 2019 are shown on Figures 3.2-01 through 3.2-08. Year 2012 was the most recent year when groundwater levels in Mound Basin were representative of average conditions, while year 2019 represents more recent conditions, which continue to be influenced by overall drought conditions that started in 2012 and the associated deficit of groundwater recharge compared to discharge. The groundwater elevations posted on Figures 3.2-01 through 3.2-08 are seasonal high and seasonal low groundwater levels, which typically occur during the spring and fall, respectively, of each year. Data shown were generally collected in March or April (for spring highs) and September or October (for fall lows). Due to the limited distribution of wells where groundwater elevations can be measured, groundwater elevations simulated by United using the Ventura Regional Groundwater Flow Model (United, 2018, 2021a, 2021b) for the Mugu and Hueneme aquifers in 2012 and 2019 were contoured to illustrate groundwater flow directions and horizontal groundwater gradients throughout Mound Basin and are shown on Figures 3.2-01 through 3.2-08.

As discussed in the HCM (Section 3.1), Mound Basin is structurally complex. The main groundwater flow pattern is from east-northeast to the west-southwest, along the axis of the Mound Basin, towards the Pacific Ocean (United, 2012). Available information indicates that Mound Basin receives groundwater underflow from both the Santa Paula Basin to the east and the Oxnard Forebay/ Oxnard Plain to the south (United, 2018). Generalized conceptual groundwater flow paths in the principal aquifers of Mound Basin are depicted on Figure 3.2-09. More detail regarding inflows and outflows of groundwater in Mound Basin are presented in Section 3.3.

Figures 3.2-01 and 3.2-02 show modeled groundwater elevation contours in the Mugu Aquifer during spring and fall of 2012, together with spring-high and fall-low groundwater level measurements reported for wells screened in the Mugu Aquifer. Overall, the pattern of groundwater contours in the Basin during spring and fall are similar, with groundwater levels about 10 ft lower in the fall than spring. The groundwater flow direction in the Mugu Aquifer is consistent with the typical flow pattern, from the eastern side of the Basin to the west-southwest toward the Pacific Ocean, with a gradient of approximately 0.002 ft/ft. Groundwater flows from areas of high groundwater elevation to areas of low groundwater elevation. The highest contoured groundwater elevation in the Mugu Aquifer during 2012, 210 ft msl, occurred in the northeastern portion of the Basin. The lowest contoured groundwater elevations in the Mugu Aquifer in 2012, 20 ft msl and 10 ft msl, occurred during spring and fall, respectively, in the central portion of Mound Basin. During the fall, a 5 ft msl contour in the Oxnard Basin extends slightly into the southwest corner of the Mound Basin.

Figures 3.2-03 and 3.2-04 show modeled groundwater elevation contours in the Hueneme Aquifer during spring and fall of 2012, together with spring-high and fall-low groundwater levels measured at wells screened in the Hueneme Aquifer. The groundwater flow direction in the Hueneme Aquifer during the spring was consistent with the typical flow pattern, from the eastern side of the Basin to the west-southwest toward the Pacific Ocean, with a gradient of approximately 0.002 ft/ft. However, during the fall of 2012, groundwater flow was to the south toward the boundary with the Oxnard Basin with a gradient of approximately 0.002 ft/ft. Groundwater levels in the Basin were more than 10 ft lower in the fall than spring. The highest contoured groundwater elevation in the Hueneme Aquifer during 2012, 295 ft msl, again occurred in the northeastern portion of the Basin. The lowest contoured groundwater elevation in the Hueneme Aquifer during spring 2012, 15 ft msl, occurred in the southwest portion of Mound Basin. The lowest contoured groundwater elevation in the Hueneme Aquifer in fall 2012, 0 ft msl (equal to mean sea level), occurred at the southern boundary with Oxnard Basin.

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Figures 3.2-05 and 3.2-06 show modeled groundwater elevation contours in the Mugu Aquifer during spring and fall of 2019, together with spring-high and fall-low groundwater level measurements reported for wells screened in the Mugu Aquifer. Contours show the ongoing effects of the 2012-2016 drought in the region, with groundwater elevations across much of the Basin below sea level during both spring and fall. Overall, the pattern of groundwater contours in Mound Basin during spring and fall are similar, with groundwater levels about 5 ft lower in the fall than spring. The hydraulic gradients (groundwater flow directions) in both the Mugu and Hueneme aquifers in spring and fall of 2019 are consistently toward the southwest in the east part of the Basin (magnitude of the hydraulic gradient in this area is approximately 0.002 ft/ft), shifting southward in the central area of the Basin. The potentiometric surface is nearly flat in the central and western portions of the Basin in 2019. The highest contoured groundwater elevation in the Mugu Aquifer during 2019, 220 ft msl, occurred in the northeastern portion of the Basin. The lowest contoured groundwater elevations in the Mugu Aquifer in 2019, -15 ft msl and -20 ft msl (spring and fall, respectively), occurred in the central and west portions of Mound Basin.

Figures 3.2-07 and 3.2-08 show modeled groundwater elevation contours in the Hueneme Aquifer during spring and fall of 2019, together with spring-high and fall-low groundwater levels measured at wells screened in the Hueneme Aquifer. Similar to the Mugu Aquifer, contours show drought conditions, with heads in much of the Basin measured below sea level. The groundwater flow direction in the Hueneme Aquifer was westward in the eastern portion of the Basin (magnitude of the hydraulic gradient was approximately 0.002 ft/ft), shifting southward in the central part of Mound Basin. Overall, the pattern of groundwater contours in Mound Basin during spring and fall are similar, with groundwater levels about 5 ft lower in the fall than spring. Again, the potentiometric surface is nearly flat in the central and western portions of the Basin in 2019. The highest contoured groundwater elevation in the Hueneme Aquifer during spring 2019, 295 ft msl, occurred in the northeastern portion of the Basin. The lowest contoured groundwater elevations in the Hueneme Aquifer in 2019, -15 ft msl and -25 ft msl (spring and fall, respectively) occurred at the southern boundary with Oxnard Basin.

3.2.1.2 Groundwater Elevation Hydrographs [§354.16(a)(2)]

§354.16 Groundwater Conditions. *Each Plan shall provide a description of current and historical groundwater conditions in the basin, including data from January 1, 2015, to current conditions, based on the best available information that includes the following:*

(a) *Groundwater elevation data demonstrating flow directions, lateral and vertical gradients, and regional pumping patterns, including:*

(2) Hydrographs depicting long-term groundwater elevations, historical highs and lows, and hydraulic gradients between principal aquifers.

Groundwater elevations in Mound Basin fluctuate in response to seasonal, annual, and longer-term changes in rainfall, which influences several water-balance components in Mound Basin (as discussed in Section 3.3). Changes in groundwater levels can vary both by location and by aquifer within Mound Basin, although the general patterns of decline and recovery are similar throughout the Basin within the principal aquifers. The cumulative departure from the average precipitation is used to identify historical wet and dry periods to aid in interpretation of groundwater level trends over time. The cumulative departure from average precipitation is calculated by accumulating the annual differences between annual precipitation and the long-term average annual precipitation. Precipitation records from rain gage station 222 (at "Ventura, Thille Ranch") and station 222A (at the Ventura County Government Center) were used to

calculate the cumulative departure curves, which are shown on the graphs included in Figures 3.2-10 through 3.2-13. These stations were selected because of their central location and long period of record (1926 to present). During this period, the calculated average annual precipitation in the central Mound Basin is 15.56 inches. For the discussion of groundwater elevation hydrographs below, wells have been grouped geographically within Mound Basin (south, north, central, east, west) with locations shown on Figures 3.2-10 through 3.2-13. In general, extended periods of low groundwater levels were recorded between the late 1920s and early 1930s, late 1940s and early 1950s, mid-1980s, early 1990s, and 2012 to 2018. These time periods are coincident with multi-year droughts, as shown in the declining limb of the curve showing cumulative departure from average precipitation, plotted on Figures 3.2-10 through 3.2-13. Groundwater elevations in both principal aquifers briefly declined below sea level during the historical droughts, but recovered during the subsequent wet periods.

Measured groundwater levels in southern Mound Basin have varied over about a 120-ft range over the period of record, ranging from approximately -60 to +60 ft msl (Figure 3.2-10). Groundwater levels generally rise and fall consistent with the cumulative departure curve for rainfall (Figure 3.2-10). Groundwater elevations at wells located south of the Oak Ridge Fault are similar to groundwater elevations measured at wells in the adjacent Oxnard Basin, to the south (Figure 3.2-10). Wells located in the southeast Mound Basin closest to the Forebay area of the Oxnard Basin (e.g., well 02N22W16K01S) exhibit the greatest annual variability in groundwater elevations, as a response to the large volumes of artificial recharge and extraction that occur in the Forebay area, although the range of recorded groundwater levels in Mound Basin is smaller than the range in the Forebay area (United, 2017b).

Groundwater level records are known to exist for only one well in the northern portion of Mound Basin, 02N23W01P01S, with a total depth of 300 ft (Figure 3.2-11). No information about the screened interval of this well is available; only total depth was provided by the VCWPD. However, the total depth of 300 ft suggests this well likely is screened in the fine-grained Pleistocene deposits instead of a principal aquifer. Groundwater level records for this well are available solely for the mid-1970s; at that time, groundwater levels at this well were about 100 ft higher than in wells located in the central portion of the Basin.

Measured groundwater levels in central Mound Basin have varied about a 120-ft range over the period of record, ranging from approximately -40 to +80 ft msl (Figure 3.2-11). The high groundwater levels shown for monitoring well 02N22W07M03S reflect groundwater levels in the fine-grained Pleistocene deposits.

Measured groundwater levels in eastern Mound Basin have varied over about a 140-ft range during the period of record, ranging from approximately -40 to +100 ft msl (Figure 3.2-12). Groundwater elevations in some principal aquifer wells in the eastern Mound Basin are approximately 80 to more than 100 ft lower than similarly screened wells in western Santa Paula Basin (Figures 3.2-01 through 3.2-08). This differential in groundwater elevations produces a large hydraulic gradient across the basin boundary between Santa Paula Basin and Mound Basin (DBSA, 2017; United, 2018). However, groundwater elevations at other wells in this area are similar to western Santa Paula Basin groundwater levels (Figure 3.2-12). These differences are likely related to the complex structural geology in the eastern Mound Basin area that is associated with the intersection of the Country Club and Oak Ridge faults. The time domain electromagnetic (TDEM) surface geophysical survey conducted by United (2020), documented changes in resistivity of the sediments across the Mound-Santa Paula and adjacent Oxnard Basin (Forebay area) boundaries. Anomalous zones of high and low resistivity (indicating sands/gravels and silts/clays, respectively) were

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observed in eastern Mound Basin, consistent with structural complexities related to faulting in this area (United, 2020).

Measured groundwater levels in western Mound Basin have varied over about a 60-ft range over the period of record, ranging from approximately -20 to +40 ft msl (Figure 3.2-13). Near the coast, few wells existed prior to the 1990s. In 1995, United and the City of Ventura jointly funded installation of three monitoring wells at Marina Park near the north side of Ventura Harbor to assess groundwater conditions at the coast. Artesian conditions (aquifer with sufficient water pressure to cause the groundwater level in a cased well to rise above land surface) are common in the shallowest of these wells, 02N23W15J03S, which is screened in the fine-grained Pleistocene deposits (170 to 240 ft bgs), as shown on Figure 3.2-13. Artesian heads of 30 ft above land surface are commonly recorded at this well. Coincident with overall drought conditions since 2012, groundwater levels in most wells in the western Mound Basin have been below sea level since approximately 2014, but heads in the monitoring well screened in the fine-grained Pleistocene deposits have remained artesian. The deeper wells at Marina Park (well 02N23W15J02S, screened from 480 to 660 ft bgs in the Mugu Aquifer and 02N23W15J01S (screened from 970 to 1070 ft bgs in the Hueneme Aquifer) commonly displayed weak artesian conditions before the recent drought began in 2012. In the agricultural area east of Ventura Harbor, groundwater levels commonly are below sea level during dry periods (Figure 3.2-13). For example, groundwater elevations of 25 ft below sea level were recorded in 1991 and 14 ft below sea level in 2004; since 2014 groundwater levels have declined up to 20 ft below sea level.

Vertical groundwater gradients between principal aquifers in Mound Basin are measured using groundwater level data collected at two of the three monitoring well clusters in Mound Basin. One cluster-well site is at Marina Park (wells 02N23W15J01S, 02N23W15J02S, 02N23W15J03S), located at the coast north of the Ventura Harbor (Figure 3.2-14). Another site is at Camino Real Park (wells 02N22W07M01S, 02N22W07M02S, 02N22W07M03S), located 2 miles inland near the intersection of U.S. Highway 101 and State Highway 126 (Figure 3.2-15). The last site (wells 02N22W09L03S, 02N22W09L04S) is farther east at the Community Water Park on Kimball Rd (Figure 3.2-16), but both wells in this cluster are interpreted to be screened within the Hueneme Aquifer. The sites at Marina Park and Camino Real Park have three monitoring wells, one screened in each of the following HSUs: fine-grained Pleistocene deposits, Mugu Aquifer, and Hueneme Aquifer. Hydrographs for these monitoring wells are shown on Figures 3.2-14 through 3.2-16. Groundwater levels in the shallowest wells, screened in the fine-grained Pleistocene deposits, are shown with a green line; groundwater levels in the middle depth wells, screened in the Mugu Aquifer, are shown with an orange line; and groundwater levels in the deepest wells, screened in the Hueneme Aquifer, are shown with a blue line. Since the monitoring wells at the Community Water Park are both screened in the Hueneme Aquifer, the groundwater level for the deeper screened well is shown in a darker blue than the groundwater level record for the shallower well. Table 3.2-01 provides the calculated vertical gradients at the three monitoring well sites. This includes the vertical gradient from the fine-grained Pleistocene deposits to the underlying Mugu Aquifer and from the Mugu Aquifer to the underlying Hueneme Aquifer at Marina Park and Camino Real Park. The vertical gradient is also calculated from upper to deeper strata of the Hueneme Aquifer at the Community Water Park, near Kimball Road. Vertical gradients were calculated using the available data record, from 1995 through 2019 at Marina Park and Camino Real Park and from 2008 through 2019 at the Community Water Park near Kimball Road. A positive vertical gradient value represents downward flow, and a negative vertical gradient value represents an upward flow.

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Near the coast, groundwater levels in the well screened in the fine-grained Pleistocene deposits at Marina Park are significantly higher than those in the deeper wells (Figure 3.2-14), indicating that this aquitard is in poor hydraulic communication with the underlying principal aquifers of Mound Basin. The vertical gradient from the fine-grained Pleistocene deposits to the underlying Mugu Aquifer ranged from 0.009 to 0.120 ft/ft and averaged 0.075 ft/ft. Groundwater levels in the well screened in the Mugu Aquifer at this location are generally higher than the deepest well, which is screened in the Hueneme Aquifer, indicating a downward vertical gradient. Since the recent drought began in 2012, groundwater levels for the wells screened in the Mugu and Hueneme aquifers are similar (Figure 3.2-14). The vertical gradient from the Mugu Aquifer to the underlying Hueneme Aquifer ranged from -0.020 to 0.033 ft/ft and averaged 0.008 ft/ft.

Farther inland at Camino Real Park, groundwater levels in the well screened in the fine-grained Pleistocene deposits are significantly higher than the deeper wells (Figure 3.2-15), again indicating limited hydraulic communication with deeper aquifers. The vertical gradient from the fine-grained Pleistocene deposits to the underlying Mugu Aquifer ranged from 0.219 to 0.325 ft/ft and averaged 0.276 ft/ft. Prior to 2010, groundwater levels in the well screened in the Mugu Aquifer at this location were generally higher than those in the deepest well, indicating a downward vertical gradient. After 2010, groundwater levels in the deepest well, screened in the Hueneme Aquifer, were usually similar to or occasionally higher than the groundwater level in the well screened in the Mugu Aquifer, indicating neutral to slightly upward vertical gradient. The vertical gradient from the Mugu Aquifer to the underlying Hueneme Aquifer ranged from -0.028 to 0.043 ft/ft and averaged 0.008 ft/ft.

The monitoring well site furthest inland at the Community Water Park at Kimball Road show that groundwater levels in the shallower well are usually higher than the deeper well, indicating a downward vertical gradient (Figure 3.2-16). The vertical gradient from the shallow to deeper depth in the Hueneme Aquifer ranged from -0.018 to 0.070 ft/ft and averaged 0.038 ft/ft. Both wells in this cluster are interpreted to be screened within the Hueneme Aquifer. The electric log at this location indicates the Hueneme Aquifer consists of a series of coarse-grained zones separated by fine-grained zones of varying thickness. The electric log shows fine-grained zones between the monitoring well screen intervals, including a 30-ft-thick clay unit. The water quality data from the upper well at this location show anomalous major-ion chemistry, and groundwater levels recover very slowly after sampling events, sometimes taking several months to return to a similar groundwater level as before the sampling event. Thus, the vertical gradients reported at this location may not be representative of vertical gradients throughout the Hueneme Aquifer.

3.2.2 Change in Storage [§354.16(b)]

§354.16 Groundwater Conditions. *Each Plan shall provide a description of current and historical groundwater conditions in the basin, including data from January 1, 2015, to current conditions, based on the best available information that includes the following:*

(b) A graph depicting estimates of the change in groundwater in storage, based on data, demonstrating the annual and cumulative change in the volume of groundwater in storage between seasonal high groundwater conditions, including the annual groundwater use and water year type.

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The annual change in volume of groundwater stored in a basin is the product of change in potentiometric head (measured as groundwater elevation), the storativity, and the area of each HSU. Similar to contouring of groundwater levels in Mound Basin (as described above), estimation of historical changes in groundwater stored in the Basin is complicated by sparse groundwater elevation data, particularly in the northern portion of the Basin and in HSUs with few monitoring points. Due to these limitations, annual and cumulative changes in groundwater in storage were estimated using United's (2018, 2021a, 2021b) groundwater flow model, which is generally well calibrated on a regional scale to groundwater elevation measurements.

Figure 3.2-17 graphically depicts the estimated annual change in groundwater storage in Mound Basin from 1986 through 2019, which is the historical period used to calibrate and validate United's (2018, 2021a, 2021b) model. The changes in storage estimated by the model from March 31 of a given year to March 31 of the subsequent year is depicted on Figure 3.2-17 as "estimated annual change in groundwater in storage" (seasonal high groundwater elevations in Mound Basin most commonly occur in March or April of each year). Also depicted on Figure 3.2-17 are:

- the cumulative change in storage, calculated as the sum of annual changes in storage up to the given year.
- the estimated groundwater use (volume of groundwater extracted) in Mound Basin during each water year.
- water year type.

The annual changes in groundwater storage in Mound Basin result from multiple groundwater inflows and outflows, as described in Section 3.3 of this GSP. However, some notable general trends are apparent from inspection of Figure 3.2-17, including:

- During most years with below-average rainfall ("dry years") and near-average rainfall ("average years"), groundwater in storage typically declined modestly (2,000 to 5,000 AF), although greater declines in storage (up to 9,000 AF annually) occurred during the exceptional droughts of 1987-1990 and 2012-2016. The greatest annual decreases in storage have not consistently been associated with years of the highest extraction rates, suggesting that other water budget components can have a significant influence on groundwater in storage.
- During most years with above-average rainfall ("wet years"), groundwater in storage often increased by 7,000 to 13,000 AF. These increases in groundwater storage were typically much larger than the annual declines observed during dry and average years, reflecting the importance of the region's infrequent wet years in recharging groundwater basins.
- The estimated cumulative change in groundwater in storage in Mound Basin declined markedly during the two exceptional droughts that occurred in the region (1987-1990 and 2012-2016). Cumulative change in storage quickly rebounded to pre-drought conditions in the four years following the 1987-1990 drought, and remained positive (greater than initial conditions in 1986) until the next exceptional drought in the region (2012-2016). During the 2012-2016 exceptional drought, cumulative change in groundwater in storage sharply declined again, although not to the same magnitude as occurred from 1987-1990, likely due to the smaller volumes of groundwater extracted from Mound Basin in the past decade compared to the late 1980s. Unlike the 1987-1990 drought, wet years did not immediately follow the 2012-2016

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drought; consequently, cumulative change in storage remained at approximately 2016 levels through 2019.

3.2.3 Seawater Intrusion [§354.16(c)]

§354.16 Groundwater Conditions. *Each Plan shall provide a description of current and historical groundwater conditions in the basin, including data from January 1, 2015, to current conditions, based on the best available information that includes the following:*

(c) Seawater intrusion conditions in the basin, including maps and cross-sections of the seawater intrusion front for each principal aquifer.

SGMA defines seawater intrusion as "the advancement of seawater into a groundwater supply that results in degradation of water quality in the basin, and includes seawater from any source." The primary cause for seawater intrusion in coastal aquifers is development of a landward hydraulic gradient in areas where groundwater extraction has caused groundwater elevations to decline below the hydraulic head necessary to prevent landward movement of seawater. If groundwater elevations inland of the coast fall below this protective elevation, and assuming there is a pathway for seawater to enter one of the principal aquifers, then landward migration of seawater from the ocean into freshwater aquifers can occur. This process is referred to herein as "lateral seawater intrusion." The principal aquifers of the adjacent Oxnard Basin are highly vulnerable to lateral seawater intrusion due to the existence of two deep submarine canyons just offshore from Port Hueneme and Point Mugu where erosion during periods of lower sea level (ice age) exposed the aquifers to seawater in the canyon walls at a very close distance to the shoreline (Figure 3.1-10). However, no such submarine canyons exist offshore of Mound Basin, greatly reducing the likelihood that seawater can find a near-shore path for intrusion into the principal aquifers (Mugu and Hueneme aquifers) (Figure 3.1-10). Instead, the Mound Basin principal aquifers may only be exposed to seawater where they crop out on the continental shelf edge, approximately 10 miles offshore (Figure 3.1-10).

Previous investigators (John F. Mann Jr. & Associates, 1959; Geotechnical Consultants, 1972; Fugro West, 1996) did not find evidence of lateral seawater intrusion into the principal aquifers of Mound Basin. Geotechnical Consultants (1972) conducted the most detailed review to that point and determined that "to date, there is no evidence that seawater intrusion has occurred historically or that it is occurring presently in Mound Basin." Their report notes that a landward hydraulic gradient existed in the area of Pierpont Bay from 1957 to 1961, as a result of extraction from municipal water supply wells in the Pierpont Bay area. Those wells have since been decommissioned. The landward gradient was a concern as a potential source of seawater intrusion at that time, and chloride concentrations increased at the former Pierpont Bay wells in the same general timeframe. However, Geotechnical Consultants (1972) proposed that downward movement of poor-quality groundwater from shallower aquifer zones via "improper well seals and/or over-extended gravel envelopes" was the cause for the increasing chloride concentrations detected at the Pierpont Bay wells, rather than seawater intrusion. Monitoring data at the Marina Park cluster of monitoring wells, located near Pierpont Bay, have shown no signs of seawater intrusion in the principal aquifers (Figure 3.1-21).

Consistent with the findings of Geotechnical Consultants (1972) nearly 50 years ago, recent water quality data for wells near the coast do not show evidence of lateral seawater intrusion into the aquifers of Mound Basin. The maximum recorded chloride concentrations from the 2017 calendar year are shown on

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Figures 3.1-14 and 3.1-18 (data for 2017 are shown because data are available for most wells in Mound Basin; fewer wells were sampled in 2018 by VCWPD due to staffing issues). Most coastal well samples contained chloride concentrations below 100 mg/L; however, four wells located farther inland (Figures 3.1-14 and 3.1-18) had chloride concentrations at or above 100 mg/L, a target water quality threshold for many agricultural operations. These chloride concentrations are not believed to be associated with seawater intrusion, as they are farther inland than coastal monitoring wells that did not show indications of seawater intrusion. The shallowest well in the Marina Park coastal monitoring well cluster, 02N23W15J03S (Figure 3.1-21), is screened from 170 to 240 ft bgs in the fine-grained Pleistocene deposits and has the poorest water quality in the area. In this well, TDS concentrations are above 3,000 mg/L and chloride values average nearly 100 mg/L. However, strong artesian heads (well above sea level) are consistently measured in this well (Figure 3.2-14). The high artesian heads in this well indicate offshore groundwater gradients in this vicinity. Groundwater quality in the principal aquifers at the Marina Park monitoring well cluster have not shown any evidence of seawater intrusion (Figure 3.1-21). Groundwater levels in the principal aquifers at this location have been typically above sea level, except briefly in 2004 and since 2014, suggesting that offshore groundwater flow has occurred more frequently than onshore flow (Figure 3.2-14). Well 02N23W14K01S, located approximately 0.75 miles inland of the Marina Park monitoring well cluster (Figure 3.1-20), has produced groundwater of good quality for the period of record (1933 to 1981). Concentrations for most analytes are fairly stable, with TDS concentrations averaging less than 1,200 mg/L (Figure 3.1-20). This agricultural well is screened in the Mugu Aquifer from 475 to 915 ft bgs. One outlier of elevated chloride (376 mg/L) was detected in 1962; otherwise, water quality data from this coastal production well show no evidence of saltwater intrusion. In summary, available data do not indicate that seawater is or has been present in the onshore portions of the principal aquifers to date. There are no available data concerning the presence or absence of seawater in the offshore portions of the aquifers.

Due to the lack of evidence of seawater intrusion in onshore portions of the Basin and lack of data concerning the location of any offshore seawater intrusion front in the principal aquifers, the maps and cross-sections of the seawater intrusion front required pursuant to §354.16(c) cannot be prepared.

3.2.4 Groundwater Quality Impacts [§354.16(d)]

§354.16 Groundwater Conditions. *Each Plan shall provide a description of current and historical groundwater conditions in the basin, including data from January 1, 2015, to current conditions, based on the best available information that includes the following:*

(d) Groundwater quality issues that may affect the supply and beneficial uses of groundwater, including a description and map of the location of known groundwater contamination sites and plumes.

This section describes groundwater quality issues that may affect the supply and beneficial uses of groundwater.

Groundwater Contamination Sites and Plumes

Information available on the State Water Resources Control Board (SWRCB) GeoTracker mapping site (SWRCB, 2020) and the Department of Toxic Substances Control (DTSC) mapping website (DTSC, 2020) were reviewed for locations of known groundwater contamination sites and plumes. Sixteen sites out of approximately 200 leaking underground storage tank (LUST) sites and other soil or groundwater cleanup

sites are identified as open cases in Mound Basin on GeoTracker. None of the DTSC sites were noted as having groundwater contamination. A map showing the locations of the open Geotracker cases is presented in Figure 3.2-18. Based on review of the open LUST cases, none are reported to have impacted groundwater quality in the principal aquifers (Mugu and Hueneme aquifers). The uppermost principal aquifer in the developed portion of Mound Basin is the Mugu Aquifer, which is vertically separated from the known waste sites by the fine-grained Pleistocene deposits aquitard (generally 350 to 585 ft thick in Mound Basin) and the Shallow Alluvial Deposits (typically 50 to 100 ft thick). Releases from most LUST sites in southwestern Ventura County, which typically involve fuel spills, do not commonly impact groundwater below the shallowest water table. No contamination sites were identified where the deeper aquifers crops out at land surface in the hillside area along the northern margin of Mound Basin (this is in an area of mostly undeveloped land, approximately 1 mile from the nearest currently active water supply well). Based on the review of open cases, the principal aquifers in Mound Basin do not appear to have been impacted by contamination sites and plumes.

Nitrate concentrations in excess of the drinking water MCL of 45 mg/L (as NO_3) were detected at three agricultural water supply wells that are screened in principal aquifers (Mugu and Hueneme aquifers) in Mound Basin in 2017 (the most recent year with abundant water quality data), as follows:

- 02N22W07P01S—Nitrate was detected at a concentration of 64.6 mg/L at this well screened in the Mugu Aquifer near the center of Mound Basin (Figure 3.1-15).
- 02N23W13K03S—Nitrate was detected at a concentration of 61.4 mg/L at this well screened in the Hueneme Aquifer in the southwest part Mound Basin (Figure 3.1-19).
- 02N22W09L04S—Nitrate was detected at a concentration of 136 mg/L at this well screened in the Hueneme Aquifer in the southeast part Mound Basin (Figure 3.1-19).

It should be noted that none of these wells are used for municipal or industrial water supply, and that wells 02N22W07P01S, 02N23W13K03S, and 02N22W09L04 also exhibit anomalously high concentrations of TDS, sulfate, and chloride, suggesting influence of shallow groundwater, possibly through a compromised well seal or well casing (as discussed in Section 3.1.4.3), rather than presence of nitrate "plumes" in the Mugu and Hueneme aquifers in Mound Basin. It is further noted that other wells in the Basin do not exhibit elevated nitrate concentrations, further reinforcing the conclusion that nitrate is not a widespread issue in the Mound Basin principal aquifers.

As discussed in Section 3.1.4.3, the common ion chemistry of the groundwater in the Mugu and Hueneme principal aquifers is not ideal, but is beneficially used by municipal and agricultural users across the Basin. Common ions with RWQCB-LA WQOs include sulfate, boron, and chloride (RWQCB-LA, 2013). TDS also has a WQO. In general, TDS, sulfate, boron, and chloride concentrations are lower in the Mugu Aquifer and meet the WQOs with few exceptions. In general, TDS, sulfate, boron, and chloride concentrations are higher in the Hueneme Aquifer and meet the WQOs for the majority of the sampled locations. Dissolved constituents are derived from natural sources, and groundwater extraction does not appear to be correlated with common ion chemistry concentrations. Elevated TDS and sulfate concentrations relative to drinking water secondary MCLRs are mitigated by blending with other water sources by the City of Ventura. The City of Ventura is pursuing its VenturaWaterPure Project (fully advanced treated recycled water) and an interconnection to facilitate delivery of its SWP entitlement, both of which may provide further opportunities to blend water produced from its Mound Basin wells.

Groundwater Quality Trends at Clustered Monitoring Wells

Three monitoring wells (02N23W15J01S, 02N23W15J02S, and 02N23W15J03S), jointly funded by United and the City of Ventura, were installed in 1995 in a cluster near the coast at Marina Park, on the north side of Ventura Harbor. Groundwater quality in these three wells has been fairly stable since the wells were installed, as indicated by the chemical hydrographs shown on Figure 3.1-21. The shallowest well at this location, well 02N23W15J03S, is screened in the fine-grained Pleistocene deposits from 170 to 240 ft bgs and has the poorest groundwater quality, with TDS typically above the WQO, exceeding 3,000 mg/L; however, there is no groundwater production from this unit in the Basin. The deepest well, screened in the Hueneme Aquifer from 970 to 1,070 ft bgs, routinely records TDS concentrations near 1,300 mg/L, slightly above the WQO, and sulfate concentrations of approximately 500 mg/L, below the WQO. Well 02N23W15J02S, screened in the Mugu Aquifer between 480 and 660 ft bgs, records lower TDS and sulfate concentrations, with TDS around 900 mg/L and sulfate around 400 mg/L, both below WQOs. Chloride concentrations at all three of these wells typically are approximately 100 mg/L, which is less than the RWQCB-LA WQO and lower than chloride concentrations detected at many of the wells located farther inland in Mound Basin, indicating that none of the monitored zones at this location are impacted by seawater intrusion. Additionally, results from a geochemical investigation by SSP&A (2020) suggest that groundwater from the shallow well is not impacted by seawater intrusion, noting that samples were more depleted in bromide, boron, and iodide compared to typical groundwater that has mixed with saline water.

A cluster of three monitoring wells (02N22W07M01S, 02N22W07M02S, and 02N22W07M03S) was also installed by United and the City of Ventura at Camino Real Park in the central portion of the Basin. These wells are the site of the only groundwater quality samples collected from north of Highway 126 in Mound Basin. As with the Marina Park wells, solute concentrations are slightly higher in the Hueneme Aquifer (well 02N22W07M01S, with a screen depth of 1,200 to 1,280 ft bgs) than in the Mugu Aquifer (well 02N22W07M02S, with a screen depth of 710 to 780 ft bgs). In the deeper screened interval, TDS concentrations of 1,100 mg/L are commonly recorded, which is below the WQO for the Basin. TDS is generally less than 1,000 mg/L in the well screened in the Mugu Aquifer (Figure 3.1-22), which is less than the RWQCB-LA WQO. Sulfate accounts for about half of the TDS of the groundwater, as is typical for other wells in the Basin. Well 02N22W07M03S, which is the shallowest of the three wells at the Camino Real Park site (screened from 210 to 280 ft bgs in the fine-grained Pleistocene deposits), has the poorest water quality in the cluster. TDS in this well sometimes exceeds 5,000 mg/L. Chloride and nitrate are also found at high concentrations in this well. However, there is no groundwater production from this unit in the Basin. The recent geochemical investigation by SSP&A (2020) found that the primary dissolved anion in samples collected from the shallow well was sulfate, which if derived from local aquifer minerals and evaporates implies a potential similar evaporitic origin for chloride.

Two monitoring wells (2N22W09L04S and 2N22W09L03S) were installed in Mound Basin near Kimball and Telegraph Roads in 2008 as part of a siting study for a potential new production well for the City of Ventura (Hopkins, 2009). These two wells are in the southeast quadrant of Mound Basin near the boundary between Mound and Santa Paula Basins. Groundwater quality data are available for these wells since 2011. Groundwater quality has consistently been very poor in the shallower well (2N22W09L04S, which is screened in the upper strata of the Hueneme Aquifer, from 480 to 510 ft bgs). Groundwater samples from this well routinely contain TDS concentrations over 6,000 mg/L and sulfate concentrations over 3,500 mg/L. Nitrate and chloride concentrations are also high. Such concentrations exceed the WQOs for the Basin. Groundwater samples from the deeper well (screened in deeper strata of the Hueneme Aquifer,

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from 890 to 950 ft bgs) contain dissolved constituent concentrations that are more typical of Hueneme Aquifer elsewhere (Figures 3.1-16 through 3.1-19).

3.2.5 Land Subsidence [§354.16(e)]

§354.16 Groundwater Conditions. *Each Plan shall provide a description of current and historical groundwater conditions in the basin, including data from January 1, 2015, to current conditions, based on the best available information that includes the following:*

(e) The extent, cumulative total, and annual rate of land subsidence, including maps depicting total subsidence, utilizing data available from the Department, as specified in Section 353.2, or the best available information.

A review of available reports during preparation of this GSP did not indicate any documented groundwater-related subsidence. DWR (2014) prepared a summary of recent, historical, and future subsidence potential for groundwater basins, described in detail in DWR Bulletin 118 (DWR, 2021a). The stated intent of the document was to provide screening-level information with respect to subsidence. Mound Basin was listed as having a "low" overall estimated potential for future subsidence.

DWR provides subsidence data on their "SGMA Data Viewer" web-based geographic information system (GIS) viewer (DWR, 2020) to support development of GSPs. The DWR data includes land subsidence estimates for Mound Basin based on interferometric synthetic aperture radar (InSAR) measurements for the period from June 13, 2015, through September 19, 2019 (TRE Altamira, 2020). This subsidence dataset is provided by DWR as a raster image depicting the range of estimated average vertical displacement values in 100-ft by 100-ft grid cells throughout Mound Basin and adjacent groundwater basins. This subsidence dataset was downloaded, mapped, and reviewed (as presented in Figure 3.2-19). The data accuracy report for the InSAR data (Towill, 2020) states that "InSAR data accurately models change in ground elevation to an accuracy tested to be 16 millimeters (mm) at 95% confidence." The measurement accuracy when converting from the raw InSAR data to the maps provided by DWR is 0.048 feet with 95% confidence level. The total estimated error is therefore 0.1 ft.

Areas falling below the reported accuracy are shown in gray on Figure 3.2-19. Areas depicted in color on Figure 3.2-19 indicate measurable subsidence above the accuracy tolerance. Although a sizeable area of the Basin shows measured subsidence that exceeds the accuracy tolerance of the InSAR data, there are several considerations that should be accounted for when evaluating the data.

As shown on Figure 3.2-19, the highest subsidence rate reported in the InSAR raster data set are concentrated in the southwestern area of the Basin. This InSAR raster data set was apparently derived by interpolating the data points shown on the same figure as black squares. As shown on the figure, there is relatively sparse coverage by the InSAR data points used to derive a full coverage of raster data within this area. In addition, it appears that deriving this high subsidence rate area was highly influenced by interpolating data points that represent a hot spot located outside the Basin. Such a hot spot represents a landfill that is located in the Oxnard Basin. It also appears that values in the southwestern portion of the Mound Basin were estimated by interpolating data points from outside the Basin across the McGrath Fault, which appears to have resulted in erroneous estimates of subsidence in the southwestern portion of the Mound Basin.

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Another important consideration is the fact that the InSAR results do not differentiate between subsidence caused by groundwater withdrawal and other potential causes, such as tectonic activity. The Mound Basin is located in a high tectonic activity area characterized by north-south compression. In fact, the Mound Basin is a synclinal basin, caused by ongoing downwarping associated with this compression. The west-east axis of the Basin follows along the Ventura-Santa Clara River Syncline (a downwarp or downward fold) that plunges (deepens) to the west. Additionally, the Mound Basin is bounded by faults to the north (Ventura-Pitas Point Fault) and south (McGrath Fault), along which the majority of the Basin is being down-dropped (Figures 3.1-05 through 3.1-08). Thus, it is to be expected that tectonic activity may be causing the observed subsidence. In fact, inspection of the InSAR data (Figure 3.2-19) reveals that the limits of measurable subsidence are constrained by the Ventura-Pitas Point Fault on the north and narrow to the west, consistent with a west-plunging synclinal structure. Unfortunately, the lack of InSAR data points to the south, and interpolation artifacts associated with the Oxnard Basin landfill prevent further evaluation of tectonic origins of subsidence along the southern Mound Basin boundary.

In addition to the InSAR results, data from a continuous Ground Positioning System (GPS), VNCO, which is maintained by a non-profit university consortium, were reviewed (Figure 3.2-19) (UNAVCO, 2020). The VNCO site is the only continuous GPS location in the Basin. The VNCO GPS site indicates a steady decline in ground position during the period of record, which began in 2000. Comparison with groundwater level data shows that the rate of ground position decline does not vary with groundwater levels, suggesting that the subsidence is unrelated to groundwater levels or extraction (Figure 3.2-19). This comparison further suggests that the measured subsidence in the Basin is of tectonic origin.

In summary, available data suggest that the Mound Basin south of the Ventura-Pitas Point Fault is subsiding at steady rate of approximately 5 mm per year due to tectonic activity. Further investigation may be warranted to confirm these conclusions and more conclusively rule out groundwater levels as a causal factor in the observed subsidence.

3.2.6 Interconnected Surface Water Systems [§354.16(f)]

§354.16 Groundwater Conditions. *Each Plan shall provide a description of current and historical groundwater conditions in the basin, including data from January 1, 2015, to current conditions, based on the best available information that includes the following:*

(f) Identification of interconnected surface water systems within the basin and an estimate of the quantity and timing of depletions of those systems, utilizing data available from the Department, as specified in Section 353.2, or the best available information.

Available data and numerical modeling analysis suggest that depletion of interconnected surface water systems within Mound Basin caused by groundwater use does not occur. The following paragraphs summarize available information regarding groundwater-surface water interaction that support this conclusion. Detailed information is provided in Appendix G.

Santa Clara River

The lowest approximate 1-mile reach of the Santa Clara River from its mouth (at the Pacific Ocean), including its estuary and adjacent areas of riparian vegetation, is within Mound Basin. The Santa Clara River flows perennially during most years along some or all of the 5-mile reach upstream from its mouth to approximately one-quarter mile northeast of the U.S. Highway 101 bridge between the cities of Ventura

and Oxnard (Figure 3.1-11) at the southwest limit of the Forebay area of the Oxnard Basin. Baseflow in the perennial reach has been estimated at approximately 2 cubic feet per second (cfs), which is equivalent to an annual discharge of 1,500 AF/yr (Stillwater Sciences, 2018). Much of this baseflow is groundwater discharge from the semi-perched aquifer of the Oxnard Basin (approximately ¾ of the perennial reach of the Santa Clara River overlies the Oxnard Basin). Total annual flow (including storm flows) in the Santa Clara River, like most streams in southern California, is highly variable, and can exceed 400,000 AF/yr during particularly wet years. Figure 3.2-20 shows records for three stream gages located along the Santa Clara River near Mound Basin; all three gages are located in the adjacent Oxnard Basin (gage locations are shown on Figure 3.1-01). No permanent stream gages have ever existed on the Santa Clara River within Mound Basin. Thus, any change in baseflow downstream of the gage 723, including within Mound Basin, is not known. It should be noted that gage 723 is poorly calibrated to low flows in the river (Stillwater Sciences, 2018).

There are multiple inferred sources of baseflow in the perennial reach of the Santa Clara River. These sources include discharge from the stream terrace deposits of the Mound Basin, discharge from the semi-perched aquifer in Oxnard Basin, agricultural tile drain systems present in both basins, and urban runoff via storm drains. The contributions of these different sources have not been documented in literature.

As discussed in Section 3.1.4.1.3, the presence of tile drains on agricultural lands situated on the stream terrace deposits (Figure 3.1-10) suggests that the stream terrace deposits are poorly permeable and, therefore, are not considered to be an aquifer, despite the occurrence of perched water in these deposits. Perched water within the stream terrace deposits, fed by percolating rainfall and agricultural return flows, is the primary groundwater that is interconnected with Santa Clara River baseflow within Mound Basin. It can be concluded that there is no direct depletion of interconnected surface water of the Santa Clara River and its estuary because there is no groundwater extraction from the Shallow Alluvial Deposits. Indirect depletion of Santa Clara River flows by groundwater extraction from the deeper, principal aquifers does not occur at material rates because the thick zone of fine-grained materials that lies between the Shallow Alluvial Deposits and the Mugu Aquifer significantly limits the propagation of hydraulic responses between these units. A detailed analysis of the potential for indirect depletion is presented in Appendix G. The results of that analysis indicated that there is no material depletion of surface water. The lack of material indirect depletion of interconnected Santa Clara River flows will be further confirmed with data obtained from a future monitoring well planned for the construction at the Ventura Wastewater Treatment Plant (WWTP) and planned interim shallow groundwater data collection and analysis along the Santa Clara River (see Sections 5.3.1 and 6.6).

Barrancas

Surface water flows in the various barrancas crossing Mound Basin are brief in response to precipitation events. These flows may be briefly interconnected with the Shallow Alluvial Deposits or perched groundwater, but this cannot be verified with available data. Regardless of the questions and uncertainty surrounding interconnection of the Shallow Alluvial Deposits with surface water flows in the barrancas, it can be concluded that there is no direct depletion of interconnected surface water in the barrancas because the Shallow Alluvial Deposits do not have any known groundwater extractions within the Mound Basin. Additionally, there is no groundwater extraction north of the Pitas Point-Ventura-Foothill Faults in the northern portion of the Basin where the principal aquifers are exposed and underlie the barrancas. Based on the foregoing, extraction from the principal aquifers is not believed to deplete surface water in

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the barrancas. Indirect depletion of barranca flows by groundwater extraction from the deeper, principal aquifers does not occur at material rates because the thick zone of fine-grained materials that lies between the Shallow Alluvial Deposits and the Mugu Aquifer significantly limits the propagation of hydraulic responses between these units. A detailed analysis of the potential for indirect depletion of the Santa Clara River is presented in Appendix G, which also applies to the brief flows in the barrancas. The results of that analysis indicated that there is no material depletion of surface water.

3.2.7 Groundwater-Dependent Ecosystems [§354.16(g)]

§354.16 Groundwater Conditions. *Each Plan shall provide a description of current and historical groundwater conditions in the basin, including data from January 1, 2015, to current conditions, based on the best available information that includes the following:*

(g) Identification of groundwater dependent ecosystems within the basin, utilizing data available from the Department, as specified in Section 353.2, or the best available information.

This section summarizes the current best available information concerning potential GDEs in Mound Basin. Detailed assessment of potential GDEs is presented in Appendix H. This understanding is primarily informed by regional information sources including (1) the DWR statewide database of iGDEs and supporting documentation and (2) descriptions of vegetation alliances from the United States Department of Agriculture (USDA) Classification and Assessment with Landsat of Visible Ecological Groupings (CALVEG), which generally correspond with the Natural Communities Commonly Associated with Groundwater (NCCAG) classifications discussed below.

The Natural Communities (NC) dataset is a compilation of 48 publicly available state and federal agency datasets that map vegetation, wetlands, springs, and seeps in California. A working group comprised of DWR, the California Department of Fish and Wildlife (CDFW), and The Nature Conservancy (TNC) reviewed the compiled dataset and conducted a screening process to exclude vegetation and wetland types less likely to be associated with groundwater and retain types commonly associated with groundwater, based on criteria described in Klausmeyer et al. (2018) and available online from the California Natural Resources Agency (2020). Because there is uncertainty in the knowledge of when and how plants and animals depend on groundwater, the spatial database identifies ecosystems that potentially rely on groundwater and, therefore, are referred to as "indicators of groundwater-dependent ecosystems (iGDEs)" (TNC, 2019). TNC suggests using the iGDEs as a starting point for the identification and analysis of GDEs under SGMA, including specifically steps to validate the groundwater dependency of iGDEs with local information (TNC, 2019). Determining whether an iGDE is actually a GDE requires local detailed data about the land use, groundwater levels, surface water hydrology, and geology. Per TNC guidance (TNC, 2019), it is suggested that this statewide database be refined using local information to ensure that the map accurately reflects local conditions. Once a connection from the iGDE to groundwater is determined/ground-truthed, the Basin's GDE map can be finalized (TNC, 2019).

The iGDEs are categorized into the following two NCCAG classifications:

- Wetland features commonly associated with the surface expression of groundwater under natural, unmodified conditions. Note, the wetlands class also includes wetlands within the channel of rivers which may also be referred to as aquatic habitat in other publications.

- Vegetation types commonly associated with the subsurface presence of groundwater (phreatophytes) (CNRA, 2020).

Figure 3.1-11 shows areas of iGDEs mapped in Mound Basin. A map of each numbered iGDE area is presented in Appendix H, indicating the NCCAG class or classes mapped. Each iGDE was screened in general accordance with TNC recommendations to evaluate groundwater dependency (TNC, 2018). The screening results are presented in Appendix H.

As presented in Appendix H, iGDE areas 1 through 10 have been screened out and are not considered GDEs, because the plants present in the mapped iGDE areas appear to meet their transpiration needs using non-groundwater sources of water, such as urban runoff (iGDEs mapped along barrancas) or irrigation (iGDEs located within or adjacent to parks or backyards).

The Area 11 iGDEs is retained as a GDE because the vegetation in this area appears to be at least partially dependent on groundwater encountered within the Shallow Alluvial Deposits (specifically, groundwater and agricultural drainage encountered within the stream terrace deposits). However, it is noted that there is no known groundwater extraction from the Shallow Alluvial Deposits within Mound Basin. Indirect impacts from deep, principal aquifer groundwater extractions on shallow groundwater levels—and, hence, the Area 11 GDE—do not occur because the thick zone of fine-grained materials that lies between the Shallow Alluvial Deposits and the Mugu Aquifer significantly limits the propagation of hydraulic responses between these units. A detailed analysis of the potential for deep, principal aquifer extraction effects on shallow groundwater levels and the Area 11 GDE is presented in Appendix G. The results of that analysis indicated that there are no material effects. The lack of material effects on the Area 11 GDE will be further confirmed with data obtained from a future monitoring well planned for the construction at the Ventura WWTP and planned limited-duration shallow groundwater level monitoring the Santa Clara River (see Sections 5.3.1 and 6.6). Additionally, MBGSA will monitor well permit applications for proposed uses of shallow groundwater in the vicinity of Area 11 and take appropriate actions if the potential for significant and unreasonable effects is indicated by analysis of the proposed uses.

Area 11 includes federally designated critical habitat for southern California Distinct Population Segment steelhead, tidewater goby, western snowy plover, and southwestern willow flycatcher. Additionally, the area provides potential habitat for eight special status plant species and twenty-eight special status wildlife species. As such, the Area 11 GDE Unit is of high ecological value. See Appendix H for more information on the GDEs within Area 11.

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3.3 Water Budget [§354.18]

§354.18 Water Budget.

(a) *Each Plan shall include a water budget for the basin that provides an accounting and assessment of the total annual volume of groundwater and surface water entering and leaving the basin, including historical, current and projected water budget conditions, and the change in the volume of water stored. Water budget information shall be reported in tabular and graphical form.*

(b) *The water budget shall quantify the following, either through direct measurements or estimates based on data:*

- ***(1)*** *Total surface water entering and leaving a basin by water source type.*
- ***(2)*** *Inflow to the groundwater system by water source type, including subsurface groundwater inflow and infiltration of precipitation, applied water, and surface water systems, such as lakes, streams, rivers, canals, springs and conveyance systems.*
- ***(3)*** *Outflows from the groundwater system by water use sector, including evapotranspiration, groundwater extraction, groundwater discharge to surface water sources, and subsurface groundwater outflow.*
- ***(4)*** *The change in the annual volume of groundwater in storage between seasonal high conditions.*
- ***(6)*** *The water year type associated with the annual supply, demand, and change in groundwater stored.*

(d) *The Agency shall utilize the following information provided, as available, by the Department pursuant to Section 353.2, or other data of comparable quality, to develop the water budget:*

- ***(1)*** *Historical water budget information for mean annual temperature, mean annual precipitation, water year type, and land use.*
- ***(2)*** *Current water budget information for temperature, water year type, evapotranspiration, and land use.*
- ***(3)*** *Projected water budget information for population, population growth, climate change, and sea level rise.*

(e) *Each Plan shall rely on the best available information and best available science to quantify the water budget for the basin in order to provide an understanding of historical and projected hydrology, water demand, water supply, land use, population, climate change, sea level rise, groundwater and surface water interaction, and subsurface groundwater flow. If a numerical groundwater and surface water model is not used to quantify and evaluate the projected water budget conditions and the potential impacts to beneficial uses and users of groundwater, the Plan shall identify and describe an equally effective method, tool, or analytical model to evaluate projected water budget conditions.*

This section presents the estimated water budgets for the Mound Basin, including information required by the SGMA Regulations and information that is important for developing an effective plan to achieve sustainability. In accordance with the SGMA Regulations §354.18, the GSP must include a water budget for the Basin that provides an accounting and assessment of the total annual volume of surface water and groundwater entering and leaving the Basin, including historical, current, and projected water budget conditions, and the change in the volume of water stored. Water budgets must be reported in graphical and tabular formats, where applicable. A description of each water budget term and data sources is provided below, and the historical, current, and projected (future) quantitative water budgets for Mound Basin are presented below in Subsections 3.3.1, 3.3.2, and 3.3.3, respectively.

In accordance with GSP Emergency Regulations §354.18(e), MBGSA relied up on the best available information and best available science to quantify the water budget for the Basin in order to provide an understanding of historical and projected hydrology, water demand, water supply, land use, population, climate change, sea level rise, groundwater and surface water interaction, and subsurface groundwater

flow. A numerical groundwater flow model was used to quantify and evaluate the projected water budget conditions and the potential impacts to beneficial uses and users of groundwater (United, 2018, 2021a, 2021b, 2021c). The numerical model is based on available hydrogeologic and land use data from the past several decades, previous studies of Basin hydrogeologic conditions, and an earlier version of the model (United, 2018). The numerical model gives insight into how the complex hydrologic processes are operating in the Basin. During previous studies, available data and a peer-review process were used to calibrate the numerical model to Basin hydrogeologic conditions (United 2018). Results of the previous calibration process demonstrated that the modeled groundwater and surface water flow conditions were similar to observed conditions. The numerical model was updated in 2020 (United, 2021a), and the calibration was improved compared to the previous model (United, 2021a). Based on the developments of the model, it is considered appropriate for the GSP.

Estimates and projections of groundwater flow components made with the numerical model have uncertainty due to limitations in available data and limitations from assumptions made to develop the model (United, 2018, 2021a). Model uncertainty was considered when developing the water budgets during the planning process and is discussed in Section 3.3.3.

In accordance with GSP Emergency Regulations §354.18(d), MBGSA utilized the following required information, provided by DWR or other data of comparable quality, to develop the water budget:

- Historical water budget information for mean annual temperature, mean annual precipitation, water year type, and land use;
- Current water budget information for temperature, water year type, evapotranspiration (ET), and land use; and
- Projected water budget information for population, population growth, climate change, and sea level rise.

Precipitation (specifically rainfall, as snow is extremely uncommon in Mound Basin) is not a direct groundwater or surface water budget component. However, precipitation is an important parameter that strongly influences several groundwater and surface water budget components directly or indirectly, such as groundwater recharge and surface water flows in streams. Data sources are provided in Table 3.3-01.

Qualitative descriptions of each inflow or outflow component of the water budgets are detailed below:

Surface Water Entering and Leaving Mound Basin

Surface water enters and leaves Mound Basin via the Santa Clara River and several smaller and ephemeral streams (barrancas) where they cross the Basin's boundaries, as shown on Figure 3.1-01. More detail regarding characteristics and sources of data are discussed in Section 3.1.1.2, and how these surface water components are incorporated in the water budget is discussed below:

Santa Clara River

Surface water flows in the Santa Clara River enter Mound Basin along the Basin's southern boundary (Figure 3.1-01) and leave Mound Basin approximately 1 mile downstream from this entry point, discharging into the Pacific Ocean.

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Stream gages for surface flows in the Santa Clara River are located upstream from Mound Basin (Figure 3.1-01), in the Oxnard Basin. These gages are operated by the VCWPD and USGS. Stillwater Sciences (2018) noted the following uncertainties regarding stream gaging data in the Santa Clara River: "The Santa Clara River discharge is based upon a stage versus flow rating curve over a large width with a seasonally variable cross-section due to sediment mobilization. In addition to periodic stage measurement equipment malfunctions, the Santa Clara River discharge rating curve is inaccurate at low flows (i.e., when water depth is below the lowest rating curve value) and during periods after storms between rating curve adjustments." However, considering the negligible interaction between surface water and groundwater in the principal aquifers of Mound Basin (as described in Section 3.2.6 and Appendix G), the uncertainty in surface water flow rates does not impact the groundwater sustainable management of the Basin. Surface water flows and rates of groundwater recharge from and discharge to the Santa Clara River are estimated using United's (2021a, 2021b, 2021c) numerical models, as discussed later in this section.

It is noted that United diverts surface water from the Santa Clara River via the Vern Freeman Diversion located approximately 10 miles upstream of where the Santa Clara River enters the Mound Basin. The water budgets presented in this GSP account for historical and projected diversions by United.

Ephemeral streams that cross Mound Basin's boundaries

Review of USGS topographic maps for the Oxnard (1949), Ventura (1951), and Saticoy (1967) 7.5-minute quadrangles indicates the presence of five subwatersheds in the foothills north of Mound Basin that convey ephemeral surface water flows across the northern boundary of Mound Basin (Figure 3.1-01). These subwatersheds north of Mound Basin include the areas supplying ephemeral flows to:

- an unnamed drainage north of Kalorama Street in northwestern Mound Basin (289 acres).
- Sanjon Barranca (171 acres).
- Prince Barranca and Hall Canyon (2,878 acres).
- the combined subwatershed areas of Sexton Canyon, Barlow Canyon, and Arundell Barranca (2,261 acres).
- Harmon Canyon and Barranca (1,838 acres).

Surface flows in these five subwatersheds are most likely to occur during and immediately following moderate to heavy rainfall events, typically in winter and spring. Some of this stormflow infiltrates permeable sediments of the San Pedro Formation along the northern Mound Basin boundary (Figure 3.1-11) in a process referred to as mountain-front recharge by United (2018) and is described as "ungauged streamflow" by the USGS (2003a). The remainder of these ephemeral flows are rapidly conveyed across Mound Basin in barrancas, some of which are partially lined with concrete, before discharging to the Pacific Ocean or Santa Clara River.

Within Mound Basin, the VCWPD operates one stream gage each in Prince, Arundell, and Harmon barrancas (Figure 3.1-01). Records are available for storm-event peak discharges in Prince (period of record from 1974 through 2017) and Harmon (1971-2018) barrancas, while both storm-event peak discharges (1963-2016) and average daily flows (1963-2006) are available for Arundell Barranca. The locations of these gages (in the central portion of Mound Basin) do not allow calculation of the difference between ephemeral surface water flows that enter and exit Mound Basin via these or the other, smaller

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drainage courses. However, average daily flow data available for Arundell Barranca were used to estimate annual (water year) surface flows in all five of the watersheds and subwatersheds in Mound Basin from 1986 through 2006 and extrapolated to estimate flows for the remainder of the historical period (1986-2015; Section 3.3.1) and current period (2016-2019; Section 3.3.2). The data was also used to estimate future annual surface flows for the projected period (2022-2096; Section 3.3.3). Specifically, VCWPD data for rainfall at Ventura County Government Center and average daily streamflow in Arundell Barranca for 1986-2006 (VCWPD, 2021) were compared to develop a correlation between annual rainfall (in inches) and annual streamflow (in AF) at the Arundell stream gage (Station 700), per acre of watershed area contributing to flows in Arundell Barranca (7,452 acres total, including 2,261 acres north of Mound Basin and 5,191 acres within Mound Basin upstream from Station 700). The linear best-fit regression is:

*Annual streamflow in Arundell Barranca (at Station 700) per acre of watershed area = 0.043 * annual rainfall – 0.1652*

The coefficient of determination (R-squared) for this relationship is 0.93, indicating a good correlation. This relationship was applied to the subwatersheds draining into Mound Basin (excluding the Santa Clara River, which is discussed separately, above) to estimate total surface water flows entering Mound Basin in the barrancas each year. To estimate surface water exiting Mound Basin from the barrancas, surface water flows generated within Mound Basin in response to rainfall (applying the above relationship to the total area of Mound Basin) were added to the water entering Mound Basin in the barrancas (as described above). The volume of surface flows in the barrancas were then calculated by United's (2021a, 2021b, 2021c) model to be "lost" to mountain-front recharge each year and were subtracted from the surface water budget.

The surface water entering the Basin via these ephemeral drainages consist chiefly of storm flows, which are conveyed rapidly across the Basin in narrow and sometimes lined channels and discharge to the ocean or the Santa Clara River. The surface water flows are expected to have a small to negligible interaction with groundwater in Mound Basin, and ET of these surface flows is assumed to be negligible. Rates of recharge resulting from these flows were estimated from precipitation data and input to United's (2021a) groundwater flow model, as discussed later in this section. Interaction between surface water and groundwater in the Harmon Barranca was modeled (United 2021a) explicitly using MODFLOW's (McDonald and Harbaugh, 1988) stream (SFR) package, due to the relatively large area of its watershed compared to other barrancas in Mound Basin.

Imported water

Surface water and groundwater are imported from adjacent basins via pipeline for M&I and agricultural uses in Mound Basin (see Section 3.1.1.3; B. Bondy, 2020; United, 2021c; Ventura Water, 2020b). Surface water is imported to Mound Basin via pipeline from Casitas MWD and from Ventura Water's groundwater extraction facilities at Foster Park in the Upper Ventura River Basin. In addition, the City of Ventura is planning to begin importing SWP water to Mound Basin by 2025 (Ventura Water, 2020b). Each purveyor reports the quantities of imported water conveyed to Mound Basin. Surface water imported to Mound Basin by Ventura Water (from Casitas MWD) is primarily used for M&I purposes; therefore, the majority of this surface water "exits" the Basin via consumptive use. Specifically, after use it is assumed that 95% of this imported surface water is either conveyed to Ventura's WWTP for treatment and discharge to the Santa Clara River estuary (immediately upstream from the Pacific Ocean) or evapotranspired following

application to outdoor landscaping and parks. The remaining 5% of imported surface water is estimated to recharge underlying HSUs as M&I return flows, as described below.

Inflows to the Groundwater System by Water Source Type

Subsurface groundwater inflow

As described in Sections 3.1 and 3.2, groundwater underflow into and out of Mound Basin occurs at the boundaries with the adjacent Santa Paula and Oxnard Basins. The boundary between Mound Basin and the Lower Ventura River Basin consists of a hydraulic divide, which by definition means little to no groundwater underflow occurs across this boundary. The direction and magnitude of inflow and outflow from Santa Paula and Oxnard Basins vary by aquifer, location, and time, depending largely on the direction of the hydraulic gradient within each aquifer at any given time. Another factor affecting groundwater underflow between basins is the nature of each boundary: the boundary between Santa Paula Basin and Mound Basin consists of a low-permeability fault zone with an offset of bedding, which constrains the quantity of groundwater that can flow between the two basins (see Section 3.2.1.1). Hydrogeologic conditions underlying the boundary between Oxnard Basin and Mound Basin are more complex, including a fault, a fold, and stratigraphic changes (described in Section 3.1.4.1). These features allow underflow to varying degrees, depending on depth (aquifer) and location along the boundary. In addition to groundwater underflow across basin boundaries, subsurface groundwater inflow to (or outflow from) Mound Basin may occur along the coastline for portions of the aquifers that extend west of Mound Basin under the floor of the Pacific Ocean. Because of the complexity and variability of subsurface inflow to Mound Basin, United's (2021a) calibrated groundwater flow model is the best available tool for estimating quantities of interbasin flows and was therefore used to quantify subsurface flows for the water budget.

Recharge to the groundwater system

Precipitation, runoff, streamflow, or other indirect sources of recharge that infiltrate to the underlying aquifer are collectively defined as recharge. The sources of recharge known to occur in Mound Basin are described in Section 3.1.4.2 of this GSP. Similar to groundwater underflow, described above, recharge is subject to temporal and spatial variability. Details regarding how recharge rates were estimated for input to United's (2018, 2021a, 2021c) groundwater model for the region are summarized as follows:

- **Infiltration of Precipitation**: Infiltration of precipitation can recharge aquifers exposed at land surface, including the Shallow Alluvial Deposits, Hueneme Aquifer, and Fox Canyon Aquifer in Mound Basin. Monthly precipitation from Ventura County (VCWPD, 2021) and land use data from Southern California Association of Governments (SCAG) (SCAG, 2008) were utilized to estimate infiltration of precipitation. Land use changes throughout the historical model period were updated using the California Department of Conservation's "Farmland Monitoring and Mapping Program" GIS data (California Department of Conservation, 2018) at years 1990, 1996, 2002, 2008, and 2012 to adjust the baseline land use (from SCAG) designations over time. On agricultural and undeveloped land, United (2018) estimated infiltration of precipitation based on monthly precipitation. Specifically, when monthly precipitation in an agricultural or undeveloped area exceeded 0.75 inches, a fraction of that precipitation ranging from 10 to 30% of the monthly total was assumed to infiltrate deeply enough to become recharge. For developed lands, including residential, commercial, and industrial areas, a fixed ratio of 5% of monthly precipitation was assumed to become recharge. In United's (2018, 2021a) model,

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infiltration of precipitation includes all recharge that occurs in response to rainfall, unless explicitly modeled as mountain-front recharge or stream-channel recharge in the Santa Clara River and Harmon Barranca.

- **Mountain-front Recharge**: United (2018, 2021a) uses the term mountain-front recharge to describe infiltration of runoff at a small portion of the San Pedro formation in the northern margin of Mound Basin (Figure 3.1-11). The source of this surface water is rainfall in the small sub-watersheds in the foothills immediately north of Mound Basin. The USGS (2003a) describes this as "ungauged streamflow" in their modeling report for the Santa Clara-Calleguas watersheds. The USGS estimated this ungauged streamflow as a percentage of the precipitation occurring in each mountain sub-watershed area that drains to the study area. Similar to the USGS (2003a) approach, United (2021a, 2021c) estimated mountain-front recharge rates in outcrops of the San Pedro Formation in the northern part of Mound Basin based on monthly precipitation rates and the area of each sub-watershed receiving the precipitation. As described in the HCM (Section 3.1.4.2), the United model (2021a) assumes mountain-front recharge in the northern Mound Basin to model layers representing the Hueneme and Fox Canyon aquifers of the San Pedro formation. The Mugu Aquifer is not known to crop out at land surface within Mound Basin (Figures 3.1-07 and 3.1-08), as it underlies the fine-grained Pleistocene deposits. Therefore, the Mugu Aquifer does not receive direct areal recharge. This assumption does not have a substantial effect on the water budgets for the Basin or for individual aquifers.
- **M&I Return Flows**: M&I return flows include leakage from distribution pipelines, recharge of "excess" water applied to residential and municipal landscaping, and infiltration of storm water that is retained in urban or suburban areas of communities. Sources for M&I water supply that contribute to M&I return flow in Mound Basin include groundwater extracted from within Mound Basin and imported groundwater and surface water from other basins, as described in Section 3.1.4.4. The magnitude of these M&I return flows varies substantially in both location and timing. Most of the City of Ventura overlies alluvial and stream terrace deposits; therefore, infiltrating M&I return flows have the potential to reach the Shallow Alluvial Deposits if they are not intercepted by the thin perched groundwater zones described in Section 3.1.3. In developed hillside areas of the City that directly overlie the San Pedro Formation, M&I return flows may contribute to recharge in the Hueneme and Fox Canyon aquifers. The United (2018) groundwater model applied M&I return flows of 5% of the total M&I water use, which resulted in a good model calibration. During development of the Ventura Regional Groundwater Flow Model (VRGWFM), a study of urban recharge in a portion of Los Angeles County was completed by the Water Replenishment District of Southern California and the USGS (Hevesi and Johnson, 2016). Their investigation used a daily precipitation runoff model to estimate recharge and runoff for the greater Los Angeles area, and found average recharge in the urban portion of their study area to be 8% of the combined inflow from precipitation and urban irrigation. Applying the Hevesi and Johnson (2016) results to urban portions of the United (2018, 2021a) model area, and assuming that 50% of M&I water is used for outdoor irrigation (landscaping and parks), the calculated percentage of M&I water that becomes return-flow recharge is 4%, which is close to the 5% adopted by United (2018).
- **Agricultural Return Flows**: Farmers apply irrigation water to meet evaporation, transpiration, and salt-leaching requirements on their fields when rainfall is insufficient to meet those demands, with the goal of maintaining acceptable crop yields. The primary sources of water

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used for agricultural irrigation in Mound Basin are groundwater extracted from wells in Mound Basin, and groundwater extracted from wells in Santa Paula and Oxnard Basins that is imported to Mound Basin via pipeline (Section 3.1.1.3 of this GSP). The salt-leaching requirement is the percentage of "excess" irrigation water required to control salt concentrations in the root zone of agricultural fields. Water applied to meet the leaching requirement is assumed to flow past the root zone to recharge the underlying groundwater. Initially, United (2018) input agricultural return flows of 14% of applied water on farmland (based on previous research in the region [United, 2013]), and assumed that the leaching requirement was the sole driver for "excess" irrigation. However, during model calibration the initial agricultural return-flow estimates were evaluated and adjusted upward or downward to improve calibration. In Mound Basin, increasing model-input agricultural return flows to 20% resulted in improved model calibration. Most agriculture in Mound Basin occurs in the southern half of the Basin; therefore, most of the agricultural return flows provide recharge to units located above the principal aquifers. Tile drains are present under some farmland in southern Mound Basin (Figure 3.1-11), which intercept agricultural return flows almost immediately after infiltration, then convey them to the Santa Clara River via drainage ditches. In avocado and citrus orchards present in the foothills where the San Pedro Formation crops out, agricultural return flows are modeled as contributing to recharge in the Hueneme and Fox Canyon aquifers.

- **Stream-channel Recharge**: As described in Sections 3.1.4.2 and 3.2.6 a small amount of stream-channel recharge may occur in the barrancas flowing across the alluvial and stream terrace deposits in Mound Basin, which may reach the Shallow Alluvial Deposits. This stream-channel recharge is distinct from mountain-front recharge, as it occurs throughout the Basin—not just along the northern margins. Stream-channel recharge in most of the barrancas in Mound Basin (excluding Harmon Barranca) was modeled as part of United's (2021a) estimates of "infiltration of precipitation" determined during model calibration, as described above. Stream-channel recharge in Harmon Barranca and the Santa Clara River in Mound Basin was modeled explicitly by United (2021a) using MODFLOW's (McDonald and Harbaugh, 1988) stream (STR) package.

Outflows from the Groundwater System

Evapotranspiration

ET of groundwater occurs where the water table is present at very shallow depths (in United's [2018, 2021a] groundwater flow model, ET is assumed to occur within the upper 5 ft of the soil zone). In Mound Basin, such conditions occur in and adjacent to the Santa Clara River in the southwest part of the Basin, and ET rates in these areas are computed by United's (2021a) groundwater model based on computed groundwater elevations and estimates of the other parameters that control ET (ET surface elevation, extinction depth, and maximum flux rate).

Groundwater extraction (by use sector)

Historical groundwater extractions by use sector (M&I and agriculture) in Mound Basin are described in detail in Section 3.1.4.4 and illustrated on Figures 3.1-27 through 3.1-29. Extraction (pumping) data for water supply wells in Mound Basin consist of records for two 6-month periods (January 1 through June 30 and July 1 through December 31) reported to United by pumpers each year as required by United pursuant the authority provided in California Water Code §74500-74554. For the purpose of estimating monthly

extraction from each well during a given year, United developed a precipitation-weighted formula that assumes an inverse relationship between groundwater extraction and rainfall (United, 2018), since both agricultural and, to a lesser extent, M&I water demand are inversely correlated with monthly precipitation.

United's (2021a) MODFLOW (McDonald and Harbaugh, 1988) groundwater flow model is calculated with uniform 2,000 ft X 2,000 ft grid cells, which do not align precisely with the boundaries of Mound Basin (i.e., there is a small amount of overlap and undercutting of no more than a few hundred feet). As a result, one well in Oxnard Basin (02N22W19J03S), located approximately 130 ft south of Mound Basin's boundary, is captured within the model grid. Extraction from this well is included in the water budget estimates and represents around 5% of the total groundwater extraction rates from Mound Basin; thus, inclusion of this well in the water budget is not considered to create a significant discrepancy. Extraction from this well cannot simply be subtracted from the modeled groundwater budget for Mound Basin without creating a small imbalance in the modeled groundwater flow budget. Therefore, it was determined that it would be better to retain the extraction at this well in the Mound Basin groundwater budget for the purpose of developing this GSP. If United's model grid is discretized differently in future model updates, this issue can be revisited.

Groundwater discharge to surface water

As described in Section 3.2.6, groundwater discharge from the Shallow Alluvial Deposits may contribute to the perennial flow observed during most years in the Santa Clara River in the southwestern part of Mound Basin, together with discharge from tile drains, drainage ditches, and perched zones in shallow soils of the Mound Basin and sources from the Oxnard Basin. Similar to stream-channel recharge, as described above, groundwater discharge to the Santa Clara River is dependent on the difference between river stage and groundwater elevations in the underlying perched zones or the Shallow Alluvial Deposits, as well as the physical characteristics of the riverbed (width and slope) and is calculated by United's (2021a) groundwater flow model. Discharge of groundwater from the principal aquifers (Mugu and Hueneme) to the barrancas in Mound Basin is not known to occur and is not included in United's (2021a) groundwater flow model for the region.

Groundwater discharge to tile drains

Tile or other agricultural drainage systems are reported (Isherwood and Pillsbury, 1958) to have been installed across much of the Oxnard Plain in the 20th century and extend into the southern Mound Basin (United, 2018; location shown on Figure 3.1-11 of this GSP). Tile drains were installed to prevent waterlogging of the roots of crops in areas where the water table may rise close to land surface. In the area of Mound Basin where tile drains exist, the water table in the Shallow Alluvial Deposits could potentially approach land surface if tile drains were not present. Similar to groundwater discharge to stream channels, as described above, the rate of groundwater discharge to tile drains depends on the difference between the depth and conductance of tile drains and groundwater elevations in the underlying Shallow Alluvial Deposits. Groundwater discharge from the Shallow Alluvial Deposits to tile drains is calculated by United's (2021a) groundwater flow model using MODFLOW's (McDonald and Harbaugh, 1988) drain (DRN) package.

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Subsurface groundwater outflow

Similar to subsurface groundwater inflow, subsurface groundwater outflow can occur from Mound Basin to the adjacent Santa Paula and Oxnard Basins. Subsurface groundwater outflow from Mound Basin may also occur along the coastline at the Basin's western boundary to portions of the aquifers which extend offshore under the floor of the Pacific Ocean. As noted previously in this section, United's (2021a) calibrated groundwater flow model is the best available tool for quantifying these flows.

Change in the Annual Volume of Groundwater in Storage between Seasonal high Conditions

Annual changes in the volume of groundwater in storage in the Basin reflect annual imbalances between inflows and outflows. In years when inflow (recharge) exceeds outflow (discharge), the volume of groundwater in storage increases; such conditions manifest as a rise in groundwater levels in wells. Conversely, when outflows exceed inflows, the volume of groundwater in storage in an aquifer decreases (referred to in this GSP as "groundwater released from storage"), and declining groundwater levels are observed in wells. Groundwater storage cannot be directly measured; rather it can only be estimated using groundwater levels and knowledge of the basin geometry and subsurface hydraulic properties., There is a significant amount of uncertainty in such an approach, particularly in a basin such as the Mound Basin that has a multiple principal aquifers and a significant uncertainty in the distribution of storage properties between HSUs and within the transitional areas between confined and unconfined portions of the Basin. Therefore, United's (2021a) groundwater flow model is considered to be the best available tool for estimating changes in groundwater storage in the Mound Basin.

Water Year Types

GSP Emergency Regulations §354.18(b)(6) requires presentation of the water year type associated with annual water budget terms. GSP Emergency Regulation §351(an) defines "water year type" as the "classification provided by the Department to assess the amount of annual precipitation in a basin." DWR provided a water year type designation for each year (from 1931 through 2018) for the entire Santa Clara River watershed—including the portion in Los Angeles County. The DWR based their designation system on spatially averaged rainfall throughout the watershed in a given year and the previous year, relative to the 30-year moving average rainfall amounts for the region (DWR, 2021b). Unfortunately, the DWR designations do not correlate well with observed groundwater conditions (i.e., rising and falling groundwater levels) in Mound Basin. Therefore, MBGSA elected to develop an alternative water year type classification that is more representative of local trends. Years when rainfall is 75% or less of the average are referred to herein as "dry years." Years when rainfall is 125% or more of the average are referred to as "wet years." Years when annual rainfall is between 75 and 125% of the average are referred to as "near-average years." These quantitative breakpoints for defining dry, near-average, and wet years correlate well with periods of increasing, approximately stable, and decreasing groundwater elevations in Mound Basin, as described subsequently in this section.

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3.3.1 Historical Water Budget [§354.18(c)(2)(B)]

§354.18 Water Budget.

(c) *Each Plan shall quantify the current, historical, and projected water budget for the basin as follows:*

(2) *Historical water budget information shall be used to evaluate availability or reliability of past surface water supply deliveries and aquifer response to water supply and demand trends relative to water year type. The historical water budget shall include the following:*

(B) *A quantitative assessment of the historical water budget, starting with the most recently available information and extending back a minimum of 10 years, or as is sufficient to calibrate and reduce the uncertainty of the tools and methods used to estimate and project future water budget information and future aquifer response to proposed sustainable groundwater management practices over the planning and implementation horizon.*

The SGMA Regulations require that the historical surface water and groundwater budget be based on a minimum of 10 years of historical data. Water years 1986 through 2015 (30 years) were selected to represent the historical water budget. Water year 1986 is the first complete water year included in United's regional groundwater flow model (United, 2021a), which is the primary source of information for several key water budget components estimated for Mound Basin. Prior to January 1985, groundwater extraction data were increasingly sparse, which is why United selected water year 1986 as the first year for their historical model calibration. The historical period is long enough to capture typical climate variations and include two significant drought cycles (1987-1990 and 2012-2016).

The historical surface water and groundwater budgets are presented in the following tables and figures and described below:

- Surface Water Budget: Table 3.3-02 and Figure 3.3-01
- Basin Groundwater Budget: Table 3.3-03 and Figures 3.3-02 and 3.3-03
- Hydrostratigraphic Unit Groundwater Budgets: Table 3.3-04

Historical Surface Water Budget

Inspection of Table 3.3-02 and Figure 3.3-01 indicates that the largest source of surface water inflow to and outflow from Mound Basin during the historical period is the Santa Clara River, with inflows ranging from less than 100 AF/yr during drought periods to over 1,000,000 AF/yr during high-rainfall years. The historical average of surface flows in the Santa Clara River entering and exiting Mound Basin is nearly an order of magnitude or greater than the average of all other inflows or outflows combined (Table 3.3-02). As noted previously, much of this flow occurs during or soon after (days to weeks) major storms; baseflow in the Santa Clara River is estimated to be only about 1,500 AF/yr (Section 3.2.6). Surface water inflows and outflows in the Santa Clara River during water years 1993, 1995, 1998, and 2005 were particularly large, correlating with El Nino/Southern Oscillation (ENSO) and Pacific Decadal Oscillation (PDO)-driven high-rainfall events. As shown on Figure 3.1-01, the length of the reach of the Santa Clara River that is within Mound Basin is only 1 mile; therefore, high flows that follow storm events pass rapidly through this reach with little groundwater interaction (Section 3.2.6). However, a small fraction of these flows infiltrates the river channel and banks to become stream-channel recharge to the underlying Shallow Alluvial Deposits during high-flow years (Table 3.3-02).

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Ephemeral streamflows entering, generated within, and leaving Mound Basin in barrancas are typically the next largest components of surface water inflows and outflows, after Santa Clara River. Identical to the Santa Clara River, the majority of the higher flows occur during and immediately following storms, with little to no baseflow other than leakage of return flows from perched zones of the Shallow Alluvial Deposits and fine-grained Pleistocene deposits, as described in Section 3.2.6. Imported surface water to Mound Basin can exceed ephemeral streamflows during some years, particularly those with low rainfall (Table 3.3-02).

Historical Groundwater Budget

Inspection of Tables 3.3-03 and 3.3-04, and Figure 3.3-02 and 3.3-03, indicates that the largest sources of groundwater inflow to Mound Basin during the historical period included underflow from the Santa Paula Basin, areal recharge (the sum of infiltration of precipitation, M&I return flows, and agricultural irrigation return flows), and mountain-front recharge. Surface water percolation from Santa Clara River and Harmon Barranca provided considerably less recharge to the Basin. Outflow of groundwater from Mound Basin largely occurs as groundwater extractions (pumping) and groundwater outflow to the Oxnard Basin during dry periods. Groundwater flow to the offshore portions of HSUs, ET from the Shallow Alluvial Deposits, and groundwater discharge from the Shallow Alluvial Deposits to surface water are secondary mechanisms of discharge.

Some groundwater budget components are consistently positive (representing inflows to Mound Basin), including underflow from Santa Paula Basin, areal recharge, mountain-front recharge, and return flows. Other components are consistently negative (outflows from Mound Basin), including groundwater extractions (pumping from wells), ET from the Shallow Alluvial Deposits, and discharge to tile drains. Some water budget components vary in sign (negative, representing outflow; to positive, representing inflow) over time, which is largely dependent on rainfall (i.e., recharge), as shown on Figure 3.3-02.

Each of these variable components is described further as follows:

- **Groundwater Underflow between the Mound and Oxnard Basins**: Groundwater underflow between the Mound and Oxnard Basins typically occurred as outflow from Mound Basin during dry years, and as inflow to Mound Basin during wet years. During near-average years, a modest volume of groundwater (usually less than 2,000 AF) flowed either into or out of Mound Basin along its boundary with Oxnard Basin. During the droughts in 1987-1990 and 2012-2016, groundwater underflow from Mound Basin to Oxnard Basin was typically the second-largest outflow component of the groundwater budget for Mound Basin, after groundwater extractions from wells. During the extended wet period from 1992 through 2005, this condition reversed, and groundwater underflow from Oxnard Basin to Mound Basin was frequently an important inflow component of the groundwater budget for Mound Basin, occasionally exceeding the annual volumes of recharge in Mound Basin and underflow from Santa Paula Basin. The reversal in flow direction is correlated with United's artificial recharge operations in the Oxnard Basin.
- **Groundwater Exchange Between Onshore and Offshore Areas**: Groundwater underflow between the Mound Basin and offshore areas west of the coastline has typically consisted of net outflow from Mound Basin (Figure 3.3-02 and Table 3.3-03). However, modest volumes of inflow to Mound Basin occurred across the coastline during the droughts from 1987-1990 and 2012-2016. As described in Section 3.1.4 and depicted in Figure 3.1-10, the offshore portions of

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the principal aquifers of Mound Basin store significant quantities of fresh groundwater. For this reason, groundwater flowing into Mound Basin from across the coastline during droughts should not be assumed to consist of seawater. As described in Section 3.2.3 of this GSP, there are no historical or recent data suggesting that seawater intrusion has occurred in the principal aquifers within Mound Basin.

- **Groundwater Exchange with Santa Clara River**: Figure 3.3-02 and Table 3.3-03 indicate a modest volume (generally less than 2,000 AF) of groundwater has discharged from the Shallow Alluvial Deposits to the lower Santa Clara River in Mound Basin during most average to dry years. During wet years and two average years (2017 and 2019), the stage in the Santa Clara River was higher than groundwater elevations in the Shallow Alluvial Deposits, resulting in surface water percolating into the Shallow Alluvial Deposits as recharge. These modeled surface water and groundwater interactions are consistent with field observations of discharge to the Santa Clara River (Stillwater Sciences, 2018).
- **Groundwater Exchange with Harmon Barranca**: In every year except 1998, the model estimated that the net effect of groundwater/surface water interaction in Harmon Barranca was to provide a small volume of recharge to the underlying aquifers. The sole exception, water year 1998, had the highest rainfall total during the historical period (1986-2015); the model estimated that a small volume (142 AF) of groundwater was discharged to the channel of Harmon Barranca that year (Table 3.3-03).
- **Groundwater Storage**: In response to the annual variability in inflows and outflows to the groundwater system in Mound Basin, the volume of groundwater in storage in the Basin has increased or decreased, reflected in rising and falling groundwater elevations that can be measured in wells. In wet years, groundwater inflows (e.g., recharge) often exceeded outflows (e.g., groundwater extraction from wells), resulting in rising groundwater levels and adding to the volume of groundwater in storage in the Basin. When groundwater is added to storage in the Basin, for accounting purposes it is counted as an outflow from the groundwater budget. That groundwater added to storage remains in the Basin as a "reserve" of groundwater that can be drawn from in subsequent dry years. When that reserve of groundwater in storage is used for water supply or flows out of the Basin—corresponding to declining groundwater elevations—it is counted in the groundwater budget as an inflow. As can be seen on Figure 3.3-02, these changes in the volume of groundwater in storage in Mound Basin balance any difference between inflows and outflows each year (shown by white bars with a dashed black outline) such that total inflows equaled total outflows. The result is that the groundwater budget each year remained in balance on both an annual basis and over the historical period, with an average net decline in groundwater in storage of 469 AF/yr.

While the GSP Emergency Regulations do not require water budgets for each principal aquifer, sustainable management of the Mound Basin benefits from such an understanding. The historical water budget for each HSU, including the principal aquifers, is presented in Table 3.3-04. Review of water budget components for specific aquifers (Table 3.3-04) indicates that average groundwater inflows and outflows have varied substantially from aquifer to aquifer within Mound Basin. Table 3.3-04 also shows average vertical groundwater flow volumes between aquifers within Mound Basin; with this information, the model-estimated groundwater budget for each aquifer was balanced (sum of all components for each

aquifer equals zero). Following are some of the salient conclusions that can be drawn from review of the HSU breakdown of the historical water budget:

- As expected, all ET, discharge to tile drains, and interaction between groundwater and surface water in the Santa Clara River occurred in the Shallow Alluvial Deposits, which is the uppermost aquifer across most of Mound Basin. Most areal recharge (including infiltration of precipitation, agricultural return flows, and M&I return flows) infiltrated to the Shallow Alluvial Deposits, with smaller volumes infiltrating into outcrops of the Hueneme and Fox Canyon aquifers in the foothills of the north part of Mound Basin. The Mugu Aquifer is not known to crop out at land surface within Mound Basin (Figures 3.1-07 and 3.1-08), as it underlies the fine-grained Pleistocene deposits. Therefore, the Mugu Aquifer does not receive direct areal recharge. A significant volume (approximately 2,600 AF) of mountain-front recharge occurred in Mound Basin in the northern foothills, primarily into the Hueneme Aquifer.
- Nearly all groundwater extraction (pumping from wells) occurred in the Mugu and Hueneme aquifers, as was described in Section 3.1.4.4 of this GSP. A minor amount of groundwater extraction occurred in the Fox Canyon Aquifer and no extraction occurred in the Shallow Alluvial Deposits.
- Vertical exchanges of groundwater with overlying and underlying HSUs can be important flow components for the principal aquifers.
- Most groundwater inflow to Mound Basin from Santa Paula Basin occurred in the Hueneme and Fox Canyon aquifers. Although the Country Club fault system at the boundary between the Mound and Santa Paula basins impedes groundwater flow to some degree (evidenced by steeper groundwater elevation contours along this boundary as described in Section 3.1.4 of this GSP), approximately 4,400 AF/yr of groundwater flow into Mound Basin occurred during the historical water budget period.
- Most of the groundwater inflow to the Mound Basin from Oxnard Basin (approximately 2,600 AF/yr, on average) during the historical period occurred in the Shallow Alluvial Deposits and in the fine-grained Pleistocene deposits, which is stratigraphically equivalent to the Oxnard Aquifer in the Oxnard Basin (Section 3.1 of this GSP). Most of the groundwater outflow from Mound Basin to Oxnard Basin (approximately 3,900 AF/yr, on average) occurred in the Hueneme and Fox Canyon aquifers
- Approximately 1,800 AF/yr of groundwater flowed from Mound Basin to the offshore (submarine) areas of the aquifers in the Shallow Alluvial Deposits during the historical period, while much smaller volumes of groundwater outflow occurred in the Mugu and Fox Canyon aquifers. A modest quantity (500 AF/yr) of groundwater flowed into Mound Basin from offshore areas in the Hueneme Aquifer. As noted above and in Section 3.2.3, significant quantities of fresh groundwater are present in the aquifers offshore from Mound Basin. Intrusion of seawater has not been detected in the aquifers of Mound Basin to date.
- Cumulative changes in groundwater in storage (from April of each year through March of the next year) in the principal aquifers (Mugu and Hueneme), together with annual groundwater extractions in Mound Basin, are shown on Figure 3.3-03. Changes in storage in the principal aquifers generally correlate with changes in storage in the Basin as a whole but are more subdued.

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3.3.1.1 Reliability of Historical Surface Water Supplies [§354.18(c)(2)(A)]

§354.18 Water Budget.
(c) *Each Plan shall quantify the current, historical, and projected water budget for the basin as follows:*
(2) *Historical water budget information shall be used to evaluate availability or reliability of past surface water supply deliveries and aquifer response to water supply and demand trends relative to water year type. The historical water budget shall include the following:*
(A) *A quantitative evaluation of the availability or reliability of historical surface water supply deliveries as a function of the historical planned versus actual annual surface water deliveries, by surface water source and water year type, and based on the most recent ten years of surface water supply information.*

As described in Section 3.1.1.3 and summarized at the beginning of Section 3.3, surface water is imported to Mound Basin via pipeline from Casitas MWD by the City of Ventura for use within the Casitas MWD service area (Figure 2.2-01).

Figure 3.3-04 shows surface water deliveries and groundwater production for the City of Ventura in Mound Basin for the past 10 years. Inspection of Figure 3.3-04 indicates that during 2010 and 2011, prior to the 2012-2016 drought in Ventura County, total surface water imports from the Ventura River to Mound Basin averaged approximately 4,100 AF/yr. From 2012 through 2014 (the first three years of the 2012-2016 drought), total surface water imports declined to approximately 3,600 AF/yr. Conservation and increased groundwater extraction from the City's wells in Mound Basin and Oxnard Basin increased to make up the difference. From 2016 through 2019, total surface water imports declined further to an average of approximately 1,500 AF/yr. Table 3.3-05 summarizes the City of Ventura's planned (Kennedy/Jenks Consultants, 2011; 2016) and actual (Ventura Water, 2020b) imports of surface water from Casitas MWD for the 10-year period from 2010 through 2019. The values shown on this table include surface water imports from Casitas MWD delivered to the City's entire service area, not just the portion in Mound Basin. Review of the differences between planned and actual surface water deliveries indicates that less surface water from Casitas MWD was actually delivered than was planned from 2012 through 2019; this period included an exceptional drought from 2012 through 2016. The lower-than-anticipated surface water deliveries were related to a combination of factors, including mandated conservation goals along with the associated penalties.

3.3.1.2 Impact of Historical Conditions on Basin Operations [§354.18(c)(2)(C)]

§354.18 Water Budget.
(c) *Each Plan shall quantify the current, historical, and projected water budget for the basin as follows:*
(2) *Historical water budget information shall be used to evaluate availability or reliability of past surface water supply deliveries and aquifer response to water supply and demand trends relative to water year type. The historical water budget shall include the following:*
(C) *A description of how historical conditions concerning hydrology, water demand, and surface water supply availability or reliability have impacted the ability of the Agency to operate the basin within sustainable yield. Basin hydrology may be characterized and evaluated using water year type.*

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GSP Emergency Regulations §354.18(c)(2)(C) require a description of how historical water budget conditions have impacted the ability of MBGSA to operate that Basin within sustainable yield. The estimated sustainable yield for Mound Basin is provided in Section 3.3.4. Prior to adoption of this GSP, MBGSA has had neither the regulatory authority nor the technical justification to "operate the basin within sustainable yield." Thus, GSP Emergency Regulations §354.18(c)(2)(C) appear inapplicable to the Mound Basin. However, the impacts of historical conditions can provide insight into what challenges MBGSA may have faced had it existed historically and with authority to manage the Basin.

Review of the historical water budgets indicates that a small amount of declining groundwater storage occurred over time (the average groundwater released from storage between seasonal highs is 469 AF/yr; Table 3.3-03). This suggests a relatively minor amount of overdraft may have occurred during the historical period equal to approximately 6.3% of the average groundwater extraction rates during that timeframe. However, undesirable results were not reported during the historical period, suggesting negligible, if any, impacts on the ability of the Basin to operate within the sustainable yield.

The existence of multiple sources of water (local groundwater, imported groundwater, and imported surface water) available to meet demand in Mound Basin is a key reason why the Mound Basin has not historically experienced undesirable results for the sustainability indicators. The City of Ventura seeks to maximize wet-year water supplies from Casitas MWD and its facilities in the Upper Ventura River Basin and rely less on Mound Basin groundwater and other basin groundwater supplies and vice versa. In addition, the City implements a water shortage contingency plan to reduce water demands through increased conservation. The diverse water supply portfolio and conservation actions have helped reduce pressure on Mound Basin groundwater supplies, keeping basin operations within the sustainable yield and preventing significant and unreasonable effects from occurring.

3.3.2 Current Water Budget [§354.18(c)(1)]

§354.18 Water Budget.
(c) *Each Plan shall quantify the current, historical, and projected water budget for the basin as follows:*
(1) *Current water budget information shall quantify current inflows and outflows for the basin using the most recent hydrology, water supply, water demand, and land use information.*

The SGMA Regulations require that the current surface water and groundwater budget be based on the most recent hydrology, water supply, water demand, and land use information. Water year 2019 is the last complete water year included in United's regional groundwater flow model (United, 2021b), which is the primary source of information for most water budget components estimated for Mound Basin. Therefore, water years 2016 through 2019 were selected to represent the current water budget, as they are representative of recent water use trends and groundwater conditions in Mound Basin. The current water budget period corresponds to a period of average to dry annual precipitation, with an average of about 14% less precipitation than the historical average. It should also be noted that the current water budget period was preceded by an exceptional drought that occurred in the region from 2012 through 2016. As a result of the antecedent groundwater conditions caused by this drought (i.e., record- or near-record-low groundwater elevations at most wells in Mound Basin and adjacent basins), combined with below-average rainfall during water year 2018, estimated volumes for some of the water budget components during the current period are significantly different than they were during the historical

period. As a result, the current water budget period represents a drier than average condition with antecedent drought conditions in the Basin and is therefore not appropriate for sustainability planning.

The current surface water and groundwater budgets are presented in the following tables and figures and described below:

- Surface Water Budget: Table 3.3-02 and Figure 3.3-01
- Basin Groundwater Budget: Table 3.3-03 and Figures 3.3-02 and 3.3-03
- Hydrostratigraphic Unit Groundwater Budgets: Table 3.3-04

Current Surface Water Budget

Inspection of Table 3.3-02 and Figure 3.3-01 indicates that the largest source of surface water inflow and outflow for Mound Basin during the current period is the Santa Clara River, consistent with the historical water budget. A notable difference is that both average inflow from the Santa Clara River and from imported water from Casitas MWD during the current water budget period are both less than half of what they were during the historical water budget period (Table 3.3-02). This difference is due to the relatively low average rainfall during the current period compared to the historical period. The averages for most other surface water budget components during the current period largely remained similar to values estimated for the historical period, although they are overall less than the historical, resulting from overall drier conditions can be seen in Table 3.3-02.

Current Groundwater Budget

Average volumes of groundwater estimated to comprise each component of the current water budget for the principal aquifers together with the Shallow Alluvial Deposits and fine-grained Pleistocene deposits HSU in Mound Basin are quantified in Table 3.3-03.

Following are key aspects of the current groundwater budget and notable differences compared to the historical groundwater budget:

- Groundwater underflow from Mound Basin to Oxnard Basin was substantially greater during the current period compared to the average over the historical period. This increase in outflow comprises the largest difference between the historical and current groundwater budgets for Mound Basin and is a result of greater drawdown in the Oxnard Basin than in Mound Basin since 2012 (largely due to the 2012-2016 drought). This differential drawdown temporarily created a steeper hydraulic gradient—inducing greater groundwater underflow—from the Mound Basin to Oxnard Basin.
- The net direction and magnitude of groundwater underflow across the coastline (to and from areas where the aquifers underlie the seafloor) changed substantially during the current period as compared to the historical period. During the historical period, the net direction of groundwater underflow was seaward (toward the ocean), with small to modest volumes of landward flow, on average, in the fine-grained Pleistocene deposits and the Hueneme Aquifer. During the current period, landward groundwater underflow occurred in all HSUs, except for the Shallow Alluvial Deposits (where seaward flow continued). However, monitoring results do

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not indicate intrusion of seawater into the aquifers of the Mound Basin during this period, as described in Section 3.2.3 of this GSP.

- As a result of below-average annual rainfall during the current water budget period, recharge volumes were also less than the average historical values during the current water budget period.
- Less ET and discharge to tile drains occurred during the current water budget period compared to the historical period, due to lower groundwater elevations in the Shallow Alluvial Deposits.
- Average annual groundwater extraction rates (pumping from wells) were lower in the current period than in the historical period.
- As can be seen on Figure 3.3-03 and Tables 3.3-03 and 3.3-04, a small decline in the quantity of groundwater stored in Mound Basin (and the principal aquifers) occurred during the current water budget period.

3.3.3 Projected Water Budget

SGMA Regulations require the development of a projected surface water and groundwater budget to estimate future baseline conditions of supply, demand, and aquifer response to GSP implementation. The future water budget provides a baseline against which management actions will be evaluated over the GSP implementation period from 2022-2041. The projected water budget was developed for a 77-year period that is subdivided into three periods, including the 20-year implementation period required under SGMA (water years 2022-2041), the 30-year sustaining period under SGMA (water years 2042-2071), and a 25-year post-SGMA period (water years 2072-2096). This section describes the methods used to estimate the projected water budget for Mound Basin, provides a quantitative estimate for each projected water budget component, and evaluates uncertainty in the projected water budget by considering potential effects of future DWR-recommended climate change scenarios. The DWR's climate change scenarios could result in changes to inflows and outflows in Mound Basin compared to the "baseline" future water budget.

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3.3.3.1 Projected Water Budget Calculation Methods [§354.18(d)(1),(d)(2),(d)(3),(e), and (f)]

§354.18 Water Budget.

(d) *The Agency shall utilize the following information provided, as available, by the Department pursuant to Section 353.2, or other data of comparable quality, to develop the water budget:*

- ***(1)*** *Historical water budget information for mean annual temperature, mean annual precipitation, water year type, and land use.*
- ***(2)*** *Current water budget information for temperature, water year type, evapotranspiration, and land use.*
- ***(3)*** *Projected water budget information for population, population growth, climate change, and sea level rise.*

(e) *Each Plan shall rely on the best available information and best available science to quantify the water budget for the basin in order to provide an understanding of historical and projected hydrology, water demand, water supply, land use, population, climate change, sea level rise, groundwater and surface water interaction, and subsurface groundwater flow. If a numerical groundwater and surface water model is not used to quantify and evaluate the projected water budget conditions and the potential impacts to beneficial uses and users of groundwater, the Plan shall identify and describe an equally effective method, tool, or analytical model to evaluate projected water budget conditions.*

(f) *The Department shall provide the California Central Valley Groundwater-Surface Water Simulation Model (C2VSIM) and the Integrated Water Flow Model (IWFM) for use by Agencies in developing the water budget. Each Agency may choose to use a different groundwater and surface water model, pursuant to Section 352.4.*

The projected water budget for Mound Basin was developed using the same tools and methods as the historical and current water budgets, and is primarily based on United's (2018, 2021a, 2021b, 2021c) surface water and groundwater flow modeling, modified to incorporate projections of future hydrology and demand, as described in the following subsections. The future projections utilize United's best available estimates of future surface water diversions from the Santa Clara River via the Vern Freeman Diversion.

3.3.3.1.1 Projected Hydrology [§354.18(c)(3)(A)]

§354.18 Water Budget.

(c) *Each Plan shall quantify the current, historical, and projected water budget for the basin as follows:*

- ***(3)*** *Projected water budgets shall be used to estimate future baseline conditions of supply, demand, and aquifer response to Plan implementation, and to identify the uncertainties of these projected water budget components. The projected water budget shall utilize the following methodologies and assumptions to estimate future baseline conditions concerning hydrology, water demand and surface water supply availability or reliability over the planning and implementation horizon:*
  - ***(A)*** *Projected hydrology shall utilize 50 years of historical precipitation, evapotranspiration, and streamflow information as the baseline condition for estimating future hydrology. The projected hydrology information shall also be applied as the baseline condition used to evaluate future scenarios of hydrologic uncertainty associated with projections of climate change and sea level rise.*

In accordance with GSP Emergency Regulations §354.18 (c)(3)(A), the future water budget must be based on 50 years of historical precipitation, ET, and streamflow information. To satisfy this regulation, the

forward version of the numerical model used for the projected water budget includes 77 years of historical precipitation, ET, and streamflow data from the period 1943-2019, which supports a time period from 2022-2096. The streamflow values were modified to incorporate United's best available estimates of future surface water diversions from the Santa Clara River via the Vern Freeman Diversion.

It is believed that the selected historical period is representative and is the best available information for groundwater sustainability planning purposes. This period includes two major drought cycles for the Santa Clara River watershed and was therefore preferred over any single 50-year period (the minimum timeframe required under SGMA regulations) available in DWR's historical dataset, which includes water years 1931-2019 for rainfall (DWR, 2021b) and 1916-2011 for streamflow change factors (DWR, 2018).

Baseline future streamflow in the Santa Clara River and its major contributing tributaries (including Santa Paula Creek, Sespe Creek, Pole Creek, Hopper Creek, Piru Creek, and Castaic Creek, all of which are located east and upstream of Mound Basin) was projected based on historical stream gaging records provided by the USGS and VCWPD. Streamflow in the small subwatersheds present in the foothills north of Mound Basin that contribute to mountain-front recharge, as described in the introduction to Section 3.3, was projected to change in direct proportion to increases or decreases in rainfall in accordance with 2030 and 2070 climate change factors provided by DWR (2018), and is described further below. Projected annual rainfall rates assumed under future baseline, 2030, and 2070 climate change scenarios are shown on Figure 3.3-05. The future baseline scenario assumed no sea level rise, the 2030 climate change scenario assumed 15 centimeters (6 inches) of sea level rise, and the 2070 climate change scenario assumed 45 centimeters (18 inches) of sea level rise, consistent with DWR (2018) guidance. Sea level rise was addressed by increasing the head along the general-head boundary representing the Pacific Ocean in United's (2021c) groundwater model. These changes in model boundary conditions were forecasted to have small impacts on groundwater elevations and groundwater budget components in Mound Basin and are discussed further in Section 3.3.3.2.

For the purpose of projecting future streamflows in the Santa Clara River, the historical stream gage records were modified and supplemented as follows:

- Where data gaps existed in the 1943-2019 records for specific stream gages, correlations with nearby stream gages were developed to fill those gaps. Suitable stream gage records were available to populate all data gaps in gaging data within the Santa Clara River watershed.
- Outflows for Lake Piru and Castaic Lake were simulated using reservoir operations models with historical upstream creek flows as reservoir inputs. Current reservoir operations were applied to the entire future baseline modeling period.
- Historical surface water discharge from the urban and suburban areas of the Santa Clarita Valley to the Santa Clara River was adjusted upwards, with more significant flow increases applied to older data, to reflect current levels of urban impervious area in this drainage area that underwent significant development between 1943 and 2019.
- Historical streamflow in the reach of Santa Clara River in Los Angeles County was adjusted to reflect anticipated future discharges from Water Reclamation Facilities (WRFs).

Uncertainty in future hydrology associated with potential climate change was evaluated by applying DWR (2018) streamflow change factors from their 2030 and 2070 central-tendency scenarios to the historical

streamflow records for Castaic Lake (reservoir) inflows, Santa Clara River upstream of Castaic Creek (excluding WRF discharges which were added after applying streamflow change factors), Middle Piru Creek (inflow to Lake Piru), Pole Creek, Hopper Creek, Sespe Creek, and Santa Paula Creek. Daily historical flow records were adjusted to 2030 and 2070 future conditions by applying the annual and monthly streamflow change factors provided for the Santa Clara River watershed (designated HUC8_18070102 by DWR), utilizing the methodology for application of time-series change-factor data described in DWR (2018) guidance. DWR (2018) streamflow change factors are available for water years 1916-2011. Change factors for water years 2012-2019 were modeled by selecting analogous water years in the historical record and applying the streamflow change factors published for these analogous water years. Analogous water years were determined using the monthly precipitation record for VCWPD rain gage 245 (Santa Paula), which has a complete data record from 1915-2019, and is representative of the average annual precipitation observed in much of the Santa Clara River watershed, particularly the Ventura County portion. Analogous water years for 2012-2019 were determined by calculating the root mean square error (RMSE) based on monthly precipitation with each water year from 1915-2011. Generally, the year with the lowest RMSE was selected as the analogous water year.

Compared to historical streamflow between 1943 and 2019, annual average streamflow decreased by 3.8-4.7% for the 2030 climate change scenario, and by 2.6-3.5 % for the 2070 climate change scenario. The calculated change in streamflow for the 2030 and 2070 climate change scenarios is mostly driven by the monthly change factors provided by DWR (as opposed to annual change factors). The Santa Clara River watershed (HUC8_18070102) monthly change factors vary significantly between years, especially during the months of January through March, when much of the precipitation occurs in the Santa Clara River watershed. During these months, projected streamflow may increase or decrease in the 2030 and 2070 climate change scenarios and are more variable for the 2070 climate change scenario. Monthly change factors are mostly less than 1.0—indicating reduced flow compared to the historical period—during the months April, May, June, October, and November. Therefore, streamflow in the Santa Clara River is projected to decrease outside the main wet season under the 2030 and 2070 climate change scenarios.

A more detailed description of the surface water hydrology models utilized to simulate reservoir operations, modifications to streamflow records for future hydrology, application of DWR streamflow change factors, and interaction between the surface water and groundwater models is presented in United's model documentation (United, 2021a, 2021c).

3.3.3.1.2 Projected Water Demand [§354.18(c)(3)(B)]

§354.18 Water Budget.

(c) *Each Plan shall quantify the current, historical, and projected water budget for the basin as follows:*

(3) *Projected water budgets shall be used to estimate future baseline conditions of supply, demand, and aquifer response to Plan implementation, and to identify the uncertainties of these projected water budget components. The projected water budget shall utilize the following methodologies and assumptions to estimate future baseline conditions concerning hydrology, water demand and surface water supply availability or reliability over the planning and implementation horizon:*

(B) *Projected water demand shall utilize the most recent land use, evapotranspiration, and crop coefficient information as the baseline condition for estimating future water demand. The projected water demand information shall also be applied as the baseline condition used to evaluate future scenarios of water demand uncertainty associated with projected changes in local land use planning, population growth, and climate.*

GSP Emergency Regulations §354.18(c)(3)(B) require use of the most recent land use, ET, and crop coefficient information as the baseline condition for estimating future water demand and as a baseline condition used to evaluate future scenarios of water demand uncertainty associated with projected changes in local land use planning,

For the purpose of developing a projected water budget for Mound Basin, baseline future water demand in Mound Basin was input to United's (2021c) groundwater flow model using current (most recent) land use information, agricultural and M&I water use trends, and assumptions regarding future climatic conditions (including rainfall and ET).

Projected Agricultural Water Demands

Projected agricultural groundwater demand was provided by MBAWG (Section 2.3). MBAWG was provided historical groundwater extraction data and was asked to provide input on future groundwater demands. MBAWG advised that baseline average year irrigation demands are estimated to be 3,300 AF/yr. Wet year and dry year baseline irrigation demands were assumed to be slightly lower (2,873 AF/yr) and higher (3,548 AF/yr), respectively. Climate change effects on irrigation demand were also considered by accounting for changes in future precipitation and temperature. Future precipitation projections were developed based on historical precipitation records (with baseline conditions taken from 1943-2019) and climate change factors provided by DWR (2018) for SGMA planning purposes. Irrigation demands for future wet, average, and dry conditions (based on total precipitation for the water year) were based on historical irrigation demands for similar wet, average, and dry conditions (based on reported historical groundwater extraction). To account for future increased temperatures due to climate change, the future annual irrigation demands were further scaled by a factor representing the average annual increase (over the projected period of 1943-2019) in future ET (calculated from ET climate change factors provided by DWR). The average ET climate change factor for the 2030s was 1.0359 (increase of 3.6%) and for the 2070s was 1.0825 (increase of 8.25%); hence irrigation demand was increased by the corresponding factors to account for higher ET uptake (demand) of irrigation water. Similar to the ET climate change factors, the net agricultural demand for groundwater extracted from Mound Basin was estimated to increase 3.6% and 8.5% for the 2030 and 2070 climate change scenarios, respectively, as compared to baseline conditions. The baseline and climate change projections of agricultural water demand also apply to groundwater imported from the Santa Paula and Oxnard Basins for agricultural use, which is reflected in the return flow calculations.

Projected Municipal and Industrial Demands

The City of Ventura provides most of the municipal and industrial water supply in the Basin. The City of Ventura forecasts that it will extract 4,000 AF/yr from the Mound Basin during 2021-2030 on average (Ventura Water, 2020a). As described in Section 3.1.1.3, the City has a diverse water supply portfolio, making it impossible to predict how its Mound Basin groundwater extraction might vary from year to year. Thus, the projected water budget assumes a fixed value of 4,000 AF of groundwater extraction each year. The projected groundwater extraction for the two private industrial wells in the Basin were assumed to continue at historical average rates.

Changes in future application of local and imported water sources in Mound Basin also change future agricultural and M&I return flows in Mound Basin. Changes in return flows each year are simulated in United's (2021c) groundwater flow model as a function of changes in water demand (described above)

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and adjusted by precipitation (as described in the beginning of Section 3.3). The methodology for calculating the projected changes in return flow and the associated values for the baseline, 2030, and 2070 scenarios are further described in the model documentation (United 2021c).

Land Use and Population Change Effects on Water Demand

As described in Section 2.2.3, changes in land use that could have a significant impact on groundwater demand are not expected in the foreseeable future.

As of December 2019, there are 47 infill development projects within the City of Ventura that are either approved or under construction, which collectively have an estimated 921 AF/yr of water demand (Ventura Water, 2020a). These new demands are accounted for in the City's projected Mound Basin groundwater extraction estimate of 4,000 AF/yr, discussed above.

Any additional future development (and associated population increase) is not expected to impact water demands for groundwater in the Mound Basin because the City's Water Rights Dedication and Water Resource Net Zero Fee Ordinance and Resolution ("Net Zero Policy", adopted June 6, 2016), requires all new and intensified development to offset the demand associated with its impact on the City's potable water system. Offsets can take the form of water rights dedication (i.e. transfer existing rights to extract groundwater from the Mound Basin or the adjacent Oxnard or Santa Clara basins) or payment of a fee that funds development of new City water supplies. Future water supplies include VenturaWaterPure (potable reuse of advanced treated tertiary treated effluent from the VWRF) and an interconnection with Calleguas MWD that will allow the City to access its 10,000 AF/yr Table A entitlement from the California SWP.

Significant development of agricultural land or open space is not expected because agricultural land and open space in the Basin is subject to the City of Ventura and County of Ventura SOAR voter initiatives currently approved through 2050 (County of Ventura, 2020). The SOAR initiatives require a majority vote of the people to rezone unincorporated open space, agricultural, or rural land for development. In addition to the SOAR initiatives, the City of Ventura HVPAA (City of Ventura, 2005), also approved through 2050, requires voter approvals for development or the extension of City urban services into the hillsides. The existence of the SOAR and HVPPA make it very unlikely that a material change in land use will occur during the foreseeable future. Because agricultural land and open space is not expected to convert to other uses, it is assumed that there is little potential for new development that could impact basin recharge or water demands. These assumptions will be revisited during each five-year GSP assessment.

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3.3.3.1.3 Projected Surface Water Supply [§354.18(c)(3)(C)]

§354.18 Water Budget.

(c) *Each Plan shall quantify the current, historical, and projected water budget for the basin as follows:*

(3) *Projected water budgets shall be used to estimate future baseline conditions of supply, demand, and aquifer response to Plan implementation, and to identify the uncertainties of these projected water budget components. The projected water budget shall utilize the following methodologies and assumptions to estimate future baseline conditions concerning hydrology, water demand and surface water supply availability or reliability over the planning and implementation horizon:*

(C) *Projected surface water supply shall utilize the most recent water supply information as the baseline condition for estimating future surface water supply. The projected surface water supply shall also be applied as the baseline condition used to evaluate future scenarios of surface water supply availability and reliability as a function of the historical surface water supply identified in Section 354.18(c)(2)(A), and the projected changes in local land use planning, population growth, and climate.*

As explained in Section 3.1.1.3 and summarized at the beginning of Section 3.3, surface water from Casitas MWD is imported to Mound Basin as part of the City's M&I water supply. The City of Ventura's projected future water deliveries from Casitas MWD are calculated for normal years and drought years at approximately 6,000 AF/yr and 3,400 AF/yr, respectively (Ventura Water, 2020b). These values are consistent with actual surface water deliveries for normal to wet years 2010 and 2011, and the average for dry to near-average water years 2012 through 2019 (Table 3.3-05). The City's diverse water supply portfolio must be considered when evaluating the reliability of surface water supplies because the diversity tends to compensate for shortages of one supply. In addition, the City is pursuing new water supplies including VenturaWaterPure (potable reuse of advanced treated tertiary treated effluent from the VWRF) and an interconnection with Calleguas MWD that will allow the City to access its 10,000 AF/yr Table A entitlement from the California SWP. Based on the foregoing, changes in surface water supply availability would not necessarily impact the City's Mound Basin groundwater extraction. Based on the foregoing, MBGSA concludes that the GSP Emergency Regulations §354.18(c)(3)(C) requirement to "evaluate future scenarios of surface water supply availability and reliability as a function of the historical surface water supply…" is not particularly relevant to the Mound Basin GSP. Surface water supply availability and any impacts on the Mound Basin will be evaluated during each five-year GSP assessment.

3.3.3.2 Projected Water Budget

The projected baseline surface water and groundwater budgets are presented in the following tables and figures and described below:

- Surface Water Budget: Table 3.3-06 and Figure 3.3-07
- Basin Groundwater Budget: Table 3.3-07 and Figures 3.3-08 and 3.3-09
- Hydrostratigraphic Unit Groundwater Budgets: Table 3.3-08

Projected Surface Water Budget

Average annual volumes for each component of the projected baseline surface water budget in Mound Basin are quantified in Table 3.3-06. The projected surface water budget is subdivided into three periods, including the 20-year implementation period required under SGMA (water years 2022-2041), the 30-year

sustaining period under SGMA (water years 2042-2071), and a 25-year post-SGMA period (water years 2072-2096). Baseline projected annual Basin totals for each surface water budget component are shown graphically on Figure 3.3-07. Following are salient results of modeling the baseline projected surface water budget, focusing on notable differences compared to the historical and current water budgets (shown on Table 3.3-02):

- Similar to the historical and current surface water budget periods, the largest source of surface water inflow to and outflow from Mound Basin in the projected water budget is the Santa Clara River, with inflows ranging from zero during drought periods to over 1,000,000 AF/yr during high-rainfall years (Table 3.3-06). Ephemeral streamflows typically comprise the next largest sources of inflows and outflows, although imports of surface water (from Casitas MWD) are greater than ephemeral streamflows during dry years.
- Surface water inflows and outflows in the Santa Clara River and ephemeral streamflows are projected to be substantially smaller during the implementation period than during the sustaining and post-SGMA periods, largely as a result of the smaller average rainfall assumed during the implementation period (Table 3.3-06).
- The long-term average inflow and outflow in the Santa Clara River during the projected water budget period are approximately 4% smaller than long-term average inflow and outflow during the historical and current periods (combined). This difference is partly explained by slightly lower (1% less) rainfall assumed during the projected period compared to rainfall during the combined historical and current periods. The remainder of this difference likely results from changes in hydrologic and groundwater conditions modeled by United (2021c) upstream from Mound Basin in the Santa Clara River watershed (less than 1% of the Santa Clara River's watershed is within Mound Basin).

As was described in Section 3.3.3.1.1 of this GSP, the projected surface water budget was also modeled under two climate change scenarios (2030 and 2070) in accordance with DWR (2018) guidance. Projected surface water budget components under the 2030 climate change scenario are summarized in Table 3.3-09 and graphically illustrated on Figure 3.3-10. Projected surface water budget components under the 2070 climate change scenario are summarized in Table 3.3-10 and graphically illustrated on Figure 3.3-11. The effect of the simulated climate change scenarios on the projected surface water budget components is small; the largest change in long-term average flow projections is less than 3% (larger) compared to baseline surface water budget components.

Projected Groundwater Budget

Average annual volumes of groundwater that comprise each component of the baseline projected water budget for the principal aquifers, Shallow Alluvial Deposits, and fine-grained Pleistocene deposits HSU in Mound Basin are quantified in Table 3.3-08. The projected water budget is subdivided into three periods, including the 20-year implementation period required under SGMA (water years 2022-2041), the 30-year sustaining period under SGMA (water years 2042-2071), and a 25-year post-SGMA period (water years 2072-2096). Baseline projected annual Basin totals for each groundwater budget component are provided in Table 3.3-07 and shown graphically on Figure 3.3-08. Following are salient results of modeling the baseline projected groundwater budget, focusing on notable differences compared to the historical and current water budgets (shown on Tables 3.3-03 and 3.3-04):

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- Groundwater underflow (considering all aquifers) between Oxnard Basin and Mound Basin nearly always comprises net inflow to Mound Basin under the future baseline scenario instead of fluctuating between inflow and outflow during the historical period. Exceptions to this net positive inflow to Mound Basin are small amounts of net outflow projected to occur during or immediately after droughts. The overall projected increase in underflow into Mound Basin comprises the largest difference between the baseline projected water budget compared to the historical and current groundwater budgets for Mound Basin. The increase in groundwater inflow from Oxnard Basin to Mound Basin is in large part due to projected increases in groundwater elevations in Oxnard Basin (that increase the hydraulic gradient towards Mound Basin), which in turn are expected to result from implementation of the GSP for the Oxnard Basin (Dudek, 2019). It should be noted that a modest quantity of net outflow from Mound Basin to Oxnard Basin is projected to occur in the Hueneme and Fox Canyon aquifers, albeit at significantly lower rates (Table 3.3-08).
- The net direction and magnitude of groundwater underflow across the coastline (between Mound Basin and areas to the west where the aquifers underlie the seafloor) during the baseline projected water budget period also changed substantially compared to the historical and current periods. During the projected baseline period, the net direction of groundwater underflow for all aquifers combined is forecasted to be nearly always seaward (toward the ocean), including during drought periods, at a rate of approximately 5,000 AF/yr; during the historical and current periods, influx of water across the coastline occurred during drought periods. However, small to modest quantities of landward flow are projected across the coastline during the GSP implementation period (water years 2022-2041) in the Hueneme and Fox Canyon aquifers. However, seawater intrusion into the aquifers of Mound Basin is not projected to occur as a result of this landward flow, owing to the presence of fresh water in the offshore areas of the Hueneme and Fox Canyon aquifers.
- The projected annual volume of groundwater inflow to Mound Basin from Santa Paula Basin is approximately 800 AF/yr less during the baseline future water budget period (decreasing slightly from the implementation period through the post-SGMA period), compared to the historical and current water budget periods. This decrease in groundwater inflow from Santa Paula Basin is primarily due to projected increases in groundwater elevations in Mound Basin, which would decrease the hydraulic gradient between Santa Paula and Mound Basins.
- The magnitude of groundwater/surface water interaction in the Santa Clara River during the baseline projected water budget period is substantially different compared to the historical and current periods. During the projected baseline period, the net effect of groundwater/surface water interaction is recharge to the Shallow Alluvial Deposits from surface flows in the Santa Clara River, at rates of approximately 1,000 AF/yr, on average, during the implementation period; 1,600 AF/yr during the sustaining period; and 1,300 AF/yr during the post-SGMA period (Table 3.3-08). However, during the historical period, groundwater discharge to the river was approximately equal to infiltration of surface flows into the Shallow Alluvial Deposits (net discharge of approximately 30 AF/yr on average to the river from the shallow aquifer), becoming 270 AF/yr of recharge to the Shallow Alluvial Deposits on average during the current period.
- The net volume of groundwater released from storage in Mound Basin during the entire baseline projected water budget period is approximately -80 AF/yr on average, meaning a small

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amount of groundwater is projected to be added to storage (associated with rising groundwater levels) on average (Table 3.3-07 and Figure 3.3-09). This is compared with an average of 550 AF/yr of groundwater storage loss during the combined historical and current period.

- Differences in the remaining projected baseline water budget components compared to historical and current water budget components are modest to negligible, as can be seen by comparing Table 3.3-07 and Figure 3.3-08 to Table 3.3-03 and Figure 3.3-02.

As was described in Section 3.3.3.1.1 of this GSP, the projected groundwater budget was also modeled under two climate change scenarios (2030 and 2070) in accordance with DWR (2018) guidance. Projected groundwater budget components under the 2030 climate change scenario are summarized in Tables 3.3-11 and 3.3-12 and Figures 3.3-12 and 3.3-13. Projected groundwater budget components under the 2070 climate change scenario are summarized in Tables 3.3-13 and 3.3-14 and Figures 3.3-14 and 3.3-15. The effect of the simulated climate change scenarios on the projected water budget components is small; the largest change is an 8% decrease in groundwater underflow from the Oxnard Basin to Mound Basin in the 2070 climate change scenario compared to the baseline scenario. The simulated effects of climate change on other water budget components are smaller, ranging from less than 1% to a few percent. It should be noted that existing cyclical climate phenomena, such as the ENSO and PDO, have historically had a greater effect on water budget components in Mound Basin than the projected effects of the 2030 and 2070 climate change scenarios. In other words, the effects of existing climate cycles (ENSO and PDO) likely will have greater impacts on future groundwater conditions in Mound Basin than the longer-term climate change assumptions recommended by DWR (2018) to evaluate potential uncertainty in the projected water budget.

3.3.4 Overdraft Assessment and Sustainable Yield Estimate [§354.18(b)(5) and (b)(7)]

§354.18 Water Budget.
(b) *The water budget shall quantify the following, either through direct measurements or estimates based on data:*
(5) *If overdraft conditions occur, as defined in Bulletin 118, the water budget shall include a quantification of overdraft over a period of years during which water year and water supply conditions approximate average conditions.*
(7) *An estimate of sustainable yield for the basin.*

3.3.4.1 Overdraft Assessment

GSP Emergency Regulations § 354.18(b)(5) requires quantification of overdraft over a period of years during which water year and water supply conditions approximate average conditions if overdraft conditions exist.

Bulletin 118, Update 2003 (DWR, 2003) describes groundwater overdraft as "[t]he condition of a groundwater basin or subbasin in which the amount of water withdrawn by extraction exceeds the amount of water that recharges the basin over a period of years, during which the water supply conditions approximate average conditions. Overdraft can be characterized by groundwater levels that decline over

a period of years and never fully recover, even in wet years. If overdraft continues for a number of years, significant adverse impacts may occur, including increased extraction costs, costs of well deepening or replacement, land subsidence, water quality degradation, and environmental impacts."

Review of the historical, current and projected groundwater budgets indicate small amounts of declining groundwater storage over time (469 and 147 for the historical and current periods, respectively), as shown in Table 3.3-03. These results suggest a minor amount of overdraft may have occurred during the historical and current period of 6.3% and 2.3%, respectively, of the groundwater extraction during that timeframe. However, these values are considered to be within the range of uncertainty of the water budget calculations and no undesirable results have been reported historically. Therefore, it is does not appear that overdraft has occurred historically in the Basin.

The projected water budget suggests that groundwater in storage would increase slightly (68 to 84 AF/yr) between 2022 and 2096, under the assumed future precipitation rates modeled. During the implementation period (2022-2041), declines in storage range from 4 to 38 AF/yr are projected, depending on the climate change assumptions (Tables 3.3-07, 3.3-11, and 3.3-13). These values are considered to be within the range of uncertainty of the water budget calculations. Therefore, MBGSA concludes that overdraft during the 50-year GSP planning horizon is not likely under the assumed conditions.

Although the water budget projections suggest groundwater storage will not decline significantly during the 50-year GSP planning horizon, the model results indicate 318 to 458 AF/yr of groundwater inflow will occur from offshore portions of the Hueneme Aquifer into onshore portions of the aquifer during the implementation period (2022-2041), depending on climate change assumptions (Tables 3.3-08, 3.3-12, and 3.3-14). Modeled flow across the coastline during the next 55 years (sustaining and post-GSP periods, 2042-2096) is projected to reverse (consist of outflow from Mound Basin to the offshore areas), on average. As discussed in Section 3.2.3, available data do not indicate that seawater is or has been present in the onshore portions of the principal aquifers to date. With projected average net outflows of groundwater from Mound Basin to the offshore areas west of the coastline of approximately 5,000 AF/yr (Tables 3.3-08, 3.3-11, and 3.3-14), seawater intrusion into Mound Basin is considered unlikely to occur. Additionally, Section 4.6 presents model results of particle tracking analyses, which suggest that it will take more than 100 years for the seawater front in the Hueneme Aquifer to reach the shoreline of the Mound Basin. This is clearly beyond the 50-year GSP planning horizon and neither SGMA nor the GSP Emergency Regulations explicitly require consideration of potential undesirable results that could manifest after the 50-year GSP planning horizon. Nonetheless, this GSP prudently includes SMC and a monitoring network for seawater intrusion. A contingency plan for unexpected seawater intrusion during the 50-year GSP planning horizon will also be developed and can survive following the 50-year GSP planning horizon and be used to address any future potential landward movement of seawater in the Hueneme Aquifer.

3.3.4.2 Sustainable Yield

GSP Emergency Regulations § 354.18(b)(7) requires an estimate of the sustainable yield for the Basin. Water Code §10721(w) defines "Sustainable yield" as the maximum quantity of water, calculated over a base period representative of long-term conditions in the Basin and including any temporary surplus that can be withdrawn annually from a groundwater supply without causing an undesirable result.

Modeling results for the future projection periods indicate that the projected inflow and outflows will be approximately balanced during the 20-year GSP implementation period (change in storage ranging from 4 to 38 AF/yr; Tables 3.3-07, 3.3-10, and 3.3-13), depending on climate change assumptions. The modeling results also suggest that the minimum thresholds will not be exceeded. Therefore, an estimate of the sustainable yield is approximately equal to the projected extraction (averaging 7,900 to 8,200 AF/yr), depending on climate change assumptions (Tables 3.3-07, 3.3-10, and 3.3-13). It is recognized that increasing extraction rates above these amounts could increase underflow from adjacent basins, thereby increasing the sustainable yield of the Mound Basin; however, this could impact sustainable management of the adjacent Santa Paula and/or Oxnard basins and is not included the sustainable yield estimate at this time.

3.4 Management Areas [§354.20]

No management areas were established for this GSP.

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4.0 Sustainable Management Criteria [Article 5, SubArticle 3]

4.1 Introduction to Sustainable Management Criteria [§354.22]

§354.22 Introduction to Sustainable Management Criteria. *This Subarticle describes criteria by which an Agency defines conditions in its Plan that constitute sustainable groundwater management for the basin, including the process by which the Agency shall characterize undesirable results, and establish minimum thresholds and measurable objectives for each applicable sustainability indicator.*

This chapter defines the conditions that direct sustainable groundwater management in the Mound Basin, discusses the process by which MBGSA characterized undesirable results, and established minimum thresholds, measurable objectives, and interim milestones for each applicable sustainability indicator.

Defining the SMC requires a significant level of analysis and scrutiny; this section presents the data and methods used to develop the SMC for the Mound Basin and explains how the SMC affect the interests of beneficial uses and users of groundwater and/or land uses and property interests. The SMC presented in this Section were developed using the best available science and information for the Basin. As noted in this GSP, data gaps exist in the HCM, and uncertainty caused by these data gaps was considered during SMC development. The SMC will be reevaluated during each Plan assessment and potentially modified in the future as new data become available.

The layout for this GSP groups the SMC by each sustainability indicator, and their order is kept consistent with the SGMA regulatory text for minimum thresholds (§354.28). For this GSP, land subsidence is the most limiting sustainability indicator, and it may benefit the reader to understand the SMC for Section 4.8 before reading Sections 4.4 through 4.7. The following sustainability indicators are applicable in the Basin:

- Chronic lowering of groundwater levels (Section 4.4)
- Reduction in groundwater storage (Section 4.5)
- Seawater Intrusion (Section 4.6)
- Degraded water quality (Section 4.7)
- Land subsidence (Section 4.8)

The sixth sustainable management criterion, depletion of interconnected surface water, is not applicable in the Basin because surface water is not materially affected by groundwater extraction for the reasons described in the Basin Setting (see Sections 3.1.4.2, 3.2.6, and 3.3, and Appendix G for further information). There is no direct depletion of interconnected surface water of the Santa Clara River and its estuary because there is no groundwater extraction from the Shallow Alluvial Deposits. Indirect depletion of Santa Clara River flows by groundwater extraction from the deeper, principal aquifers does not occur at material rates because the thick zone of fine-grained materials that lies between the Shallow Alluvial Deposits and the Mugu Aquifer significantly limits the propagation of hydraulic responses between these units. A detailed analysis of the potential for indirect depletion is presented in Appendix G. The results of that analysis indicated that there is no material depletion of surface water.

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To retain an organized approach, this chapter follows the same structure for each sustainability indicator. The description of each SMC contains all the information required by §354.22 et seq. of the SGMA regulations and outlined in DWR BMP 6, Sustainable Management Criteria (DWR, 2017), including:

- Description of undesirable results:
  - Potential effects on beneficial uses and users of groundwater, on land uses and property interests, and other potential effects (§354.26(b)(3)).
  - The cause of groundwater conditions that would lead to or has led to undesirable results (§354.26(b)(1)).
  - The criteria used to define when and where the effects of groundwater conditions cause undesirable results (i.e., the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin) (§354.26(b)(2)).
- How minimum thresholds were developed:
  - The information and methodology used to develop minimum thresholds (§354.28 (b)(1)).
  - The relationship between minimum thresholds and the relationship of these minimum thresholds to other sustainability indicators (§354.28 (b)(2)).
  - The effect of minimum thresholds on neighboring basins (§354.28 (b)(3)).
  - The effect of minimum thresholds on beneficial uses and users (§354.28 (b)(4)).
  - How minimum thresholds relate to relevant Federal, State, or local standards (§354.28 (b)(5)).
  - The method for quantitatively measuring minimum thresholds (§354.28 (b)(6)).
- How measurable objectives and interim milestones were developed:
  - The methodology for setting measurable objectives (§354.30).
  - Interim milestones (§354.30 (a), §354.30 (e), §354.34 (g)(3)).

Minimum thresholds, measurable objectives, and interim milestones have been established to evaluate chronic lowering of groundwater levels, reduction in groundwater storage, and land subsidence (Table 4.1-01), water quality (Tables 4.1-02 and 4.1-03), and seawater intrusion (Table 4.1-03). For this GSP and pursuant to GSP Emergency Regulations §354.28(d), a groundwater elevation minimum threshold serves as the metric for chronic lowering of groundwater levels (Section 4.4), depletion of groundwater storage (Section 4.5), and land subsidence (Section 4.8) sustainability indicators. Adequate evidence demonstrating groundwater levels are a reasonable proxy is presented in Sections 4.4.2, 4.5.2, and 4.8.2. More information about specific minimum thresholds, measurable objectives, and interim milestones relating to each groundwater condition is available in Sections 4.4 through 4.9.

To facilitate discussion of the land subsidence minimum thresholds the Basin is divided into a “western half,” “eastern half,” and “coastal area” (Figure 4.1-01), and these terms are used throughout the GSP.

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4.2 Sustainability Goal [§354.24]

§354.24 Sustainability Goal. *Each Agency shall establish in its Plan a sustainability goal for the basin that culminates in the absence of undesirable results within 20 years of the applicable statutory deadline. The Plan shall include a description of the sustainability goal, including information from the basin setting used to establish the sustainability goal, a discussion of the measures that will be implemented to ensure that the basin will be operated within its sustainable yield, and an explanation of how the sustainability goal is likely to be achieved within 20 years of Plan implementation and is likely to be maintained through the planning and implementation horizon.*

The sustainability goal is key to the SMC development process because it provides policy guidance for defining undesirable results and desirable conditions for each applicable sustainability indicator and for the Basin as a whole. Recognizing the importance of the sustainability goal, MBGSA's SMC process began with developing and adopting the sustainability goal. MBGSA used a deliberate process to develop the sustainability goal, which included providing ample opportunity for input on the goal. Sustainability goal outreach included a GSP newsletter article, web-posting, multiple email notices to the interested parties list, discussion at a GSP Workshop, and discussion at four Board of Director meetings. The sustainability goal was adopted by the Board of Directors on September 17, 2020, after three months of outreach. Information from the Basin setting used to establish the sustainability goal is described in the subsections for each individual sustainability indicator.

The sustainability goal for the MBGSA GSP is as follows:

> *The goal of this Groundwater Sustainability Plan (GSP) is to sustainably manage the groundwater resources of the Mound Basin for the benefit of current and anticipated future beneficial users of groundwater and the welfare of the general public who rely directly or indirectly on groundwater. Sustainable groundwater management will ensure the long-term reliability of the Mound Basin groundwater resources by avoiding undesirable results pursuant to the Sustainable Groundwater Management Act (SGMA) no later than 20 years from GSP adoption through implementation of a data-driven and performance-based adaptive management framework. It is the express goal of this GSP to develop sustainable management criteria and plan implementation measures to avoid undesirable results for the applicable SGMA sustainability indicators by:*
>
> 1. *Using best available science and information, including consideration of uncertainty in the basin setting and groundwater conditions;*
> 2. *Conducting active and meaningful stakeholder engagement;*
> 3. *Considering potential impacts on the management of adjacent basins and, where necessary coordinating with adjacent basins; and*
> 4. *Balancing economic, social, and environmental impacts and benefits associated with current and anticipated future beneficial users of groundwater, by considering:*
>
>   a. *Water supply reliability for agriculture and municipal and industrial users;*
>   b. *Availability of alternative water sources for domestic groundwater beneficial users;*
>   c. *Identifying and considering potential impacts to groundwater-dependent ecosystems;*

d. State, federal, or local standards relevant to applicable sustainability indicators;

e. Feasibility of projects and management actions necessary to achieve proposed measurable objectives; and

f. Economic impact of projects and management actions necessary to achieve proposed measurable objectives on all beneficial users, with special consideration of disadvantage communities and agricultural landowners lacking alternative land use options.

The measures that will be implemented to ensure that the Basin will be operated within its sustainable yield, and an explanation of how the sustainability goal is likely to be achieved within 20 years of Plan implementation (and is likely to be maintained through the planning and implementation horizon) is presented in Section 6 (Projects and Management Actions) and Section 7 (Plan Implementation).

4.3 Process for Establishing Sustainable Management Criteria [§354.26(a), §354.34(g)(3)]

§354.26 Undesirable Results.

(a) *Each Agency shall describe in its Plan the processes and criteria relied upon to define undesirable results applicable to the basin. Undesirable results occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the basin.*

§354.34 Monitoring Network

(g) *Each Plan shall describe the following information about the monitoring network:*

(3) *For each sustainability indicator, the quantitative values for the minimum threshold, measurable objective, and interim milestones that will be measured at each monitoring site or representative monitoring sites established pursuant to Section 354.36.*

On June 18, 2020, the MBGSA Board of Directors adopted a deliberate process for developing SMC for this GSP (depicted in Figure 4.3-01 below).

As shown in Figure 4.3-01, a key part of the SMC development process is defining undesirable results (GSP Emergency Regulations §354.26(a)). The process for defining undesirable results was modified as the work was completed and consisted of multiple steps:

1. First, potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other effects were evaluated and described qualitatively.
2. This qualitative undesirable results statement was then translated and quantified into minimum thresholds at specific monitoring network sites (existing and proposed).
3. Lastly, a combination of minimum threshold exceedances representing undesirable results (when significant and unreasonable effects occur on any of the sustainability indicators) in the Basin was established.

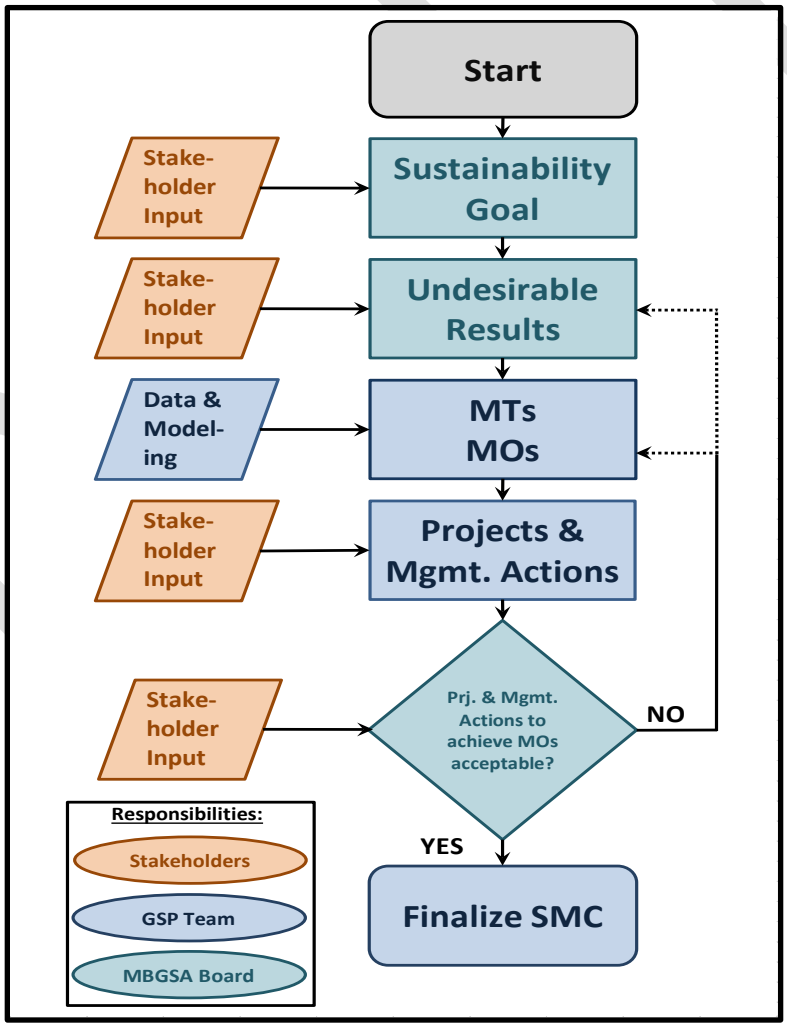
The Board of Directors and stakeholders reviewed SMC proposals prepared by staff. Written proposals were provided in the form of staff reports and presentations at numerous Board of Directors meetings, which included information on SGMA requirements, relevant information from the Basin Setting section, and results of additional analyses completed to support SMC development. Meeting summaries (minutes)

were posted on the MBGSA website to reflect the discussions that took place for each sustainability indicator.

SMC were also presented at two GSP workshops. The first GSP workshop was held on September 3, 2020, and focused on providing foundational information for SMC development, including the Basin setting, groundwater model, SMC development process, and sustainability goal. The second GSP workshop was held on March 4, 2021, and focused on detailed SMC proposals. The Board approved the SMC for inclusion in the draft GSP on March 18, 2021.

The proposed SMC were also subject to review and comment during the Draft GSP comment period. Outreach was performed throughout the SMC development process to encourage input on the proposed SMC, including GSP newsletters, e-mails to the interested parties list, social media posts, telephone communications with stakeholders, updates at the Santa Clara River Watershed Committee, public notices, and a bilingual bill stuffer in the City of Ventura's consumer water bills.

Figure 4.3-01 Sustainable Management Criteria Development Process



4.4 Chronic Lowering of Groundwater Levels

4.4.1 Undesirable Results [§354.26(a),(b)(1),(b)(2),(b)(3),(c), and (d)]

§354.26 Undesirable Results.

(a) *Each Agency shall describe in its Plan the processes and criteria relied upon to define undesirable results applicable to the basin. Undesirable results occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the basin.*

(b) *The description of undesirable results shall include the following:*

(1) *The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results based on information described in the basin setting, and other data or models as appropriate.*

(2) *The criteria used to define when and where the effects of the groundwater conditions cause undesirable results for each applicable sustainability indicator. The criteria shall be based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin.*

(3) *Potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results.*

(c) *The Agency may need to evaluate multiple minimum thresholds to determine whether an undesirable result is occurring in the basin. The determination that undesirable results are occurring may depend upon measurements from multiple monitoring sites, rather than a single monitoring site.*

(d) *An Agency that is able to demonstrate that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin shall not be required to establish criteria for undesirable results related to those sustainability indicators.*

Process and Criteria for Defining Undesirable Results [§354.26(a)]

The overall process relied upon to define undesirable results for this GSP is described in Section 4.3. The specific process and criteria for defining undesirable results applied to the chronic lowering of groundwater levels sustainability indicator are described below.

Evaluation of Potential Effects on Beneficial Uses and Users, Land Uses, and Property Interests [§354.26(b)(3)]

The process for defining undesirable results for chronic lowering of groundwater levels began with considering the potential effects on beneficial uses and users of groundwater, land uses, and property interests.

Potential effects on beneficial uses and users of groundwater include the following:

- Impact on the ability of existing and future wells to produce groundwater at an adequate rate for beneficial uses, and
- Significant financial burden to groundwater beneficial users related to increased extraction costs, well repairs or modifications, and well replacements.

Potential effects on land uses and property interests include decreased property values resulting from decreased well yields and/or increased costs to produce water or purchase supplemental water.

The above-listed potential effects were analyzed by evaluating information about the following:

- Historical groundwater elevation data;
- Depths and locations of existing wells; and
- Numerical modeling results of groundwater level conditions from the 50-year projected water budget.

Chronic lowering of groundwater levels has not historically occurred and is not currently occurring in the Basin. The results of the analysis indicate that groundwater levels could decline by a considerable amount below historical low levels in many areas of the Basin before a significant and unreasonable depletion of supply would occur. The reason for this available groundwater level decline is related to the fact that wells are located in the confined portion of the Basin and the aquifers occur at considerable depths (see Figures 3.1-05 through 3.1-08). In short, there is a high enough water column in most wells to support large groundwater declines before a significant loss of production capacity would occur. The analysis results are supported by the lack of reported pumping problems during historical periods of lowered groundwater levels. While accessing water from depths below historical low groundwater levels may require deeper pump settings than current, the cost for lowering pumps is not considered significant and unreasonable. Significant and unreasonable effects are assumed to occur if wells could no longer be used as designed. Because wells in the Basin are designed to produce from confined aquifers, this means maintaining pumping levels above the top of the aquifers.

Based on the foregoing, the qualitative description of undesirable results is chronic lowering of groundwater levels that causes a significant number of wells in the Basin to no longer be capable of being operated as designed for the confined aquifers of the Mound Basin.

Cause of Groundwater Conditions That Could Lead to Undesirable Results [§354.26(b)(1)]

The cause of groundwater conditions that could lead to undesirable results would be lowering of the groundwater potentiometric surface to depths that cause pumping levels to drop below an operable height above the top of the principal aquifer in a significant number of wells.

The following factors could result in groundwater levels declining to such levels:

1. Mound Basin groundwater extractions rates that significantly exceed those assumed for the projected water budget analysis.
2. Droughts that exceed the duration and severity of droughts included in the hydrologic period used for the projected water budget analysis.
3. If Oxnard Basin does not meet the sustainability goal in its GSP, which would impact underflow between the basins to the detriment of the Mound Basin.
4. Increased groundwater extraction in the adjacent Oxnard Basin near the boundary with the Mound Basin, which would impact underflow between the basins to the detriment of the Mound Basin.
5. Increased groundwater extraction in the adjacent Santa Paula Basin near the boundary with the Mound Basin, which would impact underflow between the basins to the detriment of the Mound Basin.

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6. Combinations of items 1 through 5.

Criteria Used to Define Undesirable Results [§354.26(b)(2)]

The combination of minimum threshold exceedances that is deemed to cause significant and unreasonable effects in the Basin for chronic lowering of groundwater levels is minimum threshold exceedances in 50% of the groundwater level monitoring sites in either principal aquifer. Exceedances beyond 50% would indicate widespread significant and unreasonable effects in either principal aquifer leading to undesirable results in the Basin.

4.4.2 Minimum Thresholds [§354.28]

The minimum thresholds for the chronic lowering of groundwater levels are set at the historical low groundwater level for each monitoring well (Appendix I). The basis, description, and definition for the minimum threshold is discussed in the subsequent sections below.

4.4.2.1 Information and Criteria to Define Minimum Thresholds [§354.28(a),(b)(1),(c)(1)(A),(c)(1)(B), and (e)]

§354.28 Minimum Thresholds.

(a) *Each Agency in its Plan shall establish minimum thresholds that quantify groundwater conditions for each applicable sustainability indicator at each monitoring site or representative monitoring site established pursuant to Section 354.36. The numeric value used to define minimum thresholds shall represent a point in the basin, that, if exceeded, may cause undesirable results as described in Section 354.26.*

(b) *The description of minimum thresholds shall include the following:*

(1) *The information and criteria relied upon to establish and justify the minimum thresholds for each sustainability indicator. The justification for the minimum threshold shall be supported by information provided in the basin setting, and other data or models as appropriate, and qualified by the uncertainty in the understanding of the basin setting.*

(c) *Minimum thresholds for each sustainability indicator shall be defined as follows:*

(1) *Chronic Lowering of Groundwater Levels. The minimum threshold for chronic lowering of groundwater levels shall be the groundwater elevation indicating a depletion of supply at a given location that may lead to undesirable results. Minimum thresholds for chronic lowering of groundwater levels shall be supported by the following:*

(A) *The rate of groundwater elevation decline based on historical trend, water year type, and projected water use in the basin.*

(B) *Potential effects on other sustainability indicators.*

(e) *An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish minimum thresholds related to those sustainability indicators.*

The evaluation of potential effects on beneficial uses and users, land uses, and property interests that would be affected by chronic lowering of groundwater levels was described in the evaluation of undesirable results (Section 4.4.1). Summarizing Section 4.4.1, significant and unreasonable effects from chronic lowering of groundwater levels would be causing wells to no longer be capable of being operated as designed for the confined aquifers of the Mound Basin. Wells are designed to not have the screens desaturate. For the confined aquifers in the Mound Basin, this means the maximum available drawdown is generally limited by the water column above the top of the aquifer (Driscoll, 1986). Drawing

groundwater levels into the screen and aquifer causes cascading water in the well, which can cause pump cavitation and can accelerate biofouling, corrosion, and encrustation of the well screen. These effects can rapidly cause a significant loss of well production capacity and can render wells inoperable. Therefore, preventing significant and unreasonable effects requires that static groundwater levels be maintained at levels that provide sufficient water column for pumping levels to remain above the top of the aquifers.

With respect to the undesirable results described above, the groundwater elevations that indicate depletion of supply were calculated for each monitoring location to evaluate potential minimum thresholds for chronic lowering of groundwater levels. The calculations were completed by adding the estimated drawdown for a typical pumping well to 40 ft above the top elevation of the aquifer (see Appendix I for additional details and results of these calculations). Although this calculation was considered for the minimum threshold for the chronic lowering of groundwater levels sustainability indicator, it was noted that some calculated levels are several hundred feet lower in elevation than the measured historical low groundwater elevation (especially for the Hueneme aquifer), while others are similar to the historical low elevations. This is due to the significant folding of the principal aquifers that create a variable depth to the top of aquifer throughout the Basin. Other considerations include the prevention of land subsidence, avoiding potentially unrecoverable reduction of groundwater storage, and impacting underflows to/from the adjacent Oxnard Basin. After considering these factors, the minimum thresholds for the chronic lowering of groundwater levels were set at the historical low groundwater elevations in the monitoring wells. This approach will protect the wells near anticlines (upward folds), prevent land subsidence, prevent the Basin groundwater levels from falling beyond a point from which groundwater storage may not fully recover, and ensure that underflow to/from the Oxnard Basin is not unduly impacted. The resulting minimum thresholds are provided in Table 4.1-01 and are depicted on the time-series plots (hydrographs) included in Appendix I.

Pursuant to GSP Emergency Regulations §354.28(c)(1)(A), the rate of groundwater elevation decline based on historical trend, water year type, and projected water use in the Basin were considered during development of the minimum thresholds for chronic lowering of groundwater levels. Declining groundwater levels have been observed during periods of multiple consecutive dry water years or sequences with alternating dry and normal water years (e.g. Figures 3.2-10 through 3.2-13 and 3.3-02). Projected water use in the Basin is accounted for in the numerical modeling of the 50-year projected period and the modeling results suggest that projected extraction rates will not cause minimum threshold exceedances (Appendix I).

4.4.2.1.1 Evaluation of Representative Minimum Thresholds [§354.28(d)]

§354.28 Minimum Thresholds.
(d) *An Agency may establish a representative minimum threshold for groundwater elevation to serve as the value for multiple sustainability indicators, where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual minimum thresholds as supported by adequate evidence.*

As discussed in Section 4.8, InSAR data is not adequate for monitoring land subsidence in the western half of the Basin. Because of this inadequacy, groundwater level elevations are used as a proxy for land subsidence minimum thresholds in the western half of the Basin. As such, groundwater elevation is used as a representative minimum threshold for multiple sustainability indicators (land subsidence and chronic lowering of groundwater levels in the western half of the Basin). Groundwater levels are a reasonable

proxy for multiple minimum thresholds for these sustainability indicators because they are closely correlated. Groundwater levels could decline below historical low levels without causing undesirable results for the chronic lowering of groundwater levels sustainability indicator at some locations in the western half of the Basin based on the drawdown analysis described in Appendix I. However, undesirable results for land subsidence could occur in the "Coastal Area" (see Figure 4.1-01) if groundwater levels decline below historical low levels in the western half of the Basin. Therefore, it is appropriate to use the historical low as minimum thresholds for the land subsidence and chronic lowering of groundwater levels sustainability indicators in the western half of the Basin. Appendix I describes the calculation of the minimum thresholds and measurable objectives for each monitoring well in the Basin.

4.4.2.2 Relationships Between Minimum Thresholds and Sustainability Indicators [§354.28(b)(2)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(2) *The relationship between the minimum thresholds for each sustainability indicator, including an explanation of how the Agency has determined that basin conditions at each minimum threshold will avoid undesirable results for each of the sustainability indicators.*

The relationships between the minimum thresholds for the chronic lowering of groundwater levels sustainability indicator and other sustainability indicators are described in Section 4.4.2.5.

4.4.2.3 Minimum Thresholds in Relation to Adjacent Basins [§354.28(b)(3)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(3) *How minimum thresholds have been selected to avoid causing undesirable results in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals.*

The minimum thresholds for the chronic lowering of groundwater levels sustainability indicator are based on historical low groundwater elevations, which is considered protective of both the Mound Basin and the adjacent Oxnard Basin. Deeper groundwater levels could potentially increase underflow into the Mound Basin from the Oxnard and/or Santa Paula Basins (or decrease underflow to the Oxnard Basin), which could potentially contribute to undesirable results in those Basins. Underflow between the basins will be estimated during Plan implementation using groundwater level data near the basin boundary and numerical modeling to evaluate whether the minimum thresholds are unduly impacting sustainable management of the Oxnard Basin.

4.4.2.4 Impact of Minimum Thresholds on Beneficial Uses and Users [§354.28(b)(4)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(4) *How minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests.*

The chronic lowering of groundwater levels minimum thresholds may have several effects on beneficial users and land uses in the Basin:

Groundwater Beneficial Users (All Types)

The minimum thresholds will prevent significant and unreasonable depletions of supply and prevent significant financial burdens for well repairs and well replacements. Numerical modeling results suggest that the future groundwater levels will be above the minimum thresholds and achieve the measurable objective without the need for extraction rate reductions or any projects or other management actions. Therefore, the minimum thresholds are not anticipated to limit the beneficial use of groundwater.

Land Uses and Property Interests (All Types)

The minimum thresholds will prevent significant and unreasonable effects on land uses and property interests by preserving water supply for beneficial uses, thereby helping maintain property values. As discussed in Section 2.2.3.1, agricultural land and open space in the Basin is subject to the City of Ventura and County of Ventura SOAR voter initiatives currently approved through 2050 (SOAR, 2015). The SOAR initiatives require a majority vote of the people to rezone unincorporated open space, agricultural, or rural land for development. The existence of SOAR makes it very unlikely that agricultural land could be developed. Therefore, it is important to ensure that agricultural beneficial uses of groundwater are protected by the minimum thresholds because there is no practical alternative land use for most agricultural land in the Basin. Absent groundwater supplies, agricultural property values would likely be significantly impacted. The impact on property values for other land uses and property uses in the Basin is less directly tied to Mound Basin groundwater because the City of Ventura (water supplier for majority of the non-agricultural areas of the Basin) has a diverse water supply portfolio that includes multiple supplies derived from sources located outside of the Basin.

4.4.2.5 Potential Effects on other Sustainability Indicators [§354.28(c)(1)(B)]

§354.28 Minimum Thresholds.
(c) *Minimum thresholds for each sustainability indicator shall be defined as follows:*
(1) *Chronic Lowering of Groundwater Levels. The minimum threshold for chronic lowering of groundwater levels shall be the groundwater elevation indicating a depletion of supply at a given location that may lead to undesirable results. Minimum thresholds for chronic lowering of groundwater levels shall be supported by the following:*
(B) *Potential effects on other sustainability indicators.*

Pursuant to GSP Emergency Regulations §354.28(c)(1)(B), potential effects on other sustainability indicators were considered. The following effects were identified:

- **Land Subsidence in the Western Half of the Basin**: As discussed in Section 4.8, InSAR data is not adequate for monitoring land subsidence in the western half of the Basin; therefore, groundwater level elevations are used as a proxy for land subsidence minimum thresholds. The minimum thresholds are the same for the chronic lowering of groundwater levels and land subsidence sustainability indicators in the western half of the Basin. The potential effect of the chronic lowering of groundwater levels minimum thresholds is prevention of minimum

threshold exceedances for the land subsidence sustainability indicator in the western half of the Basin.

Land Subsidence in the Eastern Half of the Basin: As discussed in Section 4.8, InSAR data is adequate for monitoring land subsidence in the eastern half of the Basin and the land subsidence minimum thresholds are a rate and extent of subsidence. The chronic lowering of groundwater levels minimum threshold is the historical low groundwater level elevations, which should prevent inelastic subsidence. Thus, the potential effect of the chronic lowering of groundwater levels minimum thresholds is prevention of minimum threshold exceedances for the land subsidence sustainability indicator in the eastern half of the Basin.

- **Reduction of Groundwater Storage**: Managing groundwater levels above historical lows is expected to prevent unrecoverable groundwater storage loss because the Basin has been demonstrated to recover from historical low groundwater elevations historically. Thus, the potential effect of the chronic lowering of groundwater levels minimum thresholds is prevention of unrecoverable reduction of groundwater storage.
- **Seawater Intrusion**: Numerical modeling results suggest that seawater intrusion is not anticipated during the 50-year SGMA planning and implementation period (Section 4.6). In addition, the Mugu and Hueneme aquifers crop out on the continental shelf approximately 10 miles offshore without any submarine canyons (Figure 3.1-10), greatly reducing the likelihood that seawater can find a near-shore path for intrusion. Several investigations have concluded that seawater intrusion is not occurring for Mound Basin. Therefore, the effect of groundwater level minimum thresholds on the seawater intrusion sustainability indicators is not significant. However, it is noted that maintaining groundwater levels above historical low levels will help limit inland gradients in the Hueneme Aquifer that could eventually lead to onshore migration of seawater in the future (beyond the 50-year SGMA planning and implementation period).
- **Degraded Water Quality**: Managing groundwater levels above historical lows is expected to prevent water quality degradation associated with groundwater extraction because the Basin has not experienced degradation of water quality in the principal aquifers during periods of historical low groundwater elevations. Thus, the potential effect of the chronic lowering of groundwater levels minimum thresholds is prevention of degradation of water quality associated with groundwater extraction.
- **Depletion of Interconnected Surface Water**: This sustainability indicator is not applicable to the Mound Basin.

4.4.2.6 Current Standards Relevant to Sustainability Indicator [§354.28(b)(5)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(5) *How state, federal, or local standards relate to the relevant sustainability indicator. If the minimum threshold differs from other regulatory standards, the Agency shall explain the nature of and basis for the difference.*

MBGSA is unaware of any federal, state, or local standards for chronic lowering of groundwater levels.

4.4.2.7 Measurement of Minimum Thresholds [§354.28(b)(6)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(6) *How each minimum threshold will be quantitatively measured, consistent with the monitoring network requirements described in Subarticle 4.*

Groundwater elevations will be directly measured to determine their relation to minimum thresholds. Groundwater level monitoring will be conducted in accordance with the monitoring plan outlined in Section 5. Section 7 Plan Implementation includes an implementation budget to install additional monitoring sites identified in Section 5.

4.4.3 Measurable Objectives and Interim Milestones [§354.30(a),(b),(c),(d),(e),(g)]

§354.30 Measurable Objectives.
(a) *Each Agency shall establish measurable objectives, including interim milestones in increments of five years, to achieve the sustainability goal for the basin within 20 years of Plan implementation and to continue to sustainably manage the groundwater basin over the planning and implementation horizon.*
(b) *Measurable objectives shall be established for each sustainability indicator, based on quantitative values using the same metrics and monitoring sites as are used to define the minimum thresholds.*
(c) *Measurable objectives shall provide a reasonable margin of operational flexibility under adverse conditions which shall take into consideration components such as historical water budgets, seasonal and long-term trends, and periods of drought, and be commensurate with levels of uncertainty.*
(d) *An Agency may establish a representative measurable objective for groundwater elevation to serve as the value for multiple sustainability indicators where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual measurable objectives as supported by adequate evidence.*
(e) *Each Plan shall describe a reasonable path to achieve the sustainability goal for the basin within 20 years of Plan implementation, including a description of interim milestones for each relevant sustainability indicator, using the same metric as the measurable objective, in increments of five years. The description shall explain how the Plan is likely to maintain sustainable groundwater management over the planning and implementation horizon.*
(g) *An Agency may establish measurable objectives that exceed the reasonable margin of operational flexibility for the purpose of improving overall conditions in the basin, but failure to achieve those objectives shall not be grounds for a finding of inadequacy of the Plan.*

4.4.3.1 Description of Measurable Objectives

The chronic lowering of groundwater levels measurable objectives were developed by applying the concept of providing a reasonable margin of operational flexibility under adverse conditions (GSP Emergency Regulations §354.30(c)). Adverse conditions for the Mound Basin include drought-phases of the long-term and climatic-driven groundwater level cycles, as described in Section 3.2 (Groundwater Conditions). The reasonable margin of operational flexibility was determined to be groundwater levels following wet phases that are sufficiently high to prevent groundwater levels from dropping below the minimum thresholds during a subsequent drought phase (Figures 3.2-10 through 3.2-13). The measurable objectives were developed for each monitoring site using the following approach:

1. Modeled groundwater level data were plotted for the projected period for each monitoring site.

2. The maximum modeled groundwater level decline during the 50-year GSP planning and implementation horizon was determined and, when necessary, adjusted using professional judgment based on model calibration results (see Appendix I for additional details on the methodology);
3. The maximum projected groundwater level decline was added to the minimum threshold to establish the range of operational flexibility.

The measurable objectives are listed along with minimum thresholds for each monitoring site in Table 4.1-01 (§354.30(b)) and apply following wet phases of the climate cycle. Failure to meet the measurable objectives during other times shall not be considered failure to sustainably manage the Basin. Time-series plots (hydrographs) showing the measured and modeled groundwater elevation data and measurable objectives are included in Appendix I.

4.4.3.2 Interim Milestones [§354.30(e)]

§354.30 Measurable Objective.
(e) *Each Plan shall describe a reasonable path to achieve the sustainability goal for the basin with 20 years of Plan implementation, including a description of interim milestones for each relevant sustainability indicator, using the same metric as the measurable objective, in increments of five years. The description shall explain how the Plan is likely to maintain sustainable groundwater management over the planning and implementation horizon.*

Interim milestones were developed to illustrate a reasonable path to achieve the sustainability goal for the Basin within 20 years of Plan implementation. Development of interim milestones is significantly complicated by the fact that the hydrologic conditions for the next 20 years cannot be predicted. Currently, groundwater levels in the Basin are below the measurable objectives for approximately ⅓ of the wells because the Basin has experienced overall dry conditions for much of the past decade. It is anticipated that groundwater levels will rise during the next wet period and as a result of Oxnard Basin GSP implementation. It is anticipated that the measurable objectives will be met at some point during the 20-year GSP planning period and then may fluctuate above or below the measurable objective thereafter. Because of the uncertainty concerning when the measurable objectives will be met, the interim milestones are shown as a linear path toward the measurable objective over the 20-year sustainability timeframe. This interim milestone path should not be taken literally because it is climate dependent. The interim milestones and path to sustainability will be reviewed during each required five-year GSP assessment (GSP Emergency Regulations §354.38(a)). The interim milestones are listed in Table 4.1-01 and are plotted on the time-series plots (hydrographs) included in Appendix I.

Once the measurable objectives are met, numerical modeling results suggests that sustainability will be maintained during the remainder of the 50-year GSP planning and implementation horizon (Appendix I). The causes of groundwater conditions that could lead to undesirable results for the land subsidence sustainability indicator (described in Section 4.8.1) will be carefully reviewed during each required five-year GSP assessment. The GSP will be updated to include any projects or management actions deemed necessary to maintain sustainable conditions in the Basin.

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4.5 Reduction of Groundwater Storage

4.5.1 Undesirable Results [§354.26]

§354.26 Undesirable Results.

(a) *Each Agency shall describe in its Plan the processes and criteria relied upon to define undesirable results applicable to the basin. Undesirable results occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the basin.*

(b) *The description of undesirable results shall include the following:*

(1) *The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results based on information described in the basin setting, and other data or models as appropriate.*

(2) *The criteria used to define when and where the effects of the groundwater conditions cause undesirable results for each applicable sustainability indicator. The criteria shall be based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin.*

(3) *Potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results.*

(c) *The Agency may need to evaluate multiple minimum thresholds to determine whether an undesirable result is occurring in the basin. The determination that undesirable results are occurring may depend upon measurements from multiple monitoring sites, rather than a single monitoring site.*

(d) *An Agency that is able to demonstrate that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin shall not be required to establish criteria for undesirable results related to those sustainability indicators.*

Process and Criteria for Defining Undesirable Results [§354.26(a)]

The overall process relied upon to define undesirable results for this GSP was described in Section 4.3. The specific process and criteria for defining undesirable results applied to the reduction of groundwater storage sustainability indicator are described below.

Pursuant to Water Code §10721(x)(2) the undesirable result for the reduction of groundwater storage sustainability indicator is a "significant and unreasonable reduction of groundwater storage." The reduction in groundwater storage sustainability indicator is measured as the "total volume of groundwater that can be withdrawn from the basin without causing conditions that may lead to undesirable results" (GSP Emergency Regulations §354.28(c)(2)).

The HCM for the Mound Basin describes the principal aquifers (Mugu and Hueneme) as extensively deep and confined, except where the Hueneme unit outcrops in the higher elevations to the north (Section 3.1.4.1.3). The principal aquifers are also regional flow-through units, with groundwater underflow from the upgradient Santa Paula Basin contributing to rebound from declines in storage associated with drier periods (Figure 3.3-03). In addition, historical low groundwater levels are consistently well above the top of the principal aquifer units (Figures 3.1-05 – 3.1-07). Storage is not directly measured for the Basin; therefore there are no storage targets or goals associated with groundwater use. These combinations of factors indicate that groundwater storage is not a directly relevant sustainability indicator for the Basin. Regardless, the potential impacts of the reduction of groundwater storage are evaluated under the guidelines of the GSP Emergency Regulations to maintain compliance.

In many basins, including the Mound Basin, the effects of decreasing groundwater storage would manifest as effects for other sustainability indicators; the reduction of groundwater storage is associated with chronic lowering of groundwater levels and subsidence. For example, a key concern for the Mound Basin would be a reduction in groundwater storage that causes groundwater levels to decline to a point that undesirable results for the land subsidence sustainability indicator occur.

Based on the foregoing, the qualitative description of undesirable results is reduction of groundwater storage that will likely cause other sustainability indicators to have undesirable results.

Evaluation of Potential Effects on Beneficial Uses and Users, Land Uses, and Property Interests [§354.26(b)(3)]

The evaluation of potential effects on beneficial uses and users, land uses, and property interests for the reduction of groundwater storage sustainability indicator is the same as for the other sustainability indicators and is incorporated herein by reference to Sections 4.4.2.4, 4.6.2.4, and 4.7.2.4.

Reduction of groundwater storage has the potential to impact the beneficial uses and users of groundwater in the Mound Basin by limiting the volume of groundwater available that can be economically extracted for agricultural, municipal, and industrial use. These impacts can affect all users of groundwater in the Mound Basin. Groundwater elevations are used to determine whether significant and unreasonable reduction of groundwater in storage is occurring.

Cause of Groundwater Conditions That Could Lead to Undesirable Results [§354.26(b)(1)]

The cause of groundwater conditions that could lead to undesirable results would be reduction of groundwater storage that subsequently causes undesirable results for the other sustainability indicators.

The following factors could result in groundwater storage reductions that could lead to undesirable results for the other sustainability indicators:

1. Mound Basin groundwater extractions rates that significantly exceed those assumed for the projected water budget analysis.
2. Droughts that exceed the duration and severity of droughts included in the hydrologic period used for the projected water budget analysis.
3. If Oxnard Basin does not meet the sustainability goal in its GSP, which would impact underflow between the basins to the detriment of the Mound Basin.
4. Increased groundwater extraction in the adjacent Oxnard Basin near the boundary with the Mound Basin, which would impact underflow between the basins to the detriment of the Mound Basin.
5. Increased groundwater extraction in the adjacent Santa Paula Basin near the boundary with the Mound Basin, which would impact underflow between the basins to the detriment of the Mound Basin.
6. Combinations of items 1 through 5.

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Criteria Used to Define Undesirable Results [§354.26(b)(2)]

Because there is a single minimum threshold that applies to the entire Basin, the criteria used to define undesirable results for the reduction of groundwater storage sustainability indicator is the exceedance of the minimum threshold. If the reduction of groundwater storage minimum threshold is exceeded, MBGSA will assess the other sustainability indicators to determine if undesirable results are occurring or are likely to occur.

4.5.2 Minimum Thresholds [§354.28]

The minimum threshold for the reduction of groundwater storage sustainability indicator is the estimated sustainable yield of 8,200 AF/yr of the Basin calculated over a long-term, balanced hydrologic period. Because the minimum threshold applies over an averaging period, groundwater extractions exceeding the minimum threshold in any given year will not automatically be considered to indicate undesirable results are occurring in the Basin (please see Section 4.5.1).

4.5.2.1 Information and Criteria to Define Minimum Thresholds [§354.28(a),(b)(1),(c)(2), and (e)]

§354.28 Minimum Thresholds.

(a) *Each Agency in its Plan shall establish minimum thresholds that quantify groundwater conditions for each applicable sustainability indicator at each monitoring site or representative monitoring site established pursuant to Section 354.36. The numeric value used to define minimum thresholds shall represent a point in the basin that, if exceeded, may cause undesirable results as described in Section 354.26.*

(b) *The description of minimum thresholds shall include the following:*

(1) *The information and criteria relied upon to establish and justify the minimum thresholds for each sustainability indicator. The justification for the minimum threshold shall be supported by information provided in the basin setting, and other data or models as appropriate, and qualified by the uncertainty in the understanding of the basin setting.*

(c) *Minimum thresholds for each sustainability indicator shall be defined as follows:*

(2) *Reduction of Groundwater Storage. The minimum threshold for reduction of groundwater storage shall be a total volume of groundwater that can be withdrawn from the basin without causing conditions that my lead to undesirable results. Minimum thresholds for reduction of groundwater storage shall be supported by the sustainable yield of the basin, calculated based on historical trends, water year type, and projected water use in the basin.*

(e) *An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish minimum thresholds related to those sustainability indicators.*

Groundwater storage cannot be directly measured; rather it can only be estimated using measured or modeled groundwater levels and knowledge of basin geometry and subsurface hydraulic properties, and there is a calibrated numerical model that is used to relate groundwater levels to storage (United, 2021c). Groundwater extraction values from the Basin's principal aquifers are a more direct and reliable measure as compared to estimated storage changes. For these reasons, groundwater extraction rates will be used for the reduction of groundwater storage sustainability indicator. The information used to define the minimum threshold (sustainable yield) is the water budgets presented in Section 3.3, which are based on the numerical modeling performed for GSP development.

4.5.2.1.1 Evaluation of Representative Minimum Thresholds [§354.28(d)]

§354.28 Minimum Thresholds.
(d) *An Agency may establish a representative minimum threshold for groundwater elevation to serve as the value for multiple sustainability indicators, where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual minimum thresholds as supported by adequate evidence.*

This requirement is not applicable to the reduction of groundwater storage sustainability indicator.

4.5.2.2 Relationships Between Minimum Thresholds and Sustainability Indicators [§354.28(b)(2)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(2) *The relationship between the minimum thresholds for each sustainability indicator, including an explanation of how the Agency has determined that basin conditions at each minimum threshold will avoid undesirable results for each of the sustainability indicators.*

The relationships between the minimum thresholds for the reduction of groundwater storage sustainability indicator and other sustainability indicators are as follows:

- **Chronic Lowering of Groundwater Levels**: Extraction rates directly influence groundwater levels within the principal aquifers, so there is a direct relationship between the reduction of groundwater storage and the chronic lowering of groundwater levels minimum thresholds. Maintaining the long-term average groundwater extraction rates to below the sustainable yield is expected to minimize minimum threshold exceedances for the chronic lowering of groundwater levels sustainability indicator.
- **Land Subsidence:** A lowering of groundwater levels below the historical low levels could cause land subsidence in the Basin. Because extraction rates directly influence groundwater levels within the principal aquifers, the groundwater storage minimum threshold has a direct relationship to land subsidence if groundwater levels fall below the historical low. Maintaining the long-term average groundwater extraction rates to below the sustainable yield should minimize minimum threshold exceedances for the land subsidence sustainability indicator.
- **Seawater Intrusion**: Numerical modeling results suggest that seawater intrusion is not anticipated during the 50-year SGMA planning and implementation period (Section 4.6). In addition, the Mugu and Hueneme aquifers crop out on the continental shelf approximately 10 miles offshore without any submarine canyons (Figure 3.1-10), greatly reducing the likelihood that seawater can find a near-shore path for intrusion. Several investigations have concluded that seawater intrusion is not occurring for Mound Basin. Therefore, the relationship between reduction of groundwater storage minimum thresholds and the seawater intrusion sustainability indicator is not significant. Nevertheless, maintaining the long-term average groundwater extraction rates to below the sustainable yield should further minimize any potential for seawater intrusion.
- **Degraded Water Quality**: A lowering of groundwater levels below the historical low levels could cause degradation of water quality in the principal aquifers. Maintaining the long-term average

groundwater extraction rates to below the sustainable yield will help prevent degradation of water quality associated with groundwater extraction.

- **Depletion of Interconnected Surface Water**: This sustainability indicator is not applicable to the Mound Basin.

4.5.2.3 Minimum Thresholds in Relation to Adjacent Basins [§354.28(b)(3)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(3) *How minimum thresholds have been selected to avoid causing undesirable results in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals.*

The minimum threshold for the reduction of groundwater storage sustainability indicator will ensure groundwater storage does not decrease over long-term, average hydrologic conditions. This is considered protective of both the Mound Basin and the adjacent Oxnard Basin. If storage was allowed to decline over a long-term period of average hydrologic conditions, deeper groundwater levels would result, which could potentially increase underflow into the Mound Basin from the Oxnard and/or Santa Paula basins (or decrease underflow to the Oxnard Basin), which could potentially contribute to undesirable results in those basins. Underflow between the basins will be estimated during Plan implementation using groundwater level data near the basin boundary and numerical modeling to evaluate whether the minimum thresholds are unduly impacting sustainable management of the Oxnard Basin.

4.5.2.4 Impact of Minimum Thresholds on Beneficial Uses and Users [§354.28(b)(4)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(4) *How minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests.*

The effects on beneficial users and land uses in the Basin are the same as analyzed for the other sustainability indicators and are incorporated herein by reference.

4.5.2.5 Current Standards Relevant to Sustainability Indicator [§354.28(b)(5)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(5) *How state, federal, or local standards relate to the relevant sustainability indicator. If the minimum threshold differs from other regulatory standards, the Agency shall explain the nature of and basis for the difference.*

MBGSA is unaware of any federal, state, or local standards for reduction of groundwater storage.

4.5.2.6 Measurement of Minimum Thresholds [§354.28(b)(6)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(6) *How each minimum threshold will be quantitatively measured, consistent with the monitoring network requirements described in Subarticle 4.*

Groundwater extractions will be directly measured and recorded to determine their relation to minimum thresholds. Extraction rate monitoring will be conducted in accordance with the monitoring plan outlined in Section 5.

4.5.3 Measurable Objectives and Interim Milestones [§354.30(a),(b),(c),(d),(e),(g)]

§354.30 Measurable Objectives.
(a) *Each Agency shall establish measurable objectives, including interim milestones in increments of five years, to achieve the sustainability goal for the basin within 20 years of Plan implementation and to continue to sustainably manage the groundwater basin over the planning and implementation horizon.*
(b) *Measurable objectives shall be established for each sustainability indicator, based on quantitative values using the same metrics and monitoring sites as are used to define the minimum thresholds.*
(c) *Measurable objectives shall provide a reasonable margin of operational flexibility under adverse conditions which shall take into consideration components such as historical water budgets, seasonal and long-term trends, and periods of drought, and be commensurate with levels of uncertainty.*
(d) *An Agency may establish a representative measurable objective for groundwater elevation to serve as the value for multiple sustainability indicators where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual measurable objectives as supported by adequate evidence.*
(e) *Each Plan shall describe a reasonable path to achieve the sustainability goal for the basin within 20 years of Plan implementation, including a description of interim milestones for each relevant sustainability indicator, using the same metric as the measurable objective, in increments of five years. The description shall explain how the Plan is likely to maintain sustainable groundwater management over the planning and implementation horizon.*
(g) *An Agency may establish measurable objectives that exceed the reasonable margin of operational flexibility for the purpose of improving overall conditions in the basin, but failure to achieve those objectives shall not be grounds for a finding of inadequacy of the Plan.*

4.5.3.1 Description of Measurable Objectives

The reduction of groundwater storage measurable objective is 90% of the sustainable yield (i.e., 7,400 AF/yr), based on professional judgement and to account for uncertainty in the sustainable yield estimate. Like the minimum threshold, the measurable objective applies over a long-term period of average hydrology. It is anticipated that the measurable objective will be met in wet periods, but not met in drier than average periods and perhaps some average years. Failure to meet the measurable objective during average to dry years shall not be considered failure to sustainably manage the Basin. The measurable objective will be tracked over time and updated based on measured and recorded extraction rates for the Basin.

4.5.3.2 Interim Milestones [§354.30(e)]

§354.30 Measurable Objective.
(e) *Each Plan shall describe a reasonable path to achieve the sustainability goal for the basin with 20 years of Plan implementation, including a description of interim milestones for each relevant sustainability indicator, using the same metric as the measurable objective, in increments of five years. The description shall explain how the Plan is likely to maintain sustainable groundwater management over the planning and implementation horizon.*

Interim milestones were developed to illustrate a reasonable path to achieve the sustainability goal for the Basin within 20 years of Plan implementation. Development of interim milestones is significantly complicated by the fact that the hydrologic conditions for the next 20 years cannot be predicted. The historical and current average groundwater extractions are lower than the minimum threshold value (7,391 and 7,288 AF/yr compared to 8,200 AF/yr). The historical and current average groundwater extractions are also less than the measurable objective (7,400 AF/yr), so the interim milestones are set to be equal to the measurable objective. Numerical modeling results suggest that sustainability will be maintained during the remainder of the 50-year GSP planning and implementation horizon (Appendix I).

4.6 Seawater Intrusion

As described in Section 3.2.3 Seawater Intrusion, available data indicate that seawater has not been present in the onshore portions of the principal aquifers to date. Section 3.2.3 also explains that the Mound Basin principal aquifers may only be exposed to seawater where they crop out on the continental shelf edge, approximately 10 miles offshore, greatly reducing the likelihood that seawater can find a near-shore path for intrusion into the principal aquifers (Figure 3.1-10).

Additional numerical modeling analysis of seawater intrusion potential was conducted to support SMC development. Particle tracking was performed to estimate historical movement of seawater over the last approximate 100-year period to represent groundwater flow conditions since predevelopment. The calibrated MODFLOW model was coupled with MODPATH (Pollock, 2016) for this analysis. Particles were released at the offshore aquifer subcrop locations to simulate seawater movement in the principal aquifers over the 100-year period. The particle tracking results suggests that seawater has moved an average of approximately 0.5 miles from the offshore subcrop toward the shoreline in the Hueneme Aquifer during the past 100 years (Figure 4.6-01). The particle tracking results suggest no migration occurred in the Mugu Aquifer during the same period.

Particle tracking results demonstrate onshore migration of seawater did not occur under historical conditions and is not anticipated during the 50-year SGMA planning and implementation horizon. This is due to the large distance between the shoreline and the edge of the continental shelf where the aquifers are hydraulically connected to seawater. The travel time for seawater to reach the coast is estimated to be multiple centuries or more. This is in contrast with the adjacent Oxnard Plain Basin, where the aquifers are highly vulnerable to lateral seawater intrusion due to the existence of two deep submarine canyons at Port Hueneme and Point Mugu that expose the aquifers to seawater in the walls of the canyons at a very close distance to the shoreline. Although the numerical model results indicate onshore flow in the Hueneme Aquifer, it is believed this water will most likely continue to consist of fresh groundwater from the offshore portion of the aquifer.

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While the above-described modeling results are encouraging, it is necessary to consider the possibility that a short-circuit pathway for seawater could exist nearshore (for example along the Oak Ridge Fault). A nearshore short-circuit pathway could allow seawater to enter the aquifer and potentially migrate onshore during the SGMA planning horizon. The impact of potential short-circuit pathways for seawater was evaluated with additional particle tracking simulations. The 50-year baseline numerical model simulation performed for the projected water budget was coupled with MODPATH for this analysis. Particles were released in each principal aquifer at the shoreline to simulate seawater migration from a hypothetical near-shore short-circuit pathway. This simulation provides information for the worst-case scenario of potential seawater intrusion, in the event that seawater is just offshore and migrates onshore due to inland hydraulic gradients. Particles traces were exported after 20 and 50 years of migration to provide results for the 20-year GSP implementation period and the full 50-year SGMA planning period (Figures 4.6-02 and 4.6-03). As shown in Figures 4.6-02 and 4.6-03, the particle traces indicate an approximate average of 500 and 800 ft of potential migration (under the worst-case scenario) over the 20-year implementation and 50-year planning periods, respectively. Even under the worst-case scenario the inland extent of seawater migration is approximately 1 mile from the nearest active production well. It is recognized that migration rates in the more permeable portions of the aquifers could be several times higher than the average rates simulated. Even so, the results of these simulations indicate that it is unlikely that beneficial users of groundwater would be impacted during the 50-year SGMA planning and implementation horizon (see active wells plotted on Figures 4.6-02 and 4.6-03) by onshore migration of seawater via potential short-circuit pathways located near the coast.

Despite the very encouraging model results for seawater intrusion, SMC are included in the GSP to protect current and future beneficial users and users and property interests against potential unexpected seawater intrusion.

4.6.1 Undesirable Results [§354.26]

§354.26 Undesirable Results.

(a) *Each Agency shall describe in its Plan the processes and criteria relied upon to define undesirable results applicable to the basin. Undesirable results occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the basin.*

(b) *The description of undesirable results shall include the following:*

- ***(1)*** *The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results based on information described in the basin setting, and other data or models as appropriate.*
- ***(2)*** *The criteria used to define when and where the effects of the groundwater conditions cause undesirable results for each applicable sustainability indicator. The criteria shall be based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin.*
- ***(3)*** *Potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results.*

(c) *The Agency may need to evaluate multiple minimum thresholds to determine whether an undesirable result is occurring in the basin. The determination that undesirable results are occurring may depend upon measurements from multiple monitoring sites, rather than a single monitoring site.*

(d) *An Agency that is able to demonstrate that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin shall not be required to establish criteria for undesirable results related to those sustainability indicators.*

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Process and Criteria for Defining Undesirable Results [§354.26(a)]

The overall process relied upon to define undesirable results for this GSP is described in Section 4.3. The specific process and criteria for defining undesirable results applied to the seawater intrusion sustainability indicator are described below.

Evaluation of Potential Effects on Beneficial Uses and Users, Land Uses, and Property Interests [§354.26(b)(3)]

The process for defining undesirable results for seawater intrusion began with considering the potential effects on beneficial uses and users of groundwater, land uses, and property interests.

The potential effect on beneficial uses and users of groundwater would be that seawater intrusion would render groundwater unusable for beneficial use. Current and future anticipated beneficial uses of groundwater lie east of Harbor Boulevard. Based on land use designations, there are no current or future anticipated beneficial uses of groundwater in the Coastal Area located west of Harbor Boulevard (Figure 2.1-03).

Given that the beneficial uses immediately east of Harbor Boulevard are agricultural, the potential effect of seawater intrusion on land uses and property interests would be the economic impacts of decreased agricultural activity and decreased property values resulting from the inability to produce water for agricultural activities. As discussed in Section 2.2.3.1, agricultural land and open space in the Basin lies is subject to the City of Ventura and County of Ventura SOAR voter initiatives currently approved through 2050 (SOAR, 2015). The SOAR initiatives require a majority vote of the people to rezone unincorporated open space, agricultural or rural land for development. The existence of the SOAR makes it very unlikely that agricultural land could be developed. Therefore, it is important to ensure that agricultural beneficial uses of groundwater are protected by the minimum thresholds because there is no practical alternative land use for most agricultural land in the Basin.

Based on the foregoing, the qualitative description of undesirable results is seawater intrusion extending east of Harbor Boulevard into areas with current or anticipated future beneficial uses.

Cause of Groundwater Conditions That Could Lead to Undesirable Results [§354.26(b)(1)]

As discussed in Section 4.6, undesirable results for seawater intrusion are not anticipated during the 50-year SGMA planning and implementation period even if a near-shore short-circuit pathway for seawater intrusion exists.

The following combination of factors would be required for seawater intrusion to cause undesirable results during the 50-year SGMA planning and implementation period:

1. A near-shore short-circuit pathway for seawater to enter the principal aquifers would need to exist;
2. Onshore groundwater flow rates would need to be significantly greater than simulated (note the model suggest there is offshore flow in the Mugu Aquifer). This could potentially occur in the highest permeability zones of the aquifer, particularly if the onshore

groundwater flow gradient increases above that observed historically. The groundwater flow gradient could increase as a result of the following:

a. Mound Basin groundwater extractions rates that significantly exceed those assumed for the projected water budget analysis.

b. Droughts that exceed the duration and severity of droughts included in the hydrologic period used for the projected water budget analysis.

c. If Oxnard Basin does not meet the sustainability goal in its GSP, which would impact underflow between the basins to the detriment of the Mound Basin.

d. Increased groundwater extraction in the adjacent Oxnard Basin near the boundary with the Mound Basin, which would impact underflow between the basins to the detriment of the Mound Basin.

e. Increased groundwater extraction in the adjacent Santa Paula Basin near the boundary with the Mound Basin, which would impact underflow between the basins to the detriment of the Mound Basin.

f. Combinations of items a through e.

Criteria Used to Define Undesirable Results [§354.26(b)(2)]

The criteria used to define when and where the effects of the groundwater conditions cause undesirable results is based on the qualitative description of undesirable result, which is seawater intrusion extending east of Harbor Boulevard into areas with current or anticipated future beneficial uses. Preventing undesirable results for seawater intrusion means that the chloride concentrations should be maintained below concentration indicative of seawater intrusion impacts at monitoring sites along Harbor Boulevard. Therefore, the combination of minimum threshold exceedances that is deemed to cause significant and unreasonable effects would be an isocontour line that exceeds the minimum threshold at or east of Harbor Boulevard (Table 4.1-01).

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4.6.2 Minimum Thresholds [§354.28]

4.6.2.1 Information and Criteria to Define Minimum Thresholds [§354.28(a), (b)(1),(c)(3)(A),(c)(3)(B), and (e)]

§354.28 Minimum Thresholds.

(a) *Each Agency in its Plan shall establish minimum thresholds that quantify groundwater conditions for each applicable sustainability indicator at each monitoring site or representative monitoring site established pursuant to Section 354.36. The numeric value used to define minimum thresholds shall represent a point in the basin that, if exceeded, may cause undesirable results as described in Section 354.26.*

(b) *The description of minimum thresholds shall include the following:*

(1) *The information and criteria relied upon to establish and justify the minimum thresholds for each sustainability indicator. The justification for the minimum threshold shall be supported by information provided in the basin setting, and other data or models as appropriate, and qualified by the uncertainty in the understanding of the basin setting.*

(c) *Minimum thresholds for each sustainability indicator shall be defined as follows:*

(3) *Seawater Intrusion. The minimum threshold for seawater intrusion shall be defined by a chloride concentration isocontour for each principal aquifer where seawater intrusion may lead to undesirable results. Minimum thresholds for seawater intrusion shall be supported by the following:*

(A) *Maps and cross-sections of the chloride concentration isocontour that defines the minimum threshold and measurable objective for each principal aquifer.*

(B) *A description of how the seawater intrusion minimum threshold considers the effects of current and projected sea levels.*

(e) *An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish minimum thresholds related to those sustainability indicators.*

Contrary to the general rule for setting minimum thresholds for other sustainability indicators, seawater intrusion minimum thresholds do not have to be set at individual monitoring sites. Rather, the minimum threshold is set along an isocontour (GSP Emergency Regulations §354.28(c)(3). However, for practical purposes of monitoring the isocontour, minimum thresholds are set at the monitoring and production wells used to define the isocontour.

Information used for establishing the chloride isocontour seawater intrusion minimum thresholds and measurable objectives include:

- Description of undesirable results (Section 4.6.1);
- Depths, locations, and logged lithology of existing wells used to monitor groundwater quality;
- Historical and current chloride concentrations in monitoring and production wells near the coast; and
- Minimum thresholds for chloride for the degraded water quality sustainability indictor.

Based on analysis of the above-listed factors, the seawater intrusion minimum threshold was established as a 150 mg/L chloride concentration isocontour along Harbor Boulevard. The minimum threshold is the same for both principal aquifers.

Figures 4.6-04 and 4.6-05 show the minimum threshold isocontour in map view and cross-section view for both principal aquifers, as required by GSP Emergency Regulations §354.28(c)(3)(A). Table 4.1-03 summarizes the seawater intrusion minimum threshold and measurable objective for the Mugu and Hueneme aquifers for the planned monitoring wells discussed in Section 4.6.2.6 below.

GSP Emergency Regulations §354.28(c)(3)(B) requires a description of how the seawater intrusion minimum threshold considers the effects of current and projected sea levels. As described in Section 3.3, modeling for the 50-year projected water budget includes scenarios the considered 2030 and 2070 climate change conditions. The future baseline scenario assumed no sea level rise, the 2030 climate change scenario assumed 15 centimeters (6 inches) of sea level rise, and the 2070 climate change scenario assumed 45 centimeters (18 inches) of sea level rise, consistent with DWR (2018) guidance. The projected sea level rise amounts were incorporated into the general head boundary used to simulate the offshore seawater interface with the aquifer. The results of the 2030 and 2070 climate change model simulations are not significantly different from the baseline (no climate change) model simulation (Appendix I).

4.6.2.1.1 Evaluation of Representative Minimum Thresholds [§354.28(d)]

§354.28 Minimum Thresholds.
(d) *An Agency may establish a representative minimum threshold for groundwater elevation to serve as the value for multiple sustainability indicators, where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual minimum thresholds as supported by adequate evidence.*

This requirement is not applicable to the seawater intrusion sustainability indicator because groundwater levels are not used as proxy.

4.6.2.2 Relationships Between Minimum Thresholds and Sustainability Indicators [§354.28(b)(2)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(2) *The relationship between the minimum thresholds for each sustainability indicator, including an explanation of how the Agency has determined that basin conditions at each minimum threshold will avoid undesirable results for each of the sustainability indicators.*

The relationships between the minimum thresholds for the sweater intrusion sustainability indicator and other sustainability indicators are as follows:

- **Chronic Lowering of Groundwater Levels**: Numerical modeling results suggest that seawater intrusion is not anticipated during the SGMA planning and implementation periods. Therefore, the relationship between the seawater intrusion and chronic lowering of groundwater levels sustainability indicator is not significant. However, it is noted that maintaining groundwater levels above historical low levels will help limit inland gradients in the Hueneme Aquifer that could eventually lead to onshore migration of seawater in the future (beyond the 50-year SGMA planning and implementation period).
- **Reduction of Groundwater Storage:** Numerical modeling results suggest that seawater intrusion is not anticipated during the SGMA planning and implementation periods. Therefore, the relationship between the seawater intrusion and reduction of groundwater storage

sustainability indicator is not significant. However, it is noted that maintaining groundwater extraction totals will help limit the onshore movement of fresh groundwater in the Hueneme Aquifer that could eventually lead to onshore migration of seawater.

- **Land Subsidence**: Numerical modeling results suggest that seawater intrusion is not anticipated during the SGMA planning and implementation periods. Therefore, the relationship between the land subsidence sustainability and seawater intrusion indicators is not significant. However, it is noted that maintaining groundwater levels above historical low levels for the land subsidence sustainability indicator in the western half of the Basin will help limit the onshore movement of fresh groundwater in the Hueneme Aquifer that could eventually lead to onshore migration of seawater.
- **Degraded Water Quality**: The minimum threshold for seawater intrusion is consistent with the chloride minimum threshold for the degraded water quality sustainability indicator.
- **Depletion of Interconnected Surface Water**: This sustainability indicator is not applicable to the Mound Basin.

4.6.2.3 Minimum Thresholds in Relation to Adjacent Basins [§354.28(b)(3)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(3) *How minimum thresholds have been selected to avoid causing undesirable results in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals.*

The seawater intrusion minimum thresholds do not affect management of the adjacent Oxnard and Santa Paula basins.

4.6.2.4 Impact of Minimum Thresholds on Beneficial Uses and Users [§354.28(b)(4)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(4) *How minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests.*

Seawater intrusion minimum thresholds affect beneficial users and land uses in the Basin in the following ways:

Groundwater Beneficial Users (All Types)

The minimum thresholds will prevent significant and unreasonable degradation of groundwater quality by seawater intrusion, thereby avoiding loss of groundwater supply. Numerical modeling results suggest that the minimum thresholds will be met without the need for extraction rate reductions or any projects or management actions. Therefore, the minimum thresholds are not anticipated to limit the beneficial use of groundwater.

Land Uses and Property Interests (All Types)

The minimum thresholds will prevent significant and unreasonable effects on land uses and property interests by preserving water supply for beneficial uses, thereby helping maintain property values. As discussed in Section 4.6.1, the existence of SOAR makes it very unlikely that agricultural land could be developed. Therefore, it is important to ensure that agricultural beneficial uses of groundwater are protected by the minimum thresholds because there is no practical alternative land use for most agricultural land in the Basin. Absent useable groundwater supplies, agricultural property values would likely be significantly impacted. The impact on property values for other land uses and property uses in the Basin is not applicable because M&I wells are located inland, away from area that could be impacted by seawater intrusion.

4.6.2.5 Current Standards Relevant to Sustainability Indicator [§354.28(b)(5)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(5) *How state, federal, or local standards relate to the relevant sustainability indicator. If the minimum threshold differs from other regulatory standards, the Agency shall explain the nature of and basis for the difference.*

MBGSA is unaware of any federal, state, or local standards for seawater intrusion other than the WQOs included in the RWQCB-LA Basin Plan (RWQCB-LA, 2019). The minimum threshold for seawater intrusion is equal to the RWQCB Basin Plan WQO for chloride.

4.6.2.6 Measurement of Minimum Thresholds [§354.28(b)(6)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(6) *How each minimum threshold will be quantitatively measured, consistent with the monitoring network requirements described in Subarticle 4.*

Chloride concentrations will be directly measured to determine their relation to the minimum threshold. Groundwater quality monitoring will be conducted in accordance with the monitoring plan outlined in Section 5.

A minimum of two monitoring sites are needed along Harbor Boulevard to monitor chloride concentrations relative to the minimum threshold chloride isocontour. As described in Section 5, two monitoring sites are planned to satisfy this requirement. In addition, a potential shoreline "early warning" well may eventually augment cluster well 02N23W15J0X. This well will be evaluated following the five-year GSP review. The shoreline wells will provide early detection of seawater intrusion, thereby providing time to react to any unexpected landward migration of seawater before the minimum thresholds are exceeded. Section 7 on Plan Implementation includes an implementation budget to install additional monitoring sites identified in Section 5.

4.6.3 Measurable Objectives and Interim Milestones [§354.30(a),(b),(c),(d),(e),(g)]

§354.30 Measurable Objectives.

(a) *Each Agency shall establish measurable objectives, including interim milestones in increments of five years, to achieve the sustainability goal for the basin within 20 years of Plan implementation and to continue to sustainably manage the groundwater basin over the planning and implementation horizon.*

(b) *Measurable objectives shall be established for each sustainability indicator, based on quantitative values using the same metrics and monitoring sites as are used to define the minimum thresholds.*

(c) *Measurable objectives shall provide a reasonable margin of operational flexibility under adverse conditions which shall take into consideration components such as historical water budgets, seasonal and long-term trends, and periods of drought, and be commensurate with levels of uncertainty.*

(d) *An Agency may establish a representative measurable objective for groundwater elevation to serve as the value for multiple sustainability indicators where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual measurable objectives as supported by adequate evidence.*

(e) *Each Plan shall describe a reasonable path to achieve the sustainability goal for the basin within 20 years of Plan implementation, including a description of interim milestones for each relevant sustainability indicator, using the same metric as the measurable objective, in increments of five years. The description shall explain how the Plan is likely to maintain sustainable groundwater management over the planning and implementation horizon.*

(g) *An Agency may establish measurable objectives that exceed the reasonable margin of operational flexibility for the purpose of improving overall conditions in the basin, but failure to achieve those objectives shall not be grounds for a finding of inadequacy of the Plan.*

The seawater intrusion sustainability indicator measurable objectives and interim milestones are based on the chloride measurable objectives and interim milestones developed for the degraded water quality sustainability indicator. As such, the measurable objective is a 75-mg/L chloride isocontour for the Mugu Aquifer and a 100-mg/L chloride isocontour for the Hueneme Aquifer, both along Harbor Boulevard (Figures 4.6-04 and 4.6-05). Based on available water quality data, it is anticipated that the measurable objective will already be met. However, this cannot be confirmed until the planned monitoring wells are drilled and sampled. Therefore, interim milestones are assumed to be equal to the measurable objective, but this needs to be confirmed in the first GSP update.

Please see section 4.7.3 for more information concerning basis for the measurable objectives and interim milestones.

4.7 Degraded Water Quality

GSP Emergency Regulations 354.28(c)(4) requires GSAs to address migration of contaminant plumes that impair water supplies or other indicator of water quality as determined by the Agency that may lead to undesirable results. As discussed in Section 3.2.4, Groundwater Quality Impacts, there are no known contaminant plumes in the Basin. Potential impacts related to elevated concentrations of common ions and nitrate are there the focus for the degraded water quality sustainability indicator. It is noted that DWR has been consistent in its responses when asked about this sustainability indicator that GSAs are only responsible for managing water quality degradation that is caused by groundwater extraction or GSP projects or management actions. The SMC for the water quality degradation sustainability indicator were developed with this construct in mind.

As described in Section 3.1.4.3, Groundwater Quality, and Section 3.2.4, Groundwater Quality Impacts, the common ion chemistry of the groundwater in the Mugu and Hueneme principal aquifers is not ideal, but is beneficially used by municipal and agricultural users across the Basin. Common ions with RWQCB WQOs include sulfate, boron, and chloride. TDS also has a WQO. In general, TDS, sulfate, boron, and chloride concentrations are lower in the Mugu Aquifer and meet the WQOs with few exceptions. In general, TDS, sulfate, boron, and chloride concentrations are higher in the Hueneme Aquifer and meet the WQOs at most of the locations. The dissolved constituents are derived from natural sources, and groundwater extraction does not appear to be correlated with common ion chemistry concentrations.

It is noted that the City of Ventura has experienced elevated TDS and sulfate concentrations relative to secondary MCLs and detectable nitrate in extracted water from its wells. Based on comparison with monitoring data from other wells in the Basin, the elevated concentrations of sulfate and TDS in the City's wells appear to be related to well seal or casing integrity issues that facilitate intrusion of very poor-quality water from the shallow groundwater system into the well. This is considered a well construction/condition issue and not an indicator of regional degradation of water quality in the principal aquifer that can or should be managed by the GSA. This same pattern is also observed in some agricultural wells.

Nitrate can impact drinking water beneficial uses. The nitrate MCL is 45 mg/L (as NO_3; equivalent to 10 mg/L as N). Nitrate concentrations in excess of the drinking water MCL have been detected in groundwater samples from three agricultural wells that are screened in principal aquifers in Mound Basin (Mugu and Hueneme aquifers). Nitrate is also detected frequently in one of the two City of Ventura wells at concentrations above background but below the MCL. The other City of Ventura well has periodic low-level detections of nitrate. All of these wells exhibit anomalously high concentrations of TDS, sulfate, and chloride, suggesting influence of shallow groundwater through a possibly compromised well seal or well casing rather than presence of nitrate "plumes" in the Mugu and Hueneme aquifers in Mound Basin. It is further noted that other wells in the Basin do not exhibit elevated nitrate concentrations, further reinforcing the conclusion that nitrate is not a widespread issue in the Mound Basin principal aquifers.

In summary, groundwater quality in the Mound Basin is marginal due to natural geochemical processes, and groundwater extraction does not appear to exacerbate these natural processes. Occurrences of elevated sulfate, TDS, and nitrate concentrations appear to be related to well construction/condition issues that facilitate intrusion of very poor-quality water from the shallow groundwater system into these wells, as opposed to being an indicator of regional water quality degradation in the principal aquifers. In conclusion, it does not appear that significant or unreasonable groundwater quality degradation has occurred in the Mound Basin. However, it is recognized that potential future increases in Mugu Aquifer groundwater extraction could induce downward movement of very poor-quality water from the shallow groundwater system into the Mugu Aquifer, which could potentially lead to undesirable results. Additionally, improperly constructed wells that remain in use and abandoned wells that have not been properly destroyed (backfilled) can provide conduits for downward movement of very poor-quality water from the shallow groundwater system into the Mugu and/or Hueneme aquifers. Therefore, MBGSA must establish water quality sustainability criteria and monitor groundwater quality relative to those criteria.

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4.7.1 Undesirable Results [§354.26]

§354.26 Undesirable Results.

(a) *Each Agency shall describe in its Plan the processes and criteria relied upon to define undesirable results applicable to the basin. Undesirable results occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the basin.*

(b) *The description of undesirable results shall include the following:*

- ***(1)*** *The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results based on information described in the basin setting, and other data or models as appropriate.*
- ***(2)*** *The criteria used to define when and where the effects of the groundwater conditions cause undesirable results for each applicable sustainability indicator. The criteria shall be based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin.*
- ***(3)*** *Potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results.*

(c) *The Agency may need to evaluate multiple minimum thresholds to determine whether an undesirable result is occurring in the basin. The determination that undesirable results are occurring may depend upon measurements from multiple monitoring sites, rather than a single monitoring site.*

(d) *An Agency that is able to demonstrate that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin shall not be required to establish criteria for undesirable results related to those sustainability indicators.*

Process and Criteria for Defining Undesirable Results [§354.26(a)]

The overall process relied upon to define undesirable results for this GSP is described in Section 4.3. The specific process and criteria for defining undesirable results applied to the degraded water quality sustainability indicator are described below.

Evaluation of Potential Effects on Beneficial Uses and Users, Land Uses, and Property Interests [§354.26(b)(3)]

The process for defining undesirable results for degraded water quality began with considering the potential effects on beneficial uses and users of groundwater, land uses, and property interests.

Potential effects on municipal beneficial uses would be increased costs for treatment or blending to meet drinking water standards. Potential effects on agricultural beneficial uses could include lower quality crops, increased water use to meet leaching requirements, and implementation of treatment or blending to reduce salinity. The potential effects on agricultural beneficial uses would result in increased costs and potential impacts on lease rates and land values.

The above-listed potential effects were analyzed by evaluating information about the following:

- Historical groundwater quality data;
- Relevant local, state, and federal water quality standards applicable to the Basin; and
- The 50-year projected water budget.

The analysis revealed that the common ion chemistry of the groundwater in the Mugu and Hueneme principal aquifers is not ideal but has been and continues to be beneficially used by municipal and agricultural users across the Basin. Based on the foregoing, the qualitative description of undesirable results is groundwater quality that exceed historical concentrations and significantly impacts beneficial uses.

Cause of Groundwater Conditions That Could Lead to Undesirable Results [§354.26(b)(1)]

Potential future increases in Mugu Aquifer extraction could potentially induce downward movement of very poor-quality water from the shallow groundwater system into the Mugu Aquifer, which could potentially lead to undesirable results. Additionally, improperly constructed wells that remain in use and abandoned wells that have not been properly destroyed (backfilled) can provide conduits for downward movement of very poor-quality water from the shallow groundwater system into the Mugu and/or Hueneme aquifers.

Criteria Used to Define Undesirable Results [§354.26(b)(2)]

The effects of groundwater conditions deemed to cause undesirable results is considered to occur when all representative monitoring wells in a principal aquifer exceed the minimum threshold concentration for a constituent for two consecutive years.

4.7.2 Minimum Thresholds [§354.28]

4.7.2.1 Information and Criteria to Define Minimum Thresholds [§354.28(a),(b)(1),(c)(4), and (e)]

§354.28 Minimum Thresholds.

(a) *Each Agency in its Plan shall establish minimum thresholds that quantify groundwater conditions for each applicable sustainability indicator at each monitoring site or representative monitoring site established pursuant to Section 354.36. The numeric value used to define minimum thresholds shall represent a point in the basin that, if exceeded, may cause undesirable results as described in Section 354.26.*

(b) *The description of minimum thresholds shall include the following:*

(1) *The information and criteria relied upon to establish and justify the minimum thresholds for each sustainability indicator. The justification for the minimum threshold shall be supported by information provided in the basin setting, and other data or models as appropriate, and qualified by the uncertainty in the understanding of the basin setting.*

(c) *Minimum thresholds for each sustainability indicator shall be defined as follows:*

(4) *Degraded Water Quality. The minimum threshold for degraded water quality shall be the degradation of water quality, including the migration of contaminant plumes that impair water supplies or other indicator of water quality as determined by the Agency that may lead to undesirable results. The minimum threshold shall be based on the number of supply wells, a volume of water, or a location of an isocontour that exceeds concentrations of constituents determined by the Agency to be of concern for the basin. In setting minimum thresholds for degraded water quality, the Agency shall consider local, state, and federal water quality standards applicable to the basin.*

(e) *An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish minimum thresholds related to those sustainability indicators.*

Minimum thresholds were developed to address the qualitative description of undesirable results provided in Section 4.7.1: "groundwater quality that exceed historical concentrations and significant impacts beneficial uses." The potential effects on beneficial uses and users were considered together with applicable local, state, and federal water quality standards applicable to the Basin.

These criteria were considered when developing the minimum thresholds:

- **Primary MCLs**: Applicable to nitrate only. It is desirable to maintain existing water quality at levels suitable potable water for human consumption for current and future beneficial uses. Widespread occurrence of nitrate in excess of the MCL is considered a significant and unreasonable effect.
- **Secondary MCLs**: Applicable to TDS, sulfate, and chloride. It is desirable to maintain water quality at levels acceptable to consumers. Widespread occurrence of TDS, sulfate, or chloride concentrations in excess of the short-term consumer acceptance level established by the DDW would be considered a significant and unreasonable effect.
- **RWQCB WQOs**: These standards are designed to protect beneficial uses and preserve existing water quality at the time of RWQCB Basin Plan (RWQCB-LA, 2019) development from degradation, consistent with the Porter-Cologne Act and SWRCB Antidegradation Policy (Resolution No. 68-16).
- **Agricultural Thresholds**: Certain crops grown in the Basin are sensitive to chloride and boron in irrigation water. The RWQCB WQOs were developed, in part to protect agricultural beneficial uses of water. Therefore, widespread chloride or boron concentrations in excess of WQOs for these constituents would be considered a significant and unreasonable effect.
- **Existing Water Quality**: Current groundwater quality is known to support beneficial uses in the Basin and there is an absence of significant and unreasonable effects due to water quality. Therefore, minimum thresholds should be set equal to or greater than existing water quality to recognize the absence of significant and unreasonable effects at present.
- **MBGSA's Ability to Improve Water Quality**: TDS, sulfate, chloride, and boron are naturally occurring constituents that are derived from groundwater interaction with subsurface sediments. The GSA has no feasible means of reducing the existing in situ concentrations of these constituents in the Basin. The GSA can take measures to minimize the downward migration of these constituents and nitrate from the shallow groundwater into the principal aquifers.

In general, the minimum thresholds were selected be consistent with the RWQCB WQOs. The one exception is TDS in the Hueneme Aquifer, which has historically exceeded the RWQCB WQO. The TDS minimum threshold was set higher than the RWQCB WQO based on the upper range of concentrations observed in representative monitoring wells during the previous 10 years. Setting the minimum threshold above the RWQCB WQO is not considered an issue because there are no direct potable uses of groundwater and the City of Ventura manages water quality through blending within its system. It is also noted that the minimum threshold is less than the short-term consumer acceptance level established by the DDW. The minimum thresholds and specific rationale for each water quality constituent minimum threshold are provided in Table 4.1-02. The minimum thresholds and measurable objectives with respect

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to each aquifer are shown on Table 4.1-03. The minimum thresholds are also shown on the water quality plots provided in Appendix J.

4.7.2.1.1 Evaluation of Representative Minimum Thresholds [§354.28(d)]

§354.28 Minimum Thresholds.
(d) *An Agency may establish a representative minimum threshold for groundwater elevation to serve as the value for multiple sustainability indicators, where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual minimum thresholds as supported by adequate evidence.*

The requirement is not applicable to the degraded water quality sustainability indicator because groundwater elevations are not used as a proxy for the minimum thresholds.

4.7.2.2 Relationships Between Minimum Thresholds and Sustainability Indicators [§354.28(b)(2)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(2) *The relationship between the minimum thresholds for each sustainability indicator, including an explanation of how the Agency has determined that basin conditions at each minimum threshold will avoid undesirable results for each of the sustainability indicators.*

The relationships between the minimum thresholds for the degraded water quality and other sustainability indicators are as follows:

- **Chronic Lowering of Groundwater Levels**: Managing groundwater levels above historical lows is expected to prevent water quality degradation associated with groundwater extraction because the Basin has not experienced degradation of water quality in the principal aquifers during periods of historical low groundwater elevations. Thus, the potential effect of the chronic lowering of groundwater levels minimum thresholds is prevention of degradation of water quality associated with groundwater extraction.
- **Reduction of Groundwater Storage**: A lowering of groundwater levels below the historical low levels could cause degradation of water quality in the principal aquifers. Maintaining the long-term average groundwater extraction rates below the sustainable yield will help prevent degradation of water quality associated with groundwater extraction.
- **Land Subsidence**: The land subsidence minimum thresholds are designed to minimize future potential inelastic land subsidence. Because poor-quality water is expelled from clays when inelastic subsidence occurs, minimizing inelastic land subsidence helps prevent significant and unreasonable effects for the degraded water quality sustainability indicator.
- **Seawater Intrusion**: The seawater intrusion minimum threshold is consistent with the degraded water quality minimum threshold for chloride.
- **Depletion of Interconnected Surface Water**: This sustainability indicator is not applicable to the Mound Basin.

4.7.2.3 Minimum Thresholds in Relation to Adjacent Basins [§354.28(b)(3)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(3) *How minimum thresholds have been selected to avoid causing undesirable results in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals.*

The degraded water quality minimum thresholds help protect that quality of groundwater that underflows into the adjacent Oxnard Basin.

4.7.2.4 Impact of Minimum Thresholds on Beneficial Uses and Users [§354.28(b)(4)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(4) *How minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests.*

Groundwater Beneficial Users (All Types)

The minimum thresholds will prevent significant and unreasonable degradation of groundwater quality that would limit the beneficial use of groundwater. Potential effects on municipal beneficial uses would be increased costs for treatment or blending to meet drinking water standards. Potential effects on agricultural beneficial uses could include lower quality crops, increased water use to meet leaching requirements, and implementation of treatment or blending to reduce salinity. The potential effects on agricultural beneficial uses would result in increased costs and potential impacts on lease rates and land values.

Land Uses and Property Interests (All Types)

The minimum thresholds will prevent significant and unreasonable effects on land uses and property interests by preserving water supply for beneficial uses, thereby helping maintain property values. As discussed in Section 2.2.3.1, agricultural land and open space in the Basin lies is subject to the City of Ventura and County of Ventura SOAR voter initiatives currently approved through 2050 (SOAR, 2015). The SOAR initiatives require a majority vote of the people to rezone unincorporated open space, agricultural or rural land for development. The existence of the SOAR makes it very unlikely that agricultural land could be developed. Therefore, it is important to ensure that agricultural beneficial uses of groundwater are protected by the minimum thresholds because there is no practical alternative land use for most agricultural land in the Basin. Absent useable groundwater supplies, agricultural property values would likely be significantly impacted. The impact on property values for other land uses and property uses in the Basin is less directly tied to Mound Basin groundwater because the City of Ventura (water supplier for majority of the non-agricultural areas of the Basin) has a diverse water supply portfolio that includes multiple supplies derived from sources located outside of the Basin.

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4.7.2.5 Current Standards Relevant to Sustainability Indicator [§354.28(b)(5)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(5) *How state, federal, or local standards relate to the relevant sustainability indicator. If the minimum threshold differs from other regulatory standards, the Agency shall explain the nature of and basis for the difference.*

The state, federal, and local standards applicable to the degraded water quality sustainability indicator are discussed in Section 4.7.2.1.

4.7.2.6 Measurement of Minimum Thresholds [§354.28(b)(6)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(6) *How each minimum threshold will be quantitatively measured, consistent with the monitoring network requirements described in Subarticle 4.*

Groundwater quality will be directly measured to determine where dissolved constituent concentrations are in relation to minimum thresholds. Groundwater quality monitoring will be conducted in accordance with the monitoring plan outlined in Section 5.

4.7.3 Measurable Objectives and Interim Milestones [§354.30(a),(b),(c),(d),(e),(g)]

§354.30 Measurable Objectives.
(a) *Each Agency shall establish measurable objectives, including interim milestones in increments of five years, to achieve the sustainability goal for the basin within 20 years of Plan implementation and to continue to sustainably manage the groundwater basin over the planning and implementation horizon.*
(b) *Measurable objectives shall be established for each sustainability indicator, based on quantitative values using the same metrics and monitoring sites as are used to define the minimum thresholds.*
(c) *Measurable objectives shall provide a reasonable margin of operational flexibility under adverse conditions which shall take into consideration components such as historical water budgets, seasonal and long-term trends, and periods of drought, and be commensurate with levels of uncertainty.*
(d) *An Agency may establish a representative measurable objective for groundwater elevation to serve as the value for multiple sustainability indicators where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual measurable objectives as supported by adequate evidence.*
(e) *Each Plan shall describe a reasonable path to achieve the sustainability goal for the basin within 20 years of Plan implementation, including a description of interim milestones for each relevant sustainability indicator, using the same metric as the measurable objective, in increments of five years. The description shall explain how the Plan is likely to maintain sustainable groundwater management over the planning and implementation horizon.*
(g) *An Agency may establish measurable objectives that exceed the reasonable margin of operational flexibility for the purpose of improving overall conditions in the basin, but failure to achieve those objectives shall not be grounds for a finding of inadequacy of the Plan.*

The measurable objectives were developed using the same information and criteria used to develop the minimum thresholds, which are described in Section 4.7.2.1. In general, the measurable objectives were selected to preserve existing water quality for beneficial uses in the Basin. The measurable objectives and

specific rationale for each water quality constituent measurable objective are provided in Table 4.1-02. The measurable objectives provide a reasonable range of operational flexibility above the minimum thresholds and historical concentrations observed in the Basin, as shown in the water quality plots provided in (Appendix J).

4.7.3.1 Interim Milestones [§354.30(e)]

§354.30 Measurable Objective.
(e) *Each Plan shall describe a reasonable path to achieve the sustainability goal for the basin with 20 years of Plan implementation, including a description of interim milestones for each relevant sustainability indicator, using the same metric as the measurable objective, in increments of five years. The description shall explain how the Plan is likely to maintain sustainable groundwater management over the planning and implementation horizon.*

Based on available water quality data, the measurable objectives are already being met. Therefore, interim milestones are equal to the measurable objective.

4.8 Land Subsidence

As described in Section 3.2.5 Land Subsidence, no land subsidence due to groundwater extraction has been documented historically in the Mound Basin. Section 3.2.5 also explains that the Mound Basin is considered to have a low estimated potential for inelastic land subsidence. Numerical modeling for the water budget suggests that future groundwater levels will remain above historical low levels, which would prevent inelastic subsidence due to groundwater extraction (Appendix I). Despite these factors, sustainable management is prudent because groundwater levels could decline below historical levels and trigger inelastic land subsidence if actual future conditions differ significantly from those assumed in the projected water budget analysis.

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4.8.1 Undesirable Results [§354.26]

§354.26 Undesirable Results.

(a) *Each Agency shall describe in its Plan the processes and criteria relied upon to define undesirable results applicable to the basin. Undesirable results occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the basin.*

(b) *The description of undesirable results shall include the following:*

- ***(1)*** *The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results based on information described in the basin setting, and other data or models as appropriate.*
- ***(2)*** *The criteria used to define when and where the effects of the groundwater conditions cause undesirable results for each applicable sustainability indicator. The criteria shall be based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin.*
- ***(3)*** *Potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results.*

(c) *The Agency may need to evaluate multiple minimum thresholds to determine whether an undesirable result is occurring in the basin. The determination that undesirable results are occurring may depend upon measurements from multiple monitoring sites, rather than a single monitoring site.*

(d) *An Agency that is able to demonstrate that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin shall not be required to establish criteria for undesirable results related to those sustainability indicators.*

Process and Criteria for Defining Undesirable Results [§354.26(a)]

The overall process relied upon to define undesirable results for this GSP was described in Section 4.3. The specific process and criteria for defining undesirable results applied to the land subsidence sustainability indicator are described below.

Evaluation of Potential Effects on Beneficial Uses and Users, Land Uses, and Property Interests [§354.26(b)(3)]

The process for defining undesirable results for land subsidence began with considering the potential effects on beneficial uses and users of groundwater, land uses, and property interests. Beneficial uses and users of groundwater are not anticipated to be affected by the low amounts of land subsidence that could potentially occur in this basin (i.e. potential subsidence does not appear sufficient to damage wells). Therefore, the process for defining undesirable results focused on assessing potential effects on land uses and property interests in the Basin. This was accomplished by reviewing best available information concerning land uses (existing and planned), 100-year floodplain extents, infrastructure, sea level rise and related coastal hazards. The City of Ventura, which overlies most of the Basin, was consulted in this process.

Evaluation of the above-listed factors revealed that the Coastal Area located west of Harbor Boulevard is particularly susceptible to impacts of land subsidence (Figure 4.1-01). Primary sewer lines to the City's wastewater treatment plant run along Harbor Boulevard and have a low slope that could be impacted by relatively small amounts of land subsidence. Available studies indicate that the developed areas located west of Harbor Boulevard, including the Pierpont community and Ventura Harbor, will be impacted by sea level rise (Figure 4.8-01a and 4.8-01b) (VCWPD, 2018). Inelastic land subsidence in this area would

unreasonably exacerbate the already significant impacts associated with sea level rise. For these reasons it was determined that any measurable (0.1 ft or greater) inelastic land subsidence in the Coastal Area could potentially result in undesirable results, particularly as the effects of sea level rise act to increase coastal hazards in the Coastal Area during the planning and implementation horizons. The potential impact of land subsidence on the remainder of the Basin is less clear.

Based on the foregoing, the qualitative description of undesirable results is:

> *Land subsidence in the Coastal Area that exacerbates coastal hazards associated sea level rise or that impacts the City of Ventura's sewer mains along Harbor Boulevard and/or that substantially interferes with surface land uses in elsewhere in the Basin.*

Cause of Groundwater Conditions That Could Lead to Undesirable Results [§354.26(b)(1)]

The cause of groundwater conditions that could lead to undesirable results would be groundwater levels that decline below historical low levels resulting in inelastic land subsidence in the Coastal Area.

The following factors could result in groundwater levels declining below historical low levels:

1. Mound Basin groundwater extractions rates that significantly exceed those assumed for the projected water budget analysis.
2. Droughts that exceed the duration and severity of droughts included in the hydrologic period used for the projected water budget analysis.
3. If Oxnard Basin does not meet the sustainability goal in its GSP, which would impact underflow between the basins to the detriment of the Mound Basin.
4. Increased groundwater extraction in the adjacent Oxnard Basin near the boundary with the Mound Basin, which would impact underflow between the basins to the detriment of the Mound Basin.
5. Increased groundwater extraction in the adjacent Santa Paula Basin near the boundary with the Mound Basin, which would impact underflow between the basins to the detriment of the Mound Basin.
6. Combinations of items 1 through 5.

Criteria Used to Define Undesirable Results [§354.26(b)(2)]

The criteria used to define when and where the effects of the groundwater conditions cause undesirable results is based on the qualitative description of undesirable result, which is land subsidence in the Coastal Area (Figure 4.1-01) that exacerbates coastal hazards associated with sea level rise or that impacts the City of Ventura's sewer mains along Harbor Boulevard and/or that substantially interferes with surface land uses elsewhere in the Basin.

InSAR is the best available method for measuring the rate and extent of land subsidence over large areas, such as a groundwater basin. As described in Section 4.8.2, InSAR data utility is impacted by a significant lack of coverage in the western half of the Mound Basin as well as other factors (Figure 3.2-19) and is inadequate to be relied upon for developing the land subsidence sustainability indicators. As a result, the minimum thresholds described in Section 4.8.2 were developed using groundwater levels as a proxy for the western

half of the Basin. Subsidence rates that will be monitored using InSAR are used for the minimum threshold for the eastern half of the Basin because there is adequate InSAR coverage in that area.

Western Half of Mound Basin

For the Coastal Area, preventing undesirable results for land subsidence would mean that the groundwater levels are maintained above historical low levels, which avoids inelastic land subsidence. Because land subsidence can propagate radially away from an area of depressed groundwater levels, it is also necessary to maintain groundwater levels above historical lows in the remainder of the western half of the Basin to prevent inelastic land subsidence that could propagate into the Coastal Area. Based on the foregoing, the combination of minimum threshold exceedances that is deemed to cause significant and unreasonable effects in the western half of the Basin for land subsidence is minimum threshold exceedances in 50% of monitoring sites (Table 4.1-01). This combination is intended to indicate significant and unreasonable effects are widespread in the western half of the Basin. If InSAR coverage and other data issues are resolved in the future, MBGSA will update the GSP to use a rate and extent of land subsidence for the minimum threshold in the western half of the Basin.

Eastern Half of Mound Basin

By regulation, the land subsidence undesirable result is a quantitative combination of subsidence minimum threshold exceedances. For the eastern half of the Mound Basin, no land subsidence that substantially interferes with surface land uses is acceptable. Therefore, the combination of minimum threshold exceedances that may cause undesirable results in the eastern half of the Basin for land subsidence is as follows: in any one year, there will be zero exceedances of the minimum thresholds for subsidence *caused by groundwater conditions*, as indicated by InSAR. To determine whether InSAR-indicated land surface elevation changes were caused by groundwater conditions, InSAR data will only be considered when groundwater levels are below historical low levels. The InSAR data will be adjusted to account for rates of subsidence related to tectonic activity using continuous GPS data historical trends to determine if the minimum threshold has been exceeded.

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4.8.2 Minimum Thresholds [§354.28]

4.8.2.1 Information and Criteria to Define Minimum Thresholds [§354.28(a),(b)(1),(c)(5)(A),(c)(5)(B), and (e)]

§354.28 Minimum Thresholds.

(a) *Each Agency in its Plan shall establish minimum thresholds that quantify groundwater conditions for each applicable sustainability indicator at each monitoring site or representative monitoring site established pursuant to Section 354.36. The numeric value used to define minimum thresholds shall represent a point in the basin that, if exceeded, may cause undesirable results as described in Section 354.26.*

(b) *The description of minimum thresholds shall include the following:*

(1) *The information and criteria relied upon to establish and justify the minimum thresholds for each sustainability indicator. The justification for the minimum threshold shall be supported by information provided in the basin setting, and other data or models as appropriate, and qualified by the uncertainty in the understanding of the basin setting.*

(c) *Minimum thresholds for each sustainability indicator shall be defined as follows:*

(5) *Land Subsidence. The minimum threshold for land subsidence shall be the rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results. Minimum thresholds for land subsidence shall be supported by the following:*

(A) *Identification of land uses and property interests that have been affected or are likely to be affected by land subsidence in the basin, including an explanation of how the Agency has determined and considered those uses and interests, and the Agency's rationale for establishing minimum thresholds in light of those affects.*

(B) *Maps and graphs showing the extent and rate of land subsidence in the basin that defines the minimum threshold and measurable objectives.*

(e) *An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish minimum thresholds related to those sustainability indicators.*

Land uses and property interests that would be affected by land subsidence in the Basin were described in the evaluation of undesirable results (Section 4.8.1). Summarizing Section 4.8.1, the Coastal Area of the Basin is particularly vulnerable to land subsidence impacts because land subsidence in this area would exacerbate coastal hazards associated with sea level rise in the Pierpont community and Ventura Harbor and could impact the City of Ventura's sewer mains that feed the City's WWTP. Section 4.8.1 concluded that any measurable inelastic land subsidence in the Coastal Area could potentially result in undesirable results, particularly as the effects of sea level rise act to increase coastal hazards in the Coastal Area during the planning and implementation horizons. However, because land subsidence can propagate radially away from an area of depressed groundwater levels, it is also important to prevent land subsidence in proximal areas adjacent to the Coastal Area in order to prevent inelastic land subsidence from propagating into the Coastal Area. It was further concluded that the potential impact of land subsidence on the remainder of the Basin is less clear.

Western Half of Mound Basin

Pursuant to GSP Emergency Regulations §354.28(c)(5), the minimum threshold for land subsidence shall be the rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results. InSAR is the best available method for measuring the rate and extend of land

subsidence over large areas, such as a groundwater basin. However, the interpolated InSAR data for the Mound Basin are impacted by multiple factors:

1. There is a significant lack of coverage in the western half of the Mound Basin (Figure 3.2-19), which causes the interpolated InSAR subsidence rates to be unreliable.
2. InSAR data provided by DWR are interpolated across the basin boundary between Mound and Oxnard basins. This is not appropriate because of the faults and folds that comprise the basin boundary. These structures likely impact the propagation of any subsidence between the basins (Figures 3.1-02, 3.1-06, and 3.2-19).
3. There is a subsidence "hotspot" that corresponds with a landfill located just south of the Mound Basin in the adjacent Oxnard Basin, which would be representing natural land compaction at the landfill. Careful inspection of the InSAR interpolation reveals that the hotpot greatly influences the subsidence values in the western portion of the Mound Basin, which lacks InSAR data (Figure 3.2-19).

For these reasons, InSAR is not considered a reliable method for measuring land subsidence in the western half of the Mound Basin and groundwater levels will be used as a proxy minimum threshold, as provided for in GSP Emergency Regulations §354.28(d). This regulation section allows the use of groundwater levels as a proxy for other sustainability indicators if a significant correlation between groundwater elevations and the other sustainability indicators can be demonstrated. The preconsolidation stress, the effective stress threshold at which inelastic compaction begins, generally is exceeded when groundwater levels decline past historical low levels (California Water Foundation, 2014). Therefore, groundwater levels are an appropriate proxy for monitoring inelastic land subsidence due to groundwater extraction. Based on the Section 4.8.1 discussion of undesirable results, minimum thresholds must be established to prevent inelastic land subsidence caused by groundwater conditions in the Coastal Area of the Basin. This means that the GSP should prevent groundwater levels from declining below historical low levels within the Coastal Area. Because land subsidence propagates radially away from an area of depressed groundwater levels, it is also necessary to maintain groundwater levels above historical lows in the remainder of the western half of the Basin to prevent inelastic land subsidence that could propagate into the Coastal Area. Therefore, the minimum thresholds for land subsidence in the western half of the Basin are defined as the historical low groundwater levels (Table 4.1-01).

The historical low groundwater elevations which define the minimum thresholds in the western half of the Basin were established using the following approach:

1. Review of available historical data presented in the Basin Setting (Section 3; Figures 3.2-10 through 3.2-13), suggests that historical low groundwater levels occurred in late 1990 to early 1991.
2. Measured and modeled groundwater level data were plotted for the historical period for each monitoring site.
3. If measured data are available during late 1990 to early 1991, the historical low groundwater elevation was established using the lowest measured groundwater levels during this period.
4. If measured data were not available during late 1990 to early 1991, the historical low groundwater elevations were estimated based on numerically modeled groundwater levels,

accounting for bias in simulated low water levels compared to observed groundwater levels (where available) from the recent drought (Appendix I).

Time-series plots (hydrographs) showing the measured and modeled groundwater elevation data and minimum thresholds are included in Appendix I.

Eastern Half of Mound Basin

For the eastern half of the Basin, InSAR provides adequate coverage and there are no apparent interpolation issues. As such, the minimum threshold for land subsidence for the eastern half of the Basin is the rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results. Section 3.2.5 explains that available reports do not indicate any documented groundwater-related subsidence in the Mound Basin, and the DWR (2014) screening of the Mound Basin indicated a "low" overall estimated potential for future subsidence. Thus, significant and unreasonable effects from inelastic land subsidence caused by groundwater conditions are considered unlikely in the eastern half of the Basin. No basin-specific data exist to determine rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results (GSP Emergency Regulations §354.28(c)(5)). MBGSA staff consulted with land subsidence expert Michelle Sneed of the USGS concerning methods for predicting rates of subsidence that could substantially interfere with surface land uses. Ms. Sneed was unaware of any studies or proven methodologies for predicting rates of subsidence that could substantially interfere with surface land uses (M. Sneed of USGS, personal communication, 2020). Given the apparent lack of a published methodology for predicting rates of subsidence that could substantially interfere with surface land uses in the eastern half of the Basin, MBGSA estimated these rates of subsidence based on a literature review of subsidence case studies. The case studies provide insight into subsidence amounts that have led to significant and unreasonable impacts in other groundwater basins. A summary of case studies from the 10 basins identified in the literature review is presented in Table 4.8-01. As indicated in Table 4.8-01, the rates of subsidence that led to undesirable results ranged from approximately 1.2 to 4.5 inches per year (0.1 to 0.38 feet per year [ft/yr]). Reported cumulative subsidence ranged from 0.6 to 10 ft. MBGSA concluded that it may be reasonable to assume a threshold for potential significant and unreasonable effects based on the low end of the values reported from the case studies (i.e., 0.1 ft/yr, 0.6 ft cumulative). These values were selected as the basis for minimum thresholds for the eastern half of the Basin and will be revised later if basin-specific information becomes available. To determine whether InSAR-indicated land surface elevation changes were caused by groundwater conditions, InSAR data will only be considered when groundwater levels are at or below historical low levels. The InSAR data will be adjusted to account for subsidence related to tectonic activity using continuous GPS data and historical trends to determine if the minimum threshold has been exceeded.

Figure 4.8-02 shows the minimum thresholds and measurable objectives in map view, as required pursuant to GSP Emergency Regulations §354.28(c)(5)(B).

4.8.2.1.1 Evaluation of Representative Minimum Thresholds [§354.28 (d)]

§354.28 Minimum Thresholds.
(d) *An Agency may establish a representative minimum threshold for groundwater elevation to serve as the value for multiple sustainability indicators, where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual minimum thresholds as supported by adequate evidence.*

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As discussed in Section 4.8.2.1, InSAR data is not adequate for monitoring land subsidence in the western half of the Basin. Because of this, groundwater level elevations are used as a proxy for land subsidence minimum thresholds. As such, groundwater elevation is used as a representative minimum threshold for multiple sustainability indicators (land subsidence and chronic lowering of groundwater levels) in the Basin. Numerical modeling results (Appendix I) indicate that groundwater levels could decline below historical low levels without causing undesirable results for the chronic lowering of groundwater levels sustainability indicator for some locations in the western half of the Basin. However, undesirable results for land subsidence could occur in the Coastal Area if groundwater levels decline below historical low levels in the western half of the Basin. Therefore, it is appropriate to use groundwater level elevations as representative minimum thresholds for the land subsidence sustainability indicator.

4.8.2.2 Relationships Between Minimum Thresholds and Sustainability Indicators [§354.28(b)(2)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(2) *The relationship between the minimum thresholds for each sustainability indicator, including an explanation of how the Agency has determined that basin conditions at each minimum threshold will avoid undesirable results for each of the sustainability indicators.*

The relationships between the minimum thresholds for the land subsidence sustainability indicator and other sustainability indicators are as follows:

- **Chronic Lowering of Groundwater Levels in the Western Half of the Basin:** The minimum thresholds are the same for the land subsidence and chronic lowering of groundwater levels sustainability indicators in the western half of the Basin. The potential effect of the chronic lowering of groundwater levels minimum thresholds is prevention of minimum threshold exceedances for the land subsidence sustainability indicator in the western half of the Basin.
- **Chronic Lowering of Groundwater Levels in the Eastern Half of the Basin:** The chronic lowering of groundwater levels minimum threshold is the historical low groundwater level elevations, which should prevent inelastic subsidence. Thus, the potential effect of the chronic lowering of groundwater levels minimum thresholds is prevention of minimum threshold exceedances for the land subsidence sustainability indicator in the eastern half of the Basin.
- **Reduction of Groundwater Storage:** A lowering of groundwater levels below the historical low levels could cause land subsidence in the Basin, and because extraction rates directly influence groundwater levels within the principal aquifers, the groundwater storage minimum threshold has a direct relationship to land subsidence if groundwater levels fall below the historical low. Maintaining the long-term average groundwater extraction rates below the sustainable yield should prevent minimum threshold exceedances for the land subsidence sustainability indicator.
- **Seawater Intrusion**: Numerical modeling results suggest that seawater intrusion is not anticipated during the SGMA planning and implementation periods. Therefore, the relationship between the land subsidence sustainability and seawater intrusion indicators is not significant. However, it is noted that maintaining groundwater levels above historical low levels for the land subsidence sustainability indicator in the western half of the Basin will help limit inland

gradients in the Hueneme Aquifer that could eventually lead to onshore migration of seawater in the future (beyond the 50-year SGMA planning and implementation period).

- **Degraded Water Quality**: The land subsidence sustainability indicator minimum thresholds will limit future groundwater level declines, which will help prevent downward movement of very poor-quality water from the shallow groundwater system into the Mugu Aquifer, which could potentially lead to undesirable results.
- **Depletion of Interconnected Surface Water**: This sustainability indicator is not applicable to the Mound Basin.

4.8.2.3 Minimum Thresholds in Relation to Adjacent Basins [§354.28(b)(3)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(3) *How minimum thresholds have been selected to avoid causing undesirable results in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals.*

The land subsidence sustainability indicator minimum thresholds will limit future groundwater level declines, thereby minimizing impacts to underflow, which will help prevent undesirable results in the adjacent Oxnard and Santa Paula basins.

4.8.2.4 Impact of Minimum Thresholds on Beneficial Uses and Users [§354.28(b)(4)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(4) *How minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests.*

Land subsidence minimum thresholds may have several effects on beneficial users and land uses in the Basin:

Groundwater Beneficial Users (All Types

Beneficial uses and users of groundwater are not anticipated to be affected by the low amounts of land subsidence that could potentially occur in this basin (i.e. potential subsidence does not appear sufficient to damage wells); therefore, the minimum thresholds do not effect groundwater beneficial uses and users. Numerical modeling results suggest that the minimum thresholds will be met without the need for groundwater extraction reductions or any projects or management actions. Therefore, the minimum thresholds are not anticipated to limit the beneficial use of groundwater.

Land Uses and Property Interests (All Types)

The minimum thresholds will protect land uses and property interests against significant and unreasonable inelastic land subsidence.

4.8.2.5 Current Standards Relevant to Sustainability Indicator [§354.28(b)(5)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(5) *How state, federal, or local standards relate to the relevant sustainability indicator. If the minimum threshold differs from other regulatory standards, the Agency shall explain the nature of and basis for the difference.*

MBGSA is unaware of any federal, state, or local standards for land subsidence.

4.8.2.6 Measurement of Minimum Thresholds [§354.28(b)(6)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(6) *How each minimum threshold will be quantitatively measured, consistent with the monitoring network requirements described in Subarticle 4.*

For the western half of the Basin, groundwater elevations will be directly measured to determine their relation to minimum thresholds. Groundwater level monitoring will be conducted in accordance with the monitoring plan outlined in Section 5. Section 7, Plan Implementation, includes an implementation budget to install additional monitoring sites identified in Section 5.

For the eastern half of the Basin, InSAR data will be used to measure inelastic subsidence in relation to the minimum thresholds. To determine whether InSAR data indicated land surface elevation changes were caused by groundwater conditions, InSAR data will only be considered when groundwater levels are below historical low levels. The InSAR data will be adjusted to account for subsidence related to tectonic activity using continuous GPS data and historical trends to determine if the minimum threshold has been exceeded.

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4.8.3 Measurable Objectives and Interim Milestones [§354.30(a),(b),(c),(d),(e),(g)]

§354.30 Measurable Objectives.

(a) *Each Agency shall establish measurable objectives, including interim milestones in increments of five years, to achieve the sustainability goal for the basin within 20 years of Plan implementation and to continue to sustainably manage the groundwater basin over the planning and implementation horizon.*

(b) *Measurable objectives shall be established for each sustainability indicator, based on quantitative values using the same metrics and monitoring sites as are used to define the minimum thresholds.*

(c) *Measurable objectives shall provide a reasonable margin of operational flexibility under adverse conditions which shall take into consideration components such as historical water budgets, seasonal and long-term trends, and periods of drought, and be commensurate with levels of uncertainty.*

(d) *An Agency may establish a representative measurable objective for groundwater elevation to serve as the value for multiple sustainability indicators where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual measurable objectives as supported by adequate evidence.*

(e) *Each Plan shall describe a reasonable path to achieve the sustainability goal for the basin within 20 years of Plan implementation, including a description of interim milestones for each relevant sustainability indicator, using the same metric as the measurable objective, in increments of five years. The description shall explain how the Plan is likely to maintain sustainable groundwater management over the planning and implementation horizon.*

(g) *An Agency may establish measurable objectives that exceed the reasonable margin of operational flexibility for the purpose of improving overall conditions in the basin, but failure to achieve those objectives shall not be grounds for a finding of inadequacy of the Plan.*

4.8.3.1 Description of Measurable Objectives

Western Half of Mound Basin

The measurable objectives for land subsidence in the western half of the Basin were developed by applying the concept of providing a reasonable margin of operational flexibility under adverse conditions (GSP Emergency Regulations §354.30(c)). Adverse conditions for the Mound Basin include long-term drought phases and climatic-driven groundwater level cycles, as described in Section 3.2 (Groundwater Conditions). The reasonable margin of operational flexibility was determined to be groundwater levels following wet phases that are sufficiently high to prevent groundwater levels from dropping below the minimum thresholds during a subsequent drought phase (Figures 3.2-10 through 3.2-13). The measurable objectives were developed for each monitoring site using the following approach:

1. Modeled groundwater level data were plotted for the projected period for each monitoring site.
2. The maximum modeled groundwater level decline during the 50-year GSP planning and implementation horizon was determined and, when necessary, adjusted using professional judgment based on model calibration results (see Appendix I for additional details on the methodology).
3. The maximum projected groundwater level decline was added to the minimum threshold.

The measurable objectives along with minimum thresholds for each monitoring site are listed in Table 4.1-01 (354.30 (b)) and apply following wet phases of the climate cycle. Failure to meet the measurable

objectives during other times shall not be considered failure to sustainably manage the Basin. Time-series plots (hydrographs) showing the measured and modeled groundwater elevation data and measurable objectives are included in Appendix I.

Eastern Half of Mound Basin

The measurable objective for land subsidence for the eastern half of the Basin is no measurable inelastic land subsidence due to groundwater level declines. Measurable inelastic land subsidence is the minimum amount of subsidence that can be detected using the InSAR method when water levels are at or below historical lows. The InSAR data provided by DWR are subject to measurement error. DWR has stated that on a statewide level for the total vertical displacement measurements between June 2015 and June 2018, the errors are as follows (Paso Robles GSA, 2020):

1. The error between InSAR data and continuous GPS data is 16 mm (0.052 ft) with a 95% confidence level, and
2. The measurement accuracy when converting from the raw InSAR data to the maps provided by DWR is 0.048 ft with 95% confidence level.

The total estimated error, therefore, is 0.1 ft. A land surface change of less than 0.1 ft, therefore, is within the noise of the data collection and processing and is considered equivalent to no measurable subsidence in this GSP. The measurable objective is, therefore, equal to the minimum threshold for the eastern half of the Basin. To determine whether InSAR-indicated land surface elevation changes are caused by groundwater conditions, InSAR data will only be considered when groundwater levels are below historical low levels. The InSAR data will be adjusted to account for subsidence related to tectonic activity using continuous GPS data and historical trends to determine if the minimum threshold has been exceeded.

4.8.3.2 Interim Milestones [§354.30(e)]

§354.30 Measurable Objective.
(e) *Each Plan shall describe a reasonable path to achieve the sustainability goal for the basin with 20 years of Plan implementation, including a description of interim milestones for each relevant sustainability indicator, using the same metric as the measurable objective, in increments of five years. The description shall explain how the Plan is likely to maintain sustainable groundwater management over the planning and implementation horizon.*

Western Half of Mound Basin

Interim milestones were developed to illustrate a reasonable path to achieve the sustainability goal for the Basin within 20 years of Plan implementation for the western half of the Basin. Development of interim milestones is significantly complicated by the fact that there is significant uncertainty in predicting hydrologic conditions for the next 20 years. Currently, groundwater levels in the Basin are below the measurable objectives for approximately ⅓ of the wells because the Basin has experienced overall dry conditions for the better part of the last decade. It is anticipated that groundwater levels will rise during the next wet period and as a result of Oxnard Basin GSP implementation. It is anticipated that the measurable objectives will be met at some point during the 20-year GSP implementation period and then may fluctuate above or below the measurable objective thereafter. Because of the uncertainty concerning when the measurable objectives will be met, the interim milestones are shown as a linear path toward

the measurable objective over the 20-year sustainability timeframe. This interim milestone path should not be taken literally because it is climate dependent. The interim milestones and path to sustainability will be reviewed during each required five-year GSP assessment (GSP Emergency Regulations §354.38(a)). The interim milestones are listed in Table 4.1-01 and are plotted on the time-series plots (hydrographs) included in Appendix I.

Once the measurable objectives are met, numerical modeling results suggest that sustainability will be maintained during the remainder of the 50-year GSP planning and implementation horizon (Appendix I). The causes of groundwater conditions that could lead to undesirable results described in Section 4.8.1 will be carefully reviewed during each required five-year GSP assessment. The GSP will be updated to include any projects or management actions deemed necessary to maintain sustainable conditions in the Basin.

Eastern Half of Mound Basin

The InSAR data available for GSP development indicate that the measurable objective for the eastern half of the Basin is already met. Therefore, the land subsidence interim milestones for the eastern half of the Basin are equal to the measurable objective.

4.9 Depletions of Interconnected Surface Water

Depletions of interconnected surface water is not an applicable indicator of groundwater sustainability in the Mound Basin and, therefore, no SMC are set. Section 3.2.6, Interconnected Surface Water Systems, and Appendix G provides the evidence for the inapplicability of this sustainability indicator.

4.10 Measurable Objectives and Interim Milestones for Additional Plan Elements [§354.30(f)]

§354.30 Measurable Objectives.
(f) *Each Plan may include measurable objectives and interim milestones for additional Plan elements described in Water Code Section 10727.4 where the Agency determines such measures are appropriate for sustainable groundwater management in the basin.*

No measurable objectives were developed for the additional plan elements included in the GSP.

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5.0 Monitoring Networks [Article 5, SubArticle 4]

5.1 Introduction to Monitoring Networks [§354.32]

§354.32 Introduction to Monitoring Networks. *This Subarticle describes the monitoring network that shall be developed for each basin, including monitoring objectives, monitoring protocols, and data reporting requirements. The monitoring network shall promote the collection of data of sufficient quality, frequency, and distribution to characterize groundwater and related surface water conditions in the basin and evaluate changing conditions that occur through implementation of the Plan.*

Section 5 describes existing monitoring networks and improvements to those monitoring networks that will be developed as part of GSP implementation. Section 5 is prepared in accordance with the GSP Emergency Regulations §354.32 - §354.40 and includes monitoring objectives, monitoring protocols, data reporting requirements, assessment of the monitoring network, and DMS.

Consistent with GSP Emergency Regulations §354.34(e), the monitoring networks presented in this chapter are based primarily on existing monitoring sites. The existing monitoring networks in the Basin have been used for several decades to collect information to demonstrate short-term, seasonal, and long-term trends in groundwater and related surface water conditions. The monitoring networks include features for the collection of data to monitor the groundwater sustainability indicators applicable to the Basin. Additional monitoring sites will be added to enhance the existing monitoring network based on the assessment herein, pursuant to GSP Emergency Regulations §354.38. The additional monitoring sites are necessary to fully demonstrate sustainability and will also help refine the HCM and improve the numerical model.

Monitoring networks are described for each applicable sustainability indicator, and data gaps are identified for each, as appropriate in the following sections. As discussed in Sections 3 and 4, depletion of interconnected surface water is not an applicable sustainability indictor in the Basin and therefore monitoring of surface water flow is not included in the monitoring network. Section 3.3 and Table 3.3-01 do, however, include the sources of publicly available surface water monitoring data.

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5.2 Monitoring Network Objectives and Design Criteria [§354.34(a),(b)(1),(b)(2),(b)(3),(b)(4),(d),(f)(1),(f)(2),(f)(3), and (f)(4)]

§354.34 Monitoring Network.

(a) *Each Agency shall develop a monitoring network capable of collecting sufficient data to demonstrate short-term, seasonal, and long-term trends in groundwater and related surface conditions, and yield representative information about groundwater conditions as necessary to evaluate Plan implementation.*

(b) *Each Plan shall include a description of the monitoring network objectives for the basin, including an explanation of how the network will be developed and implemented to monitor groundwater and related surface conditions, and the interconnection of surface water and groundwater, with sufficient temporal frequency and spatial density to evaluate the affects and effectiveness of Plan implementation. The monitoring network objectives shall be implemented to accomplish the following:*

- ***(1)*** *Demonstrate progress toward achieving measurable objectives described in the Plan.*
- ***(2)*** *Monitor impacts to the beneficial uses or users of groundwater.*
- ***(3)*** *Monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds.*
- ***(4)*** *Quantify annual changes in water budget components.*

(d) *The monitoring network shall be designed to ensure adequate coverage of sustainability indicators. If management areas are established, the quantity and density of monitoring sites in those areas shall be sufficient to evaluate conditions of the basin setting and sustainable management criteria specific to that area.*

(f) *The Agency shall determine the density of monitoring sites and frequency of measurements required to demonstrate short-term, seasonal, and long-term trends based upon the following factors:*

- ***(1)*** *Amount of current and projected groundwater use.*
- ***(2)*** *Aquifer characteristics, including confined or unconfined aquifer conditions, or other physical characteristics that affect groundwater flow.*
- ***(3)*** *Impacts to beneficial uses and users of groundwater and land uses and property interests affected by groundwater production, and adjacent basins that could affect the ability of that basin to meet the sustainability goal.*
- ***(4)*** *Whether the Agency has adequate long-term existing monitoring results or other technical information to demonstrate an understanding of aquifer response.*

5.2.1 Monitoring Network Objectives

The GSP Emergency Regulations require monitoring networks be developed to collect data of sufficient quality, frequency, and spatial distribution to characterize groundwater and related surface water conditions (if applicable) in the Basin, and to evaluate changing conditions that occur during implementation of the GSP. Monitoring networks should accomplish the following (§354.34(b)):

- Demonstrate progress toward achieving measurable objectives described in the GSP.
- Monitor impacts to the beneficial uses and users of groundwater.
- Monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds.
- Quantify annual changes in water budget components.

Each of these objectives is described further below with specific discussion relevant to the planned Mound Basin GSP monitoring network:

1. **Demonstrate progress toward achieving measurable objectives described in Section 4 of this GSP:** As described in Section 4 of this GSP, the depletion of interconnected surface water indicator is not applicable to this basin. The remaining five sustainability indicators are applicable but have already met the corresponding measurable objectives historically and are expected to meet them going forward. Therefore, the focus of this objective for the Mound Basin is to demonstrate continued compliance with the measurable objectives as opposed to progress toward meeting the measurable objectives.
2. **Monitor impacts to the beneficial uses or users of groundwater:** The beneficial uses of groundwater in the primary aquifers (i.e., Mugu and Hueneme aquifers) of Mound Basin include municipal, industrial, and agricultural water supply. The beneficial users include the City of Ventura, owners of wells that are pumped for industrial water supply (two as of 2021), and owners of 22 wells used for agricultural water supply. These uses and users could be impacted by degradation of water quality, seawater intrusion, and declining groundwater levels and storage (which are an important causative factor in land subsidence). Key design criteria considered in developing a network to monitor these potential impacts on uses and users of groundwater include the following:
   - Monitoring Parameters: Monitoring groundwater levels, extraction rates, and groundwater quality can indicate trends that could precede land subsidence or seawater intrusion, as well as trends that could affect operation and associated costs of production wells (e.g., declining groundwater elevations may require setting a pump deeper in a well, combined with greater energy requirements to pump each AF of water). Monitoring common dissolved constituents in groundwater at or near active water supply wells can detect changes in groundwater quality that might affect groundwater users. Groundwater levels can be directly measured at monitoring wells using a manual sounder (where monthly, quarterly, or semiannual measurement is appropriate) or an installed pressure transducer with datalogger (where high-frequency measurement is needed). Groundwater extraction rates and amounts are reported to United by the well owners pursuant to Water Code §75611. Monitoring for seawater intrusion is commonly performed by analyzing groundwater samples for chloride, although analysis for other dissolved ions can be helpful for distinguishing chloride resulting from seawater intrusion versus other potential sources. In addition, rates of inland movement of fresh groundwater from offshore portions of the aquifer can be provided by monitoring groundwater elevations inland from the coast.
   - Monitoring Locations: As noted in DWR's best management practices for monitoring networks (DWR, 2016c), "Areas that are subject to greater groundwater pumping, greater fluctuations in conditions, significant recharge areas, or specific projects may require more monitoring (temporal and/or spatial) than areas that experience less activity or are more static." Under this guidance, appropriate monitoring sites in Mound Basin are in the southern portion of Mound Basin where all the Basin's active water supply wells are located (Figure 3.1-26) and groundwater levels are known to fluctuate. Monitoring in the northern portion of the Basin is low priority due to the lack of beneficial uses. In the event that seawater is detected in shoreline monitoring wells, additional monitoring wells may be warranted to ensure protection of beneficial users of groundwater in the western portion

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of the Basin. DWR's BMPs for monitoring networks also notes that "[u]nderstanding conditions at or across basin boundaries is important." Variable groundwater underflow occurs along the southern boundary of Mound Basin adjacent to Oxnard Basin; therefore, coverage of this area by the Mound Basin monitoring network can help confirm underflow estimated in the water budget. Finally, monitoring groundwater quality and elevations along the coastline and just inland from the coast can provide early warning of any unexpected seawater intrusion during the SGMA implementation period, as well as rates of movement of fresh groundwater to or from offshore portions of the aquifer.

- Screened Intervals (depths) of Monitoring Wells: In basins with multiple aquifers, such as Mound Basin, the depth of monitoring is an important consideration. For Mound Basin, this means ensuring monitoring takes place in both principal aquifers in the Basin (i.e., the Mugu and Hueneme aquifers). However, the emphasis should be on monitoring the Hueneme Aquifer because most of the groundwater extracted from the Basin is from wells screened in this aquifer.
- Monitoring Frequency: In Mound Basin, where groundwater elevations are subject to both seasonal fluctuations (due to changes in groundwater extraction and recharge rates) and longer-term cyclical fluctuations (due to climatic variability), the frequency of groundwater level measurements, extraction rate reporting, and groundwater quality sampling is an important design consideration. Therefore, this objective for Mound Basin includes a frequency of groundwater level measurements and extraction rates sufficient to capture the range (seasonal highs and lows) of groundwater elevations occurring within the Basin over the course of each year. For monitoring seawater intrusion, the frequency of sampling should be sufficient to detect unexpected inland advancement of seawater in time to institute mitigation measures that can prevent undesirable results (e.g., before chloride concentrations at agricultural water supply wells increase to the point that they become harmful to crops). Due to the relatively slow rate of groundwater movement, annual monitoring for seawater intrusion should suffice with the caveat that the sampling frequency should be increased if indications of seawater are detected. The frequency of groundwater level measurement and groundwater quality sampling at or near active water supply wells should be sufficient to detect any long-term trends in water quality that could result from vertical migration of poor-quality water into the principal aquifers. Due to the relatively slow rate of potential vertical migration, annual water quality monitoring should suffice.

3. **Monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds:** Similar to #1 above, the focus of this objective for the Mound Basin is to demonstrate continued compliance with the measurable objectives. As discussed in Section 4, groundwater levels are used as proxies for the land subsidence minimum threshold in the western half of the Basin. The reduction of groundwater storage sustainability indicator is monitored by reported extraction rates. Thus, monitoring of changes in groundwater conditions relative to minimum thresholds and measurable objectives will be accomplished using groundwater level, extraction rate, and groundwater quality monitoring. Monitoring in the Mound Basin should focus on whether the trend of these parameters is deviating from a pattern that is consistent with continued maintenance of groundwater conditions relative to the measurable objectives. If a significant change from historical extraction rate patterns or groundwater quality were to occur in the future (e.g., groundwater extraction from an aquifer

that was largely unused historically, or new reports of discharge of contaminants to groundwater in an area of the Basin with few monitoring wells), then modifications to the monitoring network could be required.

4. **Quantify annual changes in water budget components:** As described in Section 3 of this GSP, United's (2021a) groundwater flow model is the best tool currently available for estimating the quantities of most of the water budget components involving groundwater flow in the Mound Basin. Exceptions include:
   - Groundwater extractions, which are measured by well owners and reported to the MBGSA and United semiannually.
   - Groundwater imports from adjacent basins, which are recorded by the City of Ventura, FICO, and Alta MWC. Quantities of imported water are available to the MBGSA upon request. Imports from the California SWP, when Ventura's SWP Interconnection Project is completed, will also be recorded by the City of Ventura and made available to the MBGSA upon request.
   - Areal recharge, which can be quantified based on rainfall data and land use information. Rainfall data are collected by the VCWPD, and land use data are updated annually to biennially by several county and state agencies and can be downloaded from their websites.

The above data will be input to United's flow model for calculating future annual changes in subsurface water budget components and change in storage. Surface flows in the Santa Clara River are measured daily by the VCWPD at flow-gaging station "723 - Santa Clara River at Victoria Ave" located outside of the Basin. Data from this station are available online and can be downloaded annually to update this surface water component of the Mound Basin water budget (VCWPD, 2021). MBGSA intends to continue using data from these existing sources as input to United's model, which will in turn be used periodically to quantify changes in water budget components. At present, this GSP does not contemplate development of a new monitoring network or modification of existing monitoring networks to obtain data regarding groundwater extraction, imported water, or recharge quantities because it is MBGSA's opinion that these water budget components are currently adequate for sustainable management of the Basin.

5.2.2 Monitoring Network Design Criteria

Design criteria are discussed for each sustainability indicator regarding GSP Emergency Regulations §354.34(c)(1) through (6) and are addressed in the subsections that discuss the monitoring networks specific to each sustainability indicator.

GSP Emergency Regulations §354.34(d) adds the overarching design criteria, which echo the third monitoring network objective described in GSP Emergency Regulations §354.34(b)(3) (see #3 in Section 5.2.1 above), to "[e]nsure adequate coverage of sustainability indicators." No management areas have been established for the Basin, so the sufficient quantity and density of monitoring sites is addressed for each sustainability indicator for the entire Basin.

GSP Emergency Regulations §354.34(f) provide additional design considerations for the density of monitoring sites and frequency of measurements required to demonstrate short-term, seasonal, and long-term trends based upon the following factors:

- Amount of current and projected groundwater use.
- Aquifer characteristics, including confined or unconfined aquifer conditions, or other physical characteristics that affect groundwater flow.
- Impacts to beneficial uses and users of groundwater and land uses and property interests affected by groundwater production, and adjacent basins that could affect the ability of that basin to meet the sustainability goal.
- Whether the Agency has adequate long-term existing monitoring results or other technical information to demonstrate an understanding of aquifer response.

Other criteria from DWR BMP 2, Monitoring Networks and Identification of Data Gaps (DWR, 2016c), were also considered in developing the monitoring network. These include:

- **Access issues**: Most of the land within Mound Basin has been developed for urban/suburban uses or consists of privately owned farmland. The majority of open land occurs on the steep hillsides in the northern portion of the Basin, where access by drilling rigs would be difficult. Due to the large depth to the principal aquifers in most parts of the Basin, drilling and construction of new groundwater monitoring wells will likely require a large construction "footprint." Therefore, construction of new monitoring wells will be difficult in much of the Basin and may not be feasible in some areas. Although some new monitoring wells are proposed in this GSP (in Sections 5.3 and 5.5), existing wells should be used for monitoring to the extent practicable.
- **Consider all sustainability indicators**: DWR (2016c) recognizes that "GSAs should look for ways to efficiently use monitoring sites to collect data for more than one or all of the sustainability indicators," including those indicators that are not currently known to affect (or be affected by) uses and users of groundwater from the principal aquifers. In keeping with DWR (2016c) guidance, to the extent practicable, the proposed Mound Basin GSP monitoring network is designed to collect the most data possible with a minimum of monitoring points/resources. Potential opportunities for modifying the existing monitoring network to provide additional data regarding groundwater quality, land subsidence, and interconnected surface water in Mound Basin are provided in the following subsections of this GSP.
- **Cost**: Cost is a critical factor for MBGSA because of the small amount of groundwater extraction in this basin, compared to most medium- and high-priority basins. This means there is a significantly greater cost burden on each groundwater user to fund additional monitoring sites as compared to groundwater users in most other basins.

5.2.3 Monitoring Network Design Analysis

The objectives and design criteria set forth in the GSP Emergency Regulations were analyzed in a Basin-specific context. The analysis resulted in the following key monitoring network design factors:

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1. The applicable sustainability indicator measurable objectives have been met historically and are expected to be met going forward. Therefore, the focus of this objective for the Mound Basin is to demonstrate continued compliance with the measurable objectives as opposed to progress toward meeting the measurable objectives.
2. The depletion of interconnected surface water indicator is not applicable to this basin and percolation of surface water is not a significant water budget element. Therefore, surface water monitoring is not a priority for the Mound Basin.
3. Because groundwater levels are used as a proxy for the land subsidence in the western half of the Basin (see Figure 4.1-01), the reduction of groundwater storage is monitored using extraction rates, and surface water is not an important factor in the Mound Basin, monitoring should focus on groundwater levels, extraction rates, and groundwater quality monitoring.
4. No management areas have been established in the Mound Basin under this GSP. Therefore, adequate coverage of the sustainability indicators applies at the basin level.
5. The area of greatest risk for undesirable results is in the western half of the Basin due to the sensitivity of land uses and critical infrastructure to land subsidence in the Coastal Area, and proximity of agricultural beneficial users to the shoreline for any unexpected seawater intrusion. Thus, MBGSA's highest priority for its limited fiscal resources is to ensure adequate monitoring near the coast to protect land uses and beneficial uses relative to the land subsidence and seawater intrusion sustainability indicators.
6. Current and projected groundwater beneficial uses and users are limited to the southern portion of the Basin. Monitoring sites should be prioritized in the southern portion of the Basin, and MBGSA's limited fiscal resources should be prioritized to address monitoring needs in this area, as opposed to the northern portion of the Basin which has no groundwater extraction.
7. Data limitations in the northern portion of the Basin are not believed to limit MBGSA's ability to sustainably manage the Basin as there are no beneficial uses in that area and because the numerical model can be used to estimate the potentiometric surface and storage change in that area.
8. Current and projected groundwater extractions for beneficial uses are heavily skewed toward the Hueneme Aquifer. Therefore, the monitoring sites should be prioritized in the Hueneme Aquifer. All other factors being equal, MBGSA's limited fiscal resources should be prioritized to address monitoring needs in Hueneme Aquifer, as opposed to the Mugu and non-principal aquifers in the Basin.
9. Groundwater underflow from Oxnard Basin is more variable than underflow from the Santa Paula Basin, as described in Section 3.3 of this GSP. Additionally, sustainable groundwater management of the Mound Basin will be affected by the implementation of the Oxnard Basin GSP by the FCGMA, whereas Santa Paula Basin is adjudicated. Therefore, monitoring that supports the assessment of underflow should be prioritized along the Oxnard Basin boundary as compared to the Santa Paula Basin boundary.
10. Monitoring Frequencies: The following circumstances were considered when evaluating monitoring frequencies:

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a. Measurable objectives have consistently been met historically;

b. MBGSA has long-term existing monitoring results;

c. The Basin has a relatively small amount of groundwater extraction; and

d. The aquifers are deep and confined and, therefore, do not exhibit large seasonal changes (in response to climate variations) in groundwater levels and storage and are not susceptible to rapid changes in groundwater quality from surface activities.

Based on the foregoing, high-frequency monitoring is not necessary to characterize short-term, seasonal, and long-term trends in groundwater levels, quality, and water budget components. Quarterly groundwater level monitoring, semiannual extraction rate reporting, and annual groundwater quality sampling frequencies are considered adequate. More frequent monitoring may be desirable, but not considered necessary for sustainable management of the Basin, unless conditions change. The monitoring frequencies, among other aspects, should be evaluated during the periodic Plan assessments.

How the monitoring objectives and design criteria were specifically applied to each SMC to develop the GSP monitoring network is described in the following subsections.

5.3 Groundwater Levels Monitoring Network [§354.34(e),(g)(3),(h), and (j)]

§354.34 Monitoring Network.
(e) *A Plan may utilize site information and monitoring data from existing sources as part of the monitoring network.*
(g) *Each Plan shall describe the following information about the monitoring network:*
(3) *For each sustainability indicator, the quantitative values for the minimum threshold, measurable objective, and interim milestones that will be measured at each monitoring site or representative monitoring sites established pursuant to Section 354.36.*
(h) *The location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used.*
(j) *An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish a monitoring network related to those sustainability indicators.*

Table 5.3-01 summarizes construction and other information for the 23 existing wells in Mound Basin that have regularly been used for groundwater level monitoring historically. These wells are referred to as the "existing groundwater level monitoring network." Locations of groundwater level monitoring wells screened in the Mugu and Hueneme aquifers are shown on Figures 5.3-01 and 5.3-02, respectively. Inspection of Table 5.3-01 indicates that most (15) existing groundwater level monitoring wells are screened exclusively or almost exclusively in the Hueneme Aquifer, which is one of the two principal aquifers in the Basin and supplies most of the groundwater extracted from Mound Basin (Table 3.1-02). Five wells are screened solely in the Mugu Aquifer, which is the other principal aquifer. One well is screened in portions of both the Hueneme and Fox Canyon aquifers, and one well is screened across significant intervals of both the Mugu and Hueneme aquifers. Two wells in the existing monitoring well network are screened in the fine-grained Pleistocene Deposits overlying the Mugu Aquifer. Wells

screened in the fine-grained Pleistocene Deposits, the Fox Canyon Aquifer, or across multiple aquifers are shown on Figure 5.3-03.

Wells 02N22W07M01S/02S/03S and 02N23W07J01S/02S/03S are clustered wells that were jointly installed by United and the City of Ventura in the 1990s and provide data concerning vertical hydraulic gradients between the principal aquifers and the fine-grained Pleistocene deposits.

Two additional monitoring well clusters are planned in the Coastal Area to provide monitoring sites for implementation of the seawater intrusion sustainability indicator (Sites A and B on Table 5.3-02 and Figures 5.3-01 and 5.3-02). These monitoring well clusters will include discrete screen intervals in each principal aquifer, which will provide additional definition of the potentiometric surface in both principal aquifers and additional vertical gradient data. Site C is a potential "early warning" well and the plans to install this well will be evaluated following the five-year review.

Ventura Water monitors several shallow wells located along the Santa Clara River, which are not part of the Mound Basin GSP monitoring network. Shallow groundwater levels from these wells will be collected and analyzed as part of the interim shallow groundwater data collection and analysis described in Section 6.6.

5.3.1 Attainment of Monitoring Objectives and Other Requirements [§354.34(c)(1)(A),(c)(1)(B), and (g)(1)]

§354.34 Monitoring Network.
(c) *Each monitoring network shall be designed to accomplish the following for each sustainability indicator:*
(1) *Chronic Lowering of Groundwater Levels. Demonstrate groundwater occurrence, flow directions, and hydraulic gradients between principal aquifers and surface water features by the following methods:*
(A) *A sufficient density of monitoring wells to collect representative measurements through depth-discrete perforated intervals to characterize the groundwater table or potentiometric surface for each principal aquifer.*
(B) *Static groundwater elevation measurements shall be collected at least two times per year, to represent seasonal low and seasonal high groundwater conditions.*
(g) *Each Plan shall describe the following information about the monitoring network:*
(1) *Scientific rationale for the monitoring site selection process.*

In accordance with GSP Emergency Regulations §354.34(b) and (d), the groundwater level monitoring network sites have been selected using MBGSA's scientific judgment to (1) demonstrate progress toward achieving measurable objectives described in the GSP, (2) monitor impacts to the beneficial uses and users of groundwater, (3) monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds, (4) quantify annual changes in water budget components, and (5) to provide adequate coverage of sustainability indicators. Importantly, there is no groundwater extraction in the northern portion of the Basin; thus, the sustainability indicators that rely on groundwater levels directly (or as a proxy) and the groundwater monitoring network are necessarily focused on the southern portion of the Basin. The monitoring network has a special focus in areas of greatest risk for undesirable results: the western half of the Basin where land uses and critical infrastructure are sensitive to land subsidence effects, and agricultural beneficial users proximal to the coastline would be at risk if unexpected seawater intrusion occurs. Additional monitoring well clusters are proposed in the western half of the Basin to address these concerns.

Pursuant to GSP Emergency Regulations §354.34(c)(1)(A), the groundwater level monitoring network sites have been selected to provide a sufficient density of monitoring wells to collect representative measurements through depth-discrete intervals to characterize the potentiometric surface for each principal aquifer. The existing and planned groundwater level monitoring wells screened in the Hueneme Aquifer and the Mugu Aquifer provide sufficient density for the following scientific and practical reasons consistent with the key Basin-specific monitoring network design factors discussed in Section 5.2:

- The groundwater level monitoring sites (existing and proposed) were selected to provide focused monitoring of groundwater gradients and flow directions over time in the western half of the Basin where the greatest risk for undesirable results exists.
- The groundwater level monitoring sites (existing and proposed) were selected to provide coverage across the southern portion of the Basin to monitor the regional groundwater gradient and flow direction over time in the area where current and projected groundwater beneficial uses exist.
- Groundwater level monitoring sites are located along the southern Basin boundary to monitor gradients and flow to/from the Oxnard Basin.
- The lack of monitoring sites in the northern portion of the Basin is not believed to limit MBGSA's ability to sustainably manage the Basin because there are no beneficial uses in that area and the numerical model can be used as needed to estimate the potentiometric surface and storage changes in this area.
- A higher density of groundwater level monitoring sites has been selected in the Hueneme Aquifer commensurate with the fact that this aquifer supplies most of the water extracted from the Basin.
- The relatively limited number of groundwater level monitoring sites in the Mugu Aquifer is not believed to limit MBGSA's ability to sustainably manage the Basin because there is limited groundwater extraction from this aquifer and the existing and proposed monitoring sites provide sufficient coverage to map the regional potentiometric surface in the Mugu Aquifer.

Consistent with to GSP Emergency Regulations §354.34(c)(1)(B), static groundwater levels will be measured quarterly (or more frequently, as feasible) at wells in the groundwater level monitoring network to represent seasonal-low and seasonal-high groundwater conditions. Groundwater elevations have been measured manually on a monthly, bi-monthly, or quarterly basis at wells in the groundwater level monitoring network, exceeding the SGMA requirement for semiannual (fall and spring) measurements. In addition, United collects automated groundwater elevation measurements at 4-hour intervals in four Mound Basin monitoring wells screened in principal aquifers (Figures 5.3-01 and 5.3-02) to provide high-frequency data useful for understanding daily to seasonal variability in groundwater elevations. This is helpful for more accurately determining the precise timing of spring-high and fall-low groundwater elevations each year and for evaluating the interference effects of nearby groundwater extraction on static groundwater levels.

Additional factors considered during selection of the groundwater level monitoring sites include:

1. From a scientific perspective, monitoring sites were selected to provide data in areas where groundwater elevations and hydraulic gradients are known to fluctuate over time. In Mound Basin, such fluctuations occur chiefly in the vicinity of water supply wells, which are limited

to the southern portion of the Basin, and along the boundary with the Oxnard Basin to evaluate interbasin underflow.

2. To the extent practicable, existing wells have been used as monitoring sites to avoid the cost and public nuisance associated with drilling new wells in a largely urban setting. However, in areas where groundwater level monitoring would provide crucial information, but no existing wells are present (or are unsuitable for some reason, such as being screened at a depth that would not provide useful data), new wells have been installed in parks and other public spaces in Mound Basin in the past.
3. DWR's BMP for developing monitoring networks (2016c) cites guidance stating that the density of monitoring wells should be 6.3 wells per 100 square miles (mi^2) (Sophocleous, 1983) to 4.0 wells per 100 mi^2 (Hopkins, 1994; applies to basins with groundwater extractions of more than 10,000 AF per 100 mi^2). In the principal aquifers of the Mound Basin (which has an area of approximately 23 mi^2), there are five existing groundwater level monitoring wells (density of 22 wells per 100 mi^2) screened solely in the Mugu Aquifer and 13 existing groundwater level monitoring wells (density of 57 wells per 100 mi^2) screened solely in the Hueneme Aquifer. Therefore, the density of monitoring sites in the existing groundwater level monitoring network exceeds the metrics recommended by DWR.

5.3.2 Data and Reporting Standards [§354.34(g)(2)]

§354.34 Monitoring Network.
(g) *Each Plan shall describe the following information about the monitoring network:*
(2) *Consistency with data and reporting standards described in Section 352.4. If a site is not consistent with those standards, the Plan shall explain the necessity of the site to the monitoring network, and how any variation from the standards will not affect the usefulness of the results obtained.*

The groundwater level monitoring sites are generally consistent with applicable data and reporting standards set forth in GSP Emergency Regulations §352.4. Exceptions to the standards are described below:

- Two existing monitoring sites—wells 02N22W09K05S and 02N22W08G01S—are screened across two aquifers, as shown on Table 5.3-01. DWR (2016b) notes that groundwater levels measured at wells screened across multiple aquifers should be considered composite groundwater levels rather than being representative of specific aquifers, and that these data must be used with caution. Fortunately, wells 02N22W09K05S and 02N22W08G01S are located near other wells that are screened in individual aquifers and are monitored by United (Figures 5.3-01 and 5.3-02). Therefore, the composite groundwater levels measured at wells 02N22W09K05S and 02N22W08G01S are not necessary for evaluating groundwater elevations in the principal aquifers or for preparing groundwater elevation contour maps, but are included in the GSP groundwater level monitoring network for completeness because they are part of the existing monitoring program in the Basin.
- The depth of the screened interval for well 02N22W16H01S is not reported (Table 5.3-01); therefore, the aquifer that this well is screened in is unknown. The well is part of the existing groundwater level monitoring network and is included as such but is not relied upon for meeting SGMA and GSP regulatory requirements.

5.3.3 Monitoring Protocols [§354.34(i)]

§354.34 Monitoring Network.
(i) *The monitoring protocols developed by each Agency shall include a description of technical standards, data collection methods, and other procedures or protocols pursuant to Water Code Section 10727.2(f) for monitoring sites or other data collection facilities to ensure that the monitoring network utilizes comparable data and methodologies.*

United, VCWPD, and the City of Ventura collect and report groundwater elevation data from the groundwater level monitoring network in general conformance with the CASGEM program's "Procedures for Monitoring Entity Reporting" (DWR, 2010) and DWR BMP 1 for monitoring protocols, standards, and sites (DWR, 2016b). Some key elements of DWR guidance include (but are not limited to) the following:

- Depth to groundwater must be measured relative to an established reference point on the well casing;
- Depth to groundwater must be measured to an accuracy of 0.1 ft below the reference point (it is preferable to measure depth to groundwater to an accuracy of 0.01 ft);
- Transducers must be able to record groundwater levels with an accuracy of 0.1 ft;
- Transducer data should periodically be checked against hand-measured groundwater levels to monitor electronic drift or cable movement.

More details are provided in the referenced guidance documents (DWR, 2010, 2016b), and are not repeated in this GSP. It is presently anticipated that United, VCWPD, and the City of Ventura will continue collecting groundwater level data from the existing monitoring network, including any improvements or modifications made in the future, and report those data to CASGEM and the MBGSA.

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5.3.4 Assessment and Improvement of Monitoring Network [§354.38(a),(b),(c)(1),(c)(2),(d),(e)(1),(e)(2),(e)(3), and (e)(4)]

§354.38 Assessment and Improvement of Monitoring Network.

(a) *Each Agency shall review the monitoring network and include an evaluation in the Plan and each five-year assessment, including a determination of uncertainty and whether there are data gaps that could affect the ability of the Plan to achieve the sustainability goal for the basin.*

(b) *Each Agency shall identify data gaps wherever the basin does not contain a sufficient number of monitoring sites, does not monitor sites at a sufficient frequency, or utilizes monitoring sites that are unreliable, including those that do not satisfy minimum standards of the monitoring network adopted by the Agency.*

(c) *If the monitoring network contains data gaps, the Plan shall include a description of the following:*

- ***(1)*** *The location and reason for data gaps in the monitoring network.*
- ***(2)*** *Local issues and circumstances that limit or prevent monitoring.*

(d) *Each Agency shall describe steps that will be taken to fill data gaps before the next five-year assessment, including the location and purpose of newly added or installed monitoring sites.*

(e) *Each Agency shall adjust the monitoring frequency and density of monitoring sites to provide an adequate level of detail about site-specific surface water and groundwater conditions and to assess the effectiveness of management actions under circumstances that include the following:*

- ***(1)*** *Minimum threshold exceedances.*
- ***(2)*** *Highly variable spatial or temporal conditions.*
- ***(3)*** *Adverse impacts to beneficial uses and users of groundwater.*
- ***(4)*** *The potential to adversely affect the ability of an adjacent basin to implement its Plan or impede achievement of sustainability goals in an adjacent basin.*

The existing groundwater level monitoring network is considered generally suitable for groundwater sustainability planning relative to the criteria provided in DWR's GSP and CASGEM guidance (DWR, 2016c, 2010), and has met the needs of United, the City of Ventura, and VCWPD for the past three decades relative to their objectives for monitoring groundwater conditions.

Pursuant to GSP Emergency Regulations §354.38, MBGSA has assessed the existing groundwater level monitoring network and determined that certain data gaps exist. These data gaps and, where applicable, planned actions to address the data gaps before the next five-year assessment are discussed below.

Western Half of Mound Basin

The western half of the Basin has the greatest risk for undesirable results due to the vulnerability of land uses and critical infrastructure to land subsidence in the Coastal Area and the proximity of agricultural beneficial users to the shoreline for any unexpected seawater intrusion. This area is MBGSA's highest priority for expending its limited fiscal resources, to ensure adequate monitoring near the coast to protect land uses and beneficial uses relative to the land subsidence and seawater intrusion sustainability indicators. Two additional monitoring well clusters are planned in the Coastal Area to provide additional monitoring sites for implementation of the seawater intrusion sustainability indicator (Sites A and B on Figures 5.3-01, 5.3-02, 5.3-04, and 5.3-05). These monitoring well clusters will include discrete intervals in each principal aquifer, which will provide additional definition of the potentiometric surface in both principal aquifers and additional vertical gradient data. Site C is an additional potential "early warning" shoreline well and the plans to install the well will be evaluated following the five-year review.

- Site A is planned for construction in 2021 (supported by a SGMA Technical Support Services [TSS] grant from DWR). The wells in this cluster will be screened in the Mugu and Hueneme

aquifers. The primary purpose of this monitoring site is to provide a location for application of minimum thresholds and measurable objectives for the seawater intrusion sustainability indicator. This monitoring site will also be used for the land subsidence sustainability indicator and, more generally, to better define the potentiometric surface near the coast and provide additional vertical gradient data.

- Site B is planned for construction prior to the first five-year GSP assessment. Site B is located along Harbor Boulevard and its primary purpose is to monitor groundwater in relation to the minimum thresholds and measurable objectives for the seawater intrusion sustainability indicator. This site will also be used for the land subsidence sustainability indicator and, more generally, to better define the potentiometric surface near the coast and provide additional vertical gradient data.
- Site C is a potential "early warning" monitoring well cluster planned for construction following review of the first five-year GSP assessment. Site C is located near the coastline and its primary purpose would be to provide early warning for unexpected seawater intrusion. This site would also be used to better define the potentiometric surface near the coast and provide additional vertical gradient data.

Northern Portion of Mound Basin

The northern portion of the Basin lacks groundwater level monitoring sites screened in the principal aquifers. The lack of groundwater level monitoring sites is due to the lack of water supply wells. Future groundwater beneficial uses are not anticipated in the northern portion of the Basin due to the dominance of residential tract housing, which is supplied with potable water from the City of Ventura. Because there are no current or anticipated future beneficial uses and because the calibrated numerical model can be used to estimate the potentiometric surface in areas without data (the model can integrate existing monitoring data with modeled results to provide estimates to the northern area), this data gap is not considered a limiting factor for sustainable management of the Basin and will not be addressed unless changing conditions in the Basin warrant monitoring sites.

In addition to the efforts to address the above-described data gaps, MBGSA will consider expanding the monitoring network as opportunities arise. For example, when new or replacement wells are drilled, MBGSA will consider working with the owner to obtain access for monitoring.

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5.4 Groundwater Storage Monitoring Network [§354.34(e),(g)(3),(h), and (j)]

23 Cal. Code Regs. §354.34 Monitoring Network.
(e) *A Plan may utilize site information and monitoring data from existing sources as part of the monitoring network.*
(g) *Each Plan shall describe the following information about the monitoring network:*
(3) *For each sustainability indicator, the quantitative values for the minimum threshold, measurable objective, and interim milestones that will be measured at each monitoring site or representative monitoring sites established pursuant to Section 354.36.*
(h) *The location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used.*
(j) *An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish a monitoring network related to those sustainability indicators.*

As noted in DWR's (2016c) BMP for monitoring networks, changes in groundwater storage are not a directly measurable condition. Rather, estimation of changes in groundwater storage relies on collection of accurate groundwater levels. Measured groundwater level changes can then be used to calculate changes in storage based on understanding of aquifer thickness, porosity, and connectivity (DWR, 2016c), or can be calculated using a groundwater model. Therefore, the "groundwater storage monitoring network" consists of the groundwater level monitoring network, which is described above in Section 5.3.

An additional component of monitoring for the reduction of groundwater storage sustainability indicator involves tracking the groundwater extraction rates against the measurable objectives and minimum thresholds. The network consists of the pumping well owners and the extraction rates are reported semiannually to United by the well owners pursuant to Water Code §75611.

5.4.1 Attainment of Monitoring Objectives and Other Requirements [§354.34(c)(2) and (g)(1)]

§354.34 Monitoring Network.
(c) *Each monitoring network shall be designed to accomplish the following for each sustainability indicator:*
(2) *Reduction of Groundwater Storage. Provide an estimate of the change in annual groundwater in storage.*
(g) *Each Plan shall describe the following information about the monitoring network:*
(1) *Scientific rationale for the monitoring site selection process.*

The reduction of groundwater storage monitoring network design criterion provided in GSP Emergency Regulations §354.34(c)(2) is to provide an estimate of the change in annual storage.

As noted in Section 5.3, static groundwater levels and groundwater extraction rates will be measured and reported twice (or more) per year at wells in the groundwater level monitoring network and active extraction wells, respectively to achieve the overall monitoring objectives described in Section 5.2, and additionally to estimate annual change in groundwater in storage in the two principal aquifers used for water supply in Mound Basin—the Mugu and Hueneme aquifers. Spring is the time of year when aquifers in the region typically are in a positive water-balance condition (inflows exceed outflows) and

potentiometric surfaces are at their highest; therefore, the spring-high groundwater levels will be used for annual estimates of changes in storage. Fall-low groundwater levels in Mound and adjacent basins can be strongly influenced by short-term, local factors such as timing of the first winter rainfall event and the presence or absence of Santa Ana winds in fall (which can result in a significant increase in demand for irrigation). Therefore, fall groundwater elevations provide a less reliable indicator of annual changes in groundwater in storage compared to spring groundwater elevations.

The data limitation in the northern portion of the Basin is acknowledged but is not believed to limit MBGSA's ability to attain the monitoring objective because the numerical model can be used to estimate the potentiometric surface and storage change in areas without measured groundwater levels (Appendix I).

5.4.2 Data and Reporting Standards [§354.34(g)(2)]

§354.34 Monitoring Network.
(g) *Each Plan shall describe the following information about the monitoring network:*
(2) *Consistency with data and reporting standards described in Section 352.4. If a site is not consistent with those standards, the Plan shall explain the necessity of the site to the monitoring network, and how any variation from the standards will not affect the usefulness of the results obtained.*

The data and reporting standards for groundwater storage monitoring are identical to those for groundwater level monitoring because groundwater levels are used to estimate groundwater in storage.

5.4.3 Monitoring Protocols [§354.34(i)]

23 Cal. Code Regs. §354.34 Monitoring Network.
(i) *The monitoring protocols developed by each Agency shall include a description of technical standards, data collection methods, and other procedures or protocols pursuant to Water Code Section 10727.2(f) for monitoring sites or other data collection facilities to ensure that the monitoring network utilizes comparable data and methodologies.*

The monitoring protocols for groundwater storage monitoring are identical to those for groundwater levels monitoring (Section 5.3.2), because groundwater levels will be used to estimate aquifer storage.

5.4.4 Assessment and Improvement of Monitoring Network [§354.38(a),(b),(c)(1),(c)(2),(d),(e)(1),(e)(2),(e)(3), and (e)(4)]

§354.38 Assessment and Improvement of Monitoring Network.

(a) *Each Agency shall review the monitoring network and include an evaluation in the Plan and each five-year assessment, including a determination of uncertainty and whether there are data gaps that could affect the ability of the Plan to achieve the sustainability goal for the basin.*

(b) *Each Agency shall identify data gaps wherever the basin does not contain a sufficient number of monitoring sites, does not monitor sites at a sufficient frequency, or utilizes monitoring sites that are unreliable, including those that do not satisfy minimum standards of the monitoring network adopted by the Agency.*

(c) *If the monitoring network contains data gaps, the Plan shall include a description of the following:*

- ***(1)*** *The location and reason for data gaps in the monitoring network.*
- ***(2)*** *Local issues and circumstances that limit or prevent monitoring.*

(d) *Each Agency shall describe steps that will be taken to fill data gaps before the next five-year assessment, including the location and purpose of newly added or installed monitoring sites.*

(e) *Each Agency shall adjust the monitoring frequency and density of monitoring sites to provide an adequate level of detail about site-specific surface water and groundwater conditions and to assess the effectiveness of management actions under circumstances that include the following:*

- ***(1)*** *Minimum threshold exceedances.*
- ***(2)*** *Highly variable spatial or temporal conditions.*
- ***(3)*** *Adverse impacts to beneficial uses and users of groundwater.*
- ***(4)*** *The potential to adversely affect the ability of an adjacent basin to implement its Plan or impede achievement of sustainability goals in an adjacent basin.*

Assessment and potential improvements of the monitoring network for groundwater storage are identical to those for groundwater level monitoring (Section 5.3.4), because groundwater levels are used to estimate aquifer storage.

As noted above in Section 5.4.1, storage changes in the northern portion of the Basin will be addressed by using the numerical model.

A relationship between measured groundwater levels and storage (a.k.a. a “storage curve” approach) has been developed using the numerical model that addresses this data gap. This relationship will be used to calculate the annual storage change. More information about the storage curve approach to estimating annual change in storage is provide in Appendix K.

Groundwater extraction is reported to Untied for each active well on a semiannual basis per Water Code §75611. Thus, there are no spatial reporting gaps to address. It is noted that reporting is made for the periods January-June and July-December. MBGSA will use this reporting to estimate water year extractions.

5.5 Seawater Intrusion Monitoring Network [§354.34(e),(g)(3),(h), and (j)]

§354.34 Monitoring Network.
(e) *A Plan may utilize site information and monitoring data from existing sources as part of the monitoring network.*
(g) *Each Plan shall describe the following information about the monitoring network:*
(3) *For each sustainability indicator, the quantitative values for the minimum threshold, measurable objective, and interim milestones that will be measured at each monitoring site or representative monitoring sites established pursuant to Section 354.36.*
(h) *The location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used.*
(j) *An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish a monitoring network related to those sustainability indicators.*

A subset of the degraded water quality monitoring network consisting of cluster wells 02N23W15J01S/02S and planned monitoring well clusters at Sites A and B will be used to monitor for seawater intrusion (Figures 5.3-04 and 5.3-05). Cluster wells 02N23W15J01S/02S and the potential for planned cluster "early warning" wells at Site C will provide shoreline monitoring for early detection of any unexpected seawater intrusion. Planned cluster wells at Sites A and B will be used to monitor relative to the measurable objectives and minimum thresholds that are designed to protect beneficial uses of groundwater which exist at each of these locations (there are no groundwater beneficial uses in the Coastal Area west of planned cluster well Sites A & B). The aforementioned monitoring sites will be sampled and analyzed for chloride and other dissolved constituents and parameters no less frequently than annually as part of the degraded water quality monitoring network.

5.5.1 Attainment of Monitoring Objectives and Other Requirements [§354.34(c)(3) and (g)(1)]

§354.34 Monitoring Network.
(c) *Each monitoring network shall be designed to accomplish the following for each sustainability indicator:*
(3) *Seawater Intrusion. Monitor seawater intrusion using chloride concentrations, or other measurements convertible to chloride concentrations, so that the current and projected rate and extent of seawater intrusion for each applicable principal aquifer may be calculated.*
(g) *Each Plan shall describe the following information about the monitoring network:*
(1) *Scientific rationale for the monitoring site selection process.*

In accordance with GSP Emergency Regulations §354.34(b) and (d), the seawater intrusion monitoring network sites have been selected using MBGSA's scientific judgment to demonstrate progress toward (1) achieving measurable objectives described in the GSP, (2) monitor impacts to the beneficial uses and users of groundwater, (3) monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds, and (4) provide adequate coverage of sustainability indicators. The seawater intrusion monitoring network focuses on the Coastal Area of the Basin where agricultural beneficial users are proximal to the Coast and would be at risk if unexpected seawater intrusion occurs (Figure 5.3-04 and 5.3-05).

Pursuant to GSP Emergency Regulations §354.34(c)(3), the seawater intrusion monitoring network sites have been selected to provide chloride concentrations to assess the projected rate and extent of seawater intrusion for each principal aquifer. The existing and planned groundwater quality monitoring wells screened in the Hueneme Aquifer and the Mugu Aquifer are considered to provide sufficient density for the following scientific and practical reasons, consistent with the key Basin-specific monitoring network design factors discussed in Section 5.2:

- The groundwater quality monitoring sites (existing and proposed) were selected to provide coverage across the Coastal Area where seawater intrusion could occur.
- The seawater intrusion monitoring sites (existing and proposed) were sited to provide both early warning of seawater intrusion and measurements relative to minimum thresholds and measurable objectives to protect groundwater beneficial uses.
- An annual sampling frequency is considered adequate because numerical modeling suggests that the average travel time between the shoreline wells and planned cluster wells A & B is more than the 50-year SGMA implementation timeframe, although it is possible that travel times could be shorter in the more permeable zones of an aquifer. If monitoring results suggest seawater may be present in any of the monitoring sites, the well will be resampled and, if confirmed, the sampling frequency will be increased to quarterly.

5.5.2 Data and Reporting Standards [§354.34(g)(2)]

§354.34 Monitoring Network.
(g) *Each Plan shall describe the following information about the monitoring network:*
(2) *Consistency with data and reporting standards described in Section 352.4. If a site is not consistent with those standards, the Plan shall explain the necessity of the site to the monitoring network, and how any variation from the standards will not affect the usefulness of the results obtained.*

The data and reporting standards for seawater intrusion monitoring are identical to those for the degraded water quality monitoring network, described in Section 5.6.2.

5.5.3 Monitoring Protocols [§354.34(i)]

23 Cal. Code Regs. §354.34 Monitoring Network.
(i) *The monitoring protocols developed by each Agency shall include a description of technical standards, data collection methods, and other procedures or protocols pursuant to Water Code Section 10727.2(f) for monitoring sites or other data collection facilities to ensure that the monitoring network utilizes comparable data and methodologies.*

The monitoring protocols for seawater intrusion monitoring are identical to those for the degraded water quality monitoring network (Section 5.6.2).

5.5.4 Assessment and Improvement of Monitoring Network [§354.38(a),(b),(c)(1),(c)(2),(d),(e)(1),(e)(2),(e)(3), and (e)(4)]

§354.38 Assessment and Improvement of Monitoring Network.

(a) *Each Agency shall review the monitoring network and include an evaluation in the Plan and each five-year assessment, including a determination of uncertainty and whether there are data gaps that could affect the ability of the Plan to achieve the sustainability goal for the basin.*

(b) *Each Agency shall identify data gaps wherever the basin does not contain a sufficient number of monitoring sites, does not monitor sites at a sufficient frequency, or utilizes monitoring sites that are unreliable, including those that do not satisfy minimum standards of the monitoring network adopted by the Agency.*

(c) *If the monitoring network contains data gaps, the Plan shall include a description of the following:*

- ***(1)*** *The location and reason for data gaps in the monitoring network.*
- ***(2)*** *Local issues and circumstances that limit or prevent monitoring.*

(d) *Each Agency shall describe steps that will be taken to fill data gaps before the next five-year assessment, including the location and purpose of newly added or installed monitoring sites.*

(e) *Each Agency shall adjust the monitoring frequency and density of monitoring sites to provide an adequate level of detail about site-specific surface water and groundwater conditions and to assess the effectiveness of management actions under circumstances that include the following:*

- ***(1)*** *Minimum threshold exceedances.*
- ***(2)*** *Highly variable spatial or temporal conditions.*
- ***(3)*** *Adverse impacts to beneficial uses and users of groundwater.*
- ***(4)*** *The potential to adversely affect the ability of an adjacent basin to implement its Plan or impede achievement of sustainability goals in an adjacent basin.*

Pursuant to GSP Emergency Regulations §354.38, MBGSA has assessed the existing seawater intrusion monitoring network and determined that certain data gaps exist. MBGSA concluded that additional wells are needed for measurements relative to minimum thresholds and measurable objectives. Planned monitoring well cluster Sites A and B were identified to address these gaps (Figure 5.3-04 and 5.3-05). An additional cluster wells at Site C will be considered to augment existing cluster well 02N23W15J01S/02S for early warning of seawater intrusion along the shoreline. Construction of Site C will be considered following the five-year GSP evaluation, based on monitoring results and funding availability.

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5.6 Degraded Water Quality Monitoring Network [§354.34(e),(g)(3),(h), and (j)]

23 Cal. Code Regs. §354.34 Monitoring Network.

(e) *A Plan may utilize site information and monitoring data from existing sources as part of the monitoring network.*

(g) *Each Plan shall describe the following information about the monitoring network:*

(3) *For each sustainability indicator, the quantitative values for the minimum threshold, measurable objective, and interim milestones that will be measured at each monitoring site or representative monitoring sites established pursuant to Section 354.36.*

(h) *The location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used.*

(j) *An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish a monitoring network related to those sustainability indicators.*

Table 5.3-01 summarizes information regarding depth, sampling frequency, and purpose of the ten existing wells in Mound Basin that have been regularly sampled for water quality analysis. These wells are referred to as the "existing groundwater quality monitoring network." Locations of wells previously used to monitor groundwater quality in the Mugu and Hueneme aquifers are shown on Figures 5.3-04 and 5.3-05, respectively. Inspection of Table 5.3-01 indicates that most (six) existing groundwater quality monitoring sites are screened solely in the Hueneme Aquifer (one additional well is screened chiefly in the Hueneme Aquifer, but its screen may extend into the Mugu Aquifer), which is one of the two principal aquifers where most of the groundwater is extracted from Mound Basin (Table 3.1-02). Three groundwater quality monitoring sites are screened solely in the Mugu Aquifer, which is the other principal aquifer. In addition to these 10 groundwater quality monitoring sites, the existing monitoring wells screened in the fine-grained Pleistocene deposits overlying the Mugu Aquifer (02N22W07M03S and 02N23W07J03S) will be sampled occasionally to characterize the quality of the water that could leak into the Mugu Aquifer (Figure 5.3-03).

Two additional monitoring well clusters are planned in the Coastal Area to provide additional water quality monitoring sites for the seawater intrusion sustainability indicator (Sites A and B on Table 5.3-02 and Figures 5.3-04 and 5.3-05). These planned monitoring well clusters will include discrete screen intervals in each principal aquifer and will be incorporated into the groundwater quality monitoring network once constructed. Site C is a potential "early warning" shoreline well and the plans to install the well will be evaluated following the five-year review.

The aforementioned monitoring sites (existing and planned) will be sampled and analyzed annually for inorganic constituents (general mineral analysis) and common water quality parameters (Table 5.6-01). In addition to this annual sampling (in fall), United currently is conducting supplemental sampling at many of the monitoring wells for an abbreviated analyte list every spring; this spring sampling by United is expected to continue in the future as part of the GSP.

5.6.1 Attainment of Monitoring Objectives and Other Requirements [§354.34(c)(4) and (g)(1)]

§354.34 Monitoring Network.
(c) *Each monitoring network shall be designed to accomplish the following for each sustainability indicator:*
(4) *Degraded Water Quality. Collect sufficient spatial and temporal data from each applicable principal aquifer to determine groundwater quality trends for water quality indicators, as determined by the Agency, to address known water quality issues.*
(g) *Each Plan shall describe the following information about the monitoring network:*
(1) *Scientific rationale for the monitoring site selection process.*

In accordance with GSP Emergency Regulations §354.34(b) and (d), the groundwater quality monitoring network sites have been selected using MBGSA's scientific judgment to demonstrate progress toward (1) achieving measurable objectives described in the GSP, (2) monitor impacts to the beneficial uses and users of groundwater, (3) monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds, and (4) provide adequate coverage of sustainability indicators. Importantly, there is no groundwater extraction in the northern portion of the Basin; thus, the sustainability indicators that rely on groundwater quality are necessarily focused on the southern portion of the Basin. The groundwater quality monitoring network has a special focus in areas of greatest risk for undesirable results: the western half of the Basin where agricultural beneficial users are proximal to the coast and would be at risk if unexpected seawater intrusion occurs. Additional monitoring well clusters are proposed in the western half of the Basin to address these concerns.

Pursuant to GSP Emergency Regulations §354.34(c)(4), the groundwater quality monitoring network sites have been selected to provide sufficient spatial and temporal data from each principal aquifer to determine groundwater quality trends. The existing and planned groundwater quality monitoring wells screened in the Hueneme and Mugu aquifers are considered to provide sufficient density for the following scientific and practical reasons consistent with the key Basin-specific monitoring network design factors discussed in Section 5.2:

- The groundwater quality monitoring sites (existing and proposed) were selected to provide focused monitoring of the western half of the Basin, where the greatest risk for undesirable results exists (i.e., seawater intrusion leading to increased chloride concentrations).
- The groundwater quality monitoring sites (existing and proposed) were selected to provide coverage across the southern portion of the Basin where current and projected groundwater beneficial uses exist.
- The lack of monitoring sites in the northern portion of the Basin is not believed to limit MBGSA's ability to sustainably manage the Basin because there are no groundwater beneficial uses in that area.
- A higher density of groundwater level monitoring sites has been selected in the Hueneme Aquifer commensurate with the fact that this aquifer supplies most of the water extracted from the Basin.
- The relatively limited number of groundwater level monitoring sites in the Mugu Aquifer is not believed to limit MBGSA's ability to sustainably manage the Basin; additional groundwater

quality monitoring sites would be helpful in the Mugu Aquifer, but the proposed network is considered adequate given the small amount of groundwater extraction from the aquifer.

- The annual sampling frequency is considered adequate. More frequent monitoring, when feasible, is desirable but not considered necessary for sustainable management of the Basin unless conditions change. The monitoring frequency will be increased if unexpected changes in water quality are observed. This will happen based on the Plan Manager's professional judgment and the changes will be reflected as described in the Annual Report and incorporated in the next GSP update.

Additional factors considered during selection of the groundwater quality monitoring sites include:

1. To the extent practicable, existing wells have been used as monitoring sites to avoid the cost and public nuisance associated with drilling new wells in a largely urban setting. However, in areas where groundwater quality monitoring would provide crucial information, but no existing wells are present (or are unsuitable for some reason, such as being screened at a depth that would not provide useful data), new wells have been installed in parks and other public spaces in Mound Basin in the past.
2. DWR's BMPs for developing monitoring networks (2016c) cites guidance stating that the density of monitoring wells should be 6.3 wells per 100 mi^2 (Sophocleous, 1983) to 4.0 wells per 100 mi^2 (Hopkins, 1994; applies to basins with groundwater extractions of more than 10,000 AF per 100 mi^2). In the principal aquifers of the Mound Basin (which has an area of approximately 23 mi^2), there are two existing groundwater quality monitoring wells (density of nine wells per 100 mi^2) screened solely in the Mugu Aquifer and six existing groundwater quality monitoring wells (density of 27 wells per 100 mi^2) screened solely in the Hueneme Aquifer. Therefore, the density of monitoring sites in the existing groundwater quality monitoring network exceeds the metrics recommended by DWR.

5.6.2 Data and Reporting Standards [§354.34(g)(2)]

§354.34 Monitoring Network.
(g) *Each Plan shall describe the following information about the monitoring network:*
(2) *Consistency with data and reporting standards described in Section 352.4. If a site is not consistent with those standards, the Plan shall explain the necessity of the site to the monitoring network, and how any variation from the standards will not affect the usefulness of the results obtained.*

The groundwater quality monitoring sites are generally consistent with applicable data and reporting standards set forth in GSP Emergency Regulations §352.4. Exceptions to the standards are described below:

- Well 02N23W13F02S is screened primarily in the Hueneme Aquifer, with a small length of screened interval in the Mugu Aquifer, as noted on Table 5.3-01. Results of water quality analyses for samples obtained from this well historically have been consistent with water quality at other wells screened in the Hueneme Aquifer in Mound Basin, suggesting it extracts groundwater primarily from the Hueneme Aquifer. Therefore, this well will remain in the GSP groundwater level monitoring network.

- Well 02N22W08G01S is believed to be screened in both the Mugu Aquifer and the upper part of the Hueneme Aquifer, as noted on Table 5.3-01. Additionally, water quality samples obtained from this well have been anomalous in the past, as described in Section 3.1.4.3, suggesting influence of shallow groundwater, possibly through a compromised well seal or well casing. This well is included in the GSP groundwater level monitoring network for completeness because it has been part of the existing monitoring program in the Basin; however, results of water quality analysis for samples from this well may not be consistent with groundwater chemistry in either the Mugu or Hueneme aquifers in the vicinity of this well and will not be a determining factor when analyzing concentrations relative to the minimum threshold and measurable objectives.

5.6.3 Monitoring Protocols [§354.34(i)]

23 Cal. Code Regs. §354.34 Monitoring Network.
(i) *The monitoring protocols developed by each Agency shall include a description of technical standards, data collection methods, and other procedures or protocols pursuant to Water Code Section 10727.2(f) for monitoring sites or other data collection facilities to ensure that the monitoring network utilizes comparable data and methodologies.*

United and VCWPD collect groundwater quality data from wells in Mound Basin (Table 5.3-01) in general conformance with the DWR's BMPs for monitoring protocols, standards, and sites (DWR, 2016b). The City of Ventura must additionally meet United States Environmental Protection Agency and California DDW standards for municipal water supply. Data and reporting standards for groundwater quality sampling at their municipal water supply wells typically exceed the recommended standards described in DWR's BMPs (2016b). The key DWR "standardized protocols" for groundwater quality sampling as described in Section 5.5.2 are followed by United, VCWPD, and the City of Ventura. More details are provided in the referenced guidance document (DWR, 2016b), and are not repeated in this GSP. It is presently anticipated that United, VCWPD, and the City of Ventura will continue collecting groundwater quality data from the existing monitoring network, including any improvements or modifications made in the future, and report those data to the MBGSA.

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5.6.4 Assessment and Improvement of Monitoring Network [§354.38(a),(b),(c)(1),(c)(2),(d),(e)(1),(e)(2),(e)(3), and (e)(4)]

§354.38 Assessment and Improvement of Monitoring Network.

(a) *Each Agency shall review the monitoring network and include an evaluation in the Plan and each five-year assessment, including a determination of uncertainty and whether there are data gaps that could affect the ability of the Plan to achieve the sustainability goal for the basin.*

(b) *Each Agency shall identify data gaps wherever the basin does not contain a sufficient number of monitoring sites, does not monitor sites at a sufficient frequency, or utilizes monitoring sites that are unreliable, including those that do not satisfy minimum standards of the monitoring network adopted by the Agency.*

(c) *If the monitoring network contains data gaps, the Plan shall include a description of the following:*

- ***(1)*** *The location and reason for data gaps in the monitoring network.*
- ***(2)*** *Local issues and circumstances that limit or prevent monitoring.*

(d) *Each Agency shall describe steps that will be taken to fill data gaps before the next five-year assessment, including the location and purpose of newly added or installed monitoring sites.*

(e) *Each Agency shall adjust the monitoring frequency and density of monitoring sites to provide an adequate level of detail about site-specific surface water and groundwater conditions and to assess the effectiveness of management actions under circumstances that include the following:*

- ***(1)*** *Minimum threshold exceedances.*
- ***(2)*** *Highly variable spatial or temporal conditions.*
- ***(3)*** *Adverse impacts to beneficial uses and users of groundwater.*
- ***(4)*** *The potential to adversely affect the ability of an adjacent basin to implement its Plan or impede achievement of sustainability goals in an adjacent basin.*

The existing groundwater quality monitoring network, as described in Section 5.6, is considered generally suitable for groundwater sustainability planning relative to the criteria provided in DWR's GSP and CASGEM guidance (DWR, 2016a, 2010), and has met the needs of United and the City of Ventura in past decades.

Pursuant to GSP Emergency Regulations §354.38, MBGSA has assessed the existing groundwater quality monitoring network and determined that certain data gaps exist. Planned actions to address the data gaps before the next five-year assessment are discussed below.

Northern Portion of Mound Basin

As discussed in section 5.6.1, the northern portion of the Basin lacks groundwater quality monitoring sites. The lack of groundwater quality monitoring sites is due to the lack of groundwater extraction wells in the northern half of the Basin. Future groundwater beneficial uses are not anticipated in the northern part of the Basin due to the dominance of residential tract housing. Because there are no current or anticipated future beneficial uses, this data gap is not considered to a limiting factor for sustainable management of the Basin and will not be addressed unless changing conditions in the Basin warrant monitoring sites.

Mugu Aquifer

As discussed in section 5.6.1, there are a relatively limited number of groundwater quality monitoring sites in the Mugu Aquifer. This data gap is not believed to limit MBGSA's ability to sustainably manage the Basin because there is limited groundwater extraction from this aquifer. Additional groundwater quality monitoring sites would be helpful in the Mugu Aquifer, but the existing network is considered adequate given the small amount of groundwater extraction from the aquifer. However, it is noted that

the planned monitoring sites to address seawater intrusion (planned cluster sites A-C; section) will provide additional water quality data in the Mugu Aquifer.

5.7 Land Subsidence Monitoring Network [§354.34(e),(g)(3),(h), and (j)]

23 Cal. Code Regs. §354.34 Monitoring Network.

(e) *A Plan may utilize site information and monitoring data from existing sources as part of the monitoring network.*

(g) *Each Plan shall describe the following information about the monitoring network:*

(3) *For each sustainability indicator, the quantitative values for the minimum threshold, measurable objective, and interim milestones that will be measured at each monitoring site or representative monitoring sites established pursuant to Section 354.36.*

(h) *The location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used.*

(j) *An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish a monitoring network related to those sustainability indicators.*

As described in Section 4.8.2 of this GSP, InSAR is not considered a reliable method for measuring land subsidence in the western half of the Mound Basin due to multiple factors:

1. There is a significant lack of coverage in the western half of the Mound Basin (Figure 3.2-19), which causes the interpolated InSAR subsidence rates to be unreliable.
2. InSAR data provided by DWR are interpolated across the basin boundary between Mound and Oxnard basins. This is not appropriate because of the faults and folds that comprise the basin boundary. These structures likely impact the propagation of any subsidence between the basins (Figures 3.1-02, 3.1-06, and 3.2-19).
3. There is a subsidence "hotspot" that corresponds with a landfill located just south of the Mound Basin in the adjacent Oxnard Basin, which would be representing natural land compaction at the landfill. Careful inspection of the InSAR interpolation reveals that the hotpot greatly influences the subsidence values in the western portion of the Mound Basin, which lacks InSAR data (Figure 3.2-19).

For these reasons, groundwater elevations will be used as a proxy to detect and monitor the potential onset of inelastic land subsidence that may result from future groundwater extractions in Mound Basin (i.e., if groundwater elevations decline below historical low levels). Therefore, the land subsidence monitoring network utilizes the groundwater level monitoring network for the western half of the Basin, which is described above in Section 5.3. To ensure the best available data is used for monitoring, the eastern half of the Basin utilizes InSAR data to measure land surface elevation changes when groundwater levels are below historical lows (Section 4.8).

5.7.1 Attainment of Monitoring Objectives and Other Requirements [§354.34(c)(5) and (g)(1)]

§354.34 Monitoring Network.
(c) *Each monitoring network shall be designed to accomplish the following for each sustainability indicator:*
(5) *Land Subsidence. Identify the rate and extent of land subsidence, which may be measured by extensometers, surveying, remote sensing technology, or other appropriate method.*
(g) *Each Plan shall describe the following information about the monitoring network:*
(1) *Scientific rationale for the monitoring site selection process.*

The land subsidence monitoring network design criterion provided in GSP Emergency Regulations §354.34(c)(5) is to identify the rate and extent of land subsidence, which may be measured by extensometers, surveying, remote sensing technology, or other appropriate methods. Using groundwater levels as a proxy for inelastic land subsidence is an appropriate method because it is mentioned in the GSP Emergency Regulations (§354.36(b)) and because the sustainability goal of no measurable inelastic land subsidence due to groundwater extractions is directly correlated with maintaining groundwater levels above historical low levels. Declining groundwater levels (typically resulting from groundwater extractions) are one potential cause for land subsidence in California, especially when groundwater levels decline below historical lows (Sneed et al., 2013). However, after fine-grained sediments have been compacted during an episode of historically low groundwater levels, there is low probability of additional subsidence unless groundwater elevations decline further—specifically, below the previous historical lows (DWR, 2014). For these reasons, the groundwater level monitoring network will be used to attain the monitoring objectives for the land subsidence monitoring network.

5.7.2 Data and Reporting Standards [§354.34(g)(2)]

§354.34 Monitoring Network.
(g) *Each Plan shall describe the following information about the monitoring network:*
(2) *Consistency with data and reporting standards described in Section 352.4. If a site is not consistent with those standards, the Plan shall explain the necessity of the site to the monitoring network, and how any variation from the standards will not affect the usefulness of the results obtained.*

The data and reporting standards for land subsidence monitoring are identical to those for groundwater level monitoring since groundwater levels will be used as a proxy for indicating potential onset of land subsidence.

For the eastern half of the Basin, InSAR data acquired from DWR along with available GPS data will be reported in feet to an accuracy of at least 0.1 feet relative to North American Vertical Datum of 1988 (NAVD88). The InSAR and GPS data will be compared with groundwater level data to analyze the rate of ground position decline with variation in groundwater levels to determine subsidence in relation to groundwater levels or extraction rates. Results will be mapped, graphed, and reported consistent with standards described in GSP Emergency Regulations (§352.4 (d)), and provided with the GSP updates.

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5.7.3 Monitoring Protocols [§354.34(i)]

23 Cal. Code Regs. §354.34 Monitoring Network.
(i) *The monitoring protocols developed by each Agency shall include a description of technical standards, data collection methods, and other procedures or protocols pursuant to Water Code Section 10727.2(f) for monitoring sites or other data collection facilities to ensure that the monitoring network utilizes comparable data and methodologies.*

The monitoring protocols for land subsidence monitoring are identical to those for groundwater level monitoring, as groundwater levels will be used as a proxy for indicating potential onset of land subsidence.

Subsidence data for the eastern half of the Basin will be acquired from DWR from their SGMA Data Viewer web-based GIS viewer (DWR, 2020), and reviewed. In addition to the InSAR results, data from a continuous GPS, VNCO, which is maintained by a non-profit university consortium, will be downloaded and reviewed (UNAVCO, 2020). GPS data will be compared with groundwater level data to analyze the rate of ground position decline with variation in groundwater levels to determine subsidence in relation to groundwater levels or extraction rates.

5.7.4 Assessment and Improvement of Monitoring Network [§354.38(a),(b),(c)(1),(c)(2),(d),(e)(1),(e)(2),(e)(3), and (e)(4)]

§354.38 Assessment and Improvement of Monitoring Network.
(a) *Each Agency shall review the monitoring network and include an evaluation in the Plan and each five-year assessment, including a determination of uncertainty and whether there are data gaps that could affect the ability of the Plan to achieve the sustainability goal for the basin.*
(b) *Each Agency shall identify data gaps wherever the basin does not contain a sufficient number of monitoring sites, does not monitor sites at a sufficient frequency, or utilizes monitoring sites that are unreliable, including those that do not satisfy minimum standards of the monitoring network adopted by the Agency.*
(c) *If the monitoring network contains data gaps, the Plan shall include a description of the following:*
- ***(1)*** *The location and reason for data gaps in the monitoring network.*
- ***(2)*** *Local issues and circumstances that limit or prevent monitoring.*

(d) *Each Agency shall describe steps that will be taken to fill data gaps before the next five-year assessment, including the location and purpose of newly added or installed monitoring sites.*
(e) *Each Agency shall adjust the monitoring frequency and density of monitoring sites to provide an adequate level of detail about site-specific surface water and groundwater conditions and to assess the effectiveness of management actions under circumstances that include the following:*
- ***(1)*** *Minimum threshold exceedances.*
- ***(2)*** *Highly variable spatial or temporal conditions.*
- ***(3)*** *Adverse impacts to beneficial uses and users of groundwater.*
- ***(4)*** *The potential to adversely affect the ability of an adjacent basin to implement its Plan or impede achievement of sustainability goals in an adjacent basin.*

Assessment and potential improvements of the monitoring network for land subsidence are identical to those for groundwater level monitoring since groundwater levels are used as a proxy for indicating potential onset of land subsidence.

MBGSA has assessed the available InSAR and GPS data for the eastern half of the Basin and has considered it generally suitable for estimating land subsidence in the case that groundwater levels are below the

historical low. There are some minor gaps in InSAR raster coverage in the eastern half of the Basin (see Figure 3.2-19) but will not significantly impact the interpolation of the InSAR land displacement.

5.8 Depletions of Interconnected Surface Water Monitoring Network [§354.34(e),(g)(3),(h), and (j)]

23 Cal. Code Regs. §354.34 Monitoring Network.
(e) *A Plan may utilize site information and monitoring data from existing sources as part of the monitoring network.*
(g) *Each Plan shall describe the following information about the monitoring network:*
(3) *For each sustainability indicator, the quantitative values for the minimum threshold, measurable objective, and interim milestones that will be measured at each monitoring site or representative monitoring sites established pursuant to Section 354.36.*
(h) *The location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used.*
(j) *An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish a monitoring network related to those sustainability indicators.*

As was described in Section 3.2.6 and 4.9 of this GSP, the depletions of interconnected surface water sustainability criterion was determined to be not applicable to Mound Basin. Therefore, a monitoring network for depletions of interconnected surface water is not required.

5.9 Representative Monitoring Sites [§354.36(a),(b)(1),(b)(2), and (c)]

§354.36 Representative Monitoring. *Each Agency may designate a subset of monitoring sites as representative of conditions in the basin or an area of the basin, as follows:*
(a) *Representative monitoring sites may be designated by the Agency as the point at which sustainability indicators are monitored, and for which quantitative values for minimum thresholds, measurable objectives, and interim milestones are defined.*
(b) *Groundwater elevations may be used as a proxy for monitoring other sustainability indicators if the Agency demonstrates the following:*
(1) *Significant correlation exists between groundwater elevations and the sustainability indicators for which groundwater elevation measurements serve as a proxy.*
(2) *Measurable objectives established for groundwater elevation shall include a reasonable margin of operational flexibility taking into consideration the basin setting to avoid undesirable results for the sustainability indicators for which groundwater elevation measurements serve as a proxy.*
(c) *The designation of a representative monitoring site shall be supported by adequate evidence demonstrating that the site reflects general conditions in the area.*

At present, the MBGSA plans to use data collected from all of the monitoring sites described in Sections 5.3, 5.5, and 5.6 to monitor relevant groundwater sustainability indicators in Mound Basin and is not currently designating a subset of monitoring sites as representative of conditions in the Basin.

5.10 Reporting Monitoring Data to the Department (Data Management System) [§354.40]

§354.40 Reporting Monitoring Data to the Department. *Monitoring data shall be stored in the data management system developed pursuant to Section 352.6. A copy of the monitoring data shall be included in the Annual Report and submitted electronically on forms provided by the Department.*

Pursuant to section §352.6, monitoring data will be stored in MBGSA's DMS. Data will be transmitted to DWR with the GSP, annual reports, and GSP updates electronically on the forms provided by DWR. Information concerning the MBGSA DMS is provided in Appendix L.

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6.0 Projects and Management Actions
[Article 5, SubArticle 5]

6.1 Introduction [§354.42, 354.44(a),(b)(2),(b)(9),(c), and (d)]

§354.42 Introduction to Projects and Management Actions. *This Subarticle describes the criteria for projects and management actions to be included in a Plan to meet the sustainability goal for the basin in a manner that can be maintained over the planning and implementation horizon.*

§354.44 Projects and Management Actions

(a) *Each Plan shall include a description of the projects and management actions the Agency has determined will achieve the sustainability goal for the basin, including projects and management actions to respond to changing conditions in the basin.*

(b) *Each Plan shall include a description of the projects and management actions that include the following:*

(2) *If overdraft conditions are identified through the analysis required by Section 354.18, the Plan shall describe projects or management actions, including a quantification of demand reduction or other methods, for the mitigation of overdraft.*

(9) *A description of the management of groundwater extractions and recharge to ensure that chronic lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels or storage during other periods.*

(c) *Projects and management actions shall be supported by best available information and best available science.*

(d) *An Agency shall take into account the level of uncertainty associated with the basin setting when developing projects or management actions.*

This section describes the projects and management actions included in the plan to ensure the sustainability goal is met and to address additional plan elements. Determination of the projects and management actions is based on the best available information and best available science and accounts for the level of uncertainty associated with the Basin setting.

The GSP Emergency Regulations specifically require the inclusion of projects or management actions to address the following:

- **Overdraft (§354.44(b)(2))**: A description of the projects or management actions, including a quantification of demand reduction or other methods, for the mitigation of overdraft, if and overdraft condition is identified through the analysis required by §354.18.
- **Drought Offset Measures §354.44(b)(9)**: A description of the management of groundwater extractions and recharge to ensure that chronic lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels or storage during other periods.

As described in earlier sections, the 50-year modeling projections developed for the water budget suggest that the measurable objectives for the applicable sustainability indicators will be met without the need for overdraft mitigation or drought offset measures. However, several management actions are included to respond to potential changing conditions in the Basin and to help protect groundwater quality.

6.2 Seawater Intrusion Monitoring Wells for Sustainable Management Criteria Implementation [§354.44(b)(1) and (d)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.*
(d) *An Agency shall take into account the level of uncertainty associated with the basin setting when developing projects or management actions.*

As described in Sections 4.6.2.6 and 5.5.4, MBGSA has assessed the existing seawater intrusion monitoring network and determined that additional monitoring wells are needed between the shoreline and locations of water wells to implement minimum thresholds and measurable objectives designed to protect beneficial uses (monitoring well clusters at Sites A and B (Figure 5.3-04 and 5.3-05)). These wells are needed to meet the SGMA requirement for using a chloride concentration isocontour to delineate the seawater intrusion minimum thresholds and measurable objectives. At least two wells are needed along Harbor Boulevard to establish an isocontour between the coast and the beneficial users of groundwater located to the east. The Site A monitoring well is planned for construction in 2021 and will be funded by the DWR TSS program. The Site B monitoring well would be funded by MBGSA, unless a grant is obtained. Because monitoring wells are required for SMC implementation, they must be constructed before the first five-year GSP assessment (GSP Emergency Regulations §354.38(d)).

6.2.1 Relevant Measurable Objective(s) [§354.44(b)(1)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.*

The relevant measurable objective for the seawater intrusion monitoring wells project is the measurable objective for the seawater intrusion sustainability indicator. The planned Site A and B wells would also provide groundwater level and quality data that would be relevant to the measurable objectives for the other sustainability indicators.

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6.2.2 Implementation Triggers [§354.44(b)(1)(A)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *The Plan shall include the following:*
(A) *A description of the circumstances under which projects or management actions shall be implemented, the criteria that would trigger implementation and termination of projects or management, and the process by which the Agency shall determine that conditions requiring the implementation of particular projects or management actions have occurred.*

The implementation trigger for the seawater intrusion monitoring wells project is GSP Emergency Regulations §354.38(d), which requires GSAs to address data gaps before the first five-year GSP assessment. This project is already underway, with the Site A monitoring well scheduled for construction in 2021 with funding from the DWR TSS program. No known criteria would trigger the termination of this Project, and the conditions requiring the implementation of this project are discussed in Sections 4.6.2.6 and 5.5.4.

6.2.3 Public Notice Process [§354.44(b)(1)(B)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *The Plan shall include the following:*
(B) *The process by which the Agency shall provide notice to the public and other agencies that the implementation of projects or management actions is being considered or has been implemented, including a description of the actions to be taken.*

MBGSA will continue to follow its adopted SEP to inform the public about progress implementing the seawater intrusion monitoring wells project.

6.2.4 Permitting and Regulatory Process [§354.44(b)(3)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(3) *A summary of the permitting and regulatory process required for each project and management action.*

The seawater intrusion monitoring wells project will require the following permits:

- CEQA compliance (most likely a categorical exemption).
- Administrative Coastal Development Permit (City of Ventura).
- Ventura County Well Permit.

6.2.5 Implementation Timeline [§354.44(b)(4)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(4) *The status of each project and management action, including a time-table for expected initiation and completion, and the accrual of expected benefits.*

This project is already underway and will be completed prior to the first five-year GSP assessment. The Site A monitoring well is scheduled for construction in 2021 with funding from the DWR TSS program. Site B monitoring wells are budgeted for construction in 2026 but would be completed sooner if grant funding is available.

6.2.6 Anticipated Benefits [§354.44(b)(5)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(5) *An explanation of the benefits that are expected to be realized from the project or management action, and how those benefits will be evaluated.*

The primary benefit of the seawater intrusion monitoring wells project is to provide monitoring sites to implement SMC for the seawater intrusion sustainability indicator.

6.2.7 Implementation Approach [§354.44(b)(6)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(6) *An explanation of how the project or management action will be accomplished. If the project or management actions rely on water from outside the jurisdiction of the Agency, an explanation of the source and reliability of that water shall be included.*

The Site A monitoring well is scheduled for construction in 2021 with funding from the DWR TSS program.

The Site B monitoring well will be completed by MBGSA. The project will be implemented as a typical design-bid-build project. MBGSA staff will obtain right-of-way, design, bid, and issue a construction contract with the assistance of legal counsel and consultants.

6.2.8 Legal Authority [§354.44(b)(7)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(7) *A description of the legal authority required for each project and management action, and the basis for that authority within the Agency.*

MBGSA will rely on the authority provided for under SGMA to contract for the construction of monitoring wells.

6.2.9 Cost & Funding [§354.44(b)(8)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(8) *A description of the estimated cost for each project and management action and a description of how the Agency plans to meet those costs.*

The Site A monitoring well cluster is funded by the DWR TSS program. Unreimbursed costs paid by MBGSA include Coastal Development permit application development and permit fees, well permit fees, and labor to obtain right-of-way and coordinate with DWR. MBGSA' estimated costs for the Site A monitoring wells are $50,000.

Site B monitoring well cluster is budgeted for construction in 2026. The total project costs (all-in) is estimated to be $884,000 (escalated from 2021 dollars assuming 3% per year inflation). The Site B monitoring wells will be funded using groundwater extraction fees, unless grant funding is available.

6.3 Seawater Intrusion Contingency Plan and Additional Shoreline Monitoring Well [§354.44(b)(1) and (d)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.*
(d) *An Agency shall take into account the level of uncertainty associated with the basin setting when developing projects or management actions.*

As described in Section 3.2.3 Seawater Intrusion, available data indicate that seawater has not been present in the onshore portions of the principal aquifers to date. Section 3.2.3 also explains that the Mound Basin principal aquifers may only be exposed to seawater where they crop out on the continental shelf edge, approximately 10 miles offshore, greatly reducing the likelihood that seawater can find a near-shore path for intrusion into the principal aquifers (Figure 3.1-10). As discussed in Section 4.6, particle tracking simulations indicated that GSP indicate that onshore migration of seawater is not anticipated during the 50-year SGMA planning and implementation horizon from the offshore aquifer subcrops. The possibility of nearshore short-circuit pathways that could allow seawater to enter the aquifer (for example along the Oak Ridge Fault) and migrate onshore during the SGMA planning horizon were also considered in the particle tracking analysis. The particle tracking results indicate that it is unlikely that beneficial users of groundwater would be impacted during the 50-year SGMA planning and implementation horizon by onshore migration of seawater via potential short-circuit pathways located near the coast.

Despite the very encouraging model results for seawater intrusion, MBGSA believes it would be prudent to develop a contingency plan to address any unexpected seawater intrusion. The contingency plan will be developed to identify measures that would be taken to address unexpected seawater intrusion. The contingency plan will be developed prior the first five-year GSP assessment. A related aspect of the contingency plan would be the construction of an additional shoreline monitoring well cluster (Site C on Figures 5.3-04 and 5.3-05) to provide early warning of any onshore flow of seawater. The Site C monitoring

wells would complement the existing shoreline monitoring wells located at Marina Park (02N23W15J01/2). Because the Site C monitoring wells are not required for SMC implementation, they can be constructed after the first five-year GSP assessment. Therefore, the GSP budget projections assume this well cluster would be constructed in 2032, just before the second five-year GSP assessment.

6.3.1 Relevant Measurable Objective(s) [§354.44(b)(1)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.*

The relevant measurable objective for the seawater intrusion contingency plan and additional shoreline monitoring well project is the measurable objective for the seawater intrusion sustainability indicator. The Site C monitoring well cluster would help ensure the measurable objective is met by providing early warning of unexpected seawater intrusion. The Site C wells would also provide groundwater level and quality data that would be relevant to the measurable objectives for the other sustainability indicators.

6.3.2 Implementation Triggers [§354.44(b)(1)(A)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *The Plan shall include the following:*
(A) *A description of the circumstances under which projects or management actions shall be implemented, the criteria that would trigger implementation and termination of projects or management, and the process by which the Agency shall determine that conditions requiring the implementation of particular projects or management actions have occurred.*

The seawater intrusion contingency plan and additional shoreline monitoring well project is a voluntary measure that will be undertaken by the MBGSA at its discretion. As such, there is no definitive implementation trigger for developing the contingency plan or constructing the Site C wells.

6.3.3 Public Notice Process [§354.44(b)(1)(B)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *The Plan shall include the following:*
(B) *The process by which the Agency shall provide notice to the public and other agencies that the implementation of projects or management actions is being considered or has been implemented, including a description of the actions to be taken.*

MBGSA will continue to follow its adopted SEP to inform the public about progress implementing the seawater intrusion contingency plan and additional shoreline monitoring well project.

6.3.4 Permitting and Regulatory Process [§354.44(b)(3)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(3) *A summary of the permitting and regulatory process required for each project and management action.*

No permits or regulatory approvals are required to develop the seawater intrusion contingency plan.

The additional shoreline monitoring well project will require the following permits:

- CEQA compliance (most likely a categorical exemption).
- Administrative Coastal Development Permit (City of Ventura).
- Ventura County Well Permit.

6.3.5 Implementation Timeline [§354.44(b)(4)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(4) *The status of each project and management action, including a time-table for expected initiation and completion, and the accrual of expected benefits.*

The seawater intrusion contingency plan and additional shoreline monitoring well project is a voluntary measure that will be undertaken by the MBGSA at its discretion. Contingency plan development is anticipated to be completed during the first five-year GSP assessment period (i.e., before 2027). Due to funding constraints, the additional shoreline monitoring well project is scheduled for construction in 2032 but would be completed sooner if grant funding is available.

6.3.6 Anticipated Benefits [§354.44(b)(5)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(5) *An explanation of the benefits that are expected to be realized from the project or management action, and how those benefits will be evaluated.*

The seawater intrusion contingency plan and additional shoreline monitoring well project will benefit beneficial users and property interests in the Basin by providing early warning of unexpected seawater intrusion and ensuring pre-planned measures are in place to address it before undesirable results could occur.

6.3.7 Implementation Approach [§354.44(b)(6)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(6) *An explanation of how the project or management action will be accomplished. If the project or management actions rely on water from outside the jurisdiction of the Agency, an explanation of the source and reliability of that water shall be included.*

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The seawater intrusion contingency plan will be developed through a collaborative stakeholder driven process that identifies triggers, actions, and funding mechanisms to address unexpected seawater intrusion. Engineering assistance will be obtained from consultants as needed during the seawater intrusion contingency plan development process.

The Site C additional shoreline monitoring well will be completed by MBGSA. The project will be implemented as a typical design-bid-build project. MBGSA staff will obtain right-of-way, design, and bid, and issue a construction contract with the assistance of legal counsel and consultants.

6.3.8 Legal Authority [§354.44(b)(7)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(7) *A description of the legal authority required for each project and management action, and the basis for that authority within the Agency.*

MBGSA will rely on the authority provided for under SGMA to develop the seawater intrusion contingency plan or to contract for the construction of monitoring well.

6.3.9 Cost & Funding [§354.44(b)(8)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(8) *A description of the estimated cost for each project and management action and a description of how the Agency plans to meet those costs.*

The estimated cost for seawater intrusion contingency plan development is $85,000 (shared with the land subsidence contingency plan development). The estimated all-in cost for the new shoreline monitoring well is $1,052,000 (escalated form 2021 dollars assuming 3% per year inflation). The seawater intrusion contingency plan and monitoring wells will be funded using groundwater extraction fees, unless grant funding is available.

6.4 Land Subsidence Contingency Plan [§354.44(b)(1) and (d)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.*
(d) *An Agency shall take into account the level of uncertainty associated with the basin setting when developing projects or management actions.*

As described in Section 3.2.5 Land Subsidence, no land subsidence due to groundwater extraction has been documented historically in the Mound Basin. Section 3.2.5 also explains that the Mound Basin is considered to have a low estimated potential for inelastic land subsidence. Numerical modeling for the water budget suggests that future groundwater levels will remain above historical low levels, which would

prevent inelastic subsidence due to groundwater extraction (Appendix I). Despite these factors, sustainable management is prudent because groundwater levels could decline below historical levels and trigger inelastic land subsidence if actual future conditions differ significantly from those assumed in the projected water budget analysis.

As described in Section 4.8.1, the Coastal Area (Figure 4.1-01) located west of Harbor Boulevard would be particularly susceptible to impacts of land subsidence. Primary sewer lines to the City's WWTP run along Harbor Boulevard and have a low slope that could be impacted by relatively small amounts of land subsidence. Available studies indicate that the developed areas located west of Harbor Boulevard, including the Pierpont community and Ventura Harbor, will be impacted by sea level rise (Figure 4.8-01a) (VCWPD, 2018). Inelastic land subsidence in this area would unreasonably exacerbate the already significant impacts associated with sea level rise. For these reasons it was determined that any measurable inelastic land subsidence in the Coastal Area could potentially result in undesirable results, particularly as the effects of sea level rise act to increase coastal hazards in the Coastal Area during the planning and implementation horizons.

Despite the very encouraging model results that suggest that land subsidence is not expected during the 50-year GSP implementation period, MBGSA believes it would be prudent to develop a contingency plan to address unexpected conditions that could cause groundwater levels to decline below historical low levels in the western half of the Basin and potentially trigger inelastic land subsidence in the Coastal Area. The contingency plan will be developed to identify triggers and measures that would be taken to halt groundwater level declines before historical low levels are exceeded in the western half of the Basin.

6.4.1 Relevant Measurable Objective(s) [§354.44(b)(1)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.*

The relevant measurable objective for the land subsidence contingency plan is the measurable objective for the land subsidence sustainability indicator.

6.4.2 Implementation Triggers [§354.44(b)(1)(A)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *The Plan shall include the following:*
(A) *A description of the circumstances under which projects or management actions shall be implemented, the criteria that would trigger implementation and termination of projects or management, and the process by which the Agency shall determine that conditions requiring the implementation of particular projects or management actions have occurred.*

The land subsidence contingency plan is a voluntary measure that will be undertaken by the MBGSA at its discretion. As such, there is no definitive implementation trigger for developing the contingency plan.

6.4.3 Public Notice Process [§354.44(b)(1)(B)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *The Plan shall include the following:*
(B) *The process by which the Agency shall provide notice to the public and other agencies that the implementation of projects or management actions is being considered or has been implemented, including a description of the actions to be taken.*

MBGSA will continue to follow its adopted SEP to inform the public about progress developing the land subsidence contingency plan.

6.4.4 Permitting and Regulatory Process [§354.44(b)(3)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(3) *A summary of the permitting and regulatory process required for each project and management action.*

No permits or regulatory approvals are required to develop the land subsidence contingency plan.

6.4.5 Implementation Timeline [§354.44(b)(4)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(4) *The status of each project and management action, including a time-table for expected initiation and completion, and the accrual of expected benefits.*

The land subsidence contingency plan is a voluntary measure that will be undertaken by the MBGSA at its discretion. The land subsidence contingency plan development is anticipated to be completed during the first five-year GSP assessment period (i.e., before 2027).

6.4.6 Anticipated Benefits [§354.44(b)(5)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(5) *An explanation of the benefits that are expected to be realized from the project or management action, and how those benefits will be evaluated.*

the land subsidence contingency plan will benefit beneficial users and property interests in the Basin by providing early warning of groundwater levels declines that could lead to potential land subsidence in the Coastal Area and by ensuring pre-planned measures are to address it before undesirable results could occur.

6.4.7 Implementation Approach [§354.44(b)(6)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(6) *An explanation of how the project or management action will be accomplished. If the project or management actions rely on water from outside the jurisdiction of the Agency, an explanation of the source and reliability of that water shall be included.*

The land subsidence contingency plan will be developed through a collaborative stakeholder-driven process that identifies triggers, actions, and funding mechanisms to address unexpected groundwater level declines that could lead to potential land subsidence in the Coastal Area. Engineering assistance will be obtained from consultants as needed during the land subsidence contingency plan development process.

6.4.8 Legal Authority [§354.44(b)(7)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(7) *A description of the legal authority required for each project and management action, and the basis for that authority within the Agency.*

MBGSA will rely on the authority provided for under SGMA to develop the land subsidence contingency plan.

6.4.9 Cost & Funding [§354.44(b)(8)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(8) *A description of the estimated cost for each project and management action and a description of how the Agency plans to meet those costs.*

The estimated cost for land subsidence contingency plan development is $88,4000 (shared with the seawater intrusion contingency plan development).

6.5 Groundwater Quality Protection Measures [§354.44(b)(1) and (d)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.*
(d) *An Agency shall take into account the level of uncertainty associated with the basin setting when developing projects or management actions.*

MBGSA will coordinate with the County of Ventura to identify and address improperly constructed or abandoned wells that create conduits for migration of poor-quality water from the Shallow Alluvial

Deposits into the principal aquifers. MBGSA will also coordinate with County of Ventura to review the County well permit ordinance and modify, if necessary, to ensure the future wells are properly sealed to prevent migration of poor-quality water from the Shallow Alluvial Deposits into the principal aquifers.

6.5.1 Relevant Measurable Objective(s) [§354.44(b)(1)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.*

The relevant measurable objective for the groundwater quality protection measures management action is the measurable objective for the degraded water quality sustainability indicator.

6.5.2 Implementation Triggers [§354.44(b)(1)(A)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *The Plan shall include the following:*
(A) *A description of the circumstances under which projects or management actions shall be implemented, the criteria that would trigger implementation and termination of projects or management, and the process by which the Agency shall determine that conditions requiring the implementation of particular projects or management actions have occurred.*

The groundwater quality protection measures management action is a voluntary measure that will be undertaken by the MBGSA at its discretion. As such, there is no definitive implementation trigger for developing the contingency plan.

6.5.3 Public Notice Process [§354.44(b)(1)(B)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *The Plan shall include the following:*
(B) *The process by which the Agency shall provide notice to the public and other agencies that the implementation of projects or management actions is being considered or has been implemented, including a description of the actions to be taken.*

MBGSA will continue to follow its adopted SEP to inform the public about progress implementing the groundwater quality protection measures management action.

6.5.4 Permitting and Regulatory Process [§354.44(b)(3)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(3) *A summary of the permitting and regulatory process required for each project and management action.*

No permits or regulatory approvals are required to implement groundwater quality protection measures management action.

6.5.5 Implementation Timeline [§354.44(b)(4)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(4) *The status of each project and management action, including a time-table for expected initiation and completion, and the accrual of expected benefits.*

The groundwater quality protection measures management action is a voluntary measure that will be undertaken by the MBGSA at its discretion. However, it is anticipated that the Groundwater Quality Protection Measures management action will be initiated during the first five-year GSP assessment period (i.e., before 2027).

6.5.6 Anticipated Benefits [§354.44(b)(5)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(5) *An explanation of the benefits that are expected to be realized from the project or management action, and how those benefits will be evaluated.*

The groundwater quality protection measures management action will benefit beneficial users and property interests in the Basin by protecting groundwater quality from degradation.

6.5.7 Implementation Approach [§354.44(b)(6)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(6) *An explanation of how the project or management action will be accomplished. If the project or management actions rely on water from outside the jurisdiction of the Agency, an explanation of the source and reliability of that water shall be included.*

The groundwater quality protection measures management action will be developed through collaboration with the County of Ventura, the well permitting agency for the Basin.

6.5.8 Legal Authority [§354.44(b)(7)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(7) *A description of the legal authority required for each project and management action, and the basis for that authority within the Agency.*

MBGSA will rely on the County of Ventura's legal authority as the well permitting agency for the Basin.

6.5.9 Cost & Funding [§354.44(b)(8)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(8) *A description of the estimated cost for each project and management action and a description of how the Agency plans to meet those costs.*

The estimated costs for the groundwater quality protection measures management action are included in the groundwater management, coordination, and outreach budget. Grant funding will be pursued to address any improperly constructed or abandoned wells that are identified.

6.6 Interim Shallow Groundwater Data Collection and Analysis [§354.44(b)(1) and (d)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.*
(d) *An Agency shall take into account the level of uncertainty associated with the basin setting when developing projects or management actions.*

As described in Section 3.1.4.1.3, Section 3.2.6, and Appendix G, the current HCM, data, and modeling indicate that there is virtually no impact of principal aquifer groundwater extractions on groundwater levels in the Shallow Alluvial Deposits or surface flows in the Santa Clara River. In response to concerns communicated by several commenters on the draft GSP, MBGSA will partner with the City of Ventura and United to collect interim shallow groundwater levels and water quality data from existing shallow wells located near the Santa Clara River leading up to the first five-year GSP assessment to confirm the above-described conclusions. MBGSA is currently coordinating with the City of Ventura and United to perform the interim monitoring of shallow groundwater levels in several shallow wells located along the Santa Clara River (see Figure 6.6-01, Table 6.6-01). Note, these wells are not part of the Mound Basin GSP monitoring network, but data from these wells will be collected and analyzed on an interim basis. If data from the interim study confirm the existing conclusions, then no further monitoring will be necessary. If the data suggest a significant relationship exists between the Shallow Alluvial Deposits and Santa Clara River flows with the deeper, principal aquifers, the GSP will be updated to reflect those findings and an appropriate amount of monitoring will be continued.

Consistent with to GSP Emergency Regulations §354.34(c)(1)(B), static groundwater levels will be measured monthly (or more frequently, as feasible) at the shallow wells to represent seasonal-low and seasonal-high groundwater conditions. Groundwater elevations have been measured continuously by the City of Ventura with transducers, or manually on a monthly or bi-monthly basis at the shallow wells, exceeding the SGMA requirement for semiannual (fall and spring) measurements. The continuous data from the transducers is helpful for more accurately determining the precise timing of spring-high and fall-low groundwater elevations each year and for evaluating the interference effects of nearby groundwater extraction on static groundwater levels.

The City of Ventura collects and reports groundwater elevation data from the shallow wells in general conformance with the CASGEM program's "Procedures for Monitoring Entity Reporting" (DWR, 2010) and DWR's (2016b) BMPs for monitoring protocols, standards, and sites. Some key elements of DWR guidance include (but are not limited to) the following:

- Depth to groundwater must be measured relative to an established reference point on the well casing;
- Depth to groundwater must be measured to an accuracy of 0.1 ft below the reference point (it is preferable to measure depth to groundwater to an accuracy of 0.01 ft);
- Transducers must be able to record groundwater levels with an accuracy of 0.1 ft;
- Transducer data should periodically be checked against hand-measured groundwater levels to monitor electronic drift or cable movement.

More details are provided in the referenced guidance documents (DWR, 2010, 2016b), and are not repeated in this GSP. It is presently anticipated that MBGSA, United, and the City of Ventura will continue collecting groundwater level data from the existing shallow wells, including any improvements or modifications made in the future, and report those data to CASGEM and DWR.

6.6.1 Relevant Measurable Objective(s) [§354.44(b)(1)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.*

There is no relevant measurable objective for the interim shallow groundwater data collection and analysis management action.

6.6.2 Implementation Triggers [§354.44(b)(1)(A)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *The Plan shall include the following:*
(A) *A description of the circumstances under which projects or management actions shall be implemented, the criteria that would trigger implementation and termination of projects or management, and the process by which the Agency shall determine that conditions requiring the implementation of particular projects or management actions have occurred.*

The interim shallow groundwater data collection and analysis management action is a voluntary measure that will be undertaken by the MBGSA at its discretion. As such, there is no definitive implementation trigger for developing this effort.

6.6.3 Public Notice Process [§354.44(b)(1)(B)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *The Plan shall include the following:*
(B) *The process by which the Agency shall provide notice to the public and other agencies that the implementation of projects or management actions is being considered or has been implemented, including a description of the actions to be taken.*

MBGSA will continue to follow its adopted SEP to inform the public about progress implementing the interim shallow groundwater data collection and analysis management action.

6.6.4 Permitting and Regulatory Process [§354.44(b)(3)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(3) *A summary of the permitting and regulatory process required for each project and management action.*

No permits or regulatory approvals are required to implement the interim shallow groundwater data collection and analysis management action.

6.6.5 Implementation Timeline [§354.44(b)(4)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(4) *The status of each project and management action, including a time-table for expected initiation and completion, and the accrual of expected benefits.*

MBGSA is currently coordinating with the City and United to initiate the monitoring program and data management. The interim shallow groundwater data collection and analysis management action is anticipated to be initiated in 2022 and completed during the first five-year GSP assessment period (i.e., before 2027).

6.6.6 Anticipated Benefits [§354.44(b)(5)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(5) *An explanation of the benefits that are expected to be realized from the project or management action, and how those benefits will be evaluated.*

The interim shallow groundwater data collection and analysis management action will benefit beneficial users of the shallow groundwater (GDEs) and surface water (instream uses) within the Basin by providing additional data to ensure no impacts from groundwater extraction in the deeper principal aquifers is occurring. If the data indicate a hydraulic connection between the Shallow Alluvial Deposits and the deeper principal aquifers, then the data and analysis will provide the basis and data to update the HCM, SMC, and monitoring network to protect beneficial uses associated with the Shallow Alluvial Deposits and Santa Clara River from any groundwater extraction impacts.

6.6.7 Implementation Approach [§354.44(b)(6)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(6) *An explanation of how the project or management action will be accomplished. If the project or management actions rely on water from outside the jurisdiction of the Agency, an explanation of the source and reliability of that water shall be included.*

The interim shallow groundwater data collection and analysis management action is being developed through collaboration with the City of Ventura and United to collect and manage the data. MBGSA will develop a temporary monitoring plan and conduct the data analysis.

6.6.8 Legal Authority [§354.44(b)(7)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(7) *A description of the legal authority required for each project and management action, and the basis for that authority within the Agency.*

The legal authority for the interim shallow groundwater data collection and study are currently being assessed and will be updated in the next annual report.

6.6.9 Cost & Funding [§354.44(b)(8)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(8) *A description of the estimated cost for each project and management action and a description of how the Agency plans to meet those costs.*

The estimated costs for the interim shallow groundwater data collection and analysis management action are currently being assessed and will be updated in the next annual report.

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7.0 GSP Implementation

This GSP section presents the anticipated GSP implementation costs and schedule. Please note that the costs and schedule are approximate estimates based on currently available information and will be updated annually as needed to satisfy GSP annual reporting requirements and for the Agency's annual budgeting process.

7.1 Estimate of GSP Implementation Costs [§354.6(e)]

§354.6 Agency Information. *When submitting an adopted Plan to the Department, the Agency shall include a copy of the information provided pursuant to Water Code Section 10723.8, with any updates, if necessary, along with the following information:*

(e) *An estimate of the cost of implementing the Plan and a general description of how the Agency plans to meet those costs.*

This subsection provides an estimate of the cost to implement the GSP and a general description of how the MBGSA plans to meet those costs. Implementation cost considerations include MBGSA administration, monitoring, data management, maintaining a prudent fiscal reserve, and other costs estimated over the GSP 20-year implementation horizon. The funding sources and mechanisms are also presented. The costs for projects and management actions are not included because none are anticipated to be required to meet the sustainability goal for the Mound Basin. However, costs to develop contingency plans to address unexpected land subsidence or seawater intrusion are included.

The following subsections present estimated costs for each major expense category. The estimated costs include annual costs for ongoing activities and estimated costs for one-time activities that are scheduled to occur within the first five-year GSP assessment period. This approach enables calculating the five-year total cost estimate, which is annualized to better inform MBGSA's general estimate of the costs by the major categories. Because costs are based on the best available estimates at the time of preparation, actual costs may vary from those used in the projections below.

The following subsections describe the scope of the various GSP implementation activities. Associated costs are presented in Table 7.1-01. In general, all costs were developed using 2021 dollars and escalated by 3% per year for the remainder of the 20-year GSP implementation period.

7.1.1 Agency Administration

This category includes the costs related to the administration of the MBGSA, including administrative staff support, finance staff support and related expenses, insurance, organizational memberships and conferences, miscellaneous supplies, and materials. The estimated costs are presented in Table 7.1-01. The MBGSA uses a collaborative staffing model to accomplish its work. Executive management is provided under contract with an independent consultant, Bondy Groundwater Consulting, Inc. (Bryan Bondy). Mr. Bondy serves as the Agency's Executive Director and the GSP Plan Manager. Administrative and accounting support is provided under contract with member agency United. This budget category includes finance-related costs for routine accounts payable and receivable functions, extraction fee billing, budgeting, financial reporting, and financial audits. Administrative costs also include annual liability

insurance costs, IT services (website, email, and cloud storage), and incidentals (postage, copies, etc.). MBGSA does not own or lease any office space or office equipment.

7.1.2 Legal Counsel

Legal services are provided under contract with Klein Denatale Goldner on an as-needed basis. The budget assumes legal review of contracts and access agreements as well as consultation on other matters, such as Brown Act matters and groundwater extraction fee issues.

7.1.3 Groundwater Management, Coordination, and Outreach

GSP implementation will require certain management and coordination activities. The Executive Director will monitor activities of the Member Agencies, land use planning efforts, the Santa Paula Technical Advisory Committee (management of the adjacent adjudicated Santa Paula Basin), and FCGMA (GSP implementation for the adjacent Oxnard Basin), and the Santa Clara River Watershed Committee (Integrated Regional Water Management program). The Executive Director will also stay abreast of DWR updates concerning the SGMA and related programs. This task also includes ongoing outreach required by the SGMA concerning GSP implementation in accordance with the MBGSA Board-approved SEP (Appendix D).

This cost category also includes miscellaneous technical support that may be needed to implement the GSP that is not captured in other cost categories. The specific needs and costs are yet to be identified but it is expected as the initial GSP implementation efforts proceed that these needs will become evident. Examples of technical support are potential tasks such as ongoing data review (outside of annual reporting and GSP evaluation); day-to-day data management, review of funding mechanisms; development of alternative funding mechanisms (grants), and other technical issues that may arise during GSP implementation. It is envisioned that much of the work will be completed by the Executive Director with support from United staff and other consultants, as needed.

Lastly, the year one (Fiscal Year 2022) included $25,000 for the application for a GSP Implementation Grant.

7.1.4 Data Collection

The MBGSA's proposed monitoring program is presented in the monitoring section (Section 5). The initial monitoring networks for the GSP consist of the existing monitoring programs implemented by United and to a lesser extent the VCWPD and City of Ventura. The existing monitoring networks will be supplemented with monitoring well clusters to be constructed by MBGSA (see Section 6) and perhaps several existing wells where opportunities arise.

7.1.4.1 Monitoring Well Construction

Sections 5.3.4, 5.5.4, and 5.6.4 describe monitoring network gaps. In summary, MBGSA concluded that two monitoring wells are needed between the shoreline and locations of water wells to implement minimum thresholds and measurable objectives designed to protect beneficial uses. Two multi-level monitoring wells (clusters) will be constructed to address these needs. The wells were also sited to address

monitoring needs for the land subsidence sustainability indicator and, more generally, to better define the potentiometric surface near the coast and provide additional vertical gradient data.

Pursuant to GSP Emergency Regulations § 354.38(d), the multi-level monitoring wells will be installed in a phased approach at prioritized locations within the next five years. One well is planned for construction in 2021 under DWR's TSS program (Site A on Figures 5.3-01 through 5.3-04). The fiscal year 2022 budget includes $30,000 for coordination with the DWR TSS. MBGSA will budget for and seek to install the other multi-level monitoring well (Site B on Figures 5.3-01 through 5.3-04) before the five-year GSP assessment. The MBGSA's cost to construct the multi-level monitoring wells in 2026 is estimated to be approximately $750,000 per site in 2021 dollars. The estimated costs include access agreements, permitting, project management, and construction costs. These approximate costs are estimates as there are uncertainties such as site-specific considerations and construction bid environment, as well as a variety of other factors that will ultimately determine the all-in construction costs.

In addition to the monitoring wells described above, another monitoring well is proposed to provide early detection of seawater at the shoreline (Site C on Figures 5.3-01 through 5.3-04). However, because this well is not needed for establishing minimum thresholds and measurable objectives, this well does not need to be constructed before first five-year GSP assessment. It is assumed that the well would be constructed before the second five-year GSP assessment, if funding is available.

7.1.4.2 Groundwater Elevation Monitoring

There is a combined network of 24 wells in the Basin monitored at least quarterly. Monitoring is performed by United and to a lesser extent the VCWPD and City of Ventura (Table 5.3-01). Monitoring is described in detail in Section 5.3. The costs for ongoing monitoring of the existing monitoring network are included in the budgets of the current monitoring entities. United staff have indicated a willingness to incorporate the above-described new monitoring sites into its existing network, but that MBGSA would need to cover the costs for pressure transducers. Therefore, costs are included for pressure transducers.

7.1.4.3 Groundwater Quality Monitoring

There is a combined network of 10 wells in the Basin monitored at least quarterly. Monitoring is performed by United and to a lesser extent the VCWPD and City of Ventura (Table 5.3-01). Monitoring is described in detail in Section 5.3. The costs for ongoing monitoring of the existing monitoring network are included in the budgets of the current monitoring entities. United staff have indicated a willingness to incorporate the above-described new monitoring sites into its existing network, but that MBGSA would need to cover the laboratory fees for water quality testing. Therefore, costs are included for water quality testing.

7.1.4.4 Groundwater Extraction Monitoring

Groundwater extractions are reported semiannually to United pursuant to the Water Code §75611. The reported extractions are shared with MBGSA. There is no cost to MBGSA to obtain the extraction volume data.

7.1.5 Annual Reporting

SGMA regulations require submittal of annual reports to DWR on the status of GSP implementation and basin conditions. The reporting requirements are presented in GSP Emergency Regulations §356.2. In general, the annual report must include an executive summary, description, and graphical presentation basin conditions (groundwater levels and storage), reporting of groundwater extractions, reporting of surface water supplies to the Basin, reporting of total water use in the Basin, and discussion of GSP implementation progress relative to the SMC. It is anticipated the annual reports will be prepared by the Executive Director in coordination with United staff and with consultant support. Additional consultant support will be obtained, as needed, to complete the reports. The cost for the first annual report is anticipated to be greater than the cost for subsequent reports because the first report must be developed from scratch and will include several years of data to bridge the gap between data presented in the GSP and water year 2020/2021. The first annual report is due in April 2022.

Ongoing maintenance for the SMGA-required DMS is included in the annual reporting costs. Please see Section 5.10 and Appendix L for more information concerning the DMS.

7.1.6 Projects and Management Actions

Costs to develop a contingency plan for unexpected land subsidence or seawater intrusion are included. Further information about the contingency plans can be found in Section 6. In addition, MBGSA developed a groundwater protection measures management action to identify and address improperly constructed or abandoned wells that create conduits for migration of poor-quality water from the Shallow Alluvial Deposits into the principal aquifers. This management action will also include coordination with the County of Ventura to review the County well permit ordinance and modify, if necessary, to ensure the future wells are properly sealed to prevent migration of poor-quality water from the Shallow Alluvial Deposits into the principal aquifers. Grant funding will be pursued to address any improperly constructed or abandoned wells that are identified.

7.1.7 GSP Evaluations and Amendments

GSP Emergency Regulations § 356.4 require MBGSA to evaluate the GSP at least every five years and in conjunction with any GSP amendments. The initial five-year GSP evaluation is due to DWR in 2027. It is assumed that any Plan amendments will be timed such that only one GSP assessment will be performed per five-year period. GSP evaluations will require the activities described in the following subsections.

7.1.7.1 Numerical Model Updates and Simulations

Prior to performing each five-year GSP evaluation, the numerical flow model used to support GSP development will be updated. The updated model will help inform ongoing performance assessment of the SMC. Periodic updates to the groundwater model will be required to continue to refine and improve its capabilities and maintain ongoing functionality. This includes incorporating new model tools and features, updates to data, and updates to calibration. The model will be an important tool to inform the evaluation of GSP implementation over time. Numerical model updates will be performed by United as part of the activities undertaken to achieve its mission. Therefore, there are no anticipated costs to MBGSA for model updates. Model simulations requested by MBGSA will be performed by United (for a

fee) or a consultant. Therefore, estimated costs for model simulations are included in the GSP implementation budget.

7.1.7.2 GSP Evaluation

SGMA regulations require submittal of written evaluation of the GSP to DWR at least once every five years. The GSP evaluation requirements are presented in GSP Emergency Regulations §356.4. In general, the GSP evaluation must include a description of groundwater conditions relative to each sustainability indicator, discussion of GSP implementation, proposed revisions to the Basin setting, SMC in light of new information or changes in water use, assessment of the monitoring networks, regulatory actions taken by MBGSA, summary of coordination with agencies located within the Basin and in adjacent basins, and a description of any proposed or adopted GSP amendments. It is anticipated the GSP evaluation will be prepared by the Executive Director in coordination with United staff and with consultant support. The cost of the first GSP evaluation is anticipated to be greater than the cost for subsequent reports because the first evaluation must be developed from scratch.

7.1.7.3 GSP Amendments

To control costs, MBGSA will seek to perform any Plan amendments in conjunction with the required five-year evaluations. Pertinent sections of the GSP will be amended, as appropriate, based on new information, groundwater conditions and monitoring results, water use, land use changes, land use plan updates, and groundwater conditions and management status of adjacent basins. It is anticipated the GSP evaluation will be prepared by the Executive Director in coordination with United staff and with consultant support.

7.1.8 Respond to DWR GSP Evaluations and Assessments

MBGSA will respond to DWR comments on the initial GSP and requests for additional information following its review of the adopted GSP. It is assumed that DWR comments on the initial GSP will be received and addressed during fiscal year 2024. MBGSA will respond to DWR comments and requests for information associated with its subsequent five-year GSP assessments. It is anticipated the GSP evaluation will be prepared by the Executive Director in coordination with United staff and with consultant support.

7.1.9 Contingencies

Contingency is included in the budget in recognition that the GSP implementation is new and there is potential for unanticipated expenses. For the purposes of conservatively estimating the cost to implement the GSP, the budget estimate includes a 10% contingency based upon the annual fiscal year budget estimate. The actual need for contingency will be reviewed during each annual budgeting process. It is anticipated the contingency needs will be reduced over time as MBGSA becomes more certain about ongoing GSP implementation costs.

7.1.10 Financial Reserves

Prudent financial management requires that MBGSA carry a general reserve in order to manage cash flow. General reserves have no restrictions on the types of expenses they can be used to fund. Current Board Direction policy on reserve level is $25,000.

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7.2 Total Estimated Implementation Costs Through 2042 [§354.6(e)]

§354.6 Agency Information. *When submitting an adopted Plan to the Department, the Agency shall include a copy of the information provided pursuant to Water Code Section 10723.8, with any updates, if necessary, along with the following information:*

(e) *An estimate of the cost of implementing the Plan and a general description of how the Agency plans to meet those costs.*

GSP implementation costs are presented in Table 7.1-01. The estimated cost is presented by budget categories discussed in Section 7.1. The estimated total cost of the GSP implementation over the 20-year planning horizon is [$7,002,188]. Costs through the first five-year assessment periods are also provided as subtotal, and are estimated to be [1,937,618]. The annual costs include an annual rate of inflation of 3.0% factored into the cost projections. These estimated costs are based on the best available information at the time of Plan preparation and submittal. It represents the MBGSA's current understanding of Basin conditions and the current roles and responsibilities of the MBGSA under SGMA.

7.3 Funding Sources and Mechanisms [§354.6(e)]

§354.6 Agency Information. *When submitting an adopted Plan to the Department, the Agency shall include a copy of the information provided pursuant to Water Code Section 10723.8, with any updates, if necessary, along with the following information:*

(e) *An estimate of the cost of implementing the Plan and a general description of how the Agency plans to meet those costs.*

Funding for GSP implementation will be obtained from groundwater extraction fees charged to groundwater users in the Basin. This funding approach has been used since the MBGSA's formation. This funding approach will be reevaluated over time as the GSP implementation progresses. The MBGSA obtained a $760,000 Proposition 1 Sustainable Groundwater Planning Grant from DWR to fund, in part, the development of the GSP. In addition, the Site A monitoring wells planned for construction in 2021 is being funded by DWR's TSS program. MBGSA will continue to pursue funding from state and federal sources to support GSP planning and implementation.

7.4 Implementation Schedule [§354.44(b)(4)]

§354.44 Projects and Management Actions.

(b) *Each Plan shall include a description of the projects and management actions that include the following:*

(4) *The status of each project and management action, including a time-table for expected initiation and completion, and the accrual of expected benefits.*

The GSP is anticipated to be presented to the MBGSA Board for adoption in December 2021 and will be submitted to DWR no later than January 31, 2022. Many of the budget categories consist of ongoing tasks and efforts that will be conducted throughout GSP implementation. GSP reporting will occur on an annual basis, with reports for the preceding water year due to DWR by April 1. Periodic evaluations (every five

years) and associated GSP amendments will be submitted to DWR by April 1 at least every five years (2027, 2032, 2037, and 2042).

The proposed monitoring well clusters are scheduled for construction in 2021, 2026, and 2032, but it is noted that site identification, access agreements, and permitting will take place in the years immediately preceding construction. Then first well scheduled for 2021 construction will be paid for by DWR's TSS program (Site A on Figures 5.3-01 through 5.3-04). Due to the significant construction costs for the remaining monitoring wells, it is anticipated that the second well (Site B) will be constructed during fiscal year 2026 to provide time to accumulate funding. If necessary, the third well (Site C) would be constructed in 2032 to provide time to accumulate funding after completing the second well[2].

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2 Because this well is not needed for establishing minimum thresholds and measurable objectives, this well does not need to be constructed before first five-year GSP assessment.

8.0 References and Technical Studies [§354.4(b)]

§354.4 General Information.

(b) *Each Plan shall include the following general information: A list of references and technical studies relied upon by the Agency in developing the Plan. Each Agency shall provide to the Department electronic copies of reports and other documents and materials cited as references that are not generally available to the public.*

Alta Mutual Water Company (Alta MWC). 2020, telephone conversation between John Lindquist (United Water Conservation District) and Bryan Bondy (Alta Mutual Water Company), April 2020.

Burton, C.A., Montrella, J., Landon, M.K., and Belitz, K. 2011, Status and understanding of groundwater quality in the Santa Clara River Valley, 2007—California GAMA Priority Basin Project: U.S. Geological Survey Scientific Investigations Report 2011–5052, 86 p.

California Department of Conservation. 2018. Farmland Mapping and Monitoring Program Web Site (https://www.conservation.ca.gov/dlrp/fmmp/Pages/Index.aspx).

California Natural Resources Agency. 2020. Natural Communities Commonly Associated with Groundwater data portal (https://data.cnra.ca.gov/dataset/natural-communities-commonly-associated-with-groundwater).

California Water Foundation. 2014. Land Subsidence from Groundwater Use in California, California Water Foundation Subsidence Resources Group, April.

Casitas Municipal Water District (Casitas MWD). 2021. 2020 Urban Water Management Plan. Adopted by the Board of Directors June 23.

City of Oxnard. 2014. City of Oxnard 2030 General Plan Map. Prepared by Salvador Mancha. Revised September 11.

City of Ventura. 2005. 2005 Ventura General Plan. Adopted August 8. Resolution Nos2005-072 and 2005-073. Available at: https://www.cityofventura.ca.gov/DocumentCenter/View/1805/2005-Ventura-General-Plan PDF?bidId=.

County of Ventura. 2020. Ventura County 2040 General Plan. Adopted September 15. Available at https://vc2040.org/review/documents.

Daniel B. Stephens & Associates, Inc. (DBSA). 2017. Santa Paula Basin Hydrogeologic Characterization and Safe Yield Study, Ventura County, California, May.

Department of Toxic Substances Control (DTSC). 2020. California. Envirostor mapping website. Available at www.envirostor.dtsc.ca.gov.

Department of Water Resources (DWR), 1959, Bulletin No. 75: Water Quality and Water Quality Problems, Ventura County, February.

_____. 2010. California Statewide Groundwater Elevation Monitoring (CASGEM) Program Procedures for Monitoring Entity Reporting, December.

_____. 2014. Summary of Recent, Historical, and Estimated Future Land Subsidence in California.

DRAFT

_____. 2016a. Guidance Document for the Sustainable Management of Groundwater, Groundwater Sustainability Plan (GSP) Annotated Outline. Prepared for the Sustainable Groundwater Management Program. December.

_____. 2016b. BMP 1, Best Management Practices for the Sustainable Management of Groundwater—Monitoring Protocols, Standards, and Sites BMP, December.

_____. 2016c. BMP 2, Best Management Practices for the Sustainable Management of Groundwater—Monitoring Networks and Identification of Data Gaps BMP, December.

_____. 2017. BMP 6, Best Management Practices for Sustainable Management Criteria DRAFT. November 6.

_____. 2018. Guidance Document for the Sustainable Management of Groundwater Guidance for Climate Change Data Use During Groundwater Sustainability Plan Development. July.

_____. 2019. Sustainable Groundwater Management Act 2019 Basin Prioritization—Process and Results, April.

_____. 2020. SGMA Data Viewer Web-based geographic information system (GIS) viewer. Available at (https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#landsub

_____. 2021a. California's Groundwater, Bulletin 118, Update 2020. December 22.

_____. 2021b. Sustainable Groundwater Management Act Water Year Type Dataset Development Report, January (dataset available at https://data.cnra.ca.gov/dataset/sgma-water-year-type-dataset).

Dibblee, T.W. 1988. Geologic Map of the Ventura and Pitas Point Quadrangles, Ventura County, California, edited by Helmut E. Ehrenspeck, published in cooperation with California Dpartment of Conservation, Division of Mines and Geology; and U.S. Geological Survey.

_____. 1992. Geologic Map of the Saticoy Quadrangle, Ventura County, California, edited by Helmut E. Ehrenspeck, published in cooperation with California Dpartment of Conservation, Division of Mines and Geology; and U.S. Geological Survey.

Driscoll, F.G. 1986. Groundwater and Well. 2nd Edition, Johnson Division, St Paul, 1089.

Dudek. 2019. Groundwater Sustainability Plan for the Oxnard Subbasin to the Fox Canyon Groundwater Management Agency, December.

Fugro West, Inc (Fugro West). 1996. Calendar Year 1995 Annual Report, Mound Groundwater Basin, Ventura County, California, unpublished consultant's report prepared for City of San Buenaventura, January.

Geotechnical Consultants, Inc. (Geotechnical Consultants). 1972. Hydrogeologic Investigation of the Mound Groundwater Basin for the City of San Buenaventura, California, unpublished consultant's report prepared for City of San Buenaventura.

Greene, Gary H., Wolf, Steve C., Blom, Ken G. 1978, The Marine Geology of the Eastern Santa Barbara Channel with Particular Emphasis on the Ground Water Basins Offshore from the Oxnard, Plain, Southern California, U.S. Geological Survey Open-File Report 78-305.

Gutierrez, C., Siang, S., and Clahan, K. 2008, Geologic Map of the East Half Santa Barbara 30' x 60' Quadrangle, California, California Geological Survey, January.

Hanson, R.T., Martin, P., Koczot, K.M., 2003, Simulation of ground-water/surface water flow in the Santa Clara-Calleguas ground-water basin, Ventura County, California, U.S. Geological Survey Water-Resources Investigations Report 02-4136, 214p, (https://pubs.er.usgs/usgspubs/wri/wri024136).

Heath, R.C., 1983, Basic Ground-Water Hydrology—U.S. Geological Survey Water-Supply Paper 2220.

Hevesi, J.A., and Johnson, T.D., 2016, Estimating Spatially and Temporally Varying Recharge and Runoff from Precipitation and Urban Irrigation in the Los Angeles Basin, California: U.S. Geological Survey Scientific Investigations Report 2016–5068, 192 p., http://dx.doi.org/10.3133/sir20165068.

Hopkins, J. 1994. Explanation of the Texas Water Development Board groundwater level monitoring program and water-level measuring manual: UM-52.

Hopkins Groundwater Consultants, Inc. (Hopkins). 2009. Mound Well No. 2 Siting Study, Ventura, California. Prepared for City of San Buenaventura.

_____. 2018, Preliminary Hydrogeological Study—Phase 3 Santa Clara River Estuary Groundwater Special Study, Ventura, California, prepared for City of San Buenaventura, February.

_____. 2020. Final Draft Preliminary Hydrogeological Study—Mound Basin Groundwater Conditions and Perennial Yield Study, prepared for City of San Buenaventura, March.

Isherwood, J.D., and Pillsbury, A.F. 1958. Shallow Ground Water and Tile Drainage in the Oxnard Plain, in Transactions of the American Geophysical Union, Vol. 39, No. 6, p. 1101-1110.

John F. Mann Jr. & Associates. 1959. A Plan for Groundwater Management—United Water Conservation District.

Kennedy/Jenks Consultants. 2011. 2010 Urban Water Management Plan for the City of Ventura-Ventura Water, June.

_____. 2016. 2015 Urban Water Management Plan for City of Ventura, June.

_____. 2021a. 2020 Urban Water Management Plan for City of Ventura, May.

_____. 2021b. 2020 Water Shortage Event Contingency Plan, April.

Klausmeyer, K., Howard J., Keeler-Wolf T., Davis-Fadtke K., Hull R., and Lyons, A. 2018. Mapping Indicators of Groundwater Dependent Ecosystems in California: Methods Report.

McDonald, M.G., and Harbaugh, A.W. 1988. A modular three-dimensional finite-difference ground-water flow model, U.S. Geological Survey Techniques of Water-Resources Investigations 06-A1.

Mukae, M. and Turner, J.M. 1975. Ventura County Water Resources Management Study-Geologic Formations, Structures and History in the Santa Clara Calleguas Area, January.

Natural Resource Conservation Service (NRCS). 2020. United States Department of Agriculture, Soils Online Database, (https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx)

Paso Robles Groundwater Sustainability Agency (Paso Robles GSA). 2020. Paso Robles Subbasin Groundwater Sustainability Plan. Prepared for: Paso Robles Subbasin Cooperative Committee and the Groundwater Sustainability Agencies. January 31.

DRAFT

Pollock, D.W. 2016. User guide for MODPATH Version 7 -- A particle-tracking model for MODFLOW: U.S. Geological Survey Open-File Report 2016-1086, 35 p., http://dx.doi.org/10.3133/ofr20161086.

Regional Water Quality Control Board –Los Angeles District (RWQCB –LA). 2013, Basin Plan – Chapter 3. Water Quality Objectives. April 19.

_____. 2019. Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties.

S.S. Papadopulos & Associates, Inc. (SSP&A). 2020. Mound Basin Water Quality and Isotope Study, Ventura County, California, prepared for the Mound Basin Groundwater Sustainability Agency, February.

Save Open Space and Agricultural Resources (SOAR). 2015. SOAR Voter Initiatives: Measure to Extend From 2020 through 2050 the Requirement That Changes to County's General Plan Land Use Designations, Goals and Policies for Open Space, Agricultural, and Rural Lands in the Unincorporated Area Be Approved By a Vote of the People. Available at https://www.soarvc.org/wp-content/uploads/2016/09/Ventura-County-Initiatives.pdf.

Sneed, M., Brandt, J., and Solt, M. 2013. Land subsidence along the Delta-Mendota Canal in the northern part of the San Joaquin Valley, California, 2003–10: U.S. Geological Survey Scientific Investigations Report 2013–5142, 87 p. (http://dx.doi.org/10.3133/sir20135142)

Sneed, M. 2020, personal communication, July 24, 2020.

Sophocleous, M. 1983. Groundwater observation network design for the Kansas groundwater management districts, USA: Journal of Hydrology, vol.61, pp 371-389.

Southern California Association of Governments. 2008. SCAG GIS Open Data Portal (http://gisdata-scag.opendata.arcgis.com/)

State Water Resources Control Board (SWRCB). California. 2020. GeoTracker mapping site available at https://geotracker.waterboards.ca.gov/

Stillwater Sciences. 2011. City of Ventura Special Studies, Estuary Subwatershed Study Assessment of the Physical and Biological Condition of the Santa Clara River Estuary, Ventura County, California, Amended Final Report. Prepared for City of Ventura. September.

Stillwater Sciences, 2018, Final Report, City of Ventura Special Studies—Phase 3: Assessment of the Physical and Biological Conditions of the Santa Clara River Estuary, Ventura County, California, dated February 2018.Sylvester, A.G., and Brown, G.C. 1988. Santa Barbara and Ventura Basins; Tectonics, Structure, Sedimentation, Oilfields along an East-West Transect: Coast Geological Society Guidebook 64, Ventura, California, 167 p.

Sylvester, A.G., and Brown, G.C. 1988. Santa Barbara and Ventura Basins; Tectonics, Structure, Sedimentation, Oilfields along an East-West Transect: Coast Geological Society Guidebook 64, Ventura, California, 167 p.

The Nature Conservancy (TNC). 2018. Groundwater Dependent Ecosystems under the Sustainable Groundwater Management Act—Guidance for Preparing Groundwater Sustainability Plans, January.

_____. 2019. Identifying GDEs Under SGMA, Best Practices for Using the NC Dataset. July.

DRAFT

_____. 2020. Groundwater Resource Hub: GDE Rooting Depths Database. Available for download at https://groundwaterresourcehub.org/sgma-tools/gde-rooting-depths-database-for-gdes/

Towill, Inc. (Towill). 2020. InSAR Data Accuracy for California Groundwater Basins, CGPS Data Comparative Analysis, January 2015 to September 2019. Prepared for California Department of Water Resources. March 23.

TRE Altamira, Inc. 2020. InSAR Land Surveying and Mapping Services in Support of the DWR SGMA Program Technical Report. March.

Turner, J.M. 1975. Aquifer delineation in the Oxnard-Calleguas area, Ventura County, in Compilation of Technical Information Records for the Ventura County Cooperative Investigation: California Department of Water Resources, 28 p.

UNAVCO. 2020. VNCO Station Page. Available at https://www.unavco.org/instrumentation/networks/status/nota/overview/vnco.

United States Geological Survey (USGS). 1949. Geologic Map of the Oxnard 7.5' Quadrangle.

_____. 1951. Geologic Map of the Ventura 7.5' Quadrangle.

_____. 1967. Geologic Map of the Saticoy 7.5' Quadrangle.

_____. 2003a. Simulation of ground-water/surface water flow in the Santa Clara-Calleguas ground-water basin, Ventura County, California. Prepared by Hanson, R.T., Martin, P., Koczot, K.M. U.S. Geological Survey Water-Resources Investigations Report 02-4136, 214p, (https://pubs.er.usgs/usgspubs/wri/ wri024136).

_____. 2003b. Geologic Map of the Oxnard 7.5' Quadrangle.

_____. 2003c. Geologic Map of the Ventura 7.5' Quadrangle.

_____. 2004. Geologic Map of the Saticoy 7.5' Quadrangle.

United Water Conservation District (United). 2012. Hydrogeologic Assessment of the Mound Basin, United Water Conservation District Open-File Report 2012-01, May.

_____. 2013. Technical Memorandum: Infiltration Potential of Precipitation Falling on Developed Lands and the Fate of Applied Groundwater within UWCD, dated June 2013, 20 p.

_____. 2017a. 2015 Santa Paula Basin Annual Report, United Water Conservation District Professional Paper 2017-01, March.

_____. 2017b. Groundwater and Surface Water Conditions Report - 2015, United Water Conservation District Open-File Report 2017-01, March.

_____. 2018. Ventura Regional Groundwater Flow Model and Updated Hydrogeologic Conceptual Model: Oxnard Plain, Oxnard Forebay, Pleasant Valley, West Las Posas, and Mound Basins, United Water Conservation District Open-File Report 2018-02, July.

_____. 2020. Santa Paula-Mound-Forebay Basin Boundary TDEM Geophysical Survey, United Water Conservation District Open-File Report 2020-01, March.

_____. 2021a. Ventura Regional Groundwater Flow Model Expansion and Updated Hydrogeologic Conceptual Model: Santa Paula, Fillmore, and Piru Groundwater Basins, United Water Conservation District Open-File Report 2021-01, (month).

DRAFT

_____. 2021b. Ventura Regional Groundwater Flow Model 2016-2019 Validation: Piru, Fillmore, Santa Paula, Mound, Oxnard, Pleasant Valley, and West Las Posas Valley Basins, United Water Conservation District Open-File Report 2021-02, April.

_____. 2021c. Technical Memorandum—Implementation of Groundwater Model Inputs for Simulations in Support of Groundwater Sustainability Plan Development by the Mound, Fillmore, and Piru Groundwater Sustainability Agencies, April.

Ventura County Watershed Protection District (VCWPD). 2018. Ventura County Resilient Coastal Adaptation Project Sea Level Rise Vulnerability Assessment, Appendix A-1. Map Atlas and Sector Profile Results. Available at: https://docs.vcrma.org/images/pdf/planning/programs/vcrcap/Appendix_A_SectorMaps_Part1.pdf December 14, 2018

_____. 2021. Web-based Hydrologic Data Server (Hydrodata). Available at: https://www.vcwatershed.net/hydrodata/

Ventura Water. 2020a. Spreadsheet titled "Historical Water Production in Acre-Feet – with Corrections and Rounded," provided by Jennifer Tribo (Ventura Water) via e-mail on March 3, 2020.

_____. 2020b. 2020 Comprehensive Water Resources Report—FINAL Report, April. Watershed Coalition of Ventura County.

Watersheds Coalition of Ventura County (WCVC). 2019. IRWM (Integrated Regional Water Management) Plan. Adopted in 2014. Amended in 2019. Available at http://wcvc.ventura.org/IRWMP/2019IRWMP.htm.

Weber, F.H., Kiessling, E.W., Sprotte, E.C., Johnson, J.A., Sherburne, R.W., and Cleveland, G.B. 1976. Seismic hazards study of Ventura County, California: California Department of Conservation, California Division of Mines and Geology Open-File Report 76-5, 396 p., pls. 3A and 3B.

Yeats, R.S., Clark, M.N., Keller, E.A., and Rockwell, T.K. 1981. Active Fault Hazard in Southern California: Ground Rupture Versus Seismic Shaking: Geol. Soc. America Bull, Part 1, v. 92, p. 189-196.

Yerkes, R.F., Sarna-Wojcicki, A.M., and La Joie, K.R. 1987. Recent Reverse Faulting in the Transverse Ranges, California: U.S. Geological Survey Professional Paper 1339, 203 p.

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FIGURES

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3-1 Introduction

This chapter will describe the responsibilities of the District Biologist, the definition of waters of the United States (U.S.) and State, including wetlands, how and why these resources are regulated, and the general procedures that should be implemented by the Biologist when dealing with effects to these resources. For purposes of clarity, the term “waters” will be used in this document to describe all waters of the U.S. and State as defined below in Section 3.3. For additional guidance concerning federal and state laws, regulations, Executive Orders, Caltrans procedures, and supplemental information regarding wetland and waters, refer to Volume 1, Chapter 15, Waters of the U.S. and the State.

3-2 Biologist's Role

The District Biologist acts as the liaison between Caltrans and resource and regulatory agencies, such as the U.S. Army Corps of Engineers (USACE), who are responsible for approving actions that affect waters. The District Biologist is responsible for being aware of the regulatory procedures required for identifying

these resources. In addition, the Biologist must have a basic understanding of wetland/waters ecology in order to determine the extent of potential effects and to design appropriate mitigation or compensation activities.

The District Biologist is a member of the Project Development Team (PDT) with varied responsibilities that frequently go beyond the environmental analysis process. With regard to waters, the overall processes that involve the Biologist are listed below.

- Perform field reviews of the project, as needed, to determine whether waters are present.
- Map or delineate these resources and submit a report to the USACE documenting results and requesting verification of the determination.
- Submit the report to the Natural Resources Conservation Service (NRCS) documenting results and requesting verification of the determination when agricultural lands are being converted to other land uses such as development, roads, and utility lines.
- Provide mapping to the Project Manager and discuss methods to avoid, minimize, or mitigate (compensate for) potential effects to these resources.
- Coordinate with resource and regulatory agency staff to discuss potential project effects and methods to avoid, minimize, or mitigate potential effects to these resources. Where possible, written agreement is obtained from agency staff regarding proposed methods.
- Confirm implementation of avoidance, minimization, and mitigation activities during and/or prior to construction of the transportation project.
- Where required, monitor or provide monitoring oversight for habitat mitigation activities.
- Report monitoring results to resource and regulatory staff as required.

3-3 Waters of the U.S. and the State Defined

3-3.1 Waters of the U.S.

The term "waters of the U.S." (PDF) has broad meaning and incorporates both deep-water aquatic habitats and special aquatic sites, including wetlands. This section defines the term “waters of the U.S.” as it applies to the jurisdictional limits of the authority of the USACE under the Clean Water Act (CWA). It prescribes the policy, practice, and procedures to be used in determining the extent of jurisdiction of the USACE concerning “waters of the U.S.”

The lateral limits of jurisdiction of waters may be divided into three categories. The categories include the territorial seas, tidal waters, and nontidal waters (see 33 CFR 328.4 (PDF), (a), (b), and (c), respectively). More specifically, 33 CFR 328.3(a) (PDF) provides the following clear definition of Waters of the U.S.

The term waters of the U.S. means (1) All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all water which are subject to the ebb and flow of the tide; (2) All interstate waters including interstate wetlands; (3) All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters: (i) Which are or could be used by interstate or foreign travelers for recreational or other purposes; or (ii) From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or (iii) Which are used or could be used for industrial purposes by industries in interstate commerce; (4) All impoundments of waters otherwise defined as waters of the U.S. under this definition; (5) Tributaries of waters identified in paragraphs (1)-(4); (6) The territorial seas; (7) Wetlands adjacent to waters (other than waters that are themselves wetland) identified in paragraphs (1)-(6).

Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of the CWA (other than cooling ponds as defined in 40 CFR § 123.11(m) which also meet the criteria of this definition) are not waters of the U.S. 33 CFR § 328.3(a) (PDF); 40 CFR § 230.3(s) (PDF).

Adjacent wetlands subject to CWA Section 404 jurisdictions are those that are bordering, contiguous, or neighboring to other waters of the U.S. Frequently, the term "wetlands and other waters of the U.S." is used when describing areas under USACE jurisdiction.

Waters of the U.S. includes essentially all surface waters such as all navigable waters and their tributaries, all interstate waters and their tributaries, all wetlands adjacent to these waters, and all impoundments of these waters.

3-3.2 Wetlands Defined

Wetlands are driven by hydrology and occur where water is present near the soil surface resulting in soil and plant characteristics that are not found in upland (mostly dry) or aquatic (almost always wet and un-vegetated) habitats. Wetlands are generally found in transition zones between upland and aquatic habitats.

For the regulatory process, the USACE and U.S. Environmental Protection Agency (EPA) jointly define wetlands as follows:

"Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (EPA, 40 CFR 230.3 and USACE, 33 CFR 328.3)."

For addressing federal permit issues, Caltrans recognizes this definition and uses it in the assessment of biological effects of transportation projects. The USACE, U.S. Fish and Wildlife Service (FWS), California Coastal Commission (CCC), and Regional Water Quality Control Board (RWQCB) review and approve the permits most frequently required for projects which will affect these resources.

Regulatory changes and/or litigation may result in modification of the definition of waters of the U.S. and State, including wetlands; therefore, the District Biologist or other users of the Standard Environmental Reference (SER), Volume 1 and Volume 3, must use the latest guidance from the USACE.

3-3.3 Waters of the State

The number of wetland definitions contained in state law for planning and regulatory purposes has expanded significantly over the years. The term “Waters of the State” is an attempt to capture all the various aquatic resources regulated by numerous state agencies. It includes rivers, streams, lakes, wetlands, mudflats, vernal pools, and other aquatic sites.

There have been attempts to codify a single State of California definition of “wetlands” that could be used by all state agencies; however, this has not been achieved to date. Each agency is bound by their laws, regulations and policy. Each maintains their own definition of a “wetland.”

For example, the California Department of Fish and Wildlife (CDFW) found the FWS wetland definition and classification system to be the most biologically valid. The FWS definition includes swamps; freshwater, brackish water, and saltwater marshes; bogs; vernal pools; periodically inundated saltflats; intertidal mudflats; wet meadows and pastures; springs and seeps; and portions of lakes, ponds, rivers and streams. CDFW staff use this definition as a guide in identifying wetlands while conducting on-site inspections for implementing the Fish and Game Commission’s wetlands policy.

Waters found in the “coastal zone” are regulated under the California Coastal Act of 1976 and the federal Coastal Zone Management Act of 1972 (CZMA), and are within the jurisdiction of the California Coastal Commission (CCC). Under the Coastal Act, wetlands are defined as “land within the coastal zone which may be covered periodically or permanently with shallow water and include saltwater marshes, freshwater marshes, open or closed brackish water marshes, swamps, mudflats, and fens.” This statutory definition has been expanded upon in the Coastal Commission’s regulations as: “...land where the water table is at, near, or above the land surface long enough to promote the formation of hydric soils or to support the growth of hydrophytes, and shall also include types of wetlands where vegetation is lacking and soil is poorly developed or absent as a result of frequent drastic fluctuations of surface water levels, wave action, water flow, turbidity or high concentration of salts or other substances in the substrate. Such wetlands can be recognized by the presence of surface water or saturated substrate at some time during each year and their location within, or adjacent to vegetated wetland or deep water habitats.” (14 CCR 13577)

Waters in the San Francisco Bay, however, do not lie within the Coastal Commissions jurisdiction and are managed by the San Francisco Bay Conservation and Development Commission (BCDC). The primary law governing the BCDC, the McAteer-Petris Act, does not define wetlands, but does outline the BCDC’s geographical jurisdiction respective to wetlands. BCDC defines jurisdictional wetlands as “managed wetlands consisting of all areas which have been diked off from the bay and have been maintained during the three years immediately preceding the effective date of the amendment of this section during the 1969 Regular Session of the Legislature as a duck hunting preserve, game refuge or for agriculture. (Government Code Section 66610(b)).

As previously stated, regulatory changes and/or litigation may result in modification of the definition of waters of state; therefore, the District Biologist, or other users of the SER, must use the latest guidance from USACE.

3-3.4 CWA Jurisdiction Under Rapanos

The definition of Waters of the U.S. and the State, have been controversial due to conflicting court decisions. In 2008, the EPA and USACE issued revised joint guidance interpreting the bounds of CWA jurisdictions following the 2006 Supreme Court case, Rapanos v. United States. The revised guidance replaces a previous policy issued in June 2007 and clarifies the 2006 Supreme Court decision in Rapanos. In the Rapanos case, the Supreme Court considered where the Federal government can apply the CWA, specifically by determining whether a wetland or tributary is a "water of the U.S." The Court was divided on these issues, creating two vastly different tests for CWA jurisdiction.

Four justices, in a plurality opinion authored by Justice Scalia, rejected the argument that the term "waters of the U.S. is limited to only those waters that are navigable in the traditional sense and their abutting wetlands. However, the plurality concluded that the agencies' regulatory authority should extend only to "relatively permanent, standing or continuously flowing bodies of water" connected to traditional navigable waters, and to "wetlands with a continuous surface connection to" such relatively permanent waters. Justice Kennedy did not join the plurality's opinion but instead authored an opinion concurring in the judgment vacating and remanding the cases to the Sixth Circuit Court of Appeals. Justice Kennedy agreed with the plurality that the statutory term "waters of the U.S." extends beyond water bodies that are traditionally considered navigable. Justice Kennedy, however, found the plurality's interpretation of the scope of the CWA to be "inconsistent with the Act's text, structure, and purpose" and he instead presented a different standard for evaluating CWA jurisdiction over wetlands and other water bodies. Justice Kennedy concluded that wetlands are "waters of the U.S." "if the wetlands, either alone or in combination with similarly situated lands in the region, significantly affect the chemical, physical, and biological integrity of other covered waters more readily understood as 'navigable.' When, in contrast, wetlands' effects on water quality are speculative or insubstantial, they fall outside the zone fairly encompassed by the statutory term 'navigable waters.'
Despite the substantial differences between the two Rapanos opinions, the joint guidance instructs the EPA and USACE to assert CWA jurisdiction when either opinion is met. Due to the Rapanos case, wetland/waters delineation reports should document hydrologic connections between the wetland and waters of the U.S. Special aquatic sites that receive special protection during the Section 404 permitting process should also be identified in delineations. In addition to wetlands, special aquatic sites include sanctuaries and refuges, mudflats, vegetated shallows, coral reefs, and riffle and pool complexes (40 CFR 230.40 et seq.).

3-3.5 Commonly Found Waters of California

In California, wetlands are commonly classified according to the length of time that an area is inundated or saturated by water, or by the types of plants and animals an area supports. For example, if an area is only saturated or inundated for part of the year, it can be classified as a seasonal or perennial wetland. Likewise, areas that are inundated or saturated throughout the entire year may be referred to as a permanent wetland.

The following are common types of waters found in California:

Freshwater: These areas may be permanent or seasonal, inland or coastal. This category includes riparian, or streamside areas, marshes, seeps, montane mountain meadows, and vernal pools. In some cases, wetlands may also occur within riparian settings above the wettest portions of the streambed areas subject to saltwater influence in coastal settings support vegetation adapted to brackish conditions. Alkaline conditions may support vegetation similar to that found in areas influenced by saltwater.

Saltwater: Coastal marsh, subject to full tidal action, occurs along the coast of California. Tidal marshes can be found along protected coastlines in middle and high latitudes worldwide. Some are freshwater marshes, others are brackish (somewhat salty), and still others are saline (salty), but they are all influenced by the motion of ocean tides. Tidal marshes are normally categorized into two distinct zones, the lower or intertidal marsh and the upper or high marsh. In saline tidal marshes, the lower marsh is normally covered and exposed daily by the tide.

Non-tidal marshes also exist, and are the most prevalent and widely distributed wetland/waters in North America. They are mostly freshwater marshes, although some are brackish or alkaline. They frequently occur along streams in poorly drained depressions, and in the shallow water along the boundaries of lakes, ponds, and rivers. Water levels in these wetland/waters generally vary from a few inches to two or three feet, and some marshes, like prairie potholes, may periodically dry out completely.

Vernal Pools/Seasonal Wetlands: Vernal pools are seasonal depressional wetlands that occur under the Mediterranean climate conditions of the West Coast. They are covered by shallow water for variable periods from winter to spring, but may be completely dry for most of the summer and fall. These

wetlands range in size from small puddles to shallow lakes and are usually found in a gently sloping plain of grassland. Although generally isolated, they are sometimes connected to each other by small drainages known as vernal swales. Beneath vernal pools lies either bedrock or a hard clay layer in the soil that helps keep water in the pool.

3-4 Federal Agencies

The following table provides a summary of the Federal agencies that regulate activities in waters of the U.S.

Agency	Regulation	Authority
U.S. Army Corps of Engineers (USACE)	Clean Water Act (CWA), Section 404	Regulates placement of dredged or fill material into waters of the U.S.
	Rivers and Harbors Act of 1899, Section 10	Regulates work in navigable waters of the U.S. and authorizes construction, dumping, and dredging permits
	National Environmental Policy Act (NEPA)	Cooperating Agency
U.S. Environmental Protection Agency (EPA)	CWA	Enforcement of regulations; may enforce violations of USACE 404 permits
	NEPA	Cooperating Agency
U.S. Fish and Wildlife Service (FWS)	Fish and Wildlife Coordination Act	Reviews/comments on Federal actions that affect waters, including Section 404 permit applications
	Federal Endangered Species Act (FESA)	USACE must consult with FWS if listed species or habitat is present on site
	NEPA	Cooperating Agency
National Marine Fisheries Service (NMFS)	Fish and Wildlife Coordination Act	Reviews/comments on Federal actions that affect waters, including Section 404 permit applications
	Federal Endangered Species Act (FESA)	USACE must consult with NMFS if listed marine species or habitat are present on site
	NEPA	Cooperating Agency
U.S. Coast Guard (USCG)	Rivers and Harbors Act of 1899, Section 9	Approves the location and plans of bridges and causeways across navigable waters by authorizing a Bridge Permit
Natural Resources Conservation Service (NRCS)	Food Security Act of 1985 (Swampbuster)	Approves wetland/waters determinations on agricultural land
	CWA, Section 404	Regulates placement of dredged or fill material into waters of the U.S. and State, including agricultural lands

Federal Regulatory Agencies

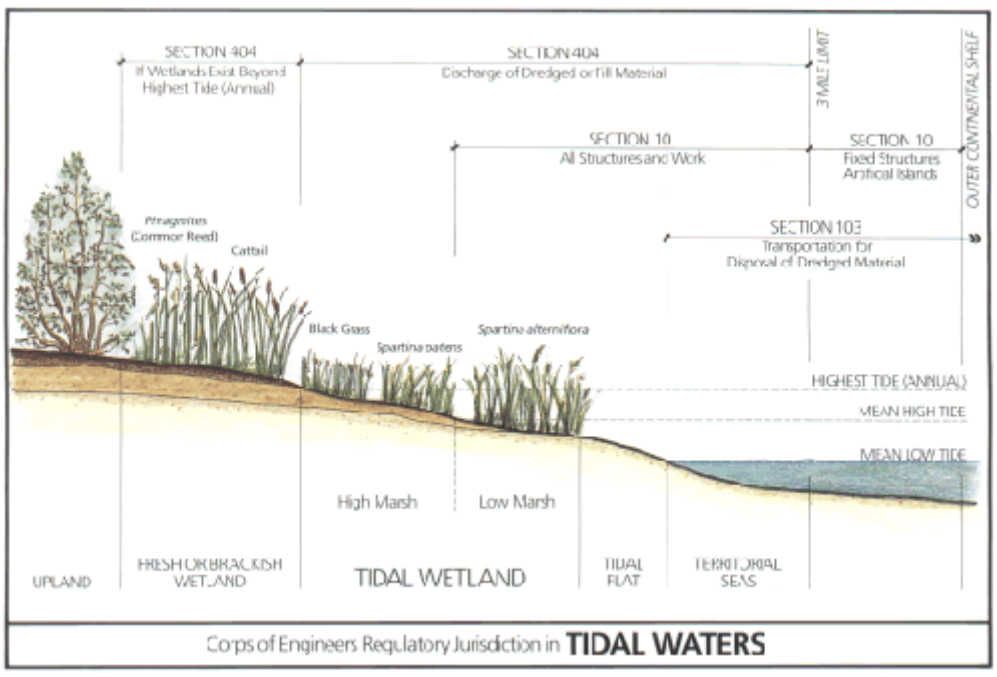
3-4.1 U.S. Army Corps of Engineers (USACE)

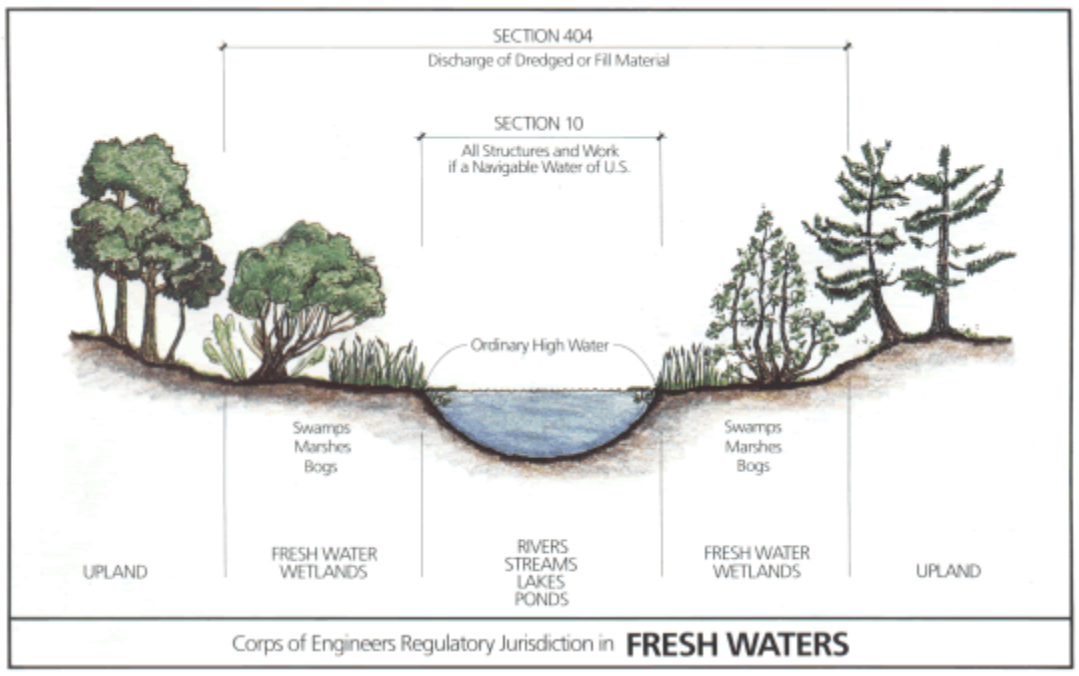
USACE is primarily responsible for implementing the CWA Section 404 program. Section 404 of the CWA establishes a permit program administered by USACE which regulates the discharge of dredged or fill material into waters of the U.S. Section 404(b)(1) guidelines allow the discharge of dredged or fill material into the aquatic system only if there is no practicable alternative which would have less adverse effects. Implementing regulations by USACE are found at 33 CFR Parts 320-330.

The purpose of the USACE and Section 404 program is to ensure that the physical, biological, and chemical quality of our nation's water is protected from irresponsible and unregulated discharges of dredged or fill material that could permanently alter or destroy these valuable resources. The USACE Regulatory Program administers and enforces Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the CWA. Under the Rivers and Harbors Act, Section 10, a permit is required for work or structures in, over or under navigable waters of the U.S. Under CWA, Section 404, a permit is required for the discharge of dredged or fill material into waters of the U.S. Many water bodies in the nation are waters of the U.S, as described in section 3-3, and are subject to the USACE regulatory authority.

The USACE regulatory authority under the Rivers and Harbors Act of 1899 is limited to traditional "navigable waters". Traditional navigable waters regulated by Section 10 are waters that are, could be, or were once used to transport interstate or foreign commerce. In contrast,"waters of the U.S." regulated under Section 404 also include "other waters" such as wetlands that have a sufficient nexus to interstate commerce. In practice, USACE regulatory authority under the Rivers and Harbors Act has been integrated with regulatory authority under the CWA, and USACE uses one permit application for both types of permits.

The diagram below illustrates the USACE lateral extent of jurisdiction under Section 10 and Section 404.





The District Biologist is typically responsible for delineation of jurisdictional waters. USACE is then responsible for verifying the Biologist's delineation. The permit process is typically initiated by a jurisdictional determination (JD) that the proposed project would occur in waters. The District Biologist prepares a wetland/waters delineation report to USACE requesting verification. USACE will review JD reports and either verifies the conclusions in the report or request changes to the report based on the review. Once the USACE agrees with the conclusions presented in the JD report, USACE will make a JD. The USACE may then proceed with the evaluation of a permit application submittal from the District Biologist (individual permit application, general permit, pre-construction notification or general permit

verification request). The USACE may also send a letter affirming a preliminary or approved JD. Upon verification, these areas are referred to as "jurisdictional areas." A graphical depiction of the overall permit review process (PDF) is provided from USACE.

USACE RGL 08-02, issued June 26, 2008, entitled "Jurisdictional Determinations," (JD) explains the differences between JDs and preliminary JDs. Approved JDs and preliminary JDs are tools used by the USACE to help implement Section 404 of the CWA and Sections 9 and 10 of the Rivers and Harbors Act of 1899. RGL 08-02 provides guidance on when an approved JD is required and when the District Biologist can decline to request and obtain an approved JD and elect to use a preliminary JD instead.

Approved JDs are an official USACE determination that jurisdictional "waters of the U.S." or "navigable waters of the U.S., or both, are either present or absent on a particular site. An approved JD precisely identifies the limits of those waters on the project site determined to be jurisdictional under the CWA and Rivers and Harbors Act (33 CFR 331.2). Preliminary JDs are not binding, but written indications that there may be wetland/waters of the U.S. on a project site. Preliminary JDs are advisory in nature and may not be appealed (33 CFR 331.2).

A Section 404 permit is required from the USACE when a project requires fill or other modification of waters. There are two types of permits issued by the USACE: Standard and General permits.

Standard Permits

There are two types of Standard permits: Individual permits and Letters of Permission

Individual Permits are complex, covering projects with more than minimal affects to waters. Processing time usually takes 60 to 120 days unless a public hearing is required or an environmental statement must be prepared. Special conditions of the permit may include mitigation activities that need to be monitored for a five to ten year period for the most complex and/or controversial projects. To apply for an individual permit, an application form must be completed.

A Letter of Permission may be issued for work that is routine or with minimal effects to the aquatic ecosystem, and objections are unlikely. If the proposed project meets these criteria, it may qualify for a Letter of Permission (LOP). An LOP is another type of individual permit used for projects with very minor effects, that do not meet any of the Nationwide permit (NWP's) conditions. An LOP is only for those projects where the District Biologist provides evidence of thorough pre-application coordination among the regulatory and resource agencies. The Biologist must submit an application that addresses programmatic concerns to support a determination that full public notice review would not result in a substantive change in the proposed project or mitigation. An LOP can be issued more quickly than a Standard permit since public notice is not required. USACE will not notify you if your proposed activity qualifies for an LOP.

General Permits

There are two types of General permits: Nationwide permits (NWP) and Regional permits (GPs).

- Nationwide Permits are issued on a nationwide basis to authorize and cover a wide variety of minor activities with no more than minimal effects.
- Regional Permits are issued by the District Engineer for a general category of activities when:
  1. The activities are similar in nature and cause minimal environmental effect (both individually and cumulatively), and
  2. The Regional permit reduces duplication of regulatory control by state and federal agencies. Compensatory mitigation is required for all effects to waters.

Initiation of a request for a USACE permit to affect waters involves other resource and regulatory agencies as a part of the interagency review process. The USACE submits permit applications to the EPA, CDFW, NMFS, and FWS for review and comment. Time periods and extent of commenting required by these agencies varies depending upon the permit type. Individual permits are the most lengthy and involved.

Applications for USACE permits may be prepared and submitted by the Project Engineer, the District Biologist, or others, using information on delineated waters as prepared by the Biologist. The Project Engineer provides information on the extent of the construction effects responsible for proposed fill. The District Biologist is the key liaison with resource and regulatory agency staff regarding the wetland/waters habitat effects and potential mitigation required.

For Standard permits, the USACE permit decision is based on whether the proposed project complies with EPA's Section 404 (b) (1) Guidelines, and whether issuance of a permit is in the public interest. The Guidelines (40 CFR 230 et seq.) state that the USACE may not issue a permit if there is a less environmentally damaging practicable alternative (LEDPA) to the proposed discharge that would have

less effects on the waters, and not have other significant adverse environmental consequences. This means that the District Biologist must document that a sequence of avoidance, minimization, and compensation has been followed, in that order. This sequence is required under the Section 404(b)(1) Guidelines (40 CFR Part 230).

The Guidelines also restrict permitting activities that:

- Violate water quality or toxic effluent standards
- Jeopardize the continued existence of listed species
- Violate marine sanctuary protections
- Cause “significant degradation” to waters of the U.S

To review the requirements for the use of Nationwide, Regional or General permits, and to determine which permit applies to your project, please visit the USACE Regulatory website in your region.

3-4.2 USACE Regulatory Guidance Letters (RGL)

USACE RGLs were developed by the USACE as a system to organize and track written guidance issued to its field agencies. RGLs are normally issued as a result of evolving policy, judicial decisions, and changes to USACE regulations or another agency’s regulations which affect the permit program. RGLs are used only to interpret or clarify existing Regulatory Program policy, but do provide mandatory guidance to the USACE district offices. Below is a list of RGLs related to wetland and waters of the U.S. The RGLs are described in further detail in this chapter.

- RGL 08-03 (PDF) - Minimum Monitoring Requirements for Compensatory Mitigation Projects Involving the Restoration, Establishment, and/or Enhancement of Aquatic Resources
- RGL 08-02 (PDF) - Jurisdictional Determinations
- RGL 02-02 (PDF) - Guidance on Compensatory Mitigation Projects for Aquatic Resource Impacts Under the Corps Regulatory Program Pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899
- RGL 02-01 (PDF) - Inclusion of Disclaimer Statements in Jurisdictional Letters Indicating that the Clean Water Act (CWA) Jurisdictional Determinations/Delineations May Not Meet the Requirements of the Food Security Act (FSA) of 1985

3-4.3 U.S. Environmental Protection Agency (EPA)

EPA activities which affect waters include, but are not limited to, developing rules to regulate municipal and industrial wastewater discharge, stormwater discharge; overseeing drinking water quality; overseeing USACE regulatory activities pertaining to protection of waters of the U.S., and dredge and fill activities. The mission of the EPA includes protection of human health and safeguarding the natural environment. The EPA has the right to challenge a USACE permit approval. Section 404 (b) (1) of the EPA and USACE guidelines involve assurance that the proposed activity does not violate water quality standards (USACE, EPA 1993). It requires that the District Biologist, along with the PDT, to provide an alternative’s analysis to illustrate that the alternative least damaging to waters of the U.S. has been selected (LEDPA). The EPA also has jurisdiction over violations. The EPA and USACE have issued several memoranda of agreement (MOA’s), including one that defines each agency’s roles more specifically.

3-4.4 U.S. Fish and Wildlife Service (FWS)

The FWS jurisdiction is nationwide and operates under a host of federal legal mandates that explicitly and implicitly refer to waters of the U.S. The mission of the FWS includes working to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people. According to the Fish and Wildlife Coordination Act, all federal agencies are required to contact the FWS, NMFS, and California's wildlife agency, CDFW, regarding activities that affect, control, or modify waters of any stream or other bodies of water. These consulted agencies review applications for permits issued under Section 404 and provide comments to the USACE about the environmental effects of the proposed project. Regulations pertaining to wetland/waters overlap with FESA requirements because wetland/waters could be habitat for federally listed plants and animals. The granting of a permit is a “federal action” for purposes of FESA; thus, if a listed species may be affected, a 404 permit request triggers the need for a consultation with FWS under FESA. FWS retains jurisdiction over terrestrial species and freshwater aquatic species.

3-4.5 National Marine Fisheries Service (NMFS)

NMFS comments on all NEPA and Section 404 documents for projects that could affect marine, estuarine, or anadromous fish, or their habitat. This includes intertidal wetlands, sub tidal areas, eelgrass habitat for marine and estuarine species, as well as riparian habitat for salmonids. NMFS is also responsible for designating critical habitat for species it lists under FESA. The critical habitat designation may include specific areas within the geographical area occupied by the species at the time of listing, if they contain physical or biological features essential to conservation, those features that may require special management considerations or protection; and specific areas outside the geographical area occupied by the species if the agency determines that the area itself is essential for conservation. Regulations pertaining to wetland/waters overlap with FESA requirements because wetland/waters could be habitat for federally listed plants and animals. As with FWS, if a listed species may be affected, a 404 permit request triggers the need for consultation with NMFS under FESA. NMFS retains jurisdiction over marine species and most anadromous fish.

3-4.6 United States Coast Guard (USCG)

The USCG administers the various bridge statutes, environmental laws of the U.S., and pertinent regulations and policies. The USCG is responsible for approval of the location and plans of bridges and causeways constructed across navigable waters of U.S. In addition, the Coast Guard is responsible for approval of the location and plans of international bridges and the alteration of bridges found to be unreasonable obstructions to navigation. Section 9 of the Rivers and Harbors Appropriations Act is administered by the U.S. Coast Guard and requires Caltrans to obtain a Bridge Permit (PDF). A Bridge permit is required by the USCG when there is construction of a new bridge or causeway or reconstruction or modification of an existing bridge or causeway across navigable waters. When Caltrans applies for a Bridge permit, they must submit an application package (PDF) to the USCG. The Bridge Application must be sent to the Coast Guard District office with jurisdiction in the vicinity of the proposed bridge site. Remember to include any approvals or other permits that you have already received.

3-4.7 Natural Resources Conservation Service (NRCS)

Caltrans may be required to coordinate with the NRCS, formerly the Soil Conservation Service, when a proposed transportation project may affect agricultural lands where farmers have been growing commodity crops in areas that were drained, filled, or otherwise altered wetlands prior to 1985. The Food Security Act of 1985 (referred to as "Swampbuster") ended the NRCS approval of the draining of wetlands for commodity crops. The NRCS administers the Act, as amended by the Food, Agriculture, Conservation, and Trade Act of 1990 and the Federal Agriculture Improvement and Reform Act of 1996.

In 1994, the NRCS signed a Memorandum of Agreement (MOA) with USACE which makes the NRCS responsible for wetland/waters delineations on prior converted croplands and farmed wetlands that receive agricultural subsidies through the federal government. The NRCS may use the procedures for delineating wetland/waters as described in the National Food Security Act Manual, Third Edition (PDF). The NFSAM 4th Edition contains only the common provisions and the Highly Erodible Land Conservation compliance parts. The National Food Security Act Manual (NFSAM) 5th Edition will be out soon. It is comprised of 12 parts, covering both the highly erodible land conservation and wetland/waters conservation compliance provisions. This edition will be available online in its entirety. Please refer to the latest guidance from NRCS. Linear projects such as roadway improvements may be excluded from the NRCS involvement.

When the NRCS is involved, the District Biologist is responsible for contacting the NRCS, submitting the wetland/waters delineation report to the appropriate NRCS field office, and requesting verification. In some cases, the USACE may take the responsibility for the NRCS verification, or provide evaluation of an "other waters" determination. It is best to obtain guidance from the NRCS regarding responsibility of all aspects of the determination.

3-5 State Agencies

The following table provides a summary list of the State agencies that regulate activities in waters of the U.S. and the State.

Agency	Regulation	Authority
California Department of Fish and Wildlife (CDFW)	California Fish and Game Code, Sections 1600-1607	Regulates activities resulting in alteration of streams and lakes including stream banks (Streambed Alteration Agreement)
	CEQA	Responsible or Trustee Agency
Regional Water Quality Control Board (RWQCB)	Clean Water Act, Section 401	Proposed fill in waters requires coordination with the appropriate RWQCB that administers Section 401 and provides certification
	Clean Water Act, Section 402	Issues National Pollutant Discharge Elimination System (NPDES) permit
	CEQA	Responsible or Trustee Agency
California Coastal Commission (CCC)	California Coastal Act of 1976	Issues all coastal development permits
	Coastal Zone Management Act of 1972 as amended through the Coastal Zone Protection Act of 1996	Issues notice that work is consistent with state Coastal Management Plan (PDF)
	CEQA	Responsible or Trustee Agency
San Francisco Bay Conservation and Development Commission (BCDC)	McAteer-Petris Act of 1965	Regulates work within the bay, certain creeks, and a shoreline band of 100 feet inland from line of highest tidal action; projects that require BCDC permits often must receive authorization from the RWQCB and USACE
	Coastal Zone Management Act of 1972 as amended through the Coastal Zone Protection Act of 1996	Issues federal consistency determinations under the Coastal Zone Management Act
	CEQA	Responsible or Trustee Agency
State Lands Commission (SLC)	Public Trust Doctrine	Protects publically owned property rights in the navigable waters of the state; the Commission manages the use of the state owned wetland/waters through lease to other public agencies and private parties
	CEQA	Responsible or Trustee Agency

State Regulatory Agencies

3-5.1 California Department of Fish and Wildlife (CDFW)

Waters may also be subject to jurisdiction of the CDFW in accordance with Fish and Game Code Sections 1600-1607. The CDFW regulates activities that would alter the flow, bed, channel or bank of streams and lakes by issuing Lake or Streambed Alteration Agreements. In riparian areas, CDFW jurisdictional limits are usually delineated by the top of the stream or lake banks, or the outer edge of riparian vegetation; whichever is wider. Waters under jurisdiction of the USACE may or may not be included in the area covered by a Lake or Streambed Alteration Agreement obtained from the CDFW.

Caltrans must contact the CDFW regarding any potential Section 1600-1607 effects independent of their role as reviewer on USACE Section 404 permits. The CDFW contacts for Section 1600 are best facilitated by coordination with the District Biologist.

3-5.2 Regional Water Quality Control Board (RWQCB)

SWRCB and the nine (9) Regional Water Quality Control Boards (RWQCB) work together to protect California's water resources. The SWRCB is generally responsible for setting statewide water quality policy and considering petitions contesting RWQCB actions. The State Board is also solely responsible for allocation of surface water rights. Section 401 of the CWA (33 U.S.C. 1341) requires any applicant of a federal license or permit conducting any activity that may result in a discharge of a pollutant into waters of the U.S. to obtain certification from the state in which the discharge originates. As a result, proposed fill in waters requires coordination with the appropriate RWQCB that administers Section 401 and provides certification. The RWQCB also plays a role in review of water quality and wetland/waters issues, including avoidance and minimization of effects. Section 401 certification is required prior to issuance of a Section 404 permit.

3-5.3 California Coastal Commission (CCC)

When a project will require fill in waters within the coastal zone, Caltrans must obtain a permit from the CCC or the city or county with coastal permit jurisdiction. The CCC oversees implementation of the California Coastal Act (CCA) and the nationwide Coastal Zone Management Act (CZMA). The coastal zone extends three miles seaward and generally about 1,000 yards inland. In particularly important and generally undeveloped areas where there can be considerable effects on the coastline from inland development, the coastal zone extends to a maximum of 5 miles inland from mean high tide line. In developed urban areas, the coastal zone extends substantially less than 1,000 yards inland. The Coastal Commission's jurisdiction does not extend into or around San Francisco Bay, where development is regulated by the San Francisco Bay Conservation and Development Commission. The District Biologist and the Project Engineer may share coordination with the CCC, when needed.

3-5.4 San Francisco Bay Conservation and Development Commission (BCDC)

Projects affecting waters within the limits of San Francisco Bay may require a permit from the BCDC. The BCDC has jurisdiction over all areas of San Francisco Bay subject to tidal action up to the mean high tide line, or a line five feet above mean sea level in marshlands. The area 100 feet inland from the mean high tide is also within jurisdiction. All projects proposed in tidal wetland/waters within the BCDC's jurisdiction require an approved BCDC permit before proceeding. Projects that require BCDC permits often must receive authorization from the RWQCB and USACE. Under state and federal law the BCDC is required to set conditions for these permits in order to minimize effects on waters and to offset those effects that are unavoidable. The BCDC is responsible for federal implementation of the CZMA within the limits of San Francisco Bay, rather than the CCC. The Project Engineer is usually the key contact for this agency. The District Biologist provides analysis of wetland/waters effects and may work directly with agency staff on mitigation requirements unique to the BCDC.

3-5.5 State Lands Commission (SLC)

The California SLC manages some 4.5 million acres of land held in trust for the people of California. The State holds these lands for all people of the State for the public trust purposes of water related commerce, navigation, fisheries, recreation, and open space. The Commission manages the use of the State owned waters through leases to other public agencies and private parties. The Commission staff reviews permit applications submitted to the CCC, the San Francisco BCDC, and the USACE. The Commission has jurisdiction and control over State owned lands pursuant to PRC 6000 et seq. These lands include: a three mile-wide section of tidal and submerged land adjacent to the coast and offshore islands, including bays, estuaries, and lagoons; the waters and underlying beds of more than 120 rivers, lakes, streams, and sloughs; and 585,000 acres of school lands granted to the state by the federal government to support public education.

3-6 Early Coordination And Agreements

3-6.1 Early Coordination

It is important to identify potential effects to waters as early in the environmental process as possible. Complex wetlands/waters delineation and assessment reports require extensive involvement from the District Biologist. Early coordination is an informal process where the Biologist meets with project managers (PM), the developed PDT, and regulatory agencies, to discuss the project in its early planning stages. These early coordination meetings allow time to review your proposed plans and discuss permit requirements, potential problems, timeframes, and ways to change the project to reduce or further minimize effects. Early involvement will also help to avoid potential delays in project delivery and minimize potential changes in the project scope that may result in project cost increases. You are encouraged to contact the USACE for proposed work in waters in your project area. Exemptions, nationwide, regional and individual requirements will be reviewed. By discussing all information prior to application submittal, your application will be processed more efficiently. Click here for more information on USACE pre-application consultation.

Early notification to the PM, PDT, and resource and regulatory agencies also allows time for investigation of design modifications to avoid or minimize potential effects to waters. If effects cannot be avoided, and have been reduced to the minimum level practicable, wetland/waters mitigation proposals to compensate for those effects must be developed by the District Biologist and others on the PDT, and evaluated as part of the environmental impact analysis process.

3-6.2 NEPA/404 Memorandum of Understanding

Caltrans has implemented early coordination with the state and federal agencies involved in the wetland/waters regulation process. In 1993, Caltrans signed a Memorandum of Understanding (MOU) with the Federal Highway Administration (FHWA), Federal Transit Administration (FTA), EPA, USACE, FWS, NMFS, and the Arizona and Nevada Departments of Transportation. The objective of the MOU is to integrate the National Environmental Policy Act (NEPA) and the CWA, Section 404. Referred to as the NEPA/404 integration process, the MOU commits these agencies to ensuring the earliest possible consideration and identification of environmental concerns pertaining to waters of the U.S. This is accomplished in conjunction with land use and transportation planning.

3-6.3 Wetlands Only Practicable Alternative Finding

Early stage planning meetings allow for full discussion of project alternatives to avoid wetland/waters. These alternatives may need to be discussed in the environmental document as a “Wetlands Only Practicable Alternative Finding” (WOPAF). Executive Order 11990 , Protection of Wetlands (1977), calls for no net loss of habitats referred to as wetlands and established a national policy to avoid adverse effects on wetlands wherever there is a practicable alternative. The Federal Department of Transportation promulgated DOT Order 5660.1A in 1978 to comply with this direction. On Federally funded projects, effects to wetland/waters must be identified in the environmental document. Alternatives that avoid wetland/waters must be considered. If wetland/waters effects cannot be avoided, then all practicable measures to minimize harm must be included. If the preferred alternative is located in wetlands/waters, the final EIS needs to contain the finding required by Executive Order 11990. The finding will document compliance with the Executive Order 11990 requirements (23 CFR 771.125(a)(1)). The finding should be included in a separate subsection entitled "Wetlands Only Practicable Alternative Finding" and should be supported by the following information:

1. A reference to Executive Order 11990;
2. An explanation why there are no practicable alternatives to the proposed action;
3. An explanation why the proposed action includes all practicable measures to minimize harm to wetland/waters; and
4. A concluding statement that: "Based upon the above considerations, it is determined that there is no practicable alternative to the proposed construction in wetland and that the proposed action includes all practicable measures to minimize harm to wetlands which may result from such use."

An additional requirement is the opportunity for early public involvement in projects affecting waters. The Federal Highway Administration provides technical assistance in meeting these criteria (FHWA Technical Advisory 6640.8A) and reviews environmental documents for compliance. Section 404 Individual Permit applications also require a Section 404(b)(1) alternatives analysis (LEDPA), as discussed above in section 3-4.1.

3-7 Wetland/Waters Delineation

As stated in Section 3-3, Caltrans follows the wetland/waters definition agreed to by the EPA and USACE. Although CDFW and FWS have their own definitions that may play a role in the wetland/waters delineation and assessment process, this discussion focuses on the USACE process.

In 1994, the EPA, NRCS, and USACE agreed to use the 1987 USACE Wetland Delineation Manual, together with applicable regional supplements, for non-agricultural lands (CFR Vol. 59, No. 12, pp. 2920-2924 Jan. 19, 1994). The procedure describes a three-parameter approach that includes presence of hydrophytic vegetation, wetland hydrology, and hydric soils. All three parameters must be present, under normal circumstances, for an area to be designated as wetland under jurisdiction of the USACE. Such wetlands are referred to as jurisdictional wetlands. In order to obtain a Section 404 permit, the District Biologist must provide USACE with a delineation of potential jurisdictional areas.

A large portion of California occurs within the Arid West Region. This region is characterized by low rainfall and hot, dry summers. The Arid West Region has a slightly different set of wetland/waters indicator criteria. In 2008, USACE published the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0) (USACE 2008) to be used in areas defined as the Arid West. This supplement allows for delineation in areas which the arid climate may not distinctly show one of the three parameters. USACE also offers the Arid West Data Form (PDF) and the Western Arid Regional Jurisdictional Determinations Checklist (PDF) (Interstate Nexus Worksheet).

In 2008, USACE published the Field Guide to the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States (PDF) (USACE 2008). This supplement is an approach for identifying the lateral limits of non-wetland/waters. The western mountains, valleys, and coastal range have a slightly different set of wetland/waters indicator criteria.

The Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (PDF) is one of a series of Regional Supplements to the Corps of Engineers Wetland Delineation Manual, which provides technical guidance and procedures for identifying and delineating wetland/waters that may be subject to regulatory jurisdiction under Section 404 of the CWA or Section 10 of the Rivers and Harbors Act. The development of Regional Supplements is part of a nationwide effort to address regional wetland/waters characteristics and improve the accuracy and efficiency of wetland/waters delineation procedures. This supplement is applicable to the Western Mountains, Valleys, and Coast Region, which consists of portions of 12 states, including Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, South Dakota, Utah, Washington, and Wyoming.

Wetland/waters must be delineated by a qualified Biologist, who is trained in soils, hydrology, local vegetation, as well as the USACE Wetlands Delineation Manual. Biologist's who do not have the appropriate training need to be supervised by a qualified Biologist when delineating wetland/waters. The Biologist takes site information and background materials to prepare a Wetland/Waters Delineation and Assessment Report. The Wetlands/Waters Delineation and Assessment Report is submitted to the USACE as a part of the Section 404 permit application package.

The Wetlands/Waters Delineation and Assessment Report also serves as a technical report for the environmental document, in conjunction with the Natural Environment Study (NES). The NES describes the existing biological environment and how the project alternatives affect that environment. The NES is the technical backup for statements made in the environmental document concerning plants, animals, and natural communities occurring in the biological study area. If the wetland/waters effects of a project are very small, the discussion may be included as a part of the NES. If included as a discussion in the NES, a separate Wetland/Waters Delineation Report would be prepared and submitted to the USACE for the permitting process. Materials to include in these reports will be discussed in the following section. If the wetland/waters effects are large or controversial, it is more convenient to prepare a report separate from the NES. The NES covers non-wetland/waters effects that would not necessarily be of interest to the USACE in review of a Section 404 permit application and does not need to be sent to the USACE.

3-8 Wetland/Waters Assessment

Delineation of waters is only the first phase of determining potential effects. USACE and EPA have a national goal of no net loss of wetlands to be applied to each permit decision. In measuring no net loss, USACE primarily will consider loss of wetlands functions and values. The Biologist must analyze the effects of the proposed loss of function and values. Proposed mitigation or compensation actions must also be developed. In order to do this, the functions and values of the wetlands habitat must be evaluated to determine the degree of effects resulting from the proposed transportation project. In this manner, appropriate mitigation plans may be developed to replace those functions and values.

Functions: Functions are the physical, chemical, and biological attributes of wetlands without regard to their importance to society. Examples of functions include flood flow alteration, wildlife habitat, and groundwater discharge.

Values: The term values may be used to describe those functions that are generally regarded as beneficial to society. Recreation and uniqueness are examples of values. All or part of society may not value some functions. Nutrient removal and transformation, for example, may not be considered a value if that function leads to algal blooms and noxious odors.

Caltrans uses the functions and values described by USACE and the EPA. Although the complex methodology described by USACE and the EPA may be used, experience has shown that informed professional judgment, applied to the identified functions and values, accomplishes the same result in California waters. These results are obtained in significantly less time than implementing the full methodology. The District Biologist is responsible for interpreting and understanding the functions and values and using their best professional judgment to determine potential effects.

3-9 Wetland/Waters Delineation And Assessment Report Format

To improve the quality and consistency of wetland/waters delineations, the USACE Districts have specific requirements for delineation reports. USACE District requirements vary by area and are updated frequently. There are three USACE District locations within the South Pacific Division in California. These include the Sacramento District, the San Francisco District, and the Los Angeles District.

- The USACE Sacramento District provides specific requirements necessary for accepting delineation in its "Minimum Standards for Acceptance of Preliminary Wetlands Delineation (PDF)".
- The San Francisco District provides its own requirements in its "San Francisco District Information Requested for Verification of Corps Jurisdiction (PDF)" to ensure rapid and accurate evaluation of materials prepared by the applicant.
- The Los Angeles District wetland/waters delineation requirements provide a "List of Information Required for Complete Application" which would assist the USACE in reviewing your application for a permit.

Applicants providing supportive documentation in other formats could encounter delays from the increased time it takes to evaluate non-standard materials submitted to the USACE. Accurate delineations by qualified individuals have resulted in a quicker review and response from the appropriate USACE District; substandard or inaccurate delineations have resulted in unnecessary time delays for Biologists. These delays are due to insufficient, incomplete, or conflicting data, which prevent the USACE District from verifying the proposed wetlands/waters boundaries. Such delineations must be returned by the USACE District to the Biologist for revision.

The following outline represents a suggested example of how to present information in a report format. This outline may be adapted to meet the needs of a particular project.

Format and Content of the Delineation Report

- No set format
  - Typical example:
    - Introduction
    - Setting
    - Methods
    - Results
  - Include a summary and table of contents only it is a lengthy report
  - Useful near the beginning of long reports is a list of acronyms and abbreviations
- Contents: Review USACE's minimum standards for reports
- Is Rapanos required?

The Delineation Report: Introduction

Typically Includes:

- Project location
- Directions to the site
- Property ownership (including any property to be acquired)
- How the study limits were determined
- Total area within the study limits

- Name(s) of the preparer(s) of the delineation report and/or applicant, together with contact information

The Delineation Report: Setting

Typically includes:

- Physical setting of the project area
  - Topography
  - Watershed(s)
  - Climate, in particular, mean annual rainfall and snowfall
- Hydrology
  - Where does the water come from?
  - Where does it go?
  - Keep the Rapanos requirements in mind
- Soils
- Vegetation

3-10 Wetland/Waters Migration

In accordance with state and federal permit requirements, unavoidable effects to wetland/waters shall be compensated. The District Biologist works closely with the PDT to design a suitable creation or restoration project that will replace the wetland/waters functions and values affected by the transportation project. A combination of onsite and offsite mitigation may best compensate for damage or destruction of functions and values. Onsite mitigation may focus on flood storage, flood conveyance, erosion control, and water quality protection. Offsite mitigation at some distance from project effects may help restore regional wildlife.

The District Biologist is usually responsible for monitoring and preparation of the mitigation report and submitting annual monitoring reports to the USACE. The processes involved are described in detail in Volume 3, Chapter 5, Mitigation and Monitoring (PDF).

Mitigation guidance may also be found in the USACE and EPA 1990 Memorandum of Agreement (USACE and EPA, 1990), USACE Regulatory Guidance Letter 02-2 (PDF) (USACE, 2002), and more recently in Regulatory Guidance Letter 08-03 (PDF) (73 Fed. Reg. 19594).

The USACE and EPA 1990 MOA establishes the basic mitigation sequencing framework. Wetland/waters effects can be mitigated through avoidance, minimization, or compensation. Avoidance through selecting a non-wetland/waters site, and minimization of effects through project modifications and permit conditions should be implemented prior to compensation.

RGL 02-2 (PDF), “Guidance on Compensatory Mitigation Projects for Aquatic Resource Impacts Under the Corps Regulatory Program Pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899,” requires appropriate and practicable mitigation for authorized effects to aquatic resources by requiring the use of watershed and ecosystem approaches when determining compensatory mitigation requirements. The District Biologist must consider the resource needs of the watersheds where effects will occur, and also consider the resources needs of neighboring watersheds.

RGL 08-03 (PDF), “Minimum Monitoring Requirements for Compensatory Mitigation Projects Involving the Restoration, Establishment, and/or Enhancement of Aquatic Resources (PDF),” provides guidance on minimum monitoring requirements for compensatory mitigation projects, including the required minimum content for monitoring reports. The final Mitigation Rule published on April 10, 2008, states that the submission of monitoring reports to assess the development and condition of compensatory mitigation projects is required, but the content and level of detail for those reports must be commensurate with the scale and scope of the compensatory mitigation projects as well as the compensatory mitigation project type (33 CFR 333.6(a)(1)).

Specifically, the rule:

- emphasizes that the process of selecting a location for compensation sites should be driven by assessments of watershed needs and how specific wetland restoration and protection projects can best address those needs;
- requires measurable and enforceable ecological performance standards for all types of compensation so that project success can be evaluated;
- requires regular monitoring to document that compensation sites achieve ecological performance standards;
- clearly specifies the components of a complete compensation plan based on the principles of aquatic ecosystem science; and,

- emphasizes the use of science-based assessment procedures to evaluate the extent of potential water resource effects and the success of compensation measures.

Compensatory mitigation is to create, restore, or enhance wetlands to replace or “compensate” for the wetland area and functions lost through the permitted alteration. Constructing a wetland in an area that never supported wetlands historically is called creation. Wetland creation is often difficult because the upland soils are not good at retaining water. Restoration means re-establishing wetland hydrology and vegetation to a site that was historically a wetland by correcting the conditions that cause it to be degraded. This may include providing more water to the site and reestablishing native plant communities. The enhancement goal is to measurably improve the condition and functions of the wetland.

3-11 Quality Control and Assurance for Biological Technical Documents

The Quality Control and Assurance for Biological Technical Documents provide document preparation requirements, quality control and assurance procedures, criteria of what is to be included in a final draft, along with independent peer review and correspondence procedures.

The District Biologist is responsible for following quality control (QC) and assurance (QA) procedures when writing technical documents such as a Wetlands/Waters Delineation/Assessment Report. Caltrans biological technical documents, and those authorized under the Federal Aid Local Assistance Program, provide natural resource information and analysis for PDT decisions, environmental document preparation, public input, as well as permits, licenses, agreements or certifications. Careful, consistent and concise quality control and assurance procedures allow the Department to effectively provide information and respond to public or agency inquiries regarding compliance with policies and regulations, as well as federal environmental responsibilities and consultations assumed pursuant to SAFETEA-LU Sections 6004 and 6005.

SER Chapter 1, Federal Requirements offers the Federal Highway Administration (FHWA) California Division Environmental Checklist "Draft" and the FHWA California Division "Final" NEPA Document Checklist. These checklists offer an environmental document preparation and review tool that provides the Biologist with the major required content of wetland/waters considerations.

The FHWA California Division "Draft" NEPA Document Checklist is a dynamic working document to be used as a tool to develop an adequate document for approval. It should be used in conjunction with other appropriate guidance and does not include all applicable federal laws or regulations nor is it intended to address the requirements of state and local laws.

The Wetlands/Waters Delineation /Assessment Report will include the name of the Biologist(s) preparing the documents and the manager overseeing the work. These people should be prepared to answer questions regarding document content, quality, and preparation. At management’s discretion, District Biologists may use specific checklists, worksheets or other tools to assist preparation and/or when verifying the documents were prepared by qualified experts, meet regulatory and professional standards, and reflect the actions and commitments of the lead agency.

Currently there is no standard template for a Wetlands/Waters Delineation/Assessment Report on the SER Forms and Templates page. As discussed in Section 3-9, each USACE District has their own requirements.

3-12 References

Environmental Laboratory, 1987. Corps of Engineers Wetlands Delineation Manual, Technical Report Y-87-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Natural Resources Conservation Service, 1996. National Food Security Act Manual, 3rd Edition. 180-V-NFSAM.

U.S. Fish and Wildlife Service (FWS), 1981. U.S. Fish and Wildlife Service Mitigation Policy (PDF). Federal Register Vol. 46, No. 15, January 23, 1981, pp. 7644-7663 (as corrected in the Federal Register of February 4, 1981).

USACE, EPA, 1993. Federal Register Vol. 58, No. 163, August 25, 1993, pp. 45008-45038. Dept. of Defense, Dept. of the Army, Corps of Engineers, 33 CFR Parts 323 and 328; Environmental Protection Agency, 40 CFR Parts 110, 112, 116, 117, 122, 230, 232, and 401, Clean Water Act Regulatory Programs.

U.S. Army Corps of Engineers (USACE). 2008. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0) (PDF). ERDC/EL TR-08-28. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

U.S. Army Corps of Engineers (USACE). 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0) (PDF). ERDC/EL TR-10-3. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

U.S. Army Corps of Engineers (USACE). 2008. Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States (PDF). ERDC/CRREL TR-08-12. Cold Regions Research and Engineering Laboratory, U.S. Army Engineer Research and Development Center, 72 Lyme Road Hanover, NH 03755-1290

U.S. Army Corps of Engineers (USACE) and Environmental Protection Agency (EPA). 2008. Clean Water Act Jurisdiction Following the U.S. Supreme Court's Decision in Rapanos v. United States and Carabell v. United States (PDF)

Statewide Campaigns

- ADA Access
- Adopt-A-Highway
- Amber Alert
- Be Work Zone Alert
- CAL FIRE
- California Climate Investments
- California Connected
- California Transportation Plan 2050
- Clean California
- Energy Upgrade
- Go Safely California
- Keep Your Home
- Move Over Law
- CalOES: Power Outage and Fire Recovery Resources
- REAL ID
- Save Our Water
- Stormwater Education Campaign
- Tenant and Landlord Resources
- Unclaimed Property

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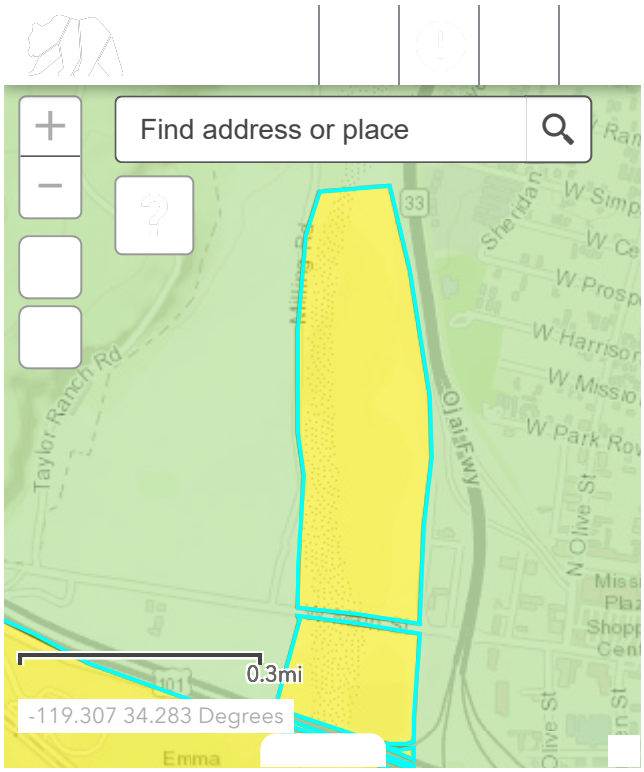
California Department of Conservation

Ventura County Tsunami Hazard Areas

Explore your area of interest in the map below. You may also OPEN THE MAP IN A NEW WINDOW



What to do Before, During, and After a Tsunami in Ventura County

Ready Ventura County - Tsunami, from the Ventura County Office of Emergency Services, is the place to go for preparedness tips and local emergency notifications.

Ready.gov: Tsunamis summarizes how to Prepare NOW, Survive DURING, and Be Safe AFTER.

TsunamiZone.org offers suggestions and resources for your family or organization to “know your zone” and to learn how to be safe.

The Earthquake Country Alliance develops resources and organizes

develops resources and organizes activities to improve earthquake and tsunami preparedness, mitigation and resiliency. The ECA offers a host of free booklets and other materials in multiple languages.

About the Maps

California Tsunami Hazard Area Maps are produced collectively by the California Governor's Office of Emergency Services, the California Geological Survey, AECOM Technical Services, and the Tsunami Research Center at the University of Southern California.

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WE THE PEOPLE

of Ventura, in order to ensure that our City continues to be a great place for us to live . . .

ACHIEVING THE VISION

2005 ventura general plan

CITY OF SAN BUENAVENTURA

2005 VENTURA GENERAL PLAN

ADOPTED AUGUST 8, 2005

RESOLUTION NOS.2005-072 AND 2005-073

The following people contributed to the preparation of the 2005 Ventura General Plan:

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…and to the countless citizens who gave their time and energy towards the making of this plan.

This plan is dedicated to the citizens of Ventura.

August 8, 2005

In loving memory of Roma Armbrust and
Dennis R. Mackay

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ventura's general plan

OVERVIEW

"The building of cities is one of man's greatest achievements. The form of his city always has been and always will be a pitiless indicator of the state of his civilization. This form is determined by the multiplicity of decisions made by the people who live in it."

— Edmund N. Bacon
Design of Cities, 1967

CITY OF
VENTURA

We, the people of Ventura, in order to ensure that our City remains a great place for us to live ...

. . . establish these goals for our community's future:

OUR NATURAL COMMUNITY

Our goal is to be a model for other communities of environmental responsibility, living in balance with our natural setting of coastline, rivers, and hillside ecosystems.

OUR PROSPEROUS COMMUNITY

Our goal is to attract and retain enterprises that provide high-value, high wage jobs; to diversity the local economy; to increase the local tax base; and to anticipate our economic future in order to strengthen our economy and help fund vital public services.

OUR WELL-PLANNED COMMUNITY

Our goal is to protect our hillsides, farmlands, and open spaces; enhance Ventura's historic and cultural resources; respect our diverse neighborhoods; reinvest in older areas of our community; and make great places by insisting on the highest standards of quality in architecture, landscaping and urban design.

OUR ACCESSIBLE COMMUNITY

Our goal is to provide residents with more transportation choices by strengthening and balancing bicycle, pedestrian and transit connections in the City and surrounding region.

OUR SUSTAINABLE INFRASTRUCTURE

Our goal is to safeguard public health, well being and prosperity by providing and maintaining facilities that enable the community to live in balance with natural systems.

OUR ACTIVE COMMUNITY

Our goal is to add to and enhance our parks and open spaces to provide enriching recreation options for the entire community.

OUR HEALTHY AND SAFE COMMUNITY

Our goal is to build effective community partnerships that protect and improve the social well being and security of all our citizens.

OUR EDUCATED COMMUNITY

Our goal is to encourage academic excellence and life-long learning resources to promote a highly-educated citizenry.

OUR CREATIVE COMMUNITY

Our goal is to become a vibrant cultural center by weaving the arts and local heritage into everyday life.

OUR INVOLVED COMMUNITY

Our goal is to strive to work together as a community to achieve the Ventura Vision through civic engagement, partnerships, and volunteer service.

State law requires each California city to adopt a comprehensive, long-term General Plan for the physical development of the community that guides local decision-making by expressing community goals about the future distribution and character of land uses and activities. The plan should be comprehensive by both covering the City's entire planning area and addressing the broad range of issues facing the community, including physical, social, aesthetic and economic concerns. The plan must be internally consistent and serve as a long-term guide, establishing policies for day-to-day land use decisions over an approximately 20-year period.

Introduction and Background

"To remain successful, Ventura must periodically renew itself, re-examine its goals and create a shared vision to guide the community into the future."

With these opening words, the citizens of our community proclaimed the **Ventura Vision,** which was unanimously accepted by the City Council in March 2000. That landmark report captured the results of "a partnership encompassing city government, non-profit organizations, community groups, businesses, schools and individual residents to chart the community's future through a process of visioning."

Building on that shared vision, the City embarked on an effort to revise the 1989 Comprehensive Plan that served as the General Plan that all cities are required by State law to use to guide land use, transportation and other important policy decisions. This new General Plan is the culmination of that effort to translate the Ventura Vision into a coherent and comprehensive implementation plan to guide future development and preservation.

Throughout the visioning process and at the ballot box, Ventura residents have made clear we want a well-planned approach to managing growth. We don't want continued suburban sprawl paving over farm land and sensitive hillside areas. Instead, we want vacant or run-down properties to be improved with high quality "infill" to provide new jobs, new homes and new stores and services.

Managing growth to improve our quality of life and standard of living is the smart thing to do. Ventura residents don't want uncontrolled growth and suburban sprawl. We also don't want traffic gridlock, more "cookie cutter" tract houses or housing prices that make Ventura unaffordable for working families. By targeting new development to areas that would benefit from reinvestment – and by respecting our historic character and sense of place – "smart growth" is a better alternative.

Our vision is for a prosperous and well-planned community. Smart Growth emphasizes reusing existing buildings and land, revitalizing our historic downtown and neighborhoods, and protecting the environment for future generations. Smart Growth channels new businesses and homes into appropriate areas. It also provides options for public transportation, creates neighborhoods where homes are in walking distance of local services and ensures green space for public use.

We seek to protect and enhance our unique "sense of place" that builds on our pride in Ventura's history and natural setting. Instead of new development that looks like everywhere else, our vision is for interesting, unique neighborhoods and districts, which reflect our values and heritage. The policies for pursuing these goals are spelled out in this new General Plan.

The Ventura General Plan

The *2005 Ventura General Plan* is the second in a series of three connected documents that will guide future conservation and change in the city. The *Ventura Vision* set the stage for this plan and enumerated four overarching principles that were affirmed by the community to guide Ventura into the future:

- Reach broadly and deeply into the community.
- Build on existing cultural, natural, and economic assets.
- Emphasize and encourage connections within the community.
- Work proactively and collaboratively to achieve the community's shared vision.

The final piece of the trilogy is a form-based *Development Code*. This code represents a new approach to zoning that prioritizes the appearance of development, while still ensuring that neighboring land uses are compatible and appropriate.

The *General Plan* will be put into action through the Development Code and a variety of other mechanisms, such as a mobility plan, specific plans, community plans, and capital improvement projects that will together shape the future of Ventura. The *General Plan* purposefully anticipates the *Code* focusing on the districts, corridors, and neighborhood centers where future change will be most pronounced.

The following vision statements reflect a high level of community consensus about a desired future for Ventura.

In the future, Ventura is a community that…

Environment

- Seeks sustainability by simultaneously promoting ecological health, economic vitality, and social well-being for current and future generations.
- Acts as an environmentally responsible model for other coastal areas.
- Protects and restores the natural character of its beaches, ocean views, hillsides, barrancas, and rivers as a scenic backdrop for its high quality urban environment.

Economy

- Develops a flourishing and balanced economy by encouraging a broad range of high quality employment and entrepreneurial opportunities.
- Encourages private economic development that supports public services and amenities associated with high quality of life.
- Has a vital, prosperous, and stable economy while maintaining its small-town feel.
- Is noted for private and public sector cooperation that enhances economic vitality.
- Actively participates in regional economic development efforts.

Planning, Design, and Circulation

- Retains its character as an attractive coastal town by growing slowly and sustainably, and by emphasizing its history, diversity, and natural environment.
- Cherishes its distinctive, diverse, and eclectic neighborhoods, and preserves their character.
- Has safe, accessible, and balanced transportation that promotes multiple modes of travel to local and regional destinations.

Social Activity

- Is known as an inclusive, diverse, and tolerant place that welcomes and celebrates all people.
- Provides all residents access to quality and affordable health and social services.
- Recognizes the importance of children and seniors by providing exceptional cultural, educational, and social support programs.
- Offers a diverse range of active and passive recreation for residents and visitors of all ages and abilities.
- Is dedicated to educational excellence and an emphasis on lifelong learning.
- Celebrates and is enriched by the arts and diverse cultural opportunities.

Collaboration

- Encourages residents to collaborate with each other and City government in an informed, active, and constructive manner to assess and resolve common issues.

ventura
seize
the future

Building on the Vision

Following adoption of the *Ventura Vision*, the City Council established a 19-member Comprehensive Plan Advisory Committee (CPAC) to shape the *Vision* concepts into issues and priorities for revision of the 1989 Comprehensive Plan. The CPAC included representatives of varied interests, including neighborhoods, agriculture, seniors and schools, as well as one member from the Planning Commission and one from the City Council. The committee met more than 30 times over almost three years. During that effort, the City published the August 2002 *Comprehensive Plan Update Background Report*, which provides a highly detailed account and analysis of opportunities and constraints that affect planning and land use in Ventura. This ultimately led to their findings, contained in the September 2003 *CPAC Issues & Alternatives Report*.

CPAC endeavored to create strategies to resolve planning and land use issues in Ventura utilizing the smart growth principles formulated by the U.S. Environmental Protection Agency:

- Mix land uses.
- Achieve compact building design.
- Provide a range of housing opportunities.
- Create walkable neighborhoods.
- Foster distinctive, attractive communities with a strong sense of place.
- Preserve open space, farmland, natural beauty, and critical environmental areas.
- Strengthen and direct development toward existing communities.
- Provide a variety of transportation choices.
- Make development decisions predictable, fair, and cost effective.
- Encourage community collaboration in planning decisions.

The recommendations of the CPAC were presented to the Planning Commission and City Council. After several months of reviewing the CPAC recommendations, the Planning Commission in December 2003 made some modifications to the CPAC's recommended land use scenario.

The City Council met 11 times from February through August 2004 to consider the CPAC and Planning Commission recommendations, review relevant data, and formulate broad goals, policies, and a diagram to guide growth and change in the City until 2025. In September 2004, the City Council established an ad-hoc General Plan Committee consisting of three Planning Commissioners and three City Council members to work with City staff and consultants to ensure that the *General Plan* would be completed expeditiously and with ample public participation, and to ensure open communication, transparency, and coordination among all parties interested in the creation of the *Plan*. All of the CPAC, Planning Commission, City Council, and General Plan Committee workshops, meetings, and hearings were open to the public and included significant, meaningful, and often extensive citizen input and participation.

Goals *summarize how conservation, development, and future growth should occur by identifying physical, economic and social ends that the community wishes to achieve.*

Policies *establish basic courses of action for the Planning Commission and City Council to follow in working to achieve community goals, by directly guiding the response of elected and appointed officials to development proposals and related community actions.*

Actions *need to be undertaken by the City to implement policies.*

Plan Format

The comprehensive and involved process of creating what is really a totally new (not just updated) *General Plan* – based on a new community vision and smart growth principles – resulted in a new set of goals, policies, and actions to guide future decision-making in Ventura that truly reflect the planning objectives of the community. These policy directives are organized by subject area in *General Plan* Chapters 1 through 10, which follow the organizational framework established in the *Ventura Vision* (see Table 1). Each topic is introduced with an overarching goal that carries forward the *Vision*, a description of issues needing resolution and methods for remedying them, and finally measurable policies and actions to achieve those solutions. Each of the policies contained within the Plan are intended to be understood and read with the following preface: "It is the intent of the City of San Buenaventura to...". All of the actions are summarized in table form in Appendix A, along with the City department or division responsible for implementing each action and timeframe for completion. Also included in the Plan are the legally binding Appendices B through E. Attachment A is provided as a reference, while Attachment B is provided to serve as guidelines for future development until an update to the Zoning Ordinance is completed.

Table 1
General Plan Organization

Vision/General Plan Chapter	Required/*Optional* Elements	Examples of Topics Covered
1. Our Natural Community	Conservation Open Space	Open space, hillsides, watersheds, riparian areas, sensitive plants and animals
2. Our Prosperous Community	*Economic Development*	Commercial and industrial growth, economic diversification, job opportunities, tourism
3. Our Well-Planned and Designed Community	Land Use/*Design* Housing *Park & Recreation*	Development patterns, neighborhoods, visual character, urban design, streetscapes, demographics, housing needs, affordability, constraints on production
4. Our Accessible Community	Circulation	Traffic, street network, parking, transit services, bike routes
5. Our Sustainable Infrastructure	Land Use	Water supply, wastewater treatment, drainage
6. Our Active Community	Land Use *Park & Recreation*	Park and recreation facilities, youth and senior programs
7. Our Healthy and Safe Community	Safety Noise Land Use	Development in hazardous areas, hazardous waste management, seismicity, flood control, water quality, brownfields, noise, police, fire, air quality
8. Our Educated Community	Land Use	Schools and libraries
9. Our Creative Community	*Culture*	Arts, events, community programs, cultural and historic resources
10. Our Involved Community	*Citizen Input*	Participation in governance

The format of the *General Plan* satisfies the State requirement that every general plan include policies for seven "elements," as follows:

Land use – establishes the general distribution and intensity of land uses, including housing, commerce, industry, open space, education, and public facilities.

Circulation – identifies the location and type of existing and proposed highways, arterial and collector roadways, bicycle routes, and other transportation facilities.

Conservation – addresses treatment of natural and cultural resources, including watersheds, wetlands, trees, rivers and barrancas, and cultural and historic landmarks.

Housing – assesses current and projected housing needs of all segments of the community and identifies land to provide adequate housing to meet those needs. Although the City's Housing Element and Technical Report is contained in a separate document to facilitate the frequent updating required by the State, the goals, policies and programs of the Housing Element must be and are consistent with the goals, policies, and actions of the *2005 Ventura General Plan.* (See Chapter 3, page 3-28, for 2004 Housing Element Goals and Policies.)

Noise – appraises noise sources in the community and develops means to mitigate nuisances.

Open Space – details techniques for preserving open space areas for natural resources, outdoor recreation, public health and safety, and agricultural activities.

Safety – establishes policies to protect the community from risks associated with seismic, geologic, flood, fire, and other hazards.

The *General Plan* also contains a number of special elements that aren't required by State law but are integral to the unique identity of Ventura. These cover a range of topics including education, recreation, arts and culture, and community involvement in local government. Another chapter treats the very important subject of the local economy, providing guidance to citizens, City staff and policy makers regarding strategies and priorities for economic development in Ventura.

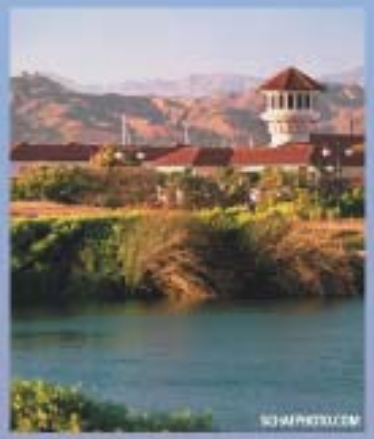
California Coastal Act

The *General Plan* also satisfies State requirements for the City's **Local Coastal Program** in accordance with the California Coastal Act (*Public Resources Code § 30000 et seq.)*. Actions in the *General Plan* that affect coastal resources are intended to become part of the Land Use Plan of the Local Coastal Program, which will be accomplished through specific or community plans for those areas. These actions are identified with the logo of the California Coastal Commission (which oversees all Local Coastal Programs). The basic goals of the State for the coastal zone are to:

- Protect, maintain, and where feasible, enhance and restore the overall quality of the coastal zone environment and its natural and artificial resources.
- Assure orderly, balanced utilization and conservation of coastal zone resources taking into account the social and economic needs of the people of the state.
- Maximize public access to and along the coast and maximize public recreational opportunities in the coastal zone consistent with sound resources conservation principles and constitutionally protected rights of the private property owners.
- Assure priority for coastal-dependent and coastal-related development over other development on the coast.
- Encourage state and local initiatives and cooperation in preparing procedures to implement coordinated planning and development for mutually beneficial uses, including educational uses, in the coastal zone.
  (Public Resources Code § 30001.5)

ventura's general plan

OUR NATURAL COMMUNITY



"As age comes on, one source of enjoyment after another is closed, but Nature's sources never fail. Like a generous host, she offers her brimming cups in endless variety, served in a grand hall, the sky its ceiling, the mountains its walls, decorated with glorious paintings and enlivened with bands of music ever playing."

— John Muir
20th Century Naturalist

CITY OF
VENTURA

1. OUR NATURAL COMMUNITY

Our goal is to be a model for other communities of environmental responsibility, living in balance with our natural setting of coastline, rivers, and hillside ecosystems.

Natural Context

Ventura's natural setting is one if its greatest assets, and preserving the environment is a top community priority. Situated between the ocean, hills, and two rivers, the city affords its residents and visitors with a significant amount of accessible, beautiful, and biologically diverse open space. Although a number of programs are in place to protect coastal and watershed ecosystems and to maintain and preserve existing open lands, some natural features in and around the city have been compromised by the impacts of human activity.

As in many communities across the nation, concern is growing in Ventura about human impacts on natural resources. The historic spread of local development has given rise to grassroots efforts aimed at preserving Ventura's viable agricultural land, open space, and hillsides. The 1995 Save Our Agricultural Resources initiative (see Appendix B) and the 2001 Hillside Voter Participation Area (Appendix C) measure require voter approval before the city can expand into open space areas. The Ventura Hillsides Conservancy formed in 2003 seeks to preserve local hillsides, canyons, and open space.

Ventura, Oxnard, Ventura County, and the County Local Agency Formation Commission have adopted agreements to preserve agricultural and open space land located between the cities. A change that amends these greenbelts requires the approval of all signatories.

Protecting Ventura's fragile natural resources is a fundamental focus of the *2005 Ventura General Plan*. Policies and actions in this chapter intend to ensure that coastal, hillside, and watershed features are preserved, remain visible and accessible, and demarcate boundaries for urban development to define and enhance the city's identity.

The community cherishes the shoreline as one of Ventura's best features. Coastal facilities in the city include:

- Emma Wood State Beach
- Ventura Seaside Park and Fairgrounds
- Surfers Point at Seaside Park
- Beachfront Promenade Park
- San Buenaventura State Beach
- Pierpont Community Beach
- Marina Beach/Cove Port District Beach
- Channel Islands National Park Headquarters
- Surfers Knoll
- Santa Clara River Mouth

Coastal Resources

Ventura boasts seven miles of beautiful sand beaches and valuable shoreline habitat. This "string of pearls" has long been identified by the community as one of the city's most prized features. At its eastern end, the Ventura Harbor offers opportunities for residents and visitors to explore the local marine environment, including the Channel Islands National Park and Marine Sanctuary. Elsewhere along the coast, shoreline and dune habitat provide nesting, feeding, and mating grounds for a wide variety of wildlife, including threatened or endangered species such as the western snowy plover and the least tern.

Shoreline conservation programs underway include the Surfers Point Managed Shoreline Retreat, San Buenaventura State Beach restoration, Ventura Harbor wetland rehabilitation, and coastline water quality monitoring. The City will continue to invest in restoration to enhance the shoreline ecosystem, with the actions in this chapter augmenting current efforts.

Hillsides

The hills of the Transverse Range rise 1,200 feet above Ventura, providing an important visual backdrop that frames the City. Not only do these hills provide residents and visitors with scenic vistas, they are also part of a larger integrated ecosystem comprised by the hillsides, coastal areas, rivers and barrancas that together provide a rich habitat for many species. It is vital to the community that these hillsides that lie outside the city limits (with a County land use designation of either Open Space or Agriculture), are protected and preserved.

These hillsides, by definition, are coterminous with the Hillside Voter Participation Area, and comprise the Hillside Open Space community as depicted on the General Plan Diagram (page 3-22). Because the Hillside Voter Participation Area measure prohibits the extension of City urban services to the hillsides through 2030 without voter approval, the General Plan Diagram identifies the hillsides affected by the measure with a Planning Designation of Open Space. The full text and map of the Hillside Voter Participation Area appears in Appendix C (as required by the act). This chapter calls working with land conservation organizations to establish a Ventura hillsides preserve, and Chapter 6, *Our Active Community*, contains actions to work with the County to create public trails in the hillsides.

Definitions for “Hillside Open Space,” “Hillside Area,” “hillsides,” and “Hillside Voter Participation Area” can be found in the Glossary (Attachment A).

Rivers and Barrancas

The Ventura River flows south to the Pacific Ocean along the western edge of the city, and the Santa Clara River bisects the Oxnard coastal plain south of Ventura. A series of seasonal watercourses called barrancas traverse the city in narrow incised drainage channels running down from the hillsides. The rivers and barrancas and their larger watersheds provide undeveloped open space, riparian vegetation, wildlife habitat and corridors, recreational opportunities, and aesthetic beauty.

Where local watercourses have not been channelized, riparian trees and shrubs grow in fringing woodlands and thickets. Several sensitive bird species breed in these areas, including the least Bell's vireo, willow flycatcher, yellow warbler, and yellow-breasted chat. Steelhead and rainbow trout seasonally inhabit both the Ventura and Santa Clara Rivers.

Riparian and freshwater marsh areas in Ventura represent only a remnant of pre-human coverage, but the City has initiated conservation and restoration efforts such as the Ventura River Estuary Program to help reverse this trend. The estuaries at the mouths of the Ventura and Santa Clara Rivers serve as breeding grounds and feeding areas for migratory and resident shorebirds and waterfowl, as well as home to many terrestrial animals, fish, and free-swimming invertebrates.

Actions in this chapter – such as maintaining adequate buffers from watercourses, requiring restoration of natural drainage features, and prohibiting the placement of manmade materials in drainages – can protect and improve water and habitat quality in local watersheds. The bolder action of removing concrete channel structures would further enhance natural functions and aesthetics.

Resource Conservation

As Ventura continues to grow, conserving resources, increasing energy efficiency, and achieving environmental sustainability become ever more important. The City desires to incorporate green building measures into the design, construction, and maintenance of public and private buildings which can result in significant cost savings and promote overall health and productivity of residents, workers, and visitors to the city. Raising conservation awareness can help minimize waste and pollution released into the natural environment. Improving energy efficiency in buildings, expanding recycling programs, and reducing transportation-related energy consumption will make the city a greener place. The policies and actions in this chapter provide clear direction to guide conservation, green practices, and responsible use of resources.

Policy 1A: Reduce beach and hillside erosion and threats to coastal ecosystem health.

Action 1.1: Adhere to the policies and directives of the California Coastal Act in reviewing and permitting any proposed development in the Coastal Zone.

Action 1.2: Prohibit non-coastal-dependent energy facilities within the Coastal Zone, and require any coastal-dependent facilities including pipelines and public utility structures to avoid coastal resources (including recreation, habitat, and archaeological areas) to the extent feasible, or to minimize any impacts if development in such areas is unavoidable.

Action 1.3: Work with the State Department of Parks and Recreation, Ventura County Watershed Protection Agency, and the Ventura Port District to determine and carry out appropriate methods for protecting and restoring coastal resources, including by supplying sand at beaches under the Beach Erosion Authority for Control Operations and Nourishment (BEACON) South Central Coast Beach Enhancement program.

Action 1.4: Require new coastal development to provide non-structural shoreline protection that avoids adverse impacts to coastal processes and nearby beaches.

Action 1.5: Collect suitable material from dredging and development, and add it to beaches as needed and feasible.

Action 1.6: Support continued efforts to decommission Matilija Dam to improve the sand supply to local beaches.

Action 1.7: Update the Hillside Management Program to address and be consistent with the Planning Designations as defined and depicted on the General Plan Diagram.

Policy 1B: Increase the area of open space protected from development impacts.

Action 1.8: Buffer barrancas and creeks that retain natural soil slopes from development according to State and Federal guidelines.

Action 1.9: Prohibit placement of material in watercourses other than native plants and required flood control structures, and remove debris periodically.

Action 1.10: Remove concrete channel structures as funding allows, and where doing so will fit the context of the surrounding area and not create unacceptable flood or erosion potential.

Action 1.11: Require that sensitive wetland and coastal areas be preserved as undeveloped open space wherever feasible and that future developments result in no net loss of wetlands or "natural" coastal areas.

Action 1.12: Update the provisions of the Hillside Management Program as necessary to ensure protection of open space lands.

Action 1.13: Recommend that the City's Sphere of Influence boundary be coterminous with the existing City limits in the hillsides in order to preserve the hillsides as open space.

Action 1.14: Work with established land conservation organizations toward establishing a Ventura hillsides preserve.

Action 1.15: Actively seek local, State, and federal funding sources to achieve preservation of the hillsides.

Policy 1C: Improve protection for native plants and animals.

Action 1.16: Comply with directives from regulatory authorities to update and enforce stormwater quality and watershed protection measures that limit impacts to aquatic ecosystems and that preserve and restore the beneficial uses of natural watercourses and wetlands in the city.

Action 1.17: Require development to mitigate its impacts on wildlife through the development review process.

Action 1.18: Require new development adjacent to rivers, creeks, and barrancas to use native or non-invasive plant species, preferably drought tolerant, for landscaping.

Action 1.19: Require projects near watercourses, shoreline areas, and other sensitive habitat areas to include surveys for State and/or federally listed sensitive species and to provide appropriate buffers and other mitigation necessary to protect habitat for listed species.

Action 1.20: Conduct coastal dredging in accordance with the U.S. Army Corps of Engineers and California Department of Fish and Game requirements in order to avoid impacts to sensitive fish and bird species.

Action 1.21: Work with State Parks on restoring the Alessandro Lagoon and pursue funding cooperatively.

Action 1.22: Adopt development code provisions to protect mature trees, as defined by minimum height, canopy, and/or trunk diameter.

Action 1.23: Require, where appropriate, the preservation of healthy tree windrows associated with current and former agricultural uses, and incorporate trees into the design of new developments.

Action 1.24: Require new development to maintain all indigenous tree species or provide adequately sized replacement native trees on a 3:1 basis.

Policy 1D: Expand the use of green practices.

Action 1.25: Purchase and use recycled materials and alternative and renewable energy sources as feasible in City operations.

Action 1.26: Reduce pesticide use in City operations.

Action 1.27: Utilize green waste as biomass/compost in City operations.

Action 1.28: Purchase low-emission City vehicles, and convert existing gasoline-powered fleet vehicles to cleaner fuels as technology becomes available.

Action 1.29: Require all City funded projects that enter design and construction after January 1, 2006 to meet a design construction standard equivalent to the minimum U.S. Green Building Council LEED™ Certified rating in accordance with the City's Green Building Standards for Private and Municipal Construction Projects.

Action 1.30: Provide information to businesses about how to reduce waste and pollution and conserve resources.

Action 1.31: Provide incentives for green building projects in both the public and private sectors to comply with either the LEED™ Rating System, California Green Builder, or the Residential Built Green program and to pursue registration and certification; incentives include "Head-of-the-Line" discretionary processing and "Head-of-the-Line" building permit processing.

Action 1.32: Apply for grants, rebates, and other funding to install solar panels on all City-owned structures to provide at least half of their electric energy requirements.

Action 1.33: Publicly acknowledge individuals and businesses that implement green construction and building practices.

OUR PROSPEROUS COMMUNITY

ventura's general plan

"Every increment of construction should be done in such a way as to heal the city."

— Christopher Alexander
Author of *A Pattern Language*, 1977

CITY OF
VENTURA

2. OUR PROSPEROUS COMMUNITY

Our goal is to attract and retain enterprises that provide high-value, high wage jobs; to diversify the local economy; to increase the local tax base; and to anticipate our economic future in order to strengthen our economy and help fund vital public services.

Adapting in the 21st Century

Great communities are prosperous communities. A successful city brings people, institutions, ideas, and capital together in creative ways that enrich the lives of those who live and work there. In today's global economy, high-wage high-value jobs are the foundation of the prosperity that instills a city with the financial resources necessary to provide high quality of life and excellent community amenities.

Ventura has been blessed with a history of prosperity, thanks in large part to success in harnessing the area's natural assets for economic benefit. For most of the 20th Century, Ventura was sustained largely by its role as the hub of the region's oil and agriculture industries. These two sectors not only provided a stable source of jobs and business opportunities, but also helped to shape Ventura's role as the legal, governmental, and cultural center of the County.

In the 21st Century, however, Venturans can't take continued prosperity for granted. Competition occurs regionally, nationally, and globally for innovative businesses, top talent, and good jobs. The community must build on its resources and constantly be on the lookout for new economic opportunities.

County government will likely remain the city's largest employer, providing an important element of economic stability, but government employment is not likely to grow significantly. Oil and agriculture will continue to be important, but their roles are diminishing. While Ventura is a regional center for healthcare, that industry will continue to face intense pressures to reduce costs. Still, the City of Ventura is positioned to move into an era dominated by innovation and reliant on emerging technologies. Cities and regions that excel in the "New Economy" promote high tech industries and boast a high quality of life. Likewise, to remain competitive, Ventura must continue to support economic development, but also create a more attractive living environment, including by providing appropriate housing for all segments of the local workforce. Efforts to boost economic development must be supported by a high quality of life, including a thriving cultural arts scene, award winning schools, and an engaged community. Tourism is also a strong market for Ventura. The beaches, museums, downtown, harbor and the nearby Channel Islands National Park attract more than 1.5 million visitors a year.

The policies and actions in this chapter seek to identify business niches that can thrive locally to diversify the economic base and ensure future community prosperity.

Economic Challenges

Ventura faces a variety of interrelated challenges to continued economic vitality, including:

1. Capturing a share of high-value job markets, such as biotechnology, computer software, communications, entertainment, multimedia, education, and business and financial services.

2. Diversifying the local economy to reduce dependence on the service, retail, and government sectors.

3. Building on the success of the tourism, manufacturing, business, and financial services sectors through marketing and job training programs that will ensure retention and attraction of these enterprises.

4. Finding appropriate locations for commercial and industrial land, including through revitalization opportunities in the Westside and Downtown and possibly via annexations of sites in the North Ventura Avenue and 101 Business Corridor areas.

5. Expanding the retail base, because sales tax represents a major City revenue source.

6. Providing housing for the full range of workforce households at all income levels.

7. Providing adequate infrastructure and financing resources.

Meeting all of these challenges in an integrated, strategic manner will be necessary to achieve long-term economic stability and success. The City must endeavor to identify the businesses most likely to remain and grow in an area that has very high costs – especially for housing – but also has outstanding community amenities, including good weather, a spectacular natural setting, and a safe and desirable community fabric.

The *Ventura Vision* calls for targeting industries that demonstrate the greatest promise for long-term community prosperity by:

- Providing high-wage, high skilled jobs,
- Possessing a local competitive advantage in the global economy,
- Being committed to local responsibility,
- Growing from local ownership, control or management,
- Practicing environmental leadership in their markets, and
- Strengthening the community's creative, cultural identity.

The *Vision* also offers principles for the City to pursue in charting future strategies for economic development:

- Encourage a broad range of high-quality employment and entrepreneurial opportunities.
- Encourage private economic prosperity that can support public services and quality-of-life amenities.

- Develop a vital, prosperous, and stable economy while maintaining a "small-town" flavor.
- Encourage the public and private sectors to work together to achieve prosperity.
- Participate constructively in regional economic development efforts.

Implementing these strategies will not be simple or easy. For one reason, California's current tax system contains provisions that result in some of the lowest-paying economic sectors providing the city with the most tax revenue, and vice versa.

Pillars for Prosperity

Community prosperity is not something that a city government can create by itself. Any successful economic development effort requires the participation of many partners, including community-based business organizations, educational and training institutions, venture capitalists, individual entrepreneurs and business owners, networks of suppliers, and other government agencies that have a mission to enhance prosperity.

Together, the City and its economic partners must ensure that the building blocks for community prosperity are in place. These foundations include organizations and institutions that can coordinate local economic development efforts, as well as land and other economic infrastructure required to make Ventura an attractive business location.

This organizational infrastructure is evolving in Ventura. Business groups such as the Chamber of Commerce and the Ventura County Economic Development Association (a countywide group) are already active, but a wider network is needed to assemble the resources and capacity of entrepreneurs, venture capitalists, educators, and other stakeholders in building a healthy business climate. Greater synergy is needed among the area's higher education institutions – including California State University Channel Islands, Ventura College, Brooks Institute, and satellite campuses of other colleges and universities.

Appropriate and sufficient land will also be necessary to ensure continued economic prosperity over the next 20 years, even as we seek to protect open space and combat sprawl. Demand for land to support retail and office development is likely to outstrip current supply unless allowable building intensities are significantly increased. While some increased density is likely, and some older industrial land may be recycled for new business uses, the City must take care to reserve sufficient land for these purposes – especially in an environment where short-term pressure is likely to encourage conversion of land to commuter housing.

Thus, the strategy for community prosperity must be coordinated with area-specific planning efforts, especially on the Westside (where industrial land is likely to be recycled), Downtown (which must stress office, studio, and retail business growth as well as an emerging residential component), and in the 101 Corridor between Mills Road and

Johnson Drive (where most of the city's business activity now takes place). The City will advance on a set of defined focused areas:

Auto Center – efforts over the short term will focus on making the area a regional retail destination. The City will strengthen its partnership with Auto Center dealers to realize beautification projects and facilitate land use entitlements for additional dealerships.

McGrath Property – the 76-acre site provides Ventura with the very best opportunity to attract new industry with high-value, high-wage jobs. The City and property owners will work on securing project entitlement approvals and recruiting desired tenants. The objective is to attract targeted industries and provide the impetus for initial site development over the short-term.

Westside – the feasibility of establishing a redevelopment project area will be considered by the City and Westside citizens. Such legal designation would provide the resources needed to leverage and implement planned initiatives in various Westside plans. Brownfield reuse efforts will also continue to secure funding for much needed site assessment and remediation activities.

Upper North Avenue – the objective is to transform this area from an oilfield industrial area to a dynamic economic engine. Development efforts will address reuse of the former USA Petroleum site, including and evaluation of the site's potential to emerge as a component of a campus expansion opportunity for Brooks Institute. Keys to this effort are site remediation, compatibility issues, and future annexation to the City.

Downtown – proposed initiatives include well defined design standards in the updated Downtown Specific Plan, enhanced efforts to market the Downtown Cultural District, formation of a downtown management entity, and attracting uses that create "around–the-clock" activity.

Anticipating Our Economic Future – Ventura's economic growth is built on a foundation of concerted efforts that fuel innovation, collaboration, and continuous learning. The focus will be on attracting high technology and knowledge-based businesses including biotechnology, non-durable manufacturing, and business and financial services. Continuous learning opportunities for job seekers, workers, and employers will acknowledge demographic pressures and rapidly changing skill needs. Through specific strategies, the community will develop leaders for tomorrow, and attract and retain new graduates and skilled employees. Critical players will include the Workforce Investment Board, Ventura College, California State Channel Islands, and the Brooks Institute.

The policies and actions in this chapter attempt to provide the means to support these targeted efforts to achieve a stable and balanced economic base.

Policy 2A: Establish a clear economic strategy.

Action 2.1: Track economic indicators for changes that may affect City land resources, tax base, or employment base, such as terms and conditions of sale or lease of available office, retail, and manufacturing space.

Action 2.2: Prepare an economic base analysis that identifies opportunities to capture retail sales in sectors where resident purchasing has leaked to other jurisdictions.

Action 2.3: Maintain and update an Economic Development Strategy to implement City economic goals and objectives.

Policy 2B: Make the local economic climate more supportive of businesses investment.

Action 2.4: Map priority locations for commercial and industrial development and revitalization, including a range of parcel sizes targeted for high-technology, non-durables manufacturing, finance, business services, tourism, and retail uses.

Action 2.5: Share economic and demographic information with organizations that may refer businesses to Ventura.

Action 2.6: Encourage intensification and diversification of uses and properties in districts, corridors, and neighborhood centers, including through assembly of vacant and underutilized parcels.

Action 2.7: Partner with local commerce groups to recruit companies and pursue funding for business development and land re-utilization.

Action 2.8: Carry out Housing Element programs that provide housing to all segments of the local workforce.

Action 2.9: Expedite review for childcare facilities that will provide support to local employees.

Policy 2C: Encourage niche industries.

Action 2.10: Expedite review of the entitlement process for installation of infrastructure necessary to support high technology and multimedia companies.

Action 2.11: Allow mixed-use development in commercial and industrial districts as appropriate.

Action 2.12: Allow uses such as conference centers with resort amenities on appropriately sized and located parcels.

Action 2.13: Market the city to businesses that link agriculture with high technology, such as biotechnology enterprises.

Action 2.14: Partner with local farms to promote farmers markets and high quality locally grown food.

Policy 2D: Expand tourism opportunities.

Action 2.15: Provide incentives for use of waterfront parcels for recreation, visitor-serving commerce, restaurant, marina, and fishing uses.

Action 2.16: Work with the State to create year-round commercial opportunities at the fairgrounds.

Action 2.17: Partner with the Harbor District and National Park Service to promote Channel Islands tours and develop a marine learning center.

Action 2.18: Prioritize uses within the Harbor master plan area as follows: (1) coastal dependent, (2) commercial fishing, (3) coastal access, and (4) visitor serving commercial and recreational uses.

Action 2.19: Partner with hotels and the Chamber of Commerce to promote city golf courses.

Action 2.20: Promote outdoor recreation as part of an enhanced visitor opportunities strategy.

ventura's general plan

OUR WELL PLANNED COMMUNITY

"Communities should be designed to serve the cycle of the day and the cycle of the lifetime."

— Andres Duany
Architect & Town Planner

CITY OF
VENTURA

3. OUR WELL PLANNED & DESIGNED COMMUNITY

Our goal is to protect our hillsides, farmlands and open spaces; enhance Ventura's historic and cultural resources; respect our diverse neighborhoods; reinvest in older areas of our community; and make great places by insisting on the highest standards of quality in architecture, landscaping and urban design.

Our City

Ventura is a unique coastal community, proud of our heritage and dedicated to being a national model for effectively managing growth to protect our natural environment and continue to be a great place for us to live.

It is our public responsibility to plan and shape the physical realm to achieve these goals. Past policies, particularly the 1989 Comprehensive Plan, reined in rapid outward suburban sprawl. The 1992 Downtown Specific Plan set the direction for revitalization of the historic heart of our community. Voter-approved measures clearly underscored a mandate to protect agricultural resources and open space, particularly in our hillsides.

Guided by the Ventura Vision of 2000, the centerpiece for this General Plan is creating a "well-planned and designed community." The policies build on the foundation of the past. This plan also represents an historic commitment to *smart* growth:

1. Mix land uses
2. Take advantage of compact building design
3. Create a range of housing opportunities and choices
4. Create walkable communities
5. Foster distinctive, attractive communities with a strong sense of place
6. Preserve open space, farmland, natural beauty, and critical environmental areas
7. Strengthen and direct development toward existing communities
8. Provide a variety of transportation choices
9. Make development decisions predictable, fair, and cost effective
10. Encourage community and stakeholder collaboration in development decisions

Source: U.S. Environmental Protection Agency

"**Smart growth** is about being good stewards of our communities and of our rural lands, parks, and forests. It is about ensuring that the best of the past is preserved, while creating new communities that are attractive, vital, and enduring."
--Michael Leavitt, EPA Administrator

Infill First

Ventura today is the product of decades of earlier growth and development. These patterns have largely established our community's character and will continue to do so in the future. The passage of SOAR, the Hillside Voter Protection Area, and other land-use constraints, along with natural boundaries, such as the ocean and the rivers, make it abundantly clear that before we expand outward any further, we must pursue an "Infill First" strategy. Such a strategy will help avoid sacrificing farmland and sensitive areas in our hillsides and along our rivers.

Our “Infill First” strategy for Ventura means avoiding suburban sprawl by directing new development to vacant land in the City and Sphere of Influence (with the exception of SOAR land), and by focusing new public and private investment in carefully selected districts, corridors, and neighborhood centers where concentrated development and adaptive reuse will improve the standard of living and quality of life for the entire community.

Recognizing that the rate of future population growth is not subject to City control, this plan has been analyzed (in the accompanying Environmental Impact Report) on the basis of estimates of what new homes and other development might be expected to take place over the next twenty years (see Table 3-2). Looking at the rate of growth over the past decade and recognizing the challenges to "infill" development compared to "greenfield" expansion, a projection of roughly 8,300 additional housing units and approximately 5 million square feet of non-residential development has been used for the plan's 20 year planning horizon. Table 3-2 provides estimates of the amount of development that could reasonably be expected to occur in the City and Sphere of Influence.

The actual distribution of future growth in the City may vary based on market forces and other factors. The districts, corridors, and neighborhood center areas, shown on Figure 3-1 Infill Areas, could accommodate more development and/or a different mix of development than shown in Table 3-2. To demonstrate this, Table 3-1 shows the potential development based on the overall carrying capacity of the land.

Distribution of growth in the districts and corridors is based on the following general assumptions:

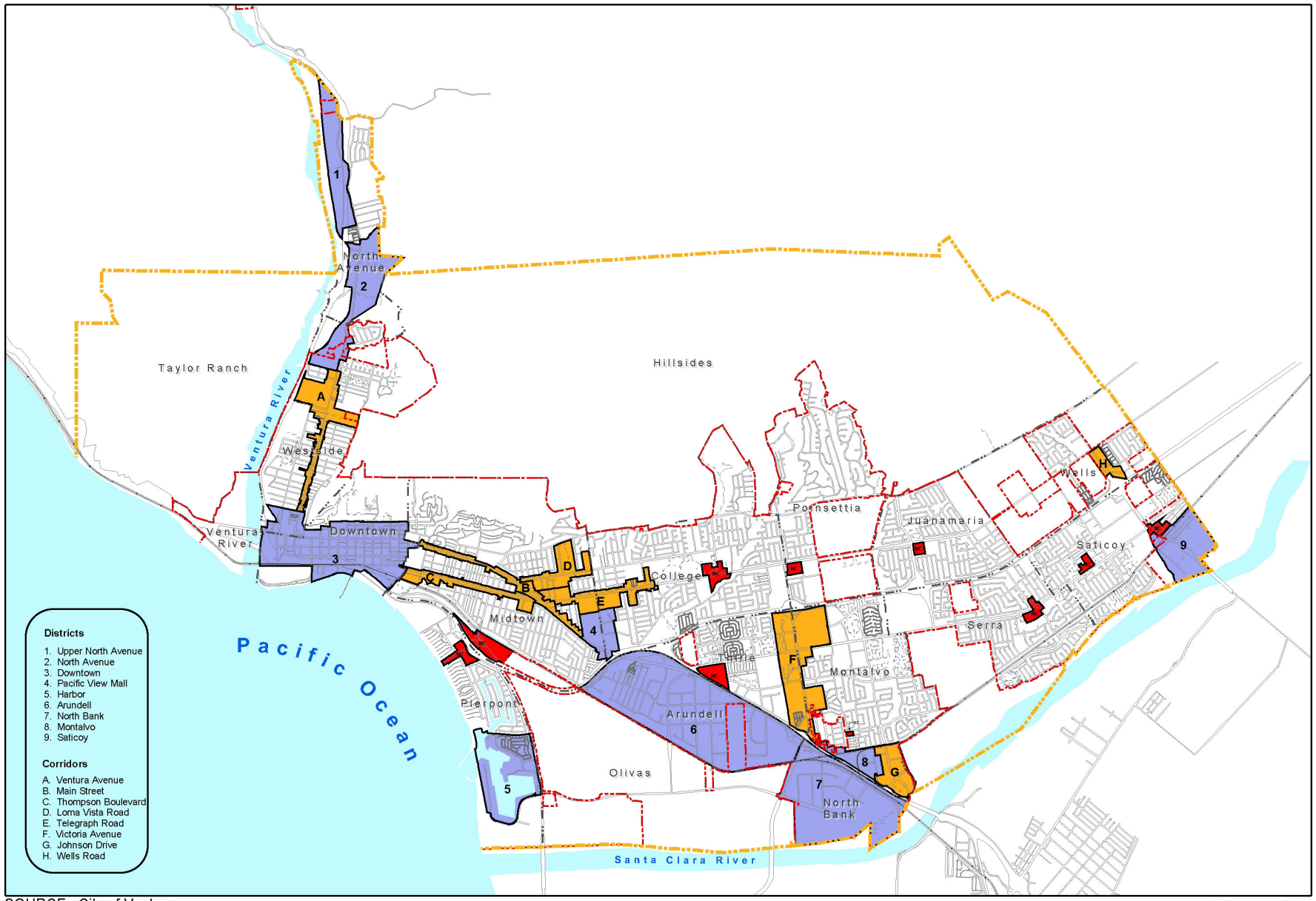
- Development in the Downtown and Harbor Districts will conform to the plans for those areas,
- The Downtown area and, to a lesser extent, the Ventura Avenue corridor will be the focus of future residential and commercial growth, and
- The Arundell, North Avenue, and Upper North Avenue areas will be the focus of future economic growth, potential expansion of the Brooks Institute, with some residential uses.

Table 3-1. Potential Development Based on Carrying Capacity of Land Area

Planning Designation	Allowed Density (du/acre)	Existing Development 2004					General Plan Capacity			
		Single Family Units	Multi Family Units	Comm./Ind. Sq. Ft.	Parcels	Acres	Vacant Parcels	Vacant Acres	Additional Potential[3] Units	Additional Potential[3] Sq. Ft.
Neighborhood Low	0-8	19,425	3,335	49,386	22,511	4,629	108	426	1,221	
Neighborhood Medium	9-20	1,163	8,965	149,513	4,414	1,061	32	116	4,859	
Neighborhood High	21-54	814	2,468	194,143	1,634	303	8	16	8,477	
Commerce[1]		257	490	4,995,248	1,366	808	95	108	7,892	22,328,276
Industry[2]		29	31	8,299,840	1,037	1,401	89	392	4,724	34,215,483
Public & Institutional		4	0	54,422	66	571				
Park & Open Space		6	0	15,491	264	11,693				
Agriculture		4	0	19,550	154	6,857				
Downtown Specific Plan	21-54	332	1,543	1,795,401	1,174	307	45	20	2,500	450,000
Harbor District		0	310	350,160	10	254	1	21	300	876,100
Total		**22,034**	**17,142**	**15,923,154**	**32,630**	**27,884**	**378**	**1099**	**29,910**	**57,869,859**

1. Commerce residential unit capacity is for property within a Corridor, District, or Neighborhood Center and assumes buildout to the maximum FAR and that 25% of floor area would be commercial (with the remainder residential).
2. Industry residential unit capacity is for property within a Corridor, District, or Neighborhood Center and assumes buildout to the maximum FAR and that 75% of floor area would be industrial (with the remainder residential).
3. "Additional Potential" assumes a historic buildout rate of 70% for both residential and non-residential.

Table 3-2. Predicted Development Intensity & Pattern	Residential Development (units)	Non-Residential Development (square feet)				
		Retail	Office	Industrial	Hotel	Total
DISTRICTS						
Upper North Avenue	100	10,000	50,000	150,000	-	210,000
North Avenue	50	10,000	50,000	250,000	-	310,000
Downtown Specific Plan	1,600	100,000	200,000	-	150,000	450,000
Pacific View Mall	25	25,000	-	-	-	25,000
Harbor	300	315,000	-	-	230,000	545,000
Arundell	200	25,000	300,000	1,000,000	-	1,325,000
North Bank	50	300,000	50,000	300,000	-	650,000
Montalvo	50	-	50,000	25,000	-	75,000
Saticoy	50	-	-	25,000	-	25,000
Subtotals (Districts)	**2,425**	**785,000**	**700,000**	**1,750,000**	**380,000**	**3,615,000**
CORRIDORS						
Ventura Avenue	800	40,000	100,000	50,000	-	190,000
Main Street	100	15,000	40,000	-	-	55,000
Thompson Boulevard	300	15,000	40,000	-	-	55,000
Loma Vista Road	25	15,000	40,000	-	-	55,000
Telegraph Road	250	15,000	40,000	-	-	55,000
Victoria Avenue	50	15,000	40,000	-	-	55,000
Johnson Drive	150	50,000	20,000	-	-	70,000
Wells Road	50	15,000	20,000	-	-	35,000
Subtotals (Corridors)	**1,725**	**180,000**	**340,000**	**50,000**	**0**	**570,000**
SPHERE OF INFLUENCE (SOI)/OTHER INFILL/NEIGHBORHOOD CENTERS						
101/126 Agriculture	200	-	-	-	-	-
Wells/Saticoy	1,050	-	-	-	-	-
Pierpont	100	30,000	-	-	-	30,000
Other Neighborhood Centers	100	-	-	-	-	-
Second Units	300	-	-	-	-	-
Underutilized	250	-	-	-	-	-
Vacant	450	165,000	50,000	-	-	215,000
Subtotals (Other Infill)	**2,450**	**195,000**	**50,000**	**0**	**0**	**245,000**
TOTAL INFILL	***6,600***	***1,160,000***	***1,090,000***	***1,800,000***	***380,000***	***4,430,000***
PLANNED AND PENDING DEVELOPMENTS						
Downtown	50	1,072	-	-	150,000	151,072
Ventura Avenue/Westside	238	7,086	-	27,000	-	34,086
Midtown	34	13,751	-	-	-	13,751
College (Telegraph/Loma Vista)	4	2,718	8,843	-	-	11,567
Telephone Road Corridor	256	-	54,785	-	-	54,785
Montalvo/Victoria	296	-	4,300	-	-	4,300
Saticoy/East End	840	7,950	5,600	-	-	13,550
Arundell	-	41,640	42,614	18,080	-	102,334
Olivas	-	7,160	7,066	390,053	-	404,279
Subtotals (Planned/Pending)	**1,718**	**81,377**	**123,214**	**435,133**	**150,000**	**789,724**
TOTAL (Infill+SOI/Other+Pending)	**8,318**	**1,241,377**	**1,213,214**	**2,235,133**	**530,000**	**5,219,724**



SOURCE: City of Ventura

Infill Sites

- Corridor
- Neigborhood Center (NC)
- District

- City Limits
- Planning Boundary
- Planning Neighborhoods

This map is a product of the City of San Buenaventura, California. Although reasonable efforts have been made to ensure the accuracy of this map, the City of San Buenaventura cannot guarantee its accuracy.

Figure 3-1
Infill Areas

Footnotes for Table 3-2:
Growth estimates for the Arundell community consider the likely development of the 75-acre McGrath property with a mix of uses and development of other vacant lands. Growth estimates for the North Bank area consider the possibility of a large retailer in that area. Estimates of growth in the SOI/Other Infill sites are based on the following general assumptions: (a) 101/126 Orchard site will develop similarly to a project recently proposed for that site; (b) Wells/Saticoy sites will develop in accordance with ongoing planning efforts for those areas; (c) the Pierpont area will develop generally in accordance with a conceptual project recently considered by the City; (d) Second Units will be added at a rate of 15/year; (e) roughly half of underutilized lands identified in the Housing Element will be re-developed over the next 20 years; (f) all vacant lands outside the districts and corridors will be developed in accordance with the proposed planning designations. Planned and Pending Developments based upon the City's 2004 Pending Projects list. Building areas do not include self storage facilities.
The following potential projects not included in the 2004 Planned and Pending Developments list have been included in the future development totals: (1) 150,000 square feet of industrial development in the North Bank area; (2) 165,000 square feet of retail development along Wells Road in the Saticoy area; (3) 50,000 square feet of office development on a 3.5-acre site along Ralston Drive. The Auto Center industrial project is included in the North Bank district; the other two projects are included in the "vacant" category. The square footage associated with these projects has been added to the projections of future growth to provide a conservative analysis of possible future impacts.

Together Table 3-2 and Figure 3-1, Infill Areas, offer a sense of how much growth Ventura might experience by 2025, and a picture of where such change is likely to occur. Precisely how and when development happens and what resources are conserved will be determined by the actions presented in the ten chapters of the *General Plan*, and by the specific land development standards. This plan is one of many tools the City will use to control where and how any future development takes place.

21st Century Tool Kit

The City has a wide array of tools at its disposal to achieve our "Infill First" strategy in ways that respect Ventura's heritage and result in beautiful buildings, blocks, streetscapes, and public places that enhance and enrich quality of life for the entire community. Shaping the City's physical form in the 21st Century will be achieved most effectively and aesthetically by combining Planning Designations with a transect-based approach, and with a new form-based Development Code. Together these can strongly influence the design and functioning of Ventura's distinct and unique neighborhoods, districts, and corridors.

The policies and actions in this chapter seek to enrich Ventura's urban fabric through appropriate design that showcases the attractive features of neighborhoods, districts, and corridors. To promote high-quality infill, the policies and actions encourage neighborhood centers, pedestrian access, established and desirable building types, and dynamic, neighborhood-serving nodes of mixed-use development along primary streets and corridors. This chapter specifically calls for detailed attention to community design through a form-based approach.

Neighborhoods: The Basic Building Blocks of Community

Like any great city, Ventura has grown around the basic unit of the neighborhood. A true neighborhood is not a subdivision of similar houses disconnected from surrounding places. Instead it is an identifiable area containing a neighborhood center with a pedestrian-friendly mix of uses and a palette of housing types for people in all stages of their lives. Neighborhoods are often defined by a quarter-mile "pedestrian shed" (see Figure 3-2), in which most residents' daily needs can be met within a five-minute walk. The organic nature of neighborhoods and their interdependency is what makes them viable for generations. Neighborhoods are not static places that resist change, but rather evolve naturally through periods of transformation to accommodate new residents' needs and desires.

> "In a neighborhood, everything that is needed is there and everything that is there is needed."
> - Anonymous

SOURCE: City of Ventura, Created for the Midtown Ventura Design Charette, March 2005

Northeast corner of Five Points

Theoretical 5 minute walk (1/4 mile)

Theoretical 10 minute walk (1/2 mile)

Actual 5 minute walk (1/4 mile)

Actual 10 minute walk (1/2 mile)

Figure 3-2
Pedestrian Shed, Theoretical versus Actual

This map is a product of the City of San Buenaventura, California. Although reasonable efforts have been made to ensure the accuracy of this map, the City of San Buenaventura cannot guarantee its accuracy.

The City is rich in a variety of neighborhoods, most of which are within one of Ventura's distinct communities. A total of 17 communities were identified in the 1989 Comprehensive Plan and have been carried forward, with some modifications to allow for a more detailed approach to describe Ventura's geography. Figure 3-3 illustrates 19 distinct communities, some of which are composed of a group of neighborhoods, each boasting their own unique attractions and potential. The oldest settled area is nearest the ocean, with newer areas found eastward, with the exception of Saticoy. Some of Ventura's communities have neighborhood centers established around parks, community gathering places, or civic buildings, and contain or are near services they share with surrounding areas, such as schools, libraries, post offices, and specialty shopping.

Ventura also has residential subdivisions and commercial and industrial districts that could evolve into true neighborhoods. A long-term strategy should be developed to gradually transform these areas that do not yet follow the neighborhood pattern. Existing subdivisions could be linked by pedestrian routes to new small-scale retail and service centers. Congested commercial areas could be redesigned as mixed-use centers on a grid of streets with walkable blocks that connect with surrounding neighborhoods and central plazas. These streets could be lined with buildings containing upper level housing and lower level commercial, office, and civic spaces that hide internal parking structures. Industrial sites that are fast converting to light industry, high tech manufacturing, and assembly could become factory villages with green space, multiple types of housing, small-scale retail to serve workers, and spin-off businesses.

Ventura's 19 communities (Figure 3-3) can each be enriched by using the *transect* (see discussion page 3-10) as a lens to understanding the ways in which it functions and by applying form-based development controls to respect and enhance its character to ensure that, where appropriate, each community provides one, if not more, walkable neighborhoods.

SOURCE: City of Ventura

City Limits

Planning Communities

Figure 3-3
Planning Communities

This map is a product of the City of San Buenaventura, California. Although reasonable efforts have been made to ensure the accuracy of this map, the City of San Buenaventura cannot guarantee its accuracy.

Taylor Ranch
This area is essentially undeveloped, with agriculture as the primary activity. Taylor Ranch is within the City's Planning Area, including a portion within the Coastal Zone Boundary.

Ventura River
This area includes the Ventura River Basin, is within the Coastal Zone Boundary, and with Emma Wood State Beach Park, its major activity is recreation offering day use and overnight camping. Opportunities exist for passive recreation and nature study.

Hillside Open Space
Within the City's Planning Area, is undeveloped, and designated Open Space. Plant communities include chaparral, riparian willow forest, and oak woodland. This area has tremendous potential for passive recreation including scenic trails with panoramic views. This area is coterminous with the Hillside Voter Participation Area or "HVPA" (see Chapter 1 and Appendix C).

North Avenue
Within the City's Planning Area. Historically, largely oilfield industrial. Includes both the Upper North Avenue and North Avenue districts, and is home to the Brooks Institute, which is world renown for its professional photographic and motion picture education. Opportunities exist to strengthen the economy of this area and provide for the expansion of the Brooks Institute into a campus-village including spin-off businesses with a mix of housing types and transit options for all ages.

Westside
Includes the Ventura Avenue corridor and is home to several neighborhood centers that are surrounded by well-connected neighborhood blocks. Opportunities exist to realize the potential of neighborhood improvements initiated in ongoing and past grassroots efforts, such as the Westside Revitalization Plan. This community includes "Hillside Areas" (see definition in Attachment A), which are subject to the Hillside Management Program that provides necessary development criteria in order to retain the natural qualities and minimize potential hazards.

Downtown
The area is regulated by the Downtown Specific Plan. This community is both an urban core with opportunity to grow economically stronger, and the historic center of the City. Civic uses include City Hall, Seaside Park, Grant Park, the Ventura County Museum, San Buenaventura Mission, and is home to a number of historic sites and landmarks. Additional opportunity to enhance the area's already strong cultural climate, including art, cookery, music, performance, and entertainment. Tremendous potential to create "around-the-clock activity" leading to increased vitality. This community includes "Hillside Areas".

Midtown
Includes the Main, Thompson, and Loma Vista corridors, a portion of the Telegraph corridor, as well as the Seaward/Alessandro neighborhood center. Home to the Pacific View Mall, the City's Bus Transfer Center, Ventura High School. Blanche Reynolds Park, Ocean Avenue Park,

and Memorial Park. Includes a small amount of agriculture. Opportunities exist to realize potential improvements initiated in ongoing and past grassroots efforts, such as Midtown by Design, and more recently the Midtown Urban Design Charrette. This community includes "Hillside Areas".

Pierpont
Within the Coastal Zone Boundary, a unique-beach oriented predominantly residential community, with high-quality beachfront homes. Includes the Harbor district and the Pierpont neighborhood center. Home to the Ventura Harbor, Seaward Elementary School, a mobile home park, and Marina Park. Currently offers highway retail such as motels, hotels, and fast food, but opportunity exists to offer residents and visitors with more attractive and improved neighborhood and coastal oriented services and to develop a specific plan for the Harbor district.

College
Includes a portion of the Telegraph corridor, and the College/Day neighborhood center. Major civic uses are Arroyo Verde and Camino Real Park, Ventura Community College and Buena High School. This community includes "Hillside Areas".

Thille
Includes the Gateway neighborhood center and shares the Victoria corridor with Montalvo to the east. Contains mix of housing types built mostly between 1960 and 1980, with some newer development in the 1990's and early 2000's. Its primary civic use is the County Square Linear Park

Arundell
This community contains the main industrial and warehouse district of Ventura, but also has mixed-use areas with retail, restaurants, and offices within walking distance of many workers. Callens Road, the historic center of this community, has great potential to expand and increase the mix of uses it contains, including residential. A significant vacant parcel, the 75-acre McGrath property, offers great economic opportunity to attract new industry that provides high value, high wage jobs to the City.

Olivas
Predominantly agricultural. Its major civic use is the Olivas Park Golf Course and is home to the Olivas Adobe. Contains some commercial and industrial.

North Bank
This community contains a portion regulated by the Auto Center Specific Plan. Its major civic use the Buenaventura Golf Course. Predominantly industrial, with some agriculture. Opportunity to enhance the area as a regional retail destination, while providing workforce serving retail uses.

Poinsettia
Includes the Victoria Plaza neighborhood center. Its primary civic uses include elementary and middle schools. Predominantly residential, with some housing in the Hillside Area, and a significant amount of agricultural operations.

Montalvo
Includes the Johnson Drive corridor, Bristol neighborhood center, and shares the Victoria corridor with Thille to the west. Its major civic use is the County Government Center (equal size to 12 downtown blocks), but also the Rancho Ventura Linear Park and the Barranca Vista Park. Contains mix of housing types and is home to the Metrolink Station.

Serra
Includes the Telephone/Petit neighborhood center, and is home to the City's newest civic use – the Community Park, set to open Fall 2005. Also includes the Chumash Park, Junipero Serra Park, North Bank Linear Park, and Bristol Bay Linear Park. Contains a significant amount of agricultural land.

Juanamaria
Includes the Kimball/Telegraph neighborhood center. Primary civic use is Hobert Park; this community contains some agricultural land.

Wells
Includes the Wells corridor. The Brown Barranca runs through the northerly portion of this area. Contains agricultural land.

Saticoy
Includes the Telephone/Cachuma and Saticoy neighborhood centers and the Saticoy district. Developed originally as a rural town in the late 1800s, Saticoy has the full range of transect characteristics: from the Santa Clara river and the rural eastern edge, to its neighborhood centers, and a mix of housing types at various intensities. Its major civic uses are the Fritz Huntsinger Youth Sports Complex, Saticoy Regional Golf Course and the Saticoy neighborhood park.

Planning Designations and Transect Zones

Land in the City's Planning Area is divided into eight basic Planning Designations on the General Plan Diagram (page 3-22). Each acknowledges a particular predominant development pattern that exhibits certain desirable characteristics, such as building types and functions that can be measured and described.

The wide range of building forms in Ventura offers great potential for compatible infill and viable mixed-use projects in existing neighborhoods, districts, corridors, and neighborhood centers. The wealth of building types includes attached and detached housing, duplexes, courtyard bungalows, second units (often over garages), lofts (some live-work), urban villas, neighborhood shopfronts, concentrated retail developments, and civic buildings. Public buildings retain special importance by serving as prominent landmarks that shape the visual character of the city.

Streetscapes set the tone for quality of life in Ventura by providing the shared outdoor living space of the community. Although the city's distinct neighborhoods, commercial and industrial districts, and agricultural areas are linked by corridors that have evolved primarily to accommodate motor vehicles, opportunities abound to make those streets more livable and to focus activities in neighborhood centers that emphasize walking, biking, and public gathering, and thereby ease traffic and reinforce community vitality. Accordingly, new development needs to be high quality, compact, and walkable, and it should incorporate design diversity that increases lifestyle choices and bolsters commerce and industry.

Determining which building types are most appropriate in specific locations requires shifting away from conventional zoning that emphasizes use toward a form-based approach that prioritizes function, appearance, and compatibility with surrounding context. A powerful tool for understanding this context is the *Transect*, which depicts the continuum from rural to urban conditions (see Figure 3-4).

The transect is a tool that can be used by the community to understand and describe the full range of unique environmental and built characteristics within each of Ventura's neighborhoods. Using the six parenthetical transect zones to better understand the broad Planning Designations of the General Plan Diagram, a finer-grained (site specific) set of development standards can be created to ensure that new development is in keeping with local preferences for building.

This new Development Code will better accommodate the diversity of lifestyles Ventura desires – from the *rural* farm to the *sub-urban* house and yard to the *urban core* with apartments above shops – and will contribute to the identity and character desired by the community. Common elements that the transect will help measure and describe, and that the Development Code will prescribe, include the types and

arrangements of buildings, their "intensity" of lot coverage, height and mass, the details of streets, public and private frontages and the requirements for and character of open spaces. In general it will prescribe individual neighborhood preferences for urban design and building characteristics, including standards.

In many cases, area specific codes, applying the Planning Designations including districts, corridors, and neighborhood centers, will be developed as part of community or specific plans that establish a detailed strategy for public and private investment and policies to promote the appropriate preservation and development of community desired character.

The following descriptions of the Planning Designations include a parenthetical reference to the transect zones they encompass that will be used as guidance in interpreting the planning designations while drafting detailed plans and codes:

"A **transect** is a geographical cross-section of a region used to reveal a sequence of environments. For human environments, this cross-section can be used to identify a set of habitats that vary by their level and intensity of urban character, a continuum that ranges from rural to urban. In transect planning, this range of environments is the basis for organizing the components of the built world: building, lot, land use, street, and all of the other physical elements of the human habitat."
--SmartCode, Volume 6.5, 2005

"All architecture should be beautiful. All towns should be beautiful. Beauty nurtures the soul and the spirit. It makes life worth living."
-Camillo Sitte

- Neighborhood Low – *(T3 Sub-Urban and T4 General Urban)*
emphasizes detached houses with some attached units in a small mix of building types from 0 up to 8 dwelling units per acre. Predominantly residential, with opportunity for limited home occupation and neighborhood services sensitively located along corridors and at intersections.

- Neighborhood Medium – *(T3 Sub-Urban, T4 General Urban and T5 Urban Center)*
anticipates a mixture of detached and attached dwellings and higher building types at approximately 9 to 20 dwelling units per acre. Predominantly residential with small scale commercial at key locations, primarily at intersections and adjacent to corridors.

- Neighborhood High – *(T3 Sub-Urban through T6 Urban Core)*
accommodates a broader mix of building types, primarily attached, from 21 to 54 dwelling units per acre; A mix of residential, commercial, office, and entertainment that includes mixed-use buildings.

- Commerce – *(T4 General Urban through T6 Urban Core, neighborhood center downtown, regional center, town center or village center)*
encourages a wide range of building types of anywhere from two to six stories (depending on neighborhood characteristics) that house a mix of functions, including commercial, entertainment, office and housing.

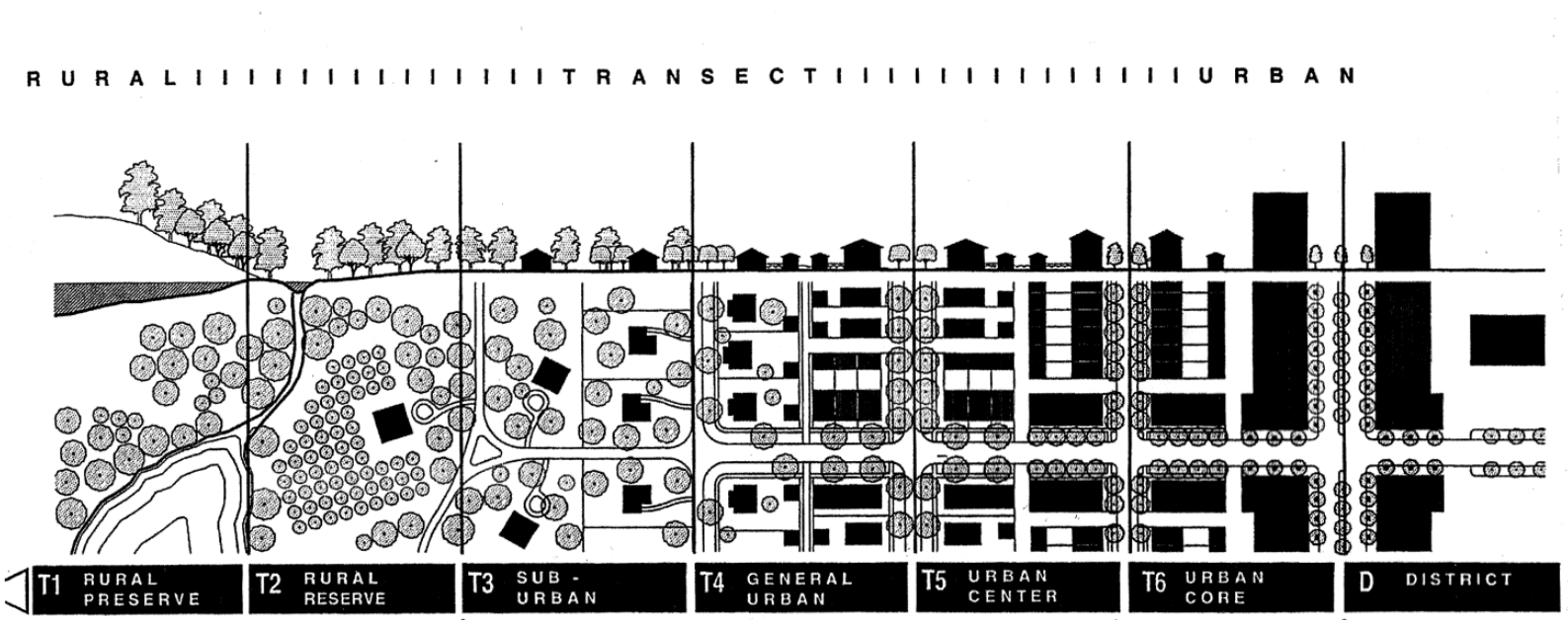
- Industry – *(T2 Rural through T6 Urban Core)*
encourages intensive manufacturing, processing, warehousing and similar uses, as well as light, clean industries and support offices; also encourages workplace-serving retail functions and work-live residences where such secondary functions would complement and be compatible with industrial uses. Primarily large-scale buildings. Also can be developed as Transit Oriented Development, employment center or working village with a mix of uses.

- Public and Institutional – *(T1 Preserve through T6 Urban Core)*
accommodates civic functions such as government offices, hospitals, libraries, schools and public green space.

- Agriculture – *(T2 Rural)*
predominantly commercial cultivation of food and plants and raising of animals.
Pursuant to SOAR: The Agricultural use (not to be considered until after the Year 2030) category identifies those lands that are designated for agricultural use on the General Plan Diagram. The target date of 2030 associated with the Agricultural Use designation indicates a review date after which agriculturally designated lands may be reconsidered for urban uses. However, during the life of this Plan as amended by initiative, it is intended that only agricultural uses are permitted on these lands, except as such lands may be appropriate to public open space and recreational usage. Furthermore, any updates to this Plan are not intended to imply that development would necessarily be appropriate at that time.

- Parks and Open Space – (*T1 Preserve through T6 Urban Core)*
designate lands to public recreation and leisure and visual resources, and can range from neighborhood tot lots and pocket parks to urban squares and plazas and playgrounds to large regional parks and natural preserves.

Figure 3-4. The Transect



Transect: a system of ordering human habitats in a range from the most natural to the most urban. For convenience, the Transect is divided into six zones which describe the physical character of place at any scale, according to the intensity of land use and urbanism. The T-Zones are T1 Natural, T2 Rural, T3 Sub-Urban, T4 General Urban, T5 Urban Center, and T6 Urban Core.

Natural Zone (T1): consists of lands approximating or reverting to a wilderness condition, includes lands unsuitable for settlement due to topography, hydrology, or vegetation.

Rural Zone (T2): consists of lands in open or cultivated state or sparsely settled. These may include woodlands, agricultural lands, grasslands and irrigable deserts.

Sub-Urban Zone (T3): though similar in density to conventional suburban residential areas, differs by its superior connectivity and by allowing home occupations. It is typically adjacent to other urban T-zones. This zone is naturalistic in its planting. Blocks may be large and the roads irregular to accommodate site conditions.

General Urban (T4): has a denser and primary residential urban fabric. Mixed-use is usually confined to certain corner locations. This zone has a wide range of building types: singles, side yard and rowhouses. Setbacks and street tree settings are variable.

Urban Center (T5): is the equivalent of the main street area. This zone includes mixed-use building types that accommodate retail, offices and dwellings, including rowhouses and apartments. This zone is a tight network of streets and blocks with wide sidewalks, steady street tree planting and buildings set close to the frontages.

Urban Core (T6): is the equivalent of a downtown. It contains the densest urbanism – the tallest buildings and the greatest variety of uses, particularly unique ones such as financial districts and important civic buildings. This zone is the least naturalistic of all the zones; street trees are formally arranged or non-existent.

Source: Duany, Plater Zyberk & Company's SmartCode, Volume 6.5, Spring 2005

The General Plan Diagram (page 3-22) also depicts the Downtown, Auto Center, and Saticoy Village Specific Plan areas, which are subject to detailed standards for form and use. In addition, the Diagram identifies Districts, Corridors, and Neighborhood Centers – where the development of housing alongside commercial uses is specifically encouraged. These Districts, Corridors, and Neighborhood Centers make up the growth priority areas as the City's "Infill First" strategy (See Figure 3-1 Infill Areas).

Districts, Corridors, and Neighborhood Centers

One of the primary objectives for infill in Ventura is to produce mixed-use development that places most people's daily needs within walking distance of their dwellings. This may include encouraging "flex space" where a single building functions as both living and working area for the owner, combining housing and commercial uses in the same structures, or sensitively integrating small-scale retail, service, and entertainment within convenient distance of residential areas. Mixed-use places inherently reduce automobile trips and improve the pedestrian experience, resulting in safer neighborhoods, healthier citizens, and better access to everyday needs. The City's corridors and districts already encompass significant mixed-use development. Opportunities exist to augment those areas in ways that complement and enhance existing urban form and streetscapes to better serve Ventura's residents.

Districts

Districts consist of streets or areas emphasizing specific types of activities and exhibiting distinct characteristics. A neighborhood or parts of neighborhoods can form a district. A thoroughfare may also be a district, such as when a major shopping avenue runs between adjoining neighborhoods. The following nine districts are depicted on the General Plan Diagram:

1. Upper North Avenue – home to a mix of industrial uses, including an abandoned oil refinery and Brooks Institute. Tremendous opportunities exist for the remediation and reuse of the former USA Petroleum site, as well as for the expansion of the Brooks Institute as a campus village, surrounded by a green edge to define the upper limits of Ventura.

2. North Avenue – an area with oilfield, industrial, and residential development, which has potential to fully develop into a more balanced mix of building types and uses with unique character, to serve as a major neighborhood anchor for northwest Ventura.

3. Downtown – the most intensely developed area of the city and its urban core. The Downtown Specific Plan regulates this area. Proposed initiatives include well-defined design standards via the Downtown Specific Plan update; enhanced efforts to market the Downtown Cultural District; formation of a

downtown management entity; and attracting uses that create "around–the-clock" activity.

4. Pacific View Mall – an enclosed shopping center and adjacent commercial uses. Large expanses of surface parking paired with significant building mass offer opportunity for the reintroduction of the block pattern and a reinvention of single-use retail into a much more sustainable mix of high intensity uses.

5. Harbor – an area with visitor serving uses, marine facilities, boating and commercial and recreational fishing activities, as well mixed-use places. A specific plan (based on the draft Harbor Master Plan) is being prepared for the Harbor District that will ensure a mix of uses, including residential, and highly defined public frontages and shared civic space for increased accessibility to ocean-front amenities.

6. Arundell – is currently an industrial center with a mix of small-scale industrial uses, business park development, and limited retail services. The McGrath Property – is a 76-acre site of undeveloped land that could provide the catalyst for Ventura's redefinition of 21st Century light industry, manufacturing, research and development, and technological innovation. It is centrally located in the Arundell area, which is ripe for redevelopment into a new form of community plan and building that incorporates large-scale employment, workforce housing and neighborhood commercial in an economically diverse setting.

7. North Bank – a combination of automobile retail, regulated by the Auto Center Specific Plan, and industrial/business park uses. Auto Center – efforts over the short tem will focus on making the area a regional retail destination. The City will strengthen its partnership with Auto Center dealers to realize beautification projects and facilitate land use entitlements for additional dealerships, as well as nurture creative partnerships to discover potential for unique attractions of regional interest.

8. Montalvo – an area of industrial and heavier commercial uses, and currently home to the Metrolink Station. Because of the strategic location of this area between east and west Ventura and it's transportation-rich infrastructure, it needs a strong plan for connectivity and a strategic mix of uses for evolution that is economically sustainable.

9. Saticoy – a mix of homes, older industrial and agricultural operations, and the planned site for the County maintenance yard. The Saticoy Village Specific Plan governs a small portion of this area. A larger effort should ensure Saticoy's seamless connection with adjacent areas, including a greenspace and circulation plan.

Corridors

Corridors, which can be natural or urban, often form boundaries, as well as connections, between neighborhoods and/or districts. Natural corridors can be those such as streams, barrancas, canyons, or green parkways. Urban corridors can be transportation thoroughfares that frequently encompass major access routes, especially ones with commercial destinations, including transit routes and rail lines. The following eight urban corridors are depicted on the General Plan Diagram. Each has the potential to evolve into a vibrant mixed-use City street with a distinct character borrowed from the neighborhoods that share it:

A. Ventura Avenue – a mix of older, small-scale commercial, industrial, and residential uses, with potential to grow even more vibrant by building on existing strengths, including its historic role as a major "working center." Using the warehouse model and diversity of building materials as a cue, "The Avenue" could harness cultural expression and become an eclectic center for the emerging arts and manufacturing crafts.

B. Main Street – currently a commerce-oriented area with a limited amount of mixed use development, this corridor displays the broadest range of architectural types and styles in the city, as well as the widest spectrum of transect characteristics. It has the most potential for increased mixed use and housing with improved streetscape and pedestrian enhancement to slow traffic.

C. Thompson Boulevard – a commercial thoroughfare in need of streetscape improvements and pedestrian amenities, this corridor is much like Main Street in that it boasts tremendous history as a "gateway to Ventura" and epitomizes a beach town character. It is a natural for a major transit or streetcar corridor, where nodes of mixed-use development and pedestrian and bike enhancement could support parallel neighborhoods and increase access to the ocean.

D. Loma Vista Road – a mix of commercial and residential development at varying scales, with a high concentration of medical facilities, this is the ideal place for Ventura to focus on creating a concentration of medical and research-centered business, with a high intensity of workforce housing and services housed in large-scale mixed-use buildings of high-tech character and serviced by increased transit.

E. Telegraph Road – a sub-urban-scale commercial area with some detached homes and multifamily buildings. The City's bus transfer station is located along this corridor, creating the perfect opportunity for a multi-modal connection with an intense node of housing and employment. The streetscape could change character along its length, with a mixture of intensities of development.

F. Victoria Avenue – currently a wide artery with high traffic volumes and shopping centers, Victoria needs effective traffic management

and pedestrian and streetscape improvements with strong attention to additional mobility options. Actions in this General Plan, along with the new Development Code, will call for revitalizing this corridor by redesigning the current array of single-use shopping centers and retail parcels with a mix of building types, uses, and public and private frontages. By eliminating "big box", mega-block, auto-oriented strip development, and the traffic patterns it generates, Victoria Avenue could create tremendous opportunity for healthy economic investment in walkable blocks, connected to better serve surrounding neighborhoods. Creative solutions, including dedicating transit or streetcar lanes, wider sidewalks, and bike lanes could transform Victoria's image into a regional thoroughfare of great and sophisticated diversity. All new commercial development within the Victoria Avenue corridor must follow this approach.

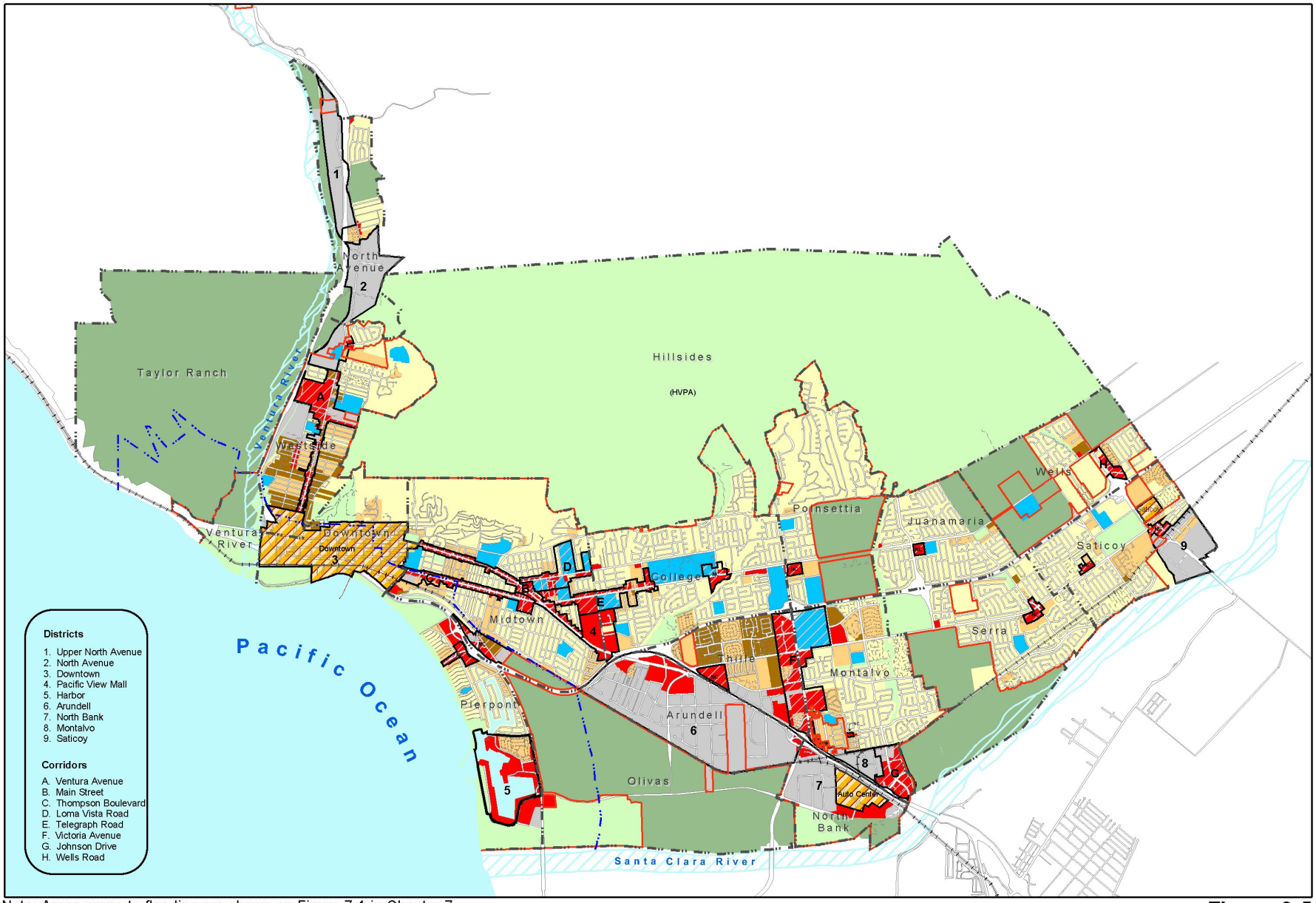
G. Johnson Drive – a connector between eastern Ventura and Highway 101 with sub-urban scale retail. Opportunities exist for high-quality, mixed-uses (such as child-care, restaurants, offices, light industrial, and housing) with ground floor commercial space to strengthen its economic presence and provide a visual gateway.

H. Wells Road – a mix of older industrial uses and newer sub-urban commercial and residential development. Well's Road should be returned to the neighborhoods it serves, so that new development can emulate the country charm that existed prior to its widening. Traffic calming in appropriate locations would encourage neighborhood connectivity, and end the current trend toward walls and buildings that turn their back to the street. This would also encourage redevelopment of the old neighborhood centers.

Neighborhood Centers

Community evolves from individual conversations and the best places to grow community are in individual neighborhoods. Every neighborhood should have at least one center where people can meet by chance at a local coffee shop, market, bookstore, diner, or even hardware store. *Our Involved Community* needs places to gather to have meaningful conversations and share civic information. Ventura's existing neighborhood centers have the opportunity to become such places. The General Plan Diagram identifies 10 neighborhood centers – where the development of housing alongside commercial uses is specifically encouraged. These centers include:

(1) Pierpont, (2) Seaward/Alessandro, (3) College/Day, (4) Gateway Plaza, (5) Victoria Plaza, (6) Bristol, (7) Kimball/Telegraph, (8) Petit/Telephone, (9) Telephone/Cachuma, and (10) Saticoy.



Note: Areas prone to flooding are shown on Figure 7-1 in Chapter 7.

Figure 3-5

GENERAL PLAN DIAGRAM

Neighborhood
- Low (up to 8 du/ac)
- Medium (9-20 du/ac)
- High (21-54 du/ac)

- Commerce
- Industry
- Public and Institutional

- Agriculture
- Parks and Open Space
- Specific Plan Area

- Corridors, Neighborhood Centers (NC)
- Districts

- City Limits
- Planning Communities
- California Coastal Zone Boundary

This map is a product of the City of San Buenaventura, California. Although reasonable efforts have been made to ensure the accuracy of this map, the City of San Buenaventura cannot guarantee its accuracy.

Special Topics

Agricultural Lands

During the 20th Century, the value of agricultural land in Ventura became secondary to that for development. However, this pattern is not irreversible, and protecting green land to save the aesthetic beauty of open space, preserve the cultural landscape of the community's heritage, and conserve land for environmental quality are high priorities in Ventura. In fact, the land's historic role for food production may soon be more highly valued once again, as prime agricultural areas continue to disappear to development at an astounding rate.

Ventura is fortunate to retain much of its rural landscape. Agriculture still plays an important role in the economy of the City and County of Ventura. Significant yields are made possible by the presence of high quality soils, adequate water supply, favorable climate, long growing season, and level topography. Mechanisms such as the California Land Conservation Act (more popularly known as the Williamson Act), the Save Our Agricultural Resources (SOAR) initiative (see Appendix B), and greenbelt agreements with neighboring jurisdictions continue to help maintain a balance between urban growth and agricultural preservation. The SOAR initiative that was adopted by the voters in 1995, and that, by its own terms, remains in full legal effect until 2030, refers to specific policies from the 1989 Comprehensive Plan that are still in effect and, as such, have been carried forward into this Plan under Policy 3D and Action 3.20 in addition to being incorporated in this General Plan as set forth in Appendix B.

A primary agricultural concern is the potential conflict with adjacent urban uses over pesticides, dust, odors, noise, and the visual impact of large greenhouses. Other issues of importance to agricultural producers include restrictions on farm-related activities, access to water, and provision of farmworker housing. Paralleling these concerns is a community interest in sustainability, the ability to provide for the needs of future generations. The policies and actions in this chapter intend to sustain viable farm operations in areas designated for agricultural use.

Growth Management

Growth management seeks to preserve public good, improve social equity, and minimize adverse impacts of development while still accommodating new housing and business attraction. The effects of growth management policies on housing prices are complex due to the idiosyncrasies of local real estate markets. Properly designed, growth management programs can plan for all development needs, such as open space, access to public transportation, and walkable neighborhoods.

The City's Residential Growth Management Program (originally established in 1979 to ensure that housing development would not outpace needed infrastructure) has not always contributed to housing affordability or quality design. This General Plan calls for revising the Residential

Subsequent to the adoption of the **SOAR** initiative, there have been two general plan amendments, which redesignated individual agricultural properties through a vote of the electorate as required by SOAR. These remain in full legal effect and have been carried forward into this Plan. These include the new Community Park at Kimball Road and the southeast corner of Montgomery and Bristol (see Appendix E and F).

Growth Management Program with an integrated set of growth management tools. Such tools not only include the adoption of a new form-based Development Code, but also community or specific plans based on availability of infrastructure and resources.

Long Term Potential Expansion Strategy

Indeed, the community has indicated that before the City expands any further, the first priority for achieving planning goals should be in the vacant and underutilized areas of the City. Yet, even the most successful effort to achieve community planning goals through infill may need to be supplemented at some point by expanding into areas outside the city limits. Such expansion may not only be necessary to fulfill development objectives; it also may be needed to provide open space, parklands, and natural areas to be preserved and restored. To address this, citizens discussed during the preparation of this General Plan which areas, if any, should be possible expansion areas. These areas were identified because they embody opportunities for achieving a variety of community vision objectives that may not be feasible within existing city limits. The community further went on to agree upon a set of rules about how these areas should be planned. These areas were analyzed in the environmental impact report prepared for this General Plan, and a "long term potential expansion strategy" will be formulated to guide the process of prioritizing any potential future expansion areas to fulfill General Plan objectives that may not be able to be achieved by our "Infill First" approach. Should any areas be selected for future planning, a specific plan, a public vote (if required pursuant to SOAR), and an amendment with the regulatory planning framework would have to occur.

The policies and actions in this chapter call for measured and appropriate growth in Ventura by prioritizing areas appropriate for additional development based on community values and infrastructure potential.

Policy 3A: Sustain and complement cherished community characteristics.

Action 3.1: Preserve the stock of existing homes by carrying out Housing Element programs.

Action 3.2: Enhance the appearance of districts, corridors, and gateways (including views from highways) through controls on building placement, design elements, and signage.

Action 3.3: Require preservation of public view sheds and solar access.

Action: 3.4 Require all shoreline development (including anti-erosion or other protective structures) to provide public access to and along the coast, unless it would duplicate adequate access existing nearby, adversely affect agriculture, or be inconsistent with public safety, military security, or protection of fragile coastal resources.

Action 3.5: Establish land development incentives to upgrade the appearance of poorly maintained or otherwise unattractive sites, and enforce existing land maintenance regulations.

Action 3.6: Expand and maintain the City's urban forest and thoroughfare landscaping, using native species, in accordance with the City's Park and Development Guidelines and Irrigation and Landscape Guidelines.

Action 3.7: Evaluate whether lot coverage standards should be changed based on neighborhood characteristics.

Policy 3B: Integrate uses in building forms that increase choice and encourage community vitality.

Action 3.8: Adopt new development code provisions that designate neighborhood centers, as depicted on the General Plan Diagram, for a mixture of residences and small-scale, local-serving businesses.

Action 3.9: Adopt new development code provisions that designate areas within districts and corridors for mixed-use development that combines businesses with housing, and focuses on the redesign of single-use shopping centers and retails parcels into walkable, well connected blocks, with a mix of building types, uses, and public and private frontages.

Action 3.10: Allow intensification of commercial areas through conversion of surface parking to building area under a district-wide parking management strategy in the Downtown Specific Plan.

Action 3.11: Expand the downtown redevelopment area to include parcels around future transit areas and along freeway frontage.

Action 3.12: The City will work with the hospitals on the new Development Code treatment for the Loma Vista corridor, which includes both hospitals.

Action 3.13: Assess whether the City's Affordable Housing Programs respond to current needs, and modify them as necessary within State mandated Housing Element updates.

Specific Plan Requirements

Specific Plans must include a statement of its relationship to the General Plan and specify all of the following:

1. distribution, location, and extent of uses
2. distribution, location, extent, and intensity of public and private transportation, sewage, water, drainage, solid waste disposal, energy
3. standards and criteria by which development will proceed and standards for conservation, development, and utilization of natural resources
4. program of implementation measures, including regulations, programs, public works projects, and financing
5. any other subjects that are necessary

(§65450-65452)

Policy 3C: Maximize use of land in the city before considering expansion.

Action 3.14: Utilize infill, to the extent possible, development to accommodate the targeted number and type of housing units described in the Housing Element.

Action 3.15: Adopt new development code provisions that ensure compliance with Housing Element objectives.

Action 3.16: Renew and modify greenbelt agreements as necessary to direct development to already urbanized areas.

Action 3.17: Continue to support the Guidelines for Orderly Development as a means of implementing the General Plan, and encourage adherence to these Guidelines by all the cities, the County of Ventura, and the Local Agency Formation Commission (LAFCO); and work with other nearby cities and agencies to avoid urban sprawl and preserve the rural character in areas outside the urban edge.

Action 3.18: Complete community or specific plans, subject to funding, for areas such as Westside, Midtown, Downtown, Wells, Saticoy, Pierpont, Harbor, Loma Vista/Medical District, Victoria Corridor, and others as appropriate. These plans will set clear development standards for public and private investments, foster neighborhood partnerships, and be updated as needed.

Action 3.19: Preparation of the new Development Code will take into account existing or proposed community or specific plans to ensure efficient use of City resources and ample citizen input.

Policy 3D: Continue to preserve agricultural and other open space lands within the City's Planning Area.

Action 3.20: Pursuant to SOAR, adopt development code provisions to "preserve agricultural and open space lands as a desirable means of shaping the City's internal and external form and size, and of serving the needs of the residents.

Action 3.21: Adopt performance standards for non-farm activities in agricultural areas that protect and support farm operations, including requiring non-farm uses to provide all appropriate buffers as determined by the Agriculture Commissioner's Office.

Action 3.22: Offer incentives for agricultural production operations to develop systems of raw product and product processing locally.

Policy 3E: Ensure the appropriateness of urban form through modified development review.

Action 3.23: Develop and adopt a form-based Development Code that emphasizes pedestrian orientation, integration of land uses, treatment of streetscapes as community living space, and environmentally sensitive building design and operation.

Action 3.24: Revise the Residential Growth Management Program (RGMP) with an integrated set of growth management tools including:

- community or specific plans and development codes based on availability of infrastructure and transit that regulate community form and character by directing new residential development to appropriate locations and in ways that integrate with and enhance existing neighborhoods, districts and corridors;
- appropriate mechanisms to ensure that new residential development produces high-quality designs and a range of housing types across all income levels; and,
- numeric limitations linked to the implementation of community or specific plans and development codes and the availability of appropriate infrastructure and resources; within those limitations, the RGMP should provide greater flexibility for timing new residential development.

Action 3.25: Establish first priority growth areas to include the districts, corridors, and neighborhood centers as identified on the General Plan Diagram; and second priority areas to include vacant undeveloped land when a community plan has been prepared for such (within the City limits).

Action 3.26: Establish and administer a system for the gradual growth of the City through identification of areas set aside for long-term preservation, for controlled growth, and for encouraged growth.

Action 3.27: Require the use of techniques such as digital simulation and modeling to assist in project review.

Action 3.28: Revise the planning processes to be more user-friendly to both applicants and neighborhood residents in order to implement City policies more efficiently.

Policies and actions related to the preservation of **historic architecture and resources** are contained in Chapter 9.

2000-2006 HOUSING ELEMENT GOALS AND POLICIES, City Council Adopted Resolution 2004-014. Adopted April 12, 2004

Goal 1

Maintain and improve the quality of existing housing and residential neighborhoods in Ventura.

Policy 1.1 Encourage citizen involvement in addressing the maintenance and improvement of the housing stock and neighborhood quality.

Policy 1.2 Continue to preserve and maintain the City's historical and architecturally significant buildings and neighborhoods.

Policy 1.3 Encourage homeowners and landlords to maintain properties in sound condition through the City's residential rehabilitation assistance programs and code enforcement efforts.

Policy 1.4 Cooperate with housing providers in the acquisition, rehabilitation, and maintenance of older residential properties as long-term affordable housing.

Policy 1.5 Permit the conversion of apartments to condominiums only when such conversion would not adversely affect the overall supply and availability of rental units, particularly units occupied by lower- and moderate-income households.

Policy 1.6 Continue to support the provision of rental assistance to lower-income households, and encourage property owners to list units with the Housing Authority.

Policy 1.7 Continue to preserve the affordability of mobile homes through the Rent Stabilization Ordinance. Support the acquisition and ownership of mobile home parks by non-profit housing providers and resident organizations.

Policy 1.8 Preserve the existing stock of affordable housing, including mobilehomes, through City regulations, as well as financial and other forms of assistance.

Goal 2

Facilitate the provision of a range of housing types to meet the diverse needs of the community.

Policy 2.1 Provide high quality housing for current and future residents with a diverse range of income levels.

Promote housing that is developed under modern sustainable community standards.

Policy 2.2 Provide expanded housing opportunities for the City's workforce. Promote the City's affordable housing programs with employers in Ventura.

Policy 2.3 Continue to offer and promote homeownership assistance programs to lower- and moderate-income households to purchase both new and existing housing. Pursue participation in other homeownership programs available in the private market.

Policy 2.4 Continue to provide financial and regulatory incentives to non-profits, private housing developers, and public agencies for the construction of the types of housing required to meet identified needs.

Policy 2.5 Support the provision of quality rental housing with three or more bedrooms to accommodate large families, and encourage room additions in the existing housing stock to address household overcrowding.

Policy 2.6 Support a variety of housing types to address the needs of agricultural workers, including affordable rentals, mobilehome parks, single room occupancy hotels (SROs), and group housing for migrant laborers.

Policy 2.7 Facilitate the provision of housing to address Ventura's growing senior population, including senior housing with supportive services, assisted living facilities, and second units.

Policy 2.8 Encourage the provision of housing adaptable to the physically disabled through integration of universal design features in new development, and compliance with Title 24 of the California Health and Safety Code.

Policy 2.9 Encourage the provision of supportive housing for persons with mental illness to address the severe shortage of housing for this special needs population.

Policy 2.10 Support efforts by non-profits to expand transitional and emergency housing in Ventura, including support of grant applications and assistance in identification of suitable sites.

Policy 2.11 Evaluate adoption of an inclusionary housing ordinance as a means of integrating affordable units within new residential development: 1) Require affordable units to be provided on or off-site, with allowance for payment of an in-lieu fee at the discretion of the City; 2) Evaluate the financial impact of inclusionary requirements on development, and assess incentive-based alternative strategies for provision of affordable housing.

Policy 2.12 Facilitate the provision of second units as a means of providing affordable rental housing in existing neighborhoods. Ensure compatibility with the primary unit and surrounding neighborhood.

Policy 2.13 Encourage the production of housing that meets the needs of all economic segments, including lower, moderate, and above moderate-income households, to achieve a balanced community.

Policy 2.14 Promote and facilitate non-traditional housing types and options, including co-housing, assisted living facilities, live-work spaces, and artist lofts.

Policy 2.15 Direct City-controlled housing funds towards programs that address the needs of very low- and low-income households.

Policy 2.16 Prioritize affordable housing opportunities and assistance for public service employees.

Policy 2.17 Annually monitor the City's progress in meeting its housing needs for all income levels.

Goal 3

Provide adequate housing sites through appropriate land use and zoning designations to accommodate the City's share of the regional housing needs.

Policy 3.1 Maintain an up-to-date inventory of vacant and underutilized parcels and provide to interested developers in conjunction with information on available development incentives. Within redevelopment project areas, provide assistance in land assembly in support of affordable housing.

Policy 3.2 Implement smart growth principles by rewarding quality infill projects that utilize existing infrastructure.

Policy 3.3 Encourage efficient utilization of the City's limited land resources by encouraging development at the upper end of the permitted Zoning Code/Comprehensive Plan density.

Policy 3.4 Utilize the Urban Infill Overlay Zone and Downtown Specific Plan as a tool to facilitate higher density residential and mixed-use development.

Policy 3.5 Explore residential reuse opportunities on obsolete commercial properties, such as older motels and underutilized historic structures.

Policy 3.6 Pursue use of publicly owned land, such as public parking lots, for development of affordable housing.

Policy 3.7 Identify opportunities for housing development that achieves other community goals such as neighborhood improvement, recreation opportunities, and the preservation of sensitive lands and neighborhood character.

Policy 3.8 Facilitate the development of mixed-use projects in appropriate commercial areas, including stand-alone residential developments (horizontal mixed-use) and housing above ground floor commercial uses (vertical mixed-use).

Policy 3.9 Promote higher density housing as part of mixed-use developments along parts of Thompson Boulevard and Main Street in Midtown Ventura, as well as other areas such as Westside, Downtown and East Ventura.

Policy 3.10 Promote mixed-use developments on the Westside of Ventura.

Policy 3.11 Ensure that the updated Land Use Element designates adequate sites for housing for executives to enhance the City's ability to attract businesses with higher paying jobs.

Goal 4

Mitigate or remove any potential governmental constraints to housing production and affordability.

Policy 4.1 Provide regulatory and/or financial incentives, where appropriate, to offset or reduce the costs of affordable housing development, including density bonuses and flexibility in site development standards.

Policy 4.2 Utilize the Affordable Housing Program to provide incentives for production of affordable units, including streamlined permit processing, reduced fees and exemption from the required competition for RGMP allocations.

Policy 4.3 Amend the City's Residential Growth Management Plan (RGMP) to better facilitate housing production, while discouraging sprawl and maintaining quality of life goals.

Policy 4.4 Undertake a comprehensive review of the City's residential development project review procedures and establish modified procedures as appropriate to streamline processing times, while maintaining adequate levels of public review.

Policy 4.5 Provide flexibility in development standards to accommodate new models and approaches to providing affordable housing, such as co-housing, live/work units and assisted living facilities.

Goal 5

Promote equal opportunity for all residents to reside in the housing of their choice.

Policy 5.1 Continue to enforce fair housing laws prohibiting arbitrary discrimination in the building, financing, selling or renting of housing on the basis of race, religion, family status, national origin, physical or mental disability, or other such factors.

Policy 5.2 Continue to support organizations that offer fair housing and mediation services to Ventura residents.

Policy 5.3 Promote housing that meets the special needs of large families, elderly persons, agricultural workers, and the disabled.

Policy 5.4 Continue to enforce notification and provide relocation assistance for lower-income persons displaced due to demolition, reuse, condominium conversion, or rehabilitation as a result of code enforcement.

ventura's general plan

OUR ACCESSIBLE COMMUNITY

"Restore human legs as a means of travel. Pedestrians rely on food for fuel and need no special parking facilities."

— Lewis Mumford
Author of *The City in History*, 1961

CITY OF
VENTURA

4. OUR ACCESSIBLE COMMUNITY

Our goal is to provide residents with more transportation choices by strengthening and balancing bicycle, pedestrian and transit opportunities in the City and surrounding region.

An Integrated Mobility System

Central to the well-being of Ventura's citizens and visitors is *mobility*, the ability to get from one place to another. Mobility depends on the range, efficiency, and connectivity of the various components that comprise the transportation network – sidewalks, bicycle routes, and thoroughfares, as well as transit services – and that enable people to access the things they need, from the most basic to the extraordinary (See Figures 4-1 Bicycle Facilities, 4-2 Bus and Rail Routes, and 4-3 Roadway Classification Plan). Ventura is a community that recognizes that thoroughfares serve a variety of functions and are not simply conduits for automobile traffic.

Balancing automobile use with other means of travel is essential to maintaining social and physical health. Safe and enjoyable routes for pedestrians and bicyclists should connect every part of the city, and neighborhoods need to be linked by ample and convenient transit service along corridors. Ventura also must be connected to the larger region by a variety of transportation modes.

Thoroughfares have a tremendous effect on neighborhood character and therefore quality of life for both residents and visitors.

Thoroughfares are essentially the stage of public life where a diversity of citizens interact. They can create places of remembrance, chance encounters, and discovery. Ensuring that Ventura thoroughfares are *great places* requires improving design and quality as well as connectivity. In some cases, city thoroughfares are over-engineered to accommodate the worst-case scenario.

Slowing down automobiles, especially in residential neighborhoods, is a desire shared by many residents. Vehicle travel should be directed toward routes that minimize congestion, avoid conflicts with walkers and bicyclists, and keep residential neighborhoods free of excessive cut-through traffic. Additionally, in some areas of the city, suburban patterns have resulted in less connectivity than is desired by the community. Transportation modes and land uses in the city need to be distributed so that residents have close and easy access to meet their basic needs and travel destinations.

Traffic congestion is a major concern among Ventura residents. Although traffic on local roads is generally free-flowing, a few key intersections and road segments experience congestion during peak traffic hours. Simply widening roads to add lanes will not solve traffic congestion. Instead, the system needs integrated solutions that improve mobility for all

The essential qualities of a properly functioning mobility system are:

1. Well connected, interesting components
2. Convenient accessibility
3. Integrated linkage of all modes
4. Comfort and safety
5. Design reflecting natural and urban context

means of travel. While walking, biking, and transit use are already popular, these alternative modes need to be enhanced and better linked. For example, bus and rail systems serve Ventura, but not thoroughly enough to provide a reasonable alternative to auto use for most travelers. And while pedestrian access exists in most areas of Ventura, the network lacks continuous routes in some key locations.

As expressed in the *Ventura Vision,* a top community priority is to minimize automobile use through a fully integrated multi-modal transportation system. The policies and actions in this chapter aim to achieve this objective.

Travel Modes

Walking

Sidewalks are arguably the most important component of the city's mobility system. As with circulation in general, the utility of pedestrian systems is inextricably linked to land use patterns. Combined with urban design elements, land use patterns influence how much walking can safely and effectively occur in the community. Circulation systems that are designed with pedestrians in mind tend to increase outdoor activity and community interaction, while those oriented toward motor vehicles tend to create disincentives to walking.

Ventura's pedestrian system consists of sidewalks, access ramps, crosswalks, linear park paths, and overpasses and tunnels. Special corridors such as the Beachfront Promenade, California Plaza, and Figueroa Plaza have been designated especially for pedestrians. The pedestrian system also includes neighborhood and park path systems, and dedicated trail facilities that are shared with bicyclists and other users.

Pedestrian paths need to be interesting, enjoyable, and lead to a destination, from the most simple – such as a pocket park – to more grand points of arrival, such as major civic spaces. Creating a network of paths that connect key features such as parks, schools, civic facilities, shops, and services is vital to the success of reducing dependence on the automobile. Those most in need of pedestrian access include children, teenagers, and the elderly, as well as those who cannot afford a car or choose not to drive.

The main deficiency of Ventura's pedestrian system is its discontinuity. Some sections of thoroughfares lack sidewalks, and pedestrian connections between some key use areas are in need of repair. Crosswalks are prohibited along some corridors, and pedestrian signal phases are not always long enough for all walkers. Traffic-calming measures also are needed to improve walkability in many neighborhoods. Citizens have placed a high emphasis on improving the pedestrian network, recommending specific improvements such as:

- narrowing selected thoroughfare segments,
- improving sidewalks and road crossings,
- lengthening pedestrian signal phases,
- adding marked crossings at key intersections,
- developing safe and attractive walkways from Downtown and Midtown to the beach,
- ensuring that new development provides ample pedestrian access,
- creating trails along watercourses and through the hillsides, and
- improving pedestrian facilities near schools.

Figure 4-1 illustrates the three State defined classes of bikeway facilities:

- Bike Path (Class I) – Class I bike paths are separated from roads by distance or barriers, and cross-traffic by motor vehicles is minimized.
- Bike Lane (Class II) – Class II bikeways are roadway lanes reserved for bicycles. These lanes are painted with pavement lines and markings and are signed.
- Bike Route (Class III) – Class III bike routes share existing roads and provide continuity to other bikeways or designated preferred routes through high traffic areas. There are no separate lanes, and bike routes are established by placing signs that direct cyclists and warn drivers of the presence of bicyclists.

Policies and actions in this chapter intend to improve pedestrian access through this range of methods.

Biking

Because bicycles are an integral component of the city's mobility system, they are allowed on *all* city thoroughfares. The City has adopted a General Bikeway Plan intended to create a safe, accessible, and interconnected network of bike paths, lanes, and routes that will ensure Ventura becomes and remains a truly bicycle-friendly community. The General Bikeway Plan is a flexible, comprehensive, and long-range guide for bicycle transportation and recreation planning, design, and budget decision-making. Accordingly, it is designed to:

- refine and implement City bicycle-related policies,
- establish bikeway design standards,
- enhance bicycle safety and education programs,
- set priorities and phasing for improvements and amenities depicted on the Select System of Bikeways map, and
- identify funding means and opportunities for interagency cooperation.

The City places high emphasis on improving the local bicycle network by following the recommendations of the General Bikeway Plan, which include:

- connecting schools, parks, activity areas, housing areas, and employment centers with bike paths and lanes, particularly in areas without thoroughfares,
- constructing additional Class I or Class II bikeways in a number of locations, including along the Santa Clara River and the coast to connect to the Ventura River Trail,
- installing bicycle racks,
- updating bicycle facility standards to ensure proper design and maintenance,
- constructing improvements to resolve bicycle/automobile conflicts,
- establishing a highly visible route identification and signage program that fits the character of the community, and
- mitigating impacts on bicyclists from new development and during and following construction of roadway projects.

Policies and actions in this chapter seek to improve bicycle access and safety by carrying out these recommendations.

Public Transit – Bus & Rail

Transit service in Ventura includes bus and rail operations (see Figure 4-2). South Coast Area Transit (SCAT) provides local bus service, Ventura Intercity Transit Authority (VISTA) runs regional routes, and Greyhound offers statewide and national connections. Metrolink provides rail service to and from Los Angeles – although on a very limited schedule, while Amtrak trains that stop in Ventura run between San Luis Obispo and San Diego.

Although local bus routes connect most activity centers, the East End is not well served, and more frequent service is needed to key destinations such as the beach and downtown. Metrolink and Amtrak need to be linked to each other and accessed by local bus routes. An agreement between the City and the Ventura County Transportation Commission calls for identifying a permanent Metrolink site, and the best way to integrate all of these services is with a major multi-modal transit center that also accommodates potential additional future alternative transportation modes.

SCAT buses are equipped with wheelchair lifts and adjustable steps to ensure access for all riders. SCAT also offers discounted fares for seniors and disabled riders, as well as dial-a-ride service. However, seniors and mobility-impaired persons also desire frequent fixed-route service in smaller vehicles, and all riders need upgraded amenities at a number of stops. Bus routes also need increased frequency and stops to make transit a viable alternative to driving.

Other transit system needs include:

- reduced-emission vehicles,
- continued use of schedule synchronization to accommodate route transfers, and
- service to regional destinations such as California State University Channel Islands and airports.

Policies and actions in this Chapter aim to improve transit efficiency, encourage ridesharing, and preserve long-term transit options.

The Automobile and Types of Roadways

The most basic component of the mobility system is the *thoroughfare*, used not only by people who drive, but also by people who ride the bus, bike and walk. Thoroughfares encompass sidewalks, bicycle lanes, travel lanes, and are the most utilized means of travel in Ventura. This system is organized into the following classifications: local thoroughfares, collectors, and arterials (see Figure 4-3, Roadway Classification Plan – also known as "Circulation Plan").

Local Thoroughfares

Local thoroughfares provide mobility within neighborhoods and are generally not shown on the Roadway Classification Plan. Local thoroughfares include *alleys, lanes,* and *"yield" streets*.

Collectors

Collectors serve as links between local thoroughfares. Collectors may front residential and neighborhood-serving commercial uses. Collectors can be configured as *boulevards, avenues, streets,* and *main streets*.

Arterials

Arterials are the primary mechanism for cross-town travel and serve the major centers of activity. These roads typically carry a high proportion of the total urban area travel. Arterials can be configured as *boulevards, avenues,* and *streets*.

Collector and arterial thoroughfare segments in the City are characterized in two ways that describe their physical features: *design* classification and *functional* classification. Design Classification defines the number of travel *lanes* using the following categories: Primary Arterial (6 lanes or more), Secondary Arterial (4 lanes), and Collector (2 lanes), as shown on the Roadway Classification Plan, Figure 4-3. Functional Classification describes how a thoroughfare is used: essentially as a *boulevard*, *avenue*, *street*, or *main street*.

Functional Classification also identifies whether roadways have medians, parking, bike lanes, and other streetscape attributes needed to achieve objectives other than just moving traffic, such as accommodating pedestrians, bicycles, and adjoining land uses and public spaces. Table 4-1 shows the design and functional classifications for thoroughfares in the City.

Ventura is mainly connected by 2-lane and 4-lane thoroughfares. The classification for each type of road segment represents a balance between vehicle capacity, pedestrian and bicycle access, parking requirements, streetscape character, and right-of-way limitations.

Boulevard
A multi-lane and generally urban corridor with a central, planted median.

Avenue
Avenues are typically multi-lane, short distance connectors, with a painted median, used in both residential and commercial areas, and often terminate at prominent buildings or plazas.

Table 4-1 Thoroughfare Sizes and Types

	Street Sizes (Engineering Design Classification)		
	Primary Arterial (6 or more lane roadway)	Secondary Arterial (4 lane roadway)	Collector (2 lane roadway)
Existing			
Future Widening			
Future Extension			
	Thoroughfare Types (Functional Classification)		
	Boulevard	Boulevard	Boulevard
	Avenue	Avenue	Avenue
		Street	Street
			Main Street

Source: Definitions for Design Classifications are the City's modifications to the American Association of State Highway and Transportation Officials (AASHTO) standards. Definitions for Functional Classifications are the City's modifications to the Traditional Neighborhood Development Street Design Guidelines.

Street
Street typically allows two way travel and may be multi-lane and does not have a central median and generally provides access to predominantly residential areas.

Main Street

Main streets have 2 vehicle lanes. Their main purpose is to provide low-speed access to commercial, mixed-uses, and higher density neighborhoods.

Consistency between the design and functional classifications is determined based on the number of through lanes. Temporary improvements, such as restriping to change the number of lanes are allowed, however a permanent improvement that moves the curbs and changes the number of lanes would require an amendment to this plan.

The *Ventura Vision* offers several key recommendations to improve the city thoroughfare system:

- add or enhance north-south arterials;
- consider an additional Santa Clara River bridge, Portola Avenue overcrossing of U.S. 101, and Johnson Drive overcrossing of Route 126; and
- soften the barrier impact of U.S. 101 by working with Caltrans to improve signage, aesthetics, undercrossings, and overcrossings.

Policies, actions, and the Roadway Classification Plan work together to address these recommendations. To improve the safety and functioning of the thoroughfare network and to maintain its compatibility with the character of the community, the policies and actions in this chapter also call for upgrading problem thoroughfares and intersections, improving and constructing freeway ramps, and connecting unfinished roadways. Additional actions intend to protect views from scenic routes, including State-designated scenic highways.

Policy 4A: Ensure that the transportation system is safe and easily accessible to all travelers.

Action 4.1: Direct city transportation investment to efforts that improve user safety and keep the circulation system structurally sound and adequately maintained. First priority for capital funding will go to our pavement management program to return Ventura streets to excellent condition.

Action 4.2: Develop a prioritized list of projects needed to improve safety for all travel modes and provide needed connections and multiple route options.

Action 4.3: Provide transportation services that meet the special mobility needs of the community including youth, elderly, and disabled persons.

Action 4.4: Combine education with enforcement to instill safe and courteous use of the shared public roadway.

Action 4.5: Utilize existing roadways to meet mobility needs, and only consider additional travel lanes when other alternatives are not feasible.

Action 4.6: Require new development to be designed with interconnected transportation modes and routes to complete a grid network.

Action 4.7: Update the traffic mitigation fee program to fund necessary citywide circulation system and mobility improvements needed in conjunction with new development.

Action 4.8: Implement the City's Neighborhood Traffic Management Program and update as necessary to improve livability in residential areas.

Action 4.9: Identify, designate, and enforce truck routes to minimize the impact of truck traffic on residential neighborhoods.

Action 4.10: Modify traffic signal timing to ensure safety and minimize delay for all users.

Action 4.11: Refine level of service standards to encourage use of alternative modes of transportation while meeting state and regional mandates.

Action 4.12: Design roadway improvements and facility modifications to minimize the potential for conflict between pedestrians, bicycles, and automobiles.

Action 4.13: Require project proponents to analyze traffic impacts and provide adequate mitigation in the form of needed improvements, in-lieu fee, or a combination thereof.

Policy 4B: Help reduce dependence on the automobile.

Action 4.14: Provide development incentives to encourage projects that reduce automobile trips.

Action 4.15: Encourage the placement of facilities that house or serve elderly, disabled, or socioeconomically disadvantaged persons in areas with existing public transportation services and pedestrian and bicycle amenities.

Action 4.16: Install roadway, transit, and alternative transportation improvements along existing or planned multi-modal corridors, including primary bike and transit routes, and at land use intensity nodes.

Action 4.17: Prepare and periodically update a Mobility Plan that integrates a variety of travel alternatives to minimize reliance on any single mode.

Action 4.18: Promote the development and use of recreational trails as transportation routes to connect housing with services, entertainment, and employment.

Action 4.19: Adopt new development code provisions that establish vehicle trip reduction requirements for all development.

Action 4.20: Develop a transportation demand management program to shift travel behavior toward alternative modes and services.

Action 4.21: Require new development to provide pedestrian and bicycle access and facilities as appropriate, including connected paths along the shoreline and watercourses.

Action 4.22: Update the General Bikeway Plan as needed to encourage bicycle use as a viable transportation alternative to the automobile and include the bikeway plan as part of a new Mobility Plan.

Action 4.23: Upgrade and add bicycle lanes when conducting roadway maintenance as feasible.

Action 4.24: Require sidewalks wide enough to encourage walking that include ramps and other features needed to ensure access for mobility-impaired persons.

Action 4:25: Adopt new development code provisions that require the construction of sidewalks in all future projects.

Action 4.26: Establish a parking management program to protect the livability of residential neighborhoods, as needed.

Action 4.27: Extend stubbed-end streets through future developments, where appropriate, to provide necessary circulation within a developing area and for adequate internal circulation within and between neighborhoods. Require new developments in the North Avenue area, where applicable, to extend Norway Drive and Floral Drive to connect to Canada Larga Road; and connect the existing segments of Floral Drive. Designate

the extension of Cedar Street between Warner Street and south of Franklin Lane and the linking of the Cameron Street segments in the Westside community as high priority projects.

Policy 4C: Increase transit efficiency and options.

Action 4.28: Require all new development to provide for citywide improvements to transit stops that have sufficient quality and amenities, including shelters and benches, to encourage ridership.

Action 4.29: Develop incentives to encourage City employees and local employers to use transit, rideshare, walk, or bike.

Action 4.30: Work with public transit agencies to provide information to riders at transit stops, libraries, lodging, and event facilities.

Action 4.31: Work with public and private transit providers to enhance public transit service.

Action 4.32: Coordinate with public transit systems for the provision of additional routes as demand and funding allow.

Action 4.33: Work with Amtrak, Metrolink, and Union Pacific to maximize efficiency of passenger and freight rail service to the City and to integrate and coordinate passenger rail service with other transportation modes.

Action 4.34: Lobby for additional transportation funding and changes to Federal, State, and regional transportation policy that support local decision-making.

Action 4.35: The City shall pursue funding and site location for a multi-modal transit facility in coordination with VCTC, SCAT, U.P.R.R., Metrolink, Greyhound Bus Lines, and other forms of transportation.

Policy 4D: Protect views along scenic routes.

Action 4.36: Require development along the following roadways – including noise mitigation, landscaping, and advertising – to respect and preserve views of the community and its natural context.

- State Route 33
- U.S. HWY 101
- Anchors Way
- Brakey Road
- Fairgrounds Loop
- Ferro Drive
- Figueroa Street
- Harbor Boulevard
- Main Street
- Navigator Drive
- North Bank Drive
- Poli Street/Foothill Road
- Olivas Park Drive
- Schooner Drive
- Spinnaker Drive
- Summit Drive

- Telegraph Road – east of Victoria Avenue
- Victoria Avenue – south of U.S. 101
- Wells Road

Action 4.37: Request that State Route 126 and 33, and U.S. HWY 101 be designated as State Scenic Highways.

Action 4.38: Continue to work with Caltrans to soften the barrier impact of U.S. HWY 101 by improving signage, aesthetics and undercrossings and overcrossings.

Action 4.39: Maintain street trees along scenic thoroughfares, and replace unhealthy or missing trees along arterials and collectors throughout the City.

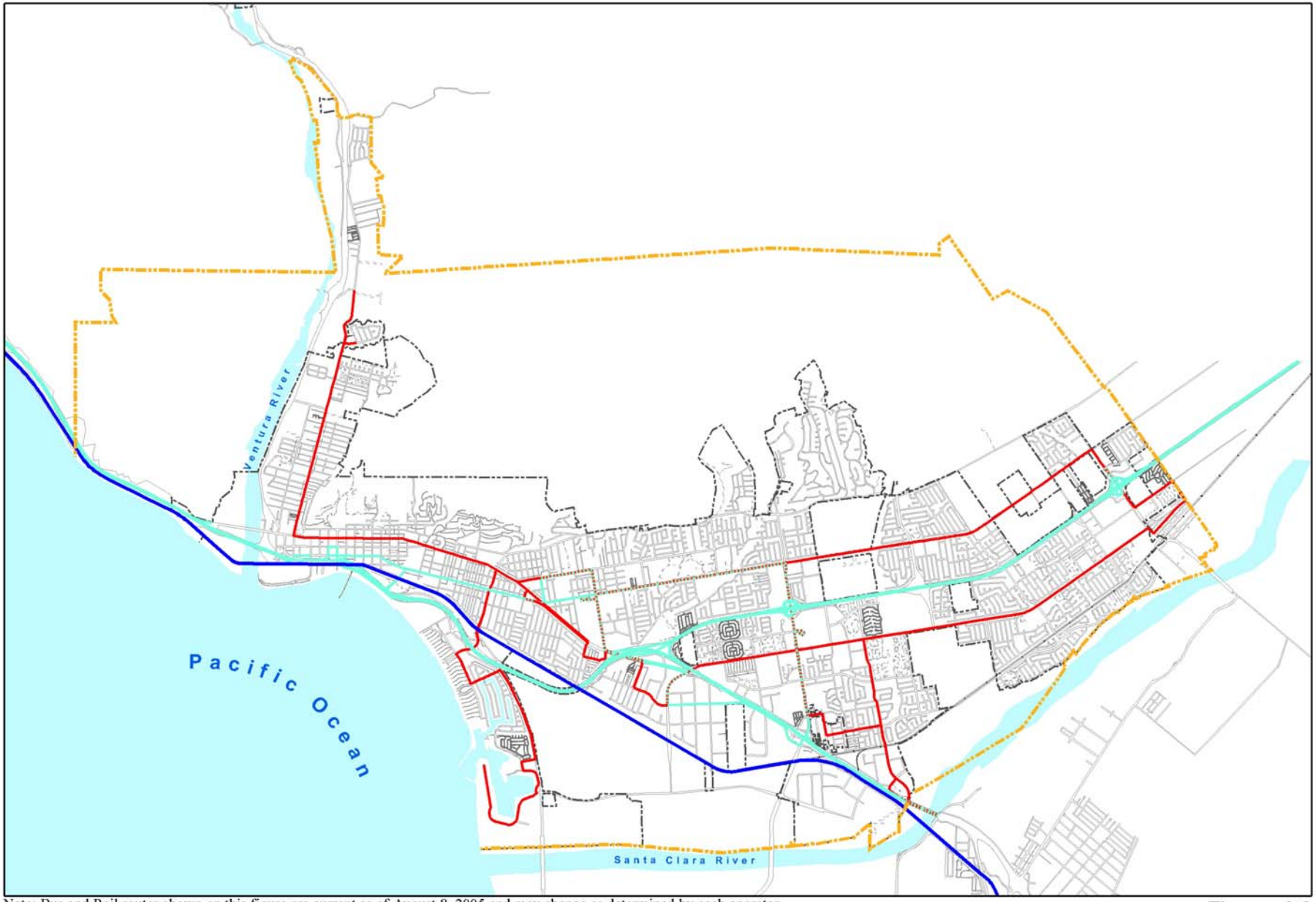
Note: Bike facilities shown on this figure are taken from the 1999 General Bikeway Plan and may change as updates to the General Bikeway Plan are completed.

Figure 4-1
Bicycle Facilities

	Class 1	Class 2	Class 3	Shoulder
Existing	———	———	———	———
Future	• • • • •	• • • • •	• • • • •	
Existing Sidewalk			———	

Other
- ---- City Limits
- - - - Planning Boundary

This map is a product of the City of San Buenaventura, California. Although reasonable efforts have been made to ensure the accuracy of this map, the City of San Buenaventura cannot guarantee its accuracy.



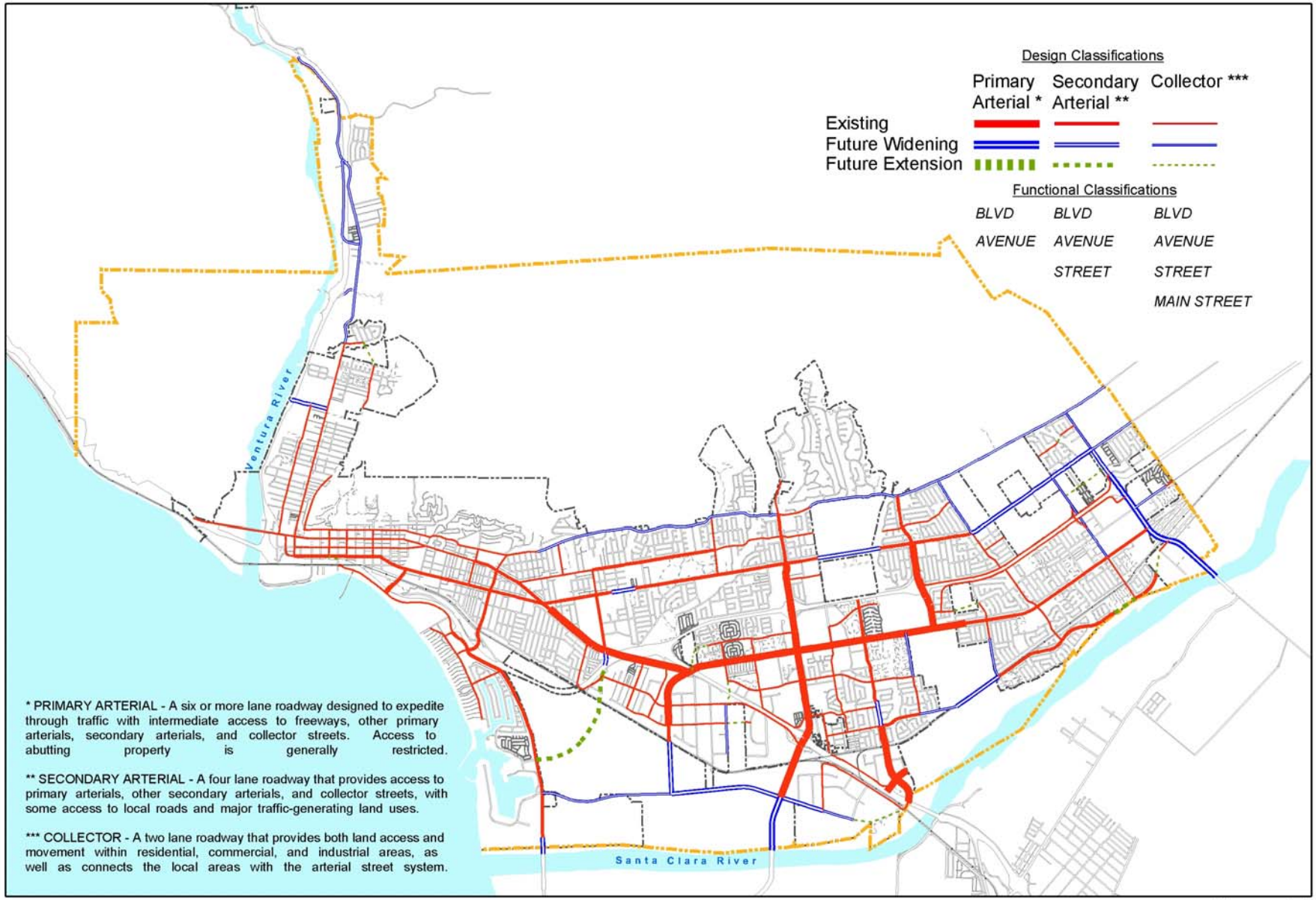
Note: Bus and Rail routes shown on this figure are current as of August 8, 2005 and may change as determined by each operator.

Figure 4-2
Bus and Rail Routes

Routes
- SCAT
- VISTA
- SCAT & VISTA
- RAIL

Other
- City Limits
- Planning Boundary

This map is a product of the City of San Buenaventura, California. Although reasonable efforts have been made to ensure the accuracy of this map, the City of San Buenaventura cannot guarantee its accuracy.



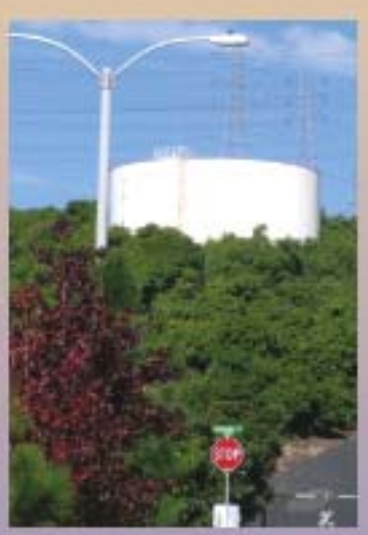
Note: Future extensions shown are conceptual in nature, unless a specific alignment has been approved by the City Council.

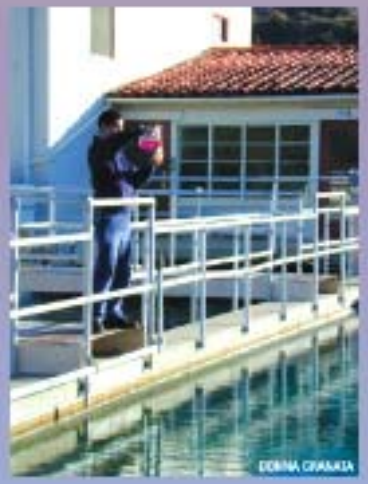
Figure 4-3
Roadway Classification Plan

This map is a product of the City of San Buenaventura, California. Although reasonable efforts have been made to ensure the accuracy of this map, the City of San Buenaventura cannot guarantee its accuracy.

ventura's general plan

OUR SUSTAINABLE INFRASTRUCTURE





"Now, I truly believe, that we in this generation, must come to terms with nature, and I think we're challenged as mankind has never been challenged before to prove our maturity and our mastery, not of nature, but of ourselves."

— Rachel Carson
Biologist, Writer; Ecologist 1907-1964

CITY OF
VENTURA

5. OUR SUSTAINABLE INFRASTRUCTURE

Our goal is to safeguard public health, well-being and prosperity by providing and maintaining facilities that enable the community to live in balance with natural systems.

Essential Support Systems

Infrastructure is an extremely important though largely unnoticed foundation of quality of life in Ventura. Efficient water supply, wastewater treatment, and drainage systems are vital to most daily activities. These facilities on which the community depends need regular maintenance, and they frequently require upgrading both to meet the demands of a growing population and to be sensitive to environmental resources.

To ensure that citizens get high-quality drinking water, the City owns and operates a State-certified laboratory where water quality is tested continuously. Each City treatment plant is also run by State-certified operators who monitor water quality. As a result, City water exceeds State and federal water quality requirements.

The City employs conservation measures and emerging technology in its effort to achieve a high standard for wastewater treatment while protecting natural systems. As a result, treatment capability historically has outpaced community needs, with even peak flows typically reaching only 75 percent of plant capacity. Even so, further expanding the use of reclaimed water and reducing water consumption will be vital to maintaining long-term water supplies.

Much of the storm drain system is aging and in need of repair or replacement, especially corrugated metal pipes in some of the older areas of Ventura. Collecting adequate fees that truly reflect the cost of serving development can help support City efforts to preclude additional deficiencies, and relying on and complementing natural drainage features can both help avoid the need for expensive and environmentally damaging channelization and improve the functioning of the overall drainage system.

Water Supply

The City provides drinking water, and water for fire protection, to households and businesses in Ventura through a complex system with more than 500 miles of distribution mains, 3 water treatment plants, 22 booster pump stations, 25 treated water reservoirs, and 13 wells. Five distinct sources provide surface and ground water to the City supply system:

- Casitas Municipal Water District
- Ventura River surface water intake, subsurface water and wells (Foster Park)
- Mound groundwater basin
- Oxnard Plain groundwater basin (Fox Canyon Aquifer)
- Santa Paula groundwater basin

The City also holds a State Water Project entitlement of 10,000 acre-feet per year;

however, new facilities would need to be constructed to transport this water to the City. The City updates its Urban Water Management Plan every two years (instead of every five years as required by State law) as part of its ongoing effort to ensure that City-managed water supplies will continue to accommodate demand in Ventura.

Meeting future water demands requires saving and reusing every drop possible. The City utilizes recycled water from its reclamation facility (a tertiary wastewater treatment plant) near the Harbor to augment the municipal water supply. Recycled water is used to irrigate City and private landscaping in the area and the Buenaventura and Olivas Park municipal golf courses. The remaining effluent is discharged to the Santa Clara River Estuary.

Largely as a result of conservation efforts, water consumption per city resident has generally declined (see Table 5-1). Projections anticipate that the City will continue to be able to meet consumer needs. Policies and actions in this chapter seek to refine demand management practices and conservation programs to further reduce per capita water use so that Ventura can sustain water resources for many more generations.

Table 5-1
Historic and Projected Water Production (Acre Feet)

Year	Estimated Population Served	Per Capita Use[1]	Treated Water Production	Raw Water Production	Total Water Production
Historic					
1980	73,774	0.236	17,381	4,766	22,147
1990	94,856	0.177	16,831	2,317	19,148
1995	99,668	0.165	16,428	1,602	18,030
1996	100,482	0.180	18,038	1,500	19,538
1997	101,096	0.178	18,002	1,829	19,831
1998	101,610	0.165	16,775	1,769	18,544
1999	102,224	0.192	19,658	1,067	20,725
2000	103,238	0.198	20,437	1,129	21,566
2001	104,153	0.173	18,071	889	18,960
2002	105,267	0.180	18,965	968	19,933
2003	106,782	0.183	19,510	846	20,356
Projected					
2005	109,465	0.179	19,594	1,000	20,594
2010	115,774	0.179	20,724	1,000	21,724
2015	122,447	0.179	21,918	1,000	22,918
2020	129,504	0.179	23,181	1,000	24,181

Sources: City of Ventura Urban Water Management Plan, Dec. 2000, City of Ventura 2004 Biennial Water Supply Report, as amended, September 2004.

[1] Per Capita use excludes raw water.

Wastewater Treatment

Ventura residents generate millions of gallons of wastewater each day, which is carried by more than 450 miles of sewer mains and 12 lift stations to the water reclamation facility in the Harbor area near the mouth of the Santa Clara River. While most residents receive sewer service directly from the City, three other sanitary sewer agencies with their own treatment facilities provide service to some citizens in the Montalvo, Saticoy, and North Ventura Avenue areas. As shown in Table 5-2, all local treatment facilities operate well below capacity.

Table 5-2 Treatment Facilities

Treatment Facilities	Treatment Type	Capacity	Average Daily Flow
Ventura Water Reclamation Facility	Tertiary	14 MGD	9.0 MGD (68% capacity)
Montalvo Municipal Improvement District Treatment Plant	Secondary	0.36 MGD	0.242 MGD (67% capacity)
Saticoy Sanitary District Treatment Plant	Secondary[2]	0.25 MGD	0.16 MGD (64% capacity)
Ojai Valley Sanitary District Treatment Plant	Tertiary	3 MGD	2.0 MGD (71% capacity)

[2] Includes nutrient removal prior to percolation.
Source: Individual agencies listed

About two-thirds of the wastewater treated locally is discharged to the Santa Clara River Estuary, as allowed by the Regional Water Quality Control Board. The remaining effluent is either transferred to recycling ponds, where some is delivered as reclaimed water, or it percolates to underground aquifers or evaporates. The policies and actions in this chapter call for improving treatment system efficiency to reclaim and reuse as much water as possible.

Storm Drainage

Storm runoff travels from the hills above Ventura through the City until it is absorbed into the ground or reaches the Ventura River, the Santa Clara River, or the Pacific Ocean. To convey the occasional high flows associated with storms, the Ventura County Flood Control District oversees about 20 natural or concrete lined barrancas that serve as the major drainage courses for local watersheds. The City has about 20 miles of off-street drain system designed to convey runoff from all but the most severe of storms, in which case water also runs off via city streets.

Maintaining the barrancas and other watercourses that are not already lined with concrete as natural flood channels can help reduce peak flows by limiting water velocity. Incorporating natural features into drainage systems rather than hard treatment devices also can improve water quality and reduce maintenance costs. The policies and actions in this chapter seek to prevent increases in future storm water impacts by incorporating natural drainage and flood control features such as wildlife ponds and wetlands – instead of cement retention basins – into the storm drain system where possible. Such less intensive approaches not only cost less, but they also preserve environmental resources and protect water quality.

Policy 5A: Follow an approach that contributes to resource conservation.

Action 5.1: Require low flow fixtures, leak repair, and drought tolerant landscaping (native species if possible), plus emerging water conservation techniques, such as reclamation, as they become available.

Action 5.2: Use natural features such as bioswales, wildlife ponds, and wetlands for flood control and water quality treatment when feasible.

Action 5.3: Demonstrate low water use techniques at community gardens and city-owned facilities.

Action 5.4: Update the Urban Water Management plan as necessary in compliance with the State 1983 Urban Water Management Planning Act.

Action 5.5: Provide incentives for new residences and businesses to incorporate recycling and waste diversion practices, pursuant to guidelines provided by the Environmental Services Office.

Policy 5B: Improve services in ways that respect and even benefit the environment.

Action 5.6: Require project proponents to conduct sewer collection system analyses to determine if downstream facilities are adequate to handle the proposed development.

Action 5.7: Require project proponents to conduct evaluations of the existing water distribution system, pump station, and storage requirements in order to determine if there are any system deficiencies or needed improvements for the proposed development.

Action 5.8: Locate new development in or close to developed areas with adequate public services, where it will not have significant adverse effects, either individually or cumulatively, on coastal resources.

Action 5.9: Update development fee and assessment district requirements as appropriate to cover the true costs associated with development.

Action 5.10: Utilize existing waste source reduction requirements, and continue to expand and improve composting and recycling options.

Action 5.11: Increase emergency water supply capacity through cooperative tie-ins with neighboring suppliers.

Action 5.12: Apply new technologies to increase the efficiency of the wastewater treatment system.

Action 5.13: Increase frequency of city street sweeping, and post schedules at key points within each neighborhood.

Action 5.14: Develop a financing program for the replacement of failing corrugated metal storm drain pipes in the City.

Action 5.15: Establish assessment districts or other financing mechanisms to address storm drain system deficiencies in areas where new development is anticipated and deficiencies exist.

Action 5.16: Require new developments to incorporate stormwater treatment practices that allow percolation to the underlying aquifer and minimize offsite surface runoff utilizing methods such as pervious paving material for parking and other paved areas to facilitate rainwater percolation and retention/detention basins that limit runoff to pre-development levels.

Action 5.17: Require stormwater treatment measures within new development to reduce the amount of urban pollutant runoff in the Ventura and Santa Clara Rivers and other watercourses.

Action 5.18: Work with the Ventura Regional Sanitation District and the County to expand the capacity of existing landfills, site new landfills, and/or develop alternative means of disposal that will provide sufficient capacity for solid waste generated in the City.

"Leave all the afternoon for exercise and recreation, which are as necessary as reading. I will rather say more necessary because health is worth more than learning."

— Thomas Jefferson
3rd President of the United States
1801-1809

CITY OF
VENTURA

OUR ACTIVE COMMUNITY

ventura's general plan

6. OUR ACTIVE COMMUNITY

Our goal is to add to and enhance our parks and open spaces to provide enriching recreation options for the entire community.

Higher Standards

For many people, spending time outdoors and participating in recreational activities represent some of life's most cherished rewards. Ventura's superb public park, open space, and recreation system offers a myriad of ways to partake in these privileges. The city offers 34 developed parks, 45 miles of linear park and trail network, stellar beaches, specialized play and sports facilities and programs, communitywide events, senior and youth activities, and two 18-hole tournament class public golf courses. Figure 6-1 at the end of this chapter shows the locations of various public facilities in the city.

The City is committed to ensuring that its citizens have ample access to high quality spaces for leisure and active recreation. The City's adopted standard of 10 acres per 1,000 residents has created far more park area than would be possible under the basic State level of 3 acres per 1,000, and also tops the more ambitious National Park and Recreation Association benchmarks for specific park types (see Table 6-1). The City continues to create customized facilities like the Community Park (approved by the voters pursuant to SOAR) to expand opportunities for local residents to enjoy healthy, active lifestyles.

Table 6-1 Park Acreage per 1,000 Population

Park Type	Standards	
	City of Ventura	National Park & Recreation Association
Neighborhood	2 acres	1.5 acres
Community	3 acres	2.5 acres
Citywide	5 acres	5 acres
Total	10 acres	9 acres

Sources: City of Ventura, www.nrpa.org.

City Parks and Open Space

The public park and open space system in Ventura includes neighborhood, community, citywide, and linear parks. As shown in Table 6-2, the City oversees nearly 600 acres of developed park facilities, plus the linear park network, which provides important connections among watersheds for both people and wildlife.

As the City continually strives to improve the quality of leisure and recreation opportunities for everyone in the community, it must address a number of challenges such as:

- modernizing existing facilities,
- finding appropriate land for new facilities,
- developing useful and enjoyable public spaces, such as plazas and mini-parks in urban settings,
- formalizing shared use arrangements for non-City facilities like school playfields,
- meeting increasing demand for athletic courts, fields and pools,
- provide opportunities for passive recreation, and
- providing services needed by youth, seniors, and residents with special needs.

Neighborhood Parks
Typically less than 8 acres each, these smaller parks primarily serve specific residential areas in the community. The 18 neighborhood parks in Ventura cover about 73 total acres. Any future development outside the current city limits will have to provide new neighborhood parks to serve the added population.

Community Parks
These parks are designed to offer specialized opportunities and facilities to residents of more than one neighborhood. Amenities in community parks may include formal athletic fields, courts, recreation buildings, preschool and youth play structures, group and individual picnic areas, and landscaped areas for informal activity or leisure.

Citywide Parks
These parks feature recreational opportunities that draw a wide range of age and interest groups from throughout the city. They offer a variety of attractive amenities, such as large open spaces, unique natural resources, interpretive centers, cultural amenities, group picnic areas, sports facilities, and equestrian, bicycling, and hiking trails. The Ventura Community Park also serves some citywide park functions and attracts visitors from outside the city with its high-quality playing fields and aquatic center.

Linear Parks
Ventura's unique linear park network intersperses trails and picnic areas among a mostly undeveloped web of barranca and riverbanks that provide valuable wildlife habitat and migration corridors. The linear parks also merge with a number of neighborhood and community parks, complementing developed recreation areas with natural riparian qualities. Extending trails through the linear park network can create additional opportunities for low-impact contact with nature, and in some cases even provide pleasant non-automobile commuting options.

Table 6-2 City Park Facilities

Park	Park Size (in acres)				
	Neighborhood Parks	Community Parks	Citywide Parks	Special Use Facilities	Total
Albinger Archaeological Museum				0.9	**0.9**
Arroyo Verde Park	2.0	23.0	104.3		**129.3**
Barranca Vista Park	8.7				**8.7**
Blanche Reynolds Park	3.4				**3.4**
Camino Real Park			38.2		**38.2**
Cemetery Memorial Park	7.1				**7.1**
Chumash Park	6.1				**6.1**
Downtown Mini-Park	0.4				**0.4**
Eastwood Park				0.7	**0.7**
Fritz Huntsinger Youth Sports Complex	4.3	14.0			**18.3**
Grant Park			107.3		**107.3**
Harry A. Lyon Park			10.7		**10.7**
Hobert Park	7.1				**7.1**
Juanamaria Park	5.0				**5.0**
Junipero Serra Park	2.7				**2.7**
Linear Park Network				46.0	**46.0**
Marina Park			15.3		**15.3**
Marion Cannon Park	5.0				**5.0**
Mission Park	1.5				**1.5**
Ocean Avenue Park	1.3				**1.3**
Olivas Adobe Historical Park				22.5	**22.5**
Ortega Adobe Historic Residence				0.3	**0.3**
Plaza Park	3.7				**3.7**
Promenade Park	1.0				**1.0**
Seaside Wilderness Park[1, 2]				24.0	**24.0**
Surfers Point at Seaside Park[1]				3.4	**3.4**
Ventura Community Park		100.0			**100.0**
Westpark	1.5	5.8			**7.3**
Total	**60.8**	**142.7**	**275.8**	**97.8**	**577.1**

Sources: City of Ventura, 2004. Note: several parks serve functions in more than one category.
[1] Acreage varies with ocean high levels.
[2] Acreage varies with fluctuations in Ventura River level.

As with most parks in the city, resources for linear park system improvements typically come through conditions placed on adjacent development. City regulations establish standards for park width, landscaping, fencing, lighting, and tree rows that apply specifically along barrancas, freeways, rivers, the shoreline, harbor, hillsides, and utility rights-of-way.

Recreation Programs

The City operates four neighborhood centers where recreation programs and senior services are available: the Ventura Avenue Adult Center, Senior Recreation Center, Barranca Vista Center, and Westpark Community Center. The City also offers a wide range of sports programs, including youth and adult sports programs, classes, aquatics, and corporate games. Other City-sponsored recreational activities include arts and environmental education, community gardening, recreation programs for special needs residents, and after-school activities and summer camps.

A variety of other recreation opportunities are available in Ventura in addition to City programs. Foremost among these are all of the activities possible at State beaches and developed waterfront areas. Other local non-City facilities include the County Fairgrounds and local golf courses. In addition, joint-use agreements allow city residents to use sports fields, pools, and gymnasiums during certain times at public schools and Ventura College.

The policies and actions in this chapter seek to further expand local park and recreation choices by:

- identifying sites for new parks,
- increasing public access to open space, including via linear park trails,
- collaborating with schools and other local agencies and organizations,
- ensuring universal and equal access to parks and recreation facilities, and
- allowing appropriate revenue-generating activities at City parks.

Policy 6A: Expand the park and trail network to link shoreline, hillside, and watershed areas.

Action 6.1: Develop new neighborhood parks, pocket parks, and community gardens as feasible and appropriate to meet citizen needs, and require them in new development.

Action 6.2: Require higher density development to provide pocket parks, tot lots, seating plazas, and other aesthetic green spaces.

Action 6.3: Work with the County to plan and develop trails that link the City with surrounding open space and natural areas, and require development projects to include trails when appropriate.

Action 6.4: Request Flood Control District approval of public access along unchannelized watercourses for hiking.

Action 6.5: Seek landowner permission to allow public access on properties adjacent to open space where needed to connect trails.

Action 6.6: Update plans for and complete the linear park system as resources allow.

Action 6.7: Work with the County of Ventura to initiate efforts to create public trails in the hillsides.

Action 6.8: Update and require periodic reviews of the Park and Recreation Workbook as necessary to reflect City objectives and community needs.

Action 6.9: Require dedication of land identified as part of the City's Linear Park System in conjunction with new development.

Action 6.10: Evaluate and incorporate, as feasible, linear park segments in the General Bikeway Plan.

Action 6.11: Update standards for citywide public parks and open space to include an expanded menu of shared park types, and identify locations and potential funding sources for acquiring new facilities in existing neighborhoods.

Action 6.12: Update and carry out the Grant Park Master Plan.

Action 6.13: Foster the partnership between the City and Fair Board to improve Seaside Park.

Policy 6B: Ensure equal access to facilities and programs.

Action 6.14: Improve facilities at City parks to respond to the requirements of special needs groups.

Action 6.15: Adjust and subsidize fees to ensure that all residents have the opportunity to participate in recreation programs.

Action 6.16: Update the project fee schedule as necessary to ensure that development provides its fair share of park and recreation facilities.

Policy 6C: Provide additional gathering spaces and recreation opportunities.

Action 6.17: Update and create new agreements for joint use of school and City recreational and park facilities.

Action 6.18: Offer programs that highlight natural assets, such as surfing, sailing, kayaking, climbing, gardening, and bird watching.

Action 6.19: Provide additional boating and swimming access as feasible.

Action 6.20: Earmark funds for adequate maintenance and rehabilitation of existing skatepark facilities, and identify locations and funding for new development of advanced level skatepark facilities.

Policy 6D: Increase funding and support for park and recreation programs.

Action 6.21: Promote the use of City facilities for special events, such as festivals, tournaments, and races.

Action 6.22: Enter into concession or service agreements where appropriate to supplement City services.

Figure 6-1
Public Faciities

This map is a product of the City of San Buenaventura, California. Although reasonable efforts have been made to ensure the accuracy of this map, the City of San Buenaventura cannot guarantee its accuracy.

ventura's general plan

OUR HEALTHY & SAFE COMMUNITY

"A city, like a living thing, is a united and continuous whole."

— Plutarch
ca. 50-120 AD, author of *Moralia*

CITY OF
VENTURA

7. OUR HEALTHY AND SAFE COMMUNITY

Our goal is to build effective community partnerships that protect and improve the social well-being and security of all our citizens.

Community Wellness

Keeping the small town feel of Ventura depends on working together as a community to look out for the well being of all residents, especially those most at risk. Community wellness requires comprehensive preventative care, as well as careful preparation for and response to dangers within the built environment and to risks posed by natural processes (see Figure 7-1).

Adequate shelter, sufficient medical services, walkable neighborhoods, and proper nutrition create an essential foundation for a healthy community. Reducing as much as possible the threat to people and property from earthquakes, landslides, floods, and fires further enhance the collective wellness of the city. In addition, a healthy Ventura community requires thorough protection from crime, and freedom from pollution, unwanted noise, and the threat of hazardous materials.

***Alquist-Priolo** designation requires a geologic investigation prior to the approval of a development permit to determine if a specific site within the zone is threatened by surface displacement from future fault movement.*

Geologic and Flood Hazards

Ventura lies in an active geologic region and is therefore subject to a variety of seismic hazards, including ground shaking, liquefaction, and slope failure. State law requires the City to regulate development in mapped seismic hazard zones. Major faults in the city include the Ventura-Foothill (a State-designated Alquist-Priolo Earthquake Fault Zone), Oak Ridge, McGrath, Red Mountain and Country Club Faults. Areas closest to these faults are most likely to experience ground shaking or rupture in the event of an earthquake. Liquefaction during an earthquake is most likely to occur in areas with loose, granular soils where the water table lies within 50 feet of the surface. As the soil liquefies, buildings and other objects may tilt or sink.

Hillside stability varies based on slope, soil, rock type and groundwater depth. The hills north of Poli Street/Foothill Road have experienced many historic landslides and are prone to future movement. The City Hillside Management Program limits development in the area to minimize dangers from landsliding, erosion, flooding, and fire, and to retain natural and scenic character.

The Federal Emergency Management Agency regulates development along watercourses based on the likelihood of flooding: the basic benchmark – the 100-year flood – has a one percent chance of occurring in any given year. Although the mapped 100-year flood hazard areas for local rivers and barrancas are fairly limited in size, the largest recorded flood events along the Ventura and Santa Clara Rivers, both following heavy rains in 1969, exceeded the 100-year flood zone. The policies and actions in this Chapter intend to limit harm from geologic and flood events by requiring detailed risk analyses and mitigation prior to development of sites in hazard prone areas.

Fire and Emergency Response

The Ventura Fire Department responds to fire, medical, and disaster calls from six stations in the city. The Department's goal is to reach the scene within 4 minutes 90% of the time. The Department has a reciprocal agreement with the County Fire Protection District to ensure that Ventura residents receive the swiftest service possible. The Department also has a responsibility to provide disaster preparedness for the City. Particular fire department concerns in the City include:

- the need for reliable and sustainable source of fire service revenue,
- lengthy response times to areas farthest from existing stations (See Figure 7-2),
- firefighter and support staffing levels that are far below the .98 firefighter per 1,000 population averages of other municipal fire departments with comparable city size, age, and population,
- the threat of wildland fire entering urban area, and
- the lack of fire protection systems in older structures.

The policies and actions in this Chapter aim to optimize firefighting and emergency response capabilities through oversight of new development, improved facilities, and added staff.

Police Protection

Ventura Police response to crimes in progress or alarm soundings averages less than six minutes, and less than sixteen minutes for most other calls. While the local crime rate is slightly higher than State average, the Department hopes to better engage the community in policing efforts to lower crime levels. As part of a Strategic Planning Process, the Department has established the following goals:

- reduce crime and the fear of crime
- improve the quality of life in neighborhoods
- enhance community and police partnerships
- develop personnel
- continued accountability

One-time grant funding has helped add officers dedicated to community crime prevention, gang control, and youth mentoring programs. As these grants end the City must face the challenge of funding these services. Actions in this Chapter seek to improve the full range of police services to maximize community safety by increasing staffing, outreach efforts, and public access to police services.

Noise

Noise is generally defined as unwanted sound. Its effects can range from annoyance to nuisances to health problems. State law requires the City to identify and address noise sources and establish projected noise levels for roadways, railroads, industrial uses, and other significant generators. The Noise Contours map (Figure 7-3) is used to help guide land use in a way that minimizes exposure of residents to excessive noise.

Vehicle traffic is by far the greatest source of noise affecting Ventura residents. Other sources include the Seaside Park raceway, the Grant Park shooting range, and railroad, commercial, and industrial activity. Homes, schools, hotels, and hospitals are considered sensitive receptors where excessive noise can interfere with normal activities.

Noise intensity is customarily measured on the decibel scale, an index of loudness. Sounds as faint as 10 decibels (dB) are barely audible, while noise over 120 dB can be painful or damaging to hearing (Table 7-1 shows some typical noise levels). A sound 10 dB higher than another is perceived as about twice as loud. A 5 dB change is readily noticeable, but a 3 dB difference is barely perceptible.

As shown in Table 7-2, normally acceptable outdoor noise in residential areas may reach 65 decibels. The Ldn label in the table indicates that sound is averaged over time to account for the fact that sources like traffic or aircraft may cause fluctuations of more than 20 dB over a few seconds. CNEL refers to the fact that 5 dB is added to noise after 7 p.m. and 10 dB added from 10 p.m. to 7 a.m., when quieter conditions make sound more noticeable.

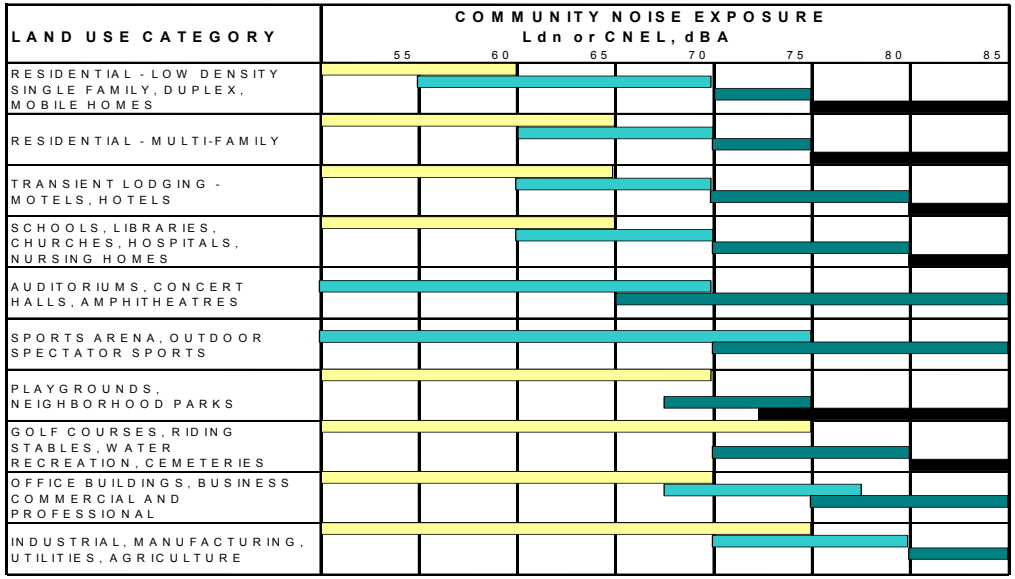
The State Building Code requires an acoustical study whenever outdoor noise would exceed 60 decibels at a proposed duplex, multifamily residence, hotel, motel or other attached dwelling. The study must show that the proposed project design would result in interior noise levels of 45 dB or less.

Although future increases in traffic are not expected to produce a significant change in perceived noise levels, other specific sound generators have been identified as problems in the community. The policies and actions in this chapter look to reduce the exposure of people in Ventura to these noise sources.

Table 7-1. Typical Noise Levels

Type of Noise or Environment	Decibels
Recording Studio	20
Soft Whisper; Quiet Bedroom	30
Busy Open-plan Office	55
Normal Conversation	60-65
Automobile *at 20 mph 25 ft. away*	65
Vacuum Cleaner *10 ft. away*	70
Dump Truck *at 50 mph 50 ft. away*	90
Train Horn *100 ft. away*	105
Claw Hammer; Jet Takeoff *200 ft. away*	120
Shotgun *at shooter's ear*	140

Table 7-2
Acceptable Noise Levels



NORMALLY ACCEPTABLE
Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

CONDITIONALLY ACCEPTABLE
New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.

NORMALLY UNACCEPTABLE
New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design

CLEARLY UNACCEPTABLE
New construction or development should generally not be undertaken.

Source: General Plan Guidelines, California Office of Planning and Research

Hazardous Materials

Hazardous materials include medical and industrial wastes, pesticides, herbicides, radioactive materials, and combustible fuels. Improper use, storage, transport, or disposal of these materials may result in harm to humans, surface or ground water degradation, air pollution, fire, or explosion. Most of the several hundred facilities in Ventura that use or store hazardous materials lie along Ventura Avenue or in the Arundell industrial district.

The Fire Department maintains a team specially trained and equipped to respond to hazardous materials emergencies. Additional equipment and personnel for large-scale hazardous materials incidents is available from the County Fire Protection District, the City of Oxnard, and the U.S. Naval Construction Battalion Center in Port Hueneme.

The Westside and North Avenue neighborhoods include about 30 brownfields: sites that may possess contaminated soils but also have potential for reuse. Cleanup of these sites will make them more attractive for redevelopment that can improve the neighborhoods and generate employment and tax revenue. The City has established a Brownfield Assessment Demonstration Pilot Program to fund site assessments and initiate remediation. The policies and actions in this chapter intend to minimize the risk of adverse health effects of hazardous materials by regulating their location and seeking funding for cleanup of brownfield sites to encourage their reuse.

Policy 7A: Encourage wellness through care and prevention.

Action 7.1: Work with interested parties to identify appropriate locations for assisted-living, hospice, and other care-provision facilities.

Action 7.2: Provide technical assistance to local organizations that deliver health and social services to seniors, homeless persons, low-income citizens, and other groups with special needs.

Action 7.3: Participate in school and agency programs to:

- provide healthy meals,
- combat tobacco, alcohol, and drug dependency,
- distribute city park and recreation materials through the schools, and
- distribute information about the benefits of proper nutrition and exercise.

Action 7.4: Enhance or create ordinances which increase control over ABC licensed premises.

Action 7.5: Investigate the creation of new land use fees to enhance funding of alcohol related enforcement, prevention and training efforts.

Policy 7B: Minimize risks from geologic and flood hazards.

Action 7.6: Adopt updated editions of the California Construction Codes and International Codes as published by the State of California and the International Code Council respectively.

Action 7.7: Require project proponents to perform geotechnical evaluations and implement mitigation prior to development of any site:

- with slopes greater than 10 percent or that otherwise have potential for landsliding,
- along bluffs, dunes, beaches, or other coastal features
- in an Alquist-Priolo earthquake fault zone or within 100 feet of an identified active or potentially active fault,
- in areas mapped as having moderate or high risk of liquefaction, subsidence, or expansive soils,
- in areas within 100-year flood zones, in conformance with all Federal Emergency Management Agency regulations.

Action 7.8: To the extent feasible, require new critical facilities (hospital, police, fire, and emergency service facilities, and utility "lifeline" facilities) to be located outside of fault and tsunami hazard zones, and require critical facilities within hazard zones to incorporate construction principles that resist damage and facilitate evacuation on short notice.

Action 7.9: Maintain and implement the Standardized Emergency Management System (SEMS) Multihazard Functional Response Plan.

Action 7.10: Require proponents of any new developments within the 100-year floodplain to implement measures, as identified in the Flood Plain Ordinance, to protect structures from 100-year flood hazards (e.g., by raising the finished floor elevation outside the floodplain).

Action 7.11: Prohibit grading for vehicle access and parking or operation of vehicles within any floodway.

Policy 7C: Optimize firefighting and emergency response capabilities.

Action 7.12: Refer development plans to the Fire Department to assure adequacy of structural fire protection, access for firefighting, water supply, and vegetation clearance.

Action 7.13: Resolve extended response time problems by:

- adding a fire station at the Pierpont/Harbor area,
- relocating Fire Station #4 to the Community Park site,
- increasing firefighting and support staff resources,
- reviewing and conditioning annexations and development applications, and
- require the funding of new services from fees, assessments, or taxes as new subdivisions are developed.

Action 7.14: Educate and reinforce City staff understanding of the Standardized Emergency Management System for the State of California.

Policy 7D: Improve community safety through enhanced police service.

Action 7.15: Increase public access to police services by:

- increasing police staffing to coincide with increasing population, development, and calls for service,
- increasing community participation by creating a Volunteers in Policing Program, and,
- require the funding of new services from fees, assessments, or taxes as new subdivisions are developed.

Action 7.16: Provide education about specific safety concerns such as gang activity, senior-targeted fraud, and property crimes.

Action: 7.17: Establish a nexus between police department resources and increased demands associated with new development.

Action 7.18: Continue to operate the Downtown police storefront.

Action 7.19: Expand Police Department headquarters as necessary to accommodate staff growth.

Policy 7D: Minimize exposure to air pollution and hazardous substances.

Action 7.20: Require air pollution point sources to be located at safe distances from sensitive sites such as homes and schools.

Action 7.21: Require analysis of individual development projects in accordance with the most current version of the Ventura County Air Pollution Control District Air Quality Assessment Guidelines and, when significant impacts are

identified, require implementation of air pollutant mitigation measures determined to be feasible at the time of project approval.

Action 7.22: In accordance with Ordinance 93-37, require payment of fees to fund regional transportation demand management (TDM) programs for all projects generating emissions in excess of Ventura County Air Pollution Control District adopted levels.

Action 7.23: Require individual contractors to implement the construction mitigation measures included in the most recent version of the Ventura County Air Pollution Control District Air Quality Assessment Guidelines.

Action 7.24: Only approve projects involving sensitive land uses (such as residences, schools, daycare centers, playgrounds, medical facilities) within or adjacent to industrially designated areas if an analysis provided by the proponent demonstrates that the health risk will not be significant.

Action 7.25: Adopt new development code provisions that ensure uses in mixed-use projects do not pose significant health effects.

Action 7.26: Seek funding for cleanup of sites within the Brownfield Assessment Demonstration Pilot Program and other contaminated areas in West Ventura.

Action 7.27: Require proponents of projects on or immediately adjacent to lands in industrial, commercial, or agricultural use to perform soil and groundwater contamination assessments in accordance with American Society for Testing and Materials standards, and if contamination exceeds regulatory action levels, require the proponent to undertake remediation procedures prior to grading and development under the supervision of the County Environmental Health Division, County Department of Toxic Substances Control, or Regional Water Quality Control Board (depending upon the nature of any identified contamination).

Action 7.28: Educate residents and businesses about how to reduce or eliminate the use of hazardous materials, including by using safer non-toxic equivalents.

Action 7.29: Require non-agricultural development to provide all necessary buffers, as determined by the Agriculture Commissioner's Office, from agricultural operations to minimize the potential for pesticide drift.

Action 7.30: Require all users, producers, and transporters of hazardous materials and wastes to clearly identify the materials that they store, use, or transport, and to notify the appropriate City, County, State and Federal agencies in the event of a violation.

Action 7.31: Work toward voluntary reduction or elimination of aerial and synthetic chemical application in cooperation with local agricultural interests and the Ventura County agricultural commissioner.

Policy 7E: Minimize the harmful effects of noise.

Action 7.32: Require acoustical analyses for new residential developments within the mapped 60 decibel (dBA) CNEL contour, or within any area designated for commercial or industrial use, and require mitigation necessary to ensure that:

- Exterior noise in exterior spaces of new residences and other noise sensitive uses that are used for recreation (such as patios and gardens) does not exceed 65 dBA CNEL, and
- Interior noise in habitable rooms of new residences does not exceed 45 dBA CNEL with all windows closed.

Action 7.33: As funding becomes available, construct sound walls along U.S. 101, SR 126, and SR 33 in areas where existing residences are exposed to exterior noise exceeding 65 dBA CNEL.

Action 7.34: Request that sound levels associated with concerts at the County Fairgrounds be limited to 70 dBA at the eastern edge of that property.

Action 7.35: Request the termination of auto racing at the County fairgrounds.

Action 7.36: Amend the noise ordinance to restrict leaf blowing, amplified music, trash collection, and other activities that generate complaints.

Action 7.37: Use rubberized asphalt or other sound reducing material for paving and re-paving of City streets.

Action 7.38: Update the Noise Ordinance to provide standards for residential projects and residential components of mixed-use projects within commercial and industrial districts.

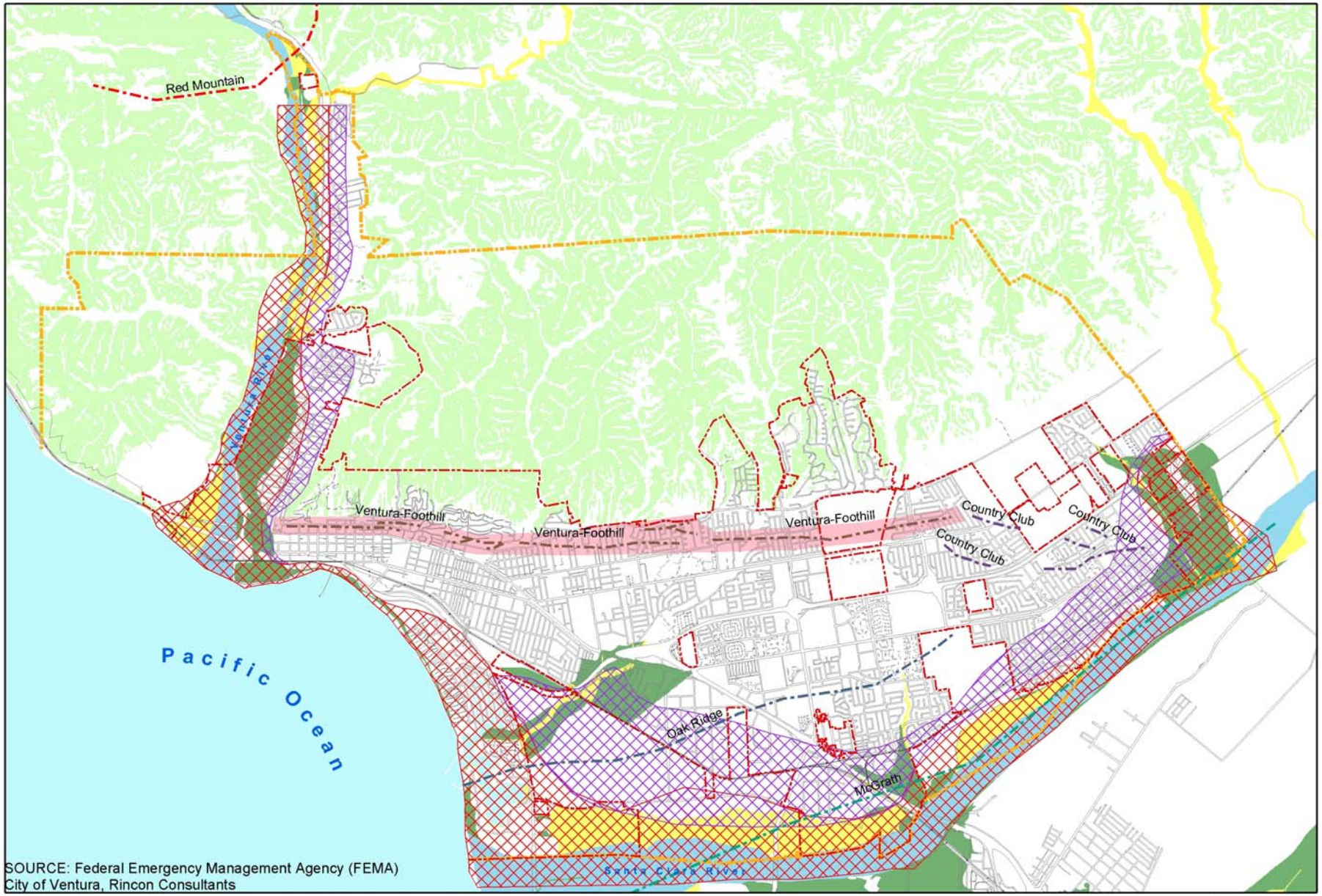


Figure 7-1
Natural Hazards

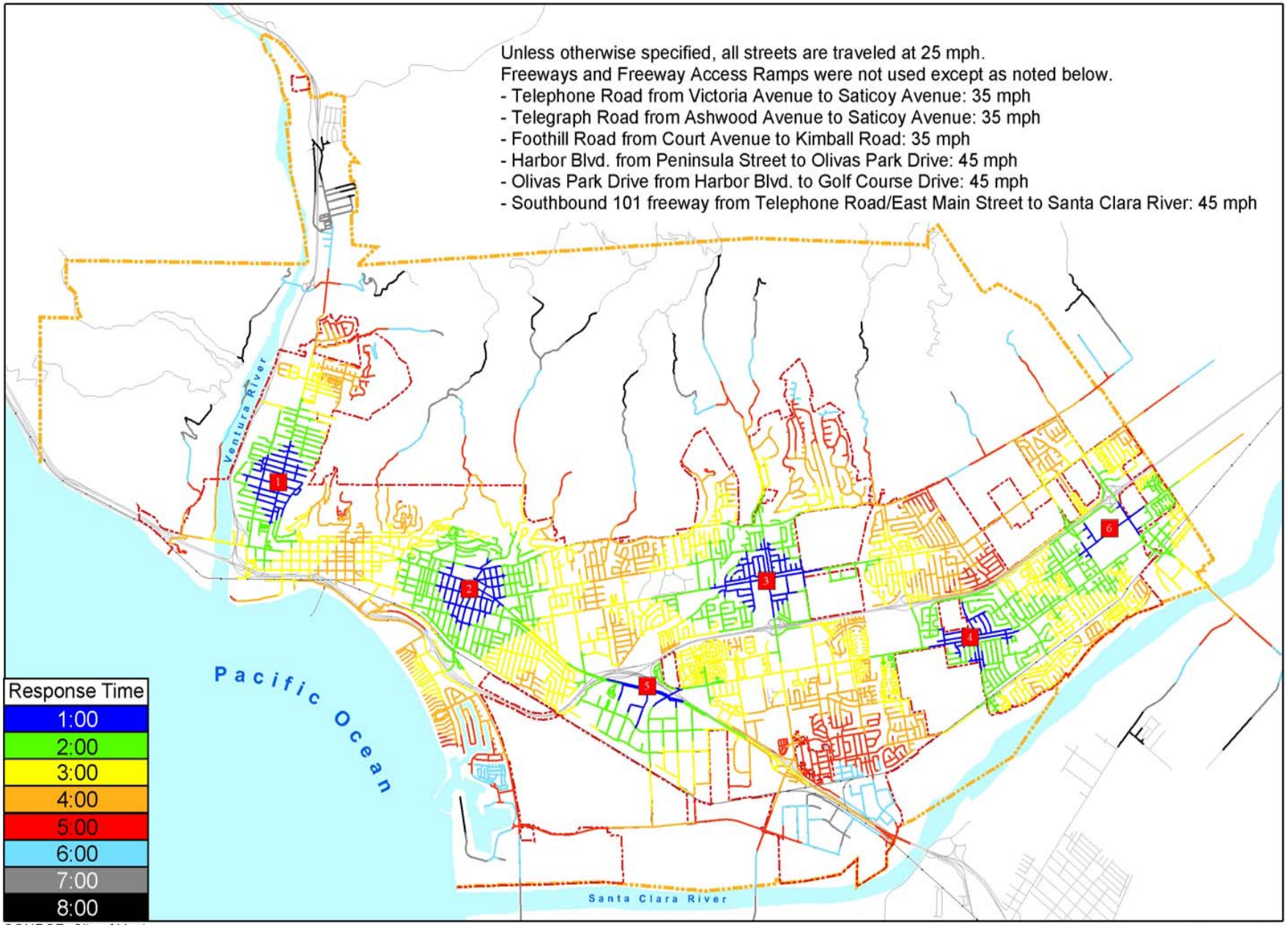
FEMA Flood Hazard Zones
- A (100-yr floodzone)
- B (500-yr floodzone)
- Floodway

Liquefaction Zones
- High Water Table
- Low Water Table

Major Fault Systems
- Country Club
- McGrath
- Oak Ridge
- Red Mountain
- Ventura-Foothill

Other
- City Limits
- Planning Boundary
- >30% Slope

This map is a product of the City of San Buenaventura, California. Although reasonable efforts have been made to ensure the accuracy of this map, the City of San Buenaventura cannot guarantee its accuracy.



SOURCE: City of Ventura

City Limits

Planning Boundary

Existing Fire Stations 1-6

Figure 7-2
Fire Response Time

This map is a product of the City of San Buenaventura, California. Although reasonable efforts have been made to ensure the accuracy of this map, the City of San Buenaventura cannot guarantee its accuracy.

SOURCE: City of Ventura and Rincon Consultants, Inc.

Figure 7-3
Noise Contours

Noise Contours
- 60dBA
- 65dBA
- 70dBA
- 75dBA
- Countoured Streets (Over 5000 ADT)
- Recreation Centers
- Hospitals
- Schools
- Library
- Government Centers
- City Limits
- Planning Boundary

This map is a product of the City of San Buenaventura, California. Although reasonable efforts have been made to ensure the accuracy of this map, the City of San Buenaventura cannot guarantee its accuracy.

ventura's general plan

OUR EDUCATED COMMUNITY

"A vigorous culture capable of making corrective, stabilizing changes depends heavily on its educated people, and especially upon their critical capacities and depth of understanding."

— Jane Jacobs
Dark Age Ahead

CITY OF
VENTURA

8. OUR EDUCATED COMMUNITY

Our goal is to encourage academic excellence and life-long learning resources to promote a highly-educated citizenry.

Lifelong Learning

Education is more important than ever before as the foundation for the vitality of informed community participation in Ventura. The *Ventura Vision* calls for the city to be "a community dedicated to educational excellence and an emphasis on lifelong learning." A truly educated community is key to achieving most of the goals in this General Plan because:

- In the 21st Century information economy a highly educated and skilled workforce is vital to community prosperity,
- Education and the institutions that provide it are critical to achieving environmental and cultural leadership, and
- An educated and informed citizenry is essential to sound planning and decision-making.

While Ventura has a comparatively well-educated population (see Table 8-1), the high costs of doing business and finding housing in the city will force even greater emphasis on businesses and jobs that require ever-higher levels of skill. The need and desire for lifelong learning will require relentlessly expanding educational resources and access to them in the years ahead. Plus, the assets that strong educational institutions provide are necessary to bring a rich cultural life to the community as well.

Ventura can build on an impressive base of well-regarded public schools, array of private alternatives, major community college, satellite university campuses, expanding media-training institute, law school, and three branch libraries, among other educational resources. The key to becoming renowned as a local "learning community" lies in creating stronger linkages between these existing resources and integrating them into the physical and social landscape of our community.

Leveraging our Assets

Excellence in public education is the top priority for the Ventura Unified School District (whose boundaries extend beyond the city). In Ventura, the District manages 16 elementary schools, four middle schools, three high schools, and one continuation high school, plus independent study and adult education programs.

In addition to District schools, the city also is home to more than a dozen private schools (see Table 8-2), serving 13 percent of elementary and high school students living in Ventura, according to the 2000 Census. Figure 6-1 shows school locations in the city.

Table 8-1
Education Level

Schooling Completed	Percent of Population
High School	21.7
Some College	28.2
Associate Degree only	9.6
Bachelors Degree only	15.4
Graduate Degree	9.3
High School Diploma & Above	***84.1***
Associate Degree & Above	***34.2***

Source: 2001 Ventura County Economic Outlook

Table 8-2
Private Schools

School	Grades
First Baptist Day	K-5
St. Augustine Academy	4-12
Sacred Heart	K-8
Ventura Missionary Christian Day	K-8
College Heights Christian	K-8
St. Bonaventure High School	9-12
Holy Cross	K-8
Our Lady of The Assumption	K-8
St. Paul's Parish Day	K-8
Grace Lutheran Christian Day	K-6
Jameson	K-12
Ventura County Christian	K-12
Hill Road Montessori Preschool	K-3
Wells Road Baptist Academy	K-12

Most public schools operate at or near capacity (see Table 8-3), and continuing growth in Ventura requires the District to search for sites for new schools (see Table 8-4). Developers of new projects are required to dedicate land or pay fees for school purposes, and any major annexation of land outside the city is likely to have to provide a school site to serve new resident children. Still, the scarcity and cost of suitable sites means that greater thought will need to be given to shared facility use and other non-traditional approaches to expanding capacity.

Table 8-3. Ventura Unified School District Enrollment

Schools – No.	Students	Capacity
Elementary – 17	8,093	95%
Middle – 4	4,304	93%
High - 3	4,820	85%
TOTAL	**17,217**	**92%**

Source: Ventura Unified School District, 2003

Table 8-4. Public School Demand

School Type	Students/ School	School Needs	Acres Needed[1]
Elementary	600	4	40
Middle	1,000	1	20
High	2,000	1	40
TOTAL		**6**	**100**

1. Assumes 10 acres for elementary schools, 20 acres for middle schools, and 40 acres for high schools.

Source: Ventura Unified School District, 2003

Ventura is increasingly becoming recognized as a center for higher education. Ventura College is a highly respected two-year school with more than 12,000 students, providing everything from a distinguished transfer opportunity for the University of California to certificates and associates degrees in important fields such as manufacturing and nursing. Students also can obtain four-year degrees in certain fields at the UCSB Ventura Center. Brooks Institute of Photography provides education in photojournalism, filmmaking, and related fields, providing the city with a significant cultural asset. Residents can earn graduate degrees in law, public policy, and education at the Ventura campuses of California Lutheran University, Azusa Pacific University, the Ventura College of Law, and the Southern California Institute of Law. The opening of the nearby California State University Channel Islands has drawn many students and faculty to live in Ventura, especially those in creative fields.

Combined, these institutions of higher learning provide Ventura with tremendous educational assets. Through the policies and actions in this chapter, the City is committed to nurturing these institutions, creating synergy among them, and instilling both cultural and economic opportunities.

Libraries of the Future

The County public library system in Ventura currently operates three branch libraries that serve about 200,000 visits annually (see Table 8-5). But in a digital age where more and more content is available online, the traditional book borrowing function is becoming outmoded. Library administrators and staff, the City's Library Advisory Commission, and patrons have all pointed to needs for adding library space, extending operating hours, and updating and expanding learning resources.

At a more fundamental level, the ideas of what constitutes a library and how it fits the patterns of a learning community need to be reexamined. Integration with school libraries, including the Ventura College Learning Center, is a top priority for this reevaluation, as embodied in the policies and actions in this chapter.

City and Community Programs

Traditional classroom settings alone cannot provide the complete set of educational skills and experience needed by people of all ages. The City provides a variety of learning opportunities, including youth and adult art programs, environmental education, adaptive recreation programs, youth after-school activities, and summer camps. Community organizations also provide a range of classes and experiences, including tours, museums, lectures, and hands-on activities. Expanding venues for such activities and promoting participation in them are key challenges.

Policies and actions in this chapter seek to expand lifelong learning opportunities for everyone in the community.

Table 8-5. Local Libraries

Library	Card-Holders	2003-2004 Patronage	Hours Open Weekly	Facility Size (sq. ft.)
E. P. Foster	48,195	366,134	54	31,000
H. P. Wright			39	12,000
Avenue			25	3,000

Source: Ventura County Library Administration, 2005

Policy 8A: Reach out to institutions and educators to advance lifelong learning.

Action 8.1: Work closely with schools, colleges, and libraries to provide input into site and facility planning.

Action 8.2: Organize a regional education summit to generate interest in and ideas about learning opportunities.

Action 8.3: Adopt joint-use agreements with libraries, schools, and other institutions to maximize use of educational facilities.

Action 8.4: Distribute information about local educational programs.

Policy 8B: Increase the availability and diversity of learning resources.

Action 8.5: Install infrastructure for wireless technology and computer networking in City facilities.

Action 8.6: Establish educational centers at City parks.

Action 8.7: Work with the State Parks Department to establish a marine learning center at the Harbor.

Action 8.8: Work with the Ventura Unified School District to ensure that school facilities can be provided to serve new development.

Policy 8C: Reshape public libraries as 21st Century learning centers.

Action 8.9: Complete a new analysis of community needs, rethinking the role of public libraries in light of the ongoing advances in information technology and the changing ways that individuals and families seek out information and life-long learning opportunities.

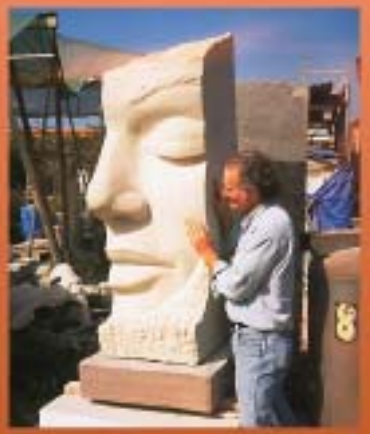
Action 8.10: Reassess the formal and informal relationships between our current three branch public libraries and school libraries – including the new Ventura College Learning Resource Center – as well as joint use of facilities for a broader range or compatible public, cultural, and educational uses.

Action 8.11: Develop a Master Plan for Facilities, Programs, and Partnerships to create an accessible, robust, and vibrant library for the 21st Century system, taking into consideration that circulation of books is no longer the dominant function but will continue to be an important part of a linked network of learning centers.

Action 8.12: Develop formal partnerships, funding, capital strategies, and joint use agreements to implement the new libraries Master Plan.

ventura's general plan

OUR CREATIVE COMMUNITY



"Whatever you can do, or dream you can, begin it. Boldness has genius, power and magic in it."

— Johann Wolfgang von Goethe

CITY OF
VENTURA

9. OUR CREATIVE COMMUNITY

Our goal is to become a vibrant cultural center by weaving the arts and local heritage into everyday life.

A Rich Foundation

Local history, artistic expression, and cultural diversity play vital roles in making Ventura a vibrant and interesting place. The heritage of Chumash civilization, which developed over the course of about 9,000 years, and influences of Mexican settlement establish a rich tableau for the modern development of the city. Art in museums, galleries, and public places, as well as space and energy devoted to the creation of artwork and crafts connect the community in complex and fundamental ways. Cultural expression in the form of festivals and informal gatherings provide additional and essential bonds that strengthen the community.

Historic Context

Abundant food and water, temperate climate, and ample material for tool manufacturing attracted early local inhabitants. Chumash peoples were living in a string of coastal villages when Spanish explorers arrived in 1542. Shisholop village (at the south end of present-day Figueroa Street) was a thriving Chumash provincial capital at the time of the Spanish arrival. Other Chumash villages and burial sites have been found in what are now the North Avenue and Saticoy neighborhoods, as well as north of the Ventura River. Mexican settlers began to arrive in earnest after the founding of Mission San Buenaventura in 1782.

Table 9-1
Key Historical and Cultural Sites

Site	Description
Albinger Museum	Artifacts spanning 3,500 years excavated from a site next to the Mission are on display in this former adobe at 113 East Main Street.
Downtown	Downtown Ventura is home to a variety of 19th Century buildings that house restaurants and retail establishments in a small-town setting with a variety of cultural amenities.
Olivas Adobe Park	Completed in 1849 for the Raymundo ranching family, the well-preserved hacienda at 4200 Olivas Park Road is utilized as concert and banquet facility.
Ortega Adobe	Built in 1857, the adobe is only remaining example of the middle class homes that once lined West Main Street. The building has since been used as a police station and restaurant.
San Buenaventura Mission	Built in 1782, the Mission anchors the western part of the downtown area and is still used for regular Catholic services.
Santa Gertrudis Chapel	The Chapel was originally completed around 1809. The site is located along Highway 33 near Foster Park.
San Miguel Chapel	The site is located at Thompson Boulevard and Palm Street. The original chapel dated back to the early 1800s.
Ventura County Museum of History and Art	The museum at 100 East Main Street houses exhibits featuring local artists and historical artifacts. Expansion plans include a 200-seat auditorium and a gallery with touring exhibits.

Source: City of Ventura

More than 90 historic sites have been identified in the planning area (which includes areas outside the city). Notable ones include the Mission, the Ortega and Olivas Adobes, and the locations of the Santa Gertrudis and San Miguel Chapels (See Table 9-1 and Figure 9-1). Many of the existing buildings in Ventura were constructed between 1880 and 1940, a period that coincided with development of the railroads and harbor. City

Hall (formerly the County Courthouse) and the Mission aqueduct are listed as landmarks on the National Register of Historic Places, and structures in the following historic districts are protected by City architectural controls:

- the grounds within the Mission District,
- the Mitchell block (south of Thompson Boulevard between Chestnut and Fir Streets),
- the Selwyn Shaw block (north of Poli Street between Ann and Hemlock Streets), and
- the Simpson Tract (west of Ventura Avenue between Simpson and Prospect Streets).

Arts and Culture

When the City first adopted a Community Cultural Plan in 1992, Ventura's creative community was in its fledgling stage. Few of the now-thriving professional art and cultural organizations existed (see Table 9-2). A burgeoning visual artist community had made the city its home, but was fairly invisible except to the more intrepid arts supporters and collectors.

Since completion of that plan, the City has either implemented or initiated all of its recommendations, which were developed through extensive public involvement. As a result, the growth of the cultural community has been extraordinary. Now Ventura is home to a wealth of active artists and arts organizations. From 1994-2004, the budgets of arts organizations in Downtown Ventura alone increased from $500,000 to more than $4 million.

Ventura also now has a complement of major cultural institutions unique for a city of its size, including the Ventura Music Festival, the Rubicon Theatre Company, the Ventura County Museum of History and Art, and Focus on the Masters. The individual artists who live and work in the city continue to comprise a major part of its cultural fabric, and are highlighted in popular cultural events like the Downtown ArtWalks.

A strong focus of the City's general is to build the arts infrastructure of Ventura. A strong cultural infrastructure is the foundation of a healthy arts ecosystem: this includes *places* (for arts creation, sales, exhibition, performance, rehearsal, living), *people* (artists, audiences, patrons), and *organizations* (production, support, and presentation).

In keeping with the community's respect for its roots, the Ventura arts scene remains authentic, no small feat in today's competitive environment. While many communities focus on importing Broadway shows or big-name art exhibits to increase their profile, Ventura successfully continues to highlight local artists, architecture, culture, history, and the environment – the unique threads that together comprise the rich tapestry of the Ventura community. Policies and actions in this chapter call for continuing to build the cultural foundations of the community by involving everyone in the production, support, and presentation of art and cultural programs, installing art in public places, providing working and display space for local artists, and identifying a site for an arts and cultural center.

Table 9-2
Art and Cultural Institutions

Name	Description	Years in Operation	Annual Patronage
Buenaventura Arts Association	Fine art gallery in downtown Ventura.	50	5,000
Channelaire Chorus	Women's chorus	42	2,500
City of Ventura Cultural Affairs Division	Supports local arts organizations; produces cultural programs (ArtWalks, Street Fairs, Music Under the Stars, Arts Education classes, grants, public art, etc.)	13	132,000
Focus on the Masters	Documentation of extraordinary artists (photographs, audio and video interviews)	10	15,000
Kids' Art	Ongoing, free kids' creative arts programs	12	350
Music 4 Kids	After school music instruction at Boys & Girls Clubs	4	800
Plexus Dance Theater	Professional modern dance performances	20	1,400
Rubicon Theater	Regional theater – classic and contemporary	6	37,000
San Buenaventura Foundation for the Arts	Arts umbrella organization - supports development of the Cultural Center and produces Arts Explosion	5	5,900
Ventura Area Theater Sports	Live improvisational theater in downtown Ventura	15	5,000
Ventura Artists' Union	Art gallery and weekly arts shows on California Plaza	15	17,000
Ventura College Opera Workshop	Opera and theater company at Ventura College	21	4,500
Ventura County Ballet	Ballet school with twice annual performances	6	11,000
Ventura County Master Chorale	Professional vocal music ensemble	23	6,000
Ventura County Museum of History and Art	Museum featuring exhibits on the history and art of Ventura County	26	55,000
Ventura Music Festival	Annual concert festival presenting international and local performers	11	9,000

Policy 9A: Increase public art and cultural expression throughout the community.

Action 9.1: Require works of art in public spaces per the City's Public Art Program Ordinance.

Action 9.2: Sponsor and organize local art exhibits, performances, festivals, cultural events, and forums for local arts organizations and artists.

Action 9.3: Expand outreach and publicity by:

- promoting locally produced art and local cultural programs
- publishing a monthly calendar of local art and cultural features,
- distributing the *State of the Arts* quarterly report, and
- offering free or subsidized tickets to events.

Action 9.4: Support the creative sector through training and other professional development opportunities.

Action 9.5: Work with the schools to integrate arts education into the core curriculum.

Action 9.6: Promote the cultural and artistic expressions of Ventura's underrepresented cultural groups.

Action 9.7: Offer ticket subsidy and distribution programs and facilitate transportation to cultural offerings.

Policy 9B: Meet diverse needs for performance, exhibition, and workspace.

Action 9.8: Increase the amount of live-work development, and allow its use for production, display, and sale of art.

Action 9.9: Work with community groups to locate sites for venues for theater, dance, music, and children's programming.

Policy 9C: Integrate local history and heritage into urban form and daily life.

Action 9.10: Provide incentives for preserving structures and sites that are representative of the various periods of the city's social and physical development.

Action 9.11: Organize and promote multi-cultural programs and events that celebrate local history and diversity.

Action 9.12: Allow adaptive reuse of historic buildings.

Action 9.13: Work with community groups to identify locations for facilities that celebrate local cultural heritage, such as a living history Chumash village and an agricultural history museum.

Policy 9D: Ensure proper treatment of archeological and historic resources.

Action 9.14: Require archaeological assessments for projects proposed in the Coastal Zone and other areas where cultural resources are likely to be located.

Action 9.15: Suspend development activity when archaeological resources are discovered, and require the developer to retain a qualified archaeologist to oversee handling of the resources in coordination with the Ventura County Archaeological Society and local Native American organizations as appropriate.

Action 9.16: Pursue funding to preserve historic resources.

Action 9.17: Provide incentives to owners of eligible structures to seek historic landmark status and invest in restoration efforts.

Action 9.18: Require that modifications to historically-designated buildings maintain their character.

Action 9.19: For any project in a historic district or that would affect any potential historic resource or structure more than 40 years old, require an assessment of eligibility for State and federal register and landmark status and appropriate mitigation to protect the resource.

Action 9.20: Seek input from the City's Historic Preservation Commission on any proposed development that may affect any designated or potential landmark.

Action 9.21: Update the inventory of historic properties.

Action 9.22: Create a set of guidelines and/or policies directing staff, private property owners, developers, and the public regarding treatment of historic resources that will be readily available at the counter.

Action 9.23: Complete and maintain historic resource surveys containing all the present and future components of the historic fabric within the built, natural, and cultural environments.

Action 9.24: Create a historic preservation element.

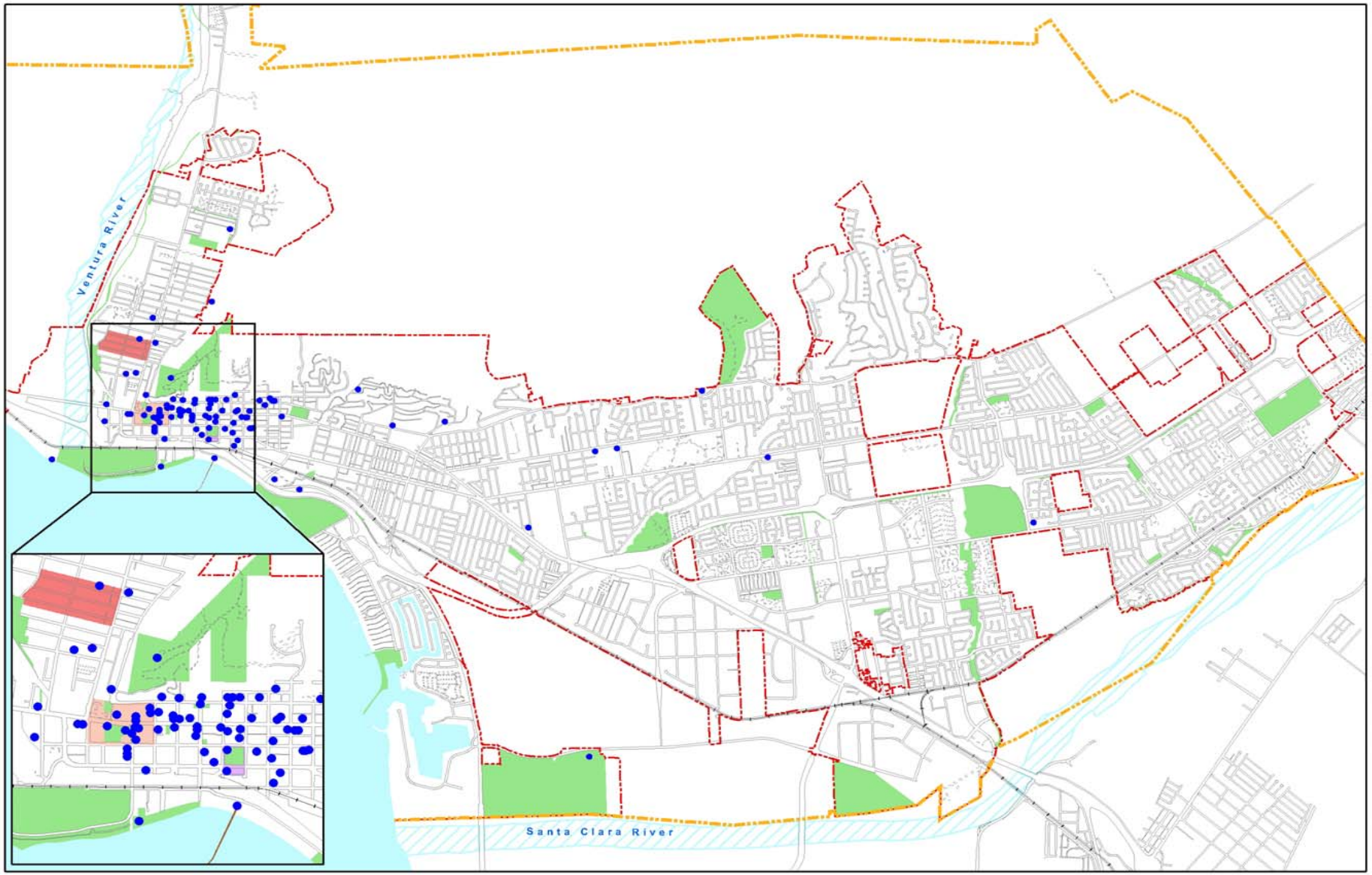
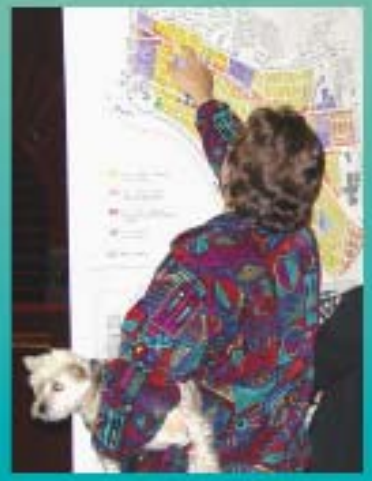


Figure 9-1
Historic Districts and Sites

This map is a product of the City of San Buenaventura, California. Although reasonable efforts have been made to ensure the accuracy of this map, the City of San Buenaventura cannot guarantee its accuracy.



"Never believe that a few caring people can't change the world. For indeed, that's all who ever have."

— Margaret Mead
Renowned Anthropologist

CITY OF
VENTURA

OUR INVOLVED COMMUNITY

ventura's general plan

10. OUR INVOLVED COMMUNITY

Our goal is to strive to work together as a community to achieve the Ventura Vision through civic engagement, partnerships, and volunteer service.

Civic Engagement

It is not enough to have a vision of smart growth for Ventura. Achieving that vision requires the active and ongoing participation of an engaged and active community. Fortunately, Ventura builds on a strong foundation: thousands of Ventura citizens are involved in their schools and places of worship and give their time to civic, cultural, and charitable organizations. City Commissions, the Community Councils, the Chamber of Commerce and other well-established avenues provide opportunities for community leadership.

This is what Alexis De Toqueville celebrated in his famous book, *Democracy in America*, calling our nation, "the one country in the world, day in and day out, that makes use of an unlimited freedom of association." Yet today in Ventura, as all across America, there is concern about the health of our democracy. Sociologist Robert Putnam gained national attention with his research showing that "by almost every measure, Americans' direct engagement in politics and government has fallen steadily and sharply over the last generation."

Among the symptoms in Ventura have been a decline in voter turnout in recent local elections – (a 36% drop from 1995 through 2003.) Over those years, the ability to build consensus about future development has been undermined by sharply polarized divisions, showdowns at the ballot box, and often rancorous public hearings. The complaint often recurs that planning decisions are made without adequate notice or consideration of the views of those affected. Many citizens criticize the City decision-making process as convoluted and counterproductive.

Moreover, ongoing participation of an engaged community requires civic places where citizens can come together. It is not insignificant that a decline in public participation and the quality of civic discourse has paralleled the loss of civic places in our cities. Historically, governments provided open spaces and buildings that were at the center of a community, physically and symbolically. Town squares and plazas, often faced by a hall for formal gathering and civic engagement, have all but disappeared. The poverty of American public places was apparent after the Columbine High School shooting in Colorado, when citizens gathered to mourn, not in a shared place for people, but in a parking lot.

Nearly everyone agrees we can and should do better. The best model for doing this was the citywide effort to craft the *Ventura Vision*. Thousands participated in a year-long partnership encompassing City government, non-profit organizations, community groups, business,

schools and individual residents to chart the community's future.

The vision of an "involved community" was described in the *Ventura Vision* report as: seeking "broad community collaboration; more widely publicizing city government services, planning processes and policies; better involvement of typically under-represented groups such as youth, seniors and ethnic minorities in community planning; and developing public parks, plazas, neighborhood greenways and other spaces that promote civic interaction and events."

Since that vision was adopted by the City Council in 2000, the City has worked to implement it, building on existing community assets and strengthening the linkages and interconnections that already exist among people, organizations, and shared community goals. A remarkable example of broad community collaboration earned attention throughout Southern California in late 2004. Facing the prospect of winter flooding, the City undertook to evacuate homeless people living in the channel of the Ventura River. This was accomplished by a partnership involving non-profit social service agencies, faith-based organizations, City staff, business leaders, community volunteers and the affected homeless population.

There are many more models of successful community collaboration in Ventura, including: the restoration of the pier, the community's rich array of after-school programs, the implementation of the 1992 Cultural Plan, the 2004 Downtown Charrette, the 2005 Midtown Design Charrette and the establishment of conservancies to preserve the Grant Park cross and Ventura's cherished hillsides.

City government has learned from these efforts to reach broadly and deeply into the community. Civic engagement and trust are built when City representatives actively seek to involve everyone in positive and transparent partnerships. That goal requires a continually evolving effort to promote participation:

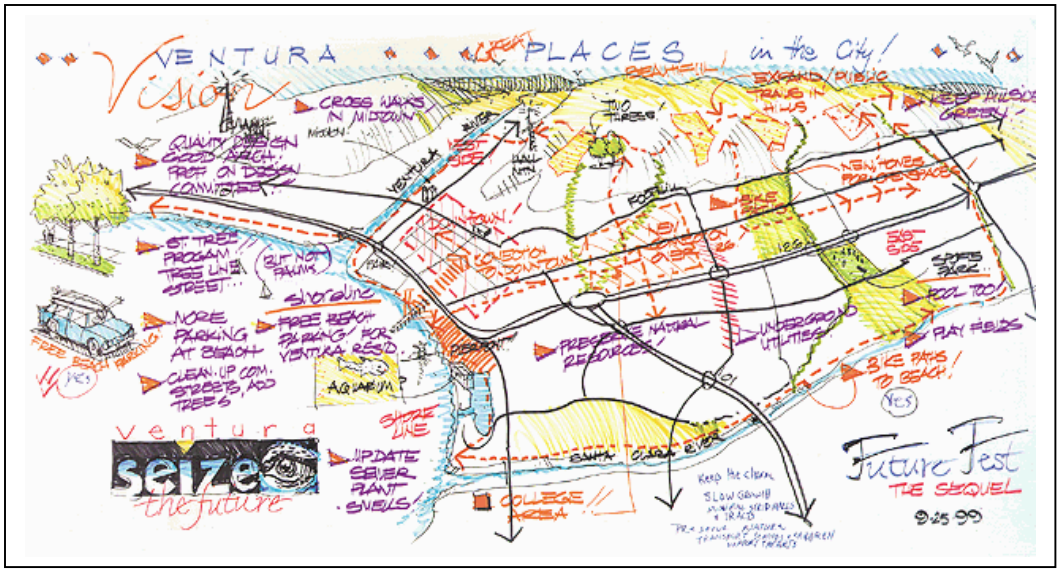
- through proactive and interactive media outreach in the press, on the web, on radio and television,
- by striving to include everyone in decision making and making it convenient for them to participate by seeking them out in their neighborhoods and gathering places like schools, houses of worship and public spaces, and
- through community dialogues, workshops, charrettes, town hall forums, and community councils, in addition to formal public hearings.

More effort needs to be put into building consensus about future growth and change upfront through community planning, rather than waiting until specific development projects are proposed. That effort will continue with the work to craft a citywide "form-based code" and concentrated planning efforts for specific neighborhoods and districts.

Focused attention should be paid to making our public decision-making processes easier to understand and participate in. Citizens have little time or patience for complicated planning and entitlement processes that drag on for years. By establishing clearer rules and public processes for applying them, the policies and actions in this chapter will enable more citizens to feel that they will be heard and their contributions valued. By involving a wider range of the community in clearly setting Ventura's planning goals and standards of quality, we can devote more time to achieving those goals and less time wrangling over specific proposals.

Ventura also needs to reestablish places for civic discourse. While the City will continue to encourage the use of our beautiful City Hall for its historic role of government by and for the people, we also need a hierarchy of civic spaces citywide that are strategically located in neighborhood centers and accessible by pedestrians (see Chapter Three, Action 3.8). Every neighborhood should have access to a physical location designated for public gathering and civic purposes.

Our long-range vision is to build an ethic and a fabric of robust civic engagement – what De Toqueville called "the habits of the heart." His phrase evokes what the Ventura Vision called "direct engagement in public affairs" through "participation, hard work and collaboration . . . sustaining Ventura as an exceptional place." The policies and actions in this chapter aim to do just that.



Policy 10A: Work collaboratively to increase citizen participation in public affairs.

Action 10.1: Conduct focused outreach efforts to encourage all members of the community – including youth, seniors, special needs groups, and non-English speakers – to participate in City activities.

Action 10.2: Obtain public participation by seeking out citizens in their neighborhoods and gathering places such as schools, houses of worship and public spaces.

Action 10.3: Invite civic, neighborhood, and non-profit groups to assist with City project and program planning and implementation.

Action 10.4: Provide incentives for City staff to participate in community and volunteer activities.

Action 10.5: Invite seniors to mentor youth and serve as guides at historical sites.

Action 10.6: Offer internships in City governance, and include youth representatives on public bodies.

Action 10.7: Continue to offer the Ambassadors program to obtain citizens assistance with City projects.

Policy 10B: Raise awareness of City operations and be clear about City objectives.

Action 10.8: Utilize the City website as a key source of information and expand it to serve as a tool for civic engagement.

Action 10.9: Publish an annual report that evaluates City performance in such areas as conservation, housing, and economic development.

Action 10.10: Continue to improve the user-friendliness of the media that communicate information about the City, including the website, cable channels, newsletters, kiosks, and water billing statements.

Policy 10 C: Work at the neighborhood level to promote citizen engagement.

Action 10.11: Establish a clear policy toward the scope, role, boundaries, and jurisdiction of neighborhood Community Councils citywide, with the objectives of strengthening their roles in decision-making.

Action 10.12: Establish stronger partnerships with neighborhood Community Councils to set area priorities for capital investment, community policing, City services, commercial investment, physical planning, education, and other concerns, to guide both City policies and day-to-day cooperation and problem-solving.

Action 10.13: Recognizing that neighborhood empowerment must be balanced and sustained by overall City policies and citywide vision and resources – establish a citywide Neighborhood Community Congress where local neighborhood Community Councils can collaborate and learn from each other.

Action 10.14: Establish clear liaison relationships to foster communication, training, and involvement efforts between the City, neighborhood Community Councils and other community partners, including the Ventura Unified School District and business, civic, cultural and religious groups.

ventura's general plan

APPENDICES

"Individual commitment to a group effort, that is what makes a team work, a company work, a society work, a civilization work."

— Vince Lombardi
Author of *What it Takes To Be #1*, 2001

CITY OF
VENTURA

KEY TO ABBREVIATIONS	
AS = Administrative Services Department AS [P] = Purchasing CA = City Attorney CD = Community Development Department CD [A] = Administration CD [CP] = Current Planning CD [LRP] = Long Range Planning CD [ED] = Economic Development CD [LD] = Land Development CD [RDA] = Redevelopment Agency CC = City Council CM = City Manager's Department CM [CE] = Civic Engagement CS = Community Services Department CS [CR] = Community Recreation	CS [CA] = Cultural Affairs CS [GS/AS] = Golf Services/Adult Sports CS [SS] = Social Services FD = Fire Department FD [IS] = Inspection Services HR = Human Resources Department PD = Police Department PW = Public Works Department PW [E] = Engineering PW [P] = Parks PW [MS] = Maintenance Services PW [U] = Utilities Short-term = 0-5 years Mid-term = 5-10 years Long-term = 10-20 years Ongoing = May require short-, mid-, and long-term action
= Action included in the Land Use Plan of the City's Local Coastal Program	

Number	Action	Lead Entity	Timeframe
1.1	Adhere to the policies and directives of the California Coastal Act in reviewing and permitting any proposed development in the Coastal Zone.	CD [CP]	Ongoing
1.2	Prohibit non-coastal-dependent energy facilities within the Coastal Zone, and require any coastal-dependent facilities including pipelines and public utility structures to avoid coastal resources (including recreation, habitat, and archaeological areas) to the extent feasible, or to minimize any impacts if development in such areas is unavoidable.	CD [CP]	Ongoing
1.3	Work with the State Department of Parks and Recreation, Ventura County Watershed Protection Agency, and the Ventura Port District to determine and carry out appropriate methods for protecting and restoring coastal resources, including by supplying sand at beaches under the Beach Erosion Authority for Control Operations and Nourishment (BEACON) South Central Coast Beach Enhancement program.	PW [E]	Ongoing
1.4	Require new coastal development to provide non-structural shoreline protection that avoids adverse impacts to coastal processes and nearby beaches.	CD [CP]	Ongoing
1.5	Collect suitable material from dredging and development, and add it to beaches as needed and feasible.	PW [E]	Ongoing
1.6	Support continued efforts to decommission Matilija Dam to improve the sand supply to local beaches.	PW [U]	Long-term
1.7	Update the Hillside Management Program to address and be consistent with the Planning Designations as defined and depicted on the General Plan Diagram.	CD [LRP]	Short-term

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Number	Action	Lead Entity	Timeframe
1.8	Buffer barrancas and creeks that retain natural soil slopes from development according to state and Federal guidelines.	CD [LD]	Ongoing
1.9	Prohibit placement of material in watercourses other than native plants and required flood control structures, and remove debris periodically.	PW [MS/P]	Ongoing
1.10	Remove concrete channel structures as funding allows, and where doing so will fit the context of the surrounding area and not create unacceptable flood or erosion potential.	PW [MS/P]	Long-term
1.11	Require that sensitive wetland and coastal areas be preserved as undeveloped open space wherever feasible and that future developments result in no net loss of wetlands or "natural" areas.	CD [LRP]	Short-term
1.12	Update the provisions of the Hillside Management Program as necessary to ensure protection of open space lands.	CD [LRP]	Mid-term
1.13	Recommend that the City's Sphere of Influence be coterminous with existing City limits in the hillsides in order to preserve the hillsides as open space.	CD [LRP]	Short-term
1.14	Work with established land conservation organizations toward establishing a Ventura hillsides preserve.	PW [P]	Long-term
1.15	Actively seek local, state, and Federal funding sources to achieve preservation of the hillsides.	PW [P]	Mid-term
1.16	Comply with directives from regulatory authorities to update and enforce stormwater quality and watershed protection measures that limit impacts to aquatic ecosystems and that preserve and restore the beneficial uses of natural watercourses and wetlands in the city.	PW	Ongoing

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Number		Action	Lead Entity	Timeframe
1.17		Require development to mitigate its impacts on wildlife through the development review process.	CD [CP]	Ongoing
1.18		Require new development adjacent to rivers, creeks, and barrancas to use native or non-invasive plant species, preferably drought tolerant, for landscaping.	CD [CP] PW [P]	Ongoing
1.19		Require projects near watercourses, shoreline areas, and other sensitive habitat areas to include surveys for State and/or federally listed sensitive species and to provide appropriate buffers and other mitigation necessary to protect habitat for listed species.	CD [LRP]	Long-term
1.20		Conduct coastal dredging in accordance with the U.S. Army Corps of Engineers and California Department of Fish and Game requirements in order to avoid impacts to sensitive fish and bird species.	PW [E]	Ongoing
1.21		Work with State Parks on restoring the Alessandro Lagoon and pursue funding cooperatively.	PW [P]	Long-term
1.22		Adopt development code provisions to protect mature trees as defined by minimum height, canopy, and/or tree trunk diameter.	CD [LRP]	Short-term
1.23		Require, where appropriate, the preservation of healthy tree windrows associated with current and former agricultural uses, and incorporate trees into the design of new developments.	CD [CP]	Short-term
1.24		Require new development to maintain all indigenous tree species or provide adequately sized replacement native trees on a 3:1 basis.	CD [CP]	Ongoing
1.25		Purchase and use recycled materials and alternative and renewable energy sources as feasible in	AS [P]	Ongoing

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Number	Action	Lead Entity	Timeframe
	City operations.		
1.26	Reduce pesticide use in City operations.	PW [P]	Mid-term
1.27	Utilize green waste as biomass/compost in City operations.	PW [P]	Mid-term
1.28	Purchase low-emission City vehicles, and convert existing gasoline-powered fleet vehicles to cleaner fuels as technology becomes available.	PW [MS]	Mid-term
1.29	Require all City funded projects that enter design and construction after January 1, 2006 to meet a design construction standard equivalent to the minimum U.S. Green Building Council LEED™ Certified rating in accordance with the City's Green Building Standards for Private and Municipal Construction Projects.	FD [IS]	Short-term
1.30	Provide information to businesses about how to reduce waste and pollution and conserve resources.	PW [MS]	Short-term
1.31	Provide incentives for green building projects in both the public and private sectors to comply with either the LEED™ Rating System, California Green Builder, or the Residential Built Green program and to pursue registration and certification; incentives include "Head-of-the-Line" discretionary processing and "Head-of-the-Line" building permit processing.	FD [IS]	Short-term
1.32	Apply for grants, rebates, and other funding to install solar panels on all City-owned structures to provide at least half of their electric energy requirements.	PW	Ongoing

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Number	Action	Lead Entity	Timeframe
1.33	Publicly acknowledge individuals and businesses that implement green construction and building practices.	FD [IS]	Ongoing
2.1	Track economic indicators for changes that may affect City land resources, tax base, or employment base, such as terms and conditions of sale or lease of available office, retail, and manufacturing space.	CD [ED]	Ongoing
2.2	Prepare an economic base analysis that identifies opportunities to capture retail sales in sectors where resident purchasing has leaked to other jurisdictions.	CD [ED]	Short-term
2.3	Maintain and update an Economic Development Strategy to implement City economic goals and objectives.	CD [ED]	Ongoing
2.4	Map priority locations for commercial and industrial development and revitalization, including a range of parcel sizes targeted for high-technology, non-durables manufacturing, finance, business services, tourism, and retail uses.	CD	Short-term
2.5	Share economic and demographic information with organizations that may refer businesses to Ventura.	CD [ED]	Ongoing
2.6	Encourage intensification and diversification of uses and properties in districts, corridors, and neighborhood centers, including through assembly of vacant and underutilized parcels.	CD [ED]	Ongoing

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Number	Action	Lead Entity	Timeframe
2.7	Partner with local commerce groups to recruit companies and pursue funding for business development and land re-utilization.	CD [ED]	Ongoing
2.8	Carry out Housing Element programs that provide housing to all segments of the local workforce.	CD	Ongoing
2.9	Expedite review for childcare facilities that will provide support to local employees.	CD [CP]	Short-term
2.10	Expedite review of the entitlement process for installation of infrastructure necessary to support high technology and multimedia companies.	CA	Mid-term
2.11	Allow mixed-use development in commercial and industrial districts as appropriate.	CD [LRP]	Short-term
2.12	Allow uses such as conference centers with resort amenities on appropriately sized and located parcels.	CD [LRP]	Short-term
2.13	Market the city to businesses that link agriculture with high technology, such as biotechnology enterprises.	CD [ED]	Ongoing
2.14	Partner with local farms to promote farmers markets and high quality locally grown food.	CS	Ongoing
2.15	Provide incentives for use of waterfront parcels for recreation, visitor-serving commerce, restaurant, marina, and fishing uses.	CD [ED]	Short-term
2.16	Work with the State to create year-round commercial opportunities at the fairgrounds.	CD [ED]	Long-term

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Number	Action	Lead Entity	Timeframe
2.17	Partner with the Harbor District and National Park Service to promote Channel Islands tours and develop a marine learning center.	CS	Long-term
2.18	Prioritize uses within the Harbor Specific Plan area as follows: (1) coastal dependent, (2) commercial fishing, (3) coastal access, and (4) visitor serving commercial and recreational uses.	CD	Short-term
2.19	Partner with hotels and the Chamber of Commerce to promote city golf courses.	CS [GS/AS]	Long-term
2.20	Promote outdoor recreation as part of an enhanced visitor opportunity strategy.	CS	Mid-term
3.1	Preserve the stock of existing homes by carrying out Housing Element programs.	CD	Ongoing
3.2	Enhance the appearance of districts, corridors, and gateways (including views from highways) through controls on building placement, design elements, and signage.	CD [LRP]	Short-term
3.3	Require preservation of public view sheds and solar access.	CD [CP]	Short-term
3.4	Require all shoreline development (including anti-erosion or other protective structures) to provide public access to and along the coast, unless it would duplicate adequate access existing nearby, adversely affect agriculture, or be inconsistent with public safety, military security, or protection of fragile coastal resources.	CD [CP]	Ongoing
3.5	Establish land development incentives to upgrade the appearance of poorly maintained or	FD [IS]	Mid-term

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Number	Action	Lead Entity	Timeframe
	otherwise unattractive sites, and enforce existing land maintenance regulations.		
3.6	Expand and maintain the City's urban forest and thoroughfare landscaping, using native species, in accordance with the City's Park and Development Guidelines and Irrigation and Landscape Guidelines.	PW [P]	Ongoing
3.7	Evaluate whether lot coverage standards should be changed based on neighborhood character.	CD [LRP]	Short-term
3.8	Adopt new development code provisions that designate neighborhood centers, as depicted on the General Plan Diagram, for a mixture of residences and small-scale, local-serving businesses.	CD [LRP]	Short-term
3.9	Adopt new development code provisions that designate areas within districts and corridors for mixed-use development that combines businesses with housing and focuses on the redesign of single-use shopping centers and retail parcels into walkable, well connected blocks, with a mix of building types, uses, and public and private frontages.	CD [LRP]	Short-term
3.10	Allow intensification of commercial areas through conversion of surface parking to building area under a districtwide parking management strategy in the Downtown Specific Plan.	CD [LRP]	Short-term
3.11	Expand the downtown redevelopment area to include parcels around future transit areas and along freeway frontage.	CD [RDA]	Mid-term
3.12	The City will work with the hospitals on the new Development Code treatment for the Loma Vista corridor, which includes both hospitals.	CD [LRP]	Short-term

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3.13	Assess whether the City's Affordable Housing Programs respond to current needs, and modify them as necessary within State mandated Housing Element updates	CD	Ongoing
3.14	Utilize infill development, to the extent possible, to accommodate the targeted number and type of housing units described in the Housing Element	CD [LRP]	Ongoing
3.15	Adopt new development code provisions that ensure compliance with Housing Element objectives.	CD [LRP]	Short-term
3.16	Renew and modify greenbelt agreements as necessary to direct development to already urbanized areas.	CD [LRP]	Long-term
3.17	Continue to support the Guidelines for Orderly Development as a means of implementing the General Plan, and encourage adherence to these Guidelines by all the cities, the County of Ventura, and the Local Agency Formation Commission (LAFCO); and work with other nearby cities and agencies to avoid sprawl and preserve the rural character in areas outside the urban edge.	CD [LRP]	Ongoing
3.18	Complete community or specific plans, subject to funding, for areas such as Westside, Midtown, Downtown, Wells, Saticoy, Pierpont, Harbor, Loma Vista/Medical District, Victoria Corridor, and others as appropriate. These plans will set clear development standards for public and private investments, foster neighborhood partnerships, and be updated as needed.	CD [LRP]	Ongoing
3.19	Preparation of the new Development Code will take into account existing or proposed community or specific plans to ensure efficient use of City resources and ample citizen input.	CD [LRP]	Short-term

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3.20	Pursuant to SOAR, adopt development code provisions to "preserve agricultural and open space lands as a desirable means of shaping the City's internal and external form and size, and of serving the needs of the residents."	CD [LRP]	Short-term
3.21	Adopt performance standards for non-farm activities in agricultural areas that protect and support farm operations, including requiring non-farm uses to provide all necessary buffers as determined by the Agriculture Commissioner's Office.	CD [LRP]	Short-term
3.22	Offer incentives for agricultural production operations to develop systems of raw product and product processing locally.	CD [ED]	Mid-term
3.23	Develop and adopt a form-based Development Code that emphasizes pedestrian orientation, integration of land uses, treatment of streetscapes as community living space, and environmentally sensitive building design and operation.	CD [LRP]	Short-term
3.24	Revise the Residential Growth Management Program (RGMP) with an integrated set of growth management tools including: • Community or specific plans and development codes based on availability of infrastructure and transit that regulate community form and character by directing new residential development to appropriate locations and in ways that integrate with and enhance existing neighborhoods, districts and corridors; • appropriate mechanisms to ensure that new residential development produces high-quality	CD [LRP]	Short-term

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	designs and a range of housing types across all income levels; and, • numeric limitations linked to the implementation of community or specific plans and development codes and the availability of appropriate infrastructure and resources; within those limitations, the RGMP should provide greater flexibility for timing new residential development.		
3.25	Establish first priority growth areas to include the districts, corridors, and neighborhood centers as identified on the General Plan Diagram; and second priority areas to include vacant undeveloped land when a community plan has been prepared for such (within the City limits).	CD [LRP]	Short-term
3.26	Establish and administer a system for the gradual growth of the City through identification of areas set aside for long-term preservation, for controlled growth, and for encouraged growth.	CD [LRP]	Mid-term
3.27	Require the use of techniques such as digital simulation and modeling to assist in project review.	CD [CP]	Short-term
3.28	Revise the planning processes to be more user-friendly to both applicants and neighborhood residents in order to implement City policies more efficiently.	CD [CP]	Short-term
4. OUR ACCESSIBLE COMMUNITY			
4.1	Direct city transportation investment to efforts that improve user safety and keep the circulation system structurally sound and adequately maintained. First priority for capital funding will go to our pavement management program to return Ventura streets to excellent conditions.	PW [E]	Ongoing

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4.2	Develop a prioritized list of projects needed to improve safety for all travel modes and provide needed connections and multiple route options.	PW [E]	Short-term
4.3	Provide transportation services that meet the special mobility needs of the community including youth, elderly, and disabled persons.	PW [E]	Ongoing
4.4	Combine education with enforcement to instill safe and courteous use of the shared public roadway.	CS	Ongoing
4.5	Utilize existing roadways to meet mobility needs, and only consider additional travel lanes when other alternatives are not feasible.	CD [LRP]	Ongoing
4.6	Require new development to be designed with interconnected transportation modes and routes to complete a grid network.	CD [CP]	Short-term
4.7	Update the traffic mitigation fee program to fund necessary citywide circulation system and mobility improvements needed in conjunction with new development.	CD [LD]	Short-term
4.8	Implement the City's Neighborhood Traffic Management Program and update as necessary to improve livability in residential areas.	PW [E]	Ongoing
4.9	Identify, designate, and enforce truck routes to minimize the impact of truck traffic on residential neighborhoods.	PW [E]	Ongoing
4.10	Modify traffic signal timing to ensure safety and minimize delay for all users.	PW [E]	Short-term

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4.11	Refine level of service standards to encourage use of alternative modes of transportation while meeting state and regional mandates.	PW [E]	Short-term
4.12	Design roadway improvements and facility modifications to minimize the potential for conflict between pedestrians, bicycles, and automobiles.	PW [E]	Ongoing
4.13	Require project proponents to analyze traffic impacts and provide adequate mitigation in the form of needed improvements, in-lieu fee, or a combination thereof.	CD [LD]	Ongoing
4.14	Provide development incentives to encourage projects that reduce automobile trips.	CD [CP]	Short-term
4.15	Encourage the placement of facilities that house or serve elderly, disabled, or socioeconomically disadvantaged persons in areas with existing public transportation services and pedestrian and bicycle amenities.	CD [CP]	Ongoing
4.16	Install roadway, transit, and alternative transportation improvements along existing or planned multi-modal corridors, including primary bike and transit routes, and at land use intensity nodes.	PW [E]	Ongoing
4.17	Prepare and periodically update a Mobility Plan that integrates a variety of travel alternatives to minimize reliance on any single mode.	CD [LRP]	Short-term
4.18	Promote the development and use of recreational trails as transportation routes to connect housing with services, entertainment, and employment.	PW [P]	Ongoing
4.19	Adopt new development code provisions that establish vehicle trip reduction requirements for all development.	CD [LRP]	Short-term

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4.20	Develop a transportation demand management program to shift travel behavior toward alternative modes and services.	PW [E]	Mid-term
4.21	Require new development to provide pedestrian and bicycle access and facilities as appropriate, including connected paths along the shoreline and watercourses.	PW [E/P]	Short-term
4.22	Update the General Bikeway Plan as needed to encourage bicycle use as a viable transportation alternative to the automobile and include the bikeway plan as part of a new Mobility Plan.	PW [E]	Mid-term
4.23	Upgrade and add bicycle lanes when conducting roadway maintenance as feasible.	PW [E]	Ongoing
4.24	Require sidewalks wide enough to encourage walking that include ramps and other features needed to ensure access for mobility-impaired persons.	PW [E]	Short-term
4.25	Adopt new development code provisions that require the construction of sidewalks in all future projects, where appropriate.	CD [LRP]	Short-term
4.26	Establish a parking management program to protect the livability of residential neighborhoods, as needed.	CD [LRP]	Short-term
4.27	Extend stubbed-end streets through future developments, where appropriate, to provide necessary circulation within a developing area and for adequate internal circulation within and between neighborhoods. Require new developments in the North Avenue area, where applicable, to extend Norway Drive and Floral Drive to connect to Canada Larga Road; and connect the existing segments of Floral Drive. Designate the extension of Cedar Street between Warner Street and	PW [E]	Mid-term

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Number	Action	Lead Entity	Timeframe
	south of Franklin Lane and the linking of the Cameron Street segments in the Westside community as high priority projects.		
4.28	Require all new development to provide for citywide improvements to transit stops that have sufficient quality and amenities, including shelters and benches, to encourage ridership.	PW [E]	Short-term
4.29	Develop incentives to encourage City employees and local employers to use transit, rideshare, walk, or bike.	HR	Mid-term
4.30	Work with public transit agencies to provide information to riders at transit stops, libraries, lodging, and event facilities.	PW [E]	Ongoing
4.31	Work with public and private transit providers to enhance public transit service.	PW [E]	Mid-term
4.32	Coordinate with public transit systems for the provision of additional routes as demand and funding allow.	PW [E]	Long-term
4.33	Work with Amtrak, Metrolink, and Union Pacific to maximize efficiency of passenger and freight rail service to the City and to integrate and coordinate passenger rail service with other transportation modes.	PW [E]	Mid-term
4.34	Lobby for additional transportation funding and changes to Federal, State, and regional transportation policy that support local decision-making.	PW [E]	Ongoing
4.35	The City shall pursue funding and site location for a multi-modal transit facility in coordination with VCTC, SCAT, U.P.R.R., Metrolink, Greyhound Bus Lines, and other forms of	PW [E]	Mid-term

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Number	Action	Lead Entity	Timeframe
	transportation.		
4.36	Require development along the following roadways – including noise mitigation, landscaping, and advertising – to respect and preserve views of the community and its natural context. • State Route 33 • U.S. HWY 101 • Anchors Way • Brakey Road • Fairgrounds Loop • Ferro Drive • Figueroa Street • Harbor Boulevard • Main Street • Navigator Drive • North Bank Drive • Poli Street/Foothill Road • Olivas Park Drive • Schooner Drive	CD [CP]	Ongoing

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	• Spinnaker Drive • Summit Drive • Telegraph Road – east of Victoria Avenue • Victoria Avenue – south of U.S. 101 • Wells Road		
4.37	Request that State Route 126 and 33, and U.S. HWY 101 be designated as State Scenic Highways.	CD [LRP]	Short-term
4.38	Continue to work with Caltrans to soften the barrier impact of U.S. HWY 101 by improving signage, aesthetics and undercrossings and overcrossings.	PW [E/P]	Ongoing
4.39	Maintain street trees along scenic thoroughfares, and replace unhealthy or missing trees along arterials and collectors throughout the City.	PW [P]	Ongoing
5. OUR SUSTAINABLE INFRASTRUCTURE			
5.1	Require low flow fixtures, leak repair, and drought tolerant landscaping (native species if possible), plus emerging water conservation techniques, such as reclamation, as they become available.	CD [CP]	Ongoing
5.2	Use natural features such as bioswales, wildlife ponds, and wetlands for flood control and water quality treatment when feasible.	PW [MS/P]	Ongoing
5.3	Demonstrate low water use techniques at community gardens and city-owned facilities.	PW [U/P]	Mid-term

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5.4	Update the Urban Water Management plan as necessary in compliance with the State 1983 Urban Water Management Planning Act.	PW [U]	Ongoing
5.5	Provide incentives for new residences and businesses to incorporate recycling and waste diversion practices, pursuant to guidelines provided by the Environmental Services Office.	PW [MS]	Ongoing
5.6	Require project proponents to conduct sewer collection system analyses to determine if downstream facilities are adequate to handle the proposed development.	PW [U]	Ongoing
5.7	Require project proponents to conduct evaluations of the existing water distribution system, pump station, and storage requirements in order to determine if there are any system deficiencies or needed improvements for the proposed development.	PW [U]	Ongoing
5.8	Locate new development in or close to developed areas with adequate public services, where it will not have significant adverse effects, either individually or cumulatively, on coastal resources.	CD [LRP]	Ongoing
5.9	Update development fee and assessment district requirements as appropriate to cover the true costs associated with development.	AS	Mid-term
5.10	Utilize existing waste source reduction requirements, and continue to expand and improve composting and recycling options.	PW [MS]	Mid-term
5.11	Increase emergency water supply capacity through cooperative tie-ins with neighboring suppliers.	PW [U]	Mid-term
5.12	Apply new technologies to increase the efficiency of the wastewater treatment system.	PW [U]	Mid-term

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Number	Action	Lead Entity	Timeframe
5.13	Increase frequency of city street sweeping, and post schedules at key points within each neighborhood.	PW [MS]	Mid-term
5.14	Develop a financing program for the replacement of failing corrugated metal storm drain pipes in the City.	PW [MS]	Short-term
5.15	Establish assessment districts or other financing mechanisms to address storm drain system deficiencies in areas where new development is anticipated and deficiencies exist.	PW [MS]	Mid-term
5.16	Require new developments to incorporate stormwater treatment practices that allow percolation to the underlying aquifer and minimize offsite surface runoff utilizing methods such as pervious paving material for parking and other paved areas to facilitate rainwater percolation and retention/detention basins that limit runoff to pre-development levels.	CD [LD]	Ongoing
5.17	Require stormwater treatment measures within new development to reduce the amount of urban pollutant runoff in the Ventura and Santa Clara Rivers and other watercourses.	CD [LD]	Ongoing
5.18	Work with the Ventura Regional Sanitation District and the County to expand the capacity of existing landfills, site new landfills, and/or develop alternative means of disposal that will provide sufficient capacity for solid waste generated in the City.	PW [MS]	Long-term

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6. OUR ACTIVE COMMUNITY			
6.1	Develop new neighborhood parks, pocket parks, and community gardens as feasible and appropriate to meet citizen needs, and require them in new development.	PW [P]	Long-term
6.2	Require higher density development to provide pocket parks, tot lots, seating plazas, and other aesthetic green spaces.	CD [CP]	Short-term
6.3	Work with the County to plan and develop trails that link the City with surrounding open space and natural areas, and require development projects to include trails when appropriate.	PW [P]	Ongoing
6.4	Request Flood Control District approval of public access to unchannelized watercourses for hiking.	PW [P]	Mid-term
6.5	Seek landowner permission to allow public access on properties adjacent to open space where needed to connect trails.	PW [P]	Ongoing
6.6	Update plans for and complete the linear park system as resources allow.	PW [P]	Long-term
6.7	Work with the County of Ventura to initiate efforts to create public trails in the hillside area.	PW [P]	Mid-term
6.8	Update and require periodic reviews of the Park and Recreation Workbook as necessary to reflect City objectives and community needs.	PW [P]	Mid-term
6.9	Require dedication of land identified as part of the City's Linear Park System in conjunction with new development.	PW [P]	Ongoing

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Number	Action	Lead Entity	Timeframe
6.10	Evaluate and incorporate, as feasible, linear park segments in the General Bikeway Plan.	PW [E]	Ongoing
6.11	Update standards for citywide public parks and open space to include an expanded menu of shared park types, and identify locations and potential funding sources for acquiring new facilities in existing neighborhoods.	PW [P]	Short-term
6.12	Update and carry out the Grant Park Master Plan.	PW [P]	Mid-term
6.13	Foster the partnership between the City and Fair Board to improve Seaside Park.	CD [ED]	Ongoing
6.14	Improve facilities at City parks to respond to the requirements of special needs groups.	PW [P]	Mid-term
6.15	Adjust and subsidize fees to ensure that all residents have the opportunity to participate in recreation programs.	CS [CR]	Short-term
6.16	Update the project fee schedule as necessary to ensure that development provides its fair share of park and recreation facilities.	PW [P]	Short-term
6.17	Update and create new agreements for joint use of school and City recreational and park facilities.	CS [CR] PW [P]	Mid-term
6.18	Offer programs that highlight natural assets, such as surfing, sailing, kayaking, climbing, gardening, and bird watching.	CS [CR]	Ongoing
6.19	Provide additional boating and swimming access as feasible.	PW	Long-term

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Number	Action	Lead Entity	Timeframe
6.20	Earmark funds for adequate maintenance and rehabilitation of existing skatepark facilities, and identify locations and funding for new development of advanced level skatepark facilities.	PW [P]	Mid-term
6.21	Promote the use of City facilities for special events, such as festivals, tournaments, and races.	CS [CA]	Ongoing
6.22	Enter into concession or service agreements where appropriate to supplement City services.	PW	Ongoing
7. OUR HEALTHY AND SAFE COMMUNITY			
7.1	Work with interested parties to identify appropriate locations for assisted-living, hospice, and other care-provision facilities.	CS [SS]	Short-term
7.2	Provide technical assistance to local organizations that deliver health and social services to seniors, homeless persons, low-income citizens, and other groups with special needs.	CS [SS]	Ongoing
7.3	Participate in school and agency programs to: ♦ provide healthy meals, ♦ combat tobacco, alcohol, and drug dependency, ♦ distribute city park and recreation materials through schools, and ♦ distribute information about the benefits of proper nutrition and exercise.	CS [SS]	Ongoing
7.4	Enhance or create ordinances which increase control over ABC licensed premises.	PD	Mid-term
7.5	Investigate the creation of new land use fees to enhance funding of alcohol related enforcement, prevention and training efforts.	PD	Mid-term

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Number	Action	Lead Entity	Timeframe
7.6	Adopt updated editions of the California Construction Codes and International Codes as published by the State of California and the International Code Council respectively.	FD [IS]	Ongoing
7.7	Require project proponents to perform geotechnical evaluations and implement mitigation prior to development of any site: • with slopes greater than 10 percent or that otherwise have potential for landsliding, • along bluffs, dunes, beaches, or other coastal features • in an Alquist-Priolo earthquake fault zone or within 100 feet of an identified active or potentially active fault, • in areas mapped as having moderate or high risk of liquefaction, subsidence, or expansive soils, • in areas within 100-year flood zones, in conformance with all Federal Emergency Management Agency regulations.	CD [CP/LD]	Ongoing
7.8	To the extent feasible, require new critical facilities (hospital, police, fire, and emergency service facilities, and utility "lifeline" facilities) to be located outside of fault and tsunami hazard zones, and require critical facilities within hazard zones to incorporate construction principles that resist damage and facilitate evacuation on short notice.	FD	Ongoing
7.9	Maintain and implement the Standardized Emergency Management System (SEMS) Multihazard Functional Response Plan.	FD	Ongoing

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7.10	Require proponents of any new developments within the 100-year floodplain to implement measures, as identified in the Floodplain Ordinance, to protect structures from 100-year flood hazards (e.g., by raising the finished floor elevation outside the floodplain).	FD [IS]	Ongoing
7.11	Prohibit grading for vehicle access and parking or operation of vehicles within any floodway.	FD [IS]	Ongoing
7.12	Refer development plans to the Fire Department to assure adequacy of structural fire protection, access for firefighting, water supply, and vegetation clearance.	CD [CP]	Ongoing
7.13	Resolve extended response time problems by: • adding a fire station at the Pierpont/Harbor area, • relocating Fire Station #4 to the Community Park site, • increasing firefighting and support staff resources, • reviewing and conditioning annexations and development applications, and • require the funding of new services from fees, assessments, or taxes as new subdivisions are developed.	FD	Long-term
7.14	Educate and reinforce City staff understanding of the Standardized Emergency Management System for the State of California.	FD	Ongoing
7.15	Increase public access to police services by: • increasing police staffing to coincide with increasing population, development, and calls for	PD	Ongoing

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	service, • increasing community participation by creating a Volunteers in Policing Program, and • require the funding of new services from fees, assessments, or taxes as new subdivisions are developed.		
7.16	Provide education about specific safety concerns such as gang activity, senior-targeted fraud, and property crimes.	PD	Ongoing
7.17	Establish a nexus between police department resources and increased service demands associated with new development.	PD	Mid-term
7.18	Continue to operate the Downtown police storefront.	PD	Ongoing
7.19	Expand Police Department headquarters as necessary to accommodate staff growth	PD	Mid-term
7.20	Require air pollution point sources to be located at safe distances from sensitive sites such as homes and schools.	FD [IS]	Short-term
7.21	Require analysis of individual development projects in accordance with the most current version of the Ventura County Air Pollution Control District Air Quality Assessment Guidelines and, when significant impacts are identified, require implementation of air pollutant mitigation measures determined to be feasible at the time of project approval.	FD [IS]	Ongoing
7.22	In accordance with Ordinance 93-37, require payment of fees to fund regional transportation demand	CD [LD]	Ongoing

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	management (TDM) programs for all projects generating emissions in excess of Ventura County Air Pollution Control District adopted levels.		
7.23	Require individual contractors to implement the construction mitigation measures included in the most recent version of the Ventura County Air Pollution Control District Air Quality Assessment Guidelines.	PW [E]	Ongoing
7.24	Only approve projects involving sensitive land uses (such as residences, schools, daycare centers, playgrounds, medical facilities) within or adjacent to industrially designated areas if an analysis provided by the proponent demonstrates that the health risk will not be significant.	CD [CP]	Ongoing
7.25	Adopt new development code provisions that ensure uses in mixed-use projects do not pose significant health effects.	CD [LRP]	Short-term
7.26	Seek funding for cleanup of sites within the Brownfield Assessment Demonstration Pilot Program and other contaminated areas in West Ventura.	CD [ED]	Mid-term
7.27	Require proponents of projects on or immediately adjacent to lands in industrial, commercial, or agricultural use to perform soil and groundwater contamination assessments in accordance with American Society for Testing and Materials standards, and if contamination exceeds regulatory action levels, require the proponent to undertake remediation procedures prior to grading and development under the supervision of the County Environmental Health Division, County Department of Toxic Substances Control, or Regional Water Quality Control Board (depending	FD [IS]	Ongoing

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	upon the nature of any identified contamination).		
7.28	Educate residents and businesses about how to reduce or eliminate the use of hazardous materials, including by using safer non-toxic equivalents.	PW [MS]	Ongoing
7.29	Require non-agricultural development to provide buffers, as determined by the Agriculture Commissioner's Office, from agricultural operations to minimize the potential for pesticide drift.	CD [CP]	Short-term
7.30	Require all users, producers, and transporters of hazardous materials and wastes to clearly identify the materials that they store, use, or transport, and to notify the appropriate City, County, State and Federal agencies in the event of a violation.	FD [IS]	Ongoing
7.31	Work toward voluntary reduction or elimination of aerial and synthetic chemical application in cooperation with local agricultural interests and the Ventura County agricultural commissioner.	FD [IS]	Mid-term
7.32	Require acoustical analyses for new residential developments within the mapped 60 decibel (dBA) CNEL contour, or within any area designated for commercial or industrial use, and require mitigation necessary to ensure that: • Exterior noise in exterior spaces of new residences and other noise sensitive uses that are used for recreation (such as patios and gardens) does not exceed 65 dBA CNEL, and • Interior noise in habitable rooms of new residences does not exceed 45 dBA CNEL with all windows closed.	FD [IS]	Ongoing

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7.33	As funding becomes available, construct sound walls along U.S. 101, SR 126, and SR 33 in areas where existing residences are exposed to exterior noise exceeding 65 dBA CNEL.	PW [E]	Long-term
7.34	Request that sound levels associated with concerts at the County Fairgrounds be limited to 70 dBA at the eastern edge of that property.	CS	Short-term
7.35	Request the termination of auto racing at the County fairgrounds	CS	Short-term
7.36	Amend the noise ordinance to restrict leaf blowing, amplified music, trash collection, and other activities that generate complaints.	FD [IS]	Short-term
7.37	Use rubberized asphalt or other sound reducing material for paving and re-paving of City streets.	PW [E]	Ongoing
7.38	Update the Noise Ordinance to provide standards for residential projects and residential components of mixed-use projects within commercial and industrial districts.	CD [LRP]	Short-term
8.1	Work closely with schools, colleges, and libraries to provide input into site and facility planning.	CS	Ongoing
8.2	Organize a regional education summit to generate interest in and ideas about learning opportunities.	CS	Mid-term
8.3	Adopt joint-use agreements with libraries, schools, and other institutions to maximize use of educational facilities.	CS	Mid-term
8.4	Distribute information about local educational programs.	CS	Mid-term

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Number	Action	Lead Entity	Timeframe
8.5	Install infrastructure for wireless technology and computer networking in City facilities.	AS	Short-term
8.6	Establish educational centers at City parks.	PW [P] CS	Mid-term
8.7	Work with the State Parks Department to establish a marine learning center at the Harbor.	PW [P]	Long-term
8.8	Work with the Ventura Unified School District to ensure that school facilities can be provided to serve new development.	CD [LRP]	Ongoing
8.9	Complete a new analysis of community needs, rethinking the role of public libraries in light of the ongoing advances in information technology and the changing ways that individuals and families seek out information and life-long learning opportunities.	CS	Mid-term
8.10	Reassess the formal and informal relationships between our current three branch public libraries and school libraries – including the new Ventura College Learning Resource Center – as well as joint use of facilities for a broader range or compatible public, cultural, and educational uses.	CS	Mid-term
8.11	Develop a Master Plan for Facilities, Programs, and Partnerships to create an accessible, robust, and vibrant library for the 21st Century system, taking into consideration that circulation of books is no longer the dominant function but will continue to be an important part of a linked network of learning centers.	CS	Mid-term
8.12	Develop formal partnerships, funding, capital strategies, and joint use agreements to implement the	CS	Ongoing

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Number	Action	Lead Entity	Timeframe
	new libraries Master Plan.		
9. OUR CREATIVE COMMUNITY			
9.1	Require works of art in public spaces per the City's Public Art Program Ordinance.	CD [CP]	Mid-term
9.2	Sponsor and organize local art exhibits, performances, festivals, cultural events, and forums for local arts organizations and artists.	CS	Ongoing
9.3	Expand outreach and publicity by: ♦ promoting locally produced art and local cultural programs, ♦ publishing a monthly calendar of local art and cultural features, ♦ distributing the *State of the Arts* quarterly report, and ♦ offering free or subsidized tickets to events.	CS	Ongoing
9.4	Support the creative sector through training and other professional development opportunities.	CS	Short-term
9.5	Work with the schools to integrate arts education into the core curriculum	CS	Short-term
9.6	Promote the cultural and artistic expressions of Ventura's underrepresented cultural groups.	CS	Mid-term
9.7	Offer ticket subsidy and distribution programs and facilitate transportation to cultural offerings.	CS	Ongoing
9.8	Increase the amount of live-work development, and allow its use for production, display, and sale of	CD [LRP]	Ongoing

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Number	Action	Lead Entity	Timeframe
	art.		
9.9	Work with community groups to locate sites for venues for theater, dance, music, and children's programming.	CS [CR]	Mid-term
9.10	Provide incentives for preserving structures and sites that are representative of the various periods of the city's social and physical development.	CD [LRP]	Mid-term
9.11	Organize and promote multi-cultural programs and events that celebrate local history and diversity.	CS [CA]	Ongoing
9.12	Allow adaptive reuse of historic buildings.	CD [LRP]	Short-term
9.13	Work with community groups to identify locations for facilities that celebrate local cultural heritage, such as a living history Chumash village and an agricultural history museum.	CS [CA]	Long-term
9.14	Require archaeological assessments for projects proposed in the Coastal Zone and other areas where cultural resources are likely to be located.	CD [CP]	Ongoing
9.15	Suspend development activity when archaeological resources are discovered, and require the developer to retain a qualified archaeologist to oversee handling of the resources in coordination with the Ventura County Archaeological Society and local Native American organizations as appropriate.	CD [CP]	Ongoing
9.16	Pursue funding to preserve historic resources.	CS	Ongoing

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9.17	Provide incentives to owners of eligible structures to seek historic landmark status and invest in restoration efforts.	CD [LRP]	Short-term
9.18	Require that modifications to historically-designated buildings maintain their character.	CD [CP]	Ongoing
9.19	For any project in a historic district or that would affect any potential historic resource or structure more than 40 years old, require an assessment of eligibility for State and federal register and landmark status and appropriate mitigation to protect the resource.	CD [CP]	Ongoing
9.20	Seek input from the City's Historic Preservation Commission on any proposed development that may affect any designated or potential landmark.	CD [CP]	Ongoing
9.21	Update the inventory of historic properties.	CD [LRP]	Ongoing
9.22	Create a set of guidelines and/or policies directing staff, private property owners, developers, and the public regarding treatment of historic resources that will be readily available at the counter.	CD [LRP]	Short-term
9.23	Complete and maintain historic resource surveys containing all the present and future components of the historic fabric within the built, natural, and cultural environments.	CD [LRP]	Ongoing
9.24	Create a historic preservation element.	CD [LRP]	Long-term
10. OUR INVOLVED COMMUNITY			
10.1	Conduct focused outreach efforts to encourage all members of the community – including youth, seniors, special needs groups, and non-English speakers – to participate in City activities.	CM [CE]	Short-term

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10.2	Obtain public participation by seeking out citizens in their neighborhoods and gathering places such as schools, houses of worship and public spaces.	CM [CE]	Ongoing
10.3	Invite civic, neighborhood, and non-profit groups to assist with City project and program planning and implementation.	CD	Ongoing
10.4	Provide incentives for City staff to participate in community and volunteer activities.	HR	Short-term
10.5	Invite seniors to mentor youth and serve as guides at historical sites.	CS	Short-term
10.6	Offer internships in City governance, and include youth representatives on public bodies.	CS	Mid-term
10.7	Continue to offer the Ambassadors program to obtain citizens assistance with City projects.	PW	Ongoing
10.8	Utilize the City website as a key source of information and expand it to serve as a tool for civic engagement.	CM [CE]	Short-term
10.9	Publish an annual report that evaluates City performance in such areas as conservation, housing, and economic development.	CD	Mid-term
10.10	Continue to improve the user-friendliness of the media that communicate information about the City, including the website, cable channels, newsletters, kiosks, and water billing statements.	CM [CE]	Short-term
10.11	Establish a clear policy toward the scope, role, boundaries, and jurisdiction of neighborhood Community Councils citywide, with the objectives of strengthening their roles in decision-making.	CD [LRP]	Mid-term

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10.12	Establish stronger partnerships with neighborhood Community Councils to set area priorities for capital investment, community policing, City services, commercial investment, physical planning, education, and other concerns, to guide both City policies and day-to-day cooperation and problem-solving.	CD [LRP]	Ongoing
10.13	Recognizing that neighborhood empowerment must be balanced and sustained by overall City policies and citywide vision and resources – establish a citywide Neighborhood Community Congress where local neighborhood Community Councils can collaborate and learn from each other.	CM[CE]	Mid-term
10.14	Establish clear liaison relationships to foster communication, training, and involvement efforts between the City, neighborhood Community Councils and other community partners, including the Ventura Unified School District and business, civic, cultural and religious groups.	CM [CE]	Short-term

ORDINANCE NO. 95-33

AN ORDINANCE OF THE PEOPLE OF THE CITY OF SAN BUENAVENTURA ADOPTING AN ORDINANCE AMENDING THE COMPREHENSIVE PLAN WITH RESPECT TO THE PRESERVATION OF AGRICULTURAL LANDS.

The people of the City of San Buenaventura do hereby ordain as follows:

Section 1. Findings and Purpose.

A. The protection of existing agricultural and watershed lands is of critical importance to present and future residents of the City of San Buenaventura (City of Ventura). Agriculture has been and remains the major contributor to the economy of the City and County of Ventura, creating employment for many people, directly and indirectly, and generating substantial tax revenues for the City.

B. In particular, the City of Ventura and surrounding area, with its unique combination of soils, micro-climate and hydrology, has become one of the finest growing regions in the world. Vegetable and fruit production from the County of Ventura and in particular production from the soils and silt from the Santa Clara and Ventura rivers have achieved international acclaim, enhancing the City's economy and reputation.

C. Uncontrolled urban encroachment into agricultural and watershed areas will impair agriculture and threaten the public health, safety and welfare by causing increased traffic congestion, associated air pollution, and potentially serious water problems, such as pollution, depletion, and sedimentation of available water resources. Such urban encroachment would eventually result in both the unnecessary, expensive extension of public services and facilities and inevitable conflicts between urban and agricultural uses.

D. The unique character of the City of Ventura and quality of life of City residents depend on the protection of a substantial amount of open space lands. The protection of such lands not only ensures the continued viability of agriculture, but also protects the available water supply and contributes to flood control and the protection of wildlife, environmentally sensitive areas, and irreplaceable natural resources.

E. The Resolution by which the City of Ventura adopted its Comprehensive Plan on August 28, 1989, Resolution No. 89-103, at page 4, contains in part the following "mitigation measures" in recognition of the importance of preserving agriculture resources:

> "Any potential significant adverse impacts are mitigated by substantially limiting the amount of agricultural land converted from an agricultural land use designation limiting the amount of prime farmland converted, and by making the various agricultural land areas designated for potential development subject to conditions which narrowly limit the possible land use."

F. The Comprehensive Plan sets out as Objective 4 (at II-9) the desire to:

"Continue to preserve agricultural and other open space lands within the City's Planning Area."

And, the Comprehensive Plan describes as the first Goal of its Resource Element (at II-3) the objective to:

> "Preserve agricultural and open space lands as a desirable means of shaping the City's internal and external form and size, and of serving the needs of residents."

G. The purpose of this initiative is to ensure that the Goals and Objectives of the Comprehensive Plan are inviolable by transitory short-term political decisions and that agricultural, watershed and open space lands are not prematurely or unnecessarily converted to other non-agricultural or non-open space uses without public debate and a vote of the people. Accordingly, the initiative ensures that until December 31, 2030, the general plan provisions governing agricultural land use designation and intent may not be change except by vote of the people. In addition, the initiative provides that any lands designated as "Agriculture Use", referring to both "Agricultural Use (not to be reconsidered until after the Year 2010" and Agricultural/Institutional" on the City of Ventura's General Plan "Land Use Plan Map" adopted by the City Council by Resolution 89-103 on August 28, 1989, as amended through February 1, 1995, will remain designated as Agricultural Use until December 31, 2030, unless the land is redesignated to another land use category by vote of the people, or redesignated by the City Council for the City of San Buenaventura pursuant to the procedures set forth in this initiative.

H. This initiative allows the City Council to redesignate agriculture lands only if certain if certain findings can be made, including (among other things) that the land is proven to be unsuitable for any form of agriculture and redesignation is necessary to avoid an unconstitutional taking of property without just compensation.

Section 2. General Plan Amendment.

The Agricultural Lands Preservation Initiative hereby reaffirms and readopts until December 31, 2030, The "Agricultural Use" designations as defined in the City of San Buenaventura Comprehensive Plan adopted August 28, 1989, as amended through February 1, 1995, at pages III-25 and III-26, with the modification that the "target date" is extended from 2010 until after December 31, 2030.

The following terminology shall replace the current "Agricultural Use" designation defined at page III-25 of The Plan:

Agricultural Use

The Agricultural Use (not to be reconsidered until after the Year 2030) category identifies those lands that are designated for agricultural use on the Land Use Plan Map.

The target date of 2030 associated with the Agricultural Use designation indicates a review date after which agriculturally designated lands may be reconsidered for urban uses. However, during the life of this plan as amended by initiative, it is intended that only agricultural uses are permitted on these lands, except as such lands may be appropriate to public open space and recreational usage. Furthermore, any updates to this Plan are not intended to imply that development would necessarily be appropriate at hat time.

In addition, the initiative hereby reaffirms and readopts until December 31, 2030, the "Agricultural" designations set forth on the of the City of Ventura Comprehensive Plan "Land Use Plan Map" adopted by the City Council on August 28, 1989, as amended through February 1, 1995, which map is incorporated herein by reference, modified, as appropriate, to delete the reference year 2010 and replace it with the reference year 2030.

Finally, the text of the Amendment Procedures of the City of Ventura Comprehensive Plan adopted August 28, 1989, as amended through February 1, 1995, (at XI-I) shall be amended to add a new subsection which provides:

Limitation on General Plan Amendments Relating to "Agricultural Use"

a) Until December 31, 2030, the provisions and designations governing the intent for lands designated "Agricultural Use" of the Land Use Element and Resource Element adopted on August 28, 1989, as amended through February 1, 1995, shall not be amended unless such amendment is approved by vote of the people.

b) All those lands designated as "Agricultural Use" in the City of Ventura Comprehensive Plan "Land Use Plan Map" adopted by the City Council on August 28, 1989 as amended through February 1, 1995, shall remain so designated until December 31, 2030 unless redesignated to another general plan land use category by vote of the people, or redesignated by the City Council pursuant to the procedures set forth in subsections c) or d), below.

c) Except as provided in subsection d), below, land designated as "Agricultural Use" may be redesignated by the City Council to a land use other than "Agricultural Use" as defined by the Comprehensive Plan adopted by the City Council on August 28, 1989, as amended through February 1, 1995, only if the City Council makes all of the following findings supported by the evidence:

   i) The land is immediately adjacent to areas developed in a manner comparable to the proposed use;

   ii) Adequate public services and facilities are available and have the capacity and capability to accommodate the proposed use;

   iii) The proposed use is compatible with agricultural uses, does not interfere with accepted agricultural practices, and does not adversely affect the stability of land use patterns in the area;

   iv) The land proposed for redesignation has not been used for agricultural purposes in the past 2 years and is unusable for agriculture due to its topography, drainage, flooding, adverse soil conditions or other physical reasons; and

v) The land proposed for redesignation pursuant to this subsection (c) does not exceed 40 acres for any one landowner in any calendar year, and one landowner may not obtain redesignation in the Comprehensive Plan of "Agricultural Use" land pursuant to this subsection (c) more often than every other year. Landowners with any unity of interest are considered one landowner for purposes of this limitation.

d) Land designated as "Agricultural Use" on the Land Use Plan Map may be redesignated to another land use category by the City Council if each of the following conditions are satisfied:

i) The City Council makes a finding that the application of the provisions of Section 2 (a) would constitute an unconstitutional taking of the landowners' property; and

ii) In permitting the redesignation, the City Council allows additional land uses only to the extent necessary to avoid said unconstitutional taking of the landowner's property.

e) Approval by a vote of the people is accomplished when a Comprehensive Plan amendment is placed on the ballot through any procedure provided for in the Election Code, and a majority of the voters vote in favor of it. Whenever the City Council adopts an amendment requiring approval by a vote of the people pursuant to the provisions of this subsection, the City Council's action shall have no effect until after such a vote is held and a majority of the voters vote in favor of it. The City Council shall follow the provisions of the Election Code in all matters pertaining to such an election.

Section 3. Implementation.

A. Upon the effective date of this initiative, the initiative shall be deemed inserted in the City of Ventura's Comprehensive Plan as an amendment thereof; except, that if the four amendments of the mandatory elements of the general plan permitted by state law for any given calendar year have already been utilized in 1995, prior to the effective date of this initiative, this Comprehensive Plan amendment shall be deemed inserted in the City's General Plan on January 1, 1996. At such time as this Comprehensive Plan amendment is deemed inserted in the City's Comprehensive Plan (hereinafter, the "insertion date") any provisions of the City's Zoning Ordinance inconsistent with that amendment shall not be enforced to the extent of the inconsistency. Within 180 days of the insertion date, the City shall complete

such revisions of its Comprehensive Plan, including, but not limited to, the Comprehensive Plan Land Use Plan Map adopted by the City Council on August 28, 1989, (as amended through February 1, 1995) and accompanying test, as are necessary to achieve consistency with all provisions of this initiative. Also, within 180 days of the insertion date, the City Council shall complete such revisions of its Zoning Ordinance and other land use regulations as are necessary to conform to and be consistent with all provisions of this initiative.

B. The provisions of this initiative shall prevail over any revisions to the City of Ventura's Comprehensive Plan as amended through February 1, 1995, or to the City of Ventura's Land Use Plan Map as amended through February 1, 1995 which conflict with the initiative. Except as provided in Section 4 below, upon the specific plans, tentative or final subdivision maps, parcel maps, conditional use permits, building permits or other ministerial or discretionary entitlements for use not yet approved or issued shall not be approved or issued unless consistent with the policies and provisions of this initiative.

Section 4. Exemptions for Certain Projects.

This initiative shall not apply to or affect any property owner whose property has acquired any of the following prior to its effective date:

A. A vested right pursuant to state law;

B. A validly approved and fully executed development agreement with the City; or

C. Approval of a vesting tentative map.

Section 5. Severability.

If any portion of this initiative is declared invalid by a court, the remaining portions are to be considered valid.

Section 6. Amendment or Repeal.

This initiative may be amended or repealed only by the voters at a general election.

STATE OF CALIFORNIA)
COUNTY OF VENTURA) ss
CITY OF SAN BUENAVENTURA)

I, BARBARA J. KAM, City Clerk of the City of San Buenaventura, California, do hereby certify that the foregoing Ordinance was adopted by the voters of the City of San Buenaventura at the General Municipal Election held on November 7, 1995 and subsequently declared adopted by the City Council of the City of San Buenaventura on November 27, 1995. The Ordinance shall take effect December 7, 1995. This ordinance shall not be repealed or amended except by a vote of the people, unless provision is otherwise made in the original ordinance.

Dated this 30th day of November, 1995.

Barbara J. Kam, CMC
City Clerk

Ventura Hillside Voter Participation Measure

The people of the City of San Buenaventura do ordain as follows:

Section 1. Title

This measure shall be known as the Ventura Hillside Voter Participation Measure.

Section 2. Purpose

The overall purpose of this measure is to allow City voters to participate in the review process relating to non-exempt development projects that may be proposed in a certain portion of the "Hillside Area" of the City as defined in the City's Comprehensive Plan Update to the Year 2010 (hereafter the "Comprehensive Plan"). The portion of the Hillside Area under consideration lies generally north of the City, constitutes an area approximately 9108 acres in size, and is further depicted as the "Hillside Voter Participation Area" indicated in Exhibit "A" attached hereto and made a part hereof. The proposed Hillside Voter Participation Area (also referred to from time to time hereafter as "HVP Area" or "HVPA") is outside the Ventura City limits, but it is within the "Planning Area" of the City of San Buenaventura as further indicated on Exhibit "A." The Comprehensive Plan Land Use Map currently designates the properties within the proposed Hillside Voter Participation Area as "Hillside Planned Residential" or "HPR" rather than "Agricultural" and, therefore, these properties are not subject to the Save Our Agricultural Resources ("SOAR") Initiative adopted by the voters in 1995.

In the recent past, some property owners within the proposed Hillside Voter Participation Area have publicly presented initial proposals to develop those properties with a combination of residential uses and open space and recreational areas proposed to include, among other things, hiking and equestrian trails for use by the public. In the course of public meetings and informational workshops discussing these proposals, it has become apparent that there is a high level of public concern over potential issues of scenic resource protection, open space and recreational opportunities, infrastructure needs, traffic circulation, and other development-related issues arising from any proposed changes in the use of this important part of the City's Planning Area. This measure, in recognition of this heightened public concern, is intended to provide the electorate of the City of San Buenaventura with an opportunity to vote on the approval of any such development proposals or any similar proposals to extend urban services to the Hillside Voter Participation Area or develop property in the Hillside Voter Participation Area with urbanized land uses.

More particularly, this measure proposes to amend the Comprehensive Plan of the City of San Buenaventura by adding a requirement that approvals for extensions of "urban services" (defined in the City's Hillside Management Program as the provision of domestic water and sewers) or any proposed "urbanized uses of land" (as defined herein) in the Hillside Voter Participation Area cannot be granted without prior approval by a majority vote of the electorate.

Section 3. Comprehensive Plan Amendment

The following text shall be inserted into the Land Use Element of the Comprehensive Plan at page 111-8 thereof:

Hillside Voter Participation Area

The electorate of the City of Ventura has adopted a Hillside Voter Participation Area (Ventura HVP Area). Its purpose, principles, implementation procedures, and methodologies for amendment are set forth in this Comprehensive Plan amendment.

A. PURPOSE

The City of Ventura Hillside Area, with its unique topography, viewsheds, watershed lands; its unique microclimate and hydrology, and its diversity of plant and wildlife resources, is one of the finest scenic resources in the Southern California region. The Comprehensive Plan recognizes the unique and important qualities and potential of the Hillside Area in, among other provisions, the declaration of specialized Objectives and Policies for the Hillside Area in the Resources Element of the Plan and the Plan's requirements for continuing operation of, and compliance with, the City's Hillside Management Program.

This Comprehensive Plan amendment is intended to provide for an increased level of public awareness and participation in the development review process applicable to that portion of the Hillside Area described and depicted in Exhibit "A" as the "Hillside Voter Participation Area." It is further intended to provide assurance to the public that any proposed development in the Hillside Voter Participation Area appropriately takes into account the Area's unique combination of viewshed, watershed, open space, scenic area, and environmentally sensitive habitat, and that agricultural, viewshed, watershed, and open space lands in the Hillside Voter Participation Area are not converted to urban or other non-open space uses without public discussion and a vote of the people. Increasing citizen participation in the development review process through the establishment of a Hillside Voter Participation Area enhances the City's sense of community, allows for development unique to the City of Ventura, and promotes the efficient use of the City's infrastructure.

More specifically, this Comprehensive Plan amendment is intended to provide an opportunity for the public to be involved in insuring that any development projects proposed in the Hillside Voter Participation Area, shall, at a minimum:

1. Maintain the scenic character of the hillsides in areas of future development, by preserving significant natural landmarks and scenic ridgelines and slopes.

2. Provide increased recreational opportunities for existing and future hillside and other City residents, by improving access to existing parks and establishing additional parks or open, non-developed areas in conjunction with future hillside development.

3. Maximize public access to hillside open space and recreation areas, by establishing a system of linear parks and hiking trails along scenic ridges and barrancas.

4. Minimize the impact of hillside development on sensitive natural habitats and historical or archaeological resources.

B. PRINCIPLES

Inappropriate urban encroachment into Hillside open space, viewshed, watershed, scenic areas, and biological resource areas would have the potential to impact sensitive environmental areas, unwarrantedly intrude on open space, diminish the quality of life and threaten the public health, safety and welfare by leading to increased traffic congestion, associated air pollution, erosion, alteration of sensitive lands in watershed areas and causing potentially serious water problems, such as pollution, depletion and sedimentation of available water resources not only for the City of Ventura, but for its jurisdictional neighbors. Inappropriate urban encroachment could further result in the unwarranted extension of public services and facilities into sensitive areas.

The unique character of the City of Ventura and quality of life of City residents depends on the appropriate protection of the Hillside Area's substantial amount of open space, viewshed, watershed, scenic resources, and biological resources. The increased public awareness and involvement in the fate of such lands through the implementation of this Comprehensive Plan amendment will provide the public a special opportunity to assure that future generations of Ventura citizens will not be deprived of the benefits of access to a viable water supply, flood and erosion control, protection of viewsheds, wildlife, environmentally sensitive areas, open space and recreational areas, and irreplaceable natural resources.

C. IMPLEMENTATION

(1) There is hereby established a Ventura Hillside Voter Participation Area (Ventura HVP Area). The Ventura HVP Area is that portion of the Hillside Area delineated and depicted in Exhibit "A" of this Comprehensive Plan amendment (hereafter, the "HVP Area Map"). As shown on the HVP Area Map, the southern boundary of the HVP Area generally follows the northern segment of the City's incorporated limit as established by the Local Agency Formation Commission for the City of Ventura, except as the HVP boundary line runs northerly of some small residential lots on or near Foothill Road west of Arroyo Verde Park as further depicted on Exhibit "A." East of Harmon Barranca, the HVP Area boundary generally follows the alignment of Foothill Road eastward to the boundary of the City's Planning Area. The northerly boundary of the HVP Area continues, generally, as the northern boundary of the City's Planning Area. The westerly boundary of the HVP Area alternately follows the City limit boundary or Sphere of Influence boundary easterly of the North Avenue area. The foregoing narrative description is intended to be general in nature and all of the foregoing is more particularly depicted and described in Exhibit "A'

Insofar as the HVP Area boundary described and depicted in this Comprehensive Plan amendment, including Exhibit "A" hereto, is said or shown to be coterminous with either the City's incorporated limit or the City's Sphere of Influence boundary, or with the boundary of the City's Planning Area, such references are intended to be, and shall be construed to be, the location of the City limit boundary or Sphere of Influence boundary or boundary of the City's Planning Area. as applicable, as each of those boundaries are established for the City of Ventura as of January 1, 2001. Although the HVP Area boundary is established, in part, in generally the same location as the City limit boundary, or in some instances, the Sphere of Influence boundary, the establishment of the HVP Area boundary is not intended to and shall in no way inhibit the Local Agency Formation Commission from changing or altering the City limit boundary or Sphere of Influence boundary in accordance with State law. The boundary of the HVP Area, although incidentally coterminous as of one point in time with the City limit boundary or Sphere of Influence boundary or boundary of the City's Planning Area, is independent from these boundaries in legal significance and purpose. While the City limit boundary or Sphere of Influence boundary may be, from time to time, altered by the Local Agency Formation Commission, or the boundary of the City's Planning Area may be changed, the HVP Area boundary shall not be changed except as provided herein.

(2) Until December 31, 2030, the City of Ventura shall not extend urban services into, and shall not authorize urbanized uses of land within, the Ventura Hillside Voter Participation Area unless otherwise authorized by a vote of the people, except for the purpose of construction of public potable water facilities, public parks or other city government facilities or as otherwise provided or excepted herein. Upon the effective date of this Hillside Voter Participation Area Comprehensive

Plan amendment, the City and its departments, boards, commissions, officers and employees shall not grant, or by inaction allow to be approved by operation of law, any Comprehensive Plan amendment, rezoning, specific plan, subdivision map, conditional use permit, building permit or any other ministerial or discretionary entitlement, which is inconsistent with the purposes of this Comprehensive Plan amendment, unless in accordance with the amendment procedures of Section 4 of this Comprehensive Plan amendment.

(3) "Urbanized uses of land" shall mean any development that would require the establishment of new community sewer systems or the significant expansion of existing community sewer systems; or, would result in the creation of residential densities greater than one primary residential unit per 40 acres in area; or, would result in the establishment of commercial or industrial uses that are neither agriculturally-related nor related to the production of mineral resources.

(4) The Land Use Map is amended to reflect the existence of the Ventura Hillside Voter Participation Area as generally described in paragraph (1) above and as depicted in Exhibit "A," attached hereto.

(5) The Hillside Voter Participation Area, as defined herein, may not be amended, altered, revoked or otherwise changed prior to December 31, 2030, except by vote of the people or by the City Council pursuant to the procedures set forth in Section 4 of this Comprehensive Plan amendment. For purposes of this Ordinance, approval by a vote of the people is accomplished when a Comprehensive Plan amendment is placed on the ballot through any procedure provided for in the Election Code, and a majority of the voters vote in favor of it. Whenever the City Council adopts an amendment requiring approval by a vote of the people pursuant to the provisions of this subsection, the City Council's action shall have no effect until after such a vote is held and a majority of the voters vote in favor of it. The City Council shall follow the provisions of the Election Code in all matters pertaining to such an election.

Section 4. Changes to Area: Procedures.

Until December 31, 2030, the foregoing Purposes, Principles and Implementation provisions of this Comprehensive Plan amendment, and the Hillside Voter Participation Area may be amended only by a vote of the people commenced pursuant to the initiative process by the public, or pursuant to the procedures set forth below:

A. The City Council may amend the boundary of the Hillside Voter Participation Area depicted on Exhibit "A" if it finds such amendment to be in the public interest, provided that the amended boundary enlarges said Hillside Voter Participation Area established by this Comprehensive Plan amendment.

B. The City Council, following at least one public hearing for presentation by an applicant and the public, and after compliance with the California Environmental Quality Act, may amend the Hillside Voter Participation Area described herein, based on substantial evidence in the record, if the City Council makes each of the following findings:

(1) Application of the provisions of subsections (A) or (B) of the amendment procedures set forth in this Section 4 are unworkable and failure to amend the Hillside Voter Participation Area would constitute an unconstitutional taking of a landowner's property for which compensation would be required or would deprive the landowner of a vested right; and

(2) The amendment and associated land use designations will allow additional land uses only to the minimum extent necessary to avoid said
unconstitutional taking of the landowner's property or to give effect to the vested right.

C. The City Council, following at least one public hearing for presentations by an applicant and the public, and after compliance with the California Environmental Quality Act, may place any amendment to the Hillside Voter Participation Area or the provisions of this Comprehensive Plan amendment on the ballot pursuant to the mechanisms provided by state law.

D. The Comprehensive Plan may be reorganized and individual provisions, including the provisions of this ordinance, maybe renumbered or reordered in the course of ongoing updates of the Comprehensive Plan in accordance with the requirements of state law.

Section 5. No Changes to Save Our Agricultural Resources Initiative

Any restrictions imposed upon the City of San Buenaventura limiting the City's ability to redesignate, or allow development of, property designated "Agricultural" that are in effect as a result of the "SOAR" initiative approved by the voters in 1995 and adopted by the City Council as Ordinance No. 95-33 shall remain in full force and effect and shall not be amended, modified, altered, or abridged by the adoption of this ordinance.

Section 6. Exemptions:

The provisions of this ordinance do not apply to:

A. Construction or reconstruction of, or related to, public potable water facilities, public: parks or other city government facilities; or

B. Construction or reconstruction of no more than one residential dwelling unit, and incidental uses or structures related thereto, on an individual parcel of land that is lawfully established of record as of the effective date of this Comprehensive Plan amendment and that is contiguous to the City's incorporation boundary but only to the extent that such a legally established parcel is developed with, or proposed to be developed with, no more than one residential dwelling unit; or

C. Any development that would result in the creation of residential densities equal to or less than one primary residential unit per 40 acres in area; or, would result in the establishment of commercial or industrial uses that are agriculturally-related or related to the production of mineral resources; or

D. Any development project that has obtained, as of the effective date of this Comprehensive Plan amendment, a vested right pursuant to state or local law; or

E. Uses that are "incidental' (as the City's Zoning Ordinance defines "incidental uses") to uses lawfully established as of the effective date of this Comprehensive Plan amendment.

Section 7. Interpretation

This ordinance shall be broadly construed in order to achieve the purposes stated in this ordinance. It is the intent of the voters that the provisions of this measure shall be interpreted by the City and others in a manner that promotes public participation in decision-making relating to future development proposals within in the Hillside Voter Participation Area.

Section 8. Insertion Date

A. Upon the effective date of this ordinance, Sections 3, 4, 5, 6, and 7 of this ordinance shall be deemed inserted in the Comprehensive Plan and the Land Use Map referred to in Part C of Section 3 shall be deemed amended even though the reprinting may not occur until it can be carried out by the staff of the City of San Buenaventura.

B. The Comprehensive Plan in effect at the time the City Council decided to place this measure on the ballot, and the Comprehensive Plan as amended by this ordinance, comprise an integrated, internally consistent and compatible statement of policies for the City of San Buenaventura. In order to ensure that the Comprehensive Plan remains an integrated, internally consistent and compatible statement of policies and to ensure that the actions of the voters in enacting this ordinance are given effect, any provision of the Comprehensive Plan that is adopted between July 23, 2001 and the effective date of this ordinance, to the extent that such provision is inconsistent with this ordinance, shall be amended as soon as possible and in the manner and time required by state law to ensure consistency between such provision and Section 3 of this ordinance. In the alternative, such interim-enacted inconsistent provisions shall be repealed.

Section 9. Amendment or Repeal

This ordinance may be amended or repealed only by the voters of the City of San Buenaventura at an election held in accordance with state law, except as expressly provided by Section 4 herein.

The people of the City of San Buenaventura do ordain as follows:

Section 1. Title

This measure shall be known as the Ventura Community Park SOAR Amendment.

Section 2. Purpose

The purpose of this measure is to allow the City to develop a Community Park on a parcel of property located at the northwest corner of the intersection of Kimball Road and Telephone Road. The subject property, which is approximately 100 acres in size, is further described in Exhibit "A," attached hereto and made a part hereof, and is hereafter referred to as the "Property." Most of the Property is outside the Ventura City limits but within the "Planning Area" of the City of San Buenaventura and therefore covered by the City's Comprehensive Plan Update to the Year 2010 (hereafter the "Comprehensive Plan"). The Property is currently designated "Agricultural" under the Comprehensive Plan and, therefore, also subject to the 1995 Save Our Agricultural Resources ("SOAR") Initiative.

The City is proposing to develop the Property with community-oriented public park facilities that may include, among other things, athletic fields, an aquatic facility, a community center and other related buildings and structures for use by the public. If this measure is approved, the City may also construct and operate a fire station on a portion of the Property.

This initiative proposes to amend the Comprehensive Plan of the City of San Buenaventura, by changing the designation of the Property in the Comprehensive Plan Land Use Plan Map from "Agricultural" (or "A") to "Parks" (or "P"). This will allow the City of San Buenaventura to potentially develop the Property with a Community Park without being restricted by the SOAR Initiative.

Section 3. Comprehensive Plan Amendment

Part A.

The following paragraph titled “Parks Uses” is hereby added to the Land Use Element of the Comprehensive Plan, more particularly, to the provisions of the Serra Community Intent and Rationale Statement on page III-96, to read as follows:

“Parks Uses: The Parks Land Use Plan designation is applied to an approximately 100-acre site at the northwest corner of Kimball Road and Telephone Road for the purpose of developing a multi-purpose community-oriented public park on this site. It is further intended that this site should be zoned to the “P” (Parks) zone if and when it is annexed to the City. Design Review should be carried out by the City's Planning Commission prior to the development of any Recreation Services use types on the site to assure that the range of community park uses potentially permitted on the site by the "P" zone are well integrated on the site and compatible with adjacent land uses.”

Part B.

The Property is deleted from the discussion of “Agricultural Uses” in the Serra Community provisions of the Land Use Element of the Comprehensive Plan. To that end, the final paragraph with the heading “Agricultural Use” beginning at the bottom of page III-95 and ending at the top of page III-96 is hereby revised to read as follows:

“Agricultural Use: A 297-acre area between Telephone Road and the Southern Pacific Railroad and a 172-acre area between Bristol Road and the Santa Clara River are designated Agricultural Use, not to be reconsidered until after the Year 2010, to preserve their existing agricultural character.”

Part C.

The Land Use Plan Map incorporated in the Comprehensive Plan is hereby amended, and official copies thereof shall be revised by City staff, to reflect the foregoing amendments to the text of the Land Use Element.

Section 4. Zoning

Upon annexation to the City of San Buenaventura, the zoning classification for the Property shall be "P" (Parks) and the Official Zoning District Map incorporated in the Zoning Ordinance shall, by this Measure, be amended, and official copies thereof shall be revised by City staff, to reflect the foregoing zone change to the Property.

Section 5. Save Open-Space and Agricultural Resources

Any restrictions imposed upon the City of San Buenaventura limiting the City's ability to redesignate, or allow development of, property designated "Agricultural" that are in effect on the day that this Initiative is approved by the voters shall remain in full force and effect except as to the Property. The City of San Buenaventura may allow development of a community park on the Property in accordance with this ordinance.

Section 6. Interpretation

This ordinance shall be broadly construed in order to achieve the purposes stated in this ordinance. It is the intent of the voters that the provisions of this ordinance shall be interpreted by the City of San Buenaventura and others in a manner that facilitates the development of a community park on the Property in accordance with the purposes of this ordinance.

Section 7. Insertion Date

Part A. Upon the effective date of this ordinance, Part A and Part B of Section 3 of this ordinance shall be deemed inserted in the Comprehensive Plan and the Land Use Map referred to in Part C of Section 3 shall be deemed amended even though the reprinting may not occur until it can be carried out by the staff of the City of San Buenaventura.

Part B. The Comprehensive Plan in effect at the time the City Council decided to place this measure on the ballot, and the Comprehensive Plan as amended by this ordinance, comprise an integrated, internally consistent and compatible statement of policies for the City of San Buenaventura.

In order to ensure that the Comprehensive Plan remains an integrated, internally consistent and compatible statement of policies and to ensure that the actions of the voters in enacting this ordinance are given effect, any provision of the Comprehensive Plan that is adopted between [the date the City Council decided to place this measure on the ballot] and the effective date of this ordinance, to the extent that such provision is inconsistent with this ordinance, shall be amended as soon as possible and in the manner and time required by state law to ensure consistency between such provision and Section 3 of this ordinance. In the alternative, such interim-enacted inconsistent provisions shall be repealed.

Section 8. Amendment or Repeal

Section 3 and Section 4 of this ordinance may be amended or repealed only by the voters of the City of San Buenaventura at an election held in accordance with state law.

The people of the City of San Buenaventura do ordain as follows:

Section 1. Title

This ordinance shall be known as the First Assembly of God Land Initiative.

Section 2. Purpose

The purpose of this ordinance is to allow the First Assembly of God (hereafter "Church") to develop a property located at the northwest corner of the intersection of Montgomery Avenue and Northbank Drive. Such property is 25.59 acres and is further described in Exhibit A, attached hereto and made a part hereof, and is hereafter referred to as "Property". The Church wishes to develop the Property in accordance with City of San Buenaventura Ordinance No 95-33 (commonly known as "SOAR") guidelines for a sanctuary, related Church buildings, and athletic fields for use by the community of San Buenaventura.

Since the Property is within the sphere of influence of the City of San Buenaventura, this ordinance (1) amends the Comprehensive Plan Update to the Year 2010 (hereafter the "General Plan") of the City of San Buenaventura, and (2) prezones the Property to the R-1 Single Family zone with a subzone of R-1-1AC. This will allow the City of San Buenaventura to annex the Property with a restricted land use that is compatible with the Church's development of the Property.

Section 3. General Plan Amendment

Part A.

The second paragraph under the heading "Residential Uses" appearing on page III-94 of the General Plan describes the areas that may be used for low-density, single family homes in the Serra Community area of the City of San Buenaventura. The single family use (designated as SF in the General Plan) is the most restrictive land use that will allow the Church to build a sanctuary, related church buildings, and athletic fields. Section 4 of this initiative will further restrict the Property by pre-zoning the Property and requiring a minimum of one acre for each parcel. This will make the Property unattractive for single family development but still acceptable for the Church sanctuary, related Church buildings, and athletic fields. This ordinance adds the Church's 25.59 acre parcel to the SF land use.

The second paragraph under the heading "Residential Uses" appearing on page III-94 of the General Plan is hereby amended to read as follows:

"The SF category is applied to an approximately 3-acre site at the southeast corner of Henderson and Petit Avenue, a 1.7-acre site southerly of Darling Road extended, and a 25.59-acre site located at the northwest corner of Montgomery Avenue and Northbank Drive."

Part B.

The final paragraph with the heading "Agricultural Use" beginning at the bottom of page III-95 and ending at the top of page III-96 of the General Plan describes that portion of the Serra Community area of the City of San Buenaventura which may only be used for agricultural uses. This ordinance deletes the Church's 25.59 acre parcel from the agricultural use category.

The final paragraph with the heading "Agricultural Use" beginning at the bottom of page III-95 and ending at the top of page III-96 of the General Plan is hereby amended to read as follows:

"Agricultural Use: A 100-acre site at the northwest corner of Kimball Road and Telephone, a 297-acre area between Telephone Road and the Southern Pacific Railroad except for the 25.59-acre site located at the northwest corner of Montgomery Avenue and Northbank Drive, and a 172-acre area between Bristol Road and the Santa Clara River are designated Agricultural Use, not to be reconsidered until after the Year 2010, to preserve their existing agricultural character."

Part C.

The map of the Land Use Plan contained in the General Plan shall be redrafted to reflect the foregoing amendments.

Section 4. Zoning

The most restrictive zoning in the City of San Buenaventura which will allow the Church to build a sanctuary, related Church buildings, and athletic fields on the Property is an R-1 Single Family zone with a subzone of R-1-1AC. The R-1-1AC subzone restricts the Property by requiring a minimum of one acre for each parcel. This will make the Property unattractive for single family development but still acceptable for the Church's sanctuary, related Church buildings, and athletic fields.

Therefore, upon annexation of the Property to the City of San Buenaventura the zoning designation for the Property shall be the R-1 Single Family zone with a subzone of R-1-1AC.

Section 5. Save Open-Space and Agricultural Resources

Any restrictions imposed upon he City of San Buenaventura limiting the City's ability to annex property and allow development of such property shall remain in full force and effect except as to the 25.59-acres of the Property.

Section 6. Construction

This ordinance shall be broadly construed in order to achieve the purposes stated in this ordinance. It is the intent of the voters that the provisions of this ordinance shall be interpreted by the City of San Buenaventura and others in a manner that facilitates the development of the Property in accordance with the purposes of this ordinance.

Section 7. Insertion Date

Part A. Upon the effective date of this ordinance, Part A and Part B of Section 3 of this ordinance shall be deemed inserted in the General Plan and the Land Use Map referred to in Part C of Section 3 shall be deemed amended even though the reprinting may not occur until deemed convenient by the City of San Buenaventura.

Part B. The General Plan in effect at the time the Notice of Intention to circulate this initiative was submitted to the City Clerk of the City of San Buenaventura, and the General Plan as amended by this ordinance, comprise an integrated, internally consistent and compatible statement of policies for the City of San Buenaventura. In order to ensure that the General Plan remains an integrated, internally consistent and compatible statement of policies and to ensure that the actions of the voters in enacting this ordinance are given effect, any provision of the General Plan that is adopted between the Notice of Intention and the effective date of this ordinance, to the extent that such provision is inconsistent with this ordinance, shall be amended as soon as possible and in the manner and time required by state law to ensure consistency between such provision and Section 3 of this ordinance. In the alternative, such interim-enacted inconsistent provisions shall be repealed.

Section 8. Amendment or Repeal

Section 3 and Section 4 of this ordinance may be amended or repealed only by the voters of the City of San Buenaventura at an election held in accordance with state law.

EXHIBIT "A"

PARCEL 1:

That portion of Subdivision 98 of Rancho Santa Paula y Saticoy, in the county of Ventura, state of California, as per map recorded in book "A" pag3 290 of Miscellaneous Records (Transcribed Records from Santa Barbara County), in the office of the county recorder of said county, described as follows:

Beginning at the point of intersection of the centerline of the right of way of the Southern Pacific Railroad and the boundary line between Subdivisions 98 and 99 of said Rancho Santa Paula y Saticoy; thence from said point of beginning,

1st: - North 10° 30' West 9.482 chains, more or less, to the southeast corner of that certain Parcel of land conveyed to Charles H. Fowler, by deed dated March 18, 1892, recorded in book 36 page 86 of Deeds; thence,

2nd: - South 79º 30' West 19.25 chains, along the south line of said lands of Charles H. Fowler, to the northeast corner of that certain Parcel of land as conveyed to Emma J. Tyler, by deed dated June 20, 1894, recorded in book 43 page 90 of Deeds; thence,

3rd: - South 10º 30' East 18.982 chains, more or less, along the east line of said lands of Emma J. Tyler, to a point in the centerline of the right of way of the Southern Pacific Railroad; thence along same,

4th: - North 53º 15' East 22.57 chains, more or less, to the point of beginning.

EXCEPT a strip of parcel of land 50 feet wide lying adjoining and immediately west of the east line of the above described land, conveyed to the County of Ventura, as a public highway, by deed recorded July 12, 1889, in book 28 page 338 of Deeds.

ALSO EXCEPT that portion thereof conveyed to the Southern Pacific Railroad Company by deed recorded January 27, 1887 in book 18 page 146 of Deeds.

RESERVING unto the grantor herein, all oil, gas and mineral rights in and to said land, without however, any right of surface entry in and to a depth of 500 feet.

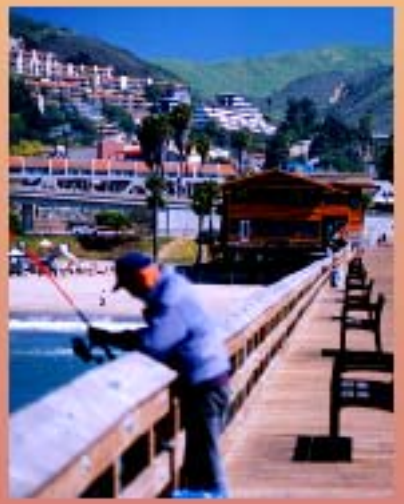
PARCEL 3:

That certain parcel in Lot 99 of the Rancho Santa Paula y Saticoy, marked “not a part of this subdivision” on the map of Tract No. 1333-1, in the City of San Buenaventura, county of Ventura, state of California, as per map recorded in book 30 page 51 of Maps, in the office of the county recorder of said county, and lying northwesterly of the Southern Pacific Railroad right of way, easterly of Bristol Road and southwesterly of Montgomery Avenue, as shown on said map.

RESERVING unto the grantor herein, all oil, gas and mineral rights in and to said land, without however, any right of surface entry in and to a depth of 500 feet from the surface thereof.

ventura's general plan

ATTACHMENTS



"The desire for community is a constant of human nature."

— Steven Price
Urban Advantage
Berkeley, California

CITY OF
VENTURA

21ST CENTURY TOOL KIT

Prelude

The 2005 Ventura General Plan envisions a new direction to protect and preserve its citizens' quality of life. This direction is based on the recognition that zoning and land development, as practiced for the past several decades, has not served our citizens, our city, or our environment as well as it should.

Currently, the two most successful movements created to alleviate this situation are "Smart Growth" and "New Urbanism." Smart Growth is a government initiated approach against sprawl that addresses underlying policy from the top-down, and is primarily marketed by government and similar agencies. New Urbanism is a grass roots, market response to outdated zoning and land use policy as it impacts development and the physical properties of the public realm. Its chief advocates are architects and town designers.

Smart Growth grew out of early New Urbanist work, and both are concerned with the real outcomes of the built environment and how it affects communities environmentally, economically, culturally, and socially.

The Ahwahnee Principles and the Charter for the New Urbanism, listed below, were created early on as "constitutions" that governed these movements. Both are valuable tools that Ventura would be wise to include in it's 21st Century Tool Kit to understand and solve long-standing problems associated with growth and change.

AHWAHNEE PRINCIPLES

Preamble:

Existing patterns of urban and suburban development seriously impair our quality of life. The symptoms are: more congestion and air pollution resulting from our increased dependence on automobiles, the loss of precious open space, the need for costly improvements to roads and public services, the inequitable distribution of economic resources, and the loss of a sense of community. By drawing upon the best from the past and the present, we can plan communities that will more successfully serve the needs of those who live and work within them. Such planning should adhere to certain fundamental principles.

Community Principles

1. All planning should be in the form of complete and integrated communities containing housing, shops, work places, schools, parks and civic facilities essential to the daily life of the residents.

2. Community size should be designed so that housing, jobs, daily needs and other activities are within easy walking distance of each other.
3. As many activities as possible should be located within easy walking distance of transit stops.
4. A community should contain a diversity of housing types to enable citizens from a wide range of economic levels and age groups to live within its boundaries.
5. Businesses within the community should provide a range of job types for the community's residents.
6. The location and character of the community should be consistent with a larger transit network.
7. The community should have a center focus that combines commercial, civic, cultural and recreational uses.
8. The community should contain an ample supply of specialized open space in the form of squares, greens and parks whose frequent use is encouraged through placement and design.
9. Public spaces should be designed to encourage the attention and presence of people at all hours of the day and night.
10. Each community or cluster of communities should have a well-defined edge, such as agricultural greenbelts or wildlife corridors, permanently protected from development.
11. Streets, pedestrian paths and bike paths should contribute to a system of fully-connected and interesting routes to all destinations. Their design should encourage pedestrian and bicycle use by being small and spatially defined by buildings, trees and lighting; and by discouraging high speed traffic.
12. Wherever possible, the natural terrain, drainage and vegetation of the community should be preserved with superior examples contained within parks or greenbelts.
13. The community design should help conserve resources and minimize waste.
14. Communities should provide for the efficient use of water through the use of natural drainage, drought tolerant landscaping and recycling.
15. The street orientation, the placement of buildings and the use of shading should contribute to the energy efficiency of the community.

Regional Principles

1. The regional land-use planning structure should be integrated within a larger transportation network built around transit rather than freeways.
2. Regions should be bounded by and provide a continuous system of greenbelt/wildlife corridors to be determined by natural conditions.
3. Regional institutions and services (government, stadiums, museums, etc.) should be located in the urban core.
4. Materials and methods of construction should be specific to the region, exhibiting a continuity of history and culture and compatibility with the climate to encourage the development of local character and community identity.

Implementation Principles

1. The general plan should be updated to incorporate the above principles.
2. Rather than allowing developer-initiated, piecemeal development, local governments should take charge of the planning process. General plans should designate where new growth, infill or redevelopment will be allowed to occur.

3. Prior to any development, a specific plan should be prepared based on these planning principles.
4. Plans should be developed through an open process and participants in the process should be provided visual models of all planning proposals.

CONGRESS FOR THE NEW URBANISM

THE CONGRESS FOR THE NEW URBANISM views disinvestment in central cities, the spread of placeless sprawl, increasing separation by race and income, environmental deterioration, loss of agricultural lands and wilderness, and the erosion of society's built heritage as one interrelated community building challenge.

WE STAND for the restoration of existing urban centers and towns within coherent metropolitan regions, the reconfiguration of sprawling suburbs into communities of real neighborhoods and diverse districts, the conservation of natural environments, and the preservation of our built legacy.

WE RECOGNIZE that physical solutions by themselves will not solve social and economic problems, but neither can economic vitality, community stability, and environmental health be sustained without a coherent supportive physical framework.

WE ADVOCATE the restructuring of public policy and development practices to support the following principles: neighborhoods should be diverse in use and population; communities should be designed for the pedestrian and transit as well as the car; cities and towns should be shaped by physically defined and universally accessible public spaces and community institutions; urban places should be framed by architecture and landscape design that celebrate local history, climate, ecology, and building practice.

WE REPRESENT a broad-based citizenry, composed of public and private sector leaders, community activists, and multidisciplinary professionals. We are committed to reestablishing the relationship between the art of building and the making of community, through citizen-based participatory planning and design.

WE DEDICATE ourselves to reclaiming our homes, blocks, streets, parks, neighborhoods, districts, towns, cities, regions, and environment.

We assert the following principles to guide public policy, development practice, urban planning, and design:

The region: Metropolis, city, and town

1. Metropolitan regions are finite places with geographic boundaries derived from topography, watersheds, coastlines, farmlands, regional parks, and river basins. The metropolis is made of multiple centers that are cities, towns, and villages, each with its own identifiable center and edges.

2. The metropolitan region is a fundamental economic unit of the contemporary world. Governmental cooperation, public policy, physical planning, and economic strategies must reflect this new reality.

3. The metropolis has a necessary and fragile relationship to its agrarian hinterland and natural landscapes. The relationship is environmental, economic, and cultural. Farmland and nature are as important to the metropolis as the garden is to the house.

4. Development patterns should not blur or eradicate the edges of the metropolis. Infill development within existing urban areas conserves environmental resources, economic investment, and social fabric, while reclaiming marginal and abandoned areas. Metropolitan regions should develop strategies to encourage such infill development over peripheral expansion.

5. Where appropriate, new development contiguous to urban boundaries should be organized as neighborhoods and districts, and be integrated with the existing urban pattern. Noncontiguous development should be organized as towns and villages with their own urban edges, and planned for a jobs/housing balance, not as bedroom suburbs.

6. The development and redevelopment of towns and cities should respect historical patterns, precedents, and boundaries.

7. Cities and towns should bring into proximity a broad spectrum of public and private uses to support a regional economy that benefits people of all incomes. Affordable housing should be distributed throughout the region to match job opportunities and to avoid concentrations of poverty.

8. The physical organization of the region should be supported by a framework of transportation alternatives. Transit, pedestrian, and bicycle systems should maximize access and mobility throughout the region while reducing dependence upon the automobile.

9. Revenues and resources can be shared more cooperatively among the municipalities and centers within regions to avoid destructive competition for tax base and to promote rational coordination of transportation, recreation, public services, housing, and community institutions.

The neighborhood, the district, and the corridor

1. The neighborhood, the district, and the corridor are the essential elements of development and redevelopment in the metropolis. They form identifiable areas that encourage citizens to take responsibility for their maintenance and evolution.

2. Neighborhoods should be compact, pedestrian-friendly, and mixed-use. Districts generally emphasize a special single use, and should follow the principles of neighborhood design when possible. Corridors are regional connectors of neighborhoods and districts; they range from boulevards and rail lines to rivers and parkways.

3. Many activities of daily living should occur within walking distance, allowing independence to those who do not drive, especially the elderly and the young. Interconnected networks of streets should be designed to encourage walking, reduce the number and length of automobile trips, and conserve energy.

4. Within neighborhoods, a broad range of housing types and price levels can bring people of diverse ages, races, and incomes into daily interaction, strengthening the personal and civic bonds essential to an authentic community.

5. Transit corridors, when properly planned and coordinated, can help organize metropolitan structure and revitalize urban centers. In contrast, highway corridors should not displace investment from existing centers.

6. Appropriate building densities and land uses should be within walking distance of transit stops, permitting public transit to become a viable alternative to the automobile.

7. Concentrations of civic, institutional, and commercial activity should be embedded in neighborhoods, and districts, not isolated in remote, single-use complexes. Schools should be sized and located to enable children to walk or bicycle to them.

8. The economic health and harmonious evolution of neighborhoods, districts, and corridors can be improved through graphic urban design codes that serve as predictable guides for change.

9. A range of parks, from tot-lots and village greens to ball fields and community gardens, should be distributed within neighborhoods. Conservation areas and open lands should be used to define and connect different neighborhoods and districts.

The block, the street, and the building

1. A primary task of all urban architecture and landscape design is the physical definition of streets and public spaces as places of shared use.

2. Individual architectural projects should be seamlessly linked to their surroundings. This issue transcends style.

3. The revitalization of urban places depends on safety and security. The design of streets and buildings should reinforce safe environments, but not at the expense of accessibility and openness.

4. In the contemporary metropolis, development must adequately accommodate automobiles. It should do so in ways that respect the pedestrian and the form of public space.

5. Streets and squares should be safe, comfortable, and interesting to the pedestrian. Properly configured, they encourage walking and enable neighbors to know each other and protect their communities.

6. Architecture and landscape design should grow from local climate, topography, history, and building practice.

7. Civic buildings and public gathering places require important sites to reinforce community identity and the culture of democracy. They deserve distinctive form, because their role is different from that of other buildings and places that constitute the fabric of the city.

8. All buildings should provide their inhabitants with a clear sense of location, weather and time. Natural methods of heating and cooling can be more resource-efficient than mechanical systems.

9. Preservation and renewal of historic buildings, districts, and landscapes affirm the continuity and evolution of urban society.

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For information, visit www.cnu.org

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GLOSSARY OF TERMS IN THE 2005 VENTURA GENERAL PLAN

Abbreviations

ADT: Average number of vehicle trips per day
CEQA: California Environmental Quality Act
CIP: Capital Improvements Program
CNEL: Community Noise Equivalent Level
dB: Decibel
DOF: California Department of Finance
EIR: Environmental Impact Report
FAR: Floor Area Ratio
FEMA: Federal Emergency Management Agency
LAFCo: Local Agency Formation Commission
Ldn: Day and Night Average Sound Level
Leq: Sound Energy Equivalent Level
LOS: Traffic Intersection Level of Service
RDA: City of Ventura Redevelopment Agency
SCAG: Southern California Association of Governments
SOI: Sphere of Influence
TDM: Transportation Demand Management
TOD: Transit-Oriented Development
VCOG: Ventura County Council of Governments

Definitions

Acre: Approximately 43,560 square feet.

Acres, Gross: The entire acreage of a site calculated to the centerline of proposed bounding streets and to the edge of the right-of-way of existing or dedicated streets.

Acres, Net: The portion of a site that can actually be built upon. The following generally are not included in the net acreage of a site**:** public or private road rights-of-way, public open space, and flood ways.

Action: A strategy carried out in response to adopted policy to achieve a specific goal or objective. Policies and action statements establish the "who," "how" and "when" for carrying out the "what" and "where" of goals and objectives.

Adaptive Reuse: The conversion of obsolescent or historic buildings from their original or most recent use to a new use; for example, the conversion of former hospital or school buildings to residential use, or the conversion of a historic single-family home to office use.

Affordable Housing: Housing capable of being purchased or rented by a household with very low, low, or moderate income, based on a household's ability to make monthly payments necessary to obtain housing. Housing is considered affordable when a household pays less than 30 percent of its gross monthly income (GMI) for housing including utilities.

Alley: A narrow service way, either public or private, which provides a permanently reserved but secondary means of public access not intended for general traffic circulation. Alleys typically are located along rear property lines.

Ambient: Surrounding on all sides; used to describe measurements of existing conditions with respect to traffic, noise, air and other environments.

Annex, *v*: To incorporate a land area into an existing district or municipality, with a resulting change in the boundaries of the annexing jurisdiction.

Aquifer: An underground, water-bearing layer of earth, porous rock, sand, or gravel, through which water can seep or be held in natural storage. Aquifers generally hold sufficient water to be used as a water supply.

Arterial: Medium-speed (30-40 mph), medium-capacity (10,000-35,000 average daily trips) roadway that provides intra-community travel and access to the county-wide highway system. Access to community arterials should be provided at collector roads and local streets, but direct access from parcels to existing arterials is common.

Bicycle Lane (Class II): A corridor expressly reserved for bicycles, existing on a street or roadway in addition to any lanes for use by motorized vehicles.

Bicycle Path (Class I): A paved route not on a street or roadway and expressly reserved for bicycles traversing an otherwise unpaved area. Bicycle paths may parallel roads but typically are separated from them by landscaping.

Bicycle Route (Class III): A facility shared with motorists and identified only by signs, a bicycle route has no pavement markings or lane stripes.

Buffer: An area of land separating two distinct land uses that acts to soften or mitigate the effects of one land use on the other.

Building: Any structure used or intended for supporting or sheltering any use or occupancy.

Building Type: a structure category determined by function, disposition on the lot, and configuration, including frontage and height. For example, a rowhouse is a type, not a style.

Buildout: Development of land to its full potential or theoretical capacity as permitted under current or proposed planning or zoning designations.

California Environmental Quality Act (CEQA): Law requiring State and local agencies to regulate activities with consideration for environmental protection. If a proposed activity has the potential for a significant adverse environmental impact, an Environmental Impact Report (EIR) must be prepared and certified before taking action on the proposed project.

Capital Improvements Program (CIP): A program that schedules permanent City improvements at least five years ahead to fit projected fiscal capability. The CIP is reviewed annually.

Channelization: The straightening and/or deepening of a watercourse for purposes of runoff control or ease of navigation; often includes lining banks with retaining material such as concrete.

Character: Special physical characteristics of a structure or area that set it apart from its surroundings and contribute to its individuality.

Charrette: An interactive, multi-day public process in which the community works together with planning and design professionals and City staff and officials to create and support a feasible plan for a specific area of the City that will produce positive and transformative community change.

City: When capitalized, refers to the governmental entity; "city" refers to the geographic area.

Civic: the term defining not-for-profit organizations dedicated to the arts, culture, education, recreation, government, transit, and municipal parking.

Clustered Development: Buildings placed close together with the purpose of retaining open space area.

Co-housing: A residential development with dwelling units for grouped around a common kitchen, gathering room, and child-care facilities. Co-housing developments normally are organized as condominiums.

Collector: Relatively-low-speed (25-30 mph), relatively low-volume (5,000-10,000 average daily trips) street that provides circulation within and between neighborhoods. Collectors usually serve short trips and are intended for collecting trips from local streets and distributing them to the arterial network.

Commerce; Commercial: The buying and selling of commodities and services.

Community Noise Equivalent Level (CNEL): A 24-hour energy equivalent level derived from a variety of single-noise events, with weighting factors of 5 and 10 dBA applied to the evening (7 PM to 10 PM) and nighttime (10 PM to 7 AM) periods, respectively, to allow for the greater sensitivity to noise during these hours.

Community Park: Land with full public access intended to provide recreation opportunities beyond those supplied by neighborhood parks. Community parks are larger in scale than neighborhood parks but smaller than regional parks.

Corridor: Linear features that may form boundaries, as well as connections, between neighborhoods. Corridors frequently encompass major access routes, especially ones with commercial destinations. Corridors also can incorporate parks or natural features such as streams or canyons.

dB: Decibel; a unit used to express the relative intensity of a sound as it is heard by the human ear.

dBA: The "A-weighted" scale for measuring sound in decibels; weighs or reduces the effects of low and high frequencies in order to simulate human hearing. Every increase of 10 dBA doubles the perceived loudness though the noise is actually ten times more intense.

Dedication: The turning over by an owner or developer of private land for public use, and the acceptance of land for such use by the governmental agency having jurisdiction over the public function for which it will be used. Dedications for roads, parks, school sites, or other public uses often are made conditions for approval of a development by a city or county.

Density, Residential: The number of permanent residential dwelling units per gross acres of land.

Density Bonus: The allocation of development rights that allow a parcel to accommodate additional square footage or additional residential units beyond the maximum for which the parcel is zoned, usually in exchange for the provision or preservation of an amenity at the same site or at another location. Under California law, a housing development that provides 20 percent of its units for lower income households, or 10 percent of its units for very low-income households, or 50 percent of its units for seniors, is entitled to a density bonus.

Design Review: The comprehensive evaluation of a development and its impact on neighboring properties and the community as a whole, from the standpoint of site and landscape design, architecture, materials, colors, lighting, and signs, in accordance with a set of adopted criteria and standards.

Detention Basin: A structure constructed to retard flood runoff and minimize the effect of sudden floods. Water is temporarily stored and released through an outlet structure at a rate that will not exceed the carrying capacity of the channel downstream. Basins often are planted with grass and used for open space or recreation in periods of dry weather.

Developer: An individual or business that prepares raw land for the construction of buildings or causes to be built physical space for use primarily by others, and in which the preparation of the land or the creation of the building space is in itself a business and is not incidental to another business or activity.

Development: The physical extension and/or construction of urban land uses, including: subdivision of land; construction or alteration of structures, roads, utilities, and other facilities; installation of septic systems; grading; deposit of refuse, debris, or fill materials; and clearing of natural vegetative cover (with the exception of agricultural activities). Routine repair and maintenance activities are exempted.

Development Fee: (See "Impact Fee.")

District: An area of the city that has a unique character identifiable as different from surrounding areas because of distinctive architecture, streets, geographic features, culture, landmarks, activities, and/or land uses. A neighborhood or parts of neighborhoods can form a district. Districts consist of streets or areas emphasizing specific types of activities. A corridor may also be a district, as when a major shopping avenue runs between adjoining neighborhoods.

Dwelling Unit: A room or group of rooms (including sleeping, eating, cooking, and sanitation facilities, but not more than one kitchen), which constitutes an independent housekeeping unit, occupied or intended for occupancy by one household on a long-term basis.

Encourage, *v*: To stimulate or foster a particular condition through direct or indirect action by the private sector or government agencies.

Enhance, *v*: To improve existing conditions by increasing the quantity or quality of beneficial uses or features.

Environment: The existing physical conditions in an area that will be affected by a proposed project, including land, air, water, mineral, flora, fauna, noise, and objects of historic or aesthetic significance.

Environmental Impact Report (EIR): A report required by CEQA that assesses all the environmental characteristics of an area and determines what effects or impacts will result if the area is altered or disturbed by a proposed action.

Fault: A fracture in the earth's crust forming a boundary between rock masses that have shifted.

Flood, 100-Year: The magnitude of a flood expected to occur on the average every 100 years, based on historical data. The 100-year flood has a one percent chance of occurring in any given year.

Floodplain: The relatively level land area on either side of the banks of a stream regularly subject to flooding. That part of the flood plain subject to a one percent chance of flooding in any given year is designated as an "area of special flood hazard" by the Federal Insurance Administration.

Floodway: The channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the "base flood" without cumulatively increasing the water surface elevation more than one foot. No development is allowed in floodways.

General Plan: A compendium of city or county policies regarding its long-term development, in the form of maps and accompanying text. The General Plan is a legal document required by the State of California Government Code Section 65301 and adopted by the City Council.

Gateway: A point along the edge of a city at which a person gains a sense of having left the environs and entered the city.

Goal: A general, overall, and ultimate purpose, aim, or end toward which the City will direct effort.

Green: A whole-building and systems approach to siting, design, construction, and operation that employs techniques that minimize environmental impacts and reduce the energy consumption of buildings while contributing to the health and productivity of occupants.

Hazardous Material: Any substance that, because of its quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment. The term includes, but is not limited to, hazardous substances and hazardous wastes.

Hillside Area: All that area north of Foothill and Poli Street, and east of Cedar Street and within City limits. This area is subject to the Hillside Management Program.

Hillside Open Space: One of the 19 distinct communities within the City's Planning Area; coterminous with the Hillside Voter Participation Area; generally referred to as "hillsides".

Hillside Voter Participation Area or HVPA: The area subject to the "Hillside Voter Participation Act" (also known as Measure "P") as set forth in Appendix X and coterminous with the "Hillside Open Space" area depicted on the Land Use Diagram.

Hillsides: Synonymous and coterminous with HVPA and "Hillside Open Space".

Historic: Noteworthy for significance in local, state, or national history or culture, architecture or design, or housing works of art, memorabilia, or artifacts.

Household: Persons who occupy a housing unit.

Housing Element: A separately published State-mandated general plan element that assesses existing and projected housing needs of all economic segments of the community, identifies potential sites adequate to provide the amount and kind of housing needed, and contains adopted goals, policies, and implementation programs for the preservation, improvement, and development of housing. The Housing Elements is updated every five years.

Housing Unit: A rooms or a rooms intended for occupancy, separate from any other living space, with direct access from outside or through a common area.

Impact: The direct or indirect effect of human action on existing physical, social, or economic conditions.

Impact or Development Fee: A fee levied on the developer of a project as compensation for otherwise-unmitigated impacts the project will produce, not to exceed the estimated reasonable cost of providing the service for which the fee is charged.

Industry/Industrial: The manufacture, production, and processing of consumer goods. Industrial is often divided into "heavy industrial" uses, such as construction yards, quarrying, and factories; and "light industrial" uses, such as research and development and less intensive warehousing and manufacturing.

Infill: Development of vacant and/or underutilized land within areas already largely developed with urban uses.

Infrastructure: Public services and facilities, such as sewage-disposal systems, water-supply systems, and other utilities.

In-lieu Fee: Payment that substitutes for required dedication of land or provision of structures or amenities.

Institutional: Uses such as hospitals, museums, schools, places of worship, and nonprofit activities of a welfare, educational, or philanthropic nature that cannot be considered residential, commercial, or industrial activities.

Landmark: (1) A building, site, object, structure, or significant tree, having historical, architectural, social, or cultural significance and marked for preservation by the local, state, or federal government. (2) A visually prominent or outstanding structure or natural feature that functions as a point of orientation or identification.

Ldn: Day-Night Average Sound Level. The A-weighted average sound level for a given area (measured in decibels) during a 24-hour period with a 10 dB weighting applied to night-time sound levels. The Ldn is approximately numerically equal to the CNEL for most environmental settings.

Leq: The energy equivalent level, defined as the average sound level on the basis of sound energy (or sound pressure squared). The Leq is a "dosage" type measure and is the basis for the descriptors used in current standards, such as the 24-hour CNEL used by the State of California.

Lease: A contractual agreement by which an owner of real property (the lessor) gives the right of possession to another (a lessee) for a specified period of time (term) and for a specified consideration (rent).

Level of Service, Intersection (LOS): A scale that measures the amount of traffic an intersection is capable of handling. Levels range from A, representing free-flow, to F corresponding to significant stoppage.

Liquefaction: The transformation of loose water-saturated granular materials (such as sand or silt) from a solid into a liquid state, which can lead to ground failure during an earthquake.

Live-Work: A dwelling unit that contains, to a limited extent, a commercial component. A live-work unit is a fee-simple unit on its own lot with the commercial component limited to the ground level. (see Work-Live)

Local Agency Formation Commission (LAFCo): A commission in each county that reviews and evaluates proposals for formation of special districts, incorporation of cities, annexation to special districts or cities, consolidation of districts, and merger of districts with cities. LAFCo members include two county supervisors, two city council members, and one member representing the general public.

Local Coastal Program (LCP): A combination of City land use plans, zoning regulations, and zoning district maps that control land use in the Coastal Zone established under the California Coastal Act of 1976.

Local Street: Relatively low-volume, low-speed streets (not shown on the Roadway Classifications map), whose primary purpose is to provide access to fronting properties.

Lot: A legally-recognized parcel with frontage on a public or City-approved private street.

Low Income: Households with annual income 80 percent of the County median or less.

Maintain: Keep in an existing state. (See “Preserve.”)

Median: The dividing area between opposing lanes of traffic.

Mitigate: Alleviate or avoid to the extent feasible.

Mixed Use: Properties on which various uses, such as office, commercial, and institutional, are combined with residences in a single building or site in an integrated development project with significant functional interrelationships and a coherent physical design. A single site may include contiguous properties.

Neighborhood: The basic building blocks of a community that together comprise the city. Each neighborhood is limited in physical area, with a defined edge and a center. The size of a neighborhood is usually based on the distance that a person can walk in five minutes from the center to the edge – a quarter-mile. Neighborhoods have a fine-grained mix of land uses, providing places to live, work, shop, and be entertained.

Neighborhood Center: The focal point of a neighborhood, commonly featuring places for work, shopping, services, entertainment, leisure, recreation, and social and civic interaction.

Neighborhood Park: A facility intended to serve the recreation needs of people living or working within a one-half mile radius of the park.

Noise: Sound that is undesirable because it interferes with speech and hearing, is intense enough to damage hearing, or is otherwise annoying.

Noise Contour: A line connecting points of equal noise level as measured on the same scale. Noise levels greater than the 60 Ldn contour (measured in dBA) require mitigation in residential development.

Office: Professional or consulting services in fields such as accounting, architecture, design, engineering, finance, law, insurance, medicine, real estate, and similar types of work.

Open Space: An area of land or water that is essentially unimproved and devoted to outdoor recreation and/or the preservation of natural resources.

Outdoor Recreation: Recreation in an urbanized outdoor setting (active recreation) or open-space outdoor setting (passive recreation).

(a) *Active outdoor recreation* includes participant sports or other activities conducted in open or partially enclosed or screened recreational activities facilities. Typical uses include driving ranges, miniature golf courses, golf courses, amusement parks, swimming pools, and tennis courts and usually rely on permanent above-ground improvements, including, but not limited to, playing fields or courts, restrooms, and tables.

(b) *Passive outdoor recreation* includes recreational activities, usually of an individual or small group nature, such as sunbathing, walking, hiking, bird watching, or nature study, conducted in an open-space setting and which, generally, do not rely on the use of permanent aboveground improvements or involve motorized vehicle use.

Parcel: A lot, or contiguous group of lots, in single ownership or under single control, usually considered a unit for purposes of development.

Parks: Open space lands whose primary purpose is recreation.

Parkway: The area between curb and sidewalk, usually planted with ground cover and/or trees.

Pedestrian Shed: an area defined by the average distance that may be traversed at and easy walking pace from its edge to its center. This distance is applied to determine the size of a neighborhood or extent of a community. A standard Pedestrian Shed is one quarter of a mile radius or 1,320 feet. With transit available or proposed, a long Pedestrian Shed has an average walking distance of ½-mile or 2,640 feet. Pedestrian Sheds should be conceived as oriented toward a central destination containing one or more important intersections, meeting places, civic spaces, civic buildings, and the capacity to accommodate a T5 Transect Zone in the future. Sometimes called a Walkshed.

Planning Area: The land area addressed by the General Plan, which includes the City Limits, potentially annexable land in the Sphere of Influence, and neighboring open space and agricultural areas of Ventura County that the City desires to remain in rural condition.

Policy: A statement of principle that anticipates specific actions to be undertaken to meet City goals.

Pollution: The presence of matter or energy whose nature, location, or quantity produces undesired environmental effects.

Preserve: Keep intact and safe from destruction or decay.

Protect: Maintain and preserve beneficial uses in their present condition.

Public and Quasi-public Facilities: Institutional, academic, governmental and community service uses, either publicly owned or operated by non-profit organizations.

Public Art: Signs, other monuments, sculptures, murals, statues, fountains, and other artistic installations in spaces accessible to the general public that accentuate or draw attention to a particular place or feature of the city, provide a focal point for public gathering, and/or serve a specific function, such as to provide seating.

Recreation, Active: A type of recreation that requires organized play areas, such as softball, baseball, football and soccer fields, tennis and basketball courts and various forms of children's play equipment.

Recreation, Passive: Recreation that does not require organized play areas.

Recycling: The process of extracting and reusing materials from waste products.

Redevelop: To demolish existing buildings, or increase the overall floor area existing on a property, or both, irrespective of whether a change occurs in land use.

Redevelopment Agency: The City division created under California Redevelopment Law for the purpose of planning, developing, re-planning, redesigning, clearing, reconstructing, and/or rehabilitating all or part of a specified area with residential, commercial, industrial, and/or public (including recreational) structures and facilities.

Regional: Pertaining to activities or economies at a scale greater than that of a single jurisdiction and affecting a broad geographic area.

Regional Park: A park typically 150-500 acres in size focusing on activities and natural features not included in most other types of parks and often based on a specific scenic or recreational opportunity.

Restore: Renew, rebuild, or reconstruct to a former state.

Ridesharing: Vehicle travel other than driving alone.

Ridgeline: A line connecting the highest points along a ridge and separating drainage basins or small-scale drainage systems from one another.

Right-of-way: Land intended to be occupied by transportation and public use facilities such as roadways, railroads, and utility lines.

Riparian: Areas adjacent to perennial and intermittent streams delineated by the existence of plant species normally found near fresh water.

Runoff: The portion of precipitation that does not percolate into the ground.

Seismic: Caused by or subject to earthquakes or earth vibrations.

Sidewalk: the paved layer of the public frontage dedicated exclusively to pedestrian activity.

Specific Plan: A legal tool allowed by State Government Code Section 65450 et seq. that prescribes detailed regulations, conditions, programs, and/or proposed legislation for a defined area of the city.

Sphere of Influence: The probable ultimate physical boundaries and service area of the city, as determined by LAFCo.

Streetscape: the urban element that establishes the major part of the public realm. The streetscape is composed of thoroughfares (travel lanes for vehicles and bicycles, parking lanes for cars, and sidewalks or paths for pedestrians) as well as the visible private frontages (building facades and elevations, porches, yards, fences, awnings, etc.), and the amenities of the public frontages (street trees and plantings, benches, and streetlights, etc.).

Structure: Anything constructed or erected that requires location on the ground (excluding swimming pools, fences, and walls used as fences).

Subdivision: The division of a land into defined lots or condominiums that can be separately conveyed by sale or lease.

Sustainable: Meeting the needs of the present without compromising the ability of future generations to meet their needs, and successfully balancing economic, environmental, and social equity concerns.

Tourism: The business of providing services for persons traveling for pleasure.

Transect: a system of ordering human habitats in a range from the most natural to the most urban. Based upon six Transect Zones that describe the physical character of place at any scale, according to the density and intensity of land use and urbanism.

Transit-Oriented Development (TOD): Relatively high-density development located within an easy walk of a major transit stop, generally with a mix of residential, employment, and shopping designed primarily for pedestrians.

Transit, Public: A system of regularly-scheduled buses and/or trains available to the public on a fee-per-ride basis.

Transportation Demand Management (TDM): Strategies for reducing the number of vehicle trips by increasing ridesharing, transit use, walking, and biking.

Trip: A one-way journey that proceeds from an origin to a destination via a single mode of transportation.

Truck Route: A route required for all vehicles exceeding set weight or axle limits, which follows major arterials through commercial or industrial areas and avoids sensitive areas.

Underutilized: Non-vacant properties that have not been fully developed with improvements that reach the allowed density and/or floor area.

Urban Design: The attempt to give form, in terms of both beauty and function, to selected urban areas or to whole cities. Urban design is concerned with the location, mass, and design of various urban components and combines elements of urban planning, architecture, and landscape architecture.

Use Permit: The discretionary and conditional review of an activity or function or operation on a site or in a building or facility.

Very Low Income: Households with annual income 50 percent of the County median or less.

View Corridor: The line of sight of an observer looking toward an object of significance (e.g., ridgeline, river, historic building, etc.).

Viewshed: The area within view from a defined point.

Watercourse: Presently or once naturally perennially or intermittently flowing water, including rivers, streams, barrancas, and creeks. Includes waterways that have been channelized, but not ditches or underground drainage and sewage systems.

Watershed: The total area above a given point on a watercourse that contributes water to its flow; also, the entire region drained by a watercourse.

Wetlands: Transitional areas between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is covered by shallow water. Federal agencies establish hydrology, vegetation, and soil criteria to define wetlands.

Work-Live: A dwelling unit that contains a commercial component. A Work-Live unit is a fee-simple unit on a lot with the commercial component anywhere within the unit. (see Live-Work)

Yield Street: A street whereby by two vehicles, going in opposite directions, one car will often have to pull over slightly and yield to the other vehicle, depending on how many cars are parked on the street. A standard residential street.

Zoning: The regulation of building forms and land uses throughout the city.

Floodplain Management

PURPOSE

The City of Ventura is using this website to educate, inform, and direct interested parties to regulations, policies, and documents associated with the use of property within the City that is likely to be subject to flooding by stormwater.

ORGANIZATION OF AUTHORITY

FEMA administers a National Flood Insurance Program (NFIP) that establishes Floodways and Zones on maps (FIRM's), imposes Development and Use Standards, and issues Policies of Flood Insurance.

The County Watershed Protection District collects a special property-related tax to fund Regional compliance with FEMA's NFIP, to monitor and study regional stormwater flows and systems, and to facilitate regional stormwater management cooperation.

The City of Ventura collects information from FEMA, the County Watershed Protection District, and our own stormwater management programs, facilitates FEMA NFIP development compliance and takes enforcement action when required to maintain compliance with FEMA's NFIP standards.

HELPFUL SOURCES OF INFORMATION

During rain events:

- National Oceanic and Atmospheric Administration (NOAA) Home Page (Identify Ventura, CA or place zip code into the location search screen): https://www.weather.gov/lox/
- NOAA Hourly Forecast website
- NOAA Flood Infographics website
- County of Ventura - Watershed Protection District webpage: https://ww
- County of Ventura - Watershed Rain Fall Totals: https://www.vcwatersh
- County of Ventura - Watershed Weather Forecast: https://www.vcwatershed.net/fws/WxLinks.html
- For questions on flood insurance coverage and rates: 1-800-427-4661 or
- For general information about flood insurance: www.FloodSmart.gov

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- FEMA Information Resource Library - www.fema.gov/library
- FEMA Publications: FEMA Distribution Center at 1-800-480-2520
- NFIP Info: www.fema.gov/business/nfip or 1-800-427-4661
- FEMA Map Service Center: http://msc.fema.gov or 1-800-358-9616
- FEMA Regions and Contacts: www.fema.gov/about/
- About Flood Insurance: https://www.fema.gov/national-flood-insurance-program
- FEMA Map Assistance Center 1-877-FEMA MAP (1-877-336-2627)
- Ventura County Sheriff Emergency Operations Center: http://www.readyventuracounty.org/
- FEMA RiskMAP Project: http://www.fema.gov/library/viewRecord.do?id=4119
- FEMA Floodplain Management webpage: http://www.fema.gov/library/viewRecord.do?id=7565

OPEN PACIFIC COAST STUDY (OPC)
CA COASTAL ANALYSIS AND MAPPING PROJECT (CCAMP)

The Federal Emergency Management Agency has informed the City that proposed changes to the floodplain maps for the City have been published in the Federal Register and are available for public review and comment. In an effort to make this public notice easier for the citizens of the City of Ventura to access the maps and understand the process, links to the maps are listed below.

Maps | Reports | General | Insurance | Notices

- Pierpont Area Map
- Fairgrounds Area Map
- Ventura River Map
- Santa Clara River Map

- 2017 Ventura CCAMP Report
- FEMA Response to CCAMP Appeal

- Substantial Improvement Calculation Guidance
- Are You Prepared for a Flood in your Neighborhood?
- Criteria for Appeals of Flood Insurance Rate Maps
- FEMA Scientific Resolution Maps
- Floodplains: FAQ
- Open Pacific Coast Study
- Main FEMA Website Page
- Ventura County Flood Information

- 2017 Elevations Flood Insurance Costs

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- Map Changes and Flood Insurance
- Myths and Facts about the National Flood Insurance Program
- Why You Need Flood Insurance
- Flood Insurance - How it Works
- Elevation Certificate

- Federal Register posting for Ventura County and City Flood Plain Maps as of 3-13-2017.
- Preliminary Flood Insurance Rate Map
- Pierpont Address included in new floodplain
- May 2017 Notice of Public Meeting

STUDIES AND PROJECTS

CURSORY STUDIES BY COUNTY WATERSHED PROTECTION DISTRICT
The following Adobe PDF files are preliminary studies conducted by the County for the purposes of identifying potentially problematic stormwater drainage areas within the City. These are offered for general information purposes only. There is no guarantee of study accuracy and additional review of these types of studies has found gross generalizations that could greatly affect the extent of local flooding.

Sanjon Barranca Study (85MB PDF)
Arundell Barranca Study (22MB PDF)
Prince Barranca Study (52MB PDF)

FEMA STUDIES
These studies and projects are more detailed and are likely to result in formal changes to FEMA's Flood Insurance Rate Maps.

Levee's certifications (38MB PDF)

FEMA MAP SERVICE CENTER
Frequently Asked Questions
National Flood Insurance Program
Pacific Ocean Mapping Project (CCAMP/OPC)

QUESTIONS OR COMMENTS

Questions and comments regarding this website and/or the information provided can be logged into My Ventura Access so that you can track the progress of your question online or sent via e-mail to FPM@cityofventura.ca.gov

Cody Stults
Associate Engineer
Email

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CITY OF VENTURA

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Monday - Thursday
7:30 am - 5:30 pm

Friday*
8 am - 5 pm
*Closed Alternate Fridays

City Department Directory

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City News Releases

Career Opportunities

Public Records Online Portal

Ventura Police Department

Ventura Fire Department

Ventura Water

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Ventura County 2040 GENERAL PLAN

Chapter 11
Hazards and Safety

Please see the next page.

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11 HAZARDS AND SAFETY

INTRODUCTION

This chapter summarizes the hazards and safety issues for the County of Ventura. It is organized into the following sections:

- Geologic and Seismic Hazards (Section 11.1)
- Flood Hazards (Section 11.2)
- Wildfire Hazards (Section 11.3)
- Aviation Hazards (Section 11.4)
- Hazardous Materials (Section 11.5)
- Noise and Vibration (Section 11.6)

SECTION 11.1 GEOLOGIC AND SEISMIC HAZARDS

Introduction

This section addresses the geology and soils conditions within Ventura County and the potential risk these conditions pose. Existing and potential problems related to geology and soils include seismic ground shaking, ground failure, and unsuitable soils. This chapter, which is consistent with the 2015 Ventura County Multi-Hazard Mitigation plan, summarizes the geologic and seismic conditions for the County of Ventura, which include the following areas of concern:

- Known Earthquake Faults
- Liquefaction
- Landslides
- Soil Erosion
- Unstable Geologic Units and Soil
- Expansive Soils

Major Findings

- There are several earthquake faults in the County of Ventura that have a status of "Active" or "Potentially Active," according to the California Geological Survey's Regional Geologic Hazards and Mapping Program. Fault designations within the County are subject to change as further evidence is received, providing either clearer proof of potential for activity or convincing geologic evidence of inactivity.
- The entire County of Ventura, including all cities, is susceptible to liquefaction, but the most vulnerable locations are along the Santa Clara River and in the Oxnard Plain.

Existing Conditions

Geologic Structures

Local physiography is dominated by the rugged slopes of the Transverse Ranges and reflects several water courses that run through the County. Three major riverine systems extend from the mountains to the ocean in the county: the Ventura River (watershed area is 227 square miles), the Santa Clara River, (watershed area is 1,634 square miles, approximately 60 percent of which is in Ventura County), and Calleguas Creek (watershed area is 343 square miles). Incised creeks, including Prince Barranca (from Hall Canyon) and Sanjon Barranca, dissect the hills to the north of the City of Ventura. Elevations range from sea level to 2,163 feet along the ridgeline of Red Mountain that lies between the Lake Casitas basin and the Pacific Ocean. The very large Ventura Oil Field runs along the axis of the Ventura Avenue Anticline. Residential and commercial development fills most of the coastal plain and the lowlands along the Ventura River.

Ventura County generally includes late Quaternary alluvial and fluvial sedimentary deposits, beach deposits, and artificial fill. These deposits are composed mainly of volcanic, marine and non-marine sedimentary rocks overlying a basement complex of granitic and metamorphic rock. The Oxnard Plain is immediately underlain by thick alluvial sediments, which overlie the older sedimentary and volcanic rocks. Young Quaternary deposits cover about 13 percent of the Ventura County Quadrangle. Most of the exposed valley alluvium is Holocene (<11,700 years old), with older Quaternary sediments locally exposed on the lower slopes of surrounding hills. Most Holocene sediments exposed along the Ventura River valley are wash (Qw), alluvial (Qya), and marine (Qym) deposits. Superficially, the alluvial fan units are composed of material ranging in size from boulders to clay, with silt and clay being the major components.

Expansive Soils

Soils within Ventura County vary, ranging from soils that are well-drained to excessively drained loamy sands to silty clay barns on alluvial fans and plains, and poorly drained loamy sands to silty clay barns in basins. The soils formed in alluvium derived predominantly from sedimentary rocks and to a lesser extent from basic igneous rocks. These generalized soil types have been derived from the more detailed soil survey of Ventura County and soils map. "Expansive soils" are soils that expand when wet and contract when dry. Historically, expansive soils have caused considerable damage in Ventura County. In the early 1960s, numerous homes were razed and many more were severely damaged in the Shadow Oaks Tract, adjacent to the City of Thousand Oaks. This area experienced soil expansion that cracked many two-inch-thick concrete slabs. As the damage started to appear in the new homes of this tract, many of them were vacated. Other houses were rented; a transient group of people occupied these and the neighborhood generally declined. In time, repairs saved some homes while others were replaced using sturdier construction techniques. The Shadow Oaks case was primarily responsible for the establishment of more stringent building code requirements. Since the initial damage in the 1960s, engineering studies have resulted in design techniques and procedures that provide for safe and economical construction on expansive soils. Local building ordinances have incorporated these techniques and procedures. This has allowed construction even in areas where the hazard is severe.

The resources most often affected by expansive soils are structures. Even though expansive soils are scattered throughout the County, their potential impact on structures is limited to just a few developed areas: portions of the Ojai Valley, the Camarillo Hills and areas around the community of Moorpark. The presence of expansive soils in these developed areas presents no threat, however, because soils tests and engineering solutions can overcome the dangers of expansive soils.

Mineral Resources

The hilly middle and southern onshore areas of the county are developed as oil fields (San Miguelito and Ventura Avenue Oil Fields). The large-scale structural feature responsible for petroleum accumulation is the Ventura Anticline, an east-west trending geologic structure 16 miles long, visible in the numerous rock outcrops in the rugged topography of the area. Within this feature, the primary petroleum-bearing unit is the Pico Formation, a sedimentary unit of turbidite sands of high porosity (16 to 20 percent). Oil was first discovered in the area in March 1919, reaching a depth of 3,498 feet. In 2009, an average of 11,600 barrels of oil per day was being drawn from the formation.

Earthquake Faults

The Transverse Range's geomorphic province is characterized by west-trending folds, thrust faults, and fault-bounded valleys. The structural framework of the region is generally considered the result of regional compression caused by right-lateral, strike-slip movement on the "Big Bend" segment of the San Andreas Fault. Major faults in the region are west-trending reverse faults. The significant faults summarized below are described in the 2015 Ventura County Multi-Hazard Mitigation Plan.

Malibu Coast Fault System

The Malibu Coast fault system includes the Malibu Coast, Santa Monica, and Hollywood faults. The system begins in the Hollywood area, extends along the southern base of the Santa Monica Mountains, and passes offshore a few miles west of Point Dume. The 1973 Point Mugu earthquake is believed to have originated on this fault system.

Oak Ridge Fault System

The Oak Ridge fault system is a steep (65 degrees) southerly dipping reverse fault that extends from the Santa Susana Mountains westward along the southerly side of the Santa Clara River Valley and into the Oxnard Plain. The system is more than 50 miles long on the mainland and may extend an equal or greater distance offshore. Several recorded earthquake epicenters on land and offshore may have been associated with the Oak Ridge fault system. Portions of the system are zoned by the state as active.

Pine Mountain Thrust Fault and Big Pine Fault

These two large faults occur in the mountainous portion of Ventura County, north of the Santa Ynez fault; the faults are located 9 and 16 miles north of the City of Ojai, respectively. The Pine Mountain thrust fault is reported to have ruptured the ground surface for a distance of 30 miles along its length during the northern Ventura County earthquakes of November 1852.

San Andreas Fault

San Andreas is the longest and most significant fault in California. While it does not run through Ventura County, it is located just north of the county boundary, in some cases less than a mile away. Because of clearly established historical earthquake activity, this fault has been designated as active by the State of California. The last major earthquake on the San Andreas Fault near Ventura County was the Fort Tejon earthquake of 1857, which was estimated at magnitude M 8.0 on the Mercalli Scale, causing the roof of Mission San Buenaventura to collapse and damaging its bell tower. It would have caused considerably

more damage if there had been structures in the county at the time. There is a 59 percent chance that a magnitude M 6.7 quake or larger will occur on this fault within the next 30 years.

San Cayetano–Red Mountain–Santa Susana Fault System

This fault system consists of a major series of north-dipping reverse faults that extend over 150 miles from Santa Barbara County into Los Angeles County. Within this system, the San Cayetano fault is the greatest hazard to Ventura County; it is a major, north-dipping reverse fault that extends for 25 miles along the northern portion of the Ventura Basin. The San Fernando earthquake of 1971 was caused by activity along this fault.

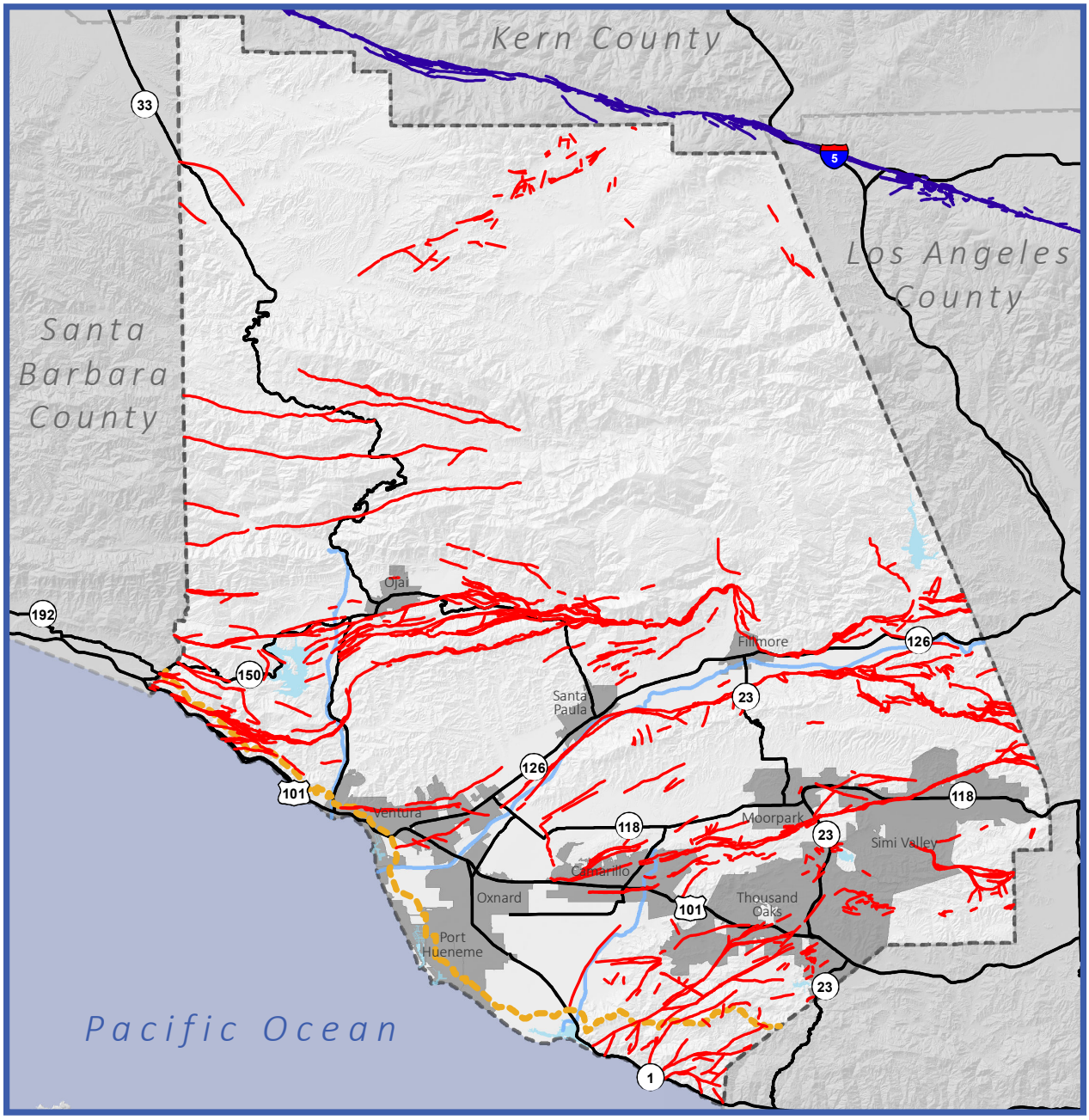
Simi–Santa Rosa Fault System

This fault system extends from the Santa Susana Mountains westward along the northern margin of the Simi and Tierra Rejada valleys and along the southern slope and crest of the Las Posas Hills to its westerly termination.

Ventura-Pitas Point Fault

The western half of this fault is known as the Pitas Point fault, and the eastern half is known as the Ventura fault. The Pitas Point fault extends offshore into the Pacific Ocean and is roughly 14 miles long. The Ventura fault extends into the communities of Ventura and Sea Cliff and runs roughly parallel to portions of U.S. 101 and State Route 126. The fault is roughly 12 miles long. The Ventura-Pitas Point fault is a left-reverse fault.

Figure 11-1 shows the general locations of faults in Ventura County.



Ventura County 2040 GENERAL PLAN

Figure 11-1:
Faults

Map Date: December 08, 2017

Source: Ventura County, 2016; California Department of Transportation, 2007; USGS, 2017.

0 7.5 15 Miles

N

- Faults within Ventura County
- San Andreas Fault Zone
- Coastal Zone Boundary
- Major Roadways
- Major Waterways
- Water Bodies
- Cities

Ground Shaking

Seismically-induced ground shaking is a critical potential seismic hazard in Ventura County. The severity of ground shaking depends primarily upon the magnitude of the earthquake, the location of the fault with respect to the site, and the soil and/or rock conditions at the site. The two most common measures of earthquake intensity used in the United States are the Modified Mercalli Intensity Scale, which measures felt intensity, and peak ground acceleration (PGA), which measures instrumental intensity by quantifying how hard the earth shakes in a given location. Magnitude is measured by the amplitude of the earthquake waves recorded on a seismograph using a logarithmic scale. The following table, taken from the 2015 Ventura County Multi-Hazard Mitigation Plan, presents intensities that are typically observed at locations near the epicenter of earthquakes of different magnitudes, with interpretations of perceived shaking and potential damage to the built environment (Table 11-1).

TABLE 11-1
MAGNITUDE/INTENSITY/GROUND-SHAKING COMPARISONS

Magnitude	Instrumental Intensity	PGA (% g)	Perceived Shaking	Potential Damage
0 – 4.3	I	<0.17	Not Felt	None
	II – III	0.17 – 1.4	Weak	
4.3 – 4.8	IV	1.4 – 3.9	Light	
	V	3.9 – 9.2	Moderate	Very Light
4.8 – 6.2	VI	9.2 – 18	Strong	Light
	VII	18 – 34	Very Strong	Moderate
6.2 – 7.3	VIII	34 – 65	Violent	Moderate to Heavy
	IX	65 – 124	Very Violent	Heavy
7.3 – 8.9	X	124+	Extreme	Very Heavy
	XI			
	XII			

Source: United States Geological Survey, Earthquake Hazards Program: https://earthquake.usgs.gov/.

The effects of ground shaking in Ventura County depend on 1) conditions of the local geology influence events: solid bedrock is far less subject to intense shaking than loose sediment; 2) duration and intensity of the earthquake are subject generally to the size of the earthquake; and (3) distance (as the distance from the epicenter drops off so the intensity of the shaking decreases). The duration of strong ground motion is a function of magnitude, underlying geology, and distance from the fault. It is probably the single most important factor in producing excessive damage to structures. Long duration, reasonably high acceleration, and considerable amplitudes, such as would likely occur from a maximum seismic event on the Malibu Coast Fault system, are the combination that would cause the most damage to buildings in the County. A distant, maximum seismic event on the San Andreas Fault would produce less intensity of shaking; however, the duration of strong ground motion would be longer, resulting in a high potential for damage to high-rise flexible structures.

Distance is another important factor affecting the severity of ground shaking. Ground shaking from distant seismic events (greater than 40 miles) will be different than events within 10 miles of the County. For more distant, large events (greater than 7.5M), such as those that occur on the San Andreas Fault, the ground shaking will reflect a predominance of long period waves. This will have minimal effects upon structures less than three stories in height, but will affect flexible structures (typically high-rise buildings, and other

buildings taller than three stories), especially if the natural period of the building should coincide with that of the long period earthquake waves. The amplifications of such motions could result in serious damage to high-rise structures. Short period waves, however, are generally very destructive near the epicenter of moderate- and large-magnitude seismic events, causing severe damage predominately to low-rise rigid structures (less than three stories) not specifically designed to resist them.

The ground-shaking hazard exists throughout Ventura County, as it does throughout California. Certain areas may have increased ground shaking due to local geologic conditions, as well as, the location and orientation of the earthquake fault. The highest amplification of ground shaking occurs in areas with the greatest potential for long period wave shaking. Basically, this is the San Andreas Fault zone in the northern part of the county and the Oakridge Fault zone in the southern part of the county.

The areas with the greatest amplification of short period shaking are along the base of the hills, in minor river valleys and in the broken bedrock along fault lines such as the San Cayetano, Oak Ridge and Simi-Santa Rosa Faults. Slight to moderate amplification of short period oscillations may occur on terrace deposits or soft bedrock. However, certain locations may experience higher than normal ground shaking due to boundary effects or wave propagations. These materials are found in young hill areas such as South Mountain, Oak Ridge, Sulphur Mountain, the north coastal hill lands and the Piru area in the south half of the county. In the north half of the county, these are along the margins of the valley areas such as Hungry and Lockwood Valleys and north of Cuyama.

In addition to the forces causing horizontal movement, such as those that predominant along the San Andreas Fault, Ventura County and portions of adjacent areas are subject to compressional forces acting in north-south directions. These forces tend to compress or shorten the distance from the San Andreas Fault south to the coast. These compressional forces caused the San Fernando Earthquake of 1971, resulting in the thrusting of the southern margin of the San Gabriel Mountains several feet southward over the north margin of the San Fernando Valley. These forces also resulted in the 1994 Northridge Earthquake. Several faults in Ventura County have been formed by and are related to these same forces. These fault systems are described in the Surface Fault Rupture section below.

Southern Ventura County

The south half of the county is considered that portion southerly of the east-west projection of Nordoff Ridge located immediately north of Ojai Valley. Even though the historic record indicates that no strong earthquakes or surface displacement have occurred along the faults within the south half, the likelihood of the occurrence of one or more of such events within the next 50 to 100 years is not remote. The San Fernando Earthquake of 1971 occurred along a fault having little historic record of activity. Several of the faults within the south half of the county, such as Santa Susana and San Cayetano, are subject to similar tectonic forces as those that caused the San Fernando Earthquake. Crustal deformation (shortening) resulting in earthquakes will continue into the indefinite future. It is probable that earthquakes of magnitude 6 or larger will occur in the south half of the county, in the nearby offshore areas, and along the San Andreas in the northern portion of the county.

According to the "Geology and Mineral Resources Study of Southern Ventura County" (CDMG 1972) prepared by the State Division of Mines and Geology in cooperation with the Ventura County Department of Public Works, the earthquake history of the south half of the county is dominated by small to moderate shocks. No earthquake greater than magnitude 4.7 has been recorded in Ventura County, or the immediate offshore area, since 1934, when adequate instrumental records became available. These relatively minor shocks have caused local damage but no recorded loss of life. A review of the earlier, less accurate record

from 1769 to 1934 suggests a similar history for the south half, although there were significant earthquakes in 1812, 1857, 1925, 1971, and 1994 that caused structural damage in specific areas of the south half of the county.

Northern Ventura County

The most important faults in the vicinity of the northern county area are the San Andreas, Big Pine, San Gabriel, and Frazier Mountain Thrust, all of which converge at the northeast corner of Ventura County. All of these faults, except perhaps the Frazier Mountain Thrust Fault, are considered to be active (i.e., are potential focal points for the occurrence of earthquakes and displacement of the ground surface). Other mapped and unknown faults within the north half may also prove to be active by future displacement or detailed investigations. The earthquakes of November 1852 were accompanied by about 30 miles of surface faulting in Lockwood Valley. The exact location of the surface breaks is unknown, but geologic evidence and reports indicate that it may have been along the Big Pine Fault, a major left-lateral fault with some oblique slip (subject to both horizontal and vertical displacement).

Several other faults found in the Lockwood Valley area have had recent movement identified by virtue of their cutting of terrace deposits and offset of other faults. These faults range from several hundred to a few thousand feet in length. Some of them indicate the region has recently undergone, and is probably still undergoing compression along north-south directions.

Geologic and survey evidence indicate that stress is building up along the San Andreas Fault to the north. It is just a question of time until the fault in this area again displaces; the resulting earthquake will probably be severe. Prediction of when displacement will occur is not possible at this time; however, it is likely that it will occur within 100 years and possibly much sooner.

Earthquakes and strong-to-severe ground shaking originating along faults within the north half is highly possible, but again, prediction of when this will happen is not possible. The historic record shows that the north half has experienced several severe shocks originating along faults both within and immediately outside of the county.

All of Ventura County is vulnerable to ground shaking from an earthquake and the entire county is in the severe, violent or extreme ground shaking potential categories. Table 11-2 provides information on the percentage of the county's population by jurisdiction that could be affected by severe, violent, or extreme ground shaking.

During severe, violent and extremely violent ground shaking events buildings can be damaged by the shaking itself or by the ground beneath them settling to a different level than it was before the earthquake (subsidence). Buildings can even sink into the ground if soil liquefaction occurs. Liquefaction is the mixing of sand or soil and groundwater (water underground) during the shaking of a moderate or strong earthquake. Buildings can also be damaged by strong surface waves making the ground heave and lurch. Any buildings in the path of these surface waves can lean or tip over from all the movement. The ground shaking may also cause landslides, mudslides, and avalanches on steeper hills or mountains, all of which can damage buildings and hurt people.

TABLE 11-2
PERCENT OF COUNTY POPULATION AFFECTED BY EARTHQUAKE RELATED GROUND SHAKING
(Ventura County, California)

Jurisdictional Area	Severe	Violent	Extreme
Camarillo	–	97.40	2.60
Moorpark	–	89.20	10.80
Ojai	–	100	–
Oxnard	–	20.40	79.6
Santa Paula	–	0.10	99.9
Simi Valley	0.02	49.60	50.3
Thousand Oaks	0.70	99.30	–
Ventura	–	25.30	74.4
Unincorporated	2.90	70.90	26.0
Fillmore	–	–	100
Port Hueneme	–	–	65.9

Source: Ventura County Multi-Hazard Mitigation Plan, September 2015.

Ground Failure

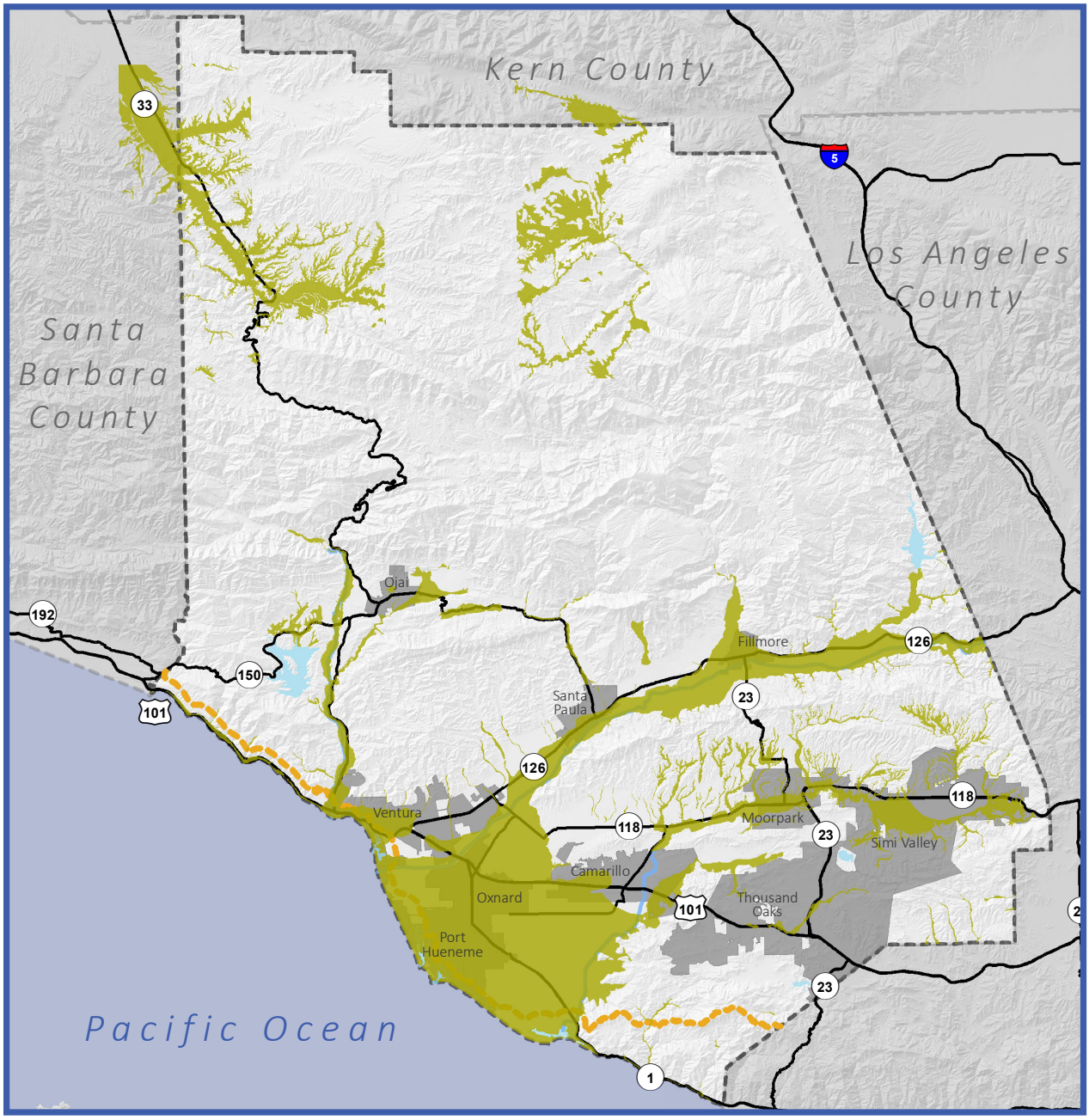
Seismically-induced ground failure includes liquefaction, differential compaction, ground lurching, ground cracking, and earthquake-induced slope failures.

Liquefaction

Liquefaction occurs when seismic waves pass through saturated granular soil, distorting its granular structure, and causing some of the empty spaces between granules to collapse. Poor water pressure may also increase sufficiently to cause the soil to behave like a fluid for a brief period and cause deformations. Liquefaction causes lateral spreads (horizontal movements of commonly 10 to 15 feet, but up to 100 feet), flow failures (massive flows of soil, typically hundreds of feet, but up to 12 miles), and loss of bearing strength (soil deformations causing structures to settle or tip). Liquefaction can cause severe damage to property. Figure 11-2 shows areas prone to liquefaction within the County.

The entire county, including all cities, is susceptible to liquefaction, but the most vulnerable locations are along the Santa Clara River and in the Oxnard Plain. The following percentages of the population live in liquefaction susceptible areas: Camarillo, 23.10 percent; Fillmore, 97.81 percent; Moorpark, 48.64 percent; Ojai, 11.48 percent; Oxnard, 99.99 percent; Port Hueneme, 100 percent; Santa Paula, 34.74 percent; Simi Valley, 42.10 percent; Thousand Oaks; 2.79 percent; Ventura, 40.26 percent; and Unincorporated Ventura County, 32.23 percent.

Liquefaction can result in settling of roadways, rupture of underground pipelines and cables, and shifting of building foundations. As foundations lose support, buildings and other objects on the ground surface can settle, tilt, and collapse. Lightweight buried structures can float to the surface. Four types of failure commonly result from liquefaction: lateral spreading, flow failure, ground oscillation and loss of bearing strength.



Ventura County 2040 GENERAL PLAN

Figure 11-2
Liquefaction

Map Date: July 18, 2016

Source: Ventura County, 2016; California Department of Transportation, 2007; USGS, 2013.

Low coastal terraces could be subject to liquefaction where groundwater is less than 15 feet from the surface. The coastal area of the Oxnard Plain may be particularly prone to liquefaction. A special study completed after the February 21, 1973, Point Mugu earthquake indicates that the areas south of the Santa Clara River, generally between Gonzales Road and Oxnard Shores, have a moderate to low liquefaction potential, while the Preble and Olivas communities, and Channel Islands Harbor extending southward to Arnold Road, have a moderate to high liquefaction potential.

The Central Coast coastal zone is the most heavily populated area along the Ventura coastal zone. Several large industries and utilities are located there, including Southern California Edison Company's Mandalay and Ormond Beach power plants, Oxnard and Ventura wastewater treatment plants, and three harbors. Liquefaction from severe ground shaking could cause major damage and disruption of services.

Differential Compaction/Consolidation or Settlement

Collectively, differential compaction and differential consolidation are known as "differential settlement." Differential compaction is caused by differences in soil types and densities in adjacent materials, leading to varying degrees of settlement when subjected to loads (e.g., buildings or vehicles). Differential consolidation occurs in saturated or nearly saturated soils when excess water pressure in one area is forced to other areas with lower pressure.[1] Differential settlement is a potential hazard in parts of Ventura County. The significance of the hazard at any particular site can be determined only by a site-specific geotechnical investigation.

Ground Cracking, Ground Lurching and Lateral Spreading

Both ground lurching and cracking are secondary effects of strong-to-moderately strong ground shaking and may be associated with liquefaction. Ground cracking usually occurs in near-surface materials, reflecting the differential compaction or liquefaction of underlying materials. The potential for ground cracking exists especially in areas of the county that have a moderate -to-high potential for liquefaction as well as in areas on known artificial fill. Ground lurching can result when soft, water-saturated surface soils are thrown into undulatory motion. Figure 11-2 shows areas prone to liquefaction within the county.

Lateral spreading is referred to as limited displacement ground failure and is often associated with liquefaction. Compact surface materials may slide on a liquefied, or low shear strength, layer at shallow depth, moving laterally several feet down slopes of less than two degrees. Lack of adequate subsurface data prohibits delineating areas in Ventura County prone to lateral spreading. Such a hazard may be present where conditions conducive to shallow liquefaction exist or where soils exist along the bluffs adjacent to the Ventura River.

[1] Soil consolidation relates to forcing water out of soil pores, whereas soil compaction relates to forcing air out of soil pores. Consolidation is the process by which soil particles, under saturated or nearly saturated conditions, are packed more closely together under the application of static loading (e.g. buildings), resulting from gradual drainage of water from soil pores. Consolidation is a natural and gradual process that takes years, compared to soil liquefaction, which results from earthquakes/strong ground shaking.

Surface Fault Rupture

Surface fault rupture is the differential movement of two sides of a fault at the earth's surface. Displacement along faults—both in terms of length and width—varies but can be significant (e.g., up to 20 feet), as can the length of the surface rupture (e.g., up to 200 miles). Surface fault rupture can cause severe damage to linear structures, including railways, highways, pipelines, tunnels, and dams. The likelihood of surface rupture on a given fault can be determined principally by studying the seismic history of the fault and reviewing geologic evidence, which suggests historic or prehistoric surface rupture. Many past studies have shown that future surface fault rupture is most likely to occur where the trace ruptured before, especially so if there is evidence of repeated and significant displacement on the trace. Faults affecting Ventura County are described under Earthquake Faults earlier in this section.

Seiche

A seiche can be considered very similar to a tsunami with the difference being that the water waves are generated in a closed or restricted body of water such as a lake or within a harbor. The most common seiche experienced by county residents in most swimming pools occurred during the 1994 Northridge earthquake. The shaking of an earthquake (or other vibration) can result in large and destructive oscillations that produce waves tens of feet above normal lake (water) level. In harbors (such as Ventura Harbor, Mandalay Bay and the Port of Hueneme) and closed or restricted bays, these waves can destroy harbor and shore facilities. Indirectly, tsunamis, can set up smaller internal oscillations in bays and harbors by causing a rapid change in sea level or more commonly by the wave itself. These seiches are very similar to tsunamis, but the waves are usually smaller and of lower energy. The trigger mechanism for seiche waves is similar to tsunamis wave generation.

The extent of most seiches is small, usually no more than ten to twenty feet above water level, and the duration is short, usually only a few minutes. However, a landslide can displace a wave that could travel hundreds of feet up the opposite shore of a body of water. Also, tsunami-caused seiches can last for many hours due to the possible rejuvenation of the seiche by each passing tsunami crest; however, each seiche would last only a few minutes and be of decreasing severity.

There is no way to alleviate the effects of possible seiches except by prohibiting construction within the hazard area. Typically, where practical, the structure is moved to a slightly higher elevation to reduce the damage potential and amount. Due to the indefinite nature of the triggering mechanisms, it seems doubtful that enough information will ever be known for general prediction of the hazard or predicting accurate seiche uprush limits for planning purposes.

There is no record of a seiche occurring in Ventura County. As such, the actual threat that is posed by seiches in Ventura County is small, in that it is probably the most remote of the hazards studied, although it may not be the least severe.

Erosion

Erosion is the removal of soil and rock from the landscape as a result of wind, water, ice. Erosion occurs as a result of three processes: detachment, entrainment, and transport. Detachment results in particles losing cohesion with surrounding material via a medium that moves the particles, most commonly wind, water, or ice. Entrainment is the lifting of particles, and transport is their movement. The process of erosion eventually ends in the deposition of the eroded particles by some factor that reduces their velocity until they settle.

Erosion can result in a variety of hazards and issues within the planning area. Wind-related erosion and wind-blown sand can cause visibility problems and damage architectural coatings and building material. Erosion due to rain or other fluvial events can deposit sediments in downstream water bodies, possibly changing drainage patterns and affecting biological regimes. Recently-graded soils are most susceptible to erosion. Unpaved roadways and other areas not stabilized by vegetation or otherwise capped can also be eroded. Erosion can also result in the loss or dispersion of nutrient rich topsoil.

Landslide

Landslide is a general term for the dislodging and fall of a mass of soil or rocks along a sloped surface, or for the dislodged mass itself. The term is used for varying phenomena, including mudflows, mudslides, debris flows, rock falls, rock slides, debris avalanches, debris slides, and slump-earth flows. Landslides may result from a wide range of combinations of natural rock, soil, or artificial fill. The susceptibility of hillside and mountainous areas to landslides depends on variations in geology, topography, vegetation, and weather. Landslides may also occur because of indiscriminate development of sloping ground or the creation of cut-and-fill slopes in areas of unstable or inadequately stable geologic conditions.

Additionally, landslides often occur together with other natural hazards, thereby exacerbating conditions, as described below:

- Shaking due to earthquakes can trigger events ranging from rock falls and topples to massive slides.
- Intense or prolonged precipitation that causes flooding can also saturate slopes and cause failures leading to landslides.
- Wildfires can remove vegetation from hillsides, significantly increasing runoff and landslide potential.
- Landslides into a reservoir can indirectly compromise dam safety; a landslide can even affect the dam itself.

Another type of landslide occurs in areas cut by perennial streams. As floodwaters erode channel banks, rivers have undercut clay-rich sedimentary rocks along their south bank, thereby destabilizing the ground and causing the ground above it to slide.

Landslides have occurred in areas along the Rincon Fault, hillsides south of the Santa Clara River, and the east side of the Ventura River. In recent years, the most damaging landslides in Ventura County have occurred in the coastal community of La Conchita, just southeast of the Santa Barbara county line. La Conchita has been the site of multiple non-earthquake-induced landslides.

La Conchita was built on ground that had been graded by the Southern Pacific Railroad after a 1909 landslide slid into the railroad tracks. The land was intended to be a buffer zone between the retreating and eroding cliff and the Pacific Ocean. However, it was subdivided into smaller residential lots in 1924. Along the bluff face above La Conchita, the upper portion of the bluff is underlain by two rock formations separated by the Red Mountain fault.

The bluff above La Conchita has been associated with a variety of landslide activity, with historical accounts dating back to 1865. More recently, two small slides occurred in 1988 and 1991, followed by large movements of the same landslide mass in 1995 and 2005. The 1995 landslide, which occurred one

month after the heaviest rainfall of an extraordinarily wet year, was considered to be a deep, slow-moving landslide. This landslide destroyed nine houses. The January 2005 event was a shallow and highly fluid remobilization of the same material that carried a thick layer of dry, viscous material. This landslide, which occurred at the peak of an extremely wet 2-week period, killed 10 people and destroyed 13 homes. Approximately 400,000 tons of debris cascaded down the slope behind the La Conchita housing development.

Slope failures are associated with landslides, and occurred along shattered ridge crests of the Santa Susana Mountains during the 1994 Northridge Earthquake.

In 2011, the California Geological Survey (CGS) created the "Susceptibility to Deep-Seated Landslides" grip map, covering the entire state of California. The map shows the relative likelihood of deep landsliding based on a methodology developed by Wilson and Keefer (1985), and uses the following information:

- Landslide inventory, including all previously mapped deep-seated landslides in California (approximately 57,000) that were assigned the lowest value of rock strength.
- Geology from a general geologic statewide map and a detailed geologic map over the most populated areas.
- Rock strength to measure the resistance to landsliding, developed from geologic and landslide inventory maps. Geologic units were classified into three rock strength units: (1) highest rock strength unit, which includes crystalline rocks and well-cemented sandstones; (2) intermediate rock strength unit, including weakly cemented sandstones; and (3) weakest rock strength unit, including shale, claystone, pre-existing landslides, and unconsolidated surficial units.
- Slope, including eight slope classes ranging from nearly flat (less than 3 degrees) to very steep (greater than 40 degrees).
- Average annual rainfall in inches.
- Earthquake shaking potential.

As shown on Figure 11-3, the factors listed above were combined to create classes of landslide susceptibility. These classes express the generalization that on very low slopes, landslide susceptibility is low even in weak materials, and that landslide susceptibility increases with slope and in weaker rocks. Very high landslide susceptibility—classes VIII, IX, and X—includes very steep slopes in hard rocks and moderate to very steep slopes in weak rocks. In Ventura County, areas most susceptible to landslide are generally located on the edge of cities, outside of the cities, and in the northern portion of the county. Each city in the county, with the exception of Port Hueneme, has some land mass in the class VII, IX, and X landslide susceptibility zones. Approximately 1,110 square miles of Ventura County located in the Very High Landslide Susceptibility area, including 175 square miles in class VIII, 670 square miles in class IX, and 265 square miles in class X.

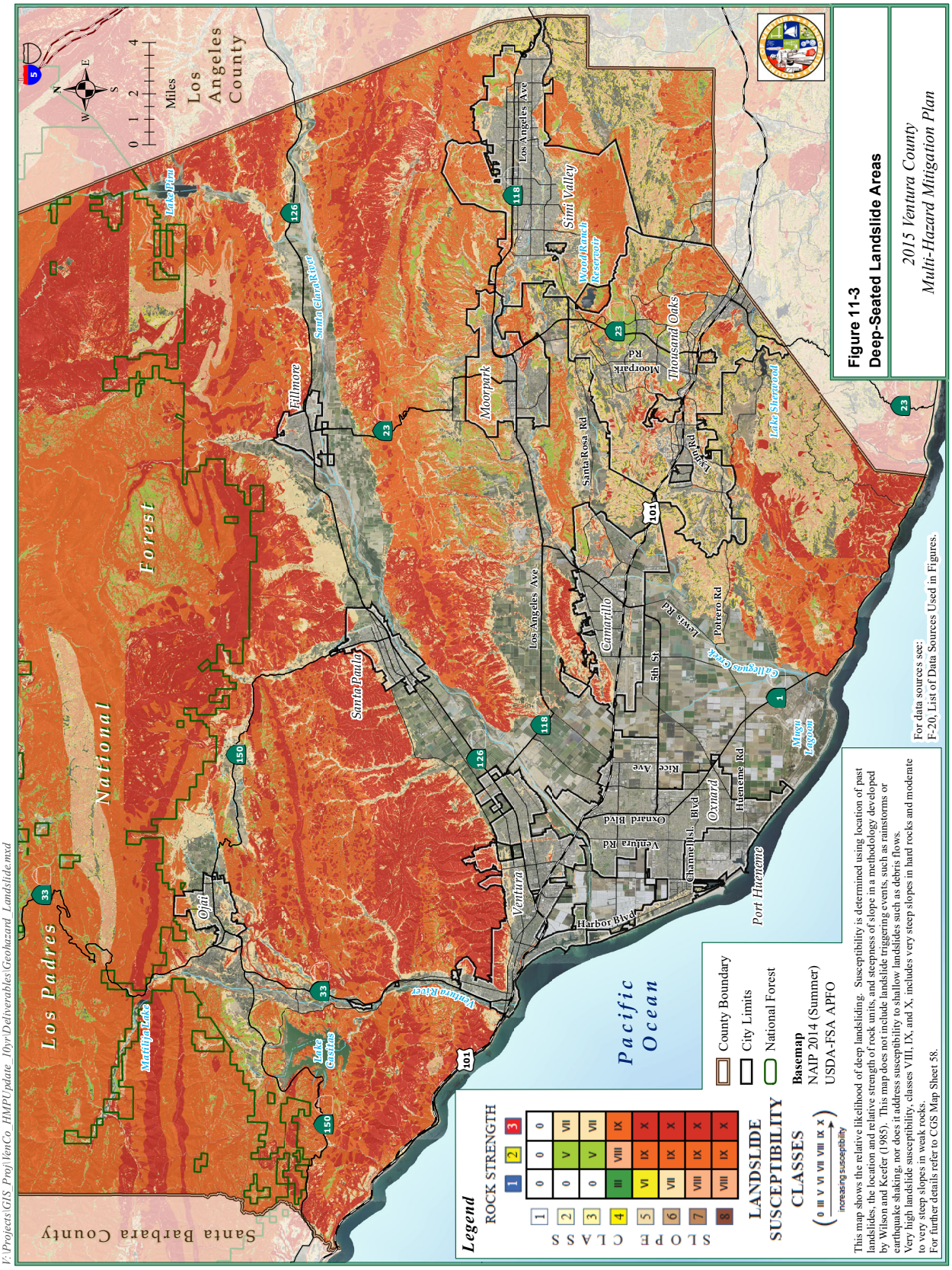


Figure 11-3
Deep-Seated Landslide Areas
2015 Ventura County
Multi-Hazard Mitigation Plan
Legend
ROCK STRENGTH
SLOPE CLASS
LANDSLIDE SUSCEPTIBILITY CLASSES
increasing susceptibility
County Boundary
City Limits
National Forest
Basemap
NAIP 2014 (Summer)
USDA-FSA APFO
Pacific Ocean
Los Padres National Forest
Santa Barbara County
Los Angeles County
Ventura
Santa Paula
Fillmore
Ojai
Port Hueneme
Oxnard
Camarillo
Moorpark
Simi Valley
Thousand Oaks
Lake Sherwood
Mugu Lagoon
Matilija Lake
Lake Piru
Lake Casitas
Santa Clara River
Ventura River
Miles
For data sources see:
F-20, List of Data Sources Used in Figures.
This map shows the relative likelihood of deep landsliding. Susceptibility is determined using location of past landslides, the location and relative strength of rock units, and steepness of slope in a methodology developed by Wilson and Keefer (1985). This map does not include landslide triggering events, such as rainstorms or earthquake shaking, nor does it address susceptibility to shallow landslides such as debris flows.
Very high landslide susceptibility, classes VIII, IX, and X, includes very steep slopes in hard rocks and moderate to very steep slopes in weak rocks.
For further details refer to CGS Map Sheet 58.
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Subsidence

"Subsidence" is any settling or sinking of the ground surface over a regional area arising from surface or subsurface causes, such as earthquakes or groundwater, or oil and gas extraction. The damage caused by subsidence is generally not of an immediate or violent nature. Except when prompted by seismic shaking, the compaction of alluvium and settling of the land surface is a process that occurs over several tens to thousands of years and over a large area.

Subsidence that results from groundwater withdrawal can be responsible for numerous structural effects. Most seriously affected are long, linear surface infrastructure facilities that are sensitive to slight changes in gradient or slope. Drainage courses, roads, rail lines, wells, oil/gas pipelines, and utility (water, gas, power, and sewer) lines are potentially the most vulnerable to damage. Basically, the process by which this most important type of subsidence occurs involves the extraction of a large quantity of water from an unconsolidated aquifer. As water is removed from the aquifer, the total weight of the overburden that the water used to help to support is placed on the alluvial structure; the overburden can then become compressed. If fine-grained silts and clays make up portions of the aquifer, the additional load can squeeze the water out of these layers and into the coarser grained portions of the aquifer. All of this compaction produces a net loss in volume and hence a depression in the land surface.

Several areas within Ventura County are experiencing subsidence due to groundwater extraction including the Oxnard Plain, the Las Posas Valley, and the Santa Clara River Valley.

Regulatory Setting

State

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Special Studies Zones Act was signed into law in 1972 (renamed the Alquist-Priolo Earthquake Fault Zoning Act in 1994). The Act's primary purpose is to mitigate the fault rupture hazard on human life and property by limiting the potential for siting human occupancy structures across an active fault trace.

The Act requires the State Geologist (Chief of the California Geological Survey) to delineate Earthquake Fault Zones along faults that are "sufficiently active and well defined." These faults show evidence of Holocene surface displacement along one or more of their segments (sufficiently active) and are clearly detectable by a trained geologist as a physical feature at or just below the ground surface (well defined). The boundary of an Earthquake Fault Zone is generally about 500 feet from major active faults, and 200 to 300 feet from well-defined minor faults. The Act dictates that cities and counties withhold development permits for sites within an Earthquake Fault Zone until geologic investigations demonstrate that the sites are not threatened by surface displacements from future faulting.

Alquist-Priolo maps are distributed to all affected cities and counties for planning and controlling new or renewed construction. Local agencies must regulate most development projects within these zones, including all land divisions and most structures for human occupancy. State law exempts single-family wood-frame and steel-frame dwellings less than three stories that are not part of a development of four units or more. However, local agencies can be more restrictive.

Seismic Hazards Mapping Act

The Alquist-Priolo Earthquake Fault Zoning Act addresses the hazard of surface fault rupture but is not directed toward other earthquake hazards. Recognizing this, the State passed the Seismic Hazards Mapping Act (SHMA) in 1990, which addresses non-surface fault rupture earthquake hazards, including strong ground shaking, liquefaction and seismically induced landslides. The California Geological Survey (CGS) is the principal state agency charged with implementing the Act. Pursuant to the SHMA, the CGS is directed to provide local governments with seismic hazard zone maps that identify areas susceptible to liquefaction, earthquake-induced landslides and other ground failures. The goal is to minimize loss of life and property by identifying and mitigating seismic hazards. The seismic hazard zones delineated by the CGS are referred to as "zones of required investigation." Site-specific geological hazard investigations are required by the SHMA when construction projects fall within these areas.

Pursuant to the 1990 SHMA, the CGS has been releasing seismic hazards maps since 1997, with emphasis on the large metropolitan areas of Los Angeles, Orange, and Ventura counties. To date, the CGS has collected data for "zones of required investigation" for most of the county.

California Building Code

The California Building Standards law states that every local agency enforcing building regulations must adopt the provisions of the California Building Code (CBC) within 180 days of its publication; however, each jurisdiction can require more stringent regulations issued as amendments to the CBC. The publication date of the CBC is established by the California Building Standards Commission and the code is known as Title 24 of the California Code of Regulations. In the past, the CBC was modeled on the Uniform Building Code (UBC); however, beginning with the 2007 version, the CBC is now modeled after the International Building Code (IBC). Building codes provide minimum requirements to prevent major structural failure and loss of life related to floods, fires, and earthquakes.

The County of Ventura adopted the 2013 CBC through Ordinance 4456 on January 9, 2014. The 2013 CBC bases its seismic design criteria on maximum considered ground motion through maps prepared by the United States Geological Survey (USGS) for the National Seismic Hazard Mapping Program (see Section 1613). Chapter 18 (Soils and Foundations) and Appendix J (Grading) of the 2013 CBC have also been adopted by the County to establish grading and foundation standards. Standards include requirements for excavation, fill, footings, retaining walls, and pier and pile foundations. Pursuant to the CBC, soils reports are required to be submitted prior to issuance of grading or depending on the permit type, other permits that allow ground disturbance.

Real Estate Disclosure Act

Since June 1, 1998, the Natural Hazards Disclosure Act has required that sellers of real property and their agents provide prospective buyers with a *Natural Hazard Disclosure Statement* when the property being sold lies within one or more State-mapped hazard areas. If a property is located in a Seismic Hazard Zone as shown on a map issued by the State Geologist, the seller or the seller's agent must disclose this fact to potential buyers. The law specifies two ways that this disclosure can be made. One is to use the Natural Hazards Disclosure Statement as provided in Section 1102.6c of the California Civil Code. The other way is to use the Local Option Real Estate Disclosure Statement as provided in Section 1102.6a of the California Civil Code. The Local Option Real Estate Disclosure Statement can be substituted for the Natural Hazards Disclosure Statement only if the Local Option Statement contains substantially the same information and substantially the same warning as the Natural Hazards Disclosure Statement.

Unreinforced Masonry Laws

Enacted in 1986, the Unreinforced Masonry Law (Section 8875 et seq. of the California Government Code) required all cities and counties in Seismic Zone 4 (zones near historically active faults) to identify potentially hazardous unreinforced masonry (URM) buildings in their jurisdictions, establish a URM loss reduction program, and report their progress to the State by 1990. The owners of such buildings were to be notified of the potential earthquake hazard these buildings pose.

Local

2005 Ventura County General Plan

The General Plan covers geologic and seismic hazards in Chapter 2, Hazards. Sections 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, and 2.8 includes goals, policies, and programs related to geologic and seismic hazards. The following Area Plans also contain applicable goals and policies related to geologic and seismic hazards:

- Coastal Area Plan;
- Oak Park Area Plan;
- Ojai Valley Area Plan;
- Piru Area Plan; and
- Lake Sherwood/Hidden Valley Area Plan.

2011 Initial Study Assessment Guidelines

The Initial Study Assessment Guidelines include criteria for evaluating environmental impacts for geologic and seismic hazards. These can be found in the following sections: 10. Fault Rupture Hazard; 11. Ground Shaking Hazard; 12. Liquefaction Hazards; 13. Seiche and Tsunami Hazards; 14. Landslide/Mudflow Hazards; 15. Expansive Soil Hazards; and 16. Subsidence Hazard.

2016 Coastal Zoning Ordinance

The Coastal Zoning Ordinance regulates geologic and seismic hazards through Section 8178-4 Mitigation of Potential Hazards

Key Terms

Alluvium. Loose, unconsolidated soil or sediments, which has been eroded, reshaped by water in some form, and redeposited in a non-marine setting.

Anticline. Anticlines are folds in which each half of the fold dips away from the crest.

Fluvial. Refers to processes associated with rivers and streams and the deposits and landforms created by them.

Holocene. The geological epoch that began after the Pleistocene at approximately 9,700 BCE (before common era) and continues to the present time.

Liquefaction. The process by which water-saturated, unconsolidated sediments are transformed into a substance that acts like a liquid, often in an earthquake.

Pleistocene. The geological epoch that lasted from about 2,588,000 to 11,700 years ago, spanning the earth's recent period of recent glaciations.

Quaternary. The current and most recent of the three periods of the Cenozoic Era. It follows the Neogene Period and span from 2.588 (±0.005) million years ago to the present time. The Quaternary period is divided into two epochs: the Pleistocene and the Holocene.

References

Reports/Publications

California Department of Conservation: California Geological Survey. Seismic Hazard Zone Report for the Ventura 7.5-Minute Quadrangle, Ventura County, California. 2003.

California Department of Conservation, Division of Mines and Geology. Seismic Hazard Zone Report for the Camarillo 7.5-Minute Quadrangle, Ventura County, California. Seismic Hazard Zone Report 054, 2002.

California Division of Mines and Geology, Fault Evaluation Report FER-29. February 25, 1977.

California Division of Mines and Geology, Fault Evaluation Report FER-36. April 18, 1977.

California Division of Mines and Geology, Fault Evaluation Report FER-55. June 9, 1977.

California Division of Mines and Geology, Fault Evaluation Report FER-66. May 19, 1977.

California Division of Mines and Geology, Fault Evaluation Report FER-237. September 23, 1997.

Ventura, County of. Ventura County General Plan: Coastal Area Plan. Last Amended by the Ventura County Planning Division September 16, 2008.

Ventura, County of. Ventura County Multi-Hazard Mitigation Plan. September 2015.

Pidwirny, Michael. Fundamentals of Physical Geography. 2nd ed. Erosion and Deposition. University of British Columbia, Okanagan. 2006.

Websites

California Department of Conservation, CGS Information Warehouse: Regulatory Maps. http://maps.conservation.ca.gov/cgs/informationwarehouse/, July 2016.

California Department of Conservation: Regional Geologic Hazards and Mapping Program. http://www.conservation.ca.gov/cgs/rghm/ap, March 2016.

California Institute of Technology, Southern California Earthquake Data Center, Significant Earthquakes and Faults. http://scedc.caltech.edu/significant/fault-index.html, July, 2016.

EQE Consultants. The January 17, 1994 Northridge, CA Earthquake, An EQE Summary Report, March 1994. http://www.lafire.com/famous_fires/1994-0117_NorthridgeEarthquake/quake/02_EQE_geology.htm, January, 2017.

U.S. Geological Survey, Earthquake Hazards Program, Quaternary Fault and Fold Database of the United States. http://geohazards.usgs.gov/cfusion/qfault/query_main_AB.cfm, July 2016.

SECTION 11.2 FLOOD HAZARDS

Introduction

This section addresses the flood hazard conditions within Ventura County and the potential risk these conditions pose. Existing and potential problems related to flood hazards include annual flooding, dam failure, and seismic-induced flooding. This section summarizes the flood hazard conditions for the County of Ventura, which include the following areas of concern:

- General Flooding
- Dam Failure Inundation
- Levee Failure Inundation
- Post-Fire Debris Flow
- Tsunami

These summaries are derived from the County's 2015 Multi-Hazard Mitigation Plan (VCMHMP). Consistent with the VCMHMP, each section includes explanations of the nature, history, location, extent, and probability associated with each type of flood hazard.

Major Findings

- Three types of flood risk have been mapped in Ventura County: upland, broad floodplain, and coastal. The Ventura County Digital Flood Insurance Rate Map (DFIRM) identifies the following Special Flood Hazard Area (SFHAs): 7.8 square miles in the 100-year "coastal high hazard" flood zone; 78.4 square miles in the 100-year flood zone; and 51.7 square miles in the 500-year flood zone.
- According to the Federal Emergency Management Agency's (FEMA) definition, ten dams in Ventura County are considered high hazard (i.e., over 1,000 acre-feet of storage capacity). Eight of these are under State jurisdiction and are inspected annually to ensure that they are in good operating condition. There is no record of a failure of any dam located in Ventura County.
- The Ventura County Watershed Protection District (VCWPD) monitors nine provisionally accredited levees (PALs) in the Calleguas Creek, Santa Clara River, and Ventura River watersheds. Most of these levees, which protect a total 5.2 square miles of land in the county, require rehabilitation to be fully compliant with FEMA levee certification regulations.
- Because of its history of wildfires, Ventura County is susceptible to potentially hazardous debris flows. The susceptibility affects areas adjacent to and downslope of these burn areas, especially in locations that are in ravines and canyons, and at the mouths of canyons.
- Coastal areas in Ventura County are subject to inundation resulting from tsunamis, including areas within the cities of Oxnard, Port Hueneme, and Ventura and unincorporated areas south of Ormond Beach and around Mugu Lagoon.

Existing Conditions

General Flooding

Nature

A flood occurs when the existing channel of a stream, river, canyon, or other watercourse cannot contain excess runoff from rainfall or snowmelt, resulting in overflow onto adjacent lands. Flooding can also occur in areas in low lying areas that have no outlet. In coastal areas, flooding may occur when high winds or tides result in a surge of seawater into areas that are above the normal high tide line.

A floodplain is the area adjacent to a watercourse or other body of water that is subject to recurring floods. Floodplains may change over time as a result of natural processes, changes in the characteristics of a watershed, or human activity such as construction of bridges or channels. In areas where flow contains a high sediment load, such as along the Santa Clara River in Ventura County, the course of a river or stream may shift dramatically during a single flood event. Coastal floodplains may also change over time as waves and currents alter the coastline. Secondary hazards from floods can include the following:

- Erosion or scouring of stream banks, roadway embankments, foundations, footings for bridge piers, and other features.
- Impact damage to structures, roads, bridges, culverts, and other features from high-velocity flow and from debris carried by floodwaters. Such debris may also accumulate on bridge piers and in culverts, increasing loads on these features or causing overtopping or backwater effects.
- Destruction of crops, erosion of topsoil, and deposition of debris and sediment on croplands.
- Release of sewage and hazardous or toxic materials when wastewater treatment plants are inundated, storage tanks are damaged, and pipelines are severed.

In areas such as Ventura County that do not have extended periods of below-freezing temperatures or significant snowfall, floods usually occur during the season of highest precipitation or during heavy rainfalls after prolonged dry periods. Ventura County is dry during the late spring, summer, and early fall and receives most of its rain during the winter months. The rainfall season extends from October 1st through April 15th, with approximately 95 percent of the annual rainfall occurring during this period. The average annual rainfall in Ventura County ranges from less than 8 inches in the Cuyama Valley in northwestern Ventura County to 38 inches in the Ventura River watershed west of Ojai (as measured in the general area of Matilija Dam). Along the coast near Oxnard, Ventura, Simi Valley, and Thousand Oaks, the average rainfall is approximately 14 inches.

The prevailing weather patterns during the winter and the orientation of the mountain ranges in the northern half of the county combine to produce extremely high-intensity rainfall. The peak historic rainfall intensity recorded by a Ventura County rain gage occurred on February 12, 1992. A rainfall intensity of approximately 4 inches per hour was measured during a 15-minute period at the Wheeler Gorge gage, approximately 3 miles northeast of Matilija Dam. Such intensities can produce severe flooding conditions, particularly in small watersheds where flash floods are likely.

Flash floods are particularly dangerous. The National Weather Service (NWS) defines a flash flood as one in which the peak flow travels the length of a watershed within a 6-hour period. These floods arise when

storms produce a high volume of rainfall in a short period over a watershed where runoff collects quickly. They are likely to occur in areas with steep slopes and sparse vegetation. They often strike with little warning and are accompanied by high-velocity flow.

History

Damaging floods in Ventura County were reported as early as 1862. A 1945 report by the Ventura County Flood Control District reported that floods of sufficient magnitude to cause extensive damage occurred in 1862, 1867, 1884, 1911, 1914, 1938, 1941, 1943, and 1944.

The largest and most damaging natural floods recorded in the Santa Clara and Ventura watersheds occurred in January and February of 1969. The January flood was a result of the highest monthly precipitation total ever recorded in Ventura County at that time. The February flood was a result of intense rainfall similar in magnitude to the rainfall that caused the record-breaking flood in January. The combined effects of the 1969 floods were disastrous: 13 people lost their lives, and property damage was estimated at $60 million (1969 dollars). Homes in Casitas Springs, Live Oak Acres, and Fillmore were flooded, and 3,000 residents in Santa Paula and several families in Fillmore were evacuated twice. A break in the Santa Clara River levee threatened the City of Oxnard. Agricultural land, primarily citrus groves, was seriously damaged or destroyed. All over the county, transportation facilities, including roads, bridges, and railroad tracks, were damaged. The Fillmore, Oak View, and Ventura sewage treatment plants were severely damaged and dumped raw sewage into the Santa Clara and Ventura rivers. The untreated sewage polluted the rivers and the beaches at their outlets into the ocean. In addition, sewer trunk lines were broken along the Ventura River and its tributary, San Antonio Creek. Suspended sediment concentrations and discharge in many streams greatly exceeded any previously measured levels in the flood-affected areas. Suspended sediment concentrations reached a maximum of about 160,000 milligrams per liter in the Santa Clara River at Saticoy, and the maximum daily sediment discharge was 20 million tons during the storm peak.

In 1980, Calleguas Creek breached its levee in the Oxnard Plain and caused approximately $9 million (in 1980 dollars) in damage to the Point Mugu Naval Base from flooding and sediment deposition. In addition, approximately 1,500 acres of farmland were covered by floodwaters. The peak discharge was 9,310 cubic feet per second at the Madera Road Bridge in Simi Valley.

In 1983, a federal disaster was declared because of storm damage. Repairs to flood-control facilities have been estimated to cost $15 million (in 1983 dollars). Improved channels in Moorpark and Simi Valley suffered severe damage from erosion during this event, and Calleguas Creek experienced record flooding. Damage to other public and private facilities has been estimated at approximately $39 million, with little more than half of that total due to damage to agricultural lands.

Table 11-1 details the major flood events to affect Ventura County over the past 20 years.

TABLE 11-1 MAJOR DISASTER DECLARATIONS FOR FLOODS, 1995-2015	
Date	**Description**
January 1995	On January 9 and 10, the region was subjected to an intense winter storm that produced more than 6 inches of rain in some areas. A major Disaster Declaration was declared for all but one county throughout California on January 10, 1995.
January through March 1995	A second powerful winter storm brought heavy rain, heavy snow, and strong winds throughout much of California from mid-January to mid-March. On January 13, a Major Disaster Declaration was declared for nearly half the counties in California.
December 1996 through January 1997	A series of subtropical storms hit California from late December through early January, resulting in one of the wettest Decembers on record. On January 4, 1997, a Major Disaster Declaration was declared for half of the counties in California, including Ventura County.
February 1998	El Niño conditions led to extensive flooding throughout California. A Major Disaster Declaration was declared for more than 30 counties, including Ventura County. Countywide damages exceeded $50 million.
December 2004 through January 2005	A powerful Pacific storm brought heavy rain, snow, flash flooding, high winds, and landslides to Central and Southern California. During the multi-day event, rainfall totals ranged from 3 to 10 inches over coastal areas, with up to 32 inches in the mountains. A Major Disaster Declaration was declared on February 4, 2005, for multiple counties, including Ventura County.

Location

Figure 11-4 shows the special flood hazard areas (SFHAs) in Ventura County, including 100- and 500-year flood zones according to the 2015 FEMA Digital Flood Insurance Rate Maps (DFIRMs). The areas of the county that are susceptible to flooding can be categorized into three types: upland, broad floodplains, and coastal, as described below.

Upland Flooding

The mountainous terrain of northern Ventura County and the hills in the central and eastern parts of the county give rise to numerous annual streams, many draining into steep canyons. These streams are subject to floods of relatively short duration, often following high-intensity rainfall. Such floods may occur with little warning and carry large quantities of sediment and debris. Communities adjacent to the upland areas, such as Fillmore, Ojai, Piru, and Santa Paula, are subject to this hazard. Many of the watersheds in question contain dams or basins designed to attenuate flow and trap debris, reducing the effects on downstream communities.

Broad Floodplains

The watersheds of the Santa Clara River (watershed area of 1,650 square miles), Ventura River (watershed area of 226 square miles), and Calleguas Creek (watershed area of 325 square miles) drain to the broad coastal plain in the southern part of Ventura County. This plain is subject to inundation during longer intervals of rain, typically as the result of a series of winter storms. These floods typically have longer duration and may be forecast with more warning time. The Santa Clara River Valley, which crosses central Ventura County, is also subject to flooding. Numerous levees have been built to protect the agricultural lands along the river; because of its sediment load, the river has historically migrated across the valley floor during flooding intervals. The levees are typically not sufficient to withstand severe flood events.

Figure 11-4
Special Flood Hazard Areas
Los Padres National Forest
Los Angeles County
Santa Barbara County
Pacific Ocean
Lake Piru
Santa Clara River
Fillmore
Santa Paula
Ventura River
Matilija Lake
Lake Casitas
Ojai
Ventura
Port Hueneme
Mugu Lagoon
Oxnard
Camarillo
Moorpark
Simi Valley
Thousand Oaks
Wood Ranch Reservoir
Lake Sherwood
Los Angeles Ave
Santa Rosa Rd
Moorpark Rd
Lewis Rd
5th St
Lewis Rd
Potrero Rd
Gabbieno Creek
Rice Ave
Oxnard Blvd
Hueneme Rd
Ventura Rd
Channel Is. Blvd
Harbor Blvd
0 1 2 4
Miles
N
W
E
S
Legend
FEMA Flood Zones DFIRM (March 19, 2015)
100-Year Floodplain
(1% Annual Chance Floodplain)
500-Year Floodplain
(0.2% Annual Chance Floodplain)
Area of Undetermined but Possible Flood Hazards
County Boundary
City Limits
National Forest
Basemap
NAIP 2014 (Summer) USDA-FSA APFO
For data sources see: F-20, List of Data Sources Used in Figures.

Coastal Flooding

The county's 43-mile coastline is subject to tidal flooding, storm surge, and wave action, all of which usually occur during winter storms. Areas that are susceptible to severe wave action are generally confined to a narrow area immediately adjacent to the tidal zone, including Sea Cliff Colony, Oxnard Shores, Silver Strand Beach, and several sections of U.S. 101 from Rincon Point to Emma Wood State Beach. However, the effects of coastal flooding can be severe—in addition to wave action, beach and bluff erosion can cause significant damage to coast-side homes and infrastructure. Coastal flooding may also occur as the result of tsunamis, which are waves, or series of waves, generated by an earthquake, landslide, volcanic eruption, or even large meteor hitting the ocean. In addition to flooding, winter coastal storms can cause coastal erosion along the shores of Ventura County. Coastal erosion is a natural process that occurs particularly in the winter, when coastal storms wear away land by wave action, tidal currents, or wave currents. Material deposited on beaches during the mild summer and fall months gets redistributed by the waves. According to City of Ventura engineers, the majority of the sand is pulled just off coast and then comes back to shore over time. Although most receding sand stays fairly close to shore, some sand is driven south by currents until it reaches Hueneme Canyon, a large deep-water depression near the Port of Hueneme.

The anticipated rise in sea levels will also impact coastal flooding. As discussed in Chapter 12 (Climate Change), the California Energy Commission has calculated sea-level estimates due to the impacts of climate change. Ventura County could experience coastal erosion of up to 1.4 meters per year (approximately 4.6 feet), by 2100 as a result of sea-level rise and related coastal flooding.

Potential climate impacts due to sea-level rise and storm events in Ventura County include:

- more frequent flooding events due to rising sea levels;
- more extensive and longer duration of flooding;
- permanent inundation in coastal areas due to higher ocean levels and shifts in the tidal range;
- increased shoreline erosion; and
- elevated groundwater levels and salinity intrusion.

Critical infrastructure within the county, including 170 miles of roads and railways, hospitals, schools, emergency facilities, wastewater treatment plants, three power plants, and facilities and structures at Naval Base Ventura County, will be at increased risk of inundation, as will wetland areas and other natural ecosystems. In addition, the cost of replacing property at risk of coastal flooding with a 1.4-meter rise in sea levels is projected at $2.2 billion (in year 2000 dollars) (CEC 2009).

Notably, FEMA released preliminary flood maps for coastal areas of Ventura County in April 2017 and initiated a 90-day Appeal Period, which started in June 2017 and ended in September 2017. FEMA is tentatively anticipating making map changes effective in July 2018. FEMA initiated the California Coastal Analysis and Mapping Project (CCAMP) in December 2011 to restudy coastal flooding risks in all 15 California open Pacific coastal counties. Results from the study are used to remap the coastal flood risk and wave hazards for the entire California coastline. In Ventura County, new flood hazard zones, floodplain boundaries, and coastal base flood elevations for the cities of Ventura, Oxnard, and Port Hueneme, Point Mugu Naval Base, and county unincorporated areas are presented in the revised Flood Insurance Study Report and on the preliminary flood maps. (More information about the updated FEMA maps is available at **www.r9map.org**.)

Unmapped Flood Hazards

Unmapped flood hazard areas include numerous small channels. Agricultural drainage ditches and urban drains cover much of the flatter parts and urban areas of Ventura County. Flooding in these areas is due to high-intensity rainfall occurring over a very short period. The flooding is usually shallow and mainly affects roadways and other low-lying areas. In particular, the Hollywood Beach and Silver Strand residential coastal communities have historically experienced localized flooding conditions primarily due to inadequate storm drainage infrastructure and topography (hence, the "Zone B"/"Zone X-Shaded" FEMA designations on the Flood Insurance Rate Maps [FIRMs] / Digital Flood Insurance Rate Map [DFIRMs]). These residential coastal communities, (which are largely built out) are not currently mapped by FEMA in the "Zone VE" coastal high hazard Special Flood Hazard Area (SFHA). These communities have historically been mapped by FEMA as a Zone B and most recently under the DFIRMs as a Zone X-Shaded (500-year floodplain). Other unmapped hazards include debris flows in the Coastal Mountain areas that can occur after saturation of the surface and intense rainfall storms that deliver 2-inch per hour intensities. Examples are in the Casitas Springs area and the La Conchita Community.

Extent

The magnitude of flooding that is used as the standard for floodplain management in the United States is a flood with a probability of occurrence of one percent in any given year. This flood is also known as the 100-year flood or the base flood. The most readily available source of information regarding the 100-year flood, as well as the 500-year flood, is on the FIRMs prepared by FEMA. These maps are used to support the National Flood Insurance Program (NFIP) described in more detail in the Regulatory Setting section below.

FEMA has recently prepared and updated countywide DFIRM and a Flood Insurance Study (FIS) for the unincorporated areas of Ventura County and for each incorporated city in the county. Figure 11-4 shows the SFHAs identified in the Ventura County DFIRM. The Ventura County DFIRM identifies the following SFHAs: 7.8 miles in the 100-year "coastal high hazard" flood zone; 78.4 square miles in the 100-year flood zone; and 51.7 square miles in the 500-year flood zone.

Probability of Future Events

On average, floods causing major damage within Ventura County occur every 5 years.

Dam Failure Inundation

Nature

Dam failure involves unintended releases or surges of impounded water, resulting in downstream flooding. The high-velocity, debris-laden wall of water released from dam failure results in the potential for human casualties, economic loss, disruption of lifelines (e.g., electric, water, transportation, and emergency service systems), and environmental damage. Although dam failure may involve the total collapse of a dam, this is not always the case, because damaged spillways, overtopping from prolonged rainfall, or other problems—including the unintended consequences from normal operations—can result in the creation of a hazardous situation. Because they occur without advance warning, failures from natural events such as earthquakes or landslides may be particularly severe. Dam failure may be caused by a variety of natural events, human-caused events, or a combination thereof. Dam failure usually occurs when the spillway capacity is inadequate and water overtops the dam, or when internal erosion through the dam foundation occurs (also known as piping). Factors contributing to dam failure events may include structural deficiencies from poor initial design or construction, lack of maintenance or repair, and the gradual weakening of the dam through the normal aging process.

History

There is no record of a failure of any dam located in Ventura County. The 1928 failure of the St. Francis Dam in Los Angeles County, however, had catastrophic effects in Ventura County. The dam, located in the San Francisquitos Canyon in the Santa Clara River watershed, was constructed to provide 38,000 acre-feet of storage for water from the Los Angeles–Owens River Aqueduct. The collapse of the dam occurred after the newly constructed concrete-arch dam was completely filled for the first time. The resulting flood swept through the Santa Clara Valley in Ventura County toward the Pacific Ocean, about 54 miles away. At its peak, the wall of water was reported to be 78 feet high; by the time it hit Santa Paula, 42 miles south of the dam, the water was estimated to be 25 feet deep. Almost everything in its path was destroyed, including structures, railways, bridges, livestock, and orchards. By the time the flood subsided, parts of Ventura County lay under 70 feet of mud and debris. Nearly 500 people were killed, and damage estimates exceeded $20 million. The communities of Piru, Fillmore, Santa Paula, Bardsdale, Saticoy, Montalvo, and El Rio sustained extensive life and property loss from the flood.

Location

Table 11-2 shows the name, year built, capacity, type, and inundation area for the dams that constitute failure hazards for Ventura County. Figure 11-5 shows the name, location, and extent of the dam failure inundation areas for every dam failure that would affect Ventura County. Clearly, it is not anticipated that every dam would fail at the same time. Rather, this map is intended to provide an approximate assessment of total risk for the county. Figure 11-6 illustrates dam failure inundation areas for particular dams. In some instances, if one dam fails there is potential that another dam downstream will also fail. For instance, according to the 2015 Ventura County Multi-Hazard Mitigation Plan, if the Pyramid Dam fails, the Santa Felicia Dam will likely fail too. Figure 11-6 does not illustrate cumulative effects. Additional information on specific dam inundation areas may be obtained from the agency that owns the dam. The map shows that dam failures may occur outside Ventura County but still pose a threat of inundation within the county. In particular, if dams in the Santa Clara River watershed in Los Angeles County fail, the resulting flood would affect the Santa Clara River corridor, which includes the cities of Santa Paula and Oxnard, as demonstrated by the 1928 St. Francis dam failure described above.

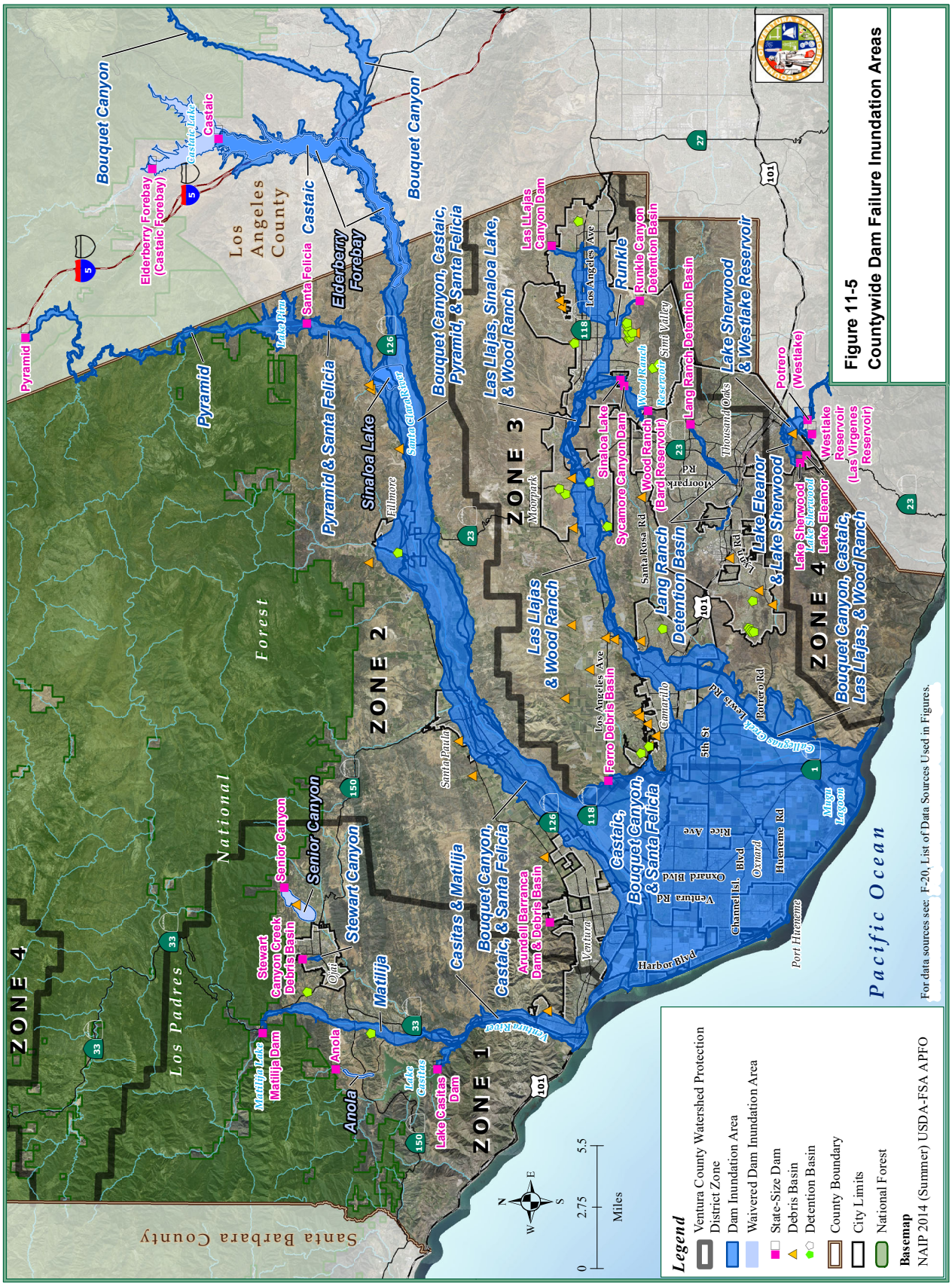
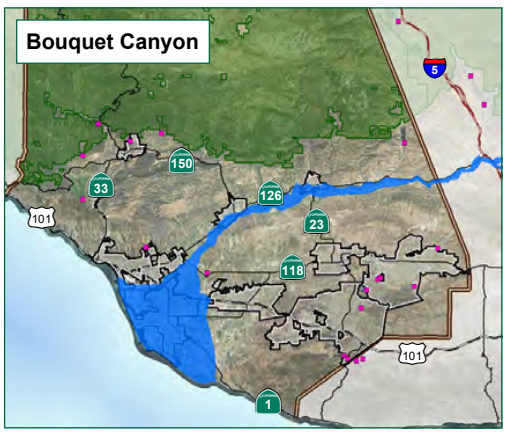
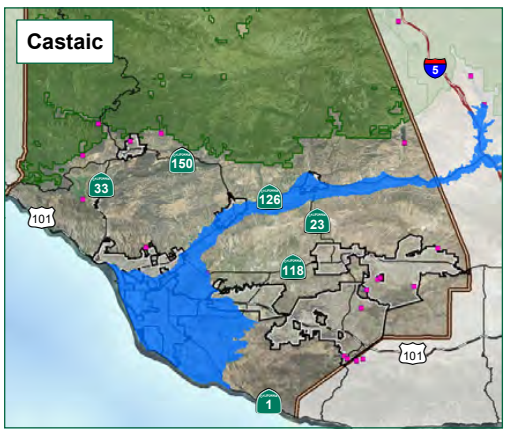
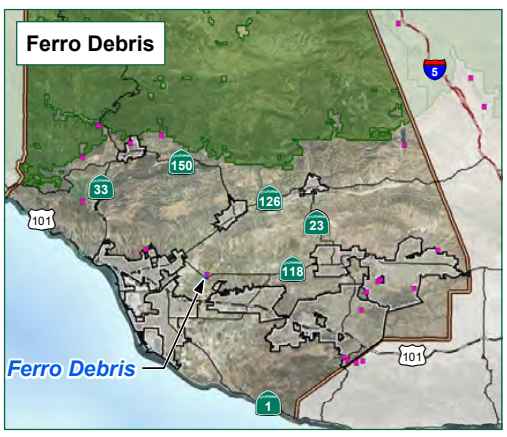
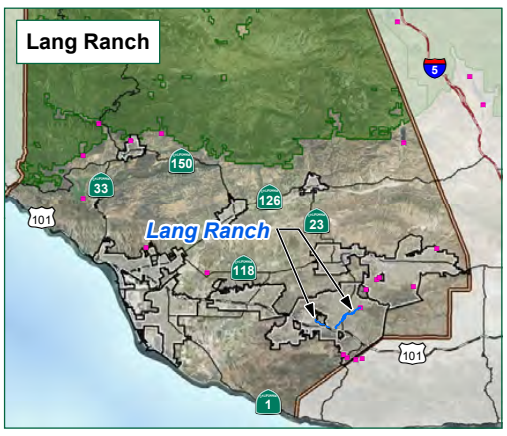


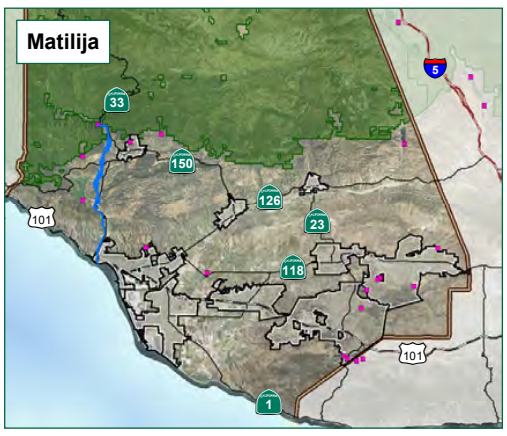
Figure 11-5
Countywide Dam Failure Inundation Areas
Legend
Ventura County Watershed Protection District Zone
Dam Inundation Area
Waivered Dam Inundation Area
State-Size Dam
Debris Basin
Detention Basin
County Boundary
City Limits
National Forest
Basemap
NAIP 2014 (Summer) USDA-FSA APFO
For data sources see: F-20, List of Data Sources Used in Figures.
Miles
ZONE 1
ZONE 2
ZONE 3
ZONE 4
Los Padres National Forest
Los Angeles County
Santa Barbara County
Pacific Ocean
Bouquet Canyon
Castaic
Castaic Lake
Elderberry Forebay (Castaic Forebay)
Pyramid
Pyramid Lake
Santa Felicia
Elderberry Forebay
Pyramid & Santa Felicia
Sinaloa Lake
Santa Clara River
Bouquet Canyon, Castaic, Pyramid, & Santa Felicia
Las Llajas, Sinaloa Lake, & Wood Ranch
Las Llajas Canyon Dam
Runkle
Runkle Canyon Detention Basin
Los Angeles Ave
Simi Valley
Moorpark
Sinaloa Lake
Sycamore Canyon Dam
Wood Ranch
Wood Ranch (Bard Reservoir)
Lang Ranch Detention Basin
Thousand Oaks
Lake Sherwood & Westlake Reservoir
Potrero (Westlake)
Westlake Reservoir (Las Virgenes Reservoir)
Las Llajas & Wood Ranch
Santa Rosa Rd
Lang Ranch Detention Basin
Lake Eleanor & Lake Sherwood
Lake Sherwood
Lake Eleanor
Bouquet Canyon, Castaic, Las Llajas, & Wood Ranch
Ferro Debris Basin
Los Angeles Ave
Camarillo
Potrero Rd
Calleguas Creek
Lewis Rd
5th St
Rice Ave
Oxnard Blvd
Channel Isl. Blvd
Ventura Rd
Harbor Blvd
Oxnard
Hueneme Rd
Port Hueneme
Mugu Lagoon
Castaic, Bouquet Canyon, & Santa Felicia
Bouquet Canyon, Castaic, & Santa Felicia
Arundell Barranca Dam & Debris Basin
Ventura
Ojai
Santa Paula
Casitas & Matilija
Stewart Canyon
Senior Canyon
Stewart Canyon Debris Basin
Matilija
Matilija Lake
Matilija Dam
Anola
Lake Casitas
Lake Casitas Dam
Ventura River

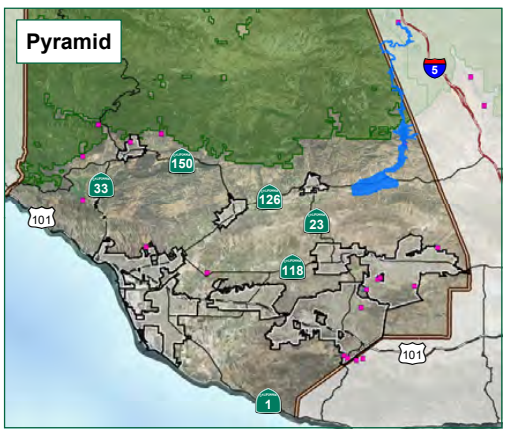


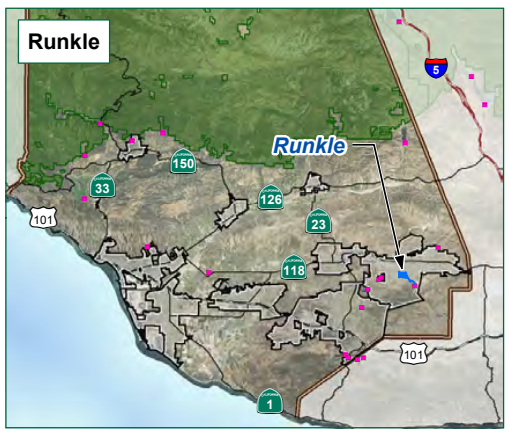


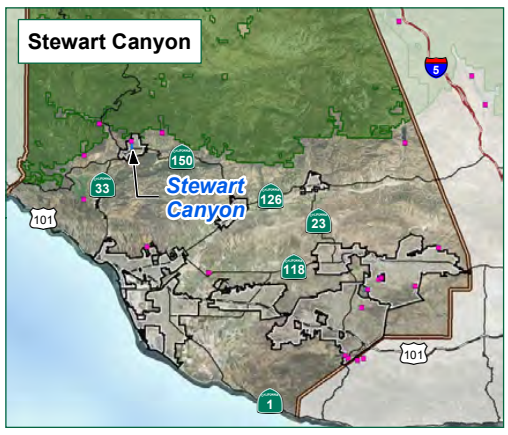


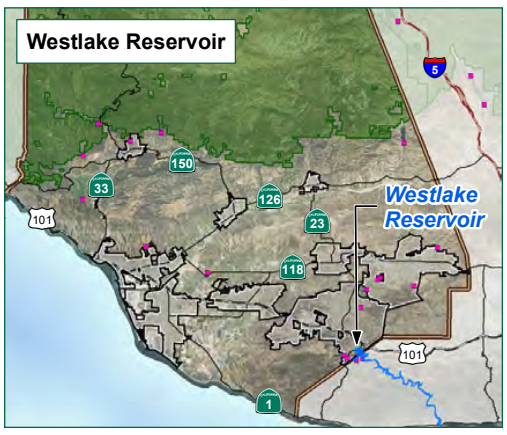


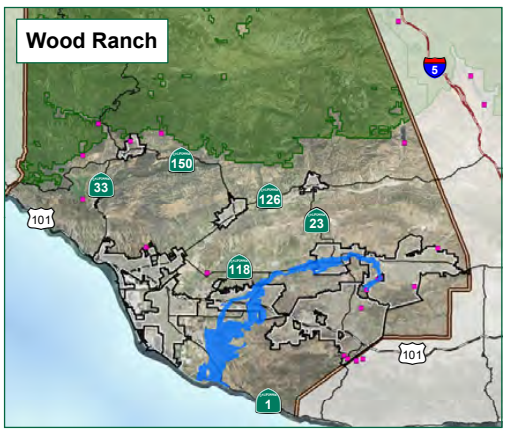


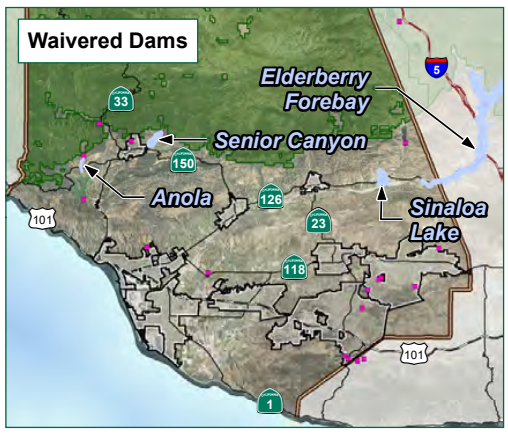












Legend

- Dam Inundation Area
- Waivered Dam Inundation Area
- State-Size Dam
- County Boundary
- City Limits
- National Forest

Basemap
NAIP 2014 (Summer) USDA-FSA APFO

0 4 8 16
Miles

N W E S

Figure 11-6
Individual Dam Failure Inundation Areas

For data sources see: F-20, List of Data Sources Used in Figures.

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TABLE 11-2
DAMS UNDER STATE OR FEDERAL JURISDICTION WITH INUNDATION AREAS
Ventura County

Dam	Year Built	Capacity (Acre Feet)	Height (Feet)	Type	Inundation Area (Sq. Mi.)
Bouquet Canyon	1934	36,505	190	earth	109.67
Casitas	1958	254,000	279	earth	5.09
Castaic	1973	323,700	340	earth	163.41
Ferro Debris	1986	24	45	earth	0.06
Lake Eleanor 1763	N/A	128	37	earth	0.32
Lake Sherwood	1904	2,694	45	constant radius arch	2.01
Lang Creek Detention Basin	2004	263	67	earth	0.48
Las Llajas	1981	1,250	96	earth	8.13
Matilija	1949	1,800	163	variable radius arch	3.85
Pyramid	1973	178,700	386	earth and rock	13.94
Runkle	1949	100	41	earth	0.65
Santa Felicia Dam	1955	100,000	213	earth	121.19
Sinaloa Lake	1925	205	30	earth	2.32
Stewart Canyon Debris Basin	1963	67	34	earth	0.06
Westlake Reservoir	1972	9,200	158	earth	2.65
Wood Ranch	1965	11,000	146	earth	33.61

Source: DSOD 2015.

Extent

FEMA characterizes a dam as a high hazard if it stores more than 1,000 acre-feet of water, is taller than 150 feet, and has the potential to cause downstream property damage. The hazard ratings for dams are set by FEMA and confirmed with site visits by engineers. Most dams in the county are characterized by increased hazard potential because of downstream development and increased risk as a result of structural deterioration or inadequate spillway capacity.

The Division of Safety of Dams (DSOD) regulates state-size dams and inspects them annually to ensure that they are in good operating condition. Also, as required by DSOD regulations, the flood inundation limits resulting from a dam breach during the design storm (probable maximum precipitation) are established for each state-size dam. The resultant maps contain flood-wave arrival time estimates and flood inundation areas. These maps are developed by Cal Office of Emergency Services (OES) and provided to DSOD and local communities. Inundation areas are shown in Table 11-2.

Probability of Future Events

The probability of dam failure inundation is unknown, but such an event would likely be the result of an extreme storm.

Levee Failure Inundation

Nature

Levees are typically earthen embankments designed to contain, control, or divert the flow of water to provide some level of protection from flooding. Some levee systems are built for agricultural purposes and provide flood protection and flood loss reduction for farm fields and other land used for agricultural purposes. Urban levee systems are built to provide flood protection and flood loss reduction for population centers and the industrial, commercial, and residential facilities within them.

Levees are designed to provide a specific level of flood protection. Agricultural levee systems provide a level of protection that is appropriate based on the value of the assets being protected. Because urban levee systems are designated to protect urban areas, they are generally built to higher standards. Urban levee systems that are shown to provide protection from a one percent annual chance flood occurrence event on a FEMA FIRM must document ongoing compliance with the FEMA Levee Certification requirements found in Section 65.10 of the NFIP regulations (i.e., 44 CFR 65.10). No levee system provides full protection from all flooding events to the people and structures located behind it. Some level of flood risk exists in the levee-affected areas.

Levee failure is the overtopping, breach, or collapse of a levee wall. Levees can fail because of an earthquake, internal erosion, seepage, poor engineering/construction or maintenance, or landslides, but levees most commonly fail as a result of significant flows. During heavy precipitation periods or sudden melting of accumulated snow, excessively large flows may overtop levee sections and cause failure. The overflow of water washes away the top portion of the levee, creating deep grooves. Eventually, the levee weakens, resulting in a breach or collapse of the levee wall and the release of uncontrollable amounts of water.

History

The floods of January and February 1969 were the most damaging floods along the Santa Clara River in Ventura County. The estimated peak discharge of the 1969 flood was 165,000 cubic feet per second (cfs), before the gage data adjustment referenced in the Ventura County hydrology report titled *Santa Clara River 2006 Hydrology Update: Phase I, From Ocean to County Line* (VCWPD 2006) was performed.

The following excerpts taken from the United States Army Corps of Engineers (USACE) report entitled *Floods in Southern California during January and February 1969* (USACE 1969) document the significant damage that occurred to the SCR-1 Levee protecting Oxnard, specifically within the reach from Highway 118 to Highway 101.

> *"The only significant damage that occurred during this reach during the January (1969) flood was damage to the revetment of an existing levee constructed by the Corps of Engineers. February flood flows washed out about 500 feet of State Route 118 Bridge, damaged agricultural properties constructed by the Corps of Engineers. ... The flood eroded the south bank (of the Santa Clara River) near the existing Corps levee, damaging some groins; then deflected, ricocheted from the State Route 118 bridge, and returned to the south bank – where the flood flows cut in close to the Corps levee, bounced off the north bank, and carved a long arch. The flood flows then deflected to south bank where they undercut the toe protection on the Corps levee, causing the failure of about 2,000 feet of levee and eroding the ground behind the levee for a distance of about 100 feet."*

After the 1969 flood, USACE repaired the resulting damage (completed in 1971). In December 1985, the VCWPD completed additional repairs in the vicinity of the 1969 levee failure location. The damage repaired in 1985 may have been due to the 1983 flood, which had a peak discharge of 100,000 cfs. The damage was likely due to the low-flow channel encroaching and washing out parts of the levee. The repair included removal of approximately two feet of existing rock and placement of two tons of rock riprap back to the original design dimensions and backfilling the uncompacted fill. This is the only known non-Corps stone that has been added to the SCR-1 Levee.

Location

In November 2009, the VCWPD completed federally-mandated engineering evaluations of nine provisionally accredited levees (PALs) within the Calleguas Creek, Santa Clara River, and Ventura River watersheds. At that time, VCWPD submitted Levee Certification Report (LCR) compliance documentation packages to FEMA for three of the nine PAL-designated levees. As shown on Figure 11-7, these levees include the ASR-2 Levee Floodwall along Arroyo Santa Rosa in the unincorporated community of Santa Rosa Valley, the AS-6 Levee along Arroyo Simi in Simi Valley, and the SC-1 Levee along Sespe Creek in Fillmore.

At that same time, PAL-Response Reports (PRRs) were also submitted to FEMA for the remaining six PAL-designated levees also shown on Figure 11-7. These are AS-7 along Arroyo Simi in Simi Valley, CC-2 and CC-3 along Calleguas Creek in Camarillo, SCR-1 along the Santa Clara River in Oxnard, VR-1 along the Ventura River in Ventura, and VR-3 in the unincorporated areas of the Ventura River Valley. The PRRs indicated that in their current condition, those six levees could not be certified by the VCWPD before FEMA's November 30, 2009, compliance submittal deadline date.

Subsequently, two additional levee systems, SC-2 (the south half of the Sespe Creek levee in Fillmore) and SCR-3 (along the Santa Clara River in Oxnard) were added to the above list of six VCWPD levees requiring rehabilitation work to be fully compliant with federal levee certification regulations (i.e., 44 CFR 65.10). Also, the VR-2 levee system, along the west bank of the Ventura River, which was originally constructed by the Natural Resources Conservation Service (NRCS) in 1979 to provide flood protection for the unincorporated community of Casitas Springs, was added to the list of VCWPD levees requiring rehabilitation and/or improvement work.

Extent

There are 5.17 square miles in Ventura County protected by VCWPD PALs from the 100-year flood.

Probability of Future Events

The probability of future levee failures in Ventura County is unknown, but may result from a large winter storm or seismic event.

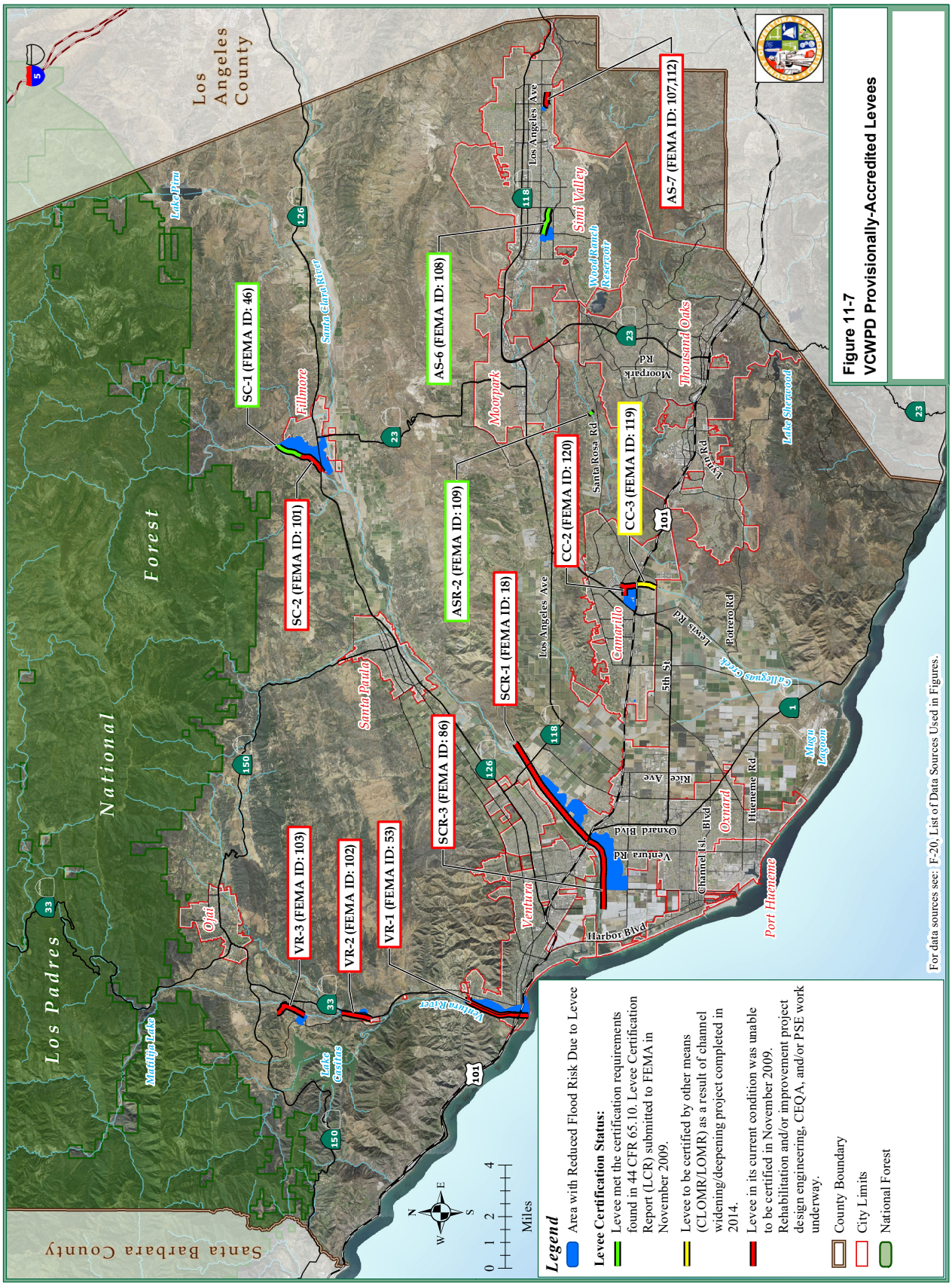


Figure 11-7
VCWPD Provisionally-Accredited Levees
Legend
Area with Reduced Flood Risk Due to Levee
Levee Certification Status:
Levee met the certification requirements found in 44 CFR 65.10. Levee Certification Report (LCR) submitted to FEMA in November 2009.
Levee to be certified by other means (CLOMR/LOMR) as a result of channel widening/deepening project completed in 2014.
Levee in its current condition was unable to be certified in November 2009. Rehabilitation and/or improvement project design engineering, CEQA, and/or PSE work underway.
County Boundary
City Limits
National Forest
For data sources see: F-20, List of Data Sources Used in Figures.
SC-1 (FEMA ID: 46)
SC-2 (FEMA ID: 101)
VR-3 (FEMA ID: 103)
VR-2 (FEMA ID: 102)
VR-1 (FEMA ID: 53)
SCR-3 (FEMA ID: 86)
SCR-1 (FEMA ID: 18)
ASR-2 (FEMA ID: 109)
AS-6 (FEMA ID: 108)
CC-2 (FEMA ID: 120)
CC-3 (FEMA ID: 119)
AS-7 (FEMA ID: 107,112)
Los Padres National Forest
Los Angeles County
Santa Barbara County
Lake Piru
Fillmore
Santa Clara River
Ojai
Matilija Lake
Lake Casitas
Ventura River
Santa Paula
Ventura
Moorpark
Simi Valley
Wood Ranch Reservoir
Thousand Oaks
Camarillo
Oxnard
Port Hueneme
Mugu Lagoon
Lake Sherwood
Los Angeles Ave
Santa Rosa Rd
Moorpark Rd
Lewis Rd
Potrero Rd
Las Posas Road
5th St
Rice Ave
Oxnard Blvd
Ventura Rd
Channel Isl. Blvd
Hueneme Rd
Harbor Blvd
Miles
0 1 2 4
N
W
E
S

Post-Fire Debris Flow

Nature

Wildfires are a common occurrence in the hills and mountainous regions of Ventura County. By reducing or destroying vegetative cover and altering soil characteristics, fires often result in conditions that can significantly increase runoff and erosion when winter rains begin to fall. These conditions may result in a debris flow (also referred to as mud flow), which is a slurry of water, sediment, and rock that converges in a stream channel.

The threats of erosion, flooding, and debris flows are significantly increased by the following processes:

- **Reduced infiltration and increased runoff:** A fire's consumption of vegetative cover increases exposure of the soil surface to raindrop impact. Soil heating destroys organic matter that binds the soil together. Extreme heating may also cause the development of water-repellant, or "hydrophobic," soil conditions that further reduce infiltration.
- **Changes in hill slope conditions:** Fires remove obstructions to overland flow, such as trees, downed timber, and plants, increasing flow velocity and therefore erosive power. Increased sediment movement also fills depressions, reducing storage capacity and further contributing to increased velocity and volume of flow. These factors combine to allow more of the watershed to contribute flow to the flood at the same time, increasing the volume of the flood.
- **Changes in channel conditions:** Increased overland flow and sediment transport result in increased velocity and volume of flow in defined channels. Channel erosion increases, as do peak discharges.

The occurrence of erosion, floods, and debris flows in burned areas is also dependent on precipitation intensity—storms with high intensity are more likely to initiate the processes described above and result in flood events. Additionally, easily eroded soils facilitate changes in hill slope conditions and increase the volume of runoff. Both of these conditions are likely to occur in Ventura County.

In extreme situations, the conditions described above combine to form a debris flow. These flows are often the most destructive events resulting from heavy rainfall in fire-affected areas. They occur with little warning, carry vast quantities of rock and other material, and strike objects with extreme force. Because of their viscosity and density, debris flows can move or carry away objects as large as vehicles and bridges, and they may travel great distances down canyons and stream valleys. Debris flow fronts may also travel at high speeds, exceeding 50 miles per hour.

History

Evidence of debris-flow movement was widespread following the 1969 storms throughout the mountain ranges in Ventura County. Debris flows occurred in numerous watersheds, including Cozy Dell Canyon, Stewart Canyon, Senior Canyon, Orcutt Canyon, Jepson Wash, and others. Mudflows also occurred in 1969 and 1971 in watersheds that were underlain by fine-grained sedimentary rocks and had been more recently burned by wildfires near Ojai. Witnesses to the mudflows described surges of what appeared to be mud covered with water behind a moving boulder.

In 2014, two post-fire debris flows occurred in the Camarillo Springs area. Around midnight on November 1, 2014, a heavy rain—the first in Ventura County in many months—dislodged debris and

created thick mud from the hills recently burned by the Springs Fire in May 2013. Twenty homes were evacuated, including two homes that were severely damaged. According to the Ventura County Fire Department, a storm drain system that should have prevented the mud and debris from flooding the area apparently filled to capacity, in part because of additional amounts of debris left on the hillside due to Springs Fire.

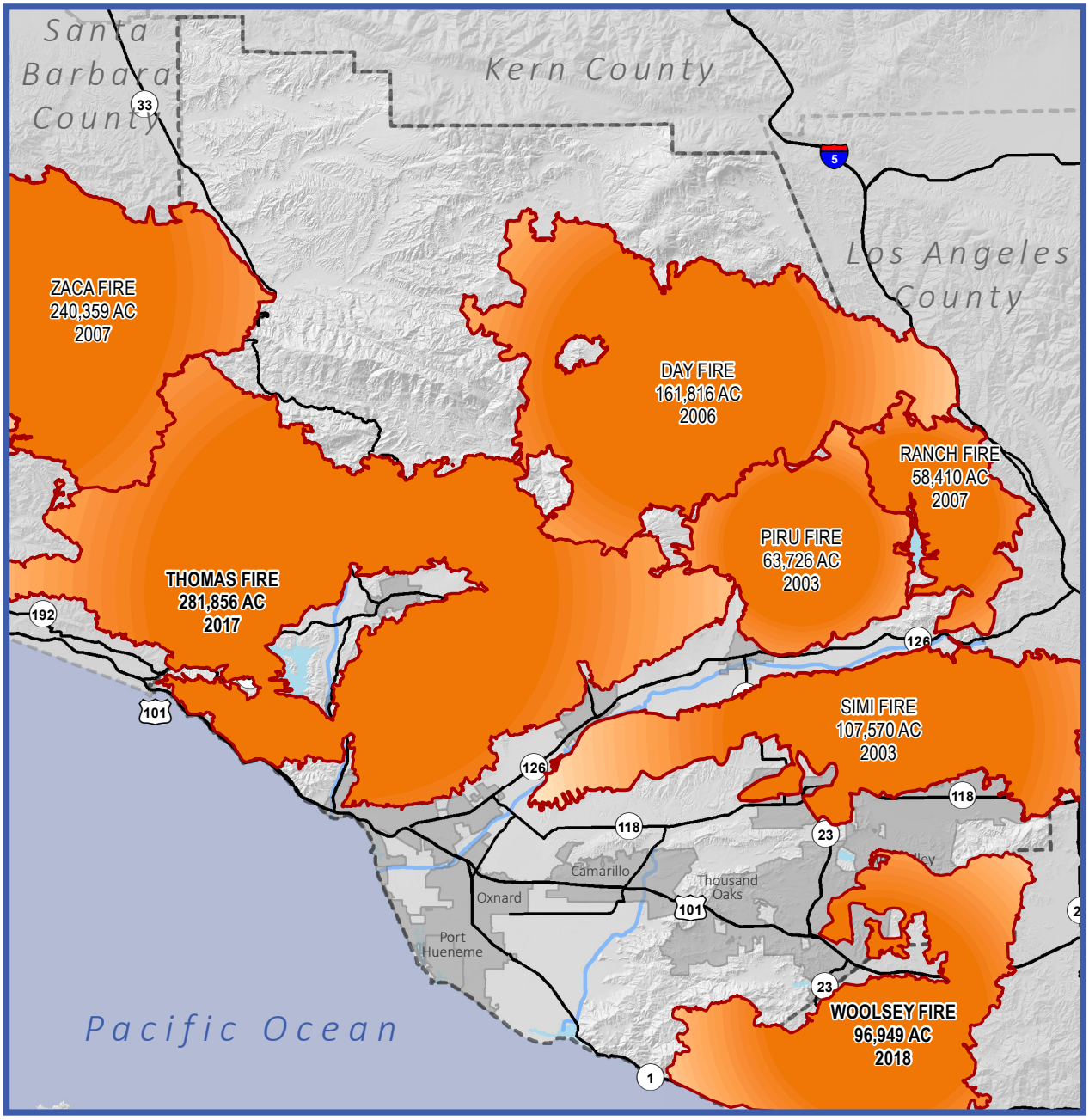
On December 12, 2014, a second debris flow affected Camarillo Springs when a storm dumped 1.8 inches of rainfall over the region. According to the Ventura County Fire Department, 16 homes were damaged, including 10 homes that were red-tagged. Hours before the storm was expected, mandatory evacuations were ordered for 124 homes. Contractors hired by the City of Camarillo worked to clear drainage areas before the storm hit and had put up K-rails to direct water and mud away from homes in the projected debris flow area. The City of Camarillo has installed steel mesh nets in hillside areas that successfully contain alluvial fan flows and will prevent further damage to private property.

Location

Areas of Ventura County that have been subject to recent wildfires are susceptible to potentially hazardous debris flows. Areas susceptible to debris flow include localities that are adjacent to and downslope of these burn areas, especially in locations that are in ravines and canyons, and at the mouths of canyons. Figure 11-8 shows wildfire perimeters of concern; this includes wildfires since 2012 (Grand and Springs fires) and burned areas that are recovering slowly (Day fire).

Extent and Probability of Future Events

Ventura County has a long history of flooding and wildfires, which are two major factors in the occurrence of post-fire debris flow. However, because a number of complex factors lead to debris flow (basin morphometry, burn severity, soil properties, and rainfall characteristics), the probability and estimate of the volume of post-fire debris flow in Ventura County is unknown. The USGS has developed model predictions that can be calculated at specific basin outlets, and along the draining network within and immediately downstream of a burn area. These models can be applied post- fires to predict the probabilities of debris flows and estimate debris-flow volumes throughout a burn area in response to a specific rainstorm event.



Ventura County 2040 General Plan

Figure 11-8:
Wildfire Perimieters of Concern

Map Date: September 08, 2020

Source: Ventura County, 2020

0 7.5 15 Miles

N

- Fire Perimeters of Concern 2000-Present (30,000 AC+)
- Ventura County Boundary
- Major Roadways
- Cities
- Major Waterways
- Water Bodies

Tsunami

Nature

A tsunami is a series of traveling ocean waves of extremely long length, generated by disturbances associated primarily with earthquakes occurring below or near the ocean floor. Subduction zone earthquakes at plate boundaries often cause tsunamis. However, tsunamis can also be generated by submarine landslides, submarine volcanic eruptions, the collapse of volcanic edifices, and—in very rare instances—large meteorite impacts in the ocean.

In the deep ocean, a tsunami may have a length from wave crest to wave crest of 100 miles or more but a wave height of only a few feet or less. Thus, the wave period can be up to several hours, and wavelengths can exceed several hundred miles. Therefore, tsunamis are unlike typical wind-generated swells on the ocean, which might have a period of about 10 seconds and a wavelength of up to 300 feet. Tsunamis cannot be felt aboard ships and they cannot be seen from the air in the open ocean. In deep water, the waves may reach speeds exceeding 700 miles per hour.

Tsunamis can originate hundreds or even thousands of miles away from coastal areas. Local geography may intensify the effect of a tsunami. Areas at greatest risk are less than 50 feet above sea level and within one mile of the shoreline. Tsunamis arrive as a series of successive crests (high water levels) and troughs (low water levels). These successive crests and troughs can occur anywhere from five to 90 minutes apart. They usually occur 10 to 45 minutes apart.

Tsunamis not only affect beaches that are open to the ocean, but also bay mouths, tidal flats, and the shores of large coastal rivers. Tsunami waves can also diffract around land masses. Because tsunamis are not symmetrical, the waves may be much stronger in one direction than another, depending on the nature of the source and the surrounding geography. However, tsunamis do propagate outward from their source, so coasts in the shadow of affected land masses are usually fairly safe.

History

According to the California Tsunami Evacuation Playbook, City of Ventura – Ventura County (No. 2014-Vent-01), and as shown in Table 11-3, there have been eight notable tsunami events run-ups recorded in Ventura County.

Location

Figure 11-9 shows tsunami evacuation areas based on two scenarios—Phase 3 and Maximum Phase—as described in the California Tsunami Evacuation Playbook, City of Ventura – Ventura County. This map illustrates coastal land areas, including areas in the cities of Oxnard, Port Hueneme, and Ventura, that can become submerged due to tsunami run-up. The area of land subject to inundation is a factor of the following factors:

- Distance of shoreline from the tsunami-generating event
- Magnitude of the earthquake causing the event; duration and period of waves
- Run-up elevations
- Tidal level at time of occurrence
- Location along shore and direction of shore in respect to propagated waves
- Topography of the seabed

TABLE 11-3 TSUNAMI EVENTS Ventura County			
Year	**Source/Source Location**	**Tsunami Location**	**Remarks**
12/21/1812	Earthquake and Landslide	City of Ventura	6.5-foot run-up
4/01/1946	Earthquake – Aleutian Islands, Alaska	Port Hueneme	3-foot run-up
		Ormond Beach	5-foot run-up
11/4/1952	Earthquake – Kamchatka Peninsula	Port Hueneme	2-foot run-up
3/09/1957	Earthquake – Aleutian Islands, Alaska	Port Hueneme	2-foot run-up
3/28/1964	Earthquake and Landslide – Alaska	City of Ventura	Tide dropped 8.0 feet
		Oxnard	Large swells
9/29/2009	Earthquake – Samoa	Ventura	Buoys moved near mouth of harbor
2/27/2010	Earthquake – Chile	Ventura, Oxnard, Port Hueneme	3-foot run-up
3/11/2011	Earthquake – Japan	Ventura, Oxnard	4-foot run-up
		Port Hueneme	5-foot run-up

Source: CGS 2014.

Run-up = the large amount of water that a tsunami pushes onto the shore above the regular sea level, that is the maximum vertical height onshore above sea level reached by a tsunami

Extent

Figure 11-9 shows the Phase 3 Evacuation and Maximum Evacuation Phase, based on models of maximum local and distance tsunamis and for tsunamis coming from the Cascadia Subduction Zone. The Phase 3 Evacuation estimates a tsunami flood level of 1.7 to 5.0 feet above the high tide line, and a tsunami flood level of 7.7 to 11.0 feet above low tide conditions. The Maximum Evacuation Phase estimates a tsunami flood level of more than 5.0 feet above the high tide line, and a tsunami flood level of more than 11.0 feet above low tide conditions.

Probability of Future Events

Based on the history of tsunami run-ups in the region and the history of earthquakes in the Pacific Rim, another tsunami event is likely to occur, although the extent and probability is unknown.

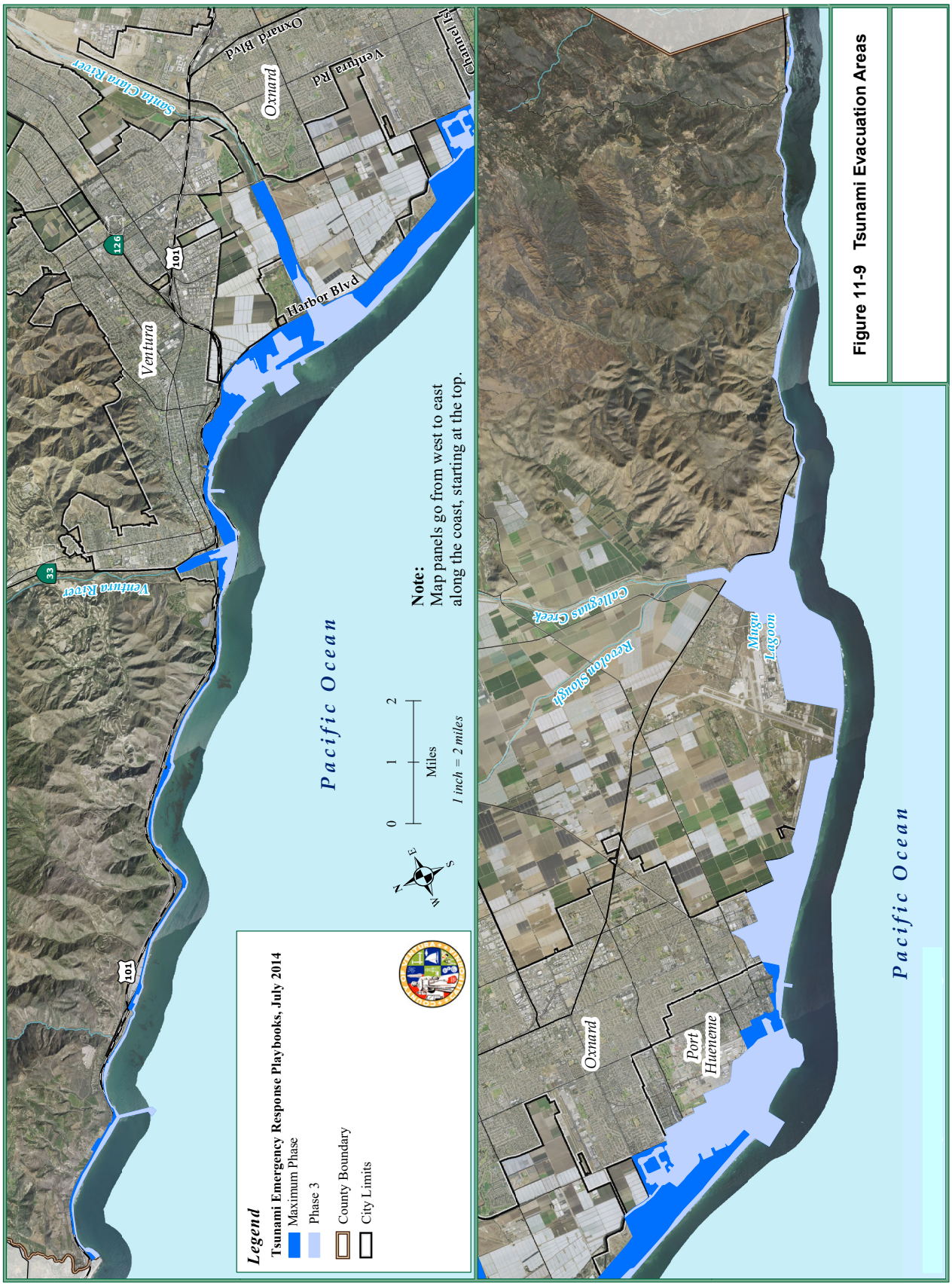


Figure 11-9 Tsunami Evacuation Areas

NAIP 2014 (Summer) USDA-FSA APFO

Regulatory Setting

The most effective means of preventing flood damage appears to be floodplain management (i.e., the regulation of the types of activities permitted in flood hazard areas). Floodplain management addresses the problems encountered in the utilization of floodplains and considers the total spectrum of possible solutions to problems involving possible future land uses. Floodplain management cannot, however, protect all existing development. Therefore, to provide for the maximum alleviation of flood hazards, a combination of federal, state, and local corrective and preventive measures is necessary. These measures are discussed in detail below.

Federal

Federal Emergency Management Act (FEMA).

FEMA is the Federal agency that oversees floodplains and manages the National Flood Insurance Program (NFIP), as adopted under the National Flood Insurance Act of 1968. FEMA's regulations govern the delineation of floodplains and establish requirements for floodplain management. FEMA prepares Digital Flood Insurance Rate Maps (DFIRMs) that indicate the regulatory floodplain to assist communities such as Ventura County with land use and floodplain management decisions to meet the requirements of the National Flood Insurance Program. FEMA has prepared a DFIRM for all of Ventura County, effective January 20, 2010.

National Flood Insurance Program (NFIP)

The regulations of the National Flood Insurance Program, which is administered by FEMA, require that communities adopt land use restrictions for the 100-year floodplain to qualify for federally subsidized insurance. The NFIP was enabled by the National Flood Insurance Act of 1968 and Flood Disaster Protection Act of 1973. The type of restrictions communities must adopt are listed in some detail in Title 44 Code of Federal Regulations, Sections 59 through 70. Additionally, the Ventura County Floodplain Management Ordinance 4465, includes a requirement that habitable structures be elevated a minimum of one foot of freeboard above the base flood elevation of the one percent annual chance flood and be flood-proofed. Participation in the National Flood Insurance Program is virtually mandatory, since flood insurance (within identified "special flood hazard" areas) is a prerequisite for receiving mortgages or construction loans from federally regulated lending institutions. Disaster assistance is not available to public agencies in hazard areas if they do not participate and remain compliant in the Program. Thus, the County must be, and is a participating community in the National Flood Insurance Program and thus qualifies for disaster assistance in the event of a declared natural disaster. Outside these limits, the prime responsibility for regulating activities in flood hazard areas lies with state and local government.

Community Rating System for Flood Control

The Community Rating System (CRS) is a program administered by FEMA. The program offers financial incentives to cities and counties that voluntarily exceed the minimum requirements of the National Flood Insurance Program. The three goals of the CRS are to: (1) reduce and avoid flood damage to insurable property; (2) strengthen and support the insurance aspects of the NFIP; and (3) foster comprehensive flood plan management. The CRS includes multiple programs or "activities" in which communities can participate to earn CRS points. These include public outreach and education on flood prevention measures, preserving open space, maintaining special certifications for staff members as Certified Floodplain

Managers, removing debris and sediment from flood control channels, and adoption of an All-Hazards Mitigation Plan. Each community receives a Class Rating based on the number of points earned. The number of points a community has earned determines if a discount is available to property owners on their flood insurance policies. As of 2016, five percent of all NFIP member communities participate in the CRS program, and fifteen percent of all NFIP California communities participate in the program.

CRS Classes are rated from 1 to 9, with Class 1 representing the highest (best) class. On May 1, 2016, Ventura County received a Class 6 rating, and consequently, properties within a floodplain in the unincorporated areas of Ventura County are eligible for a 20 percent premium discount on flood insurance.

Disaster Mitigation Act of 2000 (DMA 2000)

On October 30, 2000, Congress passed DMA 2000 (Public Law 106-390), which amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988 (Stafford Act) (Title 42 of the United States Code Section 5121 et seq.) by repealing the Act's previous mitigation planning section (409) and replacing it with a new mitigation planning section (322). This new section emphasized the need for state, tribal, and local entities to closely coordinate mitigation planning and implementation efforts. This new section also provided the legal basis for the FEMA's mitigation plan requirements for mitigation grant assistance. Under DMA 2000, local governments throughout the United States must adopt and maintain mitigation plans in order to be eligible for specific types of grant assistance. DMA 2000 is administered by FEMA (in California, Region IX) in collaboration with State Hazard Mitigation Officers (in California, the State Office of Emergency Services).

State

California Dam Safety Act

The California Dam Safety Act (Section 8589.5 California Emergency Services Act) requires the preparation of dam inundation maps showing areas of potential flooding in the event of sudden or total dam failure as well as emergency procedures for notification and evacuation of nearby residents.

Local

2005 Ventura County General Plan

The General Plan covers flood hazards in Chapter 2, Hazards. Section 2.10 includes goals, policies, and programs related to flood hazards. The following Area Plans also contain applicable goals and policies related to flood hazards:

- Coastal Area Plan;
- El Rio/Del Norte Area Plan;
- North Ventura Avenue Area Plan;
- Oak Park Area Plan;
- Ojai Valley Area Plan;
- Piru Area Plan;
- Saticoy Area Plan;
- Thousand Oaks Area Plan; and
- Lake Sherwood/Hidden Valley Area Plan.

2011 Initial Study Assessment Guidelines

The Initial Study Assessment Guidelines include criteria for evaluating environmental impacts for flood hazards. These can be found in Sections 17a. Hydraulic Hazards-Non-FEMA and 17b. Hydraulic Hazards-FEMA.

2016 Coastal Zoning Ordinance

The Coastal Zoning Ordinance regulates flood hazards through Section 8178-4 Mitigation of Potential Hazards

Ventura County Emergency Operations Plan (2012)

The Ventura County Emergency Operations Plan (EOP) describes what the County's general actions will be during a response to an emergency. The EOP also includes appendices that describe in more detail the actions required of each local jurisdiction's departments/agencies. Further, EOP describes the role of the Emergency Operation Center (EOC) and the coordination that occurs between the EOC and each local jurisdiction's departments and other response agencies. Finally, the EOP describes how the EOC serves as the focal point among local, state, and federal governments in times of disaster.

Ventura County Floodplain Management Ordinance

Ventura County's Flood Plain Management Ordinance (Ordinance No. 4465) ensures compliance with the National Flood Insurance Program. This includes permit review for structures built in the floodplain and evaluation of site plans for developments that include identified floodplains. Residential development is not allowed in the FEMA designated floodway.

Office of Emergency Services (OES)

In Ventura County, disaster coordination and planning is the responsibility of the Sheriff's Department through its Office of Emergency Services (OES). The OES serves as the depository for the County's Dam Inundation maps and is charged with ongoing maintenance of the County's Dam Failure Response Plan, which was adopted by the Board of Supervisors on September 13, 1983.

Key Terms

Alluvial Fan. An alluvial fan is a triangle-shaped deposit of gravel, sand, and even smaller pieces of sediment, such as silt (i.e., alluvium). Alluvial fans are usually created as flowing water interacts with mountains, hills, or the steep walls of canyons. Streams carrying alluvium can be trickles of rainwater, a fast-moving creek, a powerful river, or even runoff from agriculture or industry. As a stream flows down a hill, it picks up sand and other particles (alluvium).

Anticlinal. In structural geology, an anticline is a type of fold that is an arch-like shape and has its oldest beds at its core.

Erodibility. An indicator of a soil's susceptibility to rain, runoff, and other erosive processes.

Inundation. To cover with water, especially flood waters. To overwhelm as if with a flood.

Levee. Levees are typically earthen embankments designed to contain, control, or divert the flow of water to provide some level of protection from flooding. Some levee systems are built for agricultural purposes and provide flood protection and flood loss reduction for farm fields and other land used for agricultural purposes. Urban levee systems are built to provide flood protection and flood loss reduction for population centers and the industrial, commercial, and residential facilities within them. Agricultural levee systems provide a level of protection that is appropriate based on the value of the assets being protected.

National Flood Insurance Program (NFIP). The National Flood Insurance Program aims to reduce the impact of flooding on private and public structures. It does so by providing affordable insurance to property owners and by encouraging communities to adopt and enforce floodplain management regulations. These efforts help mitigate the effects of flooding on new and improved structures. Overall, the program reduces the socio-economic impact of disasters by promoting the purchase and retention of general risk insurance, but also of flood insurance, specifically.

Slurry. A semi-liquid mixture, typically of fine particles of manure, cement, or coal suspended in water.

Special Flood Hazard Area (SFHA): The land area covered by the floodwaters of the base flood is the Special Flood Hazard Area (SFHA) on NFIP maps. The SFHA is the area where the NFIP's floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies. The SFHA includes Zones A, AO, AH, A1-30, AE, A99, AR, AR/A1-30, AR/AE, AR/AO, AR/AH, AR/A, VO, V1-30, VE, and V.

References

Reports/Publications

Ventura, County of. Ventura County Hazard Mitigation Plan. Adopted by the Ventura County Board of Supervisors September 2015.

Websites

www.flood.org

www.vcfloodinfo.com

www.floodsmart.gov

www.FEMA.gov

SECTION 11.3 WILDFIRE HAZARDS

Introduction

This section addresses the wildfire hazard (also referred to as fire hazard) conditions within Ventura County and the potential risk these conditions pose. Issues related to fire hazards include fire hazard management, emergency response, and high fire hazard areas. This section summarizes the fire hazard conditions in Ventura County based on information from the 2015 Ventura County Multi-Hazard Mitigation Plan (VCMHMP). Consistent with the VCMHMP, each section includes explanations of the nature, history, location, extent, and probability associated with fire hazards. A discussion of fire protection services is included in Section 7.6 of Chapter 9 of this Background Report.

Major Findings

- Within Ventura County, very high fire hazard severity zones (FHSZs) are located in mountainous or hillside areas (west of Lake Casitas, northeast of Ojai, north of Fillmore, and surrounding Thousand Oaks and Simi Valley), where the greatest fuel density exists; very high FHSZs are also located throughout much of the county's large agricultural and cattle-grazing areas. 81.9 square miles are in the high FHSZ and 504.4 square miles are in the very high FHSZ. The populations that live in the very high FHSZ are mainly located in the cities of Moorpark (44.0 percent), Simi Valley (27.7 percent), Thousand Oaks (43.1 percent), as well as the unincorporated area (37.1 percent).
- Vegetation that has dried during long, hot summers provides a living fuel for wildfires and the Santa Ana winds combine to contribute to the high incidence of wildfires in Ventura County. In the past, fires burning more than 1,000 acres have occurred about every one to three years.

Existing Conditions

A wildfire is an uncontrolled fire that spreads through vegetative fuels, exploding and possibly consuming structures. Wildfires often begin unnoticed, spread quickly, and are usually signaled by dense smoke that may be visible from miles around. Wildfires can be human-caused (e.g., by arson or campfires), or can be caused by natural events such as lightning. Wildfires can be categorized into four types:

- **Wildland fires** occur mainly in areas under federal control, such as national forests and parks, and are fueled primarily by natural vegetation.
- **Interface or intermix fires** occur in areas where both vegetation and structures provide fuel. These are also referred to as urban-wildland interface fires.
- **Firestorms** occur during extreme weather (typically high temperatures, low humidity, and high winds) with such intensity that fire suppression is virtually impossible. These events typically burn until the conditions change or the fuel is exhausted.
- **Prescribed fires and prescribed natural fires** are intentionally set or natural fires that are allowed to burn for beneficial purposes.

The following three factors contribute significantly to wildfire behavior; as described more fully below, these factors can be used to identify wildfire hazard areas:

- **Topography:** As slope increases, the rate of wildfire spread increases. South-facing slopes are also subject to greater solar radiation, making them drier and thereby intensifying wildfire behavior. However, ridgetops may mark the end of wildfire spread because fire spreads more slowly or may even be unable to spread downhill.
- **Fuel:** The type and condition of vegetation play a significant role in the occurrence and spread of wildfires. Certain types of plants are more susceptible to burning or burn with greater intensity. Dense or overgrown vegetation increases the amount of combustible material available to fuel the fire (referred to as the "fuel load"); the ratio of living to dead plant matter is also important. The risk of fire is increased significantly during periods of prolonged drought as the moisture content of both living and dead plant matter decreases. The fuel's continuity is also an important factor, both horizontally and vertically.
- **Weather:** The most variable factor affecting wildfire behavior is weather. Variables such as temperature, humidity, wind, and lightning can affect chances for ignition and spread of fire. Extreme weather, such as high temperatures and low humidity, can lead to extreme wildfire activity. By contrast, cooling and higher humidity often signals reduced wildfire occurrence and easier containment. Years of precipitation followed by warmer years tend to encourage more widespread fires and longer burn periods. Also, since the mid-1980s, earlier snowmelt and associated warming due to global climate change has been associated with longer and more severe wildfire seasons in the western United States.

If not promptly controlled, wildfire may grow into an emergency or disaster. Even small fires can threaten lives and resources and destroy improved properties. It is also important to note that in addition to affecting people, wildfire may severely affect livestock and pets. Such events may require the emergency watering/feeding, shelter, evacuation, and even burying of animals.

Wildfires can have serious effects on the local environment. In addition to stripping the land of vegetation and destroying forest resources, including the wildlife that lives in these areas, large, intense fires can harm the soil, waterways, and the land itself. Soil exposed to intense heat may lose its capacity to absorb moisture and support life. Exposed soils erode quickly and enhance siltation of rivers and streams, thereby enhancing flood potential, harming aquatic life, and degrading water quality. Lands stripped of vegetation are also subject to increased debris flow hazards, as described above. Wildfires can also greatly affect the air quality of the surrounding area.

History

Wildfires are a common occurrence in Ventura County. In the last 50 years (1965 through 2015), 23 wildfires, with an extent greater than 10,000 acres, have occurred. Table 11-4 illustrates the 10 largest fires over the last 50 years and Figure 11-10 shows the location of these and other fires between 1965 and 2015. In May 2013, the Springs fire burned 24,251 acres; 10 structures were destroyed and 12 were damaged, and 10 injuries were recorded.

TABLE 11-4 TEN LARGEST VENTURA COUNTY FIRES, 1965 THROUGH 2015		
Name	**Date**	**Acres Affected***
Day	September 2006	162,702
Simi Valley	October 2003	108,204
Piru	October 2003	63,991
Ranch**	October 2007	58,401
Ferndale	October 1985	47,064
Green Meadow	October 1993	38,477
Creek Road	September 1979	32,000
Steckel	October 1993	27,088
Parker Ranch	October 1967	25,000
Hopper	August 1997	24,793

Source: Cal FIRE 2015

*Acres affected = total acreage.

** Fire occurred in both Ventura and Los Angeles counties.

Location and Extent of Fire Hazard Severity Zones

Public Resources Code 4201-4204 and Government Code 51175-89 directed the California Department of Forestry and Fire Protection (Cal FIRE) to map areas of significant fire hazards based on fuels, terrain, weather, and other relevant factors. These zones, referred to as Fire Hazard Severity Zones (FHSZs), are represented as very high, high, or moderate. Specifically, the maps were created using data and models describing development patterns, potential fuels over a 30- to 50-year time horizon, expected fire behavior, and expected burn probabilities. The maps are divided into local responsibility areas and state responsibility areas. Local responsibility areas generally include cities, cultivated agriculture lands, and portions of the desert. Local responsibility area fire protection is typically provided by city fire departments, fire protection districts, counties, and by Cal FIRE under contract to the local government. State responsibility area is a legal term defining the area where the state has financial responsibility for wildfire protection. Incorporated cities and federal ownership are not included. The prevention and suppression of fires in all areas that are not state responsibility areas are primarily the responsibility of federal or local agencies.

Figure 11-11 displays the areas of Ventura County most susceptible to wildfires. Within the unincorporated county, very high FHSZs are located in mountainous or hillside areas (west of Lake Casitas, northeast of Ojai, north of Fillmore, and surrounding Thousand Oaks and Simi Valley), where the greatest fuel density exists; as well as throughout much of the county's large agricultural and cattle-grazing areas. Although these areas are not heavily populated, they are near populated communities. Approximately 37.1 percent of the unincorporated area population is exposed to very high FHSZs. Population exposure in cities is highest in Moorpark (44.0 percent), Simi Valley (27.7 percent), and Thousand Oaks (43.1 percent)

As shown on Figure 11-11, in Ventura County there are 81.9 square miles in the high FHSZ and 504.4 square miles in the very high FHSZ.

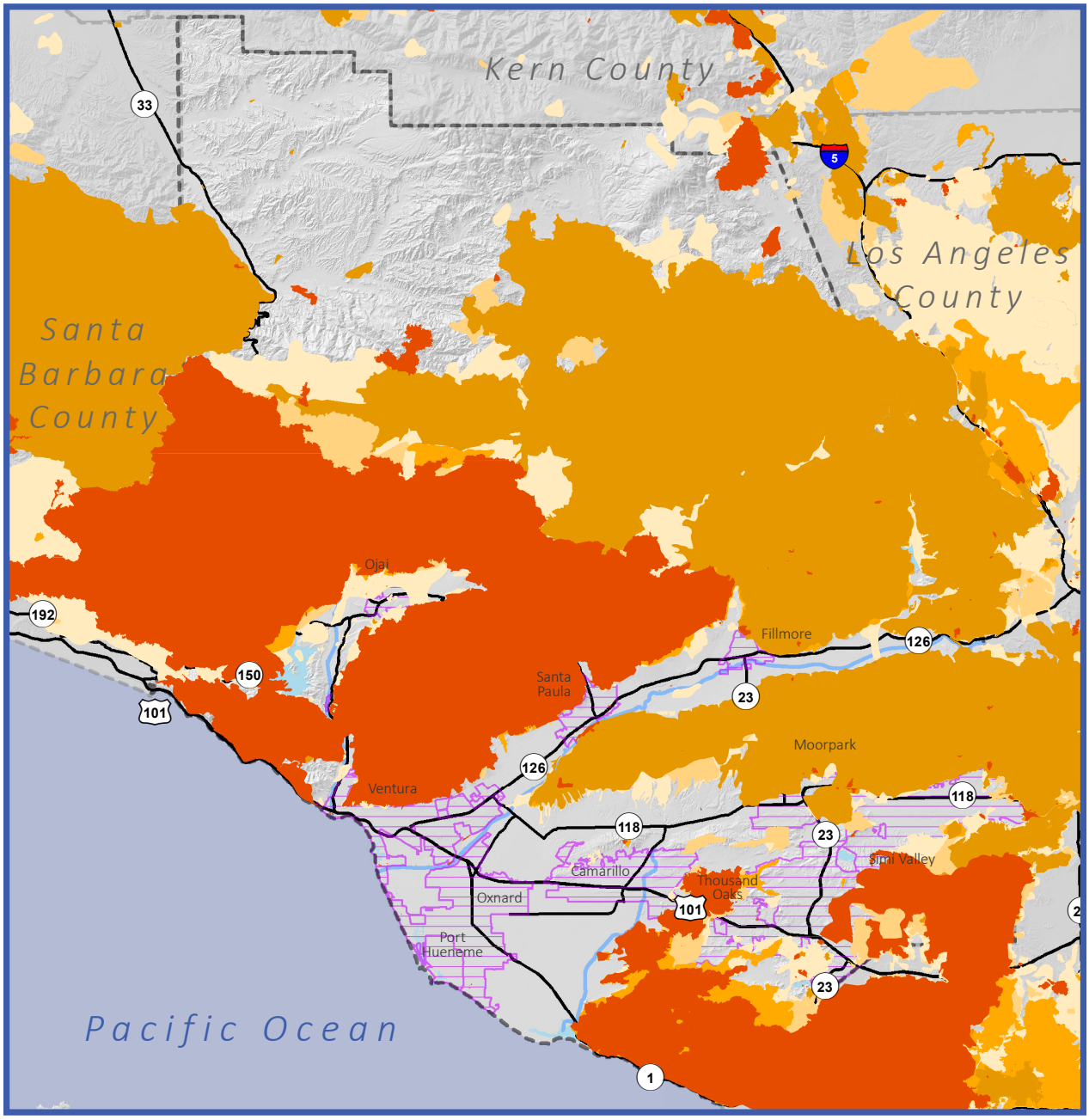
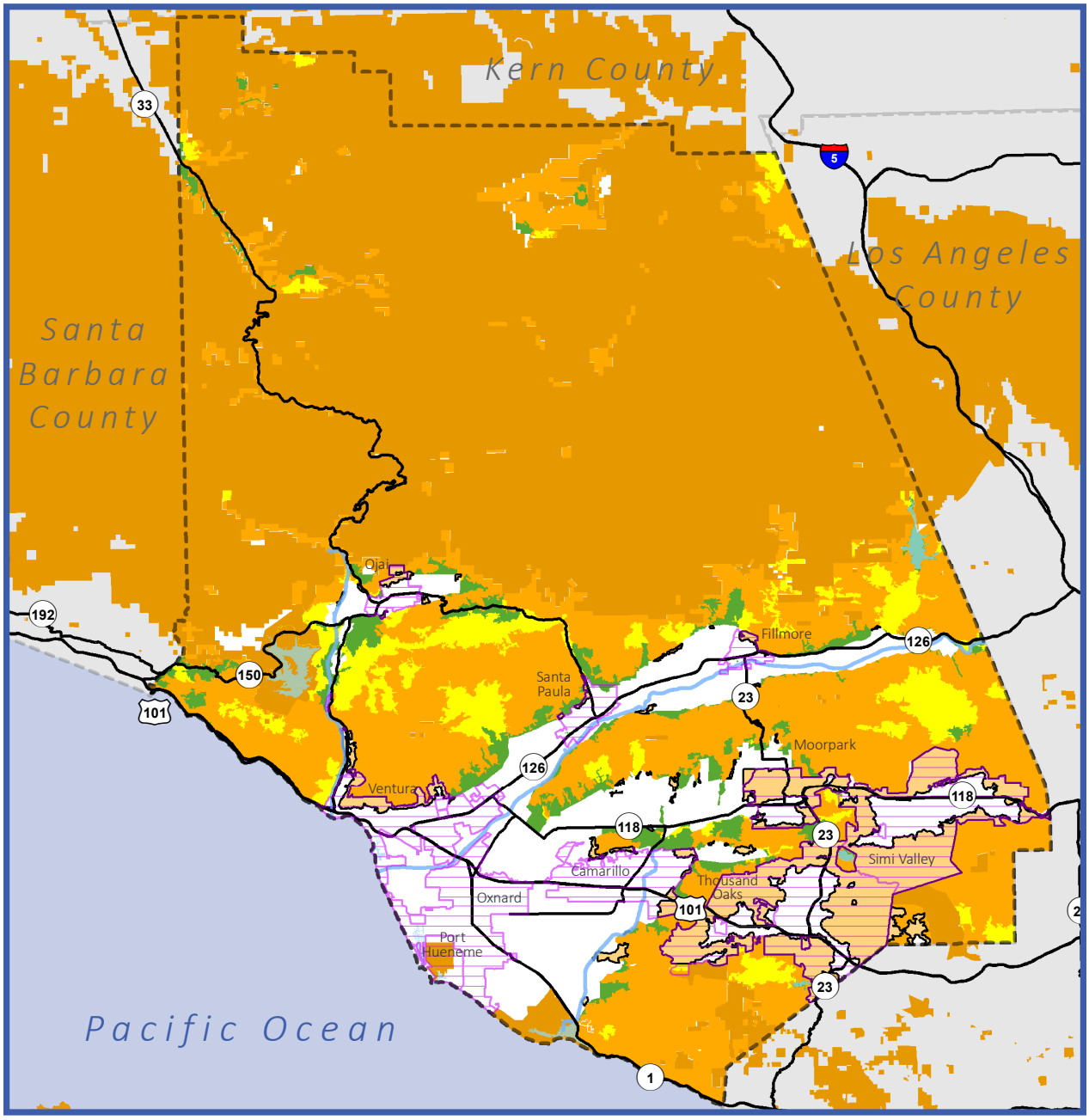


Figure 11-10:
Wildfires History Map

Map Date: September 08, 2020

Source: Ventura County, 2020



Ventura County 2040 General Plan

Figure 11-11:
Fire Hazard Areas by Responsibility Area
Federal, State, and Local

Map Date: January 09, 2017

Source: Ventura County, 2016; CAL FIRE 2007 (State), 2008 (Local), and 2016 (Federal); USGS, 2013.

0 7.5 15 Miles

N

Ventura County Boundary
Cities
Major Roadways
Major Waterways
Water Bodies

Responsibility Areas:
LRA - Very High
SRA - High
SRA - Moderate
SRA - Very High
FRA

Probability of Future Events

The climate in Ventura County is characterized as Mediterranean dry-summer featuring cool, wet winters and warm, dry summers. High moisture levels during the winter rainy season significantly increase the growth of plants. However, the vegetation is dried during the long, hot summers, decreasing plant moisture content and increasing the ratio of dead fuel to living fuel. As a result, fire susceptibility increases dramatically, particularly in late summer and early autumn. In addition, the presence of chaparral, a drought-resistant variety of vegetation that is dependent on occasional wildfires, is expected in Mediterranean dry-summer climates. Also, the history of plant succession in Ventura County is important in predicting fire susceptibility. For several years after a fire has occurred, easily flammable herbaceous species predominate and increase the likelihood of new fires. When woody species become reestablished, they contribute to a lower overall level of fire susceptibility for approximately 10 years. However, after this period, the slow aging plant community becomes ever more likely to burn because of increased levels of dead plant material and lowered plant moisture levels (Ventura County Multi-Hazard Mitigation Plan, September 2015).

In addition, the local meteorological phenomenon known as the Santa Ana winds contributes to the high incidence of wildfires in Ventura County. These winds originate during the autumn months in the hot, dry interior deserts to the north and east of Ventura County. They often sweep west into the county, bringing extremely dry air and high wind speeds that further desiccate plant communities during the period of the year when the constituent species have very low moisture content. The effect of these winds on existing fires is particularly dangerous, as the winds can greatly increase the rate at which fires spread.

Based on the conditions described above and the history of occurrence in the past, future events are very likely to occur. In the past, fires burning more than 1,000 acres have occurred about every one to three years. The extent of future events will depend on specific conditions at the time of the fire.

Regulatory Setting

Federal

Federal Land Assistance, Management, and Enhancement (FLAME) Act

In 2009, Congress passed the Federal Land Assistance, Management, and Enhancement (FLAME) Act (FLAME) as the basis for the U.S. Department of Agriculture (USDA) and the Department of the Interior (DOI) to develop a national cohesive wildland fire management strategy. In response to the FLAME Act, USDA and DOI published the National Cohesive Wildland Fire Management Strategy, which includes the National Strategy and the National Action Plan, both completed in April 2014. Together, these documents address elements requested by Congress after the passage of the FLAME Act and represent an approach wildland fire management based on the goal of achieving safer, more efficient, cost-effective public, and resource protection goals and more resilient landscapes.

Healthy Forest Restoration Act (HFRA)

The Healthy Forest Restoration Act (HFRA), enacted by the U.S. Congress on January 7, 2003, established a protocol for the creation of a type of document that articulated a wildfire safety plan for communities at risk from wildland fires- a Community Wildfire Protection Plan (CWPP). The Ventura County Fire Department has prepared a CWPP for all of Ventura County. As specified by the HFRA, the

Ventura County CWPP was developed in collaboration with local, county, state, and federal agencies as well as various community organizations within the County. The CWPP identifies wildfire risks and clarifies priorities for funding and programs to reduce impacts of wildfire on the communities at risk within Ventura County.

State

Strategic Fire Plan for California

Public Resources Code §4114 and §4130 authorize the State Board of Forestry and Fire Protection (Board) to establish a fire plan which, among other things, establishes the levels of statewide fire protection services for State Responsibility Area (SRA) lands. These levels of service recognize other fire protection resources at the federal and local level that collectively provide a regional and statewide emergency response capability. In addition, California's integrated mutual aid fire protection system provides fire protection services through automatic and mutual aid agreements for fire incidents across all ownerships. In 2010 the Board of Forestry and Fire Protection adopted the Strategic Fire Plan for California. This statewide fire plan was developed in concert between the State Board of Forestry and Fire Protection of and the California Department of Forestry and Fire Protection (CAL FIRE), in consultation with a group of outside experts to complete a needs assessment and to form the Fire Plan Steering Committee. This Committee worked for over a year preparing the 2010 Strategic Fire Plan. The Strategic Fire Plan seeks to protect lives, residential property, and natural resources. It is the basis for assessing California's complex and dynamic natural and man-made environment, and identifying a variety of actions to minimize the negative effects of wildland fire. Implementation of the 2010 Strategic Fire Plan for California is intended to occur at all levels of CAL FIRE, as well as through partnerships with local, state and federal agencies, private organizations (Fire Safe Councils, homeowners associations, industry, etc.) and citizens.

Senate Bill 1704 (Vegetation Management Program)

Senate Bill 1704 established the basic processes and procedures needed to manage chaparral-covered and associated lands within California. The Vegetation Management Program allows private landowners to enter into a contract with the California Department of Forestry and Fire Protection to use prescribed fire to accomplish a combination of fire protection and resource management goals. The main goals of the program are the reduction of conflagration fires, the optimization of soil and water productivity, and the protection and improvement of intrinsic floral and faunal values.

Public Resources Code Section 4291/Government Code Section 51182

Public Resources Code Section 4291 and Government Code Section 51182 require property owners in mountainous areas, forest-covered, lands, or any land that is covered with flammable material to create, at minimum, a 100-foot defensible space (or to the property line) around their homes and other structures. Under the law, property owners or those who control property must establish a 30-foot clean zone and a 70-foot reduced fuel zone.

Local

2005 Ventura County General Plan

The General Plan covers wildfire hazards in Chapter 1, Resources. Section 2.13 includes goals, policies, and programs related to wildfire hazards. The following Area Plans also contain applicable goals and policies related to wildfire hazards:

- Coastal Area Plan;
- Oak Park Area Plan;
- Ojai Valley Area Plan;
- Piru Area Plan;
- Saticoy Area Plan;
- Thousand Oaks Area Plan; and
- Lake Sherwood/Hidden Valley Area Plan.

2011 Initial Study Assessment Guidelines

The Initial Study Assessment Guidelines include criteria for evaluating environmental impacts for rural and wildland areas of the County. These can be found in Section 18. Fire Hazards,

2016 Coastal Zoning Ordinance

The Coastal Zoning Ordinance regulates wildfire hazards through Section 8178-4 Mitigation of Potential Hazards

Unit Strategic Fire Plan, Ventura County Fire Protection District

Ventura County maintains a contractual relationship with Cal Fire. A Unit Plan that is part of the California Strategic Fire Plan is used within the Ventura County Unit. The Unit Fire Plan also serves as the Community Wildfire Protection Plan (CWPP) for the County. The CWPP identifies wildfire risks and clarifies priorities for funding and programs to reduce impacts of wildfire on the communities at risk within Ventura County. Building on the proven and highly effective Weed Abatement Program implemented by Ventura County Fire Department under the authority of the Healthy Forests Restoration Act (HFRA), the County's CWPP documents and prioritizes the projects that stakeholders within communities at risk have identified.

Ventura County Fire Protection District Fire Hazard Reduction Program

The Ventura County Fire Protection District adopted a local ordinance that, among other things, requires mandatory 100-feet of brush clearance around structures located in or adjacent to Hazardous Fire Areas. The Fire Hazard Reduction unit manages this requirement throughout the VCFPD jurisdiction. Failure to comply with the program by the annual June 1st deadline can result in the Fire District completing the work and assessing a fee to the homeowner through a tax lien on their property. The role of individual property owners in responding to fire hazards is probably the most critical. Because of the large size of

the county and the preference of many homeowners to build within or adjacent to Hazardous Fire Areas, these individuals must assume responsibility for the prevention of conditions, that may result in property damage during the fire season. Measures that may be taken by property owners, include the planting of fire-resistant landscaping, landscape maintenance, mandatory clearance of brush around structures, and site design.

Key Terms

Conflagration. An extensive fire that destroys a great deal of land or property.

Herbaceous. Of, denoting, or relating to herbs (in the botanical sense).

Prescribed Fire. The knowledgeable and controlled application of fire to a specific land area to accomplish planned resource management objectives and weather conditions.

References

Reports/Publications

Ventura, County of. Ventura County Hazard Mitigation Plan. Adopted by the Ventura County Board of Supervisors September 2015.

Websites

N/A

Persons Consulted

N/A

SECTION 11.4 AVIATION HAZARDS

Introduction

This section summarizes the aviation issues for the County of Ventura. This chapter discusses the following issues pertaining to aviation:

- Airport Setting
- Airport Facilities
- Aircraft Incidents

Major Findings

- Airspace within the county can be heavily congested. Oxnard and Camarillo airports had a combined total of over 220,000 flights in 2015. Naval Base Ventura County Point Mugu averaged 29,493 annual flight operations between 2009-2013, and an estimated 70,000 flights occur at the Santa Paula Airport.
- Since 2010, there have been a total of 23 reported aviation incidents at Camarillo, Oxnard, Point Mugu, and Santa Paula, of which eight resulted in fatalities. During this same period, there have been a total of 33 reported incidents (five of which resulted in substantial damage to aircraft), and eight near mid-air collisions (all of them at Camarillo).

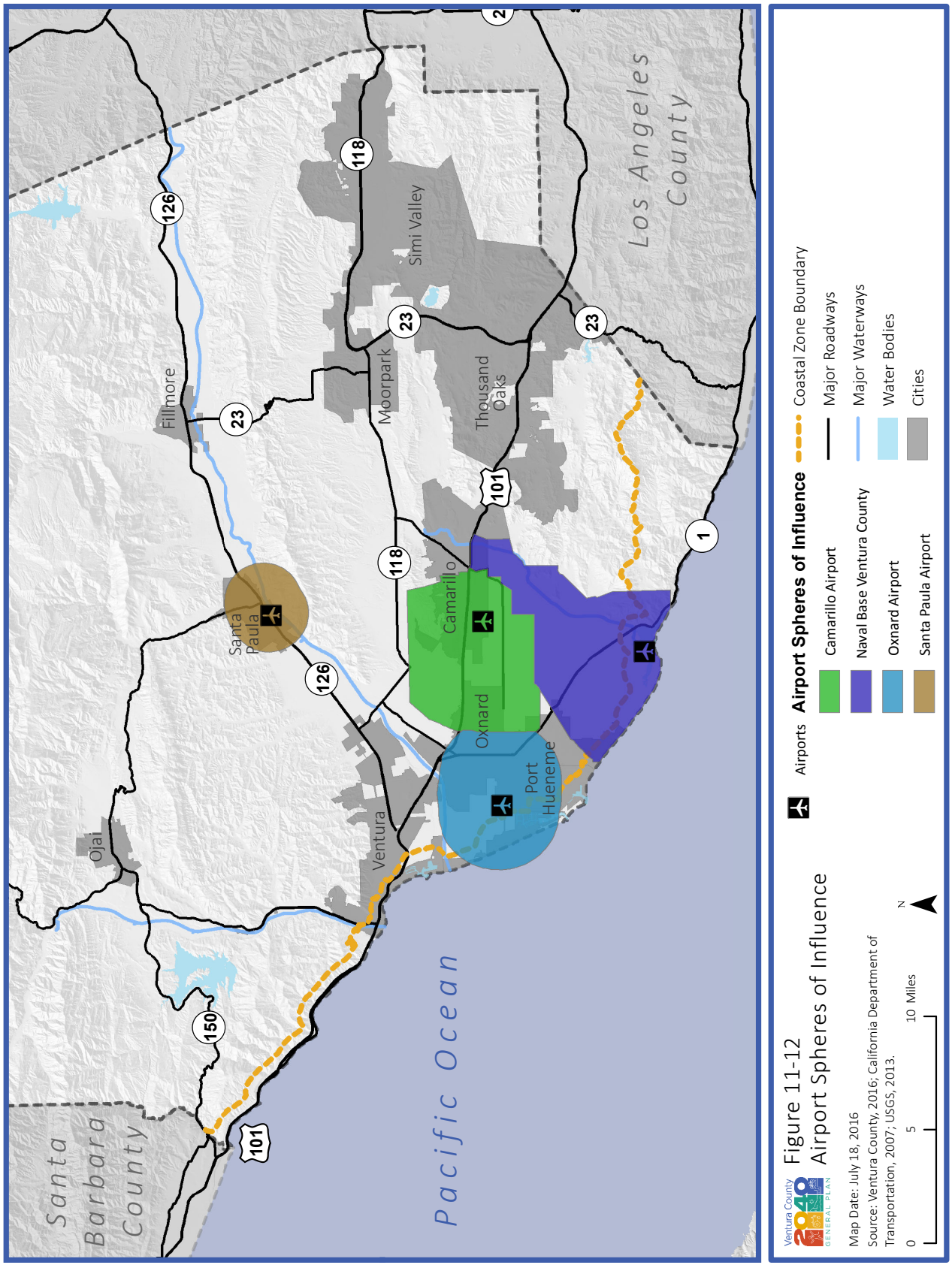
Existing Conditions

Airport Setting

There are four airports in Ventura County: the County-owned and operated airports at Camarillo and Oxnard, a private airstrip at Santa Paula that is open to the public, and the federally-operated Navy Base Ventura County Point Mugu Site, formerly the Point Mugu Naval Air Weapons Station. Figure 11-12 shows airport spheres of influence in the County. The California Air National Guard has an operation on a 204-acre site adjacent to, and utilizes the runways at, the Point Mugu Site. In addition, there are approximately 13 heliports (five associated with hospitals/medical centers), and a few privately-owned landing strips located in various parts of the county.

Airport Environs Land Use Plans

The *Airport Comprehensive Land Use Plan for Ventura County* is intended to protect and promote the safety and welfare of residents near the military and public use airports in the County, as well as airport users, while promoting the continued operation of those airports. Specifically, the plan seeks to protect the public from the adverse effects of aircraft noise, to ensure that people and facilities are not concentrated in areas susceptible to aircraft accidents, and to ensure that no structures or activities encroach upon or adversely affect the use of navigable airspace.


Pacific Ocean
Santa Barbara County
Los Angeles County
Fillmore
Ojai
Ventura
Santa Paula
Moorpark
Simi Valley
Thousand Oaks
Camarillo
Oxnard
Port Hueneme
126
118
23
101
150
1
Airports
Airport Spheres of Influence
Camarillo Airport
Naval Base Ventura County
Oxnard Airport
Santa Paula Airport
Coastal Zone Boundary
Major Roadways
Major Waterways
Water Bodies
Cities
Ventura County 2040 General Plan
Figure 11-12
Airport Spheres of Influence
Map Date: July 18, 2016
Source: Ventura County, 2016; California Department of Transportation, 2007; USGS, 2013.
0
5
10 Miles
N

Implementation of the Comprehensive Land Use Plan for Ventura County promotes compatible urban development and restricts incompatible development in the vicinity of the county's airports, thus allowing for the continued operation of those airports. The three areas of compatibility that are considered in the Plan include:

- Compatibility of surrounding land uses with airport noise levels;
- Compatibility of surrounding land uses with respect to the safety of persons on the ground and persons on board aircraft making controlled crash landings; and
- Protection of airspace needed for safe air navigation near airports.

The Plan applies to all four airports in the county.

Airport Facilities

Oxnard Airport

The Oxnard Airport is 223 acres. Although it is located within the Oxnard city limits, it is owned and operated by the County of Ventura. Oxnard Airport is approximately two miles east of the Pacific Ocean coastline, and is bordered on sides by roads, three of which are major arterials. This airport is situated along the coastal edge of the 200-square mile Oxnard Plain. The City of Oxnard lies equidistant between Santa Barbara to the northwest and Los Angeles to the southeast. Oxnard Airport is classified in the *National Plan of Integrated Airport Systems* (NPIAS) as a primary commercial service airport with inactive status due to not providing scheduled airline service since June 2010. There are 169 aircraft based at the airport. In 2015, there were 75,000 aircraft operations at the Oxnard Airport: 90 percent general aviation, five percent combined air taxi and commuter, and the remaining five percent helicopters.

Camarillo Airport

The Camarillo Airport, owned and operated by the County of Ventura, was formerly known as Oxnard Air Force Base. The airport consists of 654 acres and is located within Camarillo city limits, three miles southwest of the city's central business district. The airport is less than one mile south of the US-101 and seven miles west of the Pacific Ocean coastline. The City of Camarillo lies within the Oxnard Plain, approximately 45 miles northwest of Los Angeles. Camarillo Airport is classified in the *National Plan of Integrated Airport Systems (NPIAS)* as a general aviation reliever for the Los Angeles metropolitan area. Reliever airports provide an alternative to general aviation users in major metropolitan areas. There are 468 fixed-wing aircraft based at the airport. In 2015, there were 136,510 aircraft take-offs and landings at the airport: 93 percent general aviation, four percent air taxi flights, and the remaining three percent helicopters.

Santa Paula Airport

Santa Paula Airport is a privately-owned, public use airport located one mile east of the Santa Paula central business district, south of SR-126. The 24.5-acre airport is owned by the Santa Paula Airport Association, Ltd. and is operated by the owners/stockholders. Santa Paula Airport is classified in the *National Plan of Integrated Airport Systems (NPIAS)* as a general aviation airport. Currently there are several airport-related businesses located at the airport, including the Santa Paula Flight Center, which provides parts, supplies, instruction, fuel and maintenance, plus the airport café and additional aircraft-related businesses. Virtually

all of the estimated 52,400 annual aircraft operations at the airport involve general aviation aircraft. There is no tower, so hours of operation are limited to daytime only. Helicopters also operate out of this facility.

Naval Base Ventura County: Point Mugu

Naval Base Ventura County consists of three operating facilities – Point Mugu, Port Hueneme, and San Nicolas Island – and supports approximately 80 tenant commands that encompass a diverse set of specialties, including three warfare centers (Naval Air Warfare Center – Weapons Division, Naval Surface Water Center – Port Hueneme Division, and Naval Facilities Engineering and Expeditionary Warfare Center). NBVC is also home to deployable units, including the Pacific Seabees and the West Coast E-2 C Hawkeyes.

NBVC Point Mugu occupies 4,486 acres located at the western end of the agricultural lands of the Oxnard Plain, six miles southeast of Oxnard and just over seven miles southwest of Camarillo. The Ventura County and Point Mugu Game preserves (private clubs with no association to the Navy), and Ormond Beach are located to the northwest of the base. California State University Channel Islands is four miles to the northeast. The base is flanked by the Santa Monica Mountains on the east and by the Pacific Ocean to the south. The facility was originally developed during World War II as an extension of the base at Port Hueneme.

The primary mission of NBVC Point Mugu is to provide support for aircraft and test range operations at the installation and surrounding airspace. NBVC Point Mugu is home to the Naval Air Warfare Center – Weapons Division, which manages the 36,000-square mile Point Mugu Sea Range, used for research, development, acquisition, test and evaluation of weapons systems and related devices, and other associated activities. NBVC also manages several special areas, including facilities on Laguna Peak, and the off-shore islands of San Nicholas, Santa Cruz, San Miguel, and Santa Rosa. San Nicolas Island, located approximately 60 miles off the coast of Point Mugu within the Point Mugu Sea Range, serves as an instrumented maritime environment needed for test and evaluation of weapons systems and air-to-sea maneuvering and fleet operations.

NBVC Point Mugu serves a variety of based and transient aircraft. The based military aircraft fleet consists of approximately 75 aircraft. Squadrons based on NBVC Point Mugu include four E-2 Hawkeye squadrons, one test and evaluation squadron and a Reserve C-130T squadron. In 2015, the U.S. Coast Guard announced that two air crews and MH-65D Dolphin helicopters would relocate to NBVC Point Mugu to provide search and rescue operations, homeland security patrols, cargo transport, and drug interdiction operations for the greater Los Angeles region.

NBVC Point Mugu maintains an air traffic control center, which controls all aircraft in southern Ventura County. The air traffic control center provides service seven days a week. Mugu Approach Control provides flight- following service to approximately 125,000 aircraft annually.

Per the 2015 Air Installations Compatible Use Zone (AICUZ) Study, NBVC Point Mugu had 29,493 average total annual flight operations (CY 2009 - 2013). The AICUZ projects 39,500 total annual operations in CY2020. Hours of operation of the airfield are normally between 7 a.m. and 11 p.m. daily and closed on Christmas and New Year's Day. Utilization of the airfield is very low in the early morning and evening hours. Peak hours vary from day to day, depending on changing mission requirements. The least active day is Sunday.

Naval Base Ventura County Joint Land Use Study (JLUS)

The Naval Base Ventura County Joint Land Use Study (JLUS) is a joint, collaborative effort between the cities of Camarillo, Oxnard, and Port Hueneme, the County of Ventura, NBVC, and other stakeholders, to guide planning and land use decisions about development in local governments surrounding NBVC and its operational areas at NBVC Point Mugu, NBVC Port Hueneme, and NBVC San Nicolas Island. The goal of the NBVC JLUS is to protect current and future military training operations while simultaneously guiding community growth, sustaining the environmental and economic health of the region, and protecting public health, safety, and welfare.

Key to the JLUS is the Air Installations Compatible Use Zones (AICUZ) program, which is designed to protect the health, safety, and welfare of civilians and military personnel by encouraging land uses compatible with aircraft operations while protecting the public investment in the installation. The program recommends compatibility measures for both the Navy and surrounding communities, and recommends land uses that are compatible with elevated sound level, accident potential zones, and obstruction clearance criteria associated with military airfield operations.

The JLUS includes diagrams (figures) of Military Compatibility Areas (MCAs), which are used to formally designate a geographic area where military operations may impact local communities, and conversely, where local activities may affect the military's ability to conduct its mission(s). The MCAs include subzones that delineate areas of concern for bird/wildlife aircraft strike hazards, safety, noise, and airfield imaginary surfaces. The MCAs are intended to promote an orderly transition between community and military land uses so that land uses remain compatible; protect public health, safety, and welfare; maintain operational capabilities of military installations and areas; promote an awareness of the size and scope of military training areas to protect areas separate from the actual military installation (e.g., critical air space) used for training purposes; and establish compatibility requirements within the designated area, such as requirements for sound attenuation or avigation easements.

NBVC Point Mugu MCA encompasses four subzones: Bird/Wildlife Aircraft Strike Hazard (BASH), Safety, Noise, and Airfield Imaginary Surfaces.

Bird/Wildlife Aircraft Strike Hazard (BASH) Subzone

The NBVC Point Mugu MCA includes a Bird/Wildlife Aircraft Strike Hazard (BASH) Subzone. The BASH Subzone is a five-mile statutory area from the center of the runway based on Federal Aviation Administration (FAA) recommendations. The BASH Subzone is characterized as an area that could be affected by bird and wildlife strikes due to the lower altitude of flying operations in the area. The following land uses near the NBVC Point Mugu airfield that have the potential to increase BASH incidents include: duck club activities, wetlands, other habitat restorations or new establishments, levees and plantings that attract birds, and changes in land use.

NBVC Point Mugu is located adjacent to the wetlands of Mugu Lagoon, which is an attractive habitat for bird species. There are also two game preserves located immediately west of NBVC Point Mugu. While the Navy's BASH Plan provides a protocol and measurement of management when conditions are high risk for BASH incidents, it does not address or identify the immediate concern of the duck clubs or game preserves adjacent to the airfield. Conversely, the Ventura County Zoning Ordinance does not consider

military compatibility as it relates to BASH incidents, nor does it address concern of duck clubs and game reserves.

Safety Subzone

The Safety Subzone guides compatible land use types, densities, and intensities within the Clear Zones (CZs) and Accident Potential Zones (APZs) I and II of Point Mugu's runways. The purpose of a Safety Subzone is to prevent the development of incompatible land uses in area with the greatest potential for an incident. The location of each Safety Subzone is based on the airfield layout and air operations identified by the Navy.

Noise Subzone

The Noise Subzone is a concern to the public surrounding military installations with flyer missions. NBVC Point Mugu is home to a large airfield that can support many types of aircraft. The area immediately surrounding NBVC Point Mugu is mostly agriculture and open space, which is compatible with military land uses. However, the flight paths could affect population centers and noise sensitive land uses. The Noise Subzone includes all land located off-installation within the 60 dB CNEL noise contour for NBVC Point Mugu.

Imaginary Surfaces Subzone

The Imaginary Surfaces Subzone provides guidance on the height of structures and buildings within the imaginary surfaces areas defined by the FAA and Navy. Imaginary surfaces are 3-D geographic areas comprising approach and departure airspace corridors and safety buffers. The height of structures and buildings are a major concern for flight operations because of the potential for a structure to extend into navigable airspace. Structures of concern include cell towers, power lines, wind turbines, buildings, and trees.

Channel Islands Air National Guard Base

The California Air National Guard 146 Tactical Airlift Wing officially dedicated a 208-acre installation in September of 1990. This property is north of NBVC, at the intersection of Hueneme and Naval Air Roads. This Wing began relocating their C-130 aircraft to this site from Van Nuys Airport in 1989. The Wing uses the NBVC Point Mugu runway and its 2,500-foot taxiway.

The mission of this unit is training for other assigned units once a month with various two-week active duty obligations. This results in over 1,500 personnel during training activities on the base. The Wing operates under the Air Force Mobility Command (AMC). Normal activities average 30 take offs and landings per day between 8 a.m. and 10 p.m. Monday through Friday, with an additional five return flights on weekends. Flight activity increases when the unit performs Fire Support Missions in conjunction with the U.S. Forest Service or the California Department of Forestry.

Aircraft Incidents

The most critical stages of the flight of an aircraft are takeoff and landing where accidents occur more frequently than at other flight stages. This places property in airport approach and departure zones at a higher risk. Hazard zones have been established for the four airports in Ventura County, based on landing

and takeoff patterns, with clear zones (areas that lie immediately beyond the ends of a runway) extending beyond the runway as recommended by the Federal Aviation Administration (FAA).

Oxnard and Camarillo airports had a combined total of over 220,000 annual flights in 2015. With an additional 29,493 average annual aircraft flights at Naval Base Ventura County, Point Mugu, and an estimated 70,000 at Santa Paula Airport, the airspace in this area can be heavily congested. According to Federal Aviation Administration and National Transportation Safety Board databases, since 2010 there have been 12 reported accidents at Camarillo (and one fatality), one accident at Oxnard (one fatality), three accidents at Point Mugu (two fatalities), and seven accidents at Santa Paula (four fatalities). There have been 25 reported incidents at Camarillo (four resulting in substantial aircraft damage, and the rest minor damage), three incidents at Oxnard (all resulting in minor damage), three incidents at Point Mugu (one resulting in substantial aircraft damage, the rest minor damage), and two incidents at Santa Paula (one resulting in substantial aircraft damage, the other minor damage). Only eight near mid-air collisions were reported, all at Camarillo. Air Traffic Control Tower at Camarillo is staffed by FAA personnel and the Tower at Oxnard airport is a Federal Contract Tower. The Towers provide control for aircraft in their respective areas from 7 a.m. to 9 p.m. The tower at Point Mugu is staffed by Navy personnel and is active from 7 a.m. to 10 p.m.

Damage from aircraft accidents varies depending on the weight, speed, and fuel load of the aircraft, as well as the actual land uses (i.e., structures) in the area. The risk to lives would tend to increase with greater density in use (e.g., a school versus a single-family house).

Other effects of aircraft operations include resident concerns over potential aircraft accidents, and aircraft noise.

Regulatory Setting

Federal

FAR 77

Title 14, Regulation 49 of the Code of Federal Regulations (CFR) includes Federal Aviation Regulation, Part 77 (FAR 77). FAR 77 establishes evaluation standards and notification requirements for objects affecting navigable airspace. This includes new construction as well as alterations to existing developments in the vicinity of airports. FAR 77 allows the FAA to identify potential aeronautical hazards in advance, thus preventing or minimizing possible adverse impacts to the safe and efficient use of navigable airspace. The regulation also requires evaluation and determination about potential hazardous effects of proposed construction or alterations, identifies mitigating measures to enhance safe air navigation, and charts new potentially hazardous objects. FAR 77 establishes a series of "Imaginary Surfaces", or horizontal and vertical planes, around airports in order to provide the dimensions within which objects are considered hazardous to airport operating procedures and/or air navigation. These surfaces cover every angle of approach and departure and are based on the specific dimensions, runway types, and operations of a given airport.

State

California Public Utilities Code

The State of California Public Utilities Code (PUC), Sections 21670 et seq., requires the County Board of Supervisors to establish an Airport Land Use Commission (ALUC) in each county with an airport operated for the benefit of the general public. The PUC also sets forth the range of responsibilities, duties, and powers of the Commission. Instead of creating a new body to serve as the ALUC, State law allows the county board of supervisors to authorize an appropriately designated body to fulfill ALUC responsibilities (See Section 21670.1). In Ventura County, the Board of Supervisors has designated the Ventura County Transportation Commission (VCTC) to act as the ALUC for the County. PUC Section 21675 requires the Airport Land Use Commission to formulate a comprehensive land use plan for the area surrounding each public use airport in the County. The Commission is also tasked with formulating a plan for the area surrounding each federal military airport located in the County. Section 21675 specifies that comprehensive land use plans shall provide for the orderly growth of each airport and the area surrounding the airport, and safeguard the welfare of the inhabitants within the vicinity of the airport and the public in general. Section 21676 requires that local general plans conform with the ALUC's comprehensive airport land use plan and grants the ALUC authority to review amendments to general plans, specific plans and zoning ordinances and building regulations that apply within the airport planning boundary.

Senate Bill 1462

Senate Bill 1462 (Chapter 906, Statutes of 2004) expanded the requirements for local governments to notify military installations of proposed development and planning activities. This statute states that "prior to action by a legislative body to adopt or substantially amend a general plan, the planning agency shall refer the proposed action to the branches of the Armed Forces when the proposed project is located within 1,000 feet of a military installation, beneath a low-level flight path, or within Special Use Airspace (SUA)...."

Senate Bill 1468

Senate Bill 1468 (Chapter 971, Statutes of 2002) requires State Office of Planning and Research (OPR) to include guidance concerning incorporating military installation compatibility into a general plan, and how a general plan should consider the impact of civilian growth on readiness activities at military bases, installations, and training areas.

California Aviation System Plan-Policy Element

The California Aviation System Plan (CASP) Policy Element (PE) is the basis for implementing the State Aeronautics Act and identifying the Division of Aeronautics (Division) role in the California Department of Transportation (Caltrans) mission, vision, and values for a multimodal, interregional, transportation system. The PE is updated on approximately a five-year cycle with the last update published in October 2011.

LOCAL

Ventura County Airport Land Use Commission Airport Comprehensive Land Use Plan

Adopted in July 2000, The Airport Comprehensive Land Use Plan (ACLUP) for Ventura County is intended to protect and promote the safety and welfare of residents near the military and public use airports in the County, as well as airport users, while promoting the continued operation of those airports. Specifically, the plan seeks to protect the public from the adverse effects of aircraft noise, to ensure that people and facilities are not concentrated in areas susceptible to aircraft accidents and to ensure that no structures or activities encroach upon or adversely affect the use of navigable airspace.

The ACLUP for NBVC Point Mugu is based on a 1992 AICUZ Study and is due to be updated to reflect the 2015 AICUZ Study. The 2015 AICUZ Study contains updated compatibility analyses and updated noise contour analysis.

2005 Ventura County General Plan

The General Plan covers aviation hazards in Chapter 2, Hazards. Section 2.14 includes goals, policies, and programs related to aviation hazards.

2011 Initial Study Assessment Guidelines

The Initial Study Assessment Guidelines include criteria for evaluating environmental impacts for aviation hazards. These can be found in Section 19. Aviation Hazards.

References

Reports/Publications

California Department of Transportation, Division of Aeronautics, California Airport Land Use Planning Handbook. October 2011.

United States Department of the Navy Naval Facilities Engineering Command Southwest San Diego, California. Naval Base Ventura County Point Mugu. Air Installations Compatible Use Zones Study, December 2015.

Ventura, County of. Airport Comprehensive Land Use Plan for Ventura County Final Report. Prepared for Ventura County Airport Land Use Commission by Coffman Associates. July 7, 2000.

Ventura, County of. Airport Master Plan Draft Final for Camarillo Airport, February 2010.

Ventura, County of. Airport Master Plan for Oxnard Airport. August 2004.

Ventura, County of. Ventura County General Plan: Coastal Area Plan. Last Amended by the Ventura County Planning Division September 16, 2008.

Ventura, County of. Ventura County General Plan: Hazards Appendix. Last Amended by the Ventura County Board of Supervisors June 28, 2011.

Ventura County Transportation Commission, Naval Base Ventura County Joint Land Use Study. September 2015.

Websites

AirNav.com - Santa Paula Airport. http://www.airnav.com/airport/KSZP. November 17, 2016.

California Department of Transportation, Division of Aeronautics, Hospital Heliport Dataplates. http://dot.ca.gov/hq/planning/aeronaut/helipads/dataplates/index.htm. November 18, 2016.

Federal Aviation Administration, Airport Data and Contact Information. https://www.faa.gov/airports/airport_safety/airportdata_5010/menu/. November 16, 2016.

Federal Aviation Administration, Aviation Safety Information Analysis and Sharing (ASIAS), FAA Accident and Incident Data System (AIDS). http://www.asias.faa.gov/pls/apex/f?p=100:11:0::NO:::. November 17, 2016.

Federal Aviation Administration, Aviation Safety Information Analysis and Sharing (ASIAS), FAA Near Mid Air Collisions (NMACS). http://www.asias.faa.gov/pls/apex/f?p=100:34:0::NO:::. November 17, 2016.

Federal Aviation Administration, Aviation Safety Information Analysis and Sharing (ASIAS), NTSB Aviation Accident and Incident Data System. http://www.asias.faa.gov/pls/apex/f?p=100:27:0::NO:27::. November 17, 2016.

Federal Aviation Administration: Obstruction Evaluation/Airport Airspace Analysis (OE/AAA). http://www.wsdot.wa.gov/NR/rdonlyres/2CFA42E4-2718-4884-8FD3-AD2000491AE6/0/FAA_Part77_Basics.pdf, March 2006.

Santa Paula Airport. http://www.santapaulaairport.com/history/airport-history. November 17, 2016.

SECTION 11.5 HAZARDOUS MATERIALS

Introduction

This section addresses hazardous materials, which includes any material that, because of its quantity, concentration, physical or chemical characteristics poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment. Hazardous materials include, but are not limited to, hazardous substances, hazardous waste, and any material that the administering agency determines to be potentially injurious to the health and safety of persons or harmful to the environment if released into the workplace or the environment. This section summarizes hazardous materials and hazardous waste programs that exist in Ventura County, the types of materials that are managed, and briefly discusses current hazardous waste cleanup efforts within the county.

Major Findings

- There are over 2,600 facilities within Ventura County that store and use hazardous materials, maintain above-ground and under-ground hazardous substance storage tanks, and generate hazardous wastes. The majority of hazardous waste generated in the county is comprised of used oil, waste solvents and waste batteries.
- As of November 2016, there were 300 Hazardous Materials sites located in the unincorporated area of Ventura County, of these sites:
    - 27 were permitted underground storage tanks.
    - 273 have undergone or are undergoing hazardous materials remediation or may require remediation pending further testing. Of these, 162 have been designated as "Completed-Case Closed" including:
        - 22 Cleanup Program Sites,
        - 10 Landfill Disposal Sites,
        - 130 leaking underground fuel storage tank (LUST) sites,
    - One LUST site is designated “Open--Site Assessment,”

Existing Conditions

General Hazardous Materials Framework

A material is considered hazardous if it appears on a list of hazardous materials prepared by a federal, state, or local agency, or if it has characteristics defined as hazardous by such an agency. A hazardous material is defined in CA HSC Section 25501 as: any material that, because of its quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment.

Hazardous materials include, but are not limited to, hazardous substances, hazardous waste, and any material that meets the definition according to the handler or the administering agency. Chemical and

physical properties of a substance are directly related to the degree of hazard it poses, including properties of toxicity, ignitability, corrosiveness, and reactivity.

These materials can pose a substantial present or future hazard to human health or the environment if improperly handled, stored, disposed, remediated, or otherwise managed. If improperly handled, hazardous materials can result in public health hazards through direct human contact with contaminated soils or groundwater, or through airborne releases in vapors, fumes, or dust. There is also the potential for accidental or unauthorized releases of hazardous materials that would pose a public health concern (e.g., drinking water contamination). The health effects of hazardous materials exposure are influenced by the dose to which a person is exposed, the frequency of exposure, the exposure pathway, and individual susceptibility.

Hazardous material releases can result in both short- and long-term effects on the local population and environment. Hazardous materials are governed by regulations that require proper storage and handling, business and environmental management plans, spill contingency plans, employee and public noticing, and other emergency preventive and response measures to minimize the risk of accidental releases and related environmental impacts. Chemicals and other materials found in soils of agricultural land or industrial sites as a result of current or past activity may also be of concern. When development on such sites is considered, potentially hazardous materials are identified and evaluated through a Phase I and/or Phase II environmental site assessment review conducted by the developer.

Hazardous Materials/Waste Generation and Management

Hazardous materials and hazardous waste is generated by a diverse range of industries in the county including agriculture, aerospace, on-shore and off-shore petroleum exploration, biotech, military, automotive services, public utilities, and various manufacturing and service industries. There are over 2,600 facilities within Ventura County that store and use hazardous materials, maintain above-ground and under-ground hazardous substance storage tanks, and generate hazardous wastes. The majority of hazardous waste generated in the county is comprised of used oil, waste solvents and waste batteries. (J. Wada; VC CUPA)

In addition to hazardous materials stored/handled at many facilities within the county, the county is intersected by numerous major transportation routes for highway, rail, ocean, pipeline, and aircraft travel that all carry hazardous substances. The release of hazardous materials is considered a significant environmental and public health threat. Therefore, substantial resources have been dedicated by a variety of agencies to create effective management programs.

Certified Unified Program Agency – CUPA

Part of the Ventura County Environmental Health Division (EHD) is the Ventura County Certified Unified Program Agency, (CUPA). The CUPA implements state and federal laws, regulations, county codes and local policies related to hazardous materials management. The Ventura County CUPA provides regulatory oversight for the following six statewide environmental programs:

- **Hazardous Waste:** The purpose of the hazardous waste program is to ensure that hazardous wastes are properly managed to protect public health and the environment. Waste is generally considered hazardous if it is ignitable, corrosive, toxic, reactive, or if it can be shown to be detrimental to human health or the environment. The EHD conducts routine inspections of

facilities that generate hazardous waste to verify compliance with State hazardous waste laws and regulations contained in the California Health and Safety Code, Chapter 6.5 and the California Code of Regulations, Title 22, Division 4.5. Ventura County facilities that generate hazardous waste, except those in the city of Oxnard, are required to obtain a hazardous waste producer's permit from EHD.

- **Hazardous Materials Business Plan:** A Hazardous Materials Business Plan (HMBP) provides the CUPA, local fire agencies, and the public with information regarding hazardous materials stored/handled at businesses and government facilities. The law requires facilities that store, use, or handle hazardous materials at or above specified threshold amounts to provide the CUPA with a HMBP. The CUPA has developed a Hazardous Materials Reporting Chart that explains the inventory reporting requirements and conditional exemptions in the California Health & Safety Code (HSC), Chapter 6.95, Article 1. The CUPA provides HMBP data to the local fire agencies. These agencies use the information during hazardous materials emergency responses. The CUPA is responsible for HMBP program compliance for the unincorporated area in Ventura County and within the cities of Simi Valley, Thousand Oaks, Moorpark, Fillmore, Santa Paula, Camarillo, Port Hueneme, and Ojai. However, within the cities of Oxnard and Ventura, the city fire departments are responsible for HMBP program compliance.

  The CUPA conducts routine HMBP inspections to ensure compliance, provide guidance on preventing or minimizing the risk of hazardous materials spills or releases, and to verify hazardous materials inventories, Emergency Response Plans, site maps, and training. The law requires that the HMBP, records of employee training, and updated site maps be available for review as part of the inspection process.

- **California Accidental Release Prevention Program (CalARP):** The objective of the CalARP program is to identify the risks associated with the use of extremely hazardous materials and to reduce the chances and negative effects to the public of an extremely hazardous materials release. To accomplish this, a facility must develop and maintain risk management plans and programs contained in the California Code of Regulations, Title 19, Chapter 4.5. Facilities subject to CalARP are inspected and evaluated to determine the completeness and effectiveness of risk management plans and programs. The CUPA regulates facilities subject to CalARP within Ventura County, with the exception of the cities of Oxnard and Ventura.

- **Underground Hazardous Materials Storage Tanks:** EHD regulates the construction, operation, repair and removals of underground storage tank (UST) systems within Ventura County, with the exception of the cities of Oxnard and Ventura. The goal of the UST Program is to protect public health, the environment and groundwater. To accomplish this goal, EHD ensures that facilities with UST operations are properly permitted and meet applicable monitoring requirements. This is accomplished during plan check and inspection activities. Each UST site is inspected annually to determine if the UST facility is in compliance with all applicable sections of the California Health and Safety Code Chapter 6.7 and California Code of Regulations Title 23.

- **Aboveground Petroleum Storage Tanks:** The CUPA regulates facilities subject to the Aboveground Petroleum Storage Act (APSA) within Ventura County with the exception of the cities of Oxnard and Ventura. In general, facilities storing at least 1,320 gallons of petroleum products in aboveground storage tanks/containers are subject to APSA requirements per California Health and Safety Code, Chapter 6.67. APSA requires the facility to maintain a Spill Prevention, Control, and Countermeasure (SPCC) Plan. This plan includes information on: the stored petroleum products, how the tanks/containers will be maintained and inspected, spill prevention measures, and spill response procedures. Such facilities are also required to annually submit a

Tank Facility Statement or Hazardous Materials Business Plan (HMBP). The program allows for certain types of facilities, such as farms, nurseries and construction sites, to qualify as "conditionally exempt" from certain APSA requirements. CUPA is required to establish a fee in order to administer the inspection and enforcement of APSA and to collect a surcharge for Office of the State Fire Marshall for oversight of the program.

- **Onsite Hazardous Waste Treatment/Tiered Permit:** In most cases, businesses in the county that treat hazardous waste onsite (except those in the City of Oxnard), are required to notify the CUPA of the treatment activity and comply with state laws and regulations pertaining to onsite hazardous waste treatment. Treatment is any process designed to change the physical, chemical or biological characteristic or composition of the hazardous waste. Depending on the treatment process and type and amount of hazardous waste treated, the treatment activity may be allowed under one of three treatment tiers managed by the CUPA.

In addition to these programs, the CUPA is involved with hazardous materials emergency response, investigation of illegal disposal of hazardous waste, and public complaints.

Other County Agencies Involved in Hazardous Materials Management

The Ventura County Fire Protection District is responsible in conjunction with an Automatic Aid Agreement to provide hazardous materials response capability to the cities and unincorporated areas of the county. The FPD also participates on a variety of committees that focus on pre-planning, preparation, and grant coordination for terrorism events and hazardous materials response.

The Sheriff, as Director of the Office of Emergency Services (OES), is responsible for population protection activities. The Sheriff's OES, a non-sworn component of the Sheriff's Department, carries out the functions of emergency management, planning and exercise development for response and recovery activities related to hazardous materials and other natural and man-made disasters.

The county's Public Health Officer enforces and observes all of the following in the unincorporated area of the county: (a) orders and ordinances of the Board of Supervisors pertaining to public health and sanitary matters; (b) orders including quarantine and other regulations prescribed by the department; and (c) statutes related to public health. The Public Health Officer may take any preventive measure that may be necessary to protect and preserve the public health from any public health hazard during any "state of war emergency," "state of emergency," or "local emergency," as defined by Section 8558 of the Government Code, within his or her jurisdiction. "Preventive measure" means abatement, correction, removal or any other protective step that may be taken against any public health hazard that is caused by a disaster and affects the public health.

Household Hazardous Waste Management

Residential households generate hazardous wastes that must be property disposed. These wastes may include latex paint, batteries, electronic waste, fluorescent lights, solvents, cleaners, oils, pool chemicals, and medications. The Ventura County Integrated Waste Management Division administers the Household Hazardous Waste (HHW) collection program and the operation of the Pollution Prevention Center, a permanent HHW collection facility which specifically serves residents of the unincorporated area and from the cities of Ojai, Santa Paula, and Fillmore. The County maintains information on permitted household hazardous waste facilities for residents to find out where to drop off various types of household hazardous waste. The County of Ventura holds monthly household hazardous waste collection

events at the County's Pollution Prevention Center. Most municipal jurisdictions within the county also offer similar monthly collection events.

Tracking Hazardous Materials Sites in Ventura County

Information on hazardous materials and contaminated properties is maintained by both the State of California and the County of Ventura. This section explains the agencies and programs responsible for managing this information and explains the presence of hazardous materials and sites in Ventura County.

The California Environmental Protection Agency (CalEPA) maintains the State of California Hazardous Waste and Substances List (also known as the "Cortese List"). Government Code Section 65962.5 requires CalEPA to annually update the Cortese List. The Department of Toxic Substances Control (DTSC) is responsible for providing a portion of the Cortese List information, while other State and local agencies provide the remaining information. The EnviroStor database, managed by DTSC, lists Brownfield sites (a US EPA program for contaminated properties), sites undergoing hazardous materials mitigation, sites with known contamination that may require further investigation, Federal Superfund sites, State response sites, voluntary cleanup sites, and school cleanup sites.

The California Water Resources Control Board and the State's Regional Water Quality Control Boards maintain "GeoTracker," which is a data management system for sites that impact, or have the potential to impact, water quality in California, with emphasis on groundwater. GeoTracker contains records for sites that require cleanup, such as Leaking Underground Storage Tank (LUST) Sites, Department of Defense Sites, and Cleanup Program Sites. GeoTracker also contains records for permitted facilities such as Irrigated Lands, Oil and Gas production, operating Permitted USTs, and Land Disposal Sites. GeoTracker portals retrieve and compile records from multiple State Water Board programs and other agencies.

Effective on January 1, 2013, all businesses that submit facility information such as hazardous materials business plans, underground storage tank, and hazardous waste generator forms and related documents, will be required to use the internet to submit this information to their local agency electronically through an electronic information management system known as the California Environmental Reporting System (CERS). CERS will benefit regulated facilities by simplifying the document submittal process, including new information submittals and updating existing information to the CUPA. CERS will allow response agencies quick access to current data during emergency response activities.

According to State-maintained data (i.e., EnviroStor and GeoTracker), as of November 2016, there were 295 Hazardous Materials sites listed in the unincorporated area of Ventura County, 22 of which were permitted underground storage tanks (while the State reported 22 sites, the county was monitoring 27 sites, therefore for purposes of this Background Report, the County is reporting a total of 300 Hazardous Materials sites and 27 permitted underground storage tanks sites), of these sites:

- 273 have undergone or are undergoing hazardous materials remediation or may require remediation pending further testing. Of these, 162 have been designated as "Completed-Case Closed" including:
    - 22 Cleanup Program Sites,
    - 10 Landfill Disposal Sites,
    - 130 leaking underground fuel storage tank (LUST) sites,
- One LUST site is designated "Open--Site Assessment."

Following is a summary of the geographic distribution of sites within the unincorporated county:

- Newbury Park: 71 sites (47 closed or permitted);
- Somis: 47 sites (23 closed or permitted);
- Saticoy: 22 sites (20 closed or permitted),
- Oak View: 19 sites (18 closed or permitted),
- Piru: 19 sites (10 closed or permitted),
- Other Unincorporated Areas : 117 sites (66 closed or permitted)

Updated information on State-maintained data is available through DTSC's EnviroStor at http://www.envirostor.dtsc.ca.gov/public/ and the Water Boards' GeoTracker at http://geotracker.waterboards.ca.gov/.

Through the CUPA, the County maintains records on particular types of sites that are more up-to-date than those maintained by the State. For instance, as of November 2016, the county was monitoring 27 permitted underground storage tanks in the unincorporated area (as opposed to the 22 reported by the State). A full list of Ventura County CUPA facilities and programs, including USTs, can be found at: http://www.vcrma.org/envhealth/EHD_FACILITY_LISTS/cupa_facilities.pdf.

Ongoing Hazardous Waste Cleanup Sites in Ventura County

Halaco Superfund Site

The Halaco site is located in Oxnard at 6200 Perkins Road. The Halaco Engineering Company operated a secondary metal smelter at the site from 1965 to 2004, recovering aluminum, magnesium, and zinc from dross, castings, cans, car parts, and other scrap metal. The Site includes an 11-acre area containing the former smelter, and an adjacent 26-acre waste management area where wastes were deposited. The site includes a portion of the Ormond Beach wetlands, one of the few remaining wetlands in the area and home to several endangered or threatened species.

During its 40 years of operation, Halaco produced a large quantity of waste (i.e., slag) containing residual metals from the smelting process. From about 1965 to 1970, Halaco discharged waste into unlined settling ponds in or adjacent to the Oxnard Industrial Drain. From about 1970 to 2002, Halaco deposited wastes into unlined earthen settling ponds east of the smelter. More than 700,000 cubic yards of waste remain on-site. The U.S. Environmental Protection Agency took over site clean-up activities in 2007 and is currently conducting a Feasibility Study that will analyze options for site cleanup and reuse.

Santa Susana Field Lab (SSFL)

The SSFL site is comprised of 2,850 acres located in rocky terrain above Simi Valley. The facility opened in 1948 and began as a research, development, and testing location for rocket engines. During its history, the site has been managed by North American Aviation, Rocketdyne, Rockwell, and Boeing, in cooperation with the U.S. Army and Air Force. NASA acquired a portion of the site from the Air Force in 1973 and still manages 451.2 acres within the SSFL site today. The Boeing Company manages the remaining 2,398.8 acres. All operations at SSFL ceased in 2006.

For several decades, state and federal agencies have conducted environmental analysis to determine the extent of potential contamination on site. Studies have been conducted on soils, groundwater, and surface water. In addition, certain facilities on site, including the rocket test stands and other related ancillary structures have been found to have historical significance based on the historic importance of the engine testing and the engineering and design of the structures. The NASA-administered areas of SSFL also contain cultural resources not related to rocket development. SSFL is located near the crest of the Simi Hills that are part of the Santa Monica Mountains running east-west across Southern California. The diverse terrain consists of ridges, canyons, and sandstone rock outcrops.

A clean-up plan addressing soil and water contamination has been developed for the site by state and federal regulators, as well as by Boeing and NASA. Remediation activities are ongoing.

USA Petrochem

The USA Petroleum/Petrochem site is located at 4777 Crooked Palm Road in the unincorporated area of Ventura County, approximately 100 feet from the Ventura River. The refinery was built in the late 1970s, operated for less than 10 years, and shut down in 1984. The site contained a number of very large above ground storage tanks, many of which had oily sludge left from when the refinery closed. Since site closure, a number of leaks were observed from the piping throughout the facility. There was also a large amount of asbestos on the pipes and process units.

Since August 2012, at the request of EHD, the U.S. EPA assumed oversight of cleanup operations at the site. Cleanup activities are ongoing and include, but are not limited to removal of contaminated soil and structures, spill cleanup, and removal of all remaining fuel, sludge, and refining chemicals. The property owner has already located and closed off all outfalls and drainages from the site to the Ventura River.

Talley Facility – Telair International (TFX Aviation site)

The Talley Facility is located at 3085 Old Conejo Road, in Newbury Park. The Facility originally was built in the early 1950s on approximately 12.85 acres of property. The Facility was used by Talley Corporation for manufacturing civilian and military aircraft components from approximately 1956 to 1989. Seven buildings were located on the Facility supporting various manufacturing processes including metal casting, degreasing, pickling, and plating. During the manufacturing process, the Facility generated hazardous wastes, which included the following hazardous constituents: hexavalent chromium (Cr+6), other metals, cyanide, Trichloroethylene (TCE), miscellaneous chlorinated solvents, and waste oils, some of which contained low concentrations of polychlorinated biphenyls (PCBs). On-site waste disposal practices included the use of a surface impoundment and a leachfield.

In 1983 it was discovered that the surface impoundment had leaked. Subsequent investigations revealed that soil and groundwater were contaminated with solvents and heavy metals (mainly TCE and Cr+6). In 1984 the Facility submitted a closure plan to Department of Toxic Substances Control (DTSC) for the surface impoundment. The impoundment was closed in 1984 and a total of 3,200 cubic yards of contaminated soil were later removed. An engineered cap was then installed over the impoundment area.

A final post-closure permit was issued by DTSC on November 24, 1992 which addressed water quality monitoring of the former surface impoundment, closure of the solid waste management units, and post-closure care of the former surface impoundment. Operation of the groundwater treatment plan was subsequently taken out of the final post-closure permit and covered by DTSC's Permit by Rule process. The groundwater treatment plant was authorized by Ventura County under Permit by Rule and is not part

of this permit. The Post-Closure Permit was renewed/ reissued in October 7, 2005, with an expiration date of October 7, 2015.

Corrective action at the Facility has been conducted pursuant to the requirements of the Administrative Order on Consent issued by U.S. EPA in 1988 and the Post-Closure Permit issued by DTSC in 1992. In 1993, U.S. EPA selected extraction and treatment as the remedy for groundwater contamination. The remediation is currently ongoing, treating about 2.5 million gallons of groundwater a month and involving a total of 40 wells used for extraction and monitoring. Continuation of the pumping and treating of the groundwater is necessary to eliminate further migration and prevent future exposure. The groundwater remedy is ongoing and is expected to continue throughout the period of this permit.

Commonly Found Hazardous Materials

Commonly found hazardous materials can occur in structural building components, particularly in older buildings, which sometimes contain hazardous materials such as asbestos, polychlorinated biphenyls (PCBs), lead, and mercury. Businesses that store, use, or handle hazardous materials at or above specified threshold amounts are required to prepare a Hazardous Materials Business Plan and submit it to the County's Certified Unified Program Agency (CUPA). Also, households can generate hazardous materials, and the County of Ventura holds monthly events for the collection of household hazardous waste on an appointment basis at the Pollution Prevention Center.

Structural Building Components

Asbestos. "Asbestos" is a general name for a group of naturally occurring minerals composed of small fibers. Structures built or remodeled between 1930 and 1981 could contain asbestos-containing building materials (ACBM), such as floor coverings, drywall joint compounds, acoustic ceiling tiles, piping insulation, electrical insulation, and fireproofing materials. The presence of ACBM in a building does not mean that the building is itself a health hazard; as long as ACBM remains in good condition and are not disturbed or damaged, exposure is unlikely. Exposure is most likely to result during demolition. Many buildings in Ventura County were constructed prior to 1981 and, therefore, have the potential to contain ACBM.

Regulations formulated by the Ventura County Air Pollution Control District (VCAPCD) and California Division of Occupational Safety and Health (CalOSHA) restrict asbestos emissions from building demolition and renovation activities, and specify safe work practices to minimize release of asbestos fibers. These regulations prohibit emissions of asbestos from asbestos-related manufacturing, demolition, and construction activities; require medical examinations and monitoring of employees engaged in activities that could disturb asbestos; specify precautions and safe work practices that must be followed to minimize the potential for release of asbestos; and require notice to Federal and local government agencies prior to beginning building demolition or renovation activity that could disturb asbestos. CalOSHA and the U.S. EPA define any material with one percent or more asbestos by weight as an ACBM.

PCBs. The manufacture and import of polychlorinated biphenyls (PCBs) have been banned in the U.S. since 1978. Sources of PCBs often include fluorescent light ballasts, electric transformers, and televisions, all of which are presumed to be present in Ventura County. Such items are regulated as hazardous waste and must be transported and disposed of accordingly. DTSC classifies PCBs as hazardous waste when concentrations exceed 5 parts per million (ppm) in liquids or 50 ppm in non-liquids.

Lead. Lead is a highly toxic metal that was used in products found in and around residences. Lead exposure from paint is possible when paint peels or is removed, and the lead can contaminate dust and soil. Construction workers can be exposed to airborne lead during demolition, renovation, or maintenance work. Although lead-based paints were banned from production in the 1970s, many buildings in Ventura County were constructed prior to that and may still contain lead. In addition to residences, areas along older, major roadways may contain aerially deposited lead (ADL), which could have been deposited from vehicle exhaust prior to 1996 when the sale of lead-based gasoline was banned.

CalOSHA standards establish a maximum safe exposure level for types of construction work where lead exposure may occur, including demolition of structures where materials containing lead are present; removal or encapsulation of materials containing lead; and new construction, alteration, repair, or renovation of structures with materials containing lead. Inspection, testing, and removal of lead-containing building materials must be performed by State-certified contractors who comply with applicable health and safety and hazardous materials regulations.

Mercury. Mercury is another toxic metal considered hazardous. It can be found in fluorescent light tubes and bulbs, thermostats, and other electrical equipment. If these items are disposed of in landfills mercury could leach into the soil or groundwater. The mercury typically found in lighting tubes has been known to exceed regulatory thresholds and therefore must be managed in accordance with hazardous waste regulations. Mercury can also be present in traps in the plumbing of older buildings, where mercury-containing equipment has been used. Any items that contain mercury must be disposed of according to applicable hazardous waste regulations.

Business Hazardous Waste

Businesses are required to safely dispose of hazardous waste. Illegal disposal of hazardous waste, such as dumping in the trash, down storm drains, or abandoning it in alleyways, can result in serious legal ramifications for business owners such as fines and/or jail time. Legal disposal for businesses can become complicated, time-consuming, and expensive, since businesses are required to pay for disposal, and business owners will often hire a contractor to dispose of the waste. Ventura County offers several options for certain businesses that make disposal of hazardous waste easier and/or less expensive.

Household Hazardous Waste

Residential households are another source of hazardous materials. The Ventura County Integrated Waste Management Division administers the Household Hazardous Waste (HHW) collection program and the operation of the Pollution Prevention Center, a permanent HHW collection facility which specifically serves residents of the unincorporated area and from the cities of Ojai, Santa Paula, and Fillmore. The County maintains information on permitted household hazardous waste facilities for residents to find out where to drop off various types of household hazardous waste. These wastes may include latex paint, batteries, electronic waste, fluorescent lights, solvents, cleaners, oils, pool chemicals, medications, and more, depending on the location. The County of Ventura holds monthly household hazardous waste collection events at the County's Pollution Prevention Center. Most municipal jurisdictions within the County also offer similar monthly collection events.

Regulatory Setting

This section describes the Federal, State, and local regulatory setting related to existing and potential hazardous materials.

Federal

Federal agencies that regulate hazardous materials include the U.S. Environmental Protection Agency (EPA), Occupational Safety and Health Administration (OSHA), the United States Department of Transportation (DOT), and the National Institutes of Health (NIH). The following Federal laws and guidelines govern hazardous materials storage, handling, and remediation in Ventura County:

- Occupational Safety and Health Act
- Federal Insecticide, Fungicide, and Rodenticide Act
- Comprehensive Environmental Response, Compensation, and Liability Act
- Guidelines for Carcinogens and Biohazards
- Superfund Amendments and Reauthorization Act Title III
- Resource Conservation and Recovery Act
- Toxic Substances Control Act

U.S. Environmental Protection Agency

The Environmental Protection Agency (EPA) is responsible for researching and setting national standards for a variety of environmental programs, and delegates to states and local government responsibility for issuing permits, and monitoring and enforcing compliance. EPA Region IX has authority over the Ventura County region, regulating chemical and hazardous materials use, storage, treatment, handling, transport, and disposal practices; protects workers and the community (along with CalOSHA, see below); and integrates the federal Clean Water Act and Clean Air Act into California legislation.

Federal Occupational Safety and Health Administration

The Federal Occupational Health and Safety Administration (OSHA) establishes and enforces Federal regulations related to health and safety of workers exposed to toxic and hazardous materials. In addition, OSHA sets health and safety guidelines for construction activities and manufacturing facility operations.

State

California passed the Hazardous Waste Control Act (HWCA) in 1972, which created the California Hazardous Waste Control Program. The program surveyed existing hazardous waste generation to determine the need for new or expanded facilities for meeting future waste management demands. The facility permitting program, designed to protect public health and the environment through the issuance of operating permits for facilities that treat, store, or dispose of hazardous wastes, provided a mechanism for in-depth inspections and a permit review of each hazardous waste facility at least every ten years.

California Environmental Protection Agency

In 1991, the California Environmental Protection Agency (CalEPA) was established to oversee and coordinate the activities of the Air Resources Board, Integrated Waste Management Board (succeeded by the Department of Resources Recycling and Recovery), Department of Pesticide Regulation, Department

of Toxic Substances Control, Office of Environmental Health Hazard Assessment, and State Water Resources Control Board.

Certified Unified Program Agency Program

In 1992, Senate Bill 1082 created the Unified Hazardous Waste and Hazardous Materials Management Regulatory Program (Unified Program), to ensure consistency throughout the state regarding hazardous waste and materials standards. Cal EPA oversees the entire Unified Program and certifies local government agencies, known as Certified Unified Program Agencies (CUPA), to implement the program standards.

A local agency, such as a county or city, applies to Cal/EPA for certification as the Unified Program Agency, responsible for implementing the Unified Program within its jurisdiction. A Certified Unified Program Agency must establish a program that consolidates, coordinates and makes consistent the administrative requirements, permits, inspection activities, enforcement activities, and hazardous waste and hazardous materials fees. The implementation of the Unified Program must not result in more fragmentation between jurisdictions than existed before the Unified Program, and the Unified Program must be consistent throughout the entire county.

The Unified Program is implemented at the local level, but the program is certified by the Secretary of California Environmental Protection Agency (CalEPA). The Governor's Office of Emergency Services, Department of Toxic Substances Control, Office of the State Fire Marshal, and State Water Resources Control Board are also involved with the Unified Program.

California Governor's Office of Emergency Services

The California Governor's Office of Emergency Services (OES) supports and enhances emergency management, including preparedness, response, recovery, and mitigation needs, and assists local and tribal governments with hazard mitigation planning. The OES also develops the State Hazard Mitigation Plan, and respond to and aids in the recovery from emergencies within the State. In addition, the OES is responsible for providing technical assistance and evaluation of the Hazardous Material Release Response Plan (Business Plan) and the Area Plan Programs.

California Department of Toxic Substances Control

The California Department of Toxic Substances Control (DTSC) regulates hazardous substances and wastes, oversees remedial investigations, protects drinking water from toxic contamination, and warns public exposed to listed carcinogens. DTSC also provides technical assistance and evaluation for the hazardous waste generator program including onsite treatment (tiered permitting).

CAL FIRE- Office of the State Fire Marshal (CAL FIRE-OSFM)

The Office of the State Fire Marshal (OSFM) is responsible for ensuring the implementation of the Hazardous Material Management Plan (HMMP) and Hazardous Materials Inventory Statement (HMIS) and the Aboveground Petroleum Storage Act (APSA) Programs. The HMMP and HMIS Program is closely tied to the Business Plan Program. In addition, Cal FIRE-OSFM also handle the oversight and enforcement for the aboveground storage tank program. The OSFM is also responsible for ensuring the implementation of the California Fire Code HMMP/HMIS and the APSA program elements.

California Highway Patrol/ California Department of Transportation

The California Highway Patrol (CHP) and California Department of Transportation (Caltrans) have primary regulatory responsibility for the transportation of hazardous wastes and materials.

California Occupational Safety and Health Administration

The California Occupational Safety and Health Administration (CalOSHA) is responsible for promulgating and enforcing State health and safety standards, and implementing Federal OSHA laws. CalOSHA has authority to set and enforce standards to minimize the potential for release of asbestos and lead during construction and demolition activities.

State Water Resources Control Board/Regional Water Quality Control Board

The State Water Resources Control Board provides technical assistance and evaluation for the underground storage tank program. The Los Angeles Regional Water Quality Control Board (RWQCB) is one of nine regional boards in the state charged with protecting surface and groundwater quality from pollutants discharged or threatened to be discharged to the Waters of the State. The RWQCB issues and enforces National Pollutant Discharge Elimination System (NPDES) permits and regulates leaking underground storage tanks and other sources of groundwater contamination.

Local

Local agencies that coordinate and implement hazardous materials regulations and protocols in Ventura County include the Ventura County Air Pollution Control District (VCAPCD), Ventura County CUPA, and the Ventura County Fire Protection District.

Ventura County Air Pollution Control District

The Ventura County Air Pollution Control District (VCAPCD) regulates the demolition of buildings and structures that may contain asbestos through both inspection and law enforcement The VCAPCD is to be notified 10 days in advance of any proposed demolition or abatement work. The provisions that cover these operations are found in VCAPCD Regulation 1, Rule 62 and 62-1: Hazardous Materials and Airborne Toxics; Hazardous Materials. Individual project contractors are required to implement standard State and Federal procedures for asbestos containment and worker safety. The rule requires special handling of asbestos-containing building materials (ACBM) (e.g., by keeping materials continuously wetted). The Rule prohibits any visible emissions of ACBM to outside air. Individual project applicants are required to consult with the VCAPCD Enforcement Division prior to commencing demolition of a building containing ACBM.

Ventura County Environmental Health Division, CUPA Program

Ventura County Environmental Health Division, Certified Unified Program Agency (VC CUPA) is the CUPA for all incorporated and unincorporated areas of Ventura County, with the exception of the City of Oxnard., This means VC CUPA has been certified by the CalEPA to implement the following six state environmental programs:

- Hazardous Waste
- Hazardous Materials Business Plan (HMBP)

- California Accidental Release Prevention Program (CalARP)
- Underground Hazardous Materials Storage Tanks (UST)
- Aboveground Petroleum Storage Tanks /Spill Prevention Control & Countermeasure Plans (APSA)
- Onsite Hazardous Waste Treatment / Tiered Permit

The Hazardous Materials Business Plan (HMBP) is required to include a summary of business activities, owner and operator information including emergency contacts, the type and quantity of reportable hazardous materials, a site map, emergency response procedures, and an employee training program. In general, the submittal of a HMBP is required if a business handles and/or stores a hazardous material equal to or greater than the minimum reportable quantities. These quantities are 55 gallons for liquids, 500 pounds for solids, and 200 cubic feet (at standard temperature and pressure) for compressed gases. Exemptions to filing a HMBP are listed in the Health and Safety Code.

The Ventura County Environmental Health Division also administers the Medical Waste Program, Body Art Program, and has emergency on-call staff available to respond to hazardous and medical waste incidents/releases.

Ventura County Fire Protection District (VCFPD)

The Ventura County Fire Protection District serves the communities of Camarillo, Moorpark, Ojai, Port Hueneme, Simi Valley, and Thousand Oaks. Formed in May 1928, the VCFPD provides all-risk services including Fire Suppression, Rescue, Emergency Medical, Hazardous Materials, Urban Search and Rescue (USAR), Water Rescue, Operational Training, Fire Prevention, Investigation, Community Education, Community Emergency Response Teams (CERT) and Public Information. The VCFPD service area encompasses approximately 484 square miles and serves a population of more than 480,000. All VCFPD fire stations have a staffed fire engine in service. At strategic fire stations throughout the county, the VCFPD staffs a ladder truck along with a fire engine. Fire engines attack a fire; ladder trucks provide support to the fire attack crew. All apparatus are equipped to deliver emergency medical care. Some apparatus staffed with personnel EMTs to provide basic life support (BLS). While other apparatus are staffed with paramedics to deliver advance life support (ALS). In addition the department provides ALS services through the use of staffed paramedic squads.

The VCFPD also maintains other pieces of specialized apparatus throughout the county. The on-duty crew at the station will staff and operate these specialized units when needed. The Department responds to approximately 35,000 calls for service annually.

Ventura County Certified Unified Program Agency Program

The Ventura County CUPA implements Federal and State laws and county regulations related to hazardous waste use, storage, transport, and disposal. The CUPA activities include education on proper handling, storage, and disposal of hazardous wastes; inspections of hazardous waste generators; the investigation of illegal disposal and public complaints; and emergency response to hazardous materials. Additionally, the CUPA provides oversight and regulation of statewide environmental programs, which include the following:

- Hazardous Waste,
- Hazardous Materials Business Plan,
- California Accidental Release Prevention Program,

- Underground Hazardous Materials Storage Tanks,
- Aboveground Petroleum Storage Tanks/ Spill Prevention Control & Countermeasure Plans
- Onsite Hazardous Waste Treatment/ Tiered Permit

For emergency response services, the City of Ventura Fire Department and the Oxnard Fire Department are Participating Agencies of the CUPA and implement the programs in their respective jurisdictions. The remainder of CUPA responsibilities in the county rest with the County Environmental Health Division.

2005 Ventura County General Plan

The General Plan covers hazardous materials in Chapter 2, Hazards. Section 2.15 includes goals, policies, and programs related to hazardous materials.

2011 Initial Study Assessment Guidelines

The Initial Study Assessment Guidelines include criteria for evaluating environmental impacts for hazardous materials. These can be found in Sections 20a. Hazardous Materials/Waste-Materials and 20b. Hazardous Materials/Waste-Waste.

Key Terms

Biohazard. An infectious agent or hazardous biological material that presents a risk or potential risk to the health of humans, animals, or the environment. The risk can be direct through infection or indirect through damage to the environment.

Brownfield. Abandoned, idled, or under-used real property where expansion or redevelopment is complicated by the presence or potential presence of environmental contamination.

Carcinogen. Any substance that can cause or aggravate cancer.

Corrosiveness. The ability to eat away materials and destroy human and animal tissue by chemical action (e.g., oven cleaner).

Exposure Pathway. The route through which a chemical can enter the body (e.g., through the skin, inhaling, ingesting).

Groundwater. Water that exists beneath the land surface in openings (space) between soil and rock. Does not include water residue from underground mining.

Heavy Metal. An individual metal or metal compound that can negatively affect people's health. Though in very small amounts certain heavy metals are necessary to support life (e.g., iron, copper, manganese, zinc), when heavy metals are not metabolized by the body, they can accumulate in the soft tissues and become toxic.

Ignitability. The ability to catch fire; flammable (e.g., lighter fluid, paint remover).

Leach. The process by which soluble substances are dissolved and transported through the soil, which may result in hazardous substances entering surface water, groundwater, or nearby soil.

Petroleum Hydrocarbons. The primary constituents in oil, gasoline, and diesel, plus a variety of solvents.

Polychlorinated Biphenyls (PCBs). Chemicals formerly manufactured for use as coolants and lubricants in transformers, and in other electrical equipment (e.g., fluorescent light ballasts, old televisions). In 1978, PCB production was banned in the U.S. because accumulation in the environment can cause harmful health effects, including cancer.

Reactivity. The ability to create an explosion or produce deadly vapors (e.g., bleach mixed with an ammonia-based cleaner).

Release/Occurrence. Any means by which a substance could harm the environment (e.g., spilling, leaking, dumping).

Remediate. The act or process of removing pollution or contaminants from the soil, groundwater, sediment, or surface water to protect human health and the environment.

Solvent. A substance that dissolves another substance (or substances) to form a solution. Solvents are usually, but not always, liquids. Liquid solutions that do not have water as a solvent are called non-aqueous solutions. For example, solvents can be used to dissolve greases, oils, and paints or thin or mix pigments, paints, glues, pesticides, and epoxy resins.

Toxicity. The ability to produce injury, illness, or damage to people, domestic animals, or wildlife through ingestion, inhalation, or absorption through the body (e.g., cleaning fluids, pesticides, bleach, drain cleaner).

References

Reports/Publications

N/A

Websites

CAL FIRE, Office of the State Fire Marshal. http://osfm.fire.ca.gov/cupa/cupa, November 15, 2016.

California Department of Toxic Substances Control. EnviroStor: Ventura County. http://www.envirostor.dtsc.ca.gov/public/, July 12, 2016.

California Environmental Protection Agency. http://www.calepa.ca.gov/, November 15, 2016.

California Senate Environmental Quality Committee Oversight Hearing, Oversight of the Department of Toxic Substances Control: Hazardous Waste Management Program (January 15, 2014). http://archive.senate.ca.gov/sites/archive.senate.ca.gov/files/committees/2013-14/senv.senate.ca.gov/oversighthearings2/index.html, November 14, 2016.

California State Water Resources Control Board. GeoTracker: Ventura County. http://geotracker.waterboards.ca.gov/search.asp?cmd=search&hidept=True&status=&reporttitle=Ventura+County&county=Ventura, July 7, 2016 and November 11, 2016.

Ventura, County of. Environmental Health Division, Certified Unified Program Agency/ Hazardous Materials Program. http://www.vcrma.org/envhealth/cupa/index.html, November 14, 2016.

SECTION 11.6 NOISE AND VIBRATION

Introduction

This section includes a description of relevant acoustical background information, including fundamental principles of acoustics, a description of the existing community noise environment in Ventura County, applicable federal, state and local regulations, and key terms.

Major Findings

The major findings with respect to noise are as follows:

- Based on ambient noise level measurements throughout unincorporated areas of the county, the predominant sources of noise include traffic noise on major roadways, transit and freight trains, and aircraft.
- Roadway traffic is the predominant source of noise affecting sensitive land uses in the county. Freeways and major arterial roadways are the primary sources of traffic noise. Based on traffic-noise modeling, the roadways in unincorporated Ventura County with the greatest modeled traffic-noise levels are US-101 and State Routes 23, 118, and 126.
- Of the roadway segments modeled, the 60 A-weighted decibels (dBA) traffic noise contour ranges from 4 to 1,792 feet from the centerline of the roadway. Residential land uses located within the 60 dBA contour along these roadway segments are currently exposed to noise levels above the 60 dBA Community Noise Equivalent Level (CNEL) standard for residential land uses.
- In addition to traffic noise on local roadways and state highways, passenger and freight trains operating within the unincorporated areas of the county contribute to community noise levels. Based on the modeling conducted, the 60 dBA CNEL railroad noise contour is between approximately 154 to 165 feet from the centerline of the rail line. Residential land uses located within the 60 dBA contour along these railroad lines are currently exposed to noise levels above the 60 dBA CNEL standard for residential land uses.
- The Airport Comprehensive Land Use Plan (CLUP) for Ventura County establishes noise compatibility policies for sensitive land uses within the 60 dBA and higher CNEL noise contours. The plan restricts extremely sensitive land uses (e.g., mobile home parks) within the 60 dBA CNEL contour and requires mitigation measures for moderately sensitive land uses within the 60 dBA CNEL contour.
- Noise generated by industrial facilities and other stationary sources contribute to the ambient noise environment in their immediate vicinities.

Existing Conditions

Acoustics Fundamentals

Acoustics is the scientific study that evaluates perception, propagation, absorption, and reflection of sound waves. Sound is a mechanical form of radiant energy, transmitted by a pressure wave through a

solid, liquid, or gaseous medium. Sound that is loud, disagreeable, unexpected, or unwanted is generally defined as noise. Common sources of environmental noise and noise levels are presented in Table 11-5.

TABLE 11-5
TYPICAL NOISE LEVELS

Common Outdoor Activities	Noise Level (dB)	Common Indoor Activities
	110	Rock band
Jet flyover at 1,000 feet	100	
Gas lawnmower at 3 feet	90	
Diesel truck moving at 50 mph at 50 feet	80	Food blender at 3 feet, Garbage disposal at 3 feet
Noisy urban area, Gas lawnmower at 100 feet	70	Vacuum cleaner at 10 feet, Normal speech at 3 feet
Commercial area, Heavy traffic at 300 feet	60	
Quiet urban daytime	50	Large business office, Dishwasher in next room
Quiet urban nighttime	40	Theatre, Large conference room (background)
Quiet suburban nighttime	30	Library, Bedroom at night, Concert hall (background)
Quiet rural nighttime	20	Broadcast/Recording Studio
Threshold of Human Hearing	0	Threshold of Human Hearing

Notes: dB=decibel
Source: California Department of Transportation [Caltrans] 2013.

Sound Properties

A sound wave is initiated in a medium by a vibrating object (e.g., vocal chords, the string of a guitar, or the diaphragm of a radio speaker). The wave consists of minute variations in pressure, oscillating above and below the ambient atmospheric pressure. The number of pressure variation cycles occurring per second is referred to as the frequency of the sound wave and is expressed in hertz.

Directly measuring sound pressure fluctuations would require the use of a very large and cumbersome range of numbers. To avoid this and have a more useable numbering system, the decibel scale was introduced. A sound level expressed in decibels (dB) is the logarithmic ratio of two like pressure quantities, with one pressure quantity being a reference sound pressure. For sound pressure in air the standard reference quantity is generally considered to be 20 micropascals, which directly corresponds to the threshold of human hearing. The use of the decibel is a convenient way to handle the million-fold range of sound pressures to which the human ear is sensitive. A decibel is logarithmic; it does not follow normal algebraic methods and cannot be directly summed. For example, a 65 dB source of sound, such as a truck, when joined by another 65 dB source results in a sound amplitude of 68 dB, not 130 dB (i.e., doubling the source strength increases the sound pressure by 3 dB). A sound level increase of 10 dB corresponds to 10 times the acoustical energy, and an increase of 20 dB equates to a 100-fold increase in acoustical energy.

The loudness of sound perceived by the human ear depends primarily on the overall sound pressure level and frequency content of the sound source. The human ear is not equally sensitive to loudness at all frequencies in the audible spectrum. To better relate overall sound levels and loudness to human perception, frequency-dependent weighting networks were developed. The standard weighting networks are identified as A through E. There is a strong correlation between the way humans perceive sound and

A-weighted sound levels (dBA). For this reason, the dBA can be used to predict community response to noise from the environment, including noise from transportation and stationary sources. All sound levels discussed in this section are A-weighted decibels unless otherwise noted.

Noise can be generated by a number of sources, including: mobile (i.e., transportation) sources such as automobiles, trucks, and airplanes; and stationary (i.e., non-transportation) sources such as construction sites, machinery, and commercial and industrial operations. As acoustic energy spreads through the atmosphere from the source to the receiver, noise levels attenuate (i.e., decrease) depending on ground absorption characteristics, atmospheric conditions, and the presence of physical barriers. Noise generated from mobile sources generally attenuate at a rate of 4.5 dB per doubling of distance. Stationary noise sources spread with more spherical dispersion patterns that generally attenuate at a rate of 6 to 7.5 dB per doubling of distance.

Atmospheric conditions such as wind speed, turbulence, temperature gradients, and humidity may additionally alter the propagation of noise and affect levels at a receiver. Furthermore, the presence of a large object (e.g., barrier, topographic features, and intervening building façades) between the source and the receptor can provide significant attenuation of noise levels at the receiver. The amount of noise level reduction (i.e., shielding) provided by a barrier primarily depends on the size of the barrier, the location of the barrier in relation to the source and receivers, and the frequency spectra of the noise. Natural (e.g., berms, hills, and dense vegetation) and human-made features (e.g., buildings and walls) may be used as noise barriers.

All buildings provide some exterior-to-interior noise reduction. A building constructed with a wood frame and a stucco or wood sheathing exterior typically provides a minimum exterior-to-interior noise reduction of 25 dB with its windows closed, whereas a building constructed of a steel or concrete frame, a curtain wall or masonry exterior wall, and fixed plate glass windows of one-quarter-inch thickness typically provides an exterior-to-interior noise reduction of 30–40 dB with its windows closed (Caltrans 2009).

Effects of Noise on Humans

Excessive and chronic exposure to elevated noise levels can result in auditory and non-auditory impacts to humans. Auditory effects of noise on people are those related to temporary or permanent hearing loss caused by loud noises. Non-auditory effects of exposure to elevated noise levels are those related to behavioral and physiological effects. The non-auditory behavioral effects of noise on humans are associated primarily with the subjective effects of annoyance, nuisance, and dissatisfaction, which lead to interference with activities such as communications, sleep, and learning. The non-auditory physiological health effects of noise on humans have been the subject of considerable research attempting to discover correlations between exposure to elevated noise levels and health problems, such as hypertension and cardiovascular disease. The mass of research infers that noise-related health issues are predominantly the result of behavioral stressors and not a direct noise-induced response. The extent to which noise contributes to non-auditory health effects remains a subject of considerable research, with no definitive conclusions.

The degree to which noise results in annoyance and interference is highly subjective and may be influenced by several non-acoustic factors. The number and effect of these non-acoustic environmental and physical factors vary depending on individual characteristics of the noise environment such as sensitivity, level of activity, location, time of day, and length of exposure. One key aspect in the prediction of human response to new noise environments is the individual level of adaptation to an existing noise environment. The greater the change in the noise levels that are attributed to a new noise

source, relative to the environment an individual has become accustom to, the less tolerable the new noise source will be perceived.

With respect to how humans perceive and react to changes in noise levels, a 1 dB increase is imperceptible, a 3 dB increase is barely perceptible, a 6 dB increase is clearly noticeable, and a 10 dB increase is subjectively perceived as approximately twice as loud (Egan 2007). These subjective reactions to changes in noise levels was developed on the basis of test subjects' reactions to changes in the levels of steady-state pure tones or broad-band noise and to changes in levels of a given noise source. It is probably most applicable to noise levels in the range of 50 to 70 dB, as this is the usual range of voice and interior noise levels. For these reasons, a noise level increase of 3 dB or more is typically considered substantial for humans in terms of the degradation of the existing noise environment.

Negative effects of noise exposure include physical damage to the human auditory system, interference, and disease. Exposure to noise may result in physical damage to the auditory system, which may lead to gradual or traumatic hearing loss. Gradual hearing loss is caused by sustained exposure to moderately high noise levels over a period of time; traumatic hearing loss is caused by sudden exposure to extremely high noise levels over a short period of time. Gradual and traumatic hearing loss both may result in permanent hearing damage. In addition, noise may interfere with or interrupt sleep, relaxation, recreation, and communication. Although most interference may be classified as annoying, the inability to hear a warning signal may be considered dangerous. Noise may also be a contributor to diseases associated with stress, such as hypertension, anxiety, and heart disease. The degree to which noise contributes to such diseases depends on the frequency, bandwidth, level of the noise, and the exposure time (Caltrans 2009).

Noise levels can also have adverse impacts on animals. (See Section 8.2, "Biological Resources," for more detail.)

Vibration

Vibration is the periodic oscillation of a medium or object with respect to a given reference point. Sources of vibration include non-human-caused phenomena (e.g., earthquakes, volcanic eruptions, sea waves, and landslides) and those introduced by human activity (e.g., explosions, machinery, traffic, trains, and construction equipment). Vibration sources may be continuous (e.g., operating factory machinery) or transient (e.g., explosions). Vibration levels can be depicted in terms of amplitude and frequency (relative to displacement), velocity, or acceleration.

Vibration amplitudes are commonly expressed in peak particle velocity (PPV) or root-mean-square (RMS) vibration velocity. PPV and RMS vibration velocity are normally described in inches per second (in/sec).

Although PPV is appropriate for evaluating the potential for building damage, it is not always suitable for evaluating human response. It takes some time for the human body to respond to vibration signals. In a sense, the human body responds to average vibration amplitude. The RMS of a signal is the average of the squared amplitude of the signal, typically calculated over a 1-second period. As with airborne sound, the RMS velocity is often expressed in decibel notation as vibration decibels (VdB), which serves to compress the range of numbers required to describe vibration (Federal Transit Association [FTA] 2006). This is based on a reference value of 1 micro (μ) in/sec.

The typical background vibration-velocity level in residential areas is approximately 50 VdB. Groundborne vibration is normally perceptible to humans at approximately 65 VdB. For most people, a

vibration-velocity level of 75 VdB is the approximate dividing line between barely perceptible and distinctly perceptible levels (FTA 2006).

Typical outdoor sources of perceptible ground vibration are construction equipment, steel-wheeled trains, and traffic on rough roads. If a roadway is smooth, the ground vibration is rarely perceptible. The range of interest is from approximately 50 VdB, which is the typical background vibration-velocity level, to 100 VdB, which is the general threshold where minor damage can occur in fragile buildings. Construction activities can generate ground vibrations, which can pose a risk to nearby structures. Constant or transient vibrations can weaken structures, crack facades, and disturb occupants (FTA 2006).

Construction vibrations can be transient, random, or continuous. Transient construction vibrations are generated by events such as blasting, impact pile driving, and wrecking balls. Continuous vibrations result from activities such as vibratory pile drivers, large pumps, and compressors. Random vibration can result from jackhammers, pavement breakers, and heavy construction equipment. Table 11-6 describes the general human response to different levels of ground vibration-velocity levels.

TABLE 11-6
HUMAN RESPONSE TO DIFFERENT LEVELS OF GROUND NOISE AND VIBRATION

Vibration-Velocity Level (VdB)	Human Reaction
65	Approximate threshold of perception.
75	Approximate dividing line between barely perceptible and distinctly perceptible. Many people find that transportation-related vibration at this level is unacceptable.
85	Vibration acceptable only if there are an infrequent number of events per day.

Notes: VdB=vibration decibels referenced to 1 µ inch per second and based on the root mean squared velocity.
Source: FTA 2006

Sensitive Land Uses

Noise-sensitive land uses are generally considered to include those uses where noise exposure could result in health-related risks to individuals, as well as places where quiet is an essential element of their intended purpose. Residential dwellings are of primary concern because of the potential for increased and prolonged exposure of individuals to both interior and exterior noise levels. Additional land uses such as parks, schools, historic sites, cemeteries, sensitive habitats, and recreation areas are also generally considered sensitive to increases in exterior noise levels. Places of worship, hotels and other short-term lodging, libraries, and other places where low interior noise levels are desirable are also considered noise-sensitive. These noise-sensitive uses are also considered vibration-sensitive land uses in addition to commercial and industrial buildings where vibration would interfere with operations within the building, including levels that may be well below those associated with human annoyance.

The following sensitive land uses have been identified in Ventura County (Ventura County 2015a):

- Residential land uses
- Schools;
- Historic Sites;
- Cemeteries;
- Parks, Recreation, and Open Space Areas;
- Hospitals and Care Facilities;

- Sensitive wildlife habitats, including the habitat of rare, threatened, or endangered species;
- Hotels and other short-term lodging (e.g., bed and breakfasts, motels);
- Places of Worship; and
- Libraries.

Existing Community Noise Environment

The predominant noise sources within Ventura County are mobile sources, including motor vehicles on roadways, freight and passenger trains, and aircraft. Stationary sources from existing land uses such as industrial and agricultural operations also contribute to the existing noise environment. A total of 15 ambient noise level measurements consisting of fourteen 30-minute short-term (ST) measurements and one 24-hour long-term (LT) measurement, were conducted to characterize the existing noise environment at different locations throughout the unincorporated county. Figure 11-13 shows the locations of each sound level measurement and Table 11-7 summarizes the measured sound level at each location.

TABLE 11-7
SUMMARY OF AMBIENT NOISE LEVEL MEASUREMENTS
Ventura County

Measurement Location	Start (Date/Time)	Stop (Date/Time)	A-Weighted Sound Level (dB)			Nearby Noise-Sensitive Land Uses
Short-Term			L_{eq}	L_{max}	L_{min}	
ST-1: Intersection of SR 33 and Valley Mead Road	August 8, 2016/10:22 AM	August 8, 2016/10:52 AM	48.0	73.5	40.9	Residential
ST-2: Holser Canyon Road near the Wes Thompson Piru Rifle Range	August 8, 2016/11:24 AM	August 8, 2016/11:54 AM	64.8	83.9	49.0	Open Space
ST-3: Intersection of SR 126 and Hooper Canyon Road	August 8, 2016/12:12 PM	August 8, 2016/12:42 PM	68.5	84.3	41.6	Open Space
ST-4: Near intersection of 3rd Street and F Avenue	August 8, 2016/2:01 PM	August 8, 2016/2:31 PM	70.9	83.2	46.8	Residential
ST-5: Intersection of SR 1 and Yerba Buena Road, near Neptune's Net Restaurant	August 8, 2016/3:35 PM	August 8, 2016/4:05 PM	75.4	100.1TBD	46.6	Recreation Area
ST-6: Intersection of Vista Del Rincon Drive and	August 8, 2016/4:48 PM	August 8, 2016/5:18 PM	73.2	84.5	48.8	Residential, Open Space

TABLE 11-7
SUMMARY OF AMBIENT NOISE LEVEL MEASUREMENTS
Ventura County

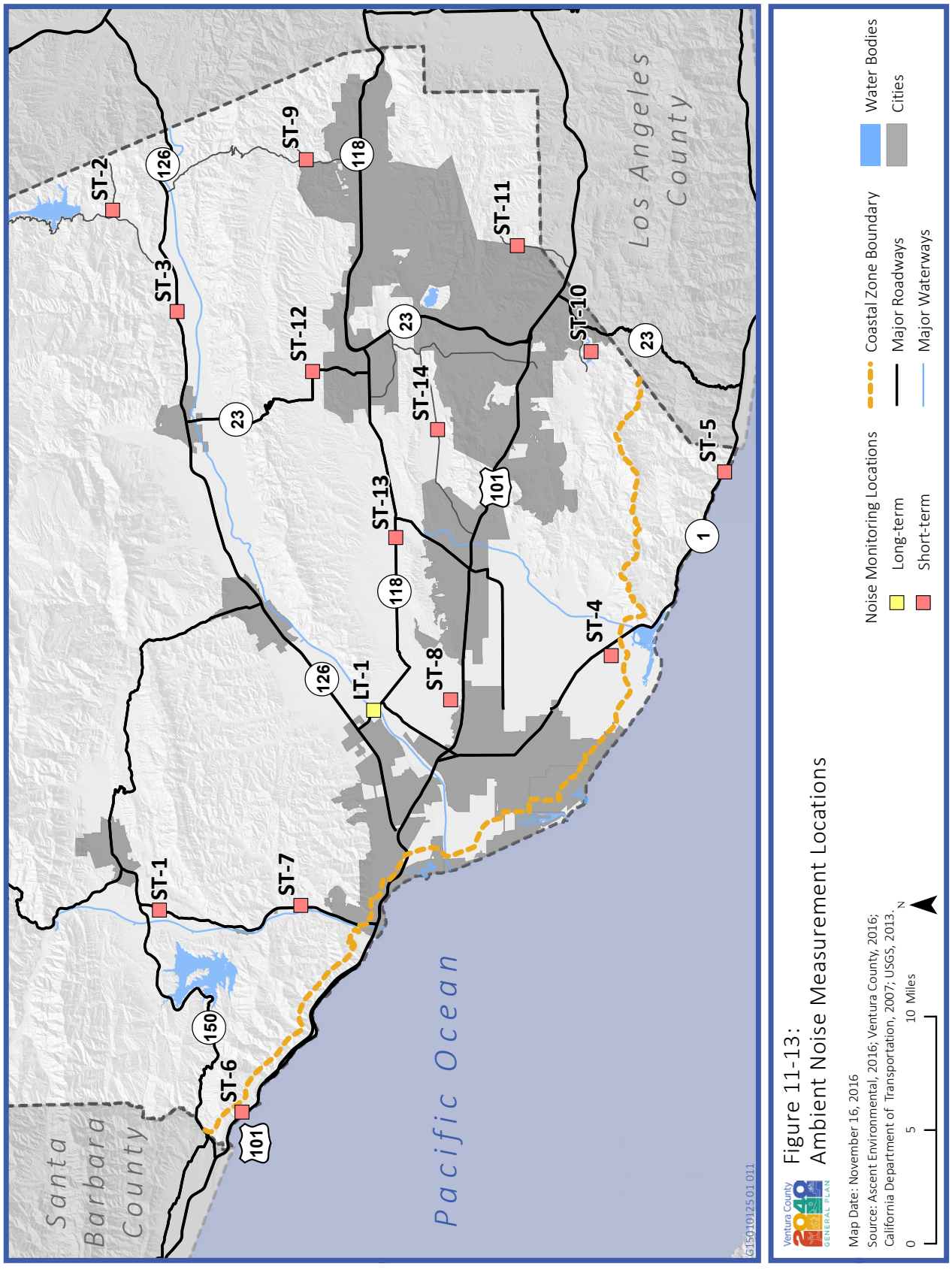
Measurement Location	Start (Date/Time)	Stop (Date/Time)	A-Weighted Sound Level (dB)			Nearby Noise-Sensitive Land Uses
Short-Term			L_{eq}	L_{max}	L_{min}	
Carpinteria Avenue near SR 1						
ST-7: Intersection of North Ventura Avenue and Holt Street Near SR 33	August 8, 2016/5:37 PM	August 8, 2016/6:07 PM	66.9	85.2	49.2	Residential
ST-8: Intersection of Santa Clara Avenue and Friedrich Road	August 9, 2016/10:26 AM	August 9, 2016/10:56 AM	49.7	69.3	36.2	Open Space, Residential
ST-9: Intersection of Tapo Canyon Road and Bennett Road	August 9, 2016/11:10 AM	August 9, 2016/11:40 AM	62.1	70.8	49.2	Open Space
ST-10: Along Lower Lake Road on Lake Sherwood	August 9, 2016/12:09 PM	August 9, 2016/12:39 PM	64.7	69.9	45.9	Residential, Recreation, Open Space
ST-11: Intersection of Lindero Canyon Road and Lakeview Canyon Road	August 9, 2016/1:17 PM	August 9, 2016/1:47 PM	62.1	83.4	34.5	Residential
ST-12: Along SR 23 at the intersection of Happy Camp Road and Broadway	August 9, 2016/3:12 PM	August 9, 2016/3:42 PM	63.6	84.7	44.0	Open Space
ST-13: Along SR 118, north of the Arch Street / North Street intersection	August 10, 2016/1:23 PM	August 10, 2016/1:53 PM	64.9	83.0	45.4	Residential
ST-14: Santa Rose Road and Yucca Drive	August 10, 2016/2:06 PM	August 10, 2016/2:36 PM	58.8	76.5	41.2	Open Space
Measurement Location	**Start (Date/Time)**	**Stop (Date/Time)**	**CNEL/L_{dn}**	**Daytime**	**Nighttime**	

TABLE 11-7
SUMMARY OF AMBIENT NOISE LEVEL MEASUREMENTS
Ventura County

Measurement Location	Start (Date/Time)	Stop (Date/Time)	A-Weighted Sound Level (dB)							Nearby Noise-Sensitive Land Uses
Short-Term			L_{eq}		L_{max}		L_{min}			
Long-Term				L_{eq}	L_{max}	L_{min}	L_{eq}	L_{max}	L_{min}	
LT-1: near SR 118 in open space area south of Riverbank Drive, north east of Santa Clara River	August 8, 2016/1:43 PM	August 9, 2016/2:35 PM	59.3[1]/58.7	56.8	69.6	45.0	48.6	63.5	35.7	Open Space, Commercial Office Buildings

Notes: CNEL=community noise equivalent level, dB=decibel, Leq=equivalent sound level, L_{max}=maximum noise level, L_{min}=minimum noise level, LT= long term, ST= short term. See Figure 11-13 for map of locations.
[1] The LT measurement does not exceed the applicable 60 dB CNEL for the noise-sensitive land uses near this location.
Source: Field data collected by Ascent Environmental, Inc., August and October 2016.

As shown in Table 11-7, the L_{eq} for ST measurement-2, 3, 4, 5, 6,7, 8, 9, 10, 11, and 12 exceed 60 dB. Sensitive receptors near these measurements include residential land use, open space, and recreational areas. It should be noted that these values were taken over the duration of 30 minutes and are intended to reflect ambient noise levels during that period alone; therefore, these values do not indicate CNEL levels at these locations. LT measurement-1, taken over a 24-hour period, provides the CNEL values for that location of 59.3 dB, which does not exceed the applicable threshold of 60 dB.


Santa Barbara County
Pacific Ocean
Los Angeles County
ST-1
ST-2
ST-3
ST-4
ST-5
ST-6
ST-7
ST-8
ST-9
ST-10
ST-11
ST-12
ST-13
ST-14
LT-1
126
118
23
101
150
1
Noise Monitoring Locations
Long-term
Short-term
Coastal Zone Boundary
Major Roadways
Major Waterways
Water Bodies
Cities
0
5
10 Miles
N
Ventura County 2040 GENERAL PLAN
Figure 11-13:
Ambient Noise Measurement Locations
Map Date: November 16, 2016
Source: Ascent Environmental, 2016; Ventura County, 2016; California Department of Transportation, 2007; USGS, 2013.

Existing Traffic Noise

Major highways in Ventura County include US 101, SR 1, SR 33, SR 150, SR 126, and SR 118. There is also a network of rural roadways throughout the county.

Traffic noise was modeled for 131 County-operated roadways segments and 82 state highway segments within the unincorporated county and adjacent areas. Table 11-8 summarizes the modeled existing traffic noise levels at 50 feet from the centerline of each major roadways and lists distances from each roadways centerline to the 70, 65, 60, and 55 dBA CNEL/L_{dn} traffic noise contours. Ascent Environmental performed noise modeling in 2016 based on existing average daily traffic (ADT) volumes and speeds as indicated by a 2015 traffic volumes report provided by the County of Ventura Public Works Agency and supplemented by Caltrans data for freeway segments (Ventura County 2015b; Caltrans 2014). Traffic noise modeling was conducted based on Caltrans' traffic noise analysis protocol and the technical noise supplement (Caltrans 2006, 2013). The modeling does not account for any natural or human-made shielding (e.g., the presence of topography, vegetation, berms, walls, or buildings) and, consequently, represents worst-case noise levels on a horizontal plane.

TABLE 11-8
SUMMARY OF MODELED EXISTING TRAFFIC NOISE LEVELS
Ventura County

Roadway Segment	Location	CNEL (dB) at 50 feet from Roadway Centerline	Distance from Noise Contours (Feet from Roadway Centerline)			
			70 CNEL (dBA)	65 CNEL (dBA)	60 CNEL (dBA)	55 CNEL (dBA)
County Operated Roadways						
Aggen Rd.	n/o L.A. Ave. (SR 118)	55.0	3	10	32	101
Balcom Canyon Rd.	s/o South Mountain Rd.	54.6	3	9	32	101
Balcom Canyon Rd.	n/o L.A. Ave. (SR 118)	56.1	4	13	41	129
Bardsdale Ave.	e/o Sespe St.	56.4	4	14	44	139
Beardsley Rd.	n/o Central Ave.	61.2	13	42	133	420
Bennett Rd.	n/o Tapo Canyon Rd.	47.4	1	2	6	17
Box Canyon Rd.	s/o Santa Susana Pass Rd.	57.7	6	18	58	184
Bradley Rd.	n/o L.A. Ave. (SR 118)	61.2	13	42	133	420
Briggs Rd.	s/o Telegraph Rd.	62.8	19	61	191	605
Briggs Rd.	n/o Telegraph Rd.	58.4	7	22	69	218
Bristol Rd.	w/o Montgomery Ave.	64.8	30	96	302	956
Broadway Rd.	w/o Grimes Canyon Rd. (SR 23)	58.8	8	24	76	241
Burnham Rd.	s/o Baldwin Rd. (SR 150)	55.1	3	10	32	101
Burnham Rd.	e/o Santa Ana Rd.	54.4	3	9	28	88

TABLE 11-8
SUMMARY OF MODELED EXISTING TRAFFIC NOISE LEVELS
Ventura County

Roadway Segment	Location	CNEL (dB) at 50 feet from Roadway Centerline	Distance from Noise Contours (Feet from Roadway Centerline)			
			70 CNEL (dBA)	65 CNEL (dBA)	60 CNEL (dBA)	55 CNEL (dBA)
Calle Yucca	n/o Camino Manzanas	54.2	3	8	26	83
Camino Dos Rios	w/o Lynn Rd.	56.6	5	14	45	143
Canada Larga Rd.	e/o Ventura Ave.	54.3	3	8	27	85
Carne Rd.	n/o Ojai Ave. (SR 150)	50.7	1	4	12	37
Casitas Vista Rd.	w/o Ojai Fwy. (SR 33)	55.6	4	12	36	115
Cawelti Rd.	w/o Lewis Rd.	60.0	10	32	101	319
Center School Rd.	s/o L.A. Ave. (SR 118)	55.8	4	12	38	119
Center St. (Piru)	w/o Telegraph Rd. (SR 126)	54.2	3	8	26	84
Central Ave.	w/o Ventura Fwy. (US 101)	66.3	42	134	423	1137
Central Ave.	w/o Santa Clara Ave.	66.9	49	156	494	1563
Central Ave.	e/o Vineyard Ave. (SR 232)	62.9	20	62	197	624
Channel Islands Blvd.	w/o Rice Ave.	67.7	58	185	585	1849
Creek Rd.	e/o Country Club Dr.	52.5	2	6	18	56
Creek Rd.	e/o Ventura Ave. (SR 33)	59.4	9	28	88	279
Deer Creek Rd.	n/o Pacific Coast Hwy. (SR 1)	43.1	<1	1	2	6
Deerhill Rd.	n/o Kanan Rd.	59.2	8	26	83	263
Del Norte Rd.	s/o Rancho Dr.	47.7	1	2	6	18
Donlon Rd.	n/o La Cumbre Rd.	50.6	1	4	12	37
Doris Ave.	e/o Victoria Ave.	63.6	23	72	229	723
El Roblar Dr.	w/o Maricopa Hwy. (SR 33)	57.3	5	17	54	170
Etting Rd.	e/o Dodge Rd.	61.6	14	45	144	454
Fairview Rd.	e/o Maricopa Hwy. (SR 33)	50.7	1	4	12	37
Fairway Dr.	n/o Valley Vista Dr.	56.7	5	15	47	148
West Fifth St.	e/o North Harbor Blvd.	58.7	7	14	74	235
Foothill Rd.	w/o Peck Rd.	59.3	9	27	85	269
Foothill Rd.	w/o Briggs Rd.	56.0	4	13	40	126

TABLE 11-8
SUMMARY OF MODELED EXISTING TRAFFIC NOISE LEVELS
Ventura County

Roadway Segment	Location	CNEL (dB) at 50 feet from Roadway Centerline	Distance from Noise Contours (Feet from Roadway Centerline)			
			70 CNEL (dBA)	65 CNEL (dBA)	60 CNEL (dBA)	55 CNEL (dBA)
Foothill Rd.	e/o North Wells Rd.	61.1	13	40	128	403
Foothill Rd.	e/o Saticoy Ave.	63.4	22	69	218	689
Gonzales Rd.	e/o North Harbor Blvd.	63.4	22	69	218	689
Grand Ave.	e/o Fordyce Rd.	60.3	11	34	106	336
Grand Ave.	w/o Fordyce Rd.	53.0	2	6	20	63
Grimes Canyon Rd.	n/o L.A. Ave (SR 118)	60.5	11	35	112	354
Guiberson Rd.	e/o Chambersburg Rd. (SR 23)	56.8	5	15	48	151
Harbor Blvd.	n/o Gonzales Rd.	70.2	106	334	1058	3345
Harbor Blvd.	s/o Gonzales Rd.	0	0	0	0	0
Hitch Blvd.	s/o L.A. Ave. (SR 118)	54.0	2	8	25	79
Howe Rd.	e/o Torrey Rd.	48.6	1	2	7	23
Hueneme Rd.	e/o Las Posas Rd.	66.5	45	142	448	1417
Hueneme Rd.	e/o Nauman Rd.	66.2	42	133	420	1328
Hueneme Rd.	e/o Wood Rd.	66.2	42	132	416	1315
Hueneme Rd.	w/o Olds Rd.	66.9	49	156	492	1556
Kanan Rd.	e/o Lindero Canyon Rd.	66.2	41	131	414	1309
Kanan Rd.	e/o Hollytree Dr./Oak Hills Dr.	66.0	40	126	399	1263
Kanan Rd.	s/o Tamarind St.	67.9	62	197	623	1969
La Luna Ave.	s/o Lomita Ave.	56.1	4	13	41	129
La Vista Ave.	n/o L.A. Ave (SR 118)	57.3	5	17	53	168
Laguna Rd.	e/o Pleasant Valley Rd.	60.7	12	37	117	370
Laguna Rd.	n/o Hueneme Rd.	60.5	11	35	112	353
Las Posas Rd.	n/o East Fifth St. (SR 34)	66.5	45	141	446	1414
Las Posas Rd.	s/o East Fifth St. (SR 34)	66.7	47	150	473	1496
Las Posas Rd.	s/o Hueneme Rd.	65.1	32	103	324	1025
East Las Posas Rd.	n/o Santa Rosa Rd.	58.8	8	24	76	241
Lewis Rd.	s/o Pleasant Valley Rd.	67.9	62	196	620	1961
Lewis Rd.	n/o Potrero Rd.	67.0	50	160	505	1597
Lockwood	w/o Kern	56.3	4	12	43	134

TABLE 11-8
SUMMARY OF MODELED EXISTING TRAFFIC NOISE LEVELS
Ventura County

Roadway Segment	Location	CNEL (dB) at 50 feet from Roadway Centerline	Distance from Noise Contours (Feet from Roadway Centerline)			
			70 CNEL (dBA)	65 CNEL (dBA)	60 CNEL (dBA)	55 CNEL (dBA)
Valley Rd.	County Line					
Lockwood Valley Rd.	e/o Maricopa Hwy. (SR 33)	53.3	2	7	21	67
Lomita Ave.	e/o Tico Rd.	57.8	6	19	60	189
Main St. (Piru)	n/o Telegraph Rd. (SR 126)	56.2	4	13	42	132
McAndrew Rd.	n/o Reeves Rd.	48.6	1	2	7	23
Moorpark Rd.	n/o Santa Rosa Rd.	69.6	91	287	909	2874
Old Telegraph Rd.	w/o Grand Ave.	57.9	6	19	61	194
Olds Rd.	n/o Hueneme Rd.	59.8	10	30	96	303
Olivas Park Dr.	w/o Victoria Ave.	69.0	64	202	638	2017
Panama Dr.	s/o Lake Shore Dr.	44.4	<1	1	3	9
Pasadena Ave.	e/o Sespe St.	49.4	1	3	9	28
Patterson Rd.	s/o Doris Ave.	51.6	1	5	15	46
Piru Canyon Rd.	n/o Orchard St.	48.6	1	2	7	23
Pleasant Valley Rd.	s/o East Fifth St. (SR 34)	69.3	85	267	845	2672
Pleasant Valley Rd.	w/o Las Posas Rd.	67.6	58	182	576	1821
Potrero Rd.	e/o Lake Sherwood Dr.	62.6	18	57	180	571
Potrero Rd.	w/o Stafford Rd.	58.5	7	23	71	226
Potrero Rd.	w/o Hidden Valley Rd.	50.6	1	4	12	37
Potrero Rd.	Milepost 2.75	57.0	5	16	50	157
Potrero Rd.	e/o Lewis Rd.	62.8	19	61	192	607
Price Rd.	n/o L.A. Ave. (SR 118)	55.0	3	10	32	101
Rice Ave.	s/o East Fifth St. (SR 34)	71.0	127	401	1268	4010
Rice Ave.	n/o Channel Islands Blvd.	70.2	105	331	1048	3314
Rice Ave.	n/o Hueneme Rd.	61.6	14	46	144	455
Rice Rd. (Meiners Oaks)	s/o Lomita Ave.	59.2	8	27	84	266
Riverside Ave.	w/o Chambersburg Rd. (SR 23)	53.1	2	6	21	65
Rose Ave.	s/o L.A. Ave.	62.4	17	55	174	551

TABLE 11-8
SUMMARY OF MODELED EXISTING TRAFFIC NOISE LEVELS
Ventura County

Roadway Segment	Location	CNEL (dB) at 50 feet from Roadway Centerline	Distance from Noise Contours (Feet from Roadway Centerline)			
			70 CNEL (dBA)	65 CNEL (dBA)	60 CNEL (dBA)	55 CNEL (dBA)
	(SR 118)					
Rose Ave.	s/o Central Ave.	63.4	22	70	220	697
Rose Ave.	n/o Collins Ave.	65.9	39	124	392	1241
Santa Ana Blvd.	e/o Ventura River	58.1	6	20	65	204
Santa Ana Rd.	s/o Baldwin Rd. (SR 150)	54.7	3	9	29	93
Santa Ana Rd.	s/o Santa Ana Blvd.	57.5	6	18	56	176
Santa Clara Ave.	n/o Friedrich Rd.	68.4	69	217	686	2168
Santa Clara Ave.	s/o L.A. Rd (SR 118)	69.1	82	256	819	2588
Santa Rosa Rd.	w/o Moorpark Rd.	70.2	105	331	1047	3311
Santa Rosa Rd.	w/o East Las Posas Rd.	69.4	88	277	877	2773
Santa Susana Pass Rd.	e/o Katherine Rd.	58.5	7	22	70	221
Sespe St.	n/o South Mountain Rd.	60.0	10	32	101	319
Sespe St.	s/o Pasadena Ave.	55.0	3	10	32	101
South Mountain Rd.	e/o Balcom Canyon Rd.	54.4	3	9	28	88
South Mountain Rd.	s/o Santa Clara River	57.2	6	18	57	180
Stockton Rd.	e/o Balcom Canyon Rd.	52.4	2	6	18	55
Sturgis Rd.	w/o Pleasant Valley Rd.	63.1	20	64	202	639
Tapo Canyon Rd.	s/o Bennet Rd.	53.9	2	8	25	78
Telegraph Rd.	w/o Briggs Rd.	63.0	20	63	200	632
Telegraph Rd.	w/o Hallock Dr.	0	0	0	0	0
Telegraph Rd.	w/o Olive Rd.	63.4	22	70	220	696
Telephone Rd.	n/o Olivas Park Dr.	67.4	54	172	544	1720
Tico Rd.	n/o Ventura Ave (SR 150)	56.6	5	14	45	143
Tierra Tejada Rd.	e/o Moorpark Frwy. (SR 23)	69.4	87	274	866	2740
Torrey Rd.	s/o Telegraph Rd. (SR 126)	54.2	3	8	27	84
Valley Vista Dr.	s/o Calle Aurora	59.1	8	26	82	258

TABLE 11-8
SUMMARY OF MODELED EXISTING TRAFFIC NOISE LEVELS
Ventura County

Roadway Segment	Location	CNEL (dB) at 50 feet from Roadway Centerline	Distance from Noise Contours (Feet from Roadway Centerline)			
			70 CNEL (dBA)	65 CNEL (dBA)	60 CNEL (dBA)	55 CNEL (dBA)
Ventura Ave.	n/o Canada Larga Rd.	56.3	4	13	43	134
Ventura Ave.	n/o Shell Rd.	59.4	9	28	88	277
Victoria Ave.	s/o Olivas Park Dr.	73.8	239	755	2386	7547
Villanova Rd.	e/o Ventura Ave. (SR 33)	55.4	4	11	35	111
Walnut Ave.	n/o L.A. Ave. (SR 118)	53.3	2	7	21	67
Wendy Dr.	n/o Gerald Dr.	62.8	19	60	191	604
Wood Rd.	s/o Hueneme Rd.	60.0	10	32	101	319
Wood Rd.	s/o East Fifth St. (SR 34)	58.0	6	20	64	202
Wooley Rd.	w/o Rice Ave.	67.0	52	163	516	1630
Wright Rd.	e/o Santa Clara Ave.	58.7	7	24	74	235
Yerba Buena Rd.	n/o Pacific Coast Hwy. (SR 1)	50.1	1	3	10	32
State Highways within Ventura County[1]						
Route 1	Callegus Creek	70.6	114	361	1143	3614
Route 1	Oxnard, Pleasant Valley Rd./Rice Ave.	64.7	30	94	295	943
Route 1	Oxnard, Saviers Rd.	65.7	37	117	369	1166
Route 1	Oxnard, Jct. Rte. 34, Fifth Rd. (West)	64.6	29	92	290	917
Route 1	Oxnard, Jct. Rte. 34, Fifth Rd. (East)	65.1	32	100	316	1001
Route 1	Oxnard, Jct. Rte. 232, Vineyard Ave. (West)	70.7	117	369	1166	3688
Route 1	Oxnard, Jct. Rte. 232, Vineyard Ave. (East)	69.3	86	272	860	2720
Route 1	Oxnard, Jct. Rte. 101 (South)	70.7	117	369	1168	3692
Route 1	Oxnard, Jct. Rte. 101 (North)	63.6	23	73	232	732
Route 1	Seacliff Colony, Jct. Rte. 101	58.3	7	21	68	214
Route 1	Las Cruces, Jct. Rte. 101, Mobil Oil Pier	59.0	8	25	80	252

TABLE 11-8
SUMMARY OF MODELED EXISTING TRAFFIC NOISE LEVELS
Ventura County

Roadway Segment	Location	CNEL (dB) at 50 feet from Roadway Centerline	Distance from Noise Contours (Feet from Roadway Centerline)			
			70 CNEL (dBA)	65 CNEL (dBA)	60 CNEL (dBA)	55 CNEL (dBA)
Route 23	Thousand Oaks, Triunfo Canyon Rd. (Back)	71.1	128	403	1276	4035
Route 23	Thousand Oaks, Triunfo Canyon Rd. (Ahead)	73.0	197	624	1973	6241
Route 23	Thousand Oaks, Jct. Rte. 101 (South)	74.8	301	953	3013	9527
Route 23	Thousand Oaks, Jct. Rte. 101 (North)	79.9	984	3112	9842	31,123
Route 23	Moorpark, Jct. Rte. 118, Ronald Reagan Fwy.	73.1	204	644	2038	6445
Route 23	Moorpark, Jct. Rte. 118, New Los Angeles Ave. (West)	72.4	173	547	1729	5467
Route 23	Moorpark, Jct. Rte. 118, New Los Angeles Ave. (East)	68.1	65	205	647	2046
Route 23	Spring Rd. (Back)	59.0	8	25	79	249
Route 23	Spring Rd. (Ahead)	68.0	63	199	629	1990
Route 23	Grimes Canyon Rd.	68.6	73	229	726	2295
Route 23	Fillmore, Jct. Rte. 126, Ventura Rd.	67.1	51	161	508	1607
Route 33	Ventura, Jct. Rte. 101, Ventura Fwy.	75.4	343	1085	3430	10,846
Route 33	Ventura, Ventura Ave.	67.3	54	171	541	1711
Route 33	West Jct. Rte. 150, Baldwin Rd. (West)	66.5	45	142	450	1424
Route 33	West Jct. Rte. 150, Baldwin Rd. (East)	57.1	5	16	51	162
Route 33	El Roblar Dr.	57.4	5	17	54	172
Route 33	Los Padres National Forest Boundary	55.6	4	11	36	115
Route 33	Sespe Gorge Maint. Station	50.2	1	3	10	33
Route 33	Ventura/Sant Barbara County Line	53.4	2	7	22	69
Route 34	Oxnard, Jct. Rte. 1, Oxnard Blvd.	62.4	17	55	174	549
Route 34	Oxnard, Rice Ave.	66.5	44	140	443	1399

TABLE 11-8
SUMMARY OF MODELED EXISTING TRAFFIC NOISE LEVELS
Ventura County

Roadway Segment	Location	CNEL (dB) at 50 feet from Roadway Centerline	Distance from Noise Contours (Feet from Roadway Centerline)			
			70 CNEL (dBA)	65 CNEL (dBA)	60 CNEL (dBA)	55 CNEL (dBA)
Route 34	Camarillo, Jct. Rte. 101, Ventura Fwy. (South)	70.0	99	313	990	3132
Route 34	Camarillo, Jct. Rte. 101, Ventura Fwy. (North)	70.6	116	366	1158	3660
Route 34	Somis, Jct. Rte. 101, Ventura Fwy.	67.4	55	175	554	1751
Route 101	Thousand Oaks, Jct. Rte. 23 South (South)	82.1	1625	5137	16,245	51,372
Route 101	Thousand Oaks, Jct. Rte. 23 South (North)	82.1	1626	5142	16,262	51,424
Route 101	Thousand Oaks, Jct. Rte. 23 North (South)	82.3	1713	5416	17,126	54,158
Route 101	Thousand Oaks, Jct. Rte. 23 North (North)	82.0	572	4972	15,725	49,723
Route 101	Thousand Oaks, Wendy Dr. (Back)	80.8	1199	3790	11,985	37,900
Route 101	Thousand Oaks, Wendy Dr. (Ahead)	80.8	1213	3836	12,130	38,359
Route 101	Camarillo, Pleasant Valley Rd. (Back)	80.8	1201	3802	12,024	38,025
Route 101	Camarillo, Pleasant Valley Rd. (Ahead)	80.8	1193	3774	11,933	37,735
Route 101	Camarillo, Jct. Rte. 34, Lewis Rd. (West)	81.0	1262	3992	12,623	39,916
Route 101	Camarillo, Jct. Rte. 34, Lewis Rd. (East)	81.3	1350	4268	13,495	42,684
Route 101	Oxnard, Jct. Rte. 232, Vineyard Ave.	81.0	1271	4019	12,711	40,195
Route 101	Oxnard, Jct. Rte. 1 South, Pacific Coast Hwy.	81.2	133	4216	13,333	42,161
Route 101	Ventura, Victoria Ave.	80.3	1082	3421	10,820	34,215
Route 101	Ventura, Jct. Rte. 126, Santa Paula Fwy. (West)	79.4	873	2760	8727	27,597

TABLE 11-8
SUMMARY OF MODELED EXISTING TRAFFIC NOISE LEVELS
Ventura County

Roadway Segment	Location	CNEL (dB) at 50 feet from Roadway Centerline	Distance from Noise Contours (Feet from Roadway Centerline)			
			70 CNEL (dBA)	65 CNEL (dBA)	60 CNEL (dBA)	55 CNEL (dBA)
Route 101	Ventura, Jct. Rte. 126, Santa Paula Fwy. (East)	80.7	1179	3729	11,791	37,286
Route 101	Ventura, Jct. Rte. 33, Ojai Fwy. (South)	79.8	956	3024	9561	30,236
Route 101	Ventura, Jct. Rte. 33, Ojai Fwy. (North)	78.7	739	2336	7386	23,355
Route 101	Ventura/Santa Barbara County Line	78.4	694	2196	6943	21,957
Route 118	Ventura, Jct. Rte. 126, Santa Paula Fwy.	74.3	272	861	2722	8608
Route 118	Jct. Rte. 232, Vineyard Ave. (West)	74.6	288	912	2882	9115
Route 118	Jct. Rte. 232, Vineyard Ave. (East)	72.9	796	621	1963	6206
Route 118	Jct. Rte. 34, Somis Rd. (West)	71.7	149	472	1492	4718
Route 118	Jct. Rte. 34, Somis Rd. (East)	71.9	156	492	1557	4923
Route 118	Grimes Canyon Rd.	72.3	169	535	1691	5346
Route 118	Moorpark, West Jct. Rte. 23, Moorpark Ave.	71.7	147	466	1475	4663
Route 118	Moorpark, East Jct. Rte. 23, at Spring Rd.	72.5	178	462	1781	5627
Route 118	Moorpark, Jct. Rte. 23, Moorpark Fwy.	74.1	255	806	2548	8056
Route 118	Tapo Rd.	80.9	1125	3874	12,250	38,739
Route 126	EB on from Main St. and Ventura, Jct. Rte. 101	76.8	481	1520	4808	15,203
Route 126	Ventura, Jct. Rte. 118 (West)	76.1	407	1287	4070	12,869
Route 126	Ventura, Jct. Rte. 118 (East)	77.1	510	1613	5100	16,127
Route 126	Laurie Lane Ped OC; e/o Peck Rd.	76.4	434	1373	4342	13,729
Route 126	Santa Paula, Jct. Rte. 150, 10th Rd. (West)	76.1	408	1289	4075	12,888
Route 126	Santa Paula, Jct. Rte. 150, 10th Rd. (East)	75.4	347	1097	3468	10,966

TABLE 11-8
SUMMARY OF MODELED EXISTING TRAFFIC NOISE LEVELS
Ventura County

Roadway Segment	Location	CNEL (dB) at 50 feet from Roadway Centerline	Distance from Noise Contours (Feet from Roadway Centerline)			
			70 CNEL (dBA)	65 CNEL (dBA)	60 CNEL (dBA)	55 CNEL (dBA)
Route 126	Fillmore, Jct. Rte. 23, A Rd. (South)	73.2	209	659	2085	6594
Route 126	Fillmore, Jct. Rte. 23, A Rd. (North)	72.9	197	623	1970	6230
Route 126	Piru	73.1	202	640	2023	6396
Route 150	Santa Barbara/Ventura County Line	57.2	5	17	53	168
Route 150	Jct. Rte. 33 South, Ventura Ave. (South)	62.9	20	62	196	618
Route 150	Jct. Rte. 33 South, Ventura Ave. (North)	65.8	38	122	385	1216
Route 150	Ojai, Jct. Rte. 33 North, Maricopa Hwy. (South)	65.8	38	121	382	1207
Route 150	Ojai, Jct. Rte. 33 North, Maricopa Hwy. (North)	66.7	47	149	470	1487
Route 150	Ojai East City Limits	60.9	12	39	122	386
Route 150	Santa Paula, North City Limit	57.7	6	18	58	185
Route 150	Santa Paula, Jct. Rte. 126, Santa Paula Fwy.	63.5	22	70	222	703
Route 232	Oxnard, Jct. Rte. 1, Oxnard Blvd.	66.1	41	129	409	1293
Route 232	Oxnard, Jct. Rte. 101	65.4	34	109	344	1089
Route 232	Jct. Rte. 118, Los Angeles Ave.	64.7	29	93	293	926

Notes: CNEL=community noise equivalent level, dB=decibel, Ave.=avenue, Rd.=Road, Blvd.=boulevard, Dr.=drive, Jct.=junction, Rte.=route, Fwy.=freeway, Hwy=highway, n/o=north of, s/o=south of, e/o=east of, w/o=west of

[1] Where applicable, direction of travel is specified based on Caltrans' nomenclature for traffic counts. Even route numbers are assumed to follow an east-to-west pattern and odd route numbers are assumed to follow a north-to-south pattern. ADT values for unnumbered roadways where direction is unclear are labeled either "back" or "ahead." Back typically represents traffic movement south or west of the count location; ahead usually represents traffic north or east of the count location.

Source: Modeling performed by Ascent Environmental, Inc. in 2017 based on Caltrans Annual Average Daily Truck Traffic on California State Highways, 2014; and Traffic Volumes of Ventura County Roadways, 2015.

Existing Railroad Noise

Noise from railroads is generated primarily by diesel locomotive engines, warning horns, and gate bells at railroad crossings. Other components of noise include diesel exhaust, cooling fans, and railroad car wheel/rail interaction. Amtrak, Metrolink, Fillmore and Western Railway, Union Pacific Railroad, and Ventura County Railroad Company all affect portions of the county.

Railroad data (e.g., engine type, trains per day) for the county were obtained from Amtrak (2016), Metrolink (2014), and the Multi-County Goods Movement Action Plan (2008). Using this data, railroad noise generated by Amtrak and Metrolink commuter diesel locomotives and general freight movement was modeled based on Noise Impact Assessment Guidelines for assessing railroad and transit noise (FTA 2006; Amtrak 2016; Metrolink 2014; Los Angeles County Metropolitan Transportation Authority et. al 2008). Table 11-9 summarizes the modeled existing railroad noise levels at 50 feet from the railroad centerline, along with approximate distances from the railroad centerlines to the 70 dB, 65 dB, 60 dB, and 55 dB CNEL/L_{dn} noise contours. The values shown in Table 11-9 assume that the receiver category is residential with no natural or human-made noise shielding or barriers (e.g., topography, vegetation, berms, walls, or buildings, or other attenuation measures), and are therefore considered "worst case" railroad noise conditions along the length of each corridor. The contours shown in Table 11-15 may be used to estimate noise levels at potential sensitive receptors near railroad lines. It is possible that existing or future sensitive receptors (e.g., residential land uses, recreation and open space, hospitals) could be located within the vicinity of a railroad. It should be noted that these contours are not based on data from specific railroad segments and therefore can be used to represent the expected noise levels for areas adjacent to these railroads throughout the unincorporated county.

TABLE 11-9
SUMMARY OF MODELED EXISTING RAILROAD NOISE LEVELS
Ventura County

Railroad Line	CNEL (dB) at 50 feet from Roadway Centerline	Distance (feet)			
		70 CNEL (dBA)	65 CNEL (dBA)	60 CNEL (dBA)	55 CNEL (dBA)
Amtrak	64.1	35	71	154	321
Metrolink	68.5	38	76	164	343
Freight Trains	68.7	38	76	165	344

Notes: CNEL=community noise equivalent level, dB=decibel
Source: Modeling conducted by Ascent Environmental, Inc. 2016 based on FTA, 2006.

Existing Airport Noise

Ventura County contains the Camarillo Airport, Santa Paula Airport, Oxnard Airport, and the Naval Base Ventura County Point Mugu. Camarillo Airport is located within the City of Camarillo, three miles southwest of the city's central business's district. The airport is situated less than one mile south of US-101 and seven miles east of the Pacific Ocean coastline. The Oxnard Airport is located one and a half miles from the Pacific Ocean coastline, four miles south of US-101 and one mile west of the SR 1. The Santa Paula Airport lies within the City of Santa Paula between SR 126 and the Santa Clara River. NBVC Point Mugu is located approximately six and a half miles southeast of Oxnard on the Pacific Coast and is bounded by SR 1 on the east.

The operations and land-use compatibility of these airports are covered by the Ventura County Airport Comprehensive Land Use Plan. A complete discussion of existing and future airport-related noise as described in this plan is discussed in detail below under the Regulatory Setting.

Existing Stationary Source Noise

The primary sources of stationary noise in unincorporated Ventura County consist of industrial and agricultural operations, and miscellaneous sources such as a shooting range in Holser Canyon, and a motocross facility near Piru. Major industrial noise sources include concrete and rock batch plants, sand and gravel mines, and Pepsi Cola and oil supply facilities. Noise from agricultural activities are generated from cultivation and harvesting equipment, irrigation and domestic water pumps, and anti-frost equipment (e.g., wind generators). Noise measurements and modeling were conducted for existing stationary noise sources at the Pepsi Cola supply facility, a batch plant, and a shooting range. See the data presented for Short-Term Measurement 1 (ST-1) for ambient noise levels at the Pepsi Cola supply facility taken in October 2016, ST-2 for ambient noise levels at the Wes Thompsons Shooting Range taken in August 2016, and ST-9 for ambient noise levels at the batch plant taken in August 2016, all contained in Table 11-7, "Summary of Ambient Noise Level Measurements."

Regulatory Setting

Federal

The Federal Noise Control Act of 1972

The Federal Noise Control Act of 1972 established a requirement that all federal agencies must comply with applicable federal, state, interstate, and local noise control regulations. Federal agencies also are directed to administer their programs in a manner that promotes an environment free from noise that jeopardizes public health or welfare.

U.S. Department of Transportation

To address the human response to groundborne vibration, the FTA of the U.S. Department of Transportation (DOT) has set forth guidelines for maximum-acceptable vibration criteria for different types of land uses. Among these guidelines are the following:

- 65 vibration velocity decibels (VdB), referenced to 1 µin/sec and based on the RMS velocity amplitude, for land uses where low ambient vibration is essential for interior operations (e.g., hospitals, high-tech manufacturing, and laboratory facilities);
- 80 VdB for residential uses and buildings where people normally sleep; and
- 83 VdB for institutional land uses with primarily daytime operations (e.g., schools, churches, clinics, and offices) (FTA 2006).

State

California requires each local government to implement a noise element as part of its general plan. California Administrative Code, Title 4, has guidelines for evaluating the compatibility of various land uses as a function of community noise exposure.

Title 24 of the California Code of Regulations

California's noise insulation standards became effective in 1974. In 1988, the Building Standards Commission approved revisions to these standards (Title 24, Part 2, California Code of Regulations). The ruling established that interior noise levels attributable to exterior sources shall not exceed 45 dB in any habitable room. The noise metric is measured in either CNEL or L_{dn}, consistent with the noise element of the local general plan. The commission also specifies that residential buildings or structures proposed to be located within exterior L_{dn} contours of 60 dB or greater, generated by an existing or planned freeway, expressway, parkway, major street, thoroughfare, rail line, rapid transit line, or industrial noise source, shall require an acoustical analysis showing that the building has been designed to limit intruding noise to an interior L_{dn} of 45 dB.

California Governor's Office of Planning and Research

The California Governor's Office of Planning and Research (OPR) publishes the State of California General Plan Guidelines (OPR 2003), which provide recommended standards for the acceptability of various types of land uses within specific Community Noise Equivalent Level (CNEL) contours. The noise standards are intended to provide guidelines for the development of noise elements. These basic guidelines may be tailored to reflect the existing noise and land use characteristics of a particular community. The Noise Compatibility Guidelines in Table 11-10 show the exterior noise standards recommended by the State for new development projects according to land use.

TABLE 11-10
STATE LAND USE COMPATIBILITY STANDARDS FOR COMMUNITY NOISE ENVIRONMENT

Land Use Category	Community Noise Exposure - L_{dn} or CNEL (db)						
	50	55	60	65	70	75	80
Residential – Low-Density Single Family, Duplex, Mobile							
Residential - Multi-Family							
Transient Lodging – Motels, Hotels							
Schools, Libraries, Churches, Hospitals, Nursing Homes							
Auditoriums, Concert Halls, Amphitheaters							
Sports Arenas, Outdoor Spectator Sports							
Playgrounds, Neighborhood Parks							
Golf Courses, Riding Stables, Water Recreation, Cemeteries							
Office Buildings, Business Commercial and Professional							
Industrial, Manufacturing, Utilities, Agriculture							

	Normally Acceptable	Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.
	Conditionally Acceptable	New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features are included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.
	Normally Unacceptable	New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.
	Clearly Unacceptable	New construction or development generally should not be undertaken.

Source: California Governor's Office of Planning and Research 2003

Caltrans

In 2004, Caltrans published the Transportation- and Construction-Induced Vibration Manual (Caltrans 2004), which provides general guidance on vibration issues associated with construction and operation of projects in relation to human perception and structural damage.

Table 11-11 presents recommended levels of vibration that could result in damage to structures exposed to continuous vibration.

TABLE 11-11
CALTRANS RECOMMENDED VIBRATION LEVELS

PPV (in/sec)	Effect on Buildings
0.4-0.6	Architectural damage and possible minor structural damage
0.2	Risk of architectural damage to normal dwellings
0.1	Virtually no risk of architectural damage to normal buildings
0.08	Recommended upper limit of vibration to which ruins and ancient monuments should be subjected
0.006-0.019	Vibration unlikely to cause damage of any type

Notes: PPV=peak particle velocity, in/sec=inches per second
Source: Caltrans 2004

In May 2011, Caltrans adopted the Traffic Noise Analysis Protocol (Protocol) for New Highway Construction, Reconstruction, and Retrofit Barrier Projects pursuant to Title 23, Part 772 of the Code of Federal Regulations (23 CFR 772). The Protocol applies to any highway projects or multimodal project that: 1) require FHWA approval regardless of funding sources; or 2) is funded with federal-aid highway funds. Application of the Protocol and the procedures it provides ensures compliance with FHWA noise standards (Caltrans 2011).

Local

2005 General Plan

The Hazards Element in the Ventura County General Plan contains goal and policies that apply to noise in the county under Goals 2.16.1 and 2.16. 2. Table 11-12 summarizes the County's noise compatibility standards that apply to noise-sensitive uses and noise generators during discretionary review, as outlined in Policies 2.16.2.

The Ventura County General Plan also includes several area plans where local issues and concerns are dealt with in greater detail than the countywide elements of the Ventura County General Plan. The area plans with goals and policies differing from those contained in the General Plan are listed below. The Coastal Area and Local Coastal, El Rio/Del Norte, and North Ventura Avenue plans do not contain supplemental noise policies beyond those set forth in the General Plan.

TABLE 11-12 2005 VENTURA COUNTY GENERAL PLAN NOISE COMPATIBILITY STANDARDS (POLICIES 2.16.2)	
Type of Use or Activity, and Location	**Standards**
(1) Noise sensitive uses proposed to be located near highways, trucks routes, heavy industrial activities, and other relatively continuous noise sources	Incorporate noise control measures so that: a. Indoor habitable rooms do not exceed CNEL 45 b. Outdoor noise levels do not exceed CNEL 60 or $L_{eq}1H$ of 65 dB(A) during any hour.
(2) Noise sensitive uses proposed to be located near railroads	Incorporate noise control measures so that: a. Indoor habitable rooms do not exceed CNEL 45 b. Outdoor noise levels do not exceed L_{10} of 60 dB(A)
(3) Noise sensitive uses proposed to be located near airports	a. Prohibited in CNEL 65 or greater noise contour b. Permitted in CNEL 60 to 65 only if measures are taken to ensure interior noise levels of CNEL 45 or less
(4) Noise generators proposed to be located near any noise sensitive use	Noise control measures must ensure that ongoing outdoor noise levels received by sensitive receptors, as measured as the exterior wall of the building, does not exceed any of the following standards: a. $L_{eq}1H$ of 55 dB(A) or ambient noise level plus 3 dB(A), whichever is greater, during any hour from 6:00 a.m. to 7:00 p.m. b. $L_{eq}1H$ of 50 dB(A) or ambient noise level plus 3 dB(A), whichever is greater, during any hour from 7:00 p.m. to 10:00 p.m. c. $L_{eq}1H$ of 45 dB(A) or ambient noise level plus 3 dB(A), whichever is greater, during any hour from 10:00 p.m. to 6:00 a.m.
(5) Construction noise	Shall be evaluated and, if necessary, mitigated in accordance with the County Construction Noise Threshold Criteria and Control Plan

Notes: CNEL = Community Noise Equivalent Level; dB(A) = A-weighted decibel; $L_{eq}1H$ = equivalent noise level for a one-hour period; L_{10} = noise level exceeded for 10 percent of the measurement duration
Source: County of Ventura 2005.

Oak Park Area Plan

The Hazards Element of the Oak Park Area Plan (2005) contains policies related to noise under Goals 2.4.1-1 and 2.4.1-2. (Ventura County 2005)

Ojai Valley Area Plan

The Hazards Element of the Ojai Valley Area Plan (1995) contains policies related to noise under Goals 2.4.1-1 and 2.4.1-2. (Ventura County 2015c)

Piru Area Plan

The Hazards Element of the Piru Area Plan (2011) contains policies related to noise under Goals 2.4.1-1 and 2.4.1-2. (Ventura County 2011)

Saticoy Area Plan

The Land Use and Mobility elements of the Saticoy Area Plan (2015) contain policies related to noise under LU Goal 3 and MOB Goal 1. (Ventura County 2015d)

Thousand Oaks Area Plan

The Hazards Element of the Thousand Oaks Area Plan (2015) contains policies related to noise Goals 2.3.1.-1 and 2.3.1-2 (Ventura County 2015e)

Lake Sherwood/Hidden Valley Area Plan

The Hazards Element of the Lake Sherwood/Hidden Valley Area Plan (2010) contains policies related to noise under Goals 3.3.1.-1 and 3.3.1-2 and their associated policies. (Ventura County 2010a)

Construction Noise Threshold Criteria and Control Plan

Standardized federal or State criteria have not been adopted for assessing construction noise impacts; therefore, municipal planning criteria are generally developed and applied on a project-specific basis. Construction project noise criteria take into account the existing noise environment, the time-varying noise during the various phases of construction activities, the duration of the construction, and the adjacent land use.

As specific construction noise limits for noise-sensitive locations are not currently specified in the general plan or administrative code of Ventura County, the Construction Noise Threshold Criteria and Control Plan establishes construction noise thresholds and standard noise monitoring and control measures. These threshold criteria, monitoring, and control measures are required for all discretionary development projects. Projects that exceed the noise threshold criteria at sensitive receptor sites are required to implement effective noise mitigation measures recommended by manufacturers (Ventura County 2010b).

Noise sensitive-receptors that would be affected by construction activities within the county are listed in Table 11-13, along with their corresponding periods of greatest sensitivity to construction noise.

TABLE 11-13
NOISE-SENSITIVE RECEPTORS
Ventura County

Sensitive Receptor	Typical Sensitive Time Period
Hospitals, Nursing Homes (quasi-residential)	24 hours
Single-Family and Multi-Family Dwellings (residential)	Evening/Night
Hotels/Motels (quasi-residential)	Evening/Night
Schools, Churches, Libraries (when in use)	Daytime/Evening

Source: Ventura County 2010b

Noise-Sensitive Receptors

Normally, no evening or nighttime construction activity is permitted in areas having noise-sensitive receptors; however, in the event that an activity is deemed necessary and is permitted (e.g., emergency situations or roadway repairs that are timed to avoid peak hour traffic conditions), reduced noise threshold

criteria are provided for construction that must occur during those hours. The County of Ventura construction noise threshold criteria for daytime, evening, and nighttime hours is shown in Table 11-14.

TABLE 11-14
DAYTIME[1] CONSTRUCTION ACTIVITY NOISE THRESHOLD CRITERIA
Ventura County

Construction Duration Affecting Noise-Sensitive Receptors[2]	Noise Threshold Criteria[1]	
	Fixed L_{eq}(h) (dB)	Hourly L_{eq} (dB)[2,3]
Daytime (Mon. to Fri. from 7:00 a.m. to 7:00 p.m.; Sat., Sun., and Holidays from 9:00 a.m. to 7:00 p.m.)		
0 to 3 days	75	Ambient L_{eq}(h) + 3
4 to 7 days	70	Ambient L_{eq}(h) + 3
1 to 2 weeks	65	Ambient L_{eq}(h) + 3
2 to 8 weeks	60	Ambient L_{eq}(h) + 3
Longer than 8 weeks	55	Ambient L_{eq}(h) + 3
Evening (7:00 p.m. to 10:00 p.m.)		
Any Duration	50	Ambient L_{eq}(h) + 3
Nighttime (Mon. to Fri. from 10:00 p.m. to 7:00 a.m.; Sat., Sun., and Holidays from 10:00 p.m. to 9:00 a.m.)		
Any Duration	45	Ambient L_{eq}(h) + 3

Notes: L_{eq}=equivalent noise level, L_{eq}(h)=hourly equivalent noise level, dB= decibel, L_{max}=maximum sound level
[1] The applicable noise threshold criteria shall be the greater of the noise levels presented in the table at the nearest receptor area or 10 feet from the nearest noise sensitive building.
[2] The instantaneous L_{max} shall not exceed the noise threshold criteria by 20 dB more than eight times per daytime hour, six times per evening hour, or four times per nighttime hour.
[3] Local ambient L_{eq} measurements shall be made on any mid-week day prior to project work.
Source: Ventura County 2010b

Ventura County Noise Ordinance

The Ventura County Noise Ordinance was adopted by the County Board of Supervisors to protect residential communities from loud or raucous nighttime noise. The Ordinance prohibits the creation of loud or raucous noise from within a residential zone, which is audible to the human ear during the hours of 9:00 p.m. to 7:00 a.m. at a distance of 50 feet from the property line of the noise source or 50 feet from any such noise source if the noise source is in a public right-of-way. The Ordinance defines "loud or raucous noise" as sounds from (1) the use or operation of any radio, musical instrument, phonograph, television receiver, video cassette recorder, or any machine or device for the production, reproduction, or amplification of the human voice or any other sound, or (2) the use or operation of any lawn mower, backpack blower, blower, lawn edger, riding tractor, or other mechanical or electrical device or hand tool.

Airport Comprehensive Land Use Plan for Ventura County

The State Aeronautics Act (Public Utilities Code, Section 21670 et seq.) requires the preparation of an airport land use compatibility plan (ALUCP) for nearly all public-use airports in the State. The intent of an ALUCP is to encourage compatibility between and airport and the various land uses surrounding it (Caltrans 2011).

California State law requires the County Board of Supervisors to establish an airport land use commission (ALUC) in each county with an airport operated for the benefit of the general public. The Code also sets forth a range of responsibilities, duties, and powers of the ALUC. These include reviewing general plans,

proposed changes to zoning code and ordinances, land use actions and development projects, and airport development plans for consistency with compatibility policies. California State law also dictates that the county and affected cities modify their general and specific plans to be consistent with the ALUC's plan, or to take steps to overrule the ALUC. State law allows the County Board of Supervisors to authorize and appropriately designated body to fulfill ALUC responsibilities. For Ventura County, the Board of Supervisors has designated the Ventura County Transportation Commission (VCTC) to act as the ALUC for the County (Ventura County ALUC 2000).

The Ventura County Airports Comprehensive Land Use Plan (CLUP) serves as a complete plan for the County's three public-use airports and one military airport (i.e., Camarillo, Oxnard, Santa Paula, and Naval Base Ventura County Point Mugu). The CLUP is the primary document used by the Ventura County ALUC to help promote compatibility between the four airports and their environs. Included in the CLUP are a series of compatibility factors, zones and policies related to noise, safety, airspace protection, and over-flight activity (Ventura County ALUC 2000). For the purposes of this section, noise-related impact zones and compatibility policies in the CLUP are discussed below.

The CLUP includes four maps (depicted in Figure 11-14, Figure 11-15, Figure 11-16, Figure 11-17 of this document) showing noise contours depicting the greatest annualized noise impact, measured in terms of CNEL. The mapped noise contours for Oxnard Airport and NBVC Point Mugu are shown for the year 1991, Santa Paula Airport for 2015, and Camarillo Airport for the composite years 2003 and 2018. According to the CLUP, all proposed land use changes beyond the 60 CNEL contour are considered consistent with the noise compatibility policies set forth by the CLUP. For any proposed land-use changes within the 60 CNEL or greater, specific noise compatibility criteria apply based on corresponding land use categories and subcategories. Design and construction mitigation to attenuate noise must be applied to certain land uses to achieve consistency with the CLUP. The CLUP noise compatibility criteria are shown in Table 11-15.

TABLE 11-15
VENTURA COUNTY AIRPORT CLUP: NOISE COMPATIBILITY CRITERIA

Land Use Category1	Exterior Noise Exposure (dB CNEL)				
	60-65	65-70	70-75	75-80	>80
Residential					
Single Family	C[1]	U	U	U	U
Multi-Family	C[1]	U	U	U	U
Mobile Home Parks	U	U	U	U	U
Public/Institutional					
Hospitals/Convalescent Homes	C[1]	C[2]	U	U	U
Schools	C[1]	C[2]	U	U	U
Churches/Synagogues	C[1]	C[2]	U	U	U
Auditoriums/Theatres	C[1]	C[2]	C[3]	U	U
Transportation Terminals	A	A	C[4]	C[5]	C[6]
Communication/Utilities	A	A	C[4]	C[5]	C[6]
Automobile Parking	A	A	C[4]	C[5]	C[6]
Commercial					
Hotels and Motels	C[1]	C[2]	C[3]	U	U
Offices and Business/Professional Services	A	A	C[7]	C[8]	U
Wholesale	A	A	C[4]	C[5]	C[6]
Retail	A	A	C[7]	C[h]	U
Industrial					
Manufacturing—General/Heavy	A	A	C[4]	C[5]	C[6]
Light Industrial	A	A	C[4]	C[5]	C[5]
Research and Development	A	A	C[4]	C[5]	C[5]
Business Parks/Corporate Offices	A	A	C[4]	C[5]	C[5]
Recreation/Open Space					
Outdoor Sports Arenas	A	C	C	U	U
Outdoor Amphitheaters	U	U	U	U	U
Parks	A	A	A	U	U
Outdoor Amusement	A	A	A	U	U
Resorts and Camps	A	A	A	U	U
Golf Course and Water Recreation	A	A	A	U	U
Agriculture	A	A	A	A	A

Notes: A=Acceptable land use, C=Land use is conditional upon meeting compatibility criteria (see footnotes), U=Unacceptable land use, CNEL=community noise equivalent level, dB=decibel, NLR=noise level reduction, dBA=A-weighted decibels

[1] New construction or development may be undertaken only after an analysis of noise reduction requirements and necessary noise insulation is included in the design.

[2] NLR from outdoors to indoor of at least 25 dBA must be achieved by incorporation of noise attenuation into the design and construction of the structure.

[3] NLR from outdoor to indoor of at least 30 dBA must be achieve by incorporation of noise attenuation into the design and construction of the structure.

[4] Measures to achieve NLR of 25 dBA must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.

[5] Measures to achieve NLR of 30 dBA must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.

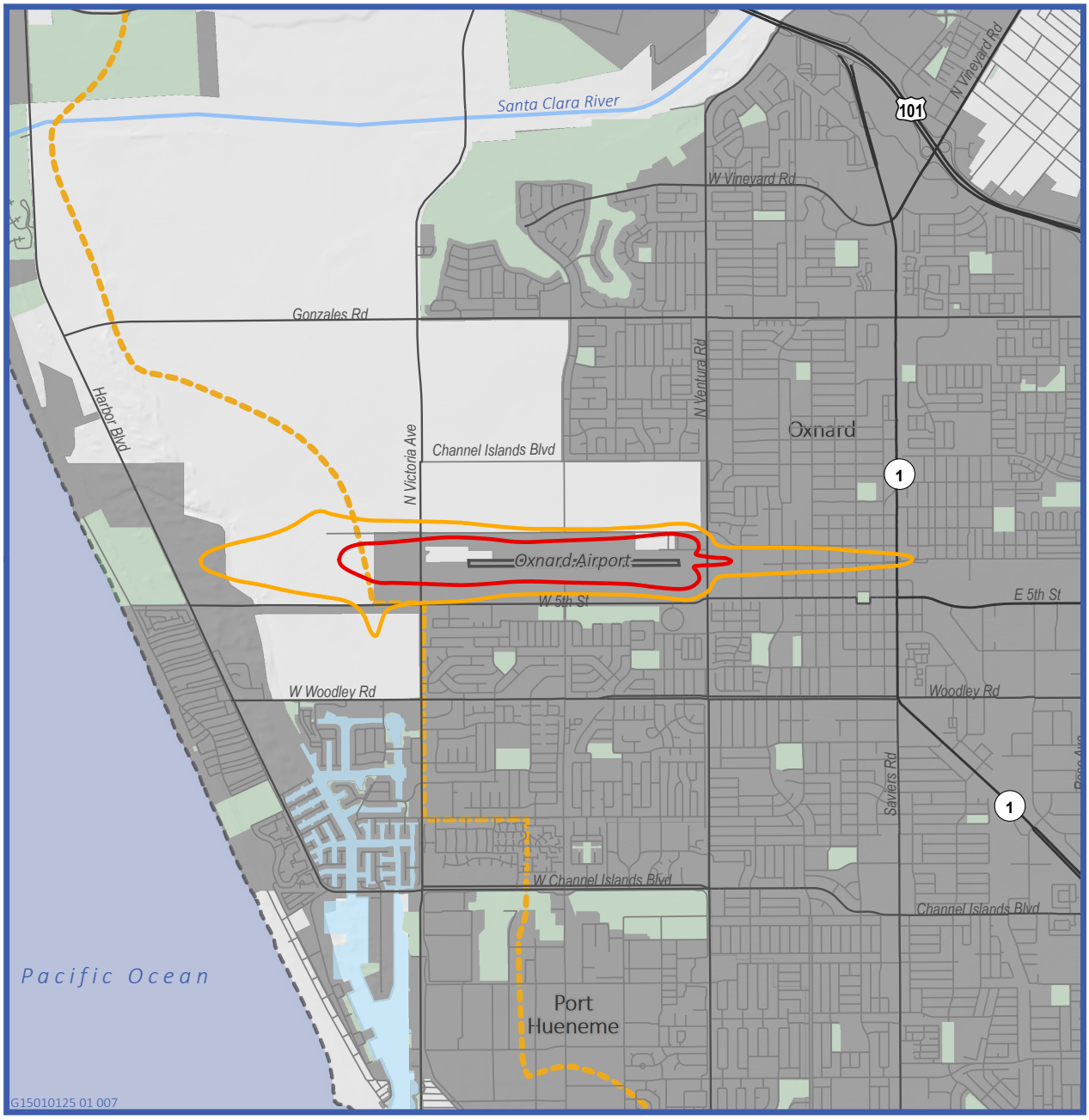
[6] Measures to achieve NLR of 35 dBA must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.

[7] NLR of 25 dBA is required.

[8] NLR of 30 dBA is required.

Notes: A=Acceptable land use, C=Land use is conditional upon meeting compatibility criteria (see footnotes), U=Unacceptable land use, CNEL=community noise equivalent level, dB=decibel

Source: Ventura County ALUC 2000.



Ventura County 2040 GENERAL PLAN

Figure 11-14:
Oxnard Airport Noise Contours

Map Date: November 16, 2016

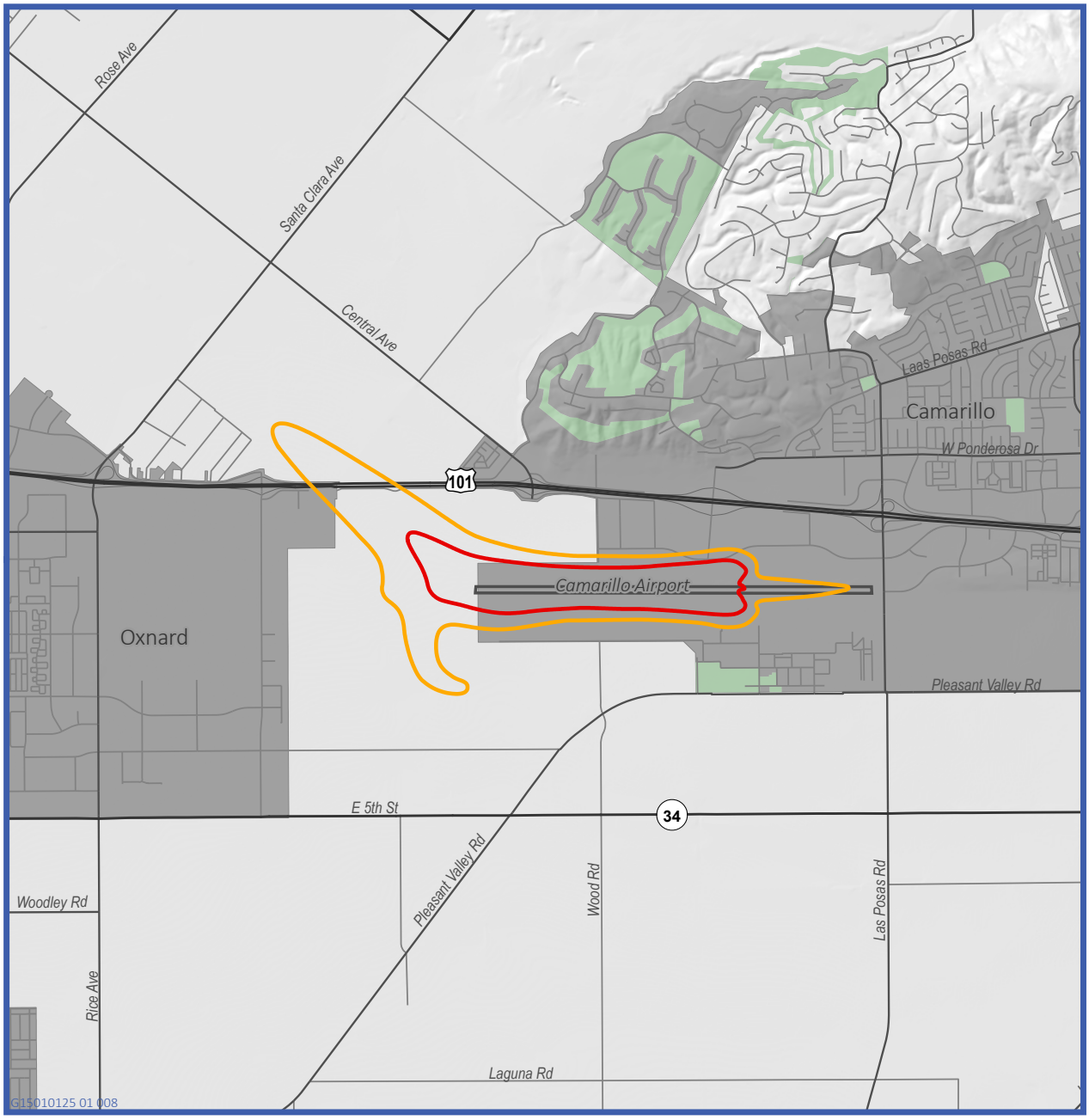
Source: Ventura County, 2016;
California Department of Transportation, 2007; USGS, 2013.

0 0.7 1.4 Miles

N

Coastal Zone Boundary
Major Roadways
Water Bodies
Cities

Noise Contours
60 dBA CNEL
65 dBA CNEL



Ventura County 2040 GENERAL PLAN

Figure 11-15:
Camarillo Airport Noise Contours

Map Date: November 16, 2016

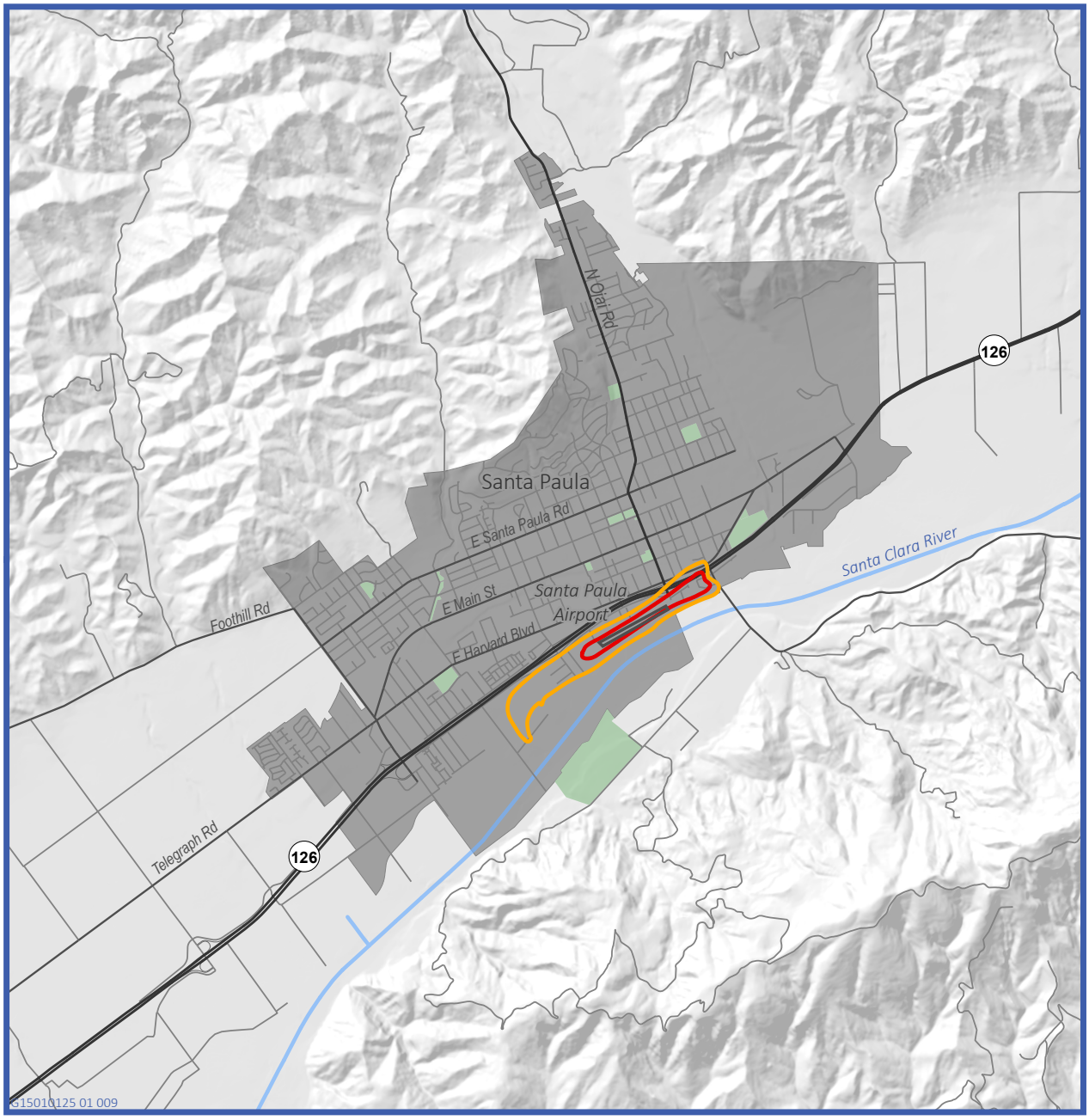
Source: Ventura County, 2016;
California Department of Transportation, 2007; USGS, 2013.

0 0.7 1.4 Miles

N

Major Roadways
Cities

Noise Contours
60 dBA CNEL
65 dBA CNEL



Ventura County 2040 GENERAL PLAN

Figure 11-16:
Santa Paula Airport Noise Contours

Major Roadways
Major Waterways
Cities

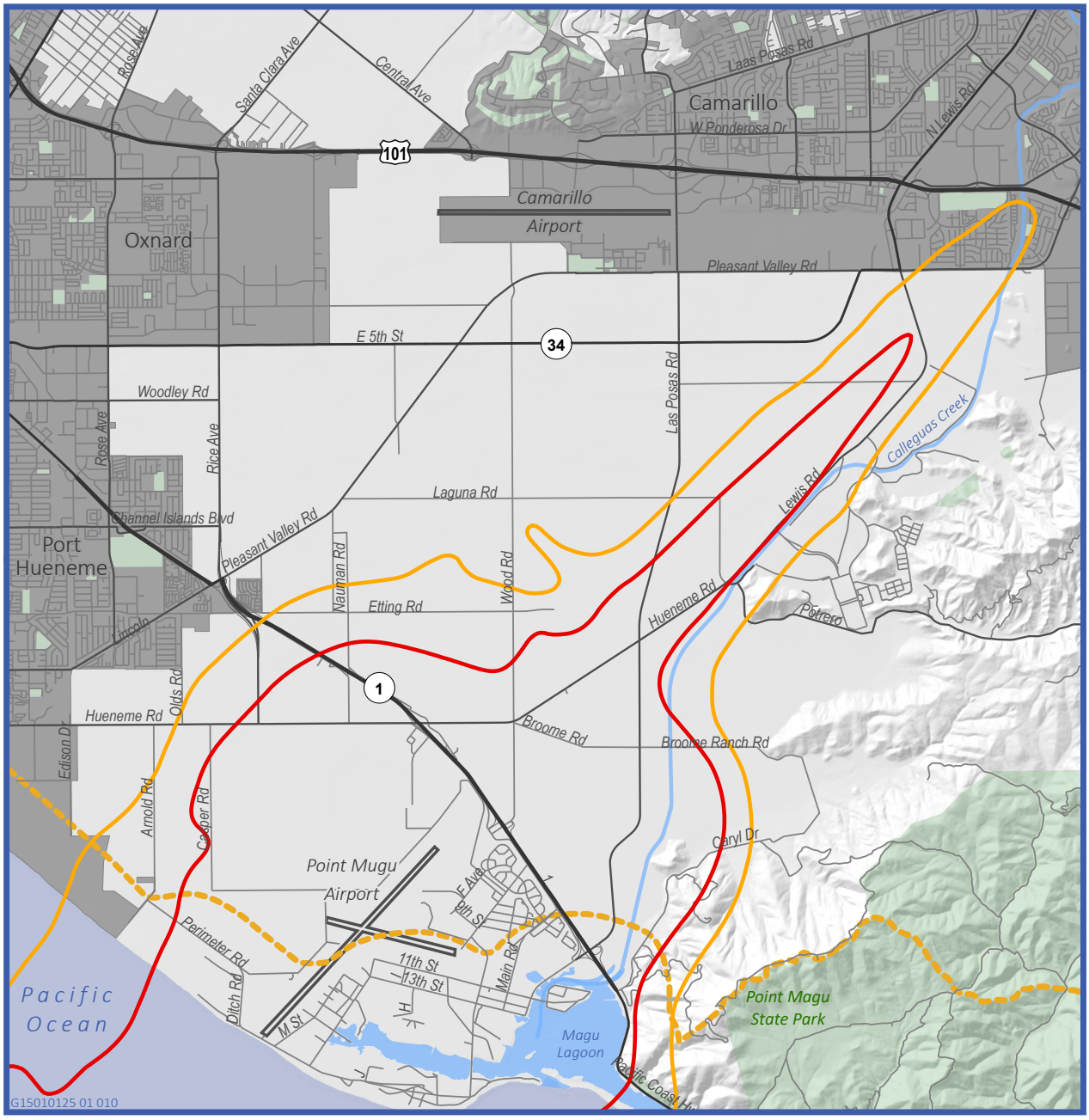
Noise Contours
60 dBA CNEL
65 dBA CNEL

Map Date: November 16, 2016

Source: Ventura County, 2016;
California Department of Transportation, 2007; USGS, 2013.

0 0.7 1.4 Miles

N



Ventura County 2040 GENERAL PLAN

Figure 11-17:
NAWS at Point Mugu
Noise Contours

Map Date: November 16, 2016

Source: Ventura County, 2016;
California Department of Transportation, 2007; USGS, 2013.

0 1 2 Miles

N

- Coastal Zone Boundary
- Major Roadways
- Major Waterways
- Water Bodies
- Cities

Noise Contours

- 60 dBA CNEL
- 65 dBA CNEL

As shown in Figure 11-14 through Figure 11-17, residential, commercial, and/or industrial land uses are located within the 60 CNEL noise contour. Any proposed land use changes in this vicinity may be subject to the Noise Compatibility Criteria. As demonstrated in Table 11-15, land use subcategories within the 60-65 CNEL range identified as "Conditional" would be subject to design and/or construction standards to attenuate airport-related noise on such land uses.

Ventura County Department of Aviation Noise Abatement Procedures

The Ventura County Department of Airports (collectively, "the Department") has adopted noise abatement procedure for visual flight rules (VFR) for Oxnard and Camarillo airports. The Department provides instructions outlining departures, arrivals, and pattern procedures at each airport that are aimed at minimizing noise exposure over noise-sensitive areas without compromising safety. Pilots are requested to follow the published procedures unless circumstances render them unsafe, weather conditions do not allow, or they are otherwise instructed to deviate by the airport traffic control tower.

The following noise abatement procedures apply to all aircrafts departing and/or approaching the Oxnard Airport (Ventura County 2016a):

- Voluntary curfew from 11:00 p.m. to 6:00 a.m.;
- Remain as high as practical over residential areas during overflight, approaches, and departures;
- Use best rate of climb when departing any runway;
- No formation takeoff or landings without prior permissions of the Airport Director;
- Touch-and-go's (i.e., landing on a runway and taking off again without coming to a complete stop) and stop-and-go's are prohibited between the hours of 8:00 p.m. and 7:00 a.m. from Monday to Friday, and from 8:00 p.m. to 8:00 a.m. on the weekends;
- Full stop/taxi back operations will be permitted only if the aircraft plans to depart the airport traffic area; and
- No high-power engine run-ups for maintenance between 7:00 p.m. and 7:00 a.m.

The following noise abatement procedures apply to all aircrafts departing and/or approaching the Camarillo Airport (Ventura County 2016b):

- No aircraft departures between 12:00 a.m. and 5:00 a.m. without prior approval from the Airport director;
- Remain as high as practical over residential areas during overflight, approaches, and departures;
- Use best rate of climb when departing any runway;
- No formation takeoffs or landings without prior permission of the Airport Director;
- Utilize low energy approaches;
- Avoid residential overflights ("Fly Friendly," Air Craft Owners and Pilots Association Guidelines); and
- North traffic fly downwind over US-101.

Key Terms

A-Weighted Sound Level. An A-weighted sound level is the frequency-response adjustment of a sound level meter that conditions the output signal to approximate human hearing response.

Airport Land Use Compatibility Plan (ALUCP). The California State Aeronautics Act (Public Utilities Code, Section 21670 et seq.) requires the preparation of an airport land use compatibility plan (ALUCP) for nearly all public-use airports in the state. The intent of the ALUCP is to encourage compatibility between airports and the various land uses that surround them.

Community Noise Equivalent Level (CNEL). A CNEL is similar to the L_{dn} with an additional 5 dB penalty applied during the noise-sensitive hours from 7 p.m. to 10 p.m., which are typically reserved for relaxation, conversation, reading, and watching television.

Day-Night Noise Level (L_{dn}). L_{dn} is the 24-hour L_{eq} with a 10 dB penalty applied during the noise-sensitive hours from 10 p.m. to 7 a.m., which are typically reserved for sleeping.

Decibel (dB). A dB is a sound level expressed in decibels which is the logarithmic ratio of two like pressure quantities, with one pressure quantity being a reference sound pressure.

Equivalent Noise Level (L_{eq}). An L_{eq} is the equivalent steady-state noise level in a stated period of time that would contain the same acoustic energy as the time-varying noise level during the same period (i.e., average noise level).

Maximum Noise Level (L_{max}). The L_{max} is the highest instantaneous noise level during a specified time period.

Minimum Noise Level (L_{min}). The L_{min} is the lowest instantaneous noise level during a specified time period.

Noise Exposure Contours. Noise exposure contours are noise exposure levels as a function of distance from the noise source.

Noise-Sensitive Area. A noise-sensitive place in a place where noise exposure could result in health-related risks to individuals, as well as places where quiet is an essential element of their intended purpose. Examples include residences, cemeteries, churches, and hospitals.

Peak Particle Velocity (PPV). PPV is defined as the maximum instantaneous positive or negative peak of a vibration signal. PPV is typically used in the monitoring of transient and impact vibration and has been found to correlate well to the stresses experienced by buildings.

Root-Mean-Square (RMS). RMS is the average of the squared amplitude of a vibration signal, typically calculated over a 1-second period. As with airborne sound, the RMS velocity is often expressed in decibel notation as vibration decibels (VdB), which serves to compress the range of numbers required to describe vibration. Because the human body responds to average vibration amplitude, RMS velocity values as measured in VdB are used to estimate vibration effects on humans.

Single-Event Noise Exposure Level (SENEL). The single event noise exposure level, in decibels (dB), is the noise exposure level of a single event, such as an aircraft flyby, measured over the time interval

between the initial and final times for which the noise level of a single event exceeds a given threshold noise level.

Vibration Decibels (VdB). Average vibration amplitude is a more appropriate measure for human response as it takes time for the human body to respond. Average particle velocity over time is zero, so the root-mean-square (RMS) amplitude velocity level, measured in VdB, is used to quantify annoyance.

References

Amtrak. 2016. *Southern California Passenger Rail System Map and Timetables.* Available: http://www.goventura.org/sites/default/files/Pacific%20Surfliner%20Sched_June2016.pdf. Accessed: July 21, 2016.

California Department of Transportation. 2004. *Transportation- and Construction-Induced Vibration Guidance Manual.* Available: http://www.dot.ca.gov/hq/env/noise/pub/vibrationmanFINAL.pdf. Accessed: May 3, 2016.

_____. 2009. *Technical Noise Supplement.* Available: http://www.dot.ca.gov/hq/env/noise/pub/tens_complete.pdf. Accessed: May 3, 2016.

_____. 2011 (May). *Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects.* Available: http://www.dot.ca.gov/hq/env/noise/pub/ca_tnap_may2011.pdf. Accessed: May 3, 2016.

_____. 2013 (September). *Technical Noise Supplement to the Traffic Noise Analysis Protocol.* Available: http://www.dot.ca.gov/hq/env/noise/pub/TeNS_Sept_2013B.pdf. Accessed: July 19, 2016.

California Governor's Office of Planning and Research. 2003. *State of California General Plan Guidelines.* Available: https://www.opr.ca.gov/docs/General_Plan_Guidelines_2003.pdf. Accessed: May 3, 2016.

Caltrans. *See California Department of Transportation.*

Egan, M. David. 2007. *Architectural Acoustics*. J. Ross Publishing. Fort Lauderdale, FL.

Federal Transit Administration. 2006. *Transit Noise and Vibration Impact Assessment.* Available: https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/FTA_Noise_and_Vibration_Manual.pdf. Accessed: May 3, 2016.

FTA. *See Federal Transition Administration*

Los Angeles County Metropolitan Transportation Authority, California Department of Transportation, Orange County Transportation Authority, Riverside County Transportation Commission, San Bernardino Associated Governments, Southern California Associated Governments, Southern California Association of Governments, Ventura County Transportation Commission, and San Diego Association of Governments. 2008 (April). *Multi-County Goods Movement Action Plan: Ventura County Action Plan.* Available: http://media.metro.net/projects_studies/mcgmap/images/04.6_Vol1_Ventura_County_AP_043008.pdf . Accessed: July 21, 2016.

Metrolink, 2014. *The Metrolink Regional System Fact Sheet.* Available: http://www.metrolinktrains.com/pdfs/Facts&Numbers/Fact_Sheets/Fact_Sheet_2014_Q1.pdf. Accessed: July 21, 2016.

Ventura County Airport Land Use Commission. 2000 (July). *Airport Comprehensive Land Use Plan Update for Ventura County.* Adopted November 1991. Available: http://www.goventura.org/sites/default/files/2000-airport-land-use-for-ventura-county.pdf. Accessed: April 27, 2016.

Ventura, County of. 2005 (November). *Ventura County General Plan Oak Park Area Plan*. Adopted May 24, 1988. Available: http://www.ventura.org/rma/planning/pdf/plans/Oak_Park_Area_Plan.pdf. Accessed: May 3, 2016.

_____. 2010a (April). *Ventura County General Plan Lake Sherwood/Hidden Valley Area Plan.* Adopted by the Ventura County Board of Supervisors July 14, 1987. Available: http://www.ventura.org/rma/planning/pdf/plans/Lk_Sherwood_Hidden_Vly_Area_Plan_4-6-10.pdf. Accessed: May 3, 2016.

_____. 2010b (July). *Construction Noise Threshold Criteria and Control Plan.* Adopted November 2005. Available: https://www.ventura.org/rma/planning/pdf/ceqa/Construction_Noise_Thresholds.pdf. Accessed: May 2, 2016.

_____. 2011 (June). *Ventura County General Plan Piru Area Plan.* Adopted December 16, 1986. Available: http://www.ventura.org/rma/planning/pdf/plans/Piru_Area_Plan_new.pdf. Accessed: May 3, 2016.

_____. 2015a (October). *Ventura County General Plan Goals, Policies, and Programs.* Adopted May 24, 1988. Available: http://www.ventura.org/rma/planning/pdf/plans/Goals-Policies-and-Programs.pdf. Accessed: May 3, 2106.

_____. 2015b. *2015 Traffic Volumes of Ventura County Roadways.*

_____. 2015c (March). *Ventura County General Plan Ojai Valley Area Plan.* Adopted July 18, 1995. Available: http://www.ventura.org/rma/planning/pdf/plans/Ojai_Valley_Area_Plan.pdf. Accessed: May 3, 2016.

_____. 2015d (September). *Ventura County General Plan Saticoy Area Plan.* Adopted April 10, 1990. Available: http://www.ventura.org/rma/planning/pdf/plans/saticoy-area-plan/Saticoy-Area-Plan-2015.pdf. Accessed: May 3, 2016.

_____. 2015e (March). *Ventura County General Plan Thousand Oaks Area Plan*. Adopted March 24, 1992. Available: http://www.ventura.org/rma/planning/pdf/plans/Thousand_Oaks_Area_Plan.pdf. Accessed: May 3, 2016.

_____. 2016a. *Noise Abatement Procedures for the Oxnard Airport.* Available: http://www.ventura.org/oxnard-airport/noise-abatement-procedures. Accessed: May 3, 2016.

_____. 2016b. *Noise Abatement Procedures for the Camarillo Airport.* Available: http://www.ventura.org/camarillo-airport/noise-abatement-procedures. Accessed: May 3, 2016.

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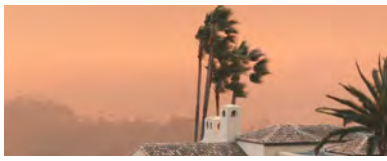
Ventura County

Multi-Jurisdictional Hazard Mitigation Plan

Update 2022

Volume 2—Jurisdictional Annexes



Public Review Draft, February 2022

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COUNTY of VENTURA

VENTURA COUNTY SHERIFF
Emergency Services

Ventura County
Multi-Jurisdictional Hazard Mitigation Plan
Update 2022

February 2022

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Appendices

Appendix A. Planning Partner Expectations
Appendix B. Annex Instructions and Templates

ACRONYMS

The following acronyms are used throughout the annexes in this volume:

- AASHTO—American Association of State Highway and Transportation Officials
- AB—Assembly Bill
- APCD—air pollution control district
- BEACON—Beach Erosion Authority for Clean Oceans and Nourishment
- BOS—Board of Supervisors
- BRIC—Building Resilient Infrastructure and Communities
- CAAP—Climate Action and Adaptation Plan
- CAL FIRE—California Department of Forestry and Fire Protection
- Cal OES—California Office of Emergency Services
- CalARP—California Accidental Release Prevention Program
- CAMUTCD—California Manual on Uniform Traffic Control Devices
- CDAA—California Disaster Assistance Act
- CDBG—Community Development Block Grant
- CDFW—California Department of Fish and Wildlife
- CEQA—California Environmental Quality Act
- CERT—Community Emergency Response Team
- CFR—Code of Federal Regulations
- CIBCSD—Channel Islands Beach Community Services District
- CIP—capital improvement program
- COS—Conservation and Open Space Element
- COSCA—Conejo Open Space Conservancy Agency
- COSP—City of Santa Paula
- CRPD—Conejo Recreation and Park District
- CRS—Community Rating System
- CSU—California State University
- CSUCI—California State University, Channel Islands
- CTM—Circulation, Transportation, and Mobility Element
- DAC—disadvantaged community
- DFIRM—digital flood insurance rate map
- DHS—Department of Homeland Security
- DSOD—Division of Safety of Dams
- DUNS—Dun and Bradstreet Number
- DWR—Department of Water Resources
- EAP—emergency action plan
- EIR—Environmental Impact Report
- EMPG—Emergency Management Performance Grant
- EOC—emergency operations center
- EOP—emergency operations plan
- EPA—Environmental Protection Agency
- ERP—emergency response plan
- ESRM—Environmental Science and Resource Management
- FB—finance and budgeting

- FEMA—Federal Emergency Management Agency
- FHRP—fire hazard reduction program
- FIPS—Federal Information Processing System
- FIRM—flood insurance rate map
- FMA—Flood Mitigation Assistance Grant Program
- FMAP—Fire Management Assistance Program
- FWS—flood warning system
- GHG—greenhouse gas
- GIS—geographic information system
- GSA—Ventura County General Services Agency
- HHPD—Rehabilitation of High Hazard Potential Dams
- HMA—Hazard Mitigation Assistance
- HMGP—Hazard Mitigation Grant Program
- HMP—hazard mitigation plan
- HPS—City of Santa Paula Hazards and Public Safety Element
- IDF—Inflow Design Flood
- IGC—intergovernmental coordination
- IRWM—Integrated Regional Water Management
- IRWMP—Integrated Regional Water Management Plan
- JP—joint partnership
- LARWQCB—Los Angeles Regional Water Quality Control Board
- LCP—Local Coastal Program
- LLAP—Local Levee Assistance Program
- MDERP—Matilija Dam Ecosystem Restoration Project
- MPSP—master plans, strategies, and programs
- MS4—municipal separate storm sewer system
- MWD—municipal water district
- NFIP—National Flood Insurance Program
- NFWF—National Fish and Wildlife Foundation
- NGO—non-governmental organization
- NOAA—National Oceanic and Atmospheric Administration
- NRCS—Natural Resources Conservation Service
- NWS—National Weather Service
- OBRAP—Ormond Beach Restoration and Access Plan
- OCC—Oxnard City Code
- OES—office of emergency services
- OMC—Ojai Municipal Code
- OVLC—Ojai Valley Land Conservancy
- OVSD—Ojai Valley Sanitary District
- PDM—Pre-Disaster Mitigation Grant Program
- PFS—Public Facilities, Services, and Infrastructure
- PMF—probable maximum flood
- POC—point of contact
- PSPS—public safety power shutoff
- PSR—planning, studies and reports
- PTP—Pumping Trough Pipeline
- PVRPD—Pleasant Valley Recreation & Park District
- RDR—regulation and development review
- RHNA—Regional Housing Needs Allocation

- SB—Senate Bill
- SCADA—supervisory control and data acquisition
- SCAG—Southern California Association of Governments
- SCC—California State Coastal Conservancy
- SCRC—Santa Clara River Conservancy
- SFD—Santa Felicia Dam
- SFHA—special flood hazard area
- SGMA—Sustainable Groundwater Management Act
- SLR—sea-level rise
- SMP—Salinity Management Pipeline
- SO—services and operations
- SVMC—Simi Valley Municipal Code
- SVOES—Simi Valley Office of Emergency Services
- SVPD—Simi Valley Police Department
- SWRCB—California State Water Resources Control Board
- THIRA—Threat & Hazard Identification & Risk Assessment
- TNC—The Nature Conservancy
- TOMC—Thousand Oaks Municipal Code
- USACE—U.S. Army Corps of Engineers
- USBR—U.S. Bureau of Reclamation
- USDA—U.S. Department of Agriculture
- UWCD—United Water Conservation District
- UWMP—urban water management plan
- VCFPD—Ventura County Fire Protection District
- VCOE—Ventura County Office of Education
- VCPWA-RT—Ventura County Public Works Agency—Roads and Transportation Department
- VCPWA-WP—Ventura County Public Works Agency—Watershed Protection
- VCSOES—Ventura County Sheriff's Office of Emergency Services
- VCSSFA—Ventura County Schools Self-Funding Authority
- VCTC—Ventura County Transportation Commission
- VMT—vehicle miles traveled
- VOAD—Voluntary Organizations Active in Disaster
- VRSD—Ventura Regional Sanitation District
- WCB—Wildlife Conservation Board
- WCVC—Watershed Coalition of Ventura County
- WEA—Wireless Emergency Alerts
- WSD—Water and Sanitation District

INTRODUCTION

BACKGROUND

Ventura County's hazard mitigation plan was developed and adopted in 2005 as a multi-jurisdictional process. Subsequent updates conducted in both 2010 and 2015 were also multi-jurisdictional efforts. Multi-jurisdictional hazard mitigation planning can be an effective process to build partnerships between communities that face common hazard risks, leading to shared solutions. It can also help build a foundation to shift priorities as risks and vulnerabilities change. Multi-jurisdictional planning processes are encouraged by the Federal Emergency Management Agency (FEMA), and offer the following advantages:

- Improves communication and coordination among jurisdictions and other regional entities
- Enables comprehensive mitigation approaches to reduce risks that affect multiple jurisdictions
- Maximizes economies of scale by leveraging individual capabilities and sharing costs and resources
- Avoids duplication of efforts, and
  Provides an organizational structure that local jurisdictions may find supportive.

For the *Ventura County Multi-Jurisdictional Hazard Mitigation Plan* 2022 update, a planning partnership was formed that expanded the partnership established during the 2015 hazard mitigation plan update, leveraging resources and meeting requirements of the federal Disaster Mitigation Act for as many eligible local governments as possible. The Disaster Mitigation Act defines a local government as follows:

> "Any county, municipality, city, town, township, public authority, school district, special district, intrastate district, council of governments (regardless of whether the council of governments is incorporated as a nonprofit corporation under State law), regional or interstate government entity, or agency or instrumentality of a local government; any Indian tribe or authorized tribal organization, or Alaska Native village or organization; and any rural community, unincorporated town or village, or other public entity."

In addition to the County, the jurisdictions participating in the *Multi-Jurisdictional Hazard Mitigation Plan* 2022 update include:

- 10 incorporated municipalities
- 14 special districts

All participating jurisdictions in a multi-jurisdictional plan must meet the requirements of Chapter 44 of the Code of Federal Regulations (44 CFR):

> "Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan." (Section 201.6(a)(4)).

Each participating planning partner prepared a jurisdiction-specific annex to this plan. These annexes, as well as information on the process by which they were created, are contained in this volume.

THE PLANNING PARTNERSHIP

Initial Solicitation and Letters of Commitment

A planning team made up of Ventura County staff solicited the participation of eligible municipalities and special districts in June 2019, at the outset of this update effort. Emails were sent to the applicable points of contact for the 18 members of the 2015 plan and to additional interested parties. Local governments wishing to join the planning effort were asked to provide the California Office of Emergency Services and County with a "letter of commitment" as a participating jurisdiction in the County's plan update process. In all, the planning team received formal commitment from 24 planning partners in addition to the County.

Municipalities/County

- Ventura County
- City of Camarillo
- City of Fillmore
- City of Moorpark
- City of Ojai
- City of Oxnard
- City of Port Hueneme
- City of Santa Paula
- City of Simi Valley
- City of Thousand Oaks
- City of Ventura

Special-Purpose Districts

- California State University, Channel Islands
- Calleguas Municipal Water District
- Casitas Municipal Water District
- Channel Islands Beach Community Services District
- Conejo Recreation & Park District
- Ojai Valley Sanitary District
- Pleasant Valley Recreation & Park District
- Saticoy Sanitary District
- Triunfo Water & Sanitation District
- United Water Conservation District
- Ventura County Fire Protection District
- Ventura County Office of Education
- Ventura County Public Works Agency—Watershed Protection
- Ventura Regional Sanitation District

A map showing the location of participating special-purpose districts is provided at the end of this introduction. Risk assessment maps for all planning areas (countywide) are provided in Volume 1 of this hazard mitigation plan while maps showing the risk assessment results for each of the participating municipalities are provided in the individual annexes for each city.

Planning Partner Expectations

The planning team and consultant, Tetra Tech, developed the following list of planning partner expectations, which were provided and discussed at a formal kickoff meeting held in May 2021 (see Appendix A for details):

- Re-confirm lead and primary points of contact for the update effort.
- Support and participate in the Steering Committee meetings.
- Provide support required to implement the public involvement strategy.
- Participate in the planning process through:
  - Steering Committee meetings
  - Public meetings and outreach efforts
  - Workshops and planning partner-specific training sessions
  - Public review and comment periods prior to adoption.
- Perform a "consistency review" of all technical studies, plans and ordinances specific to hazards.
- Review the risk assessment and identify hazards and vulnerabilities specific to the jurisdiction.
- Attend the mandatory Phase 3 jurisdictional annex workshop.
- Review and determine if the mitigation recommendations chosen in Volume 1 will meet the needs of the jurisdiction.
- Create an action plan that identifies each project, who will oversee the task, how it will be financed, and when it is estimated to occur.
- Formally adopt the hazard mitigation plan.

By adopting the hazard mitigation plan, each planning partner also agrees to the plan implementation and maintenance protocol established in Volume 1. Failure to meet these criteria may result in a partner being dropped from the partnership by the Steering Committee, and thus losing eligibility under the scope of the plan.

Final Coverage

All of the above jurisdictions submitted letters of commitment to participate, completed an annex template, fully met the participation requirements for this update, and will be covered by the updated hazard mitigation plan upon FEMA's approval of the plan and adoption of the plan by their individual governing bodies.

ANNEX DEVELOPMENT

Capability Assessment

A capability assessment creates an inventory of a jurisdiction's mission, programs, and policies, and evaluates its capacity to carry them out. All participating jurisdictions compiled a capability assessment which helped to identify potential gaps in the jurisdictions' capabilities. Specifically, if the capability assessment identified an opportunity to add a missing core capability or expand an existing one, then

doing so has been selected as an action in the jurisdiction's action plan. The sections below describe specific capabilities evaluated under the assessment.

Planning and Regulatory Capabilities

Jurisdictions can develop policies and programs and implement rules and regulations to protect and serve residents. Local policies are typically identified in planning documents, implemented via a local ordinance, and enforced by a governmental body. Because the planning and regulatory authority of counties and municipalities is generally broader than that of special-purpose districts, the assessment of these capabilities is more detailed for those partners.

Development and Permitting Capability

The County and its municipalities regulate land use through the adoption and enforcement of zoning, subdivision, and land development ordinances, building codes, building permit ordinances, floodplain, and stormwater management ordinances. When effectively prepared and administered, these regulations can mitigate hazards. As special-purpose districts typically do not have the ability to regulate land use, this capability was assessed only for the County and municipalities.

Fiscal Capability

Assessing a jurisdiction's fiscal capability provides an understanding of the ability to fulfill the financial needs associated with hazard mitigation projects. This assessment identifies both outside resources, such as grant-funding eligibility, and local jurisdictional authority to generate internal financial capability, such as through impact fees (fees charged to a development project).

Administrative and Technical Capability

Without appropriate personnel, the mitigation strategy may not be implemented. Administrative and technical capabilities focus on the availability of personnel resources responsible for implementing all the facets of hazard mitigation. These resources include technical experts, such as engineers, scientists, and grant writers.

Education and Outreach Capability

Regular engagement with the public on hazard mitigation provides opportunities to open a two-way dialogue that can result in a more resilient community. Use of a jurisdictional website, social media outlets, and other outreach resources to communicate mitigation information are assessed for each planning partner. Assessing outreach and education capability illustrates the connection between the government and community members.

Compliance with National Flood Insurance Program Requirements

Flooding is the costliest natural hazard in the United States and homeowners face increasingly high flood insurance premiums. Community participation in the National Flood Insurance Program (NFIP) opens up opportunities for additional grant funding associated specifically with flooding issues. Assessment of a jurisdiction's current NFIP status and compliance provides a greater understanding of the local flood management program, opportunities for improvement, and available grant funding

opportunities. The NFIP is not available to special-purpose districts, so this set of capabilities was assessed only for municipalities and the County.

Participation in Voluntary Programs

Participation in voluntary programs, such as FEMA's Community Rating System (CRS), the National Weather Service's StormReady and TsunamiReady programs, and the National Fire Protection Association's Firewise USA, can enhance a jurisdiction's ability to mitigate, prepare for, and respond to natural hazards. These programs complement each other by focusing on communication, mitigation, and community preparedness to save lives and minimize the impact of natural hazards on a community. Participation in these programs demonstrates a jurisdiction's commitment to go beyond the minimum requirements set forth by local, state, and federal regulations in order to create a more resilient community. The programs reviewed here are only applicable to municipalities and the County, so were not included in the capability assessments for the special-purpose districts.

Adaptive Capacity

An adaptive capacity assessment evaluates a jurisdiction's ability to anticipate impacts that may occur in the future. By looking at public support, technical adaptive capacity, and other factors, jurisdictions can identify their core capability for resilience against issues such as sea level rise and climate change. The assessment provides jurisdictions with an opportunity to identify areas for improvement by ranking their adaptive capacity as high, medium, or low.

Mitigation Action Plan Development

Risk Ranking

The risk-ranking methodology for partner annexes was the same as that used for the countywide risk ranking described in Volume 1. Each planning partner was asked to review the ranked risk for its jurisdiction, based on the impact on its population and/or facilities. Municipalities and the County based this ranking on the probability of occurrence of each hazard, and its potential impact on people, property, and the economy. Special-purpose districts based this ranking on probability of occurrence and the potential impact on their constituency, vital facilities, and the facilities' functionality after a hazard event.

The objectives of this exercise were to familiarize the planning partnership with how to use the risk ranking, part of the assessment results, as a tool to support other planning and hazard mitigation processes and to help prioritize types of mitigation actions that should be considered. Hazards that were ranked as "high" and "medium" for each jurisdiction were considered to be priorities for identifying mitigation actions, although jurisdictions also identified actions to mitigate hazards ranked "low", as appropriate.

Information Reviewed to Develop the Action Plan

In September 2021, each planning partner was provided with a tool kit of relevant documents to assist in developing their jurisdiction's action plan and was required to attend a workshop that provided guidance to develop their action plans. The tool kits were used during the mandatory Phase 3

workshops and in follow-up work conducted by the planning partners. Planning partners reviewed the following information included in the tool kit to assist in the identification of proposed mitigation actions:

- **Capability assessment**—Reviewed to identify capabilities that the jurisdiction does not currently have but should consider pursuing, or capabilities that should be revisited and updated to include best available information; also reviewed to determine how existing capabilities can be leveraged to increase or improve hazard mitigation in the jurisdiction.
- **National Flood Insurance Program compliance table**—Reviewed to identify opportunities to increase floodplain management capabilities.
- **Adaptive capacity**—Reviewed to identify ways to leverage or continue to improve existing capacities and to improve understanding of other capacities.
- **Future integration opportunities**—Reviewed to identify specific integration actions to be included in the mitigation strategy.
- **Jurisdiction-specific vulnerabilities**—Reviewed to identify actions that could reduce known vulnerabilities.
- **Mitigation best practices catalog**—Reviewed to identify actions that the jurisdiction should consider including in its action plan.
- **Public input**—Reviewed to identify potential actions and community priorities.

Action Plan Prioritization

The mitigation actions recommended in each jurisdiction's action plan were prioritized based on the following factors:

- Cost and availability of funding
- Benefit, based on likely risk reduction to be achieved
- Number of plan objectives achieved
- Timeframe for project implementation
- Eligibility for grant funding programs

Two priorities were assigned for each action:

- A high, medium, or low priority for implementing the action
- A high, medium, or low priority for pursuing grant funding for the action.

The sections below describe the benefit-cost analysis and the assignment of the two priority ratings.

Benefit/Cost Review

Pursuant to 44 CFR, Section 201.6(c)(3)(iii), the action plan must be prioritized according to a benefit-cost analysis (BCA) of the proposed actions. BCA is a method that determines the future risk reduction benefits of a hazard mitigation project and compares those benefits to its costs. For this hazard mitigation plan, a qualitative review was performed for each mitigation action by assigning ratings for benefit and cost as follows:

- Cost:
  - **High**—Existing funding will not cover the cost of the action; implementation would require new revenue through an alternative source (for example, bonds, grants, and fee increases).
  - **Medium**—The action could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the action would have to be spread over multiple years.
  - **Low**—The action could be funded under the existing budget. The action is part of, or can be part of, an ongoing, existing program.
- Benefit:
  - **High—**Action will provide an immediate reduction of risk exposure for life and property.
  - **Medium—**Action will have a long-term impact on the reduction of risk exposure for life and property, or action will provide an immediate reduction in the risk exposure for property.
  - **Low—**Long-term benefits of the action are difficult to quantify in the short term.

To assign priorities, each action with a benefit rating equal to or higher than its cost rating (such as high benefit/medium cost, medium benefit/medium cost, medium benefit/low cost, etc.) was considered to be cost-beneficial. It is important to note that this qualitative review is not intended to substitute for the more detailed level of benefit-cost analysis required for some FEMA hazard-related grant programs. More specific analysis would be performed at the time a given action is submitted for grant funding approval.

Implementation Priority

Implementation priority ratings were assigned as follows:

- **High Priority**—An action that meets multiple objectives, has benefits that exceed costs, and has a secured source of funding. Action can be completed in the short term (1 to 5 years).
- **Medium Priority**—An action that meets multiple objectives, has benefits that exceed costs, and is eligible for funding though no funding has yet been secured for it. Action can be completed in the short term (1 to 5 years) once funding is secured. Medium-priority actions become high-priority actions once funding is secured.
- **Low Priority**—An action that will mitigate the risk of a hazard, but has benefits that do not exceed the costs or are difficult to quantify, has no secured source of funding, and is not eligible for any known grant funding. Action can be completed in the long term (1 to 10 years). Low-priority actions may be eligible for grant funding from programs that have not yet been identified.

Grant Pursuit Priority

Grant pursuit priority ratings were assigned as follows:

- **High Priority**—An action that meets identified grant eligibility requirements, has high benefits, and is listed as high or medium implementation priority; local funding options are unavailable or available local funds could be used instead for actions that are not eligible for grant funding.
- **Medium Priority**—An action that meets identified grant eligibility requirements, has medium or low benefits, and is listed as medium or low implementation priority; local funding options are unavailable.

- **Low Priority**—An action that has not been identified as meeting any grant eligibility requirements.

Classification of Actions

Each recommended action was also classified based on the hazard it addresses and the type of mitigation it involves. Mitigation types used for this classification are as follows:

- **Prevention**—Government, administrative or regulatory actions that influence the way land and buildings are developed to reduce hazard losses. Includes planning and zoning, floodplain laws, capital improvement programs, open space preservation, and stormwater management regulations.
- **Property Protection**—Modification of buildings or structures to protect them from a hazard or removal of structures from a hazard area. Includes acquisition, elevation, relocation, structural retrofit, storm shutters, and shatter-resistant glass.
- **Public Education and Awareness**—Actions to inform residents and elected officials about hazards and ways to mitigate them. Includes outreach projects, real estate disclosure, hazard information centers, and school-age and adult education.
- **Natural Resource Protection**—Actions that minimize hazard loss and preserve or restore the functions of natural systems. Includes sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, wetland restoration and preservation, and green infrastructure.
- **Emergency Services**—Actions that protect people and property during and immediately after a hazard event. Includes warning systems, emergency response services, and the protection of essential facilities.
- **Structural Projects**—Actions that involve the construction of structures to reduce the impact of a hazard. Includes dams, setback levees, floodwalls, retaining walls, and safe rooms.
- **Climate Resiliency**—Actions that incorporate methods to mitigate and/or adapt to the impacts of climate change. Includes aquifer storage and recovery activities, incorporating future conditions projections in project design or planning, or actions that specifically address jurisdiction-specific climate change risks, such as sea-level rise or urban heat island effects.
- **Community Capacity Building**—Actions that increase or enhance local capabilities to adjust to potential damage, to take advantage of opportunities to build capacity, or to respond to consequences of insufficient capacity. Includes staff training, memorandums of understanding, development of plans and studies, and monitoring programs.

Annex-Preparation Process

Templates

Templates were created for the two types of jurisdictions (municipalities and special districts) participating in this plan to help the planning partners prepare their jurisdiction-specific annexes. The templates were designed so that all criteria of Section 201.6 of 44 CFR for local governments would be met based on the partners' capabilities and mode of operation. The templates were deployed in three phases during the course of the plan update process as follows:

- **Phase 1**—Profile, Trends, Previous Plan Status
  - Deployed: May 10, 2021
  - Due: June 21, 2021
- **Phase 2**—Capability Assessment and Information Sources
  - Deployed: July 6, 2021
  - Due: August 20, 2021
- **Phase 3**—Risk Ranking, Action Plan, and Information Sources
  - Deployed: September 9, 2021
  - Workshops: September 22-23, 2021
  - Due: October 25, 2021

The templates were designed to lead all partners through the necessary steps to generate the Disaster Mitigation Act-required elements specific to their jurisdictions. The templates and their instructions are included in Appendix B of this volume.

Tool Kit

Each planning partner was provided with a tool kit to assist in completing the annex template and developing their jurisdiction's action plan. The tool kits contained the following:

- A copy of the *2015 Ventura County Multi-Hazard Mitigation Plan*
- The vision statement, goals and objectives developed for the plan update
- Information on past hazard events that have impacted the planning area
- The risk assessment results developed for the plan update
- A list of jurisdiction-specific issues noted during the risk assessment
- Information on climate change and expected impacts in the planning area
- Jurisdiction-specific annex templates, with instructions for completing them
- A catalog of mitigation best practices and suggested actions to enhance adaptive capacity
- Information on the FEMA Hazard Mitigation Assistance grant program
- FEMA guidance on plan integration
- AB 2140 compliance guidance
- The results of the public survey on community awareness of hazards conducted as part of the public involvement strategy
- The public service announcement (PSA) hazard mitigation video produced by the Ventura County Sheriff's Office of Emergency Services and the Ventura County Public Works Agency.

Workshop

All partners were required to attend and participate in a virtual technical assistance workshop held the week of September 20, 2021, where key elements of the annex template were discussed. The workshops focused on how the tool kit could be used to facilitate completion of the template and develop each jurisdiction's mitigation action plan. The templates were subsequently completed by a designated point of contact for each partner and a member of the planning team. The workshop addressed the following topics:

- The jurisdictional annex templates and the tool kit
- Natural events history
- Jurisdiction-specific issues
- Risk ranking
- Status of prior actions
- Developing the action plan
- Benefit-cost review
- Prioritization protocol
- Next steps

Following conclusion of the workshop, a copy of the presentation given at the workshop session was added to the tool kit provided to each of the planning partners.

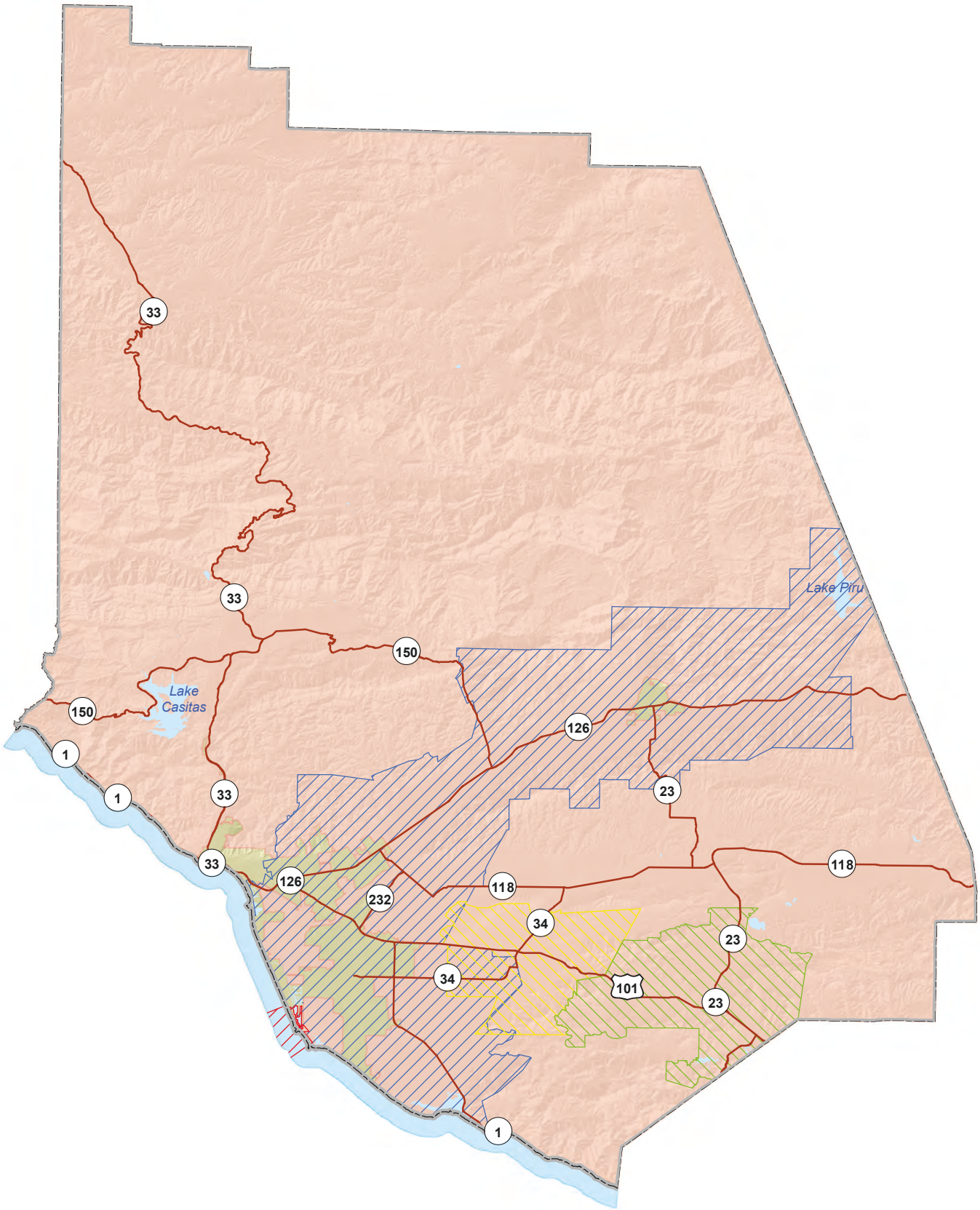
Special Purpose Districts (1 of 2)

- Ojai Valley Sanitary District
- Saticoy Sanitary District
- Ventura Regional Sanitation District
- Triunfo Water & Sanitation District
- Calleguas Municipal Water District
- Casitas Municipal Water District
- County Boundary
- Major Roads

N

0 3 6 Miles

Data Sources: Ventura Co., Esri



Special Purpose Districts (2 of 2)

- Channel Islands Beach Community Services District
- Conejo Recreation & Park District
- Pleasant Valley Recreation & Parks District
- United Water Conservation District
- Ventura County Fire Protection District
- County Boundary
- Major Roads

Ventura County Office of Education, Ventura County Public Works Agency - Watershed Protection, and California State University - Channel Islands provide services countywide.

N

0 3 6 Miles

Data Sources: Ventura Co., Esri

1. VENTURA COUNTY (UNINCORPORATED AREA)

1.1 LOCAL HAZARD MITIGATION PLANNING TEAM

Primary Point of Contact
Bonnie Luke, Senior Program Administrator
800 South Victoria Avenue
Ventura, CA 93009
Telephone: 805-765-7007
e-mail Address: BonnieK.Luke@ventura.org

Alternate Point of Contact
Kathy Gibson, Program Administrator II
800 South Victoria Avenue
Ventura, CA 93009
Telephone: 805-765-0326
e-mail Address:
Kathy.Gibson@ventura.org

This annex was developed by the local hazard mitigation planning team, whose members are listed in Table 1-1.

Table 1-1. Local Mitigation Planning Team Members

Name	Title
Patrick Maynard	Director of Emergency Services, Sheriff's Office of Emergency Services
Bonnie Luke	Senior Program Administrator, Sheriff's Office of Emergency Services
Kathy Gibson	Program Administrator II, Sheriff's Office of Emergency Services
Gerard Kapuscik	Manager, Strategic Resiliency Group, Ventura County Public Works Agency-Watershed Protection
Glenn Shephard	Director, Ventura County Public Works Agency-Watershed Protection
Ashley Bautista	Public Information Officer, County Executive Office
Jackie Nuñez	Assistant Public Information Officer, County Executive Office
Aaron Engstrom	Long Range Planning Manager, Ventura County Planning Division
Dave Ward	Director, Ventura County Planning Division
Matt Wyatt	District Manager West County Office, Ventura County Building & Safety Division
Clay Downing	Program Administrator, Sustainability Division, County Executive Office
Mark Lorenzen	Fire Chief, Ventura County Fire Protection District
Jeff Shea	Division Chief, Ventura County Fire Protection District
Debbie Conner	Management Assistant, Ventura County Fire Protection District

1.2 JURISDICTION PROFILE

1.2.1 Location and Features

Ventura County is located on southern California's Pacific coast, approximately 60 miles northwest of Los Angeles. The County is bordered to the north by Kern County; to the northwest and southwest by

Santa Barbara County and the Pacific Ocean, respectively; and to the east and southeast by Los Angeles County.

Ventura County stretches across 2,208 square miles, of which 1,845 square miles is land and 363 square miles is water. The northern half of the county, comprising approximately 53 percent of the county's total area is located within the Los Padres National Forest, and is mostly uninhabited. Two offshore islands, Anacapa and San Nicolas, are also included within the jurisdictional boundary for Ventura County. Anacapa Island is located approximately 11 miles offshore and is one of five islands that make up Channel Islands National Park. San Nicolas Island is located approximately 61 miles offshore and is operated by the United States Navy as a weapons testing and training facility. For the purposes of statistical analyses, the county is divided into 15 distinct planning areas. Within the County there are 10 cities and 18 unincorporated communities that are recognized census designated places (CDPs).

1.2.2 History

Ventura County was historically inhabited by the Chumash people, who also settled throughout much of Santa Barbara and San Luis Obispo Counties. The Chumash were originally hunters and gatherers, fisherman, traders, and are known for their rock paintings and basketry.

Spanish explorers began arriving in the area in the mid-1500s, although active occupation did not effectively occur until more than 200 years later. The Spanish encouraged settlement of the area with large land grants called ranchos, while the Catholic church established the Mission San Buenaventura in 1782 in what is now the City of Ventura.

On January 1, 1873, just 23 years after California's statehood was attained in 1850, Ventura County was formally established. At this time, however, the area remained largely rural, consisting of a population of less than 5,000 individuals that engaged predominately in ranching and the cultivation of grain crops.

During the early 1900s, increased demand from new markets in the burgeoning Los Angeles area led to a significant expansion and diversification of agriculture in Ventura. Together with the discovery of vast oil reserves in the area, this resulted in an influx of immigrants, wealth, and substantial improvements to transportation infrastructure in the region.

A second, intense population boom (>5% annually) occurred beginning in the 1940s with the construction of Port Hueneme and the establishment of a military base at Point Mugu which brought numerous professionals and ancillary industries to the region. Ventura County, and the Oxnard area in particular, benefitted from the hiring of more than 10,000 civilian workers and 21,000 military personnel, thus providing jobs for local residents and reviving the economy following the Depression of the 1930s. By 1950, the population of the county had increased to over 114,000 individuals, more than double its population in 1930.

The population continued to grow rapidly through the 1970s, assisted further by the completion of highway 101 in the mid-1964, which helped make the commute to Los Angeles easier. Although much of this growth was centered in incorporated communities, development also expanded in the unincorporated areas, particularly on the east side of the County.

1.2.3 Governing Body Format

Ventura County is administered by five elected supervisors who each serve four-year terms. The supervisors appoint department administrators who manage county functions.

The Board of Supervisors assumes responsibility for the adoption of this plan; Ventura County Sheriff's Office of Emergency Services will oversee its implementation.

1.3 CURRENT TRENDS

1.3.1 Population

According to the California Department of Finance, as of January 2020 the unincorporated areas of the County had a population of 95,001. This represents a negligible increase from the 2010 census data (94,937 individuals).

Table 1-2 lists unincorporated communities in Ventura County that are recognized by the United States Census Bureau as census-designated places for the 2020 census:

Table 1-2. Ventura County Unincorporated Communities

Census Designated Place	Population 2020	Population 2010	Population Change Since 2010
Bell Canyon	1,946	2,049	-103
Casa Conejo	3,267	3,249	+18
Channel Islands Beach (e.g. Hollywood Beach and Silver Strand)	2,870	3,103	-233
El Rio	7,037	7,198	-161
Lake Sherwood	1,759	1,527	+180
Meiners Oaks	3,911	3,571	+340
Mira Monte	6,618	6,854	-227
Oak Park	13,898	13,811	+87
Oak View	6,215	4,066	+2,149
Piru	2,587	2,063	+524
Santa Rosa Valley	3,312	3,334	-22
Santa Susana	1,160	1,037	+123
Saticoy	1,133	1,029	+104

Source: United States Census Bureau. https://www.census.gov/.

The bulk of the population within the unincorporated county area is concentrated within four of these communities. Approximately 17,000 people reside in the adjoining communities of Oak View, Meiners Oaks and Mira Monte on the west end of the county. Meanwhile, nearly 14,000 people reside in the community of Oak Park on the east end of the county.

1.3.2 Development

Unincorporated Ventura County is a slow-growth, mostly rural land use jurisdiction with policies and initiatives that seek to focus growth and development in more urbanized areas. Developed areas include about 18 existing census-designated places listed in the previous section, most of which are

governed by one of nine specific area plans. For the period between 2016-2020, single-family residences made up approximately half of the development activity in the unincorporated areas, while accessory dwelling units comprised an additional 35 percent of the development activity. Agricultural worker housing projects represented approximately 1 percent of development activity, while other multi-family projects and subdivisions were uncommon, representing less than 7 percent of the development in the unincorporated areas. Permits for commercial development constituted 9 percent of the development activity. For a more detailed description of development trends, see the 2020 Annual Progress Report available here:

https://vcrma.org/docs/images/pdf/planning/plans/2020_Ventura_County_Annual_Progress_Report.pdf

Table 1-3 summarizes development trends in the unincorporated County in the period since the preparation of the previous (2015) Hazard Mitigation Plan update, as well as expected future development trends.

Table 1-3. Recent and Expected Future Development Trends

Criterion	Response
Has your jurisdiction annexed any land since the preparation of the previous hazard mitigation plan? • **If yes, give the estimated area annexed and estimated number of parcels or structures.**	No
Is your jurisdiction expected to annex any areas during the performance period of this plan? • **If yes, describe land areas and dominant uses.** • **If yes, who currently has permitting authority over these areas?**	No
Provide the number of new construction permits for each hazard area or provide a qualitative description of where development has occurred.	Permitting activity in 2020 was concentrated in the areas around Piru, Oak View, and Meiners Oaks. In particular, within the Piru area, the buildout of the Piru Gateway development (Tract Map 5553, recorded in 2017) has been under construction for the past several years. This development consists of 53 single-family homes, 4 duplex units, and 10 triplex units, for a total of 91 new residential units. Conversely, in the Oak View and Meiners Oaks areas, most new development consisted of legalization of existing, unpermitted accessory units, and construction of new accessory dwelling units. Much of this development is being driven by state-level regulation changes that went into effect on January 1, 2020 which limit local agency authority to regulate accessory dwelling units. Much of the development is located in high fire hazard severity zones, including Piru, the Oak View and Meiners Oaks areas near Ojai, the hills north of Camarillo, and southeast of Simi Valley in Bell Canyon. A small number of single-family permits have also been issued in coastal areas that are primarily for redevelopment of existing structures. Most of these coastal structures are vulnerable to tsunami and other coastal hazards. For a more detailed description of development trends, see the 2020 Annual Progress Report available here: https://vcrma.org/docs/images/pdf/planning/plans/2020_Ventura_County_Annual_Progress_Report.pdf

<table>
<tr><th>Criterion</th><th>Response</th></tr>
<tr><td>Are any areas targeted for development or major redevelopment in the next five years?
• If yes, briefly describe, including whether any of the areas are in known hazard risk areas</td><td>Yes

In February 2021, the County approved a 360-unit farmworker housing project north of the city of Camarillo called “Somis Ranch”, which will be constructed in three phases over the next few years.

Five hundred, ninety-eight additional units are also planned to be constructed over the next four years as part of the continued development (Phase II) of the University Glenn area located adjacent to California State University Channel Islands. This master-planned, mixed-use residential community is proposed to be located on 32 acres south of the City of Camarillo, along the western edge of the Santa Monica Mountains, within a high-fire hazard area. Additional housing is also anticipated to be constructed south of Camarillo as part of the Rancho Sierra Senior Supportive Housing (50 units) on Lewis Road.

Finally, there are a total of 224 dwelling units anticipated to be constructed adjacent to Hwy 126 in the Piru Expansion Area as part of the development of two recorded tract maps: the Reider subdivision, comprising 49 townhomes, and the Finch subdivision, comprising 175 new dwelling units. The Piru Expansion area is partially located within FEMA’s A99 flood zone.

In addition to the new housing outlined above, there are a number of redevelopment projects related to fire rebuilds. Between 2017 and 2018, 337 residential dwelling units were destroyed by the Thomas and the Woolsey Fires, which together burned more than 377,000 acres, most of which were located within Ventura County. As of 2020, rebuilding efforts have included issuance of 122 Planning Permits, 87 Building Permits, and the rebuild of 40 residential units. Many of these units were located in high-fire hazard areas.

Efforts by the County Planning Division are ongoing to implement programs outlined for the disadvantaged communities within the El Rio/ Del Norte Area Plan and Saticoy Area Plan that would accommodate additional development in these areas through roadway, sewer, and water infrastructure improvements.

The County also continues to improve regulatory pathways that support the development of additional affordable housing and agricultural worker housing throughout the County via an update to the General Plan Housing Element, as well as zoning amendments for agricultural worker housing regulations and accessory dwelling units.</td></tr>
<tr><td>How many permits for new construction were issued in your jurisdiction since the preparation of the previous hazard mitigation plan?</td><td>
<table>
<tr><th></th><th>2016</th><th>2017</th><th>2018</th><th>2019</th><th>2020</th></tr>
<tr><td>Single Family</td><td>40</td><td>46</td><td>46</td><td>65</td><td>47</td></tr>
<tr><td>Multi-Family</td><td>0</td><td>0</td><td>14</td><td>3</td><td>21</td></tr>
<tr><td>Other (mobile homes, accessory dwellings, mixed use, etc.)</td><td>23</td><td>35</td><td>52</td><td>40</td><td>50</td></tr>
<tr><td>Commercial</td><td>11</td><td>4</td><td>14</td><td>9</td><td>7</td></tr>
<tr><td>Total</td><td>74</td><td>85</td><td>126</td><td>117</td><td>125</td></tr>
</table>
</td></tr>
<tr><td>Describe the level of buildout in the jurisdiction, based on your jurisdiction’s buildable lands inventory. If no such inventory exists, provide a qualitative description.</td><td>The 2040 Ventura County General Plan Background Report included an inventory of both residential holding capacity and residential development potential. The unincorporated residential development potential was estimated to be 1,361 units (Section 3.7, Table 3-19). The residential development potential accounted for parcels on vacant and underutilized land, as well as other constraints such as steep slopes and floodways. If second dwellings, farmworker housing, Channel Islands University housing, and vacant OS, AE, and RA zone parcels with single-family potential are included, the remaining residential development potential is 28,228 units (Section 3.7, Table 3-22).

The County of Ventura’s General Plan Annual Report details that Unincorporated Ventura County’s Regional Housing Needs Allocation (RHNA) for the period from 2014 to 2021 was 1,015 units. As of 2019 the County has authorized permits for 590 of the 1,015 RHNA units (Exhibit 1, page 7). The Ventura County 2040 General Plan, Chapter 3 Housing Element includes the final RHNA allocation for the period of 2021-2029 which is 1,262 units (Section 3.2, Table 3-1).</td></tr>
</table>

1.4 CAPABILITY ASSESSMENT

This section describes an assessment of existing capabilities for implementing hazard mitigation strategies. The introduction at the beginning of this volume of the hazard mitigation plan describes the components included in the capability assessment and their significance for hazard mitigation planning.

Findings of the capability assessment were reviewed to identify opportunities to expand, initiate or integrate capabilities to further hazard mitigation goals and objectives. Where such opportunities were identified and determined to be feasible, they are included in the action plan. The "Analysis of Mitigation Actions" table in this annex identifies these as community capacity building mitigation actions. The findings of the assessment are presented as follows:

- An assessment of planning and regulatory capabilities is presented in Table 1-4.
- Development and permitting capabilities are presented in Table 1-5.
- An assessment of fiscal capabilities is presented in Table 1-6.
- An assessment of administrative and technical capabilities is presented in Table 1-7.
- An assessment of education and outreach capabilities is presented in Table 1-8.
- Information on National Flood Insurance Program (NFIP) compliance is presented in Table 1-9.
- Classifications under various community mitigation programs are presented in Table 1-10.
- The community's adaptive capacity for responding to the impacts of climate change is presented in Table 1-11.

Table 1-4. Planning and Regulatory Capability

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity?
Codes, Ordinances, & Requirements				
Building Code	Yes	No	Yes	Yes
Comment: *2019 Ventura County Building Code, Ord. #4548*				
Zoning Code	Yes	No	Yes	Yes
Comment: *Non-Coastal Zoning Ordinance, last amended 4/13/21* *Coastal Zoning Ordinance, last certification 6/11/21*				
Subdivisions	Yes	No	Yes	Yes
Comment: *Ventura County Subdivision Ordinance, last amended 6/16/20*				
Stormwater Management	Yes	No	Yes	Yes
Comment: *Ventura County Ordinance Code Relating to Stormwater Quality Management for Unincorporated Areas, Ordinance #4450, last amended 7/17/12*				

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity?
Post-Disaster Recovery	Yes	Yes	No	Yes
Comment: *See https://www.venturacountyrecovers.org/ (click on "Hill and Woolsey Fires" in upper right)* *Board of Supervisors Ordinance No. 4515, Approved 12/26/17: An Emergency Ordinance establishing local standards and procedures for cleanup of debris generated by the Thomas Fire.* *Board of Supervisors Resolution No. 17-148, Approved 12/26/17:* Resolution waiving certain Planning, Building and Safety, and Environmental Health Division fees related to Temporary Dwellings during rebuilding of residential structures damaged or destroyed in the Thomas Fire. *Board of Supervisors Ordinance No. 4532, Approved 10/30/18:* Ordinance amending Division 8, Chapter 1, Article 5, Sections 8105-1.1, 8105-4 and 8105-5, Article 6, section 8106-5.12, article 7, Sections 8107-14.2 and 8107-14.3, and Article 13, Section 8113-6.1.1 of the Ventura County Ordinance code, Non-Coastal Zoning Ordinance pertaining to the permitted uses matrix, temporary dwelling during construction and reconstruction, and destruction of non-conforming structures and structures containing nonconforming uses.			
Real Estate Disclosure	No	No	No	No
Comment: *None currently*				
Growth Management	Yes	No	Yes	No
Comment: *Measure C, Save Open Space and Agricultural Resources Extension to year 2050, 11/3/16*				
Site Plan Review	Yes	Yes	Yes	Yes
Comment: *Non-Coastal Zoning Ordinance, last amended 4/13/21* *Coastal Zoning Ordinance, last certification 6/11/21* *2019 Ventura County Building Code, Ord. #4548*				
Environmental Protection	Yes	No	Yes	Yes
Comment: *Initial Study Assessment Guidelines, last amended 4/26/11*				
Flood Damage Prevention	Yes	No	Yes	Yes
Comment: *Ventura County Floodplain Management Ordinance, Ordinance. #4521, Enacted 3/27/18*				
Emergency Management	Yes	No	No	Yes
Comment: *Code of Ordinances, Div 5 (Safety), Section 3 (Public Emergency) (5300)* *https://library.municode.com/ca/ventura_county/codes/code_of_ordinances?nodeId=DIV5SA_CH3PUEM* *Created the Emergency Planning Council*				
Climate Change	Yes	No	Yes	Yes
Comment: *2040 General Plan, Climate Action Plan in Appendix B, September 15, 2020* *General Services Agency, Energy Action Plan, April 2010* *Climate Protection Plan for Government Operations, April 2012* *Saticoy Area Plan, Mobility Element* *Coastal Zoning Ordinance, Section 8178-8—Water Efficient Landscaping Requirements (2018)* *Non-Coastal Zoning Ordinance, Section 8107-25 (last amended 2008) and Coastal Zoning Ordinance, Section 8178-7 Tree Protection Regulations (last amended 2018) and Tree Protection Guidelines* *Non-Coastal Zoning Ordinance, Section 8106-8.2—General Landscaping and Water Conservation Requirements (last amended 2021), which requires compliance with the State's Model Water Efficient Landscaping Ordinance.*				
Planning Documents				
General Plan	Yes	No	Yes	Yes
Is the County's General Plan compliant with Assembly Bill 2140? *No.* ***Comment:*** *2040 General Plan, Appendix B, September 15, 2020.*				
Capital Improvement Plan	Yes	No	No	Yes
How often is the plan updated? *Annually* ***Comment:*** *Capital Improvement Plan Project Sheet Submittals are revised and updated annually in support of a rolling 5-year planning horizon.*				

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity?
Disaster Debris Management Plan	Yes	Yes	No	No
Comment: *Emergency Ordinance No. 4534, Dec. 4, 2018* *An emergency ordinance establishing local standards and procedures for cleanup of debris generated by the Hill and Woolsey Fires.*				
Floodplain or Watershed Plan	Yes	No	Yes	Yes
Comment: *Flood Safety Plan for Ventura County, March 2017*				
Stormwater Plan	Yes	No	No	Yes
Comment: *County Stormwater Program Compliance Strategy in the Unincorporated Area, approved by the Board of Supervisors on Feb. 5, 2019*				
Urban Water Management Plan	Yes	No	Yes	Yes
Comment: *2020 Urban Water Management Plan (UWMP) for County Waterworks District #1, June 22, 2021*				
Habitat Conservation Plan	Yes	No	No	Yes
Comment: *Habitat Connectivity and Wildlife Corridors Ordinance, Non-Coastal Zoning Ordinance, 2019, Ord #'s 4537 and 4539*				
Economic Development Plan	Yes	No	No	Yes
Comment: *2040 General Plan, Economic Vitality Element, September 15, 2020* *County of Ventura Economic Vitality Strategic Plan, November 13, 2017*				
Shoreline Management Plan	No	Yes	No	No
Comment: *Beach Erosion Authority for Clean Oceans and Nourishment (BEACON) Coastal Regional Sediment Management Plan and Programmatic EIR, 2009 and 2011*				
Community Wildfire Protection Plan	Yes	No	No	Yes
Comment: *Ventura County Community Wildfire Protection Plan, 2010. Plan update scheduled for completion in 2022.*				
Forest Management Plan	No	Yes	No	Yes
Comment: *Los Padres National Forest Land Management Plan, 2005*				
Climate Action Plan	Yes	No	Yes	Yes
Comment: *2040 General Plan, Climate Action Plan in Appendix B, September 15, 2020* *General Services Agency, Energy Action Plan, April 2010* *Climate Protection Plan for Government Operations, April 2012*				
Threat & Hazard Identification & Risk Assessment (THIRA)	No	No	No	No
Comment: *NA*				
Post-Disaster Recovery Plan	Yes	No	No	Yes
Comment: *Ventura County Disaster Recovery Plan, Adopted by BOS in April 2019*				
Continuity of Operations Plan	Yes	N/A	No	Yes
Comment: *Ventura County Continuity of Operations Plan was first adopted by BOS in 2008 and is maintained by the County Executive Office. The plan is included by reference within the 2021 EOP draft update (which is currently pending approval).*				
Public Health Plan	Yes	No	Yes	Yes
Comment: *Ventura County Public Health Strategic Plan, 2015-2020*				
Other	Yes	Yes	No	Yes
Comment: • Sea Level Rise Vulnerability Assessment and Adaptation Report, 2018 and 2019 • Farmworker Housing Ordinance, underway • Tree Mitigation Fund and County Tree Planting Program, • Ventura County Land Conservation Act Program, • Ventura County Surface Mining and Reclamation Act Program, • Naval Base Ventura County Joint Land Use Study, 2015				

Table 1-5. Development and Permitting Capability

Criterion	Response
Does your jurisdiction issue development permits? ***If no, who does? If yes, which department?*** Planning Division, Public Works Agency	Yes
Does your jurisdiction have the ability to track permits by hazard area?	Yes
Does your jurisdiction have a buildable lands inventory?	Yes

Table 1-6. Fiscal Capability

Financial Resource	Accessible or Eligible to Use?
Community Development Block Grants	Yes
Capital Improvements Project Funding ***Comment:*** Check with Public Works and General Services Agency	Yes
Authority to Levy Taxes for Specific Purposes ***Comment:*** new taxes require 2/3rds Board of Supervisors approval	Yes
User Fees for Water, Sewer, Gas or Electric Service ***If yes, specify:*** Check with Special Districts, typically require fee study	Yes
Incur Debt through General Obligation Bonds **Comment:** Requires Board of Supervisors Approval	Yes
Incur Debt through Special Tax Bonds Comment: Requires Board of Supervisors Approval or voter approval	Yes
Incur Debt through Private Activity Bonds **Comment:** Recovery Zone Economic Development Bonds, 2010 http://bosagenda.countyofventura.org/sirepub/cache/2/qdv0sgxbtlloepc0ihgn2r24/551690082020210412476.PDF	Yes
Withhold Public Expenditures in Hazard-Prone Areas	Yes
State-Sponsored Grant Programs **Comment:** Requires Board of Supervisors Approval to Receive Grants	Yes
Development Impact Fees for Homebuyers or Developers **Comment:** Requires Board of Supervisors Approval	Yes

Table 1-7. Administrative and Technical Capability

Staff/Personnel Resource	Available?
Planners or engineers with knowledge of land development and land management practices	Yes
If Yes, Department /Position: Yes, various positions throughout Planning Division and Public Works Agency	
Engineers or professionals trained in building or infrastructure construction practices	Yes
If Yes, Department /Position: Yes, Building and Safety Department various positions, Public Works Agency—Transportation Department and Watershed Protection, all positions.	
Planners or engineers with an understanding of natural hazards	Yes
If Yes, Department /Position: Building & Safety manager has CFM and Emergency response, Public Works Agency—Watershed Protection, Planning Division, Area Plans and Resources Manager, General Plan Manager	
Staff with training in benefit-cost analysis	Yes
If Yes, Department /Position: Building & Safety management team, Public Works Agency Directors and General Services Agency Parks Department Director	
Surveyors	Yes
If Yes, Department /Position: Public Works Agency, Surveyor's office.	
Personnel skilled or trained in GIS applications	Yes
If Yes, Department /Position: Building & Safety counter staff, plan review engineers and management team, Resource Management Agency GIS Supervisor	
Scientist familiar with natural hazards in local area	Yes
If Yes, Department /Position: PWA Engineering Managers and Hydrologists. For scientists, the Planning Division and Public Works agency also contract with consultants as needed.	
Emergency manager	Yes
If Yes, Department /Position: Sheriff's Office of Emergency Services (OES Director, and 6 additional full-time EMs), Building & Safety district managers	
Grant writers	Yes
If Yes, Department /Position: Planning Division Long Range Planning Managers, County Executive Office, Office of Sustainability Manager, various Public Works Agency departments.	

Table 1-8. Education and Outreach Capability

Criterion	Response
Do you have a public information officer or communications office?	Yes
Do you have personnel skilled or trained in website development?	Yes
Do you have hazard mitigation information available on your website?	Yes
If yes, briefly describe: ReadyVenturaCounty.org contains pages dedicated to the Hazard Mitigation Plan Update, including information on hazard mitigation and links to the existing Hazard Mitigation Plan.	
Do you use social media for hazard mitigation education and outreach?	Yes
If yes, briefly describe: Twitter, Nixle	
Do you have any citizen boards or commissions that address issues related to hazard mitigation?	Yes
If yes, briefly describe: Emergency Planning Council, CERT, Disaster Assistance Response Team, Ventura Regional Fire Safe Council, Ojai Valley Fire Safe Council, Ventu Park Fire Safe Council, and Bell Canyon Fire Safe Council	
Do you have any other programs in place that could be used to communicate hazard-related information?	Yes
If yes, briefly describe: VCEmergency.com; ReadyVenturaCounty.org, VC Alert,	
Do you have any established warning systems for hazard events?	Yes
If yes, briefly describe: VC Alert, Wireless Emergency Alerts (WEA); VCEmergency.com; Hi-Lo Sirens	

Table 1-9. National Flood Insurance Program Compliance

Criterion	Response
What local department is responsible for floodplain management?	Ventura County Public Works Agency-Engineering Services Department, Development Services Section.
Who is your floodplain administrator? (department/position)	Director, Ventura County Public Works Agency
Are any certified floodplain managers on staff in your jurisdiction?	Yes
What is the date that your flood damage prevention ordinance was last amended?	3/27/2018
Does your floodplain management program meet or exceed minimum requirements?	Meets
When was the most recent Community Assistance Visit or Community Assistance Contact?	9/21/2018
Does your jurisdiction have any outstanding NFIP compliance violations that need to be addressed?	No
Are any RiskMAP projects currently underway in your jurisdiction?	No
Do your flood hazard maps adequately address the flood risk within your jurisdiction?	Yes
Does your floodplain management staff need any assistance or training to support its floodplain management program?	Yes
If so, what type of assistance/training is needed?	Additional training on benefit-cost analysis for the BRIC grant program, and green-flood plain management project solutions eligible for FEMA funding.
Does your jurisdiction participate in the Community Rating System (CRS)?	Yes
If yes, is your jurisdiction interested in improving its CRS Classification?	No
How many flood insurance policies are in force in your jurisdiction?[a]	1,346
What is the insurance in force?	$395,320,600
What is the premium in force?	$1,327,849
How many total loss claims have been filed in your jurisdiction?[a]	724
What were the total payments for losses?	$10,126,504

a. According to FEMA statistics as of March 31, 2021

Table 1-10. Community Classifications

	Participating?	Classification	Date Classified
FIPS Code	Yes	06111	N/A
DUNS #	Yes	066691122	N/A
Community Rating System	Yes	5	5/1/2016
Building Code Effectiveness Grading Schedule	No	N/A	N/A
Public Protection	Yes	03/3X	12/21/2018
Storm Ready	Yes	N/A	N/A
Firewise	Yes	N/A	Unknown
Tsunami Ready	Yes	N/A	N/A

Table 1-11. Adaptive Capacity for Climate Change

Criterion	Jurisdiction Rating
Technical Capacity	
Jurisdiction-level understanding of potential climate change impacts	High
Comment: *High level of understanding of anticipated exacerbation of drought and wildfire risks, and sea -level rise-related impacts. Moderate understanding of secondary impacts to agricultural/biological risks, and severe weather/severe storm impacts.*	
Jurisdiction-level monitoring of climate change impacts	Medium
Comment: *2040 General Plan has emission reduction and climate adaptation programs adopted and monitoring programs are being implemented.*	
Technical resources to assess proposed strategies for feasibility and externalities	Medium
Comment: *The Planning Division has access to technical resources in other County Agencies, coordination with outside agencies with resources is frequent, and the County also has the capacity to hire consultants when needed. Additional resources in adaptation pathway planning would be helpful.*	
Jurisdiction-level capacity for development of greenhouse gas emissions inventory	High
Comment: *A GHG inventory was completed for the 2040 General Plan Update with baseline data for 2015. There is also an operational emissions inventory, and monitoring is planned for the future as part of General Plan implementation.*	
Capital planning and land use decisions informed by potential climate impacts	High
Comment: *The 2040 General Plan includes policies related to climate adaptation to guide development due to climate change impacts. The 2040 General Plan also includes implementation programs that function as climate adaptation strategies.*	
Participation in regional groups addressing climate change risks	High
Comment: *Some members of the Board of Supervisors are on committees for sea level rise and beach sediment management. The County's Office of Sustainability, the Long Range sections of the Planning Division, and the Public Works Agency regularly participate with regional groups to address climate change risks. The County Executive Office's* Ventura County Climate Emergency Council *is a citizen advisory committee focused on GHG reductions. The County's* Sustainability Committee is *an interagency work group focused on integrating sustainable practices into agency activities including Climate Action Plan implementation.*	
Implementation Capacity	
Clear authority/mandate to consider climate change impacts during public decision-making processes	High
Comment: *Included in 2040 General Plan policies and programs, see Appendix B.*	
Identified strategies for greenhouse gas mitigation efforts	High
Comment: *Included in 2040 General Plan policies and programs. The County Executive Office's Sustainability Division manages the Ventura County Climate Emergency Council to advise the County's Board of Supervisors on climate action planning and Climate Action Plan implementation. https://www.ventura.org/vccec/*	
Identified strategies for adaptation to impacts	Medium
Comment: *The County's 2019 Sea level Rise Adaptation Report includes adaptation strategies that have yet to be adopted in policy form.*	
Champions for climate action in local government departments	Medium
Comment: *Action ultimately requires Board authorization for policies and programs.* *The County Executive Office's Sustainability Division acts as lead for Climate Action Plan implementation including time invested by a full-time Sustainability Officer and supporting staff. The Sustainability Officer is the Chair of the County's the* Sustainability Committee*, an interagency work group focused on integrating sustainable practices into agency activities including Climate Action Plan implementation.*	
Political support for implementing climate change adaptation strategies	High
Comment: *In June 2020, the County's Board of Supervisors allocated an additional full-time, fixed-term employee to focus on supporting Climate Action Plan implementation efforts as part of its budget hearing process.*	

Criterion	Jurisdiction Rating
Financial resources devoted to climate change adaptation	High
Comment: *The County funded the 2020 Climate Action Plan, which is a component of the 2040 General Plan, and has provided matching funds for sea level rise planning grants. The County Executive Office's Sustainability Division has staff devoted to climate action and adaptation programs, including an additional fixed-term position focused on supporting Climate Action Plan implementation that was approved in June 2020. The County also contributes membership funds to BEACON.*	
Local authority over sectors likely to be negative impacted	High
Comment: *The County exercises land use authority in the unincorporated County.*	
Public Capacity	
Local residents' knowledge of and understanding of climate change risk	Medium
Comment: *Many residents have a general understanding of climate change risks, but ongoing outreach and education is needed for the broader community.*	
Local residents' support of adaptation efforts	Medium
Comment: *While most residents support adaptation efforts, they may be resistant if new requirements impact them financially.*	
Local residents' capacity to adapt to climate impacts	Low
Comment: *Applications for new development and redevelopment have rarely included voluntary climate adaptation features, but some features are required to be included according to 2040 General Plan policies. The County has allowed redevelopment in areas impacted by wildfires.*	
Local economy's current capacity to adapt to climate change impacts	Medium
Comment: *The agricultural industry is a substantial contributor to the local economy, with an estimated gross value in 2020 of over 1.9 billion dollars, and employing over 40,000 individuals. The County (~8,000 employees) and Naval Base Ventura County (>16,000 employees) are the two largest local employers and both are planning for climate change impacts. Additionally, the City of Port Hueneme is conducting a General Plan update that will include a vulnerability assessment and planning for sea level rise impacts at the Port of Hueneme.* *Adaptive capacity is highly dependent on the scope and severity of climate impacts. Rebuilding levees, managed retreat, and rebuilding/relocating buildings and infrastructure in the face of extreme flooding and sea level rise are costly adaptation measures and, in many cases, would require substantial public funding and a multi-jurisdictional approach to implement.*	
Local ecosystems' capacity to adapt to climate change impacts	Low
Comment: *A 2019 report by the Western Regional Climate Center indicated that, as a result of climate change Ventura County will experience air temperature increases, a greater number of extreme heat days annually, and an increased number of annual dry days leading to fewer but more intense rainfall events. Based on these findings, it is anticipated that such changes will lead to challenges in evapotranspiration and crop cultivation, increased potential for flash flooding and/or debris flows, increased susceptibility to drought, and longer wildfire seasons. More work needs to be done to evaluate how ecosystems that often straddle jurisdictional boundaries can migrate and adapt. More community education and benefit-cost analysis is needed to demonstrate how ecosystem services can minimize or abate climate change impacts.* https://wrcc.dri.edu/Climate/reports.php https://wrcc.dri.edu/Docs/VenturaClimate2019_bookmarked.pdf.	

High = Capacity exists and is in use
Medium = Capacity may exist, but is not used or could use some improvement
Low = Capacity does not exist or could use substantial improvement
Unsure = Not enough information is known to assign a rating.

1.5 INTEGRATION REVIEW

For hazard mitigation planning, "integration" means that hazard mitigation information is used in other relevant planning mechanisms, such as general planning and capital facilities planning, and that relevant information from those sources is used in hazard mitigation. This section identifies where such integration is already in place, and where there are opportunities for further integration in the future. Resources listed at the end of this annex were used to provide information on integration. The progress reporting process described in Volume 1 of the hazard mitigation plan will document the progress of hazard mitigation actions related to integration and identify new opportunities for integration.

1.5.1 Existing Integration

Some level of integration has already been established between local hazard mitigation planning and the following other local plans and programs:

- The **Ventura County 2040 General Plan**, Hazards and Safety Element was updated in September, 2020. The update also included a Water Resources Element and a Climate Action Plan.
- The **Non-Coastal Zoning Ordinance (NCZO)** includes standards for hazard mitigation and abatement relative to high fire hazard areas, earthquakes, geology and floods. Recent updates to the NCZO added water efficient landscaping standards and a wildlife corridor overlay zone that includes new standards in fencing and lighting to promote the movement of wildlife.
- The **County's Local Coastal Program (LCP)** is comprised of the **Coastal Area Plan** and **Coastal Zoning Ordinance (CZO)**. The CZO includes standards for hazard mitigation and abatement related to beach erosion, geology, earthquakes, and floods.
- The **Ventura County Subdivision Ordinance** requires consideration of both geologic and flood hazards during the siting and design of proposed lots. Additionally, it requires consideration of wildfire hazards when a proposed subdivision is located in a "state responsibility area" or a "very high fire hazard severity zone".
- **Ventura County Emergency Operations Plan** addresses the County's planned response to hazard events.
- **Ventura County Building Code** is the local adoption of the State codes Title 24

1.5.2 Opportunities for Future Integration

The capability assessment in this annex indicates opportunities to integrate this mitigation plan with other jurisdictional planning/regulatory capabilities. Capabilities were identified as integration opportunities if they can support or enhance the actions identified in this plan or be supported or enhanced by components of this plan. The capability assessment identified the following plans and programs that offer opportunities for future integration or expanded integration with this mitigation plan:

- Although the **Ventura County 2040 General Plan** includes policies and programs for hazard mitigation and abatement relative to high-fire hazard areas, earthquakes, geology and floods, as well as climate change adaptation related to droughts, sea level rise and coastal erosion it needs to be expanded to meet the requirements for compliance with AB 2140.
- The County's **Initial Study Assessment Guidelines (ISAGs)** are in the process of being updated and this may be an integration opportunity.
- The County's **NCZO** is periodically amended per Board of Supervisors directive or as required by state law. Updates per new fire codes related to brush clearance and fire prevention may be needed.
- The **County's LCP** includes standards for hazard mitigation and abatement relative to beach erosion, geology, earthquakes, and floods. The policies and standards related to environmentally sensitive habitat, coastal hazards, and sea level rise are being consolidated and updated, and this effort could present an opportunity for future integration.
- **Wetland Project Permitting Guide, 2006**—this document could be updated with support from the County's Public Works Agency to include hazard integration.

The following projects are currently underway or are planned to be updated. There could be integration opportunities to include hazards in siting and design standards.

- Sea Level Rise Vulnerability Assessment and Adaptation Report, 2019
- Farmworker Housing Ordinance, underway
- Tree Mitigation Fund and County Tree Planting Program
- Land Conservation Act Program
- Initial Study Assessment Guidelines (ISAGs)

Taking action to integrate each of these programs with the hazard mitigation plan was considered as a mitigation action to include in the action plan in this annex.

1.6 RISK ASSESSMENT

1.6.1 Jurisdiction-Specific Natural Hazard Event History

Table 1-12 lists past occurrences of natural hazards for which specific damage was recorded in this jurisdiction Other hazard events that broadly affected the entire planning area, including this jurisdiction, are listed in the risk assessments in Volume 1 of this hazard mitigation plan.

Table 1-12. Past Natural Hazard Events

Type of Event	FEMA Disaster #	Date	Damage Assessment
2019 Easy Fire	FM5298	10/30/2019 to 11/2/2019	1,806 acres burned; 6,500 homes threatened; 30,000 residents evacuated.
2019 Maria Fire	FM5302	10/31/2019 to 11/4/2019	9,412 acres burned including a substantial portion of prime ag lands; 4 structures destroyed; >1,800 homes / 7,500 residents evacuated; triggered temporary shut-down of local oil and natural gas field facilities and pipelines; damage to communications and oil and gas field facilities occurred. 160 acres of avocado orchards and 25 acres of lemon orchards were moderately to severely damaged or destroyed. Damage to avocado and lemon crops was estimated at ~$5.2 million, according to Korinne Bell, Ventura County Chief Deputy Agricultural Commissioner.
2018 Hill Fire	DR4407	11/8/2018 to 11/16/2018	4,531 acres burned; 4 structures destroyed; 4 structures damaged; 5,000 structures threatened.
2018 Woolsey Fire	DR4407/FM5280	11/8/2018 to 11/21/2018	96,949 acres burned; $6 billion in property damage; $10 million in firefighting costs; 1643 structures destroyed, 3 deaths, 295,000 residents (in Ventura and L.A. County) evacuated.
2018 Heat Event (July)		7/4/2018 to 7/6/2018	Extreme 2-day heat event broke records across the county, and resulted in damage to crops. For crops such as avocados and citrus, heat can damage both the current crop and also the fruit set for the coming season, packing a two-year punch. The California Avocado Board estimated a 2019 crop of 210 million pounds, down from 372 million pounds a year earlier, and the smallest crop in over a decade. Citrus officials say it knocked down up to 15 percent of the region's lemon crop at the tail end of the harvest. Lemons dropped by 14% in value in the County's 2019 ag report.

Type of Event	FEMA Disaster #	Date	Damage Assessment
2018 Montecito Debris Flows	DR4353	1/9/2018 – 1/22/2018	A 30-mile section of U.S. Route 101 (US 101) from Santa Barbara to Ventura was shut down for two weeks as sections filled with two feet (60 cm) of mud and debris, some of which also reached beaches 2.25 miles (3.6 km) from the mountains. Following the closure, access to Santa Barbara from the Los Angeles area was limited to a 260-mile (420 km) detour around the Los Padres National Forest or through the use of private ferries to Ventura. This closure severely impacted commerce throughout the county. Based on commuter surveys conducted by the U.S. Census Bureau (2013) and Department of Transportation estimates, in 2017 an average of 2,300 vehicles (2,400 workers) commuted daily from Santa Barbara to Ventura County, and approximately 10,000 vehicles (11,500 workers) commuted from Ventura, in addition to approximately 3,700 commercial trucks. The loss to Ventura County cities from commuter earnings for each week of the closure has been approximated at $12,235,774.
2017 Thomas Fire	FM5224	12/4/2017 to 1/12/2018	Over 280,000 acres burned. Cost of $2.2 billion; $171,296,703 in agricultural losses (crop losses and farm equipment) alone; 1,063 structures destroyed; 280 damaged; 2 deaths; and 104,607 residents evacuated; Businesses, including Ag also experienced loss of perishable goods from the nearly two-week closure of U.S. 101 that shut down commerce and prevented workers from accessing fields.
2017 Winter Storms	NA	2/17/2017 to 2/18/2017	Rainfall amounts from 2 to 6 inches across coastal areas with up to around 10 inches in the local mountains produced numerous reports of flash flooding as well as mud and debris flows. Strong southerly winds with gusts up to 70 mph reported in some areas. Highway 101 was closed in both directions north of Ventura due to mud and debris flows near the Solimar burn area. Flash flooding near the community of Thousand Oaks; three men rescued when Wildwood Creek flooded. Near the community of Camarillo, Conejo Creek to overflow its banks, flooding acres of agricultural land. State disaster declaration No. CA77 and CA77.1
2015 Coastal Erosion and Flooding Event	NA	12/11/2015	Strong waves (up to 15 ft.) from a large westerly swell event resulted in evacuation and closure of the Ventura and Port Hueneme piers. Heavy surf caused approximately 15 pylons to break off the sides of the Ventura pier—triggering an extended (four month) closure while repairs were made. Pier repairs cost $1.4 million. Localized flooding of beachfront homes in the Pierpont neighborhood and nearby streets also occurred Harbor Boulevard between Sanjon Road and California Street in the city of Ventura had to be closed due to flooding. Erosion from this event substantially altered the beach profile along Ventura State Beach near the pier, including impacts to Surfer's Point as well as other exposed coastline areas. At Naval Base Ventura County, officials temporarily closed Family Beach and a nearby campground because of high surf. Farther east along Pacific Coast Highway, State Parks relocated campers inland from the beachside Thornhill Broome State Beach Campground after the combination of high tide and the swell flooded the east and west ends of the campground.
2014 Pacific Coast Highway (Hwy 1) Landslide		11/20/2014 to 3/15/2015	Rocks, boulders, and 4-6 feet of mud slumped onto Hwy 1 near the May 2013 Springs Fire burn area. The substantial slope stabilization and highway repairs required resulted in a months-long closure of 9 miles of Hwy 1 (November through mid-March) between the Mugu and Malibu areas, isolating unincorporated south coast communities, impacting commuter traffic, and limiting access to coastal recreational resources.
2014 Coastal Erosion and Flooding Event (Hurricane Marie)	NA	8/26/2014	Large southeast swells from Hurricane Marie generated high surf conditions along local beaches and resulted in numerous rescues by local lifeguards, beach and campground closures, and flooding of some coastal roads. Local piers experienced some damage including the pier at Port Hueneme. Extensive damage also occurred to the road infrastructure of Hwy 1 near Sycamore Canyon campground in Point Mugu State Park. At postmile (PM) 4.0, the existing revetment was damaged and at PM 4.2, the vegetated slope between the road and beach was severely eroded.
2013 Springs Fire	FM5024	5/2/2013	24,251 acres burned; 15 homes destroyed; 4,000 homes threatened as well as key communications infrastructure (including $1 billion dollar Naval satellite operations station on Laguna Peak). More than $10 million in firefighting costs incurred.

Type of Event	FEMA Disaster #	Date	Damage Assessment
2009 Guiberson Fire	FM2839	9/22/2009 to 9/29/2009	17,500 acres burned;1 structure destroyed; estimated firefighting costs of more than $6.9 million
2007 Ranch Fire	FM1731	10/21/2007	58,401 acres burned in both L.A. and eastern Ventura County near Piru; over $9 million in firefighting costs
2007 Freeze Event	DR-1689	1/11/2007 to 1/17/2007	4 nights of below freezing temperatures caused losses of over $1.3 billion statewide and $281 million in crop damage locally. Damage was mainly to citrus and avocado groves, and the winter strawberry crop that was just going to harvest.
2006 Shekell Complex Fire	FM2681	12/3/2006 to 12/6/2006	13,600 acres burned; 5 homes, 2 comm. Buildings; 11 structures destroyed; $12.8-13 million in damage; 9.2 million in structural damage; 25 million in ag damage
2006 Day Fire	FM2677	9/4/2006 to 10/9/2006	162,702 acres burned, including substantial wilderness and national forest areas; $78 million in fire suppression costs; 11 structures burned, residences threatened in Lockwood Valley and Upper Ojai over course of several weeks.
2005 La Conchita Landslide	DR1577	1/10/2005	The landslide resulted in the deaths of 10 people, destroyed 13 homes and resulted in red-tagging of 23 others. It occurred following a two-week period from Dec 27-Jan 10 in which 430 mm of rainfall fell (a record 15-day rainfall). Estimated costs of ~$1.75 million in county agencies' response to the event.
2005 Winter Storms (January)	DR1577	1/7/2005 to 1/11/2005	Damage totaled more than $200 million. High water flows, scouring, and washouts in the Ventura River damaged several water wells and exposed water lines owned by the Ojai Valley Sanitary District. Severe erosion occurred along both embankments of the Ventura River. The Calleguas Creek topped its banks near the state hospital in Camarillo and flooded nearby ag fields. Homes in Moorpark, Casitas Springs and Ojai were flooded, major roads including Highways 101, 126, 33 and 150 were closed for more than a week, and the Santa Paula Airport was closed for several months due to flood damage to the runway.
2003 Simi Fire	DR1498/ FM2504	10/24/2003	108,204 acres burned; crop losses of nearly $8 million.
1999 Ranch Fire	NA	12/27/1999	4,372 acres burned, including a large proportion of national forest lands in Los Padres National Forest. Reported losses include thousands of dollars in outdoor equipment and numerous small structures at The Ojai Foundation. The fire also threatened numerous homes in Ojai Valley area. Fire officials estimated the cost of fighting the fire at nearly $5 million, and noted that firefighters constructed more than 20 miles of fire lines.
1998 Freeze Event	DR1267	12/20/1998	This severe freeze impacted citrus/avocado/strawberry crops across Ventura County; 1,139 services received; $71,541,000 in damages to agriculture industry. Other sources estimated losses as high as $74.3 million for Ventura County farmers.
1928 St. Francis Dam Failure	NA	3/12/1928	>530 people died; bridges, orchards, farms, and homes were all eradicated in flood's path down the Santa Clara river valley to the Pacific Ocean. Considered to be one of the worst engineering disasters of the 20th century.

1.6.2 Hazard Risk Ranking

Table 1-13 presents a ranking of all hazards of concern for which this hazard mitigation plan provides quantitative risk assessments. As described in detail in Volume 1, the ranking process involves an assessment of the likelihood of occurrence for each hazard, along with its potential impacts on people, property, and the economy. Mitigation actions target hazards with high and medium rankings.

Table 1-13. Hazard Risk Ranking

Rank	Hazard	Risk Ranking Score	Risk Category
1	Landslides	51	High
2	Wildfire	36	High
3	Earthquake	32	High
4	Severe Storms	24	High[a]
5	Severe Weather	24	High[a]
6	Dam Failure	24	High[a]
7	Flooding	18	High[a]
8	Sea Level Rise	12	Low
9	Tsunami	10	Low
10	Drought	9	Low

a. The risk category was increased to High, based on jurisdiction-specific vulnerabilities.

1.6.3 Jurisdiction-Specific Vulnerabilities

Volume 1 of this hazard mitigation plan provides complete risk assessments for each identified hazard of concern. This section provides information on a few key vulnerabilities for this jurisdiction. Available jurisdiction-specific risk maps of the hazards are provided at the end of this annex.

Repetitive Loss Properties

Repetitive loss records are as follows:

- Number of FEMA-identified Repetitive-Loss Properties: 63
- Number of FEMA-identified Severe-Repetitive-Loss Properties: N/A
- Number of Repetitive-Loss or Severe-Repetitive-Loss Properties that have been mitigated: N/A

Other Noted Vulnerabilities

The following jurisdiction-specific issues have been identified based on a review of the results of the risk assessment, public involvement strategy, and other available resources:

- **Prioritization of Open Space / Natural Resource Areas—**In 2015, the U.S. Department of Agriculture named Ventura County the most desirable place to live in America. Ventura's mild climate, varied topography, bountiful open space and natural resources, and proximity to additional natural resource areas are a large part of its draw for residents and visitors. Vast tracts of the unincorporated County lie adjacent to, or within, the Los Padres National Forest, Santa Monica Mountains National Recreation Area, and the Pacific Ocean. Valuation of these resources, and of our interface with these open space areas is outside the scope of FEMA's traditional risk analysis tools (e.g., property/structural damage estimates, loss of life, and critical infrastructure inventories, insurance claims), which can result in radical underestimation of disaster impacts to recreation, tourism, and the overall desirability of living and working here.
- **Santa Ana Winds and Planned/Unplanned Utility Outages—**Warm, dry northeasterly winds are a local weather phenomenon in Southern California that can result in downed trees and power lines, blowing dust and air quality concerns. Although the winds themselves do not cause wildfires and rarely rise to the level of an area-wide disaster on their own, they exacerbate

critical fire weather conditions in our area and substantially complicate wildfire response and containment. These winds may occur throughout the year, but are typically most common from October to March. Nearly all of the region's significant wildfires have occurred in conjunction with strong Santa Ana wind conditions. Local power outages have been enacted with increasing frequency by utility companies in response to high wind/low humidity conditions, both within Ventura County and adjacent counties. Supporting adaptation of local businesses and individual residents to sporadic utility outages triggered by potential wind events, as well as critical facilities (e.g., communications towers and other energy infrastructure) should be prioritized.

- **Localized Flooding—**Many communities within the unincorporated County are located adjacent to rivers (e.g., Santa Clara River, Ventura River, Sespe Creek, Piru Creek, Lockwood Creek) that are prone to flood to varying degrees during periods of heavy rainfall. The effects of this flooding range from localized road closures to damage to property (e.g., flooded croplands), vehicles, and buildings.
- **Ventura County Public Works Agency – Watershed Protection's (VCPWA-WP's) Critical Facilities in the Unincorporated Areas—**Based on the fact that virtually all of VCPWA-WP's critical facility assets were constructed to provide flood protection and/or are geospatially located proximate to and/or in flood plains, and as documented in Table 1.8 Past Natural Hazard Events above, during the aforementioned 56-year period, VCPWA-WP's critical facility flood protection assets experienced $81 Million in damage from flooding, severe storms and severe weather events, VCPWA-WP has ranked Flood risks as "High" in Table 1.9 above.
- **Matilija Dam Seismic Risk Vulnerability—**Matilija Dam in the Ventura River watershed is vulnerable to seismic failure. Many communities are at risk of inundation. Implementation of the Matilija Dam Ecosystem Restoration Project (MDERP) would address this risk while also opening 17 miles of habitat for endangered steelhead trout. MDERP comprises several downstream flood protection and water supply reliability components that must precede removal of the dam, some of which have been completed or are at various stages of completion (alternatives analysis, design, or construction).
- **Levee Rehabilitation and Certification Projects in Unincorporated Areas—**Ventura County Watershed Protection is engaged in preliminary design and CEQA work for levee retrofit and/or flood-protection enhancement projects required to certify all its levees in compliance with federal levee certification requirements. Major levee rehabilitation and ultimate certification projects in the unincorporated areas include: the Ventura River Levee (VR-2) located in the unincorporated community of Casitas Springs, and the Ventura River Levee (VR-3) located in the near the unincorporated community of Oak View. VCPWA-WP is working with FEMA, the U.S. Army Corps of Engineers (USACE), as well as affected cities, residents, and property owners throughout Ventura County to marshal scarce Federal, State, and local funding resources necessary to complete five very important levee retrofit public safety and flood protection projects. Once all VCPWA-WP's levee retrofit projects are completed, VCPWA-WP's levees will fully comply with applicable Federal Levee Certification requirements found in 44 CFR 65.10. At best, full completion of VCPWA-WP's five levee rehab projects will require a minimum of five to ten years, and could take longer, depending on final engineering design plan results, environmental considerations, and availability of project funding required to construct the rehab projects.
- **Unincorporated Area Pump Stations Vulnerable to Sea-Level Rise—**San Nicholas, Santa Monica, and Santa Paula Pump Stations lift stormwater from low elevation coastal neighborhoods and discharge directly to the Pacific Ocean. The Santa Monica and Santa Paula Pump Station outlets are frequently clogged during high tide and heavy surf events, causing the

pumps to shut off and requiring manual removal of sand to ensure the coastal communities do not flood. With sea level rise, the risk increases. While not currently afflicted with the propensity for sand to clog its outlet, San Nicholas Pump Station is vulnerable to failure as sea level rises. The pumps in each facility are over 40 years old and do not have on site backup generators, making them vulnerable to power failures, which cause alarms to sound signaling the need for immediate emergency response. All three facilities need constant repair due to corrosive salt air and water. Upgrades are needed, but more land is required for truly effective solutions, and adjacent land is occupied by high value coastal residences.

- **Ormand Lagoon Coastal Estuary Vulnerable to Sea Level Rise—**Ormond Lagoon is a coastal estuary open to the ocean only during rain events and for a variable period thereafter depending on time between rain events, tides, etc. Sea level rise may reduce the ability of storm runoff from Ormond Lagoon Waterway and Tšumaš Creek to breach the lagoon and flow into the Pacific Ocean. Without a Beach Elevation Management Plan, the following are vulnerable to flooding from storm water backed up in the lagoon: the adjacent Oxnard Wastewater Treatment Plant and Advanced Water Purification Facility, the New-Indy recycled containerboard mill, the Halaco Superfund Site, local residences and roads. Restoration of the Ormond Wetlands complex may help reduce flood potential.
- **Homeless Population—**The size and distribution of the homeless population in the unincorporated area is not easily quantified, but has been increasing in recent years and exacerbates hazard risks and mitigation costs. During a January 2020 point-in-time survey coordinated by the County Executive Office, 128 homeless individuals were counted as residing within the unincorporated County area. Many homeless individuals within the unincorporated area inhabit encampments within the Ventura and Santa Clara river bottoms, where both wildfires and flooding risks are regular concerns. Unsheltered living locations have negative impacts on watershed viability and resilience in addition to posing risks to the broader community. The presence of unauthorized habitation within the watersheds increases wildfire risks (e.g., accidental starts from cooking/warmth fires and arson) as well as the cost of hazard mitigation actions (e.g., brush clearance for wildfire hazard abatement and trash and debris removal efforts prior to winter storm season). Communication barriers, fear of government officials and law enforcement, substance abuse issues, and mental health issues can complicate public outreach and hazard awareness efforts to homeless individuals, and confound accurate assessments of hazard risk and disaster damage.
- **Importance of Agriculture and Potential for Undervaluation of Drought and Ag/Biological Risks—**Agriculture, in the forms of ranching and farming, has been a keystone of Ventura County's economy since its inception. With fertile soils and a mild climate, Ventura remains one of the leading counties for agricultural production in the state. In addition to a variety of row crops and nursery products, the county is one of the top producers of citrus, avocados, and strawberries in the nation. Much of the cultivated land lies within the unincorporated County areas of the Oxnard Plain and Santa Clara River Valley. In addition to generating direct on-farm employment and revenue, agricultural production supports a wide range of other businesses, including packinghouses, equipment dealers, chemical applicators, pest-control firms, labor contractors, fertilizer and other supply dealers, trucking firms, fuel distributors, and repair and manufacturing facilities. Altogether, farming and farm-dependent businesses provide an estimated 43,000 jobs in Ventura County, more than any other sector of the economy except services. Agriculture and agriculture-related businesses account for about 4.4 percent of overall economic activity in Ventura County, generating $2.1 billion in revenue and $76 million in indirect business taxes annually. One in 10 county residents relies to some degree on income derived from farming. However, drought and agricultural/biological hazards (e.g., invasive crop

pests and disease) do not lend themselves to evaluation using FEMA's traditional risk analysis tools (e.g. property, structural damage estimates, loss of life, critical infrastructure inventories), which results in underestimation of the disaster impacts/costs that these hazards can have on the local environment, economy, and area communities.

- **Unauthorized Immigrants—**Ventura County's farm bureau estimates there are about 36,000 immigrant workers in the county, many of them undocumented. Unauthorized immigrants may be disproportionately affected by disasters (e.g., wildfires, flooding, pandemics), particularly those that impact agricultural operations in the unincorporated county areas where many work as farm laborers. Language/ communication barriers and fear of government and law enforcement personnel can complicate public outreach and education efforts to these individuals.

Mitigation actions addressing these issues were prioritized for consideration in the action plan in this annex.

1.7 STATUS OF PREVIOUS PLAN ACTIONS

Table 1-14 summarizes the actions that were recommended in the previous version of the hazard mitigation plan and their implementation status at the time this update was prepared.

Table 1-14. Status of Previous Plan Actions

Action Item from Previous Plan	Completed	Removed; No Longer Feasible	Carried Over to Plan Update	
			Check if Yes	Action # in Update
OA 11—Develop and implement plans to increase the building owner's general knowledge of and appreciation for the value of seismic upgrading of the building's structural and nonstructural elements.			✓	VUC-8
Comment: *This is an ongoing effort to be developed over the next year.*				
OA 19—Maintain vegetation management program that provides vegetation management services to elderly, disabled, or low-income property owners who lack the resources to remove flammable vegetation from around their homes.			✓	VUC-9
Comment: *This is an ongoing program and will be carried over to the plan update.*				
OA 21—Maintain hazards fuel treatment program for areas that have been identified with overgrown/dead brush/trees to reduce the potential for tree-to-tree ignition. Ensure that a "maintenance now" component to provide continued fire resistance is partof the program.			✓	VUC-10
Comment: *This is an ongoing program and will be carried over to the plan update.*				
UVC 1—Continue to participate in the National Weather Service's (NWS) StormReady Program.			✓	VUC-11
Comment: *Ventura County continues to participate in TsunamiReady and StormReady. NWS confirmed that Ventura County was last renewed for both SR and TR on 2/25/2019. The next renewal will be due on 3/19/2022.*				
UVC 2—Develop a plan to identify funding to replace/relocate the Operational Area Emergency Operations Center (EOC).			✓	VUC-12
Comment: *This item was not completed/pursued during the last update cycle (Thomas & Woolsey fire events, OES staffing changes, and COVID impacted planning and development of many items over the last several years) but continues to be a project of interest that will be carried over to the plan update.*				

Action Item from Previous Plan	Completed	Removed; No Longer Feasible	Carried Over to Plan Update: Check if Yes	Carried Over to Plan Update: Action # in Update
UVC 3—Update Seismic Standards for Communications (Cell Towers) Facilities (Building Code).			✓	VUC-13
Comment: *This will be done through the Ventura County Building Code VCBC 2019*				
UVC 4—Reinforce and maintain County roads, bridges, ditches and culverts from flooding through various flood proofing measures.			✓	VUC-17
Comment: *Ventura County Public Works Agency—Roads and Transportation Department (VCPWA-RT) is responsible for the operation and maintenance of County roads, bridges, ditches, and culverts in the unincorporated areas of Ventura County. VCPWA-RT conducts annual ditch cleaning and culvert cleaning before winter storm season to maintain the capacity of ditches and proper drainage flow to mitigate roadway flooding in rural areas of the county. In addition to the annual cleaning of ditches and culverts, the VCPWA-RT is actively working to rehabilitate Bridge Road Bridge (#442) which is currently in design and environmental permitting phase and is expected to be completed in 2023. Replacement of Catalina Drive Bridge (#384) was completed in May 2020 and replacement of Casitas Vista Road Bridge (#327) was completed in September 2020. Mupu Road Bridge and the Wheeler Canyon Road Bridge improvements projects were completed in 2016-2017. The VCPWA-RT is developing a Bridge Management Program to maintain County bridges. The program will identify and prioritize VCPWA-RT's 158 bridge structures which include 81 bridges on the National Bridge Inventory and 77 other structures. This program will identify budget needs, and schedules for preventive maintenance as well as budget for required rehabilitation or replacement of VCPWA-RT maintained bridges for short and long-term planning needs. The Bridge Management Program is expected to be completed in calendar year 2021. In 2020-2021, VCPWA-WP continued to clean flood control channels and catch basins to prepare for winter storm seasons. VCPWA-WP also secured Proposition 1 grant funding for the Santa Ana Bridge and Camino Cielo Bridge replacement projects which are managed by VCPWA-RT (both are components of the MDERP). The design of Camino Cielo Bridge is progressing towards 30% millstone. For the Santa Ana Bridge project, a construction contract was awarded in March 2021 with an estimated completion date of December 2022.*				

1.8 HAZARD MITIGATION ACTION PLAN

Table 1-15 lists the identified actions, which make up the hazard mitigation action plan for this jurisdiction. Table 1-16 identifies the priority for each action. Table 1-17 summarizes the mitigation actions by hazard of concern and mitigation type.

Table 1-15. Hazard Mitigation Action Plan Matrix

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action VUC-1—Where appropriate, support retrofitting, purchase or relocation of structures located in hazard areas, prioritizing those that have experienced repetitive losses and/or are located in high- or medium-risk hazard areas.						
Hazards Mitigated: Landslide, Earthquake, Severe Storm, Severe Weather, Flooding, Wildfire, Dam Failure, Sea Level Rise, Tsunami						
New & Existing	1, 4, 6, 9, 10, 11, 16	Ventura County	NA	High	HMGP, PDM, FMA	Short-term

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action VUC-2—Integrate the Hazard Mitigation Plan into other plans, ordinances and programs that dictate land use decisions in the community, including the 2040 General Plan, Non-Coastal Zoning Ordinance, and Local Coastal Program.						
Hazards Mitigated: Landslide, Earthquake, Severe Storm, Severe Weather, Flooding, Wildfire, Dam Failure, Sea Level Rise, Tsunami, Drought, Agricultural/Biological						
New & Existing	1, 2, 4, 6, 9, 10, 11, 12, 15, 17, 18, 19	Ventura County Resource Management Agency, Ventura County Sheriff's OES, Ventura County Public Works Agency	NA	Low	Staff Time, General Funds	Ongoing
Action VUC-3—Actively participate in the plan maintenance protocols outlined in Volume 1 of this hazard mitigation plan.						
Hazards Mitigated: Landslide, Earthquake, Severe Storm, Severe Weather, Flooding, Wildfire, Dam Failure, Sea Level Rise, Tsunami, Drought, Agricultural/Biological						
New & Existing	1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19	Ventura County Agencies	NA	Low	Staff Time, General Funds	Short-term
Action VUC-4—Continue to maintain good standing and compliance under the NFIP through implementation of floodplain management programs that, at a minimum, meet the NFIP requirements to: • Enforce the flood damage prevention ordinance. • Participate in floodplain identification and mapping updates. • Provide public assistance/information on floodplain requirements and impacts.						
Hazards Mitigated: Flooding, Severe Storms, Sea Level Rise, Dam Failure						
New & Existing	1, 2, 4, 6, 9, 10, 11, 13, 14, 15, 17, 19	County Public Works	Building and Safety	Low	Staff Time, General Funds	Ongoing
Action VUC-5—Identify and pursue strategies to increase adaptive capacity to climate change including but not limited to the following: • Implementation of 2040 General Plan programs including a Cool Roof Ordinance and Cool Pavement Standards, Performance-Based Building Code for Green Building, Groundwater Basins Resilience Program, Sea Level Impacts Monitoring Program, and Wildfire Vulnerability Assessment and Mapping Program. • Develop programs to increase energy efficiency of new buildings above state-required design requirements						
Hazards Mitigated: Sea Level Rise, Flooding, Drought, Wildfire, Severe Weather, Severe Storms, Agricultural/Biological						
New & Existing	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19	Ventura County	NA	Low	Staff Time, General Funds	Ongoing and Short-term
Action VUC-6—Purchase and install permanent generators for critical facilities and infrastructure that lack adequate backup power.						
Hazards Mitigated: Dam Failure, Earthquake, Flooding, Severe Weather, Severe Storms, Tsunami, Wildfire						
Existing	2, 6	Ventura County	NA	High	FEMA HMA (BRIC and HMGP), Staff Time & General Funds	Short-term

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action VUC-7—Purchase and install mobile generators for critical facilities and infrastructure that lack adequate backup power.						
Hazards Mitigated: Dam Failure, Earthquake, Flooding, Severe Weather, Severe Storms, Tsunami, Wildfire						
Existing	2, 6	Ventura County	NA	High	FEMA HMA (BRIC and HMGP), Staff Time & General Funds	Short-term
Action VUC-8—Develop and implement plans to increase building owner's general knowledge of and appreciation for the value of seismic upgrading of their building's structural and nonstructural elements. (formerly 2015 Action OA-11)						
Hazards Mitigated: Earthquake						
Exitsting	1, 2, 4, 6, 9, 16, 17	Ventura County Building and Safety	NA	Medium	Staff Time, General Funds	Ongoing and Short-term
Action VUC-9—Maintain new vegetation management program that provides vegetation management services to elderly, disabled, or low-income property owners who lack the resources to remove flammable vegetation from around their homes. (formerly 2015 Action OA-19) (Coordinates with Ventura County Fire Protection District Action VFP-12)						
Hazards Mitigated: Wildfire						
New & Existing	2, 4, 5, 8, 10, 13, 14, 15, 19	VCFPD	Ventura County	Medium	FEMA HMA (BRIC, FMAP and HMGP), Staff Time, General Funds	Ongoing
Action VUC-10—Maintain wildfire hazard fuel reduction program for areas that have been identified with overgrown or dead brush, trees and weeds to reduce the potential for tree-to-tree ignition. Ensure that a "maintenance now" component to provide continued fire resistance is part of the program. (formerly 2015 Action OA-21) (Coordinates with Ventura County Fire Protection District Action VFP-6)						
Hazards Mitigated: Wildfire						
New & Existing	2, 4, 5, 6, 8, 10, 11, 13, 14, 15, 18, 19	VCFPD	CAL FIRE & USDA	Medium	FEMA HMA (BRIC, FMAP and HMGP), Staff Time & General Funds	Ongoing
Action VUC-11—Continue to participate in the National Weather Service's (NWS) StormReady and TsunamiReady Programs. (formerly 2015 Action UVC-1) (Coordinates with Action VCPWA-WP-16)						
Hazards Mitigated: Severe Storms, Severe Weather, Tsunami, Flooding, Dam Failure, Landslide, Sea Level Rise						
New & Existing	1, 2, 7, 8, 17	Ventura County Public Works	Ventura County Sheriff's OES	Low	Staff Time, General Funds	Ongoing
Action VUC-12—Develop a plan to identify funding to replace/relocate the Operational Area Emergency Operations Center (EOC). (formerly 2015 Action UVC-2)						
Hazards Mitigated: Landslide, Earthquake, Severe Storm, Severe Weather, Flooding, Wildfire, Dam Failure, Sea Level Rise, Tsunami						
New & Existing	6, 7, 8	Ventura County Sheriff's OES	NA	High	Staff Time, General Funds	Long-term
Action VUC-13—Update Seismic Standards for Communications (Cell Towers) Facilities (Building Code).						
Hazards Mitigated: Earthquake						
New & Existing	1, 2, 4, 6, 11	Ventura County Building and Safety	NA	High	HMGP, PDM, FMA	Short-term
Action VUC-14—Develop a countywide Evacuation Route Plan to identify and evaluate evacuation routes for wildfires and other hazards.						
Hazards Mitigated: Wildfire, Dam Failure, Flooding, Landslide						
New & Existing	7, 8, 17, 19	Ventura County OES	VCFPD	High	Staff Time, General Funds, Fire Safe Council Grant	Short-term

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action VUC-15—Implement a Post Disaster Critical Facilities Risk Impact Assessment Program designed to capture and geo-reference perishable data after significant events (e.g., preliminary damage estimates, damage photos, event mapping, etc.) in support of future hazard mitigation efforts including the implementation and maintenance of the HMP. Leverage applications (Maintstar v15, ArcGIS Online) to capture information related to VCPWA-RT, W&S, and WP critical facility asset impacts, and establish a centralized location to document and archive critical facilities geospatial data related to disaster events which will facilitate the development and optimize the pursuit of grant funding for future hazard mitigation projects. (Coordinates with Action VCPWA-WP-3) *Hazards Mitigated:* Dam Failure, Drought, Earthquake, Flooding, Landslide, Sea Level Rise, Severe Storms, Severe Weather, Tsunami, Wildfire						
New & Existing	1, 2, 4, 6, 8, 9, 10, 11, 12, 13, 16, 17, 18, 19	VCPWA-WP	Ventura County Departments, Cities, Special-Purpose Districts, and NGOs.	Low	WP Structural Revenues augmented by FEMA Grants (BRIC) and County General Funds, as required	Short Term
Action VUC-16—Improve public awareness and community response to flood event emergencies by upgrading and modernizing the Flood Warning System (FWS) optimized to leverage multi-social media venues. Expand the public outreach of the FWS through targeted marketing based on web-site analytics and develop multiple language interfaces to better reflect the linguistic and cultural diversity found in Ventura County communities. (Coordinates with Action VCPWA-WP-4) *Hazards Mitigated:* Flooding, Landslide, Sea Level Rise, Severe Storms, Severe Weather, Tsunami						
New & Existing	1, 2, 6, 7, 12, 17, 18, 19	VCPWA-WP	DWR, NOAA, VCSOES, Ventura County Departments, Cities, Special-Purpose Districts, community and tribal leaders, community councils, and NGOs	Medium	WP Structural Revenues augmented by DWR and FEMA Grants (BRIC and HMGP) and County General Funds, as required	Short Term
Action VUC-17—Prioritize efforts to upgrade County bridges, culverts, dams, debris and detention basins, flood conveyance channel and pipeline infrastructure, pump stations, roads, water and wastewater community infrastructure, and other critical facilities required to provide adequate flood-proofing protection and enhance the resiliency of vital community lifelines in Ventura County. (Coordinates with Action VCPWA-WP-5) *Hazards Mitigated:* Dam Failure, Earthquake, Flooding, Landslide, Sea Level Rise, Severe Storms, Severe Weather, Tsunami, Wildfire						
New & Existing	1, 2, 5, 6, 8, 9, 10, 11, 13, 16, 18, 19	VCPWA Departments	Ventura County Departments, Cities, Special-Purpose Districts	High	WP Structural Revenues augmented by FEMA Grants (BRIC, HMGP) DWR, VCTC, Caltrans and County General Funds, as required	Long-term
Action VUC-18—Complete project feasibility analyses, design engineering and CEQA work for the Ventura River Levee (VR-2) in the unincorporated community of Casitas Springs, and the Live Oak Acres Levee (VR-3) near the unincorporated community of Oak View required to evidence local compliance with Federal Levee Certification Regulations (44 CFR 65.10) (Coordinates with Action VCPWA-WP-6) *Hazards Mitigated:* Dam Failure, Earthquake, Flooding, Landslide, Sea Level Rise, Severe Storms, Severe Weather, Tsunami						
New & Existing	1, 2, 5, 6, 8, 9, 10, 11, 13, 16, 18, 19	VCPWA-WP	Ventura County Departments and Cities of Camarillo, Oxnard, and San Buenaventura	High	WP Structural Revenues augmented by FEMA Grants (BRIC and HMGP) DWR-LLAP Grants USACE, and County General Funds, as required	Long Term

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action VUC-19—Strengthen the unincorporated area's participation in the NFIP by maintaining a CRS Class 5 Rating; and pursue a renewed emphasis on the planning and implementation of flood mitigation projects for repetitive loss properties eligible for grant funding under FEMA's Building Resilient Infrastructure and Communities (BRIC) program with the goal of reducing the number of repetitive loss properties in Ventura County. (Coordinates with Action VCPWA-WP-7)						
Hazards Mitigated: Flooding, Landslide, Sea Level Rise, Severe Storms, Severe Weather, Tsunami						
New & Existing	1, 2, 4, 6, 9, 10, 11, 12, 13, 16, 18, 19	VCPWA-WP	Ventura County Departments, DWR, FEMA	High	WP Structural Revenues augmented by Grants (FMA, BRIC, HMGP) and County General Funds, as required	Ongoing
Action VUC-20—Partner with the Nature Conservancy, Santa Clara River Conservancy, Ojai Valley Land Conservancy, and other NGOs in cooperative efforts to acquire floodplain properties, carry out restoration projects, and enhance resiliency to natural disasters with green design elements included in hazard mitigation projects where feasible. (Coordinates with Action VCPWA-WP-8)						
Hazards Mitigated: Dam Failure, Drought, Flooding, Landslide, Sea Level Rise, Severe Storms, Severe Weather, Tsunami, and Wildfire						
New & Existing	1, 2, 5, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18	VCPWA-WP	Ventura County Departments, TNC, SCRC, OVLC, DWR, CDFW, State Coastal Conservancy	High	WP Structural Revenues augmented by Grants (FMA, BRIC, HMGP, DWR, SCC, etc.) and County General Funds, as required	Ongoing
Action VUC-21—Advance planning, feasibility analyses, preliminary design, and ultimate construction of multi-benefit stormwater capture projects through a regionally collaborative approach; as well as pursue strategies to maximize stormwater as a resource (enhance recycled water, stormwater capture and sanitary system diversion, and groundwater recharge) where possible in infrastructure planning and implementation of WP stormwater capital projects. (Coordinates with Action VCPWA-WP-9)						
Hazards Mitigated: Drought, Flooding, Sea Level Rise, Severe Storms, Severe Weather						
New	1, 2, 9, 10, 11, 12, 14, 15, 16, 17, 18, 19	VCPWA-WP	Ventura County Departments, SWRCB, LARWQCB, DWR, SGMAs, NGOs and Private Landowners	High	WP Structural Revenues augmented by FEMA Grants (BRIC & HMGP) DWR, IRWM, LARWQB, SWRCB) and County General Funds, as required	Ongoing
Action VUC-22—Coordinate with FEMA Region IX to proactively address flood plain management and flood risk mapping issues that could adversely impact local hazard mitigation project planning and implementation efforts which may arise from updates to the Countywide DFIRMs, Community Assistance Visits, and/or other risk mapping initiatives. (Coordinates with Action VCPWA-WP-10)						
Hazards Mitigated: Flooding, Sea Level Rise, Severe Storms, Severe Weather						
New & Existing	1, 2, 4, 6, 8, 9, 10, 11, 12, 16, 17, 18, 19	VCPWA-WP	Ventura County Departments, DWR, FEMA, Cities, NGOs, and Private Landowners	Medium	WP Structural Revenues augmented by FEMA Grants (BRIC & HMGP) DWR, and County General Funds, as required	Ongoing
Action VUC-23—Work closely with CA Division of Safety of Dams (DSOD), County Sheriff Office of Emergency Services (OES), and other Federal, State, and local agencies to update and refine the Emergency Action Plans (EAPs) for the state size dams owned by the County. (Coordinates with Action VCPWA-WP-11)						
Hazards Mitigated: Dam Failure, Flooding, Earthquake, Severe Storms, Severe Weather						
New & Existing	1, 2,4, 7,8, 12, 17, 18	VCPWA-WP	Ventura County Departments, FEMA, DWR, Cities, NGOs, and Private Landowners	Medium	WP Structural Revenues augmented by FEMA Grants (BRIC), DWR, and County General Funds, as required	Short-Term

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action VUC-24—Complete project feasibility analyses, design engineering, CEQA, and implementation of the removal of Matilija Dam, reconstruction of the Camino Cielo Bridge crossing, and work with the Casitas Municipal Water District to reconstruct the Robles Diversion, as well as complete the construction of flood protection projects in the unincorporated community of Meiners Oaks in compliance with DSOD requirements. (Coordinates with Action VCPWA-WP-12) *Hazards Mitigated:* Dam Failure, Drought, Earthquake, Flooding, Severe Storms, Severe Weather						
New & Existing	1, 2, 4, 6, 8, 9, 10, 11, 12, 13, 14, 15, 17, 18, 19	VCPWA-WP	Ventura County Departments, Casitas Municipal Water District, Bureau of Reclamation, Caltrans, CDFW, DSOD, DWR, FEMA, USACE, NGOs	High	WP Structural Revenues augmented by FEMA Grants (BRIC & HMGP) CDFW, DWR, NFWF, NRCS, SCC, WCB, and NGO's and County and Casitas General Funds, as required	Long-Term
Action VUC-25—Collaborate with the City of Oxnard, Nature Conservancy, and State Coastal Conservancy to advance planning, design, and implementation of the Ormond Beach Restoration and Access Plan (OBRAP), particularly those components alleviating flooding along the Ormond Lagoon Waterway and creating public access along *tšumaš* Creek. (Coordinates with Action VCPWA-WP-13 and supports the City of Oxnard Action OXN-12) *Hazards Mitigated:* Drought, Flooding, Severe Weather, Severe Storms, Sea Level Rise, Tsunami						
New & Existing	1, 2, 3, 9, 12, 13, 14, 15, 17, 18, 19	City of Oxnard	VCPWA-WP	High	City Structural Revenues augmented by FEMA Grants (BRIC), CDFG	Ongoing
Action VUC-26—Coordinate efforts to plan, develop, and ultimately construct multi-benefit, flood resiliency and other risk hazard mitigation projects with the Watershed Coalition of Ventura County (OBRAP) 3-Watershed Councils, its Disadvantaged Community Committee, and nonprofit partners by increasing outreach and engagement with disadvantaged and socially vulnerable communities and tribal groups to better understand their unique community-lifeline vulnerabilities, facilitate the development of flood hazard mitigation multi-benefit projects, and align and leverage advocacy efforts to optimize grant funding opportunities. (Coordinates with Action VCPWA-WP-14) *Hazards Mitigated:* Flooding, Severe Weather, Severe Storms, Severe Weather, Sea Level Rise, Tsunami						
New & Existing	1, 2, 4, 8, 9, 10, 11, 12, 14, 15, 16, 17, 18, & 19	VCPWA-WP	County of Ventura Departments, Cities, Special-Purpose Districts, community and tribal leaders, community councils, WCVC, and NGOs	Medium	WP Structural Revenues augmented by FEMA Grants (BRIC & HMGP) DWR, IRWM, and City and County General Funds as required	Ongoing

a. Short-term = Completion within 5 years; Long-term = Completion within 10 years; Ongoing= Continuing new or existing program with no completion date

Acronyms used here are defined at the beginning of this volume.

Table 1-16. Mitigation Action Priority

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Cost?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Implementation Priority[a]	Grant Pursuit Priority[a]
VUC-1	7	High	High	Yes	Yes	No	Medium	High
VUC-2	12	Medium	Low	Yes	No	Yes	High	Low
VUC-3	17	Low	Low	Yes	No	Yes	High	Low
VUC-4	12	Medium	Low	Yes	No	Yes	High	Low
VUC-5	19	Medium	Low	Yes	No	Yes	High	Medium
VUC-6	3	High	High	Yes	Yes	No	Medium	High
VUC-7	2	High	High	Yes	Yes	No	Medium	High
VUC-8	7	Low	Medium	No	No	Yes	Low	Low
VUC-9	9	High	Medium	Yes	Yes	Yes	High	High
VUC-10	12	High	Medium	Yes	Yes	Yes	High	High
VUC-11	5	Medium	Low	Yes	No	Yes	High	Low
VUC-12	3	Medium	High	No	No	No	Low	Low
VUC-13	5	Medium	High	No	Yes	No	Low	Medium
VUC-14	4	Medium	High	No	Yes	No	Low	Medium
VUC-15	14	Medium	Low	Yes	Yes	Yes-only at a level that is “Minimally Necessary to Comply”	Medium	Medium
VUC-16	8	Medium	Medium	Yes	Yes	Yes-only at a level that is “Minimally Necessary to Comply”	Medium	Medium
VUC-17	12	High	High	Yes	Yes	No	Medium	High
VUC-18	12	Medium	High	Yes	Yes	No	High	High
VUC-19	12	Medium	High	Yes	Yes	Maintaining Class 5-CRS Rating: Yes. Reducing Severe Repetitive Loss Property Exposure: No	Low	Medium
VUC-20	13	High	High	Yes	Yes	Establishing Partnerships with NGOs: Yes Acquiring flood plain properties, carrying out restoration projects, and including green design elements: No	Low	Medium
VUC-21	12	High	High	Yes	Yes	Advance planning and feasibility analysis: Yes Perform Final Design and Construction: No	Medium	High
VUC-22	13	Medium	Medium	Yes	Yes	Coordination with FEMA: Yes New Hazard Mitigation Project Planning and Execution: No	Medium	Medium
VUC-23	8	High	Medium	Yes	Yes	Coordination with FEMA, DWR, and DSOD: Yes Emergency Action Plan Refinements: No	Medium	High
VUC-24	15	High	High	Yes	Yes	No	Medium	High
VUC-25	11	High	High	Yes	Yes	Collaboration with City of Oxnard: Yes OBRAP Flood Mitigation Project Design and Implementation Actions: No	Medium	High

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Cost?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Implementation Priority[a]	Grant Pursuit Priority[a]
VUC-26	14	High	Medium	Yes	Yes	Coordination efforts with WCVC, its DAC, and NGOs: Yes Flood Mitigation Project Design and Implementation Actions: No	Medium	High

a. See the introduction to this volume for explanation of priorities.

Table 1-17. Analysis of Mitigation Actions

Hazard Type	Action Addressing Hazard, by Mitigation Type[a]							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilience	Community Capacity Building
High-Risk Hazards								
Landslides	VUC-2	VUC-1	VUC-3, 16	VUC-20		VUC-17, 18		VUC-3, 11, 12, 13, 15
Wildfire	VUC-2, 9, 10	VUC-1, 9, 10	VUC-3, 9, 10	VUC-9, 10, 20	VUC-6, 7, 9, 10		VUC-5, 9, 10	VUC-3, 5, 9, 10, 12, 13, 15
Earthquake	VUC-2, 13, 23	VUC-1	VUC-3, 8		VUC-6, 7, 23	VUC-17, 18		VUC-3, 8, 12, 15
Severe Storms	VUC-2, 4, 22, 23	VUC-1, 19	VUC-3, 4, 16	VUC-20, 21	VUC-6, 7, 16, 23	VUC-17, 18, 24	VUC-5, 17, 18, 20	VUC-3, 4, 5, 11, 12, 15, 22
Severe Weather	VUC-2, 22, 23	VUC-1, 19	VUC-3, 16	VUC-20, 21	VUC-6, 7, 16, 23	VUC-17, 18, 24	VUC-5, 17, 18, 20	VUC-3, 5, 11, 12, 15, 22
Dam Failure	VUC-2, 4, 23	VUC-1, 19	VUC-3, 4	VUC-20	VUC-6, 7, 16, 23	VUC-17, 18, 24	VUC-17, 18, 20	VUC-3, 4, 11, 12, 13, 15
Flooding	VUC-2, 4, 22, 23	VUC-1, 19	VUC-3, 4, 16	VUC-20, 21	VUC-6, 7, 23	VUC-17, 18, 24	VUC-5, 17, 18, 20	VUC-3, 4, 5, 11, 12, 13, 15, 22
Low-Risk Hazards								
Sea Level Rise	VUC-2, 4, 22	VUC-1, 19	VUC-3, 4, 16	VUC-20, 21		VUC-17, 18	VUC-5, 20	VUC-3, 4, 5, 11, 12, 15, 22
Tsunami	VUC-2	VUC-1, 19	VUC-3, 16	VUC-20	VUC-6, 7	VUC-17, 18		VUC-3, 11, 12, 15
Drought	VUC-2		VUC-3	VUC-20, 21		VUC-24	VUC-5, 20	VUC-3, 5, 15

a. See the introduction to this volume for explanation of mitigation types.

1.9 INFORMATION SOURCES USED FOR THIS ANNEX

The following technical reports, plans, and regulatory mechanisms were reviewed to provide information for this annex.

- **Ventura County Ordinance**—The ordinance code was reviewed for the full capability assessment and for identifying opportunities for action plan integration.
- **2040 General Plan**—This document was reviewed to identify opportunities for hazard plan integration.

- **Coastal and Noncoastal Zoning Ordinances**—These documents were reviewed to identify opportunities for hazard plan integration.
- **Ventura County Subdivision Ordinance, 2020**—This document was reviewed to identify opportunities for hazard plan integration.
- **Initial Study Assessment Guidelines, 2011**
- **Sea Level Rise Vulnerability Assessment, 2018**
- **Sea Level Rise Adaptation Report, 2019**
- **VCPWA-WP's Integrated Watershed Protection Plan Project Prioritization Process**—Explored possible opportunities to better integrate the development of multi-benefit flood protection project partnerships with public and private sector agencies and organizations aimed at improving community resiliency to flood hazard risk, flood plain management, groundwater conservation, stormwater capture, environmental protection, and helping to secure a sustainable water supply for agricultural and urban users.
- **VCPWA-WP 5 Year Capital Improvement Projects Plan, Annual Update**—Confirmed inclusion of flood protection projects in WP's current 5-year portfolio which address a mix of high, medium, and low hazard risks found in WP's current Jurisdiction Annex, keying-up those projects as entries in WP's new 5-year Action Plan portfolio, including seven levee rehabilitation projects which when completed will ultimately result in local compliance with Federal Levee Certification regulations found in 44CFR65.10.
- **Ventura County Flood Mitigation and Safety Plans**—Consulted current plan documents to identify opportunities of alignment and optimization of WP's new 5-Year Action Plan submittal with the baseline framework found in these historical County flood mitigation and safety plan documents.
- **VCPWA-WP's Preparation of Annual Recertifications and Cycle Verification of Class V Rating for Unincorporated Ventura County under FEMA's Community Rating System Program**—Consulted the current Class 5 Rating program performance and reporting requirements to ensure continuation of this rating, as well as identified opportunities for renewed emphasis on the planning and implementation of flood mitigation projects for repetitive loss properties eligible for grant funding under FEMA's Building Resilient Infrastructure and Communities (BRIC) program with the goal of reducing the number of repetitive loss properties in Ventura County.
- **Ventura County Emergency Services Planning Documents**—Reviewed emergency services planning documents prepared by the Ventura County Sheriff's Office of Emergency Services to gain a better understanding of how best to facilitate appropriate development of WP's new 5-year Action Plan submittal by complementing and supplementing countywide risk hazard emergency planning rubric defined by County's Emergency Action Plan, as well as refine Emergency Action Plans for the state-sized dams owned by the County.
- **Ventura County Integrated Regional Water Management Plan (IRWMP) Updates and DAC Public Outreach Engagement Initiative**—Explored framing potential opportunities to better coordinate joint efforts to plan, develop, and ultimately construct multi-benefit, flood resiliency and other risk hazard mitigation projects contained in WP's new 5-Year Action Plan submittal by increasing outreach and engagement with disadvantaged and socially vulnerable communities and tribal groups to better understand their unique community-lifeline vulnerabilities, facilitate

the development of flood hazard mitigation multi-benefit projects, and align and leverage advocacy efforts to optimize grant funding opportunities.

The following outside resources and references were reviewed:

- **Hazard Mitigation Plan Annex Development Toolkit**—The toolkit was used to support the identification of past hazard events and noted vulnerabilities, the risk ranking, and the development of the mitigation action plan.
- **BEACON Regional Sediment Management Plan**
- **General Services Agency, Energy Action Plan, April 2010**
- **Climate Protection Plan for Government Operations, April 2012**
- **Los Padres National Forest Land Management Plan, 2005**

The following website resources were used to document natural hazard event damage assessment:

- https://www.vcstar.com/story/news/2019/11/12/ventura-county-avocado-lemon-growers-blame-losses-power-shut-offs/4171383002/
- https://gro-intelligence.com/insights/articles/volatile-california-avocado-crop-keeps-market-on-edge
- https://www.vcstar.com/story/news/2019/08/03/ventura-county-california-agriculture/1859539001/
- http://www.coastalview.com/news/2019-avocado-market-rundown-volumes-down-and-prices-up/article_1a24b732-da67-11e9-9fdf-43ac94face0a.html
- https://goldrushcam.com/sierrasuntimes/index.php/news/local-news/18925-2018-heat-reduces-volume-of-2019-avocado-crop-california-farm-bureau-federation-reports
- https://www.cnbc.com/2018/07/23/heatwave-hits-california-lemons-sending-prices-soaring.html
- https://grist.org/article/so-howd-those-avocados-handle-the-searing-heatwave/
- https://www.rdniehaus.com/app/uploads/2019/08/RDN_Montecito_Mudslides_Impacts-1.pdf
- https://www.kclu.org/local-news/2016-04-27/battered-south-coast-pier-set-to-reopen-after-1-4-million-in-repairs
- http://archive.vcstar.com/news/local/ventura/much-of-the-ventura-pier-remains-closed-this-week-26f4a712-45e6-0d4b-e053-0100007ffddb-362537201.html
- http://archive.vcstar.com/news/local/ventura/ventura-pier-closed-due-to-high-surf-26a2626c-d797-40f2-e053-0100007f22a3-361574741.html
- https://archive.vcstar.com/news/waves-generated-by-hurricane-marie-threaten-pier-close-campground-beaches-ep-579996262-351261691.html/
- https://migration.ucdavis.edu/rmn/more.php?id=1194_0_2_0
- https://tdn.com/business/freeze-destroys-70-percent-of-california-orange-crop/article_de49ab3e-0d14-5b06-b53e-ea2dbcd115ce.html
- https://www.dailynews.com/2007/02/04/despite-freeze-hopes-are-high-for-spring-harvest/
- https://www.montereyherald.com/2007/09/13/not-all-is-lost-for-state-farmers-caught-in-freeze/

The following website resources were used to document other noted vulnerabilities:

- https://www.vcnewschannel.com/news/480-county-homeless-encampments-efforts-update
- https://www.conejoguardian.org/2021/09/23/county-fails-for-years-to-clear-illegal-riverbed-encampment/
- https://housefarmworkers.org/wp-content/uploads/2017/01/FAQs-about-ag.pdf
- https://www.vcstar.com/story/news/2020/11/15/california-coronavirus-covid-19-ventura-county-financial-assistance-farmworkers/6265780002/
- https://housefarmworkers.org/wp-content/uploads/2017/01/FAQs-about-ag.pdf
- https://www.kqed.org/news/11363886/deportation-threats-worry-farmworkers-and-owners

2. CITY OF CAMARILLO

2.1 LOCAL HAZARD MITIGATION PLANNING TEAM

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Table 2-1 lists the members of the local hazard mitigation planning team that developed this annex.

Table 2-1. Local Mitigation Planning Team Members

Name	Title	Name	Title
Tali Tucker	Assistant Director of Public Works/City Engineer	**Kristen Madary**	Finance/Accounting Manager
David Moe	Assistant Comm. Development Director	**Roger Pichardo**	Senior Management Analyst
Jaclyn Lee	Principal Planner	**Carmen Nichols**	Assistant City Manager
Tom Magdaleno	GIS Specialist	**Michelle D'Anna**	Community Relations Officer
Tom Juzwiak	Deputy Building Official	**Wendy Milligan**	Terra Firma Enterprises (Consultant)

2.2 JURISDICTION PROFILE

2.2.1 Location and Features

Camarillo encompasses 19.86 square miles in west Ventura County at the base of the Conejo Grade, within the Oxnard Plain. The City is some eight miles from the ocean and the Pt. Mugu entrance to Naval Base Ventura County. Homes along the City's northern border are nestled among rolling hills and citrus groves; the northernmost boundary traverses the Las Posas Country Club. Pleasant Valley Road designates much of Camarillo's southern border, though the southernmost point is on Howard Road, near the southeast corner of the City. The eastern edge of Camarillo is situated partially up the Conejo Grade, along the Ventura Freeway (Hwy 101). Camarillo's furthest point west is at the end (cul-de-sac) of Del Norte Road, just north of Hwy 101.

2.2.2 History

The City of Camarillo was incorporated in 1964. In 1837, a large expanse of what would be the Conejo and Pleasant Valleys was established though a Mexican land grant, which Juan Camarillo purchased in 1875. Juan's sons, Adolfo and Juan, Jr., would govern the 10,000-acre Rancho Calleguas for many years. Adolfo oversaw the development of the Camarillo House and Ranch in 1892, and his brother would have a prominent role in the construction of the St. Mary Magdalen Chapel in 1913.

In 1899, a line of the Southern Pacific Railroad was extended from Somis to Oxnard. At the time, a businessman named John Sebastian relocated a store and post office that were displaced from an area called Springville by the new rail line. When asked to provide a name for the new location of the store and post office, Sebastian suggested Calleguas, though the post office representative felt that name was confusing. Sebastian then proposed calling the area Camarillo, and by 1901 it was the official name for the settlement.

For years, from horse-drawn wagons to early automobiles, the route from Thousand Oaks north down the Conejo Grade involved 24 switchbacks. The journey was quite a trek, especially during warmer days. As travelers looked down the grade toward present day Camarillo, they often commented on it being such a pleasant valley.

Eventually, the region from Somis south to Pt. Mugu became known as Pleasant Valley and would be an integral part of the larger farming industry in Ventura County.

In 1942, with America involved in World War II, Naval Base Ventura County was commissioned, and a military airfield was built near Camarillo. In 1945, the airfield was officially known as Oxnard Air Force Base. The County of Ventura purchased the site in 1976 and began the transformation of the base to what is now Camarillo Airport.

In the early 1960s, a movement by the City of Oxnard to annex Camarillo galvanized community leaders, who organized a push for cityhood. In September 1964, cityhood was approved by voters and the following month Camarillo was officially recognized as an incorporated city. At the time, the City had approximately 12,000 residents, and an area of 5.5 square miles.

2.2.3 Governing Body

Camarillo is a general law city. The five-member City Council is the governing body with the responsibility of adopting the HMP. The responsibility for implementing the plan is shared by the Office of the City Manager, and the Community Development and Public Works Departments.

2.3 CURRENT TRENDS

2.3.1 Population

Camarillo has an estimated population of 70,261 (California Department of Finance estimate 2020). Camarillo is currently growing at a rate of 1.42% annually (https://worldpopulationreview.com).

2.3.2 Development

Table 2-2 summarizes development trends in the period since the preparation of the previous hazard mitigation plan, as well as expected future development trends.

Table 2-2. Recent and Expected Future Development Trends

Criterion	Response
Has your jurisdiction annexed any land since the preparation of the previous hazard mitigation plan? • **If yes, give the estimated area annexed and estimated number of parcels or structures.**	Yes Annexations since the County's last HMP update included a 3-acre parcel, initiated by the City, for the Camarillo LDS Church (n/e corner of Las Posas Road and Camino Alvarez); also, properties near the n/w corner of Lewis (Hwy 34) and Las Posas Roads were annexed for the development of the City's new desalter plant. Construction is underway, and the desalter could be operational by early 2022. The City annexed 7.81-acres for the project from the Ventura Co. Resource Conservation District, 4.5-acres of which is under the purview of the Camarillo Sanitary District.
Is your jurisdiction expected to annex any areas during the performance period of this plan?	No
Are any areas targeted for development or major redevelopment in the next five years? • **If yes, briefly describe, including whether any of the areas are in known hazard risk areas**	Yes. Over the past five years Camarillo has had significant residential construction activity, which is expected to continue for several years. A prominent commercial development is also underway just south of the 101 Freeway, and a steady progression of reuse and new industrial projects is anticipated. The primary natural hazard concerns for Camarillo include earthquakes and liquefaction, and wildland fires. Ongoing drought and dry vegetation continue to pose an elevated risk for fires, though the main areas of concern are in existing hillside communities in the northern portions of the City. The main faults in/near Camarillo include the Bailey, Simi-Santa Rosa, and Wright Faults. While these faults have limited intersection with properties proposed for development, major ruptures along the state's larger fault lines could generate substantial ground movement -- though to what extent is difficult to forecast. As is the case in much of Ventura County, liquefaction is a potential threat connected to earthquakes. Approximately 25% of Camarillo's soil is identified as being in liquefaction zones, primarily in the southeast and southwest sections of the City.
Permits for new construction issued since the preparation of the previous hazard mitigation plan. (For single-family, each residence equals one permit; for multi-fam., the numbers are total units. Multi-fam. refers to apartments, townhomes, and duplexes. A permit for one apartment building may include 20 units.)	

	2016	2017	2018	2019	2020
Single Family	90	78	37	2	11
Multi-Family	67	821	619	199	53
Other (commercial, mixed use, etc.)	4	9	8	6	2
Total	**161**	**908**	**664**	**207**	**66**

Criterion	Response
Provide the number of new-construction permits for each hazard area or provide a qualitative description of where development has occurred.	• Special Flood Hazard Areas: 0 • Landslide: 0 • High Liquefaction Areas: 0 • Tsunami Inundation Area: 0 • Wildfire Risk Areas: Please see clarification below. Of the considerable residential development in Camarillo over the past 5+ years, no units have been built, or are currently under construction within a 100-year flood zone. During this period, approximately 350 residences (low-medium-high density) have been built in 500-yr. areas, and another high-density project (385 units) is pending approval. There is a low-income project (75 units) proposed for a 2.5-acre site that is owned by the City; if these apartments are ultimately constructed, the project would likely require flood mitigation measures (100-yr.). As noted, areas of greatest concern for wildland fire, and those most involved in PSPS events, are in the northwest section of Camarillo, and parts outside (north of) the City. A large project with 281 homes (single-family and duplexes) is under construction approximately 0.8-miles west of a high fire risk zone, with a very-high zone just beyond. This development, for persons 55 years and older, is located east of Hwy 34, on the north side of Upland Road. Another project that is currently under review would result in 248 low-medium density homes in a section of the Camarillo Springs Golf Course, which lies in a very-high fire risk zone.
Describe the level of buildout in the jurisdiction, based on your jurisdiction's buildable lands inventory. If no such inventory exists, provide a qualitative description.	Under current zoning, and considering sites under construction or entitled for building, about 60-acres of land is under review for potential housing projects. Over 150-acres are proposed for changes in zoning for industrial projects. There are also 46-acres of commercially-zoned land just off (south of) the 101 Freeway, at Las Posas Road. This site has the potential for 325,000 sq. ft. of retail, though internet sales have changed the brick/mortar outlook for many retailers. Additionally, another 25-acres of vacant land could be considered for recreational uses (ice rinks, bowling, etc.) in the future.

2.4 CAPABILITY ASSESSMENT

This section describes an assessment of existing capabilities for implementing hazard mitigation strategies. The introduction at the beginning of this volume of the hazard mitigation plan describes the components included in the capability assessment and their significance for hazard mitigation planning.

Findings of the capability assessment were reviewed to identify opportunities to expand, initiate or integrate capabilities to further hazard mitigation goals and objectives. Where such opportunities were identified and determined to be feasible, they are included in the action plan. The "Analysis of Mitigation Actions" table in this annex identifies these as community capacity building mitigation actions. The findings of the assessment are presented as follows:

- An assessment of planning and regulatory capabilities is presented in Table 2-3.
- Development and permitting capabilities are presented in Table 2-4.
- An assessment of fiscal capabilities is presented in Table 2-5.
- An assessment of administrative and technical capabilities is presented in Table 2-6.
- An assessment of education and outreach capabilities is presented in Table 2-7.
- Information on National Flood Insurance Program (NFIP) compliance is presented in Table 2-8.
- Classifications under various community mitigation programs are presented in Table 2-9.
- The community's adaptive capacity for the impacts of climate change is presented in Table 2-10.

Table 2-3. Planning and Regulatory Capability

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity?
Codes, Ordinances, & Requirements				
Building Code	Yes	No	Yes	Yes
Comment: *2019 CA Building Code, as amended by the City of Camarillo (Ord. 1167), adopted Oct. 23, 2019*				
Zoning Code	Yes	No	No	Yes
Comment: *Title 19 of the Camarillo Municipal Code, as amended by the City of Camarillo (Ordinance 9), adopted February 10, 1965, including subsequent amendments.*				
Subdivisions	Yes	Yes	Yes	No
Comment: *Camarillo Municipal Code Title 18, Subdivisions (Ord. 570), adopted May 23,1984 including subsequent additions and amendments*				
Stormwater Management	Yes	Yes	Yes	Yes
Comment: *Camarillo Municipal Code Chapter 9.32, Stormwater Quality (Ord. 1074), adopted December 12, 2012 including subsequent additions and amendments*				
Post-Disaster Recovery	No	No	No	No
Comment:				
Real Estate Disclosure	No	Yes	Yes	No
Comment: *California Civil Code §1102*				
Growth Management	Yes	No	No	Yes
Comment: *Title 20 of the Camarillo Municipal Code, as amended by the City of Camarillo (Ordinance 497), effective July 2, 1981, including subsequent amendments and extensions. The City reviews all residential projects of five or more dwelling units through the Residential Development Evaluation Board process in which the City Council may award up to 400 residential units per year to projects that meet the evaluation criteria with exemptions allowed for low-income units. SB 330 became effective January 1, 2020 and prevents the City from enforcing Title 20 until January 1, 2025. SB 8 was signed into law and extends the term of SB 330 five years from January 1, 2025, to January 1, 2030.*				
Site Plan Review	Yes	No	No	Yes
Comment: *Title 19 of the Camarillo Municipal Code, as amended by the City of Camarillo (Ordinance 9), adopted February 10, 1965, including subsequent amendments.*				
Environmental Protection	No	No	Yes	Yes
Comment: *California Environmental Quality Act, signed into law by the State of California in 1970.*				
Flood Damage Prevention	Yes	Yes	No	Yes
Comment: *Camarillo Municipal Code Chapter 16.34, Flood Damage Protection (Ord 616), adopted August 27, 1986 including subsequent additions and amendments*				
Emergency Management	Yes	Yes	Yes	Yes
Comment: *Camarillo Municipal Code, Chapter 2.32—Emergency Management Systems, 2004*				
Climate Change	Yes	No	No	Yes
Comment: *The City currently does not have any adopted ordinance related to Climate Change, however the City is planning on developing a Climate Action Plan in the near future.*				
Planning Documents				
General Plan	Yes	No	Yes	Yes
Is the plan compliant with Assembly Bill 2140? *No* ***Comment:*** *The City is currently updating its Safety Element, in compliance with AB 2140.*				
Capital Improvement Plan	Yes	No	No	Yes
How often is the plan updated? *Every 5 years* ***Comment:*** *City of Camarillo FY 2021-2026 Capital Improvement Programs, adopted 6/23/21*				
Disaster Debris Management Plan	No	No	No	No
Comment:				

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity?
Floodplain or Watershed Plan	Yes	Yes	No	Yes
Comment: *FEMA Flood Insurance Rate Maps, first Effective September 29, 1986 including subsequent additions and amendments*				
Stormwater Plan	Yes	Yes	Yes	Yes
Comment: Ventura County Technical Guidance Manual, approved July 13, 2011 by LARWQCB. The manual provides guidance on the Planning and Land Development requirements in the Ventura County MS4 Permit, adopted July 8, 2010 by LA Regional Water Quality Control Board. City catch basin program prioritizes maintenance of catch basins as required by the VC MS4 Permit, adopted July 8, 2010.				
Urban Water Management Plan	Yes	Yes	Yes	Yes
Comment: *City of Camarillo 2020 Urban Water Management Plan, adopted June 23, 2021.*				
Habitat Conservation Plan	Yes	Yes/ Federal	No	Yes
Comment: A habitat conservation plan is required as part of an application for an incidental take permit under the Endangered Species Act, however the City does not currently have any habitat conservation plans.				
Economic Development Plan	Yes	No	No	No
Comment: *City of Camarillo Economic Development Strategic Plan, September 5,2018*				
Shoreline Management Plan	No	No	No	No
Comment: *No shoreline*				
Community Wildfire Protection Plan	No	Yes	No	Yes
Comment: *Ventura County Community Wildfire Protection Plan, 2010*				
Forest Management Plan	No	Yes	No	No
Comment: *City of Camarillo does have a Comprehensive Tree Plan and Approved Street List.*				
Climate Action Plan	Yes	No	No	Yes
Comment: The City currently does not have a Climate Action Plan, however the City is planning on developing one in the near future.				
Comprehensive Emergency Management Plan	Yes	Yes	Yes	Yes
Comment: *The City Manager's Office oversees emergency management and our EOC. We are currently updating the emergency operations plan (EOP).* Section Eight-Hazard Summary for City of Camarillo presents a summary of all the hazards the City is subject to and references the Ventura County Multi-Hazard Mitigation Plan for more specific information. This Plan was approved October 13, 2021.				
Threat & Hazard Identification & Risk Assessment (THIRA)	No	No	No	Yes
Comment:				
Post-Disaster Recovery Plan	No	No	No	Yes
Comment:				
Continuity of Operations Plan	No	No	No	No
Comment:				
Public Health Plan	No	Yes	Yes	No
Comment: *Ventura County Public Health Emergency Response Plan, 2019*				
Other				
Comment:				

Table 2-4. Development and Permitting Capability

Criterion	Response
Does your jurisdiction issue development permits?	Yes
If no, who does? If yes, which department? Planning, and the Building/Safety Divisions.	
Does your jurisdiction have the ability to track permits by hazard area?	No
Does your jurisdiction have a buildable lands inventory?	Yes

Table 2-5. Fiscal Capability

Financial Resource	Accessible or Eligible to Use?
Community Development Block Grants	Yes
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for Specific Purposes	Yes
User Fees for Water, Sewer, Gas or Electric Service	Yes
If yes, specify: *Public Works user fees pertain to sewer and water connection.*	
Incur Debt through General Obligation Bonds	Yes
Incur Debt through Special Tax Bonds	Yes
Incur Debt through Private Activity Bonds	Yes
Withhold Public Expenditures in Hazard-Prone Areas	Yes
State-Sponsored Grant Programs	Yes
Development Impact Fees for Homebuyers or Developers	Yes

Table 2-6. Administrative and Technical Capability

Staff/Personnel Resource	Available?
Planners or engineers with knowledge of land development and land management practices	Yes
If Yes, Department /Position: Community Development Department (Planning + Building and Safety), and Public Works (engineers in land development).	
Engineers or professionals trained in building or infrastructure construction practices	Yes
If Yes, Department /Position: Building and Safety Division, and Public Works for infrastructure projects (streets, sewer, water, storm drains).	
Planners or engineers with an understanding of natural hazards	Yes
If Yes, Department /Position: Community Development and Public Works, though consultants are also hired for certain projects.	
Staff with training in benefit-cost analysis	Yes
If Yes, Department /Position: Building and Safety, and Public Works for infrastructure projects (streets, sewer, water, storm drains). Again, consultants are hired for certain projects.	
Surveyors	No
Personnel skilled or trained in GIS applications	Yes
If Yes, Department /Position: Administrative Services, GIS Specialist	
Scientist familiar with natural hazards in local area	No
Emergency manager	Yes
If Yes, Department /Position: The Sr. Management Analyst in the City Manager's Office serves as the EOC Coordinator.	
Grant writers	Yes
If Yes, Department /Position: Sr. Management Analyst, City Manager's Office.	
Other	Yes
If Yes, Department /Position: Civil Engineer, Public Works Dept.	

Table 2-7. Education and Outreach Capability

Criterion	Response
Do you have a public information officer or communications office?	Yes
Do you have personnel skilled or trained in website development?	Yes
Do you have hazard mitigation information available on your website? ***If yes, briefly describe:*** Links to several emergency preparedness websites are available on the City's website (https://www.ci.camarillo.ca.us/departments/fire/emergencies.php).	Yes
Do you use social media for hazard mitigation education and outreach? ***If yes, briefly describe:*** City of Camarillo Government Facebook, Instagram, Twitter, LinkedIn.	Yes
Do you have any citizen boards or commissions that address issues related to hazard mitigation? ***If yes, briefly describe:*** The City has an active Community Emergency Response Team.	Yes
Do you have any other programs in place that could be used to communicate hazard-related information? ***If yes, briefly describe:*** VC Alert, City "Notify Me!" Emergency Email Distribution, City website (www.cityofcamarillo.org)	Yes
Do you have any established warning systems for hazard events? ***If yes, briefly describe:*** VC Alert	Yes

Table 2-8. National Flood Insurance Program Compliance

Criterion	Response
What local department is responsible for floodplain management?	Public Works
Who is your floodplain administrator? (department/position)	City Engineer (Public Works)
Are any certified floodplain managers on staff in your jurisdiction?	Yes
What is the date that your flood damage prevention ordinance was last amended?	1993
Does your floodplain management program meet or exceed minimum requirements?	Meets
When was the most recent Community Assistance Visit or Community Assistance Contact?	September 2018
Does your jurisdiction have any outstanding NFIP compliance violations that need to be addressed?	No
Are any RiskMAP projects currently underway in your jurisdiction?	No
Do your flood hazard maps adequately address the flood risk within your jurisdiction?	Yes
Does your floodplain management staff need any assistance or training to support its floodplain management program?	No
Does your jurisdiction participate in the Community Rating System (CRS)? ***If no, is your jurisdiction interested in joining the CRS program?*** Yes	No
How many flood insurance policies are in force in your jurisdiction?[a] ***What is the insurance in force?*** $203,471,400 ***What is the premium in force?*** $534,728	664
How many total loss claims have been filed in your jurisdiction?[a] ***What were the total payments for losses?*** $1,135,612	21

a. According to FEMA statistics as of March 31, 2021

Table 2-9. Community Classifications

	Participating?	Classification	Date Classified
FIPS Code	Yes	111-10046	
DUNS #	Yes	070207006	
Community Rating System	No		
Building Code Effectiveness Grading Schedule	Yes	Grading Class-2	
Public Protection	Yes	03/3X	12/21/2018
Storm Ready	No		
Firewise	No		
Tsunami Ready	No		

Table 2-10. Adaptive Capacity for Climate Change

Criterion	Jurisdiction Rating[a]
Technical Capacity	
Jurisdiction-level understanding of potential climate change impacts	Medium
Comment: *To be further evaluated in the Climate Action Plan that the City is planning on developing in the near future.*	
Jurisdiction-level monitoring of climate change impacts	Medium
Comment: *To be further evaluated in the Climate Action Plan that the City is planning on developing in the near future.*	
Technical resources to assess proposed strategies for feasibility and externalities	Medium
Comment: *To be further evaluated in the Climate Action Plan that the City is planning on developing in the near future.*	
Jurisdiction-level capacity for development of greenhouse gas emissions inventory	Medium
Comment: *To be further evaluated in the Climate Action Plan that the City is planning on developing in the near future.*	
Capital planning and land use decisions informed by potential climate impacts	Medium
Comment: *To be further evaluated in the Climate Action Plan that the City is planning on developing in the near future.*	
Participation in regional groups addressing climate risks	Medium
Comment: *To be further evaluated in the Climate Action Plan that the City is planning on developing in the near future.*	
Implementation Capacity	
Clear authority/mandate to consider climate change impacts during public decision-making processes	Medium
Comment: *To be further evaluated in the Climate Action Plan that the City is planning on developing in the near future.*	
Identified strategies for greenhouse gas mitigation efforts	Medium
Comment: *To be further evaluated in the Climate Action Plan that the City is planning on developing in the near future.*	
Identified strategies for adaptation to impacts	Medium
Comment: *To be further evaluated in the Climate Action Plan that the City is planning on developing in the near future.*	
Champions for climate action in local government departments	Medium
Comment: *To be further evaluated in the Climate Action Plan that the City is planning on developing in the near future.*	
Political support for implementing climate change adaptation strategies	Medium
Comment: *To be further evaluated in the Climate Action Plan that the City is planning on developing in the near future.*	
Financial resources devoted to climate change adaptation	Low
Comment: *To be further evaluated in the Climate Action Plan that the City is planning on developing in the near future.*	
Local authority over sectors likely to be negative impacted	Medium
Comment: *To be further evaluated in the Climate Action Plan that the City is planning on developing in the near future.*	
Public Capacity	
Local residents' knowledge of and understanding of climate risk	Medium
Comment: *To be further evaluated in the Climate Action Plan that the City is planning on developing in the near future.*	
Local residents' support of adaptation efforts	Medium
Comment: *To be further evaluated in the Climate Action Plan that the City is planning on developing in the near future.*	

Criterion	Jurisdiction Rating[a]
Local residents' capacity to adapt to climate impacts	Medium
Comment: *To be further evaluated in the Climate Action Plan that the City is planning on developing in the near future.*	
Local economy current capacity to adapt to climate impacts	Medium
Comment: *To be further evaluated in the Climate Action Plan that the City is planning on developing in the near future.*	
Local ecosystems capacity to adapt to climate impacts	Medium
Comment: *To be further evaluated in the Climate Action Plan that the City is planning on developing in the near future.*	

a. High = Capacity exists and is in use; Medium = Capacity may exist but is not used or could use some improvement; Low = Capacity does not exist or could use substantial improvement; Unsure= Not enough information is known to assign a rating.

2.5 INTEGRATION REVIEW

For hazard mitigation planning, "integration" means that hazard mitigation information is used in other relevant planning mechanisms, such as general planning and capital facilities planning, and that relevant information from those sources is used in hazard mitigation. This section identifies where such integration is already in place, and where there are opportunities for further integration in the future. Resources listed at the end of this annex were used to provide information on integration. The progress reporting process described in Volume 1 of the hazard mitigation plan will document the progress of hazard mitigation actions related to integration and identify new opportunities for integration.

2.5.1 Existing Integration

Some level of integration has already been established between local hazard mitigation planning and the following other local plans and programs:

- **City of Camarillo General Plan, Safety Plan, Policy SAF-1.1a–** Incorporate new and updated hazards information relevant to the City of Camarillo into the Safety Element, Emergency Operations Plan, and/or Local Hazard Mitigation Plan, as appropriate.
- **City of Camarillo, Emergency Operations Plan (EOP), 2021 (pending approval)—**Section Eight-Hazard Summary for City of Camarillo presents a summary of all the hazards the City is subject to and references the Ventura County Multi-Hazard Mitigation Plan for more specific information.
- **Capital Improvement Plan**—The capital improvement plan includes projects that can help mitigate potential hazards. The City will act to ensure consistency between the hazard mitigation plan and the current and future capital improvement plans. The hazard mitigation plan may identify new possible funding sources for capital improvement projects and may result in modifications to proposed projects based on results of the risk assessment.
- **Building Code, Title 16, Chapter 16.34.340, Hazard Mitigation Plan**—Identifies that the planning commission shall consider whether proposed development is in or affects a known floodplain, practical alternatives to the proposed development if in a floodplain, impacts of the project on the floodplain and plans to mitigate the impact of the development on the floodplain.

2.5.2 Opportunities for Future Integration

The capability assessment in this annex indicates opportunities to integrate this mitigation plan with other jurisdictional planning/regulatory capabilities. Capabilities were identified as integration opportunities if they can support or enhance the actions identified in this plan or be supported or enhanced by components of this plan. The capability assessment identified the following plans and programs that do not currently integrate hazard mitigation information but provide opportunities to do so in the future:

- **Climate Action Plan—**The Climate Action Plan is a comprehensive roadmap that outlines the specific activities that an agency will undertake to reduce greenhouse gas emissions. Currently, the City does not have a Climate Action Plan but is planning to develop one in the near future.
- **Capital Improvement Projects**—Capital improvement project proposals may take into consideration hazard mitigation potential as a means of evaluating project prioritization.
- **Post-Disaster Recovery Plan**—The City does not have a recovery plan but may consider developing one as a mitigation planning action if funds become available. The plan will build on the goals and objectives identified in the hazard mitigation plan.

Taking action to integrate each of these programs with the hazard mitigation plan was considered as a mitigation action to include in the action plan in this annex.

2.6 RISK ASSESSMENT

2.6.1 Jurisdiction-Specific Natural Hazard Event History

Table 2-11 lists past occurrences of natural hazards for which specific damage was recorded in this jurisdiction Other hazard events that broadly affected the entire planning area, including this jurisdiction, are listed in the risk assessments in Volume 1 of this hazard mitigation plan.

Table 2-11. Past Natural Hazard Events

Type of Event	FEMA Disaster #	Date	Damage Assessment
COVID-19 Pandemic	DR-4482	January 20, 2020 and continuing	City did not experience any property damages from COVID19 just emergency protective measures response related costs total approximately $30,176.
Maria Fire	FM-5302	November 1, 2019	City was not directly impacted by this fire, however, The Arc of Ventura County opened a community shelter at the Camarillo Community Center.
Wildfires, Flooding, Mudflows, and Debris Flows (Thomas Fire)	DR-4353	December 4, 2017- January 31, 2018	Although this fire burned 281,893 acres in both Ventura County and Santa Barbara County, the City was only indirectly impacted by smoke.
Camarillo Springs Mudflow		November 1 and December 12, 2014	Nov. 1 -Twenty homes were evacuated, including two homes that were severely damaged. Dec. 12. Sixteen homes were damaged, including 10 homes that were red-tagged
Springs Fire	FM-5024	May 2 – 11, 2013	24,251 acres burned; 10 outbuildings destroyed; 6 commercial properties and 6 outbuildings damaged.

Type of Event	FEMA Disaster #	Date	Damage Assessment
Wildfires, Flooding, Mudflows, and Debris Flows	DR-1731	October 21 – March 31, 2008	Although Ventura County was impacted by the Ranch Fire, the City of Camarillo was not directly impacted except for heavy smoke.
Severe Freeze	DR-1689	January 11 – 17, 2007	This disaster impacted mainly the citrus and avocado crops throughout Ventura County, but no crops in the City were impacted.
Shekell Fire	FM-2681	December 3 – 6, 2006	This fire burned in Fillmore and Moorpark. Camarillo had no direct impacts from the fire only indirectly from smoke.
Day Fire	FM-2677	September 25 – 30, 2006	City of Camarillo was not directly impacted except for heavy smoke.
Topanga Fire	FM-2583	September 28 – October 10, 2005	City of Camarillo was not directly impacted except for smoke.
Severe Storms, Flooding, Landslides, and Mud and Debris Flows	DR-1585	February 16 – 23, 2005	City experienced localized flooding. No significant losses were documented.
Severe Storms, Flooding, Debris Flows, and Mudslides	DR-1577	December 27, 2004 – January 11, 2005	Water and mudslides damaged at least two homes after debris jammed a city storm drain.
Wildfires, Flooding, Mudflow and Debris Flow	DR-1498	October 21, 2003 – March 31, 2004	City of Camarillo was not directly impacted from the fires in Piru and Fillmore except for heavy smoke. Flooding caused downed trees and blocked roads.
Severe Winter Storms and Flooding	DR-1203	February 2 – April 30, 1998	Channel at Las Posas Rd. and Ventura Blvd. damaged ($500,000), clogged storm drains. Camarillo Springs Golf course was damaged. It took 31 men about 10 full days of work to bring the course back to playability. Backed up storm drains impacted several homes. City Hall flooded.
Severe Winter Storms, Flooding, Landslides, Mud Flows	DR-1046	February 13 – April 19, 1995	Large agricultural losses. Localized flooding and clogged storm drains. No major impact to the City of Camarillo.
Severe Winter Storms, Flooding, Landslides, Mud Flows	DR-1044	January 3 – February, 1995	Localized flooding and clogged storm drains. No major impact to the City of Camarillo.
Northridge Earthquake	DR-1008	January 17 – November 30,1994	Drywall sustained large cracks; exterior concrete block walls sustained hairline cracks; a few chimneys were cracked; a few windows cracked; several small objects overturned and fell; light furniture overturned; heavy furniture was displaced; hanging objects and doors swung violently; many items were thrown from store shelves; masonry fences or retaining walls were partially fallen; underground pipes were broken.
Fires, Mud & Landslides, Soil Erosion, Flooding	DR-1005	October 26 – April 22, 1994	Multiple fires around Ventura County and subsequent flooding. Camarillo was not directly impacted except for smoke from the surrounding fires and backed up storm drains.
Severe Storm, Winter Storm, Mud & Landslides, Flooding	DR-979	January 5 – March 20, 1993	Camarillo trailer park flooded (Casa del Norte). Localized street flooding.
Snow Storm, Heavy Rain, High Winds, Flooding, Mudslide	DR-935	February 10 – 19, 1992	Countywide agricultural damages. City experienced localized street flooding.

Type of Event	FEMA Disaster #	Date	Damage Assessment
Severe Freeze	DR-894	December 19, 1990 – January 3, 1991	Countywide agricultural damages. Agricultural crops within the City suffered losses to their crops. More than $100 million worth of avocados, oranges, strawberries and other fruits were destroyed.
Grass, Wildlands, Forest Fires	DR-739	June 26 – July 19, 1985	City of Camarillo was not directly impacted except for heavy smoke.
Coastal Storms, Floods, Slides, Tornadoes	DR-677	January 21 – March 30, 1983	Countywide crop damage. Flood flows broke through the leveed banks of Calleguas Creek in the lower reach below U.S. 101 and caused an estimated $21.5 million in damage to agricultural properties. The City estimate of damages was $160,000.
Severe Storms, Mudslides, Flooding	DR-615	January 8, 1980	Flooding countywide. No significant damage in the City of Camarillo
Coastal Storms, Mudslides, Flooding	DR-547	February 15, 1978	Evacuation of Leisure Village (150 homes) due to weakened earthen catch basin. Fallen trees (65-75) throughout the City totalling $500,000 loss.
Severe Storms, High Tides, Flooding	DR-364	February 8, 1973	Countywide rain and flooding. Minor damages in the City of Camarillo
Forest, Brush Fires	DR-295	September 29, 1970	5 dwellings destroyed in the Camarillo Hills area, historic structure Rancho Lomita mansion destroyed and 10-15 outbuildings.
Severe Storms, Flooding	DR-253	January 26, 1969	Downed trees. Flooded streets, bridge damage (Calleguas Road Bridge) curb and gutter damage. Flood Control damages estimated at $2,150, roads, streets and bridges damage is estimated at $110,979.
Heavy Rains, Flooding	DR-211	December 7, 1965	Countywide flooding, Minimal damage to City of Camarillo.

2.6.2 Hazard Risk Ranking

Table 2-12 presents a local ranking of all hazards of concern for which this hazard mitigation plan provides complete risk assessments. As described in detail in Volume 1, the ranking process involves an assessment of the likelihood of occurrence for each hazard, along with its potential impacts on people, property, and the economy. Mitigation actions primarily target hazards with high and medium rankings.

Table 2-12. Hazard Risk Ranking

Rank	Hazard	Risk Ranking Score	Risk Category
1	Earthquake	32	Medium
2	Severe Storms	24	Medium
3	Severe Weather	24	Medium
4	Dam Failure	22	Medium
5	Flooding	18	Medium
6	Landslide[a]	18	Medium
7	Wildfire	12	Medium
8	Drought	9	Low
9	Tsunami	0	Low
10	Sea Level Rise	0	Low

a. Landslide ranking is based only on the Very High susceptibility category.

2.6.3 Jurisdiction-Specific Vulnerabilities

Volume 1 of this hazard mitigation plan provides complete risk assessments for each identified hazard of concern. This section provides information on a few key vulnerabilities for this jurisdiction. Available jurisdiction-specific risk maps of the hazards are provided at the end of this annex.

Repetitive Loss Properties

Repetitive loss records are as follows:

- Number of FEMA-identified Repetitive-Loss Properties: 0
- Number of FEMA-identified Severe-Repetitive-Loss Properties: 0
- Number of Repetitive-Loss Properties or Severe-Repetitive-Loss Properties that have been mitigated: 0

Other Noted Vulnerabilities

The following jurisdiction-specific issues have been identified based on a review of the results of the risk assessment, public involvement strategy, and other available resources: N/A

Mitigation actions addressing these issues were prioritized for consideration in the action plan in this annex.

2.7 STATUS OF PREVIOUS PLAN ACTIONS

Table 2-13 summarizes the actions that were recommended in the previous version of the hazard mitigation plan and their implementation status at the time this update was prepared.

Table 2-13. Status of Previous Plan Actions

Action Item	Completed	Removed; No Longer Feasible	Carried Over to Plan Update: Check if Yes	Carried Over to Plan Update: Action # in Update
OA 7—Develop a water conservation public outreach program to increase awareness about the drought, fines and penalties for overuse and solutions for conserving water.			✓	CAM-1
Comment: Ongoing. Water conservation information is on the City's website regarding the City's Stage 1 measures: Including a rebate program to retrofit indoor plumbing fixtures with water-efficient versions. • Rebates for landscaping controllers and replacement of hose nozzles. • Daily inspections throughout the City's water service area to ensure compliance with Stage 1 measures. • Best management tools for water conservation.				
OA 11—Develop and implement plans to increase the building owner's general knowledge of and appreciation for the value of seismic upgrading of the building's structural and nonstructural elements.			✓	CAM-2
Comment: Ongoing. For several years, the City has been contacting the owners of apartment complexes (and one hotel) regarding the importance of retrofitting their soft-story carports. In March 2021, the City applied to Cal OES to retrofit the carports at four of these properties. Unfortunately, the grant did not get funded, but staff has continued to reach out to the owners about future grant applications and financing options.				

Action Item	Completed	Removed; No Longer Feasible	Carried Over to Plan Update: Check if Yes	Carried Over to Plan Update: Action # in Update
OA 13—Reinforce roads/bridges from flooding through protection activities, including elevating the roads/bridges and installing/widening culverts beneath the roads/bridges or upgrading storm drains.			✓	CAM-3
Comment: While no projects are currently planned, this may change in the near future.				
CA 1—Broaden outreach efforts to get as many residents as possible registered with the VC Alert system.			✓	CAM-4
Comment: Ongoing. The City continues to disseminate information on the VC Alert and Pulse-Point programs through our CityScene and CERT-Scene newsletters, on our government TV channel programming, via social media, and on our website.				
CA 2—Develop a vegetation restoration/enhancement program for areas that have shown to be susceptible to landslides.	✓			
Comment: A vegetation restoration program was implemented for the hillsides above the Camarillo Springs communities. These efforts were in response to extensive damage caused first by the Springs Fire, and later by landslides that occurred in Camarillo Springs. No programs are currently planned for other sites in Camarillo.				

2.8 HAZARD MITIGATION ACTION PLAN

Table 2-14 lists the identified actions, which make up the hazard mitigation action plan for this jurisdiction. Table 2-15 identifies the priority for each action. Table 2-16 summarizes the mitigation actions by hazard of concern and mitigation type.

Table 2-14. Hazard Mitigation Action Plan Matrix

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action CAM-1—Develop a water conservation public outreach program to increase awareness about the drought, fines and penalties for overuse and solutions for conserving water.						
Hazards Mitigated: Drought						
New & Existing	1, 17	Public Works	None	Medium	Staff time and General Funds HMGP, BRIC	Ongoing
Action CAM-2—Develop and implement plans to increase the building owner's general knowledge of and appreciation for the value of seismic upgrading of the building's structural and nonstructural elements.						
Hazards Mitigated: Earthquake						
New & Existing	1, 9, 12, 16, 17	Community Development/ Building & Safety	None	Medium	Staff time and General Funds	Ongoing
Action CAM-3—Reinforce roads/bridges from flooding through protection activities, including elevating the roads/bridges and installing/widening culverts beneath the roads/bridges or upgrading storm drains.						
Hazards Mitigated: Flooding						
Existing	2, 6, 9	Public Works	None	High	Staff Time, General Funds, HMGP, BRIC, FMA	Ongoing

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action CAM-4—Broaden outreach efforts to get as many residents as possible registered with the VC Alert system.						
Hazards Mitigated:	Earthquake, Severe Storms, Severe Weather, Dam Failure, Flooding, Landslide, Wildfire, Tsunami, Drought, Sea Level Rise					
New & Existing	1, 7, 17	Community Relations Officer	None	Low	Staff Time, General Funds	Ongoing
Action CAM-5—Integrate the hazard mitigation plan into other plans, ordinances and programs that dictate land use decisions in the community.						
Hazards Mitigated:	Earthquake, Flood, Wildfire, Landslide					
New	19	City Manager's Office	Community Development / Building and Safety, Public Works	Low	Staff Time, General Funds	Ongoing
Action CAM-6—Actively participate in the plan maintenance protocols outlined in Volume 1 of this hazard mitigation plan.						
Hazards Mitigated:	Earthquake, Severe Storms, Severe Weather, Dam Failure, Flooding, Landslide, Wildfire, Tsunami, Drought, Sea Level Rise					
New & Existing	17, 19	City Manager's Office	Public Works/Community Development/ Building & Safety	Low	Staff Time, General Funds	Short-term
Action CAM-7—Continue to maintain good standing and compliance under the NFIP through implementation of floodplain management programs that, at a minimum, meet the NFIP requirements: • Enforce the flood damage prevention ordinance. • Participate in floodplain identification and mapping updates. • Provide public assistance/information on floodplain requirements and impacts.						
Hazards Mitigated:	Flood					
New & Existing	1, 4, 17, 18	Public Works	FEMA	Low	Staff Time, General Funds	Ongoing
Action CAM-8—Identify and pursue strategies to increase adaptive capacity to climate change including developing a Climate Action Plan.						
Hazards Mitigated:	Drought, Sea Level Rise, Severe Storms, Severe Weather, Flooding					
New & Existing	1, 2, 6, 12, 15, 17, 19	Community Development	Public Works	Medium	Staff Time, General Funds, HMGP, BRIC	Short-term
Action CAM-9—Purchase generators for critical facilities and infrastructure that lack adequate backup power, including City Hall, Library, Corporation Yard, Sanitation Plant.						
Hazards Mitigated:	Earthquake, Severe Storms, Severe Weather, Dam Failure, Flooding, Landslide, Wildfire, Tsunami					
Existing	2, 6	Public Works	None	Medium	Staff Time, General Funds, HMGP, BRIC	Short-term
Action CAM-10—Analyze the feasibility of developing a Post-Disaster Recovery Pan and develop Plan should funds become available.						
Hazards Mitigated:	Earthquake, Severe Storms, Severe Weather, Dam Failure, Flooding, Landslide, Wildfire, Tsunami					
New & Existing	2, 6, 8, 19	City Manager's Office		Low	HMGP, PDM, FMA	Short-term
Action CAM-11—Analyze the feasibility of developing a Debris Management Plan and develop Plan should funds become available.						
Hazards Mitigated:	Earthquake, Severe Storms, Severe Weather, Dam Failure, Flooding, Landslide, Wildfire, Tsunami					
New & Existing	2 ,8, 18	Public Works	None	Low	Staff Time, General Funds	Ongoing

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action CAM-12—Analyze the feasibility of developing a Continuity of Operations Plan and develop Plan should funds become available.						
Hazards Mitigated: Earthquake, Severe Storms, Severe Weather, Dam Failure, Flooding, Landslide, Wildfire, Tsunami						
New & Existing	8, 18	City Manager's Office		Low	Staff Time, General Funds	Short-term
Action CAM-13—Continue analyzing the cost/benefit of joining the Community Rating System program						
Hazards Mitigated: Flooding						
New & Existing	1, 2, 4, 9, 10, 16, 17	Public Works	FEMA	Low	Staff Time, General Funds	Ongoing
Action CAM-14—Continue to participate in updating the County's Community Wildfire Protection Plan.						
Hazards Mitigated: Wildfire						
New & Existing	2, 5, 8, 12, 17, 18	Ventura County Fire Protection District	Community Development	Low	Staff Time, General Funds	Ongoing
Action CAM-15—Update Building Code to reference better the HMP for building in all hazard areas.						
Hazards Mitigated: Earthquake, Dam Failure, Flooding, Landslide, Wildfire, Tsunami						
New & Existing	4	Community Development/ Building & Safety	None	Low	Staff Time, General Funds	Short-term
Action CAM-16—Develop a Threat and Hazard Identification and Risk Assessment specific to the City should funds become available.						
Hazards Mitigated: Earthquake, Severe Storms, Severe Weather, Dam Failure, Flooding, Landslide, Wildfire, Tsunami, Drought and Sea Level Rise						
New & Existing	1, 17	City Manager's Office	Community Development	Low/Medium	Staff Time, General Funds, HMGP, BRIC	Short-term
Action CAM-17—Analyze the feasibility of developing a City-specific Stormwater Management Plan.						
Hazards Mitigated: Flooding, Severe Storms						
New & Existing	1, 2, 4, 6, 9, 15, 17, 18	Public Works	Ventura County Watershed Protection	Low	Staff Time, General Funds	Short-term
Action CAM-18—Where appropriate, support retrofitting, purchase or relocation of structures located in hazard areas, prioritizing those that have experienced repetitive losses and/or are located in high- or medium-risk hazard areas.						
Hazards Mitigated: Earthquake, Flood, Wildfire, Landslide, Dam Failure						
Existing	9, 11	City Manager's Office	Community Development	High	HMGP, PDM, FMA	Short-term

a. Short-term = Completion within 5 years; Long-term = Completion within 10 years; Ongoing= Continuing new or existing program with no completion date

Acronyms used here are defined at the beginning of this volume.

Table 2-15. Mitigation Action Priority

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Cost?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Implementation Priority[a]	Grant Pursuit Priority[a]
1	2	Low	Medium	No	Yes	No	Low	Medium
2	5	Medium	Medium	Yes	No	No	Medium	Low
3	3	High	High	Yes	Yes	No	Medium	High
4	3	Medium	Low	Yes	No	Yes	High	Low

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Cost?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Implementation Priority[a]	Grant Pursuit Priority[a]
5	1	Medium	Low	Yes	No	No	Low	Low
6	2	Low	Low	Yes	No	Yes	Medium	Low
7	4	Low	Low	Yes	No	Yes	High	Low
8	7	Low	Medium	No	Yes	Yes	Low	Medium
9	2	High	Medium	Yes	Yes	No	Medium	High
10	4	Low	Low	Yes	Yes	No	Medium	Medium
11	3	Low	Low	Yes	No	No	Low	Low
12	2	Low	Low	Yes	No	No	Low	Low
13	7	Medium	Low	Yes	No	Yes	High	Low
14	6	Medium	Low	Yes	No	No	Low	Low
15	1	High	Low	Yes	No	Yes	High	Low
16	2	Low	Low	Yes	Yes	No	Medium	Medium
17	8	Low	Low	Yes	No	No	Low	Low
18	2	High	High	Yes	Yes	No	Medium	High

a. See the introduction to this volume for explanation of priorities.

Table 2-16. Analysis of Mitigation Actions

Hazard Type	Action Addressing Hazard, by Mitigation Type[a]							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilience	Community Capacity Building
High-Risk Hazards								
None								
Medium-Risk Hazards								
Earthquake	CAM-2, 5, 15	CAM-18	CAM-2, 4, 6		CAM-3, 4, 9			CAM-6, 10, 11, 12, 16
Severe Storms	CAM-8	CAM-3	CAM-4, 6		CAM-4, 17, 9	CAM-3	CAM-8, 16	CAM-6, 8, 10, 11, 12, 16, 17
Severe Weather	CAM-8		CAM-4, 6	CAM-17	CAM-4, 9		CAM-8, 16	CAM-6, 8, 10, 11, 12, 16
Dam Failure	CAM-15	CAM-18	CAM-4, 6		CAM-4, 10, 9			CAM-6, 10, 11, 12, 16
Flooding	CAM-5, 7, 8, 13, 15	CAM-3, 18	CAM-4, 6, 7, 13	CAM-17	CAM-3, 4, 10, 9	CAM-3	CAM-8, 16	CAM-6, 8, 10, 11, 12, 16, 17
Landslide	CAM-5, 15	CAM-18	CAM-4, 6		CAM-4, 10, 9			CAM-6, 10, 11, 12, 16
Wildfire	CAM-5, 14, 15	CAM-14, 18	CAM-4, 6, 14		CAM-4, 10, 9		CAM-8, 16	CAM-6, 10, 11, 12, 14, 16
Low-Risk Hazards								
Drought	CAM-1, 8		CAM-1, 4, 6				CAM-8, 16	CAM-6, 8, 16
Tsunami	CAM-15		CAM-4, 6		CAM-4, 9, 10			CAM-6, 10, 11, 12, 16
Sea Level Rise	CAM-8		CAM-4, 6				CAM-8, 16	CAM-6, 8, 16

a. See the introduction to this volume for explanation of mitigation types.

2.9 PUBLIC OUTREACH

Table 2-17 lists public outreach activities for this jurisdiction.

Table 2-17. Local Public Outreach

Local Outreach Activity	Date	Number of People Involved
CityScene newsletter (Hard-copy Print)	Quarterly	22,000 Households
CityScene newsletter (Email)	Quarterly	1,005
CERTScene Newsletter (Email)	Four issues per year	989
Cable TV channel	Ongoing	Unknown
Official City of Camarillo Government Website	Ongoing	Unknown
Social Media: Facebook	Ongoing/ As Needed	3,813 Followers
Social Media: Instagram	Ongoing/ As Needed	480 Followers
Social Media: LinkedIn	Ongoing/ As Needed	256 Followers
Social Media: Twitter	Ongoing/ As Needed	50 Followers
Marquee Sign (Carmen Drive/Paseo Camarillo)	Ongoing	Visible to Passersby

2.10 INFORMATION SOURCES USED FOR THIS ANNEX

The following technical reports, plans, and regulatory mechanisms were reviewed to provide information for this annex.

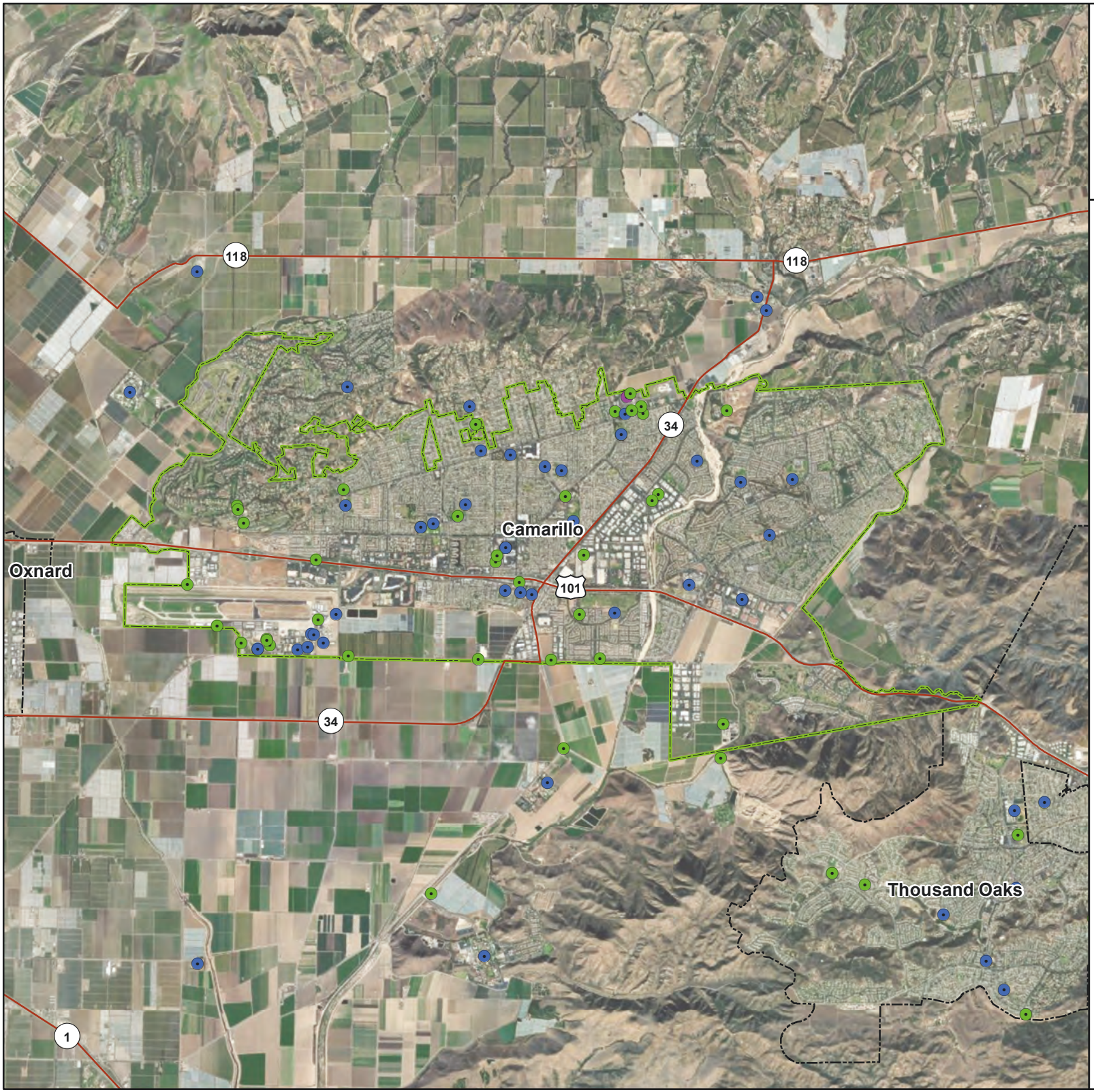
- **City of Camarillo Municipal Code**—The Municipal Code was reviewed for the full capability assessment and for identifying opportunities for HMP integration.
- **City of Camarillo General Plan, Safety Plan, Policy SAF-1.1a–** The Safety Plan was reviewed for identifying risk assessment information and for identifying opportunities for HMP integration.
- **City of Camarillo, Emergency Operations Plan (EOP)—**The EOP was used to gather risk assessment information and to assess the City's capabilities associated with response in addition to identifying opportunities for HMP integration.
- **City of Camarillo 2020 Urban Water Management Plan**—The Urban Water Management Plan was reviewed for the full capability assessment and for identifying opportunities for HMP integration.
- **City of Camarillo Economic Development Strategic Plan**—The Economic Development Strategic Plan was reviewed for the full capability assessment.
- **Capital Improvement Plan**—The Capital Improvement Plan was used to identify possible hazard mitigation actions to add to the HMP and to identify opportunities for HMP integration.
- https://www.ci.camarillo.ca.us/departments/administrativeservices/geographicalinformationsystems/gis_maps2/index.php, accessed October 4, 2021—Used to document location and features for the Jurisdictional Profile.
- **City of Camarillo, Resolution to Accompany Application for State Aid Under the Emergency Flood Relief Law, Resolution 585, May 28, 1969 --** Used to document natural hazard event damage assessment.

- **City of Camarillo, Resolution to Accompany Application for State Aid Under the Emergency Flood Relief Law, Resolution 586, May 28, 1969-—**Used to document natural hazard event damage assessment.

The following outside resources and references were reviewed:

- **Ventura County Fire Protection District, Unit Strategic Fire Plan, May 2020, page 6**—Used to document natural hazard event damage assessment.
- **Hazard Mitigation Plan Annex Development Toolkit**—The toolkit was used to support the identification of past hazard events and noted vulnerabilities, the risk ranking, and the development of the mitigation action plan.
- Levin, Charles, "Storm's fury: flooding", ***Ventura County Star***, January 10, 2005, Main News, pg.1-- Used to document natural hazard event damage assessment.
- Dodge, Dani and Levin, Charles, "County gets a wet Christmas", ***Ventura County Star***, December 26, 2003, Main News, pg. 1-- Used to document natural hazard event damage assessment.
- Mansfield, Gregg, "Airport can see light at ditch's end—Repairs on flood-damaged channel near completion EL NINO'S WAKE: Camarillo, county wrangle over who must come up with $500,000 to pay for work", ***Ventura County Star***, March 19, 1998, News, A3-- Used to document natural hazard event damage assessment.
- Zintel, Ed, "Out of bounds on the fairway—RAIN: Pre-planning helps courses survive deluge", ***Ventura County Star***, March 18, 1998, Sports, B4-- Used to document natural hazard event damage assessment.
- Mansfield, Ed, "Camarillans say city lagged in dealing with severe flooding—Neighborhood angry: Residents complain to council, but city defends its handling of job, says it couldn't be everywhere at once during last Friday's downpour", ***Ventura County Star***, February 13, 1998, New, A3-- Used to document natural hazard event damage assessment.
- Dewey, James, et.al., **U.S. Department of the Interior U.S.Geological Survey, "Intensity Distribution and Isoseismal Maps for the Northridge**, California, Earthquake Of January 17,1994", 1995- Used to document natural hazard event damage assessment.
- Lozano, Carlos, "Storm Floods Camarillo Trailer Park : Weather: Rising water surrounds mobile home residents. Sheriff's deputies airlift farm workers stranded in a field. More rain is expected", ***Los Angeles Times***, February 19, 1993, accessed digitally on October 18, 2021- Used to document natural hazard event damage assessment.
- Gorman, Gary, "1990 in Ventura County: Year in Review: Slow Economy: Freeze Ruins Crops", ***Los Angeles Times***, December 31, 1990, LA Times Archives- Used to document natural hazard event damage assessment.
- **Federal Emergency Management Agency, *Flood Insurance Study, Volume 1 of 3***, Ventura County, California, January 20, 2010- Used to document natural hazard event damage assessment.
- Bevol, Steve. "Weary county cleans up", ***Camarillo Daily News***, February 12, 1978, p.A1- Used to document natural hazard event damage assessment.
- "Worst Fire in History Hits City", ***Camarillo Daily News*** September 28, 1970, p.A1- Used to document natural hazard event damage assessment.

- Sacramento Associated Press, “President Johnson Declares County Disaster Area”, ***Camarillo Daily News***, December 9, 1965, p.A2- Used to document natural hazard event damage assessment.



Camarillo

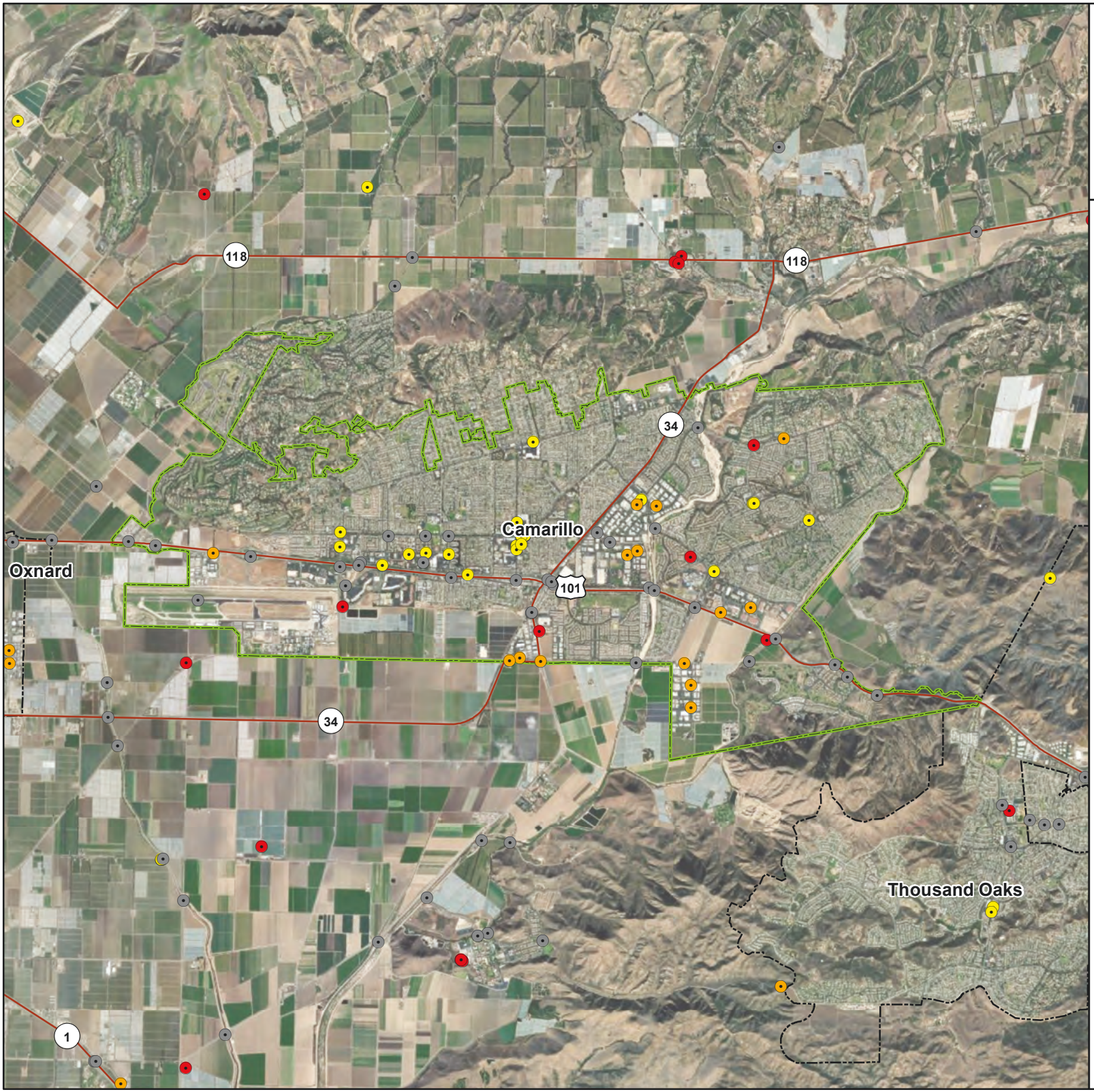
Critical Facilities (1 of 2)

- Food, Water, Shelter
- Health and Medical
- Safety and Security
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Data Sources: Ventura Co., VCFD, Casitas MWD, Calleguas MWD, City of Camarillo, CA Energy Commission, Cal Trans, EPA, HIFLD, Esri

N

0 0.5 1 2 Miles



Camarillo

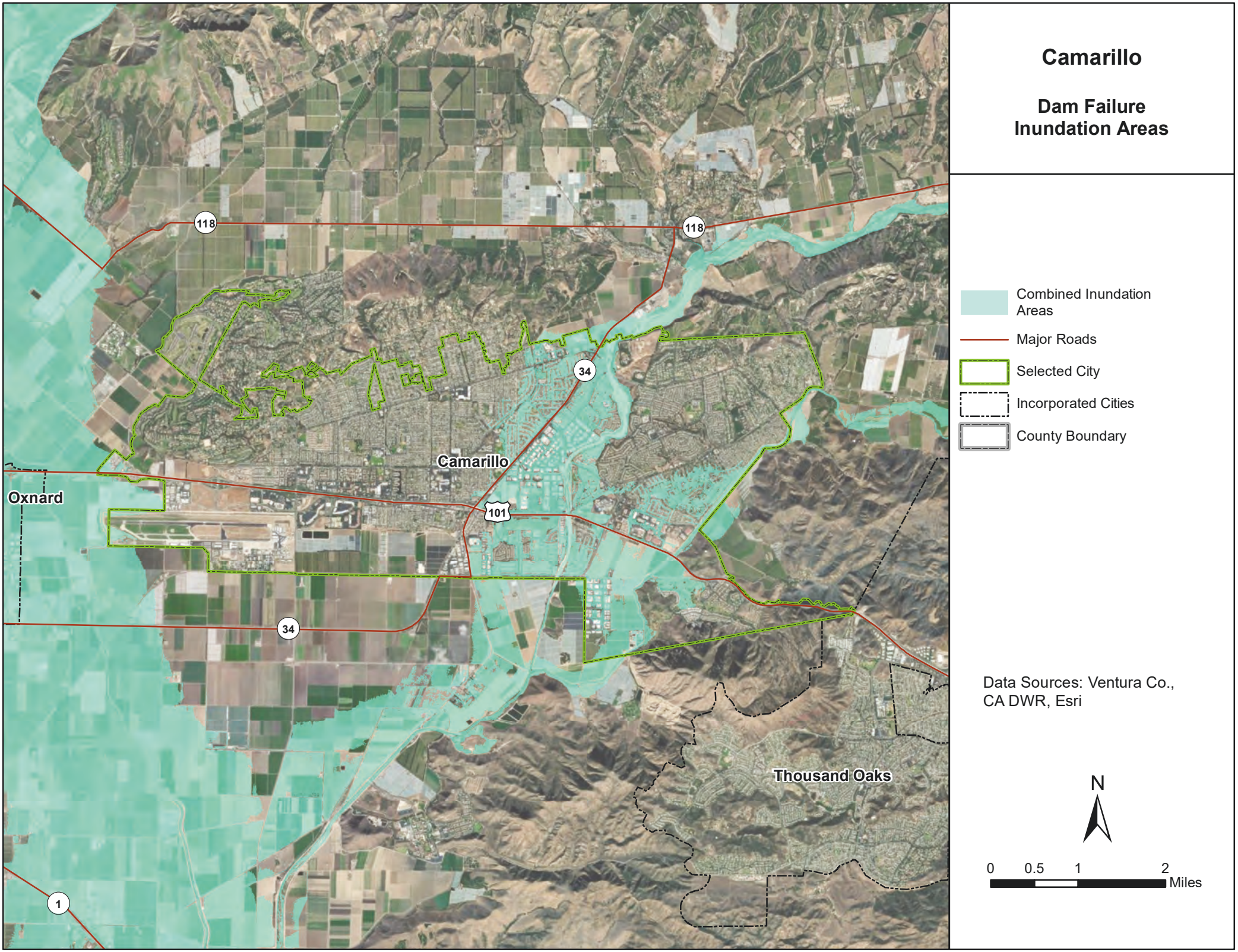
Critical Facilities (1 of 2)

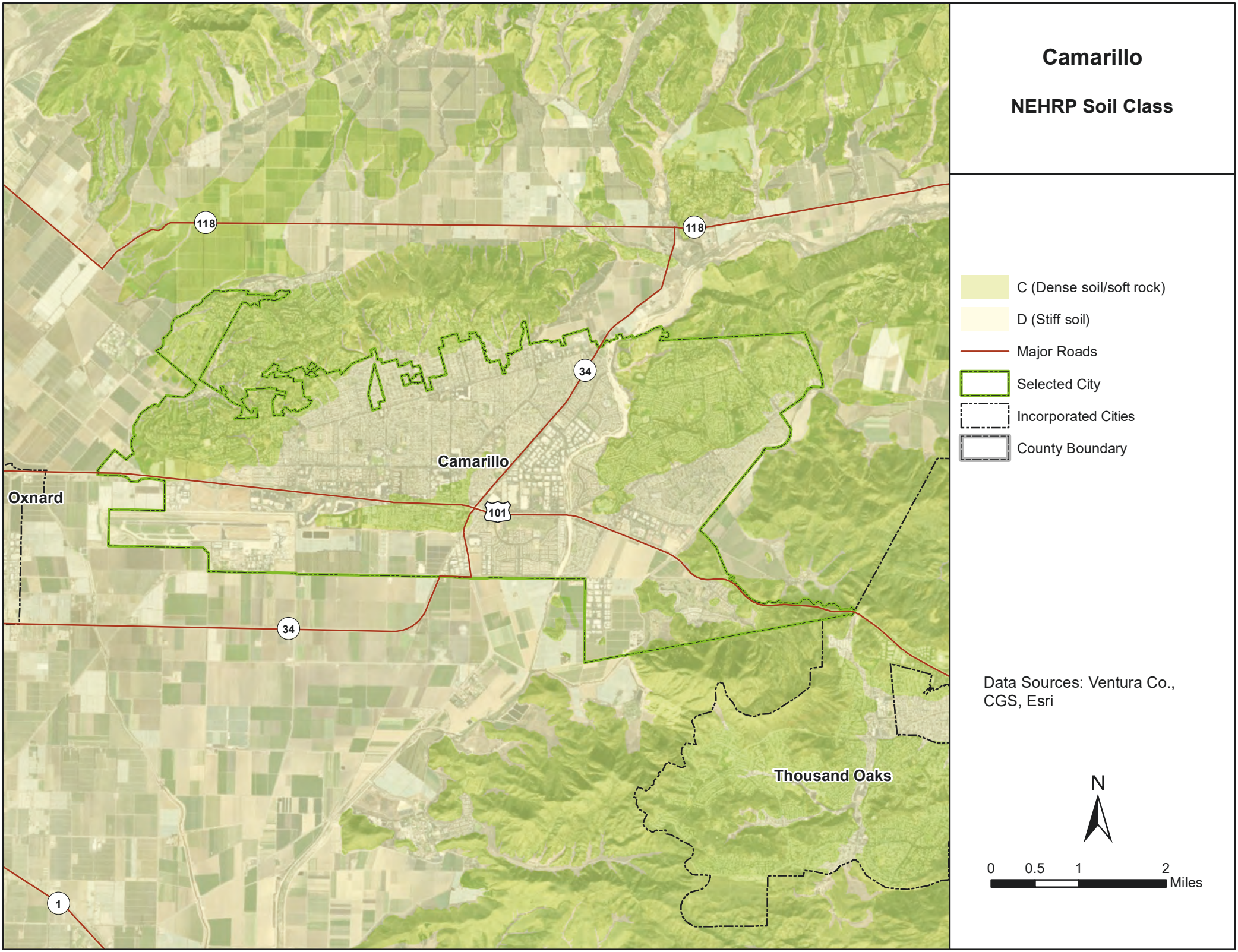
- Communications
- Energy
- Hazardous Material
- Transportation
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

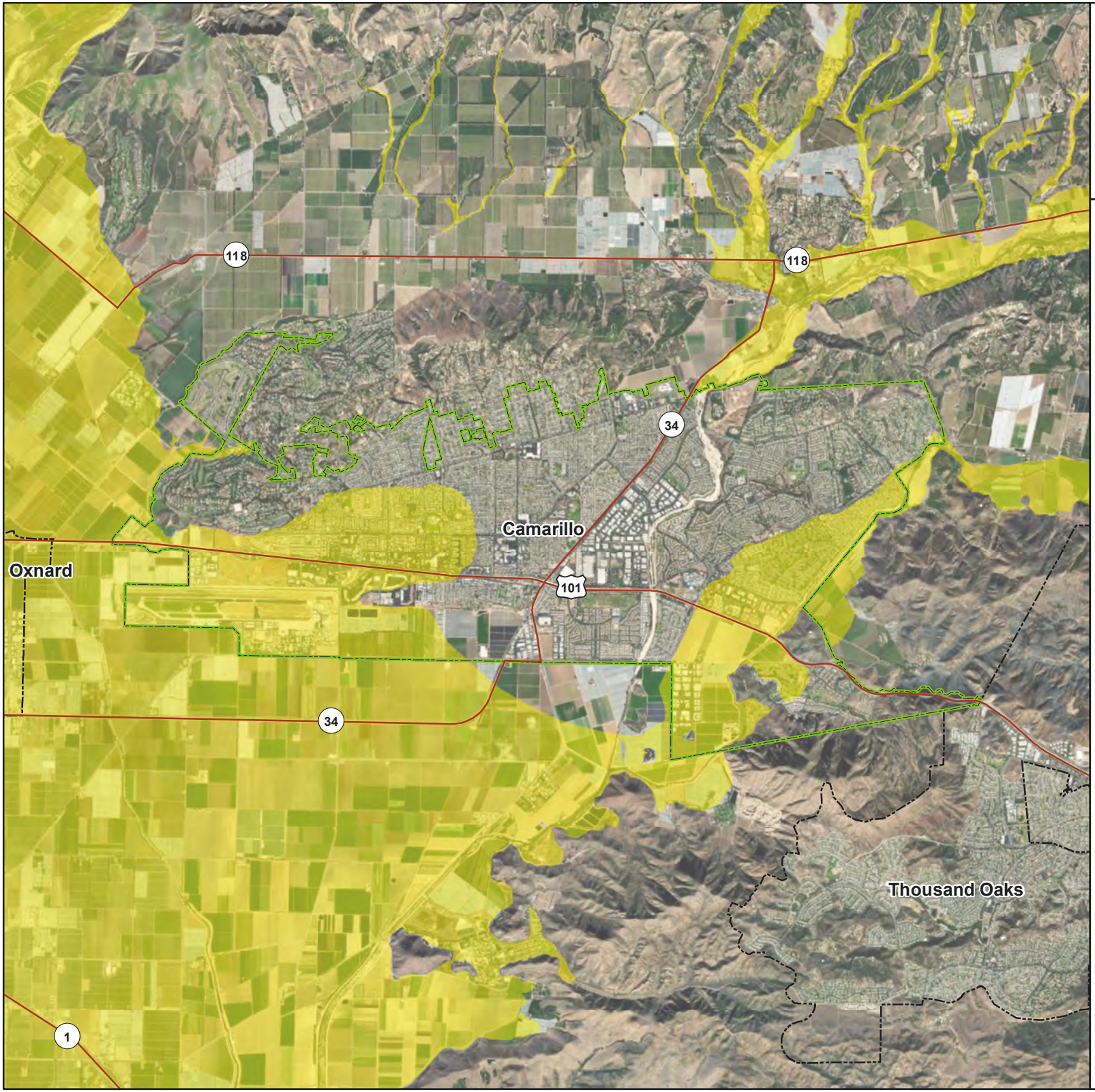
Data Sources: Ventura Co., VCFD, Casitas MWD, Calleguas MWD, City of Camarillo, CA Energy Commission, Cal Trans, EPA, HIFLD, Esri

N

0 0.5 1 2 Miles


Camarillo
Dam Failure
Inundation Areas
Combined Inundation Areas
Major Roads
Selected City
Incorporated Cities
County Boundary
Data Sources: Ventura Co., CA DWR, Esri
N
0 0.5 1 2
Miles
Camarillo
Oxnard
Thousand Oaks
118
118
34
101
34
1


Camarillo
NEHRP Soil Class
C (Dense soil/soft rock)
D (Stiff soil)
Major Roads
Selected City
Incorporated Cities
County Boundary
Data Sources: Ventura Co., CGS, Esri
N
0 0.5 1 2
Miles
118
118
34
101
34
1
Camarillo
Oxnard
Thousand Oaks



Camarillo

Liquefaction Susceptibility

Liquefaction zone

Major Roads

Selected City

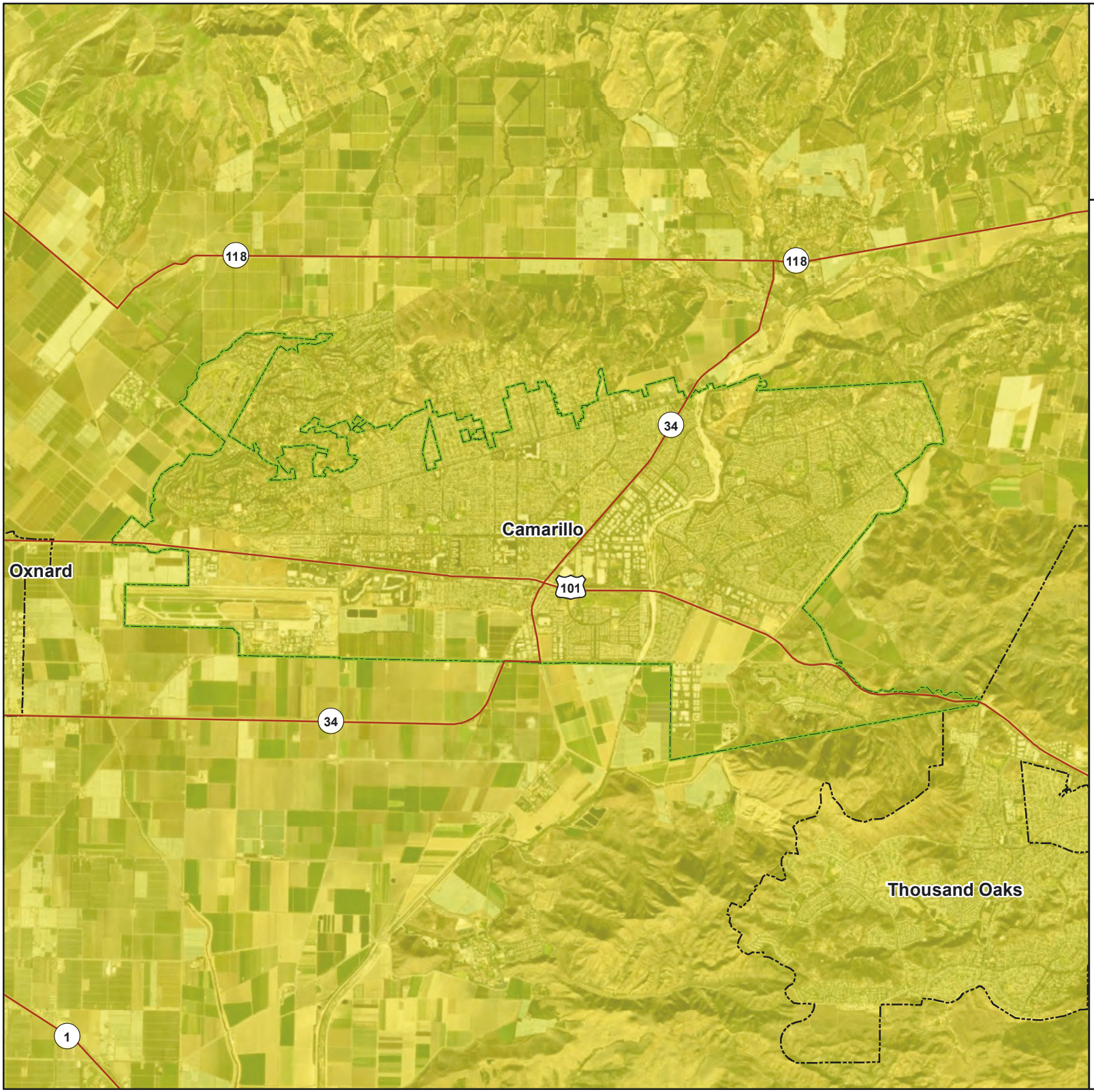
Incorporated Cities

County Boundary

Data Sources: Ventura Co., Esri

N

0 0.5 1 2 Miles



Camarillo

100-Year Probabilistic Earthquake Scenario

Mercalli Intensity Scale

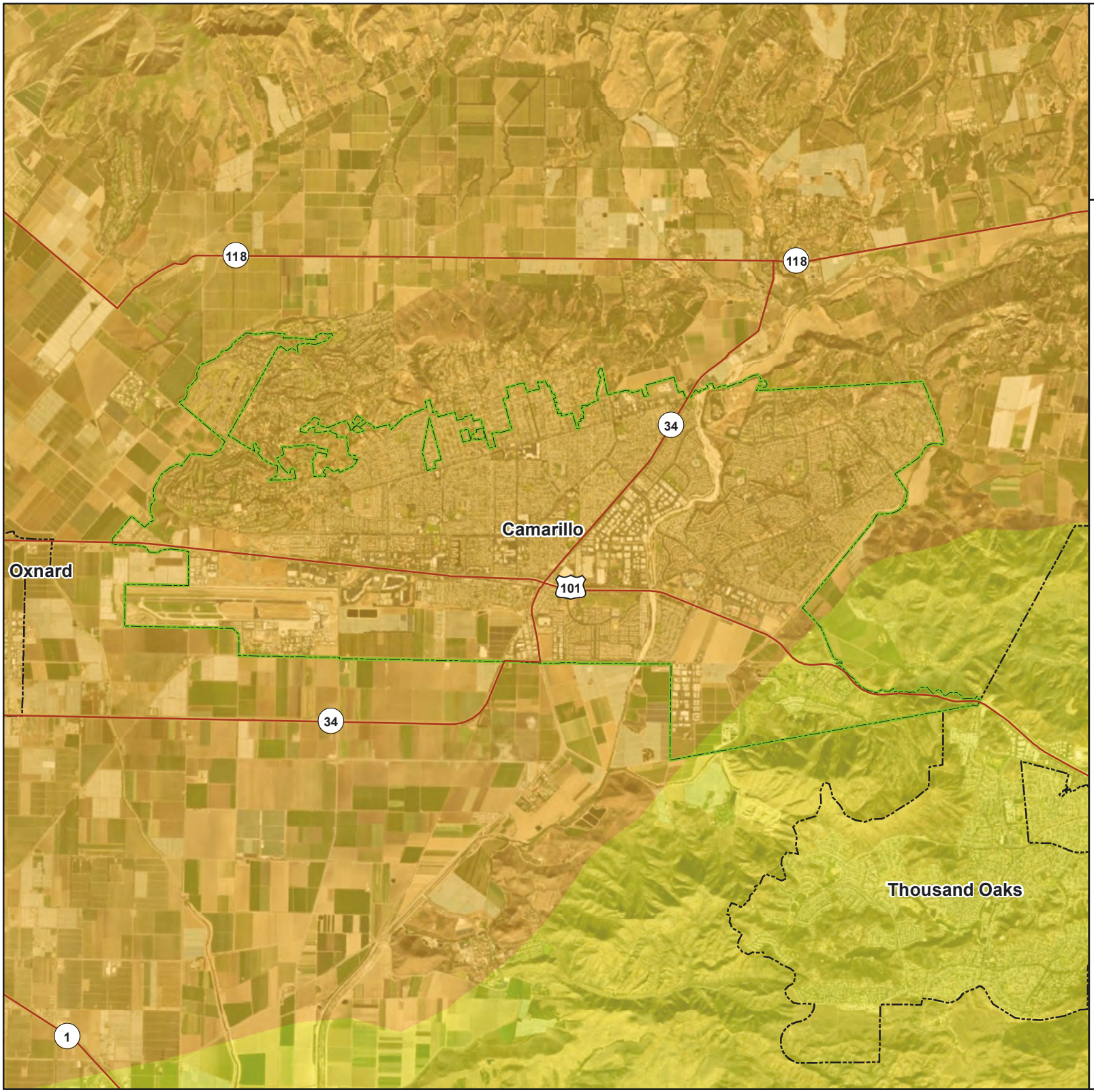
- VII (Very Strong/Moderate)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.5 1 2 Miles



Camarillo

Oak Ridge M7.16 Earthquake Scenario

Mercalli Intensity Scale

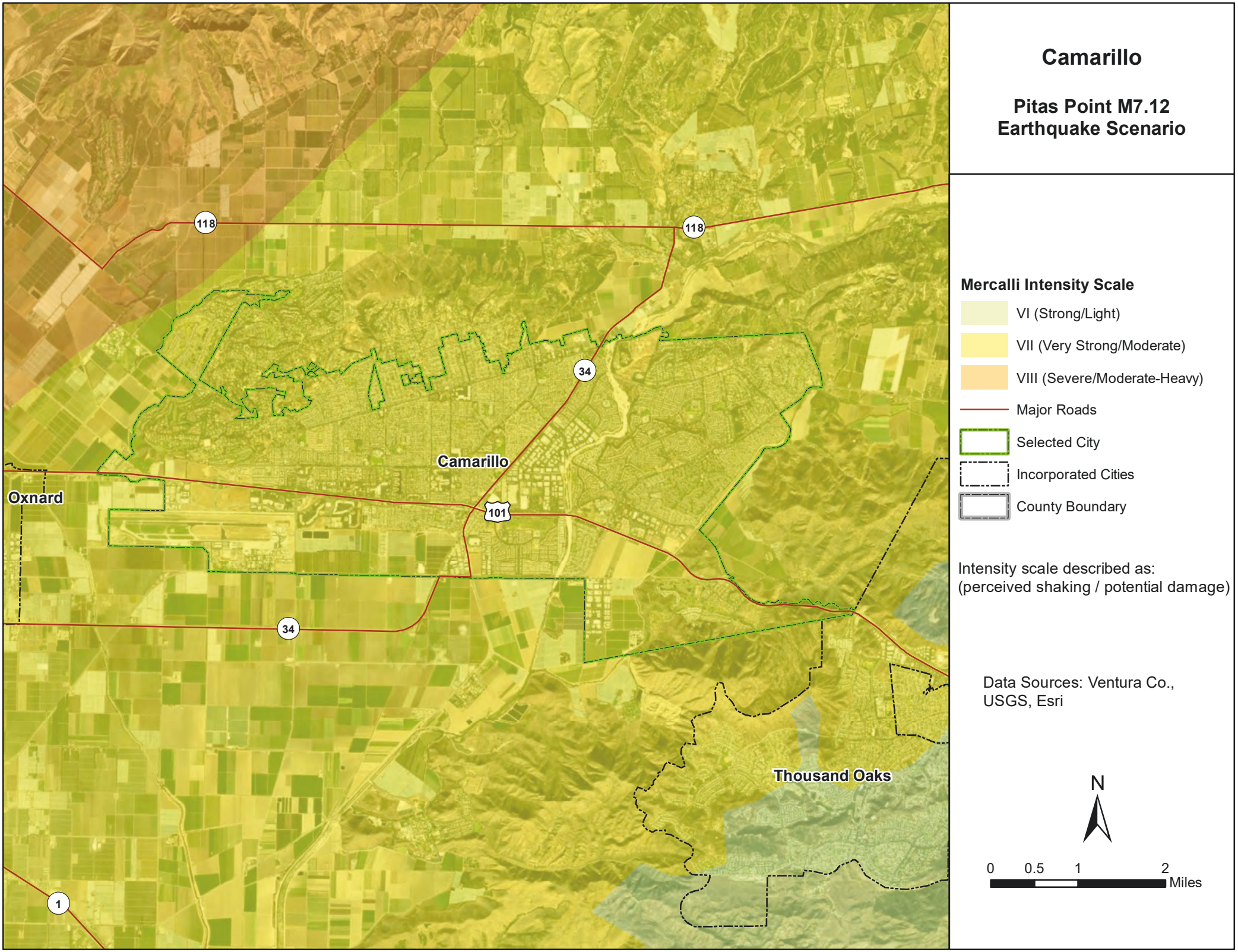
- VII (Very Strong/Moderate)
- VIII (Severe/Moderate-Heavy)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

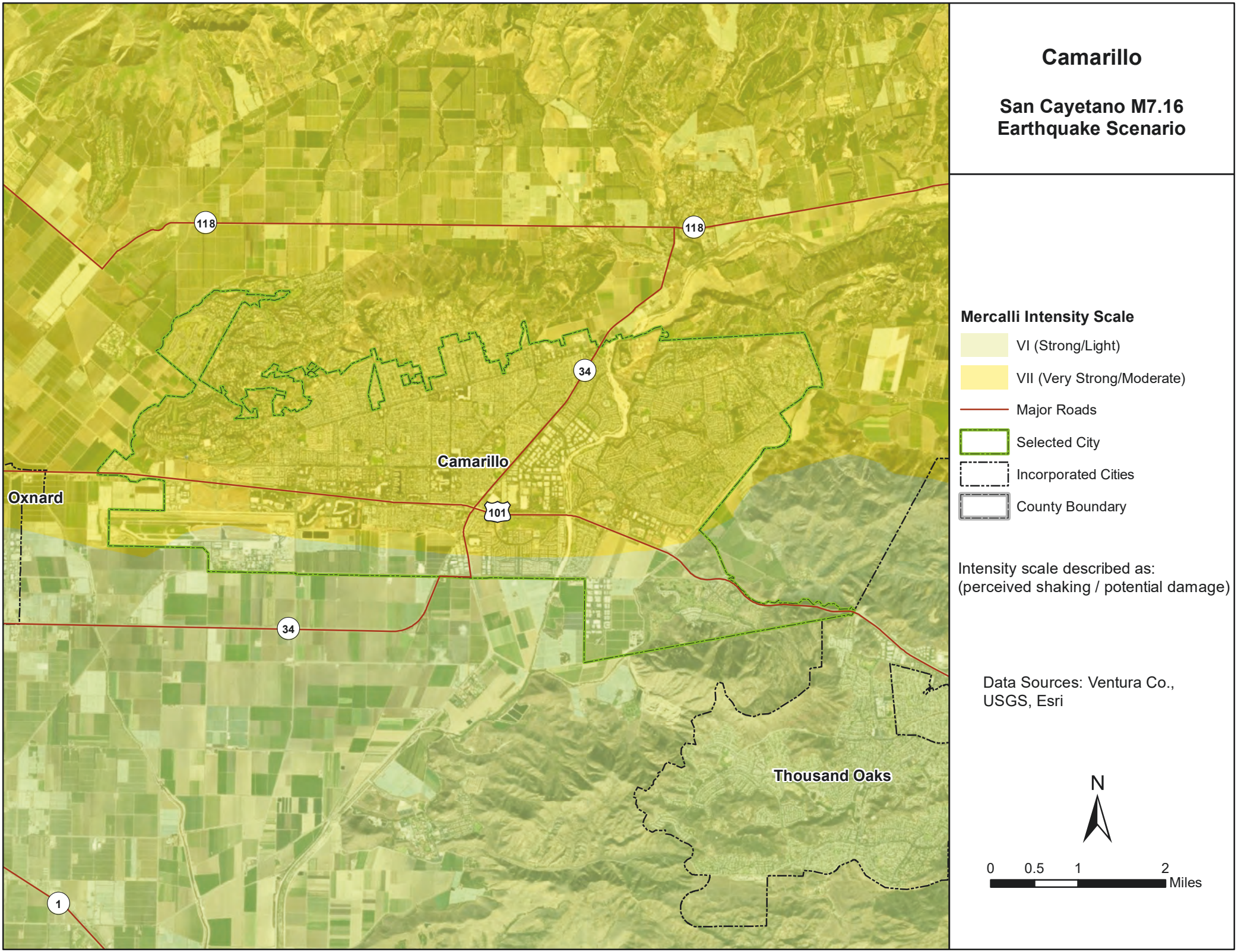
Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.5 1 2 Miles


Camarillo
Pitas Point M7.12
Earthquake Scenario
Mercalli Intensity Scale
VI (Strong/Light)
VII (Very Strong/Moderate)
VIII (Severe/Moderate-Heavy)
Major Roads
Selected City
Incorporated Cities
County Boundary
Intensity scale described as:
(perceived shaking / potential damage)
Data Sources: Ventura Co., USGS, Esri
N
0 0.5 1 2
Miles
Camarillo
Oxnard
Thousand Oaks
118
118
34
101
34
1


Camarillo
San Cayetano M7.16
Earthquake Scenario
Mercalli Intensity Scale
VI (Strong/Light)
VII (Very Strong/Moderate)
Major Roads
Selected City
Incorporated Cities
County Boundary
Intensity scale described as:
(perceived shaking / potential damage)
Data Sources: Ventura Co., USGS, Esri
N
0 0.5 1 2
Miles
118
118
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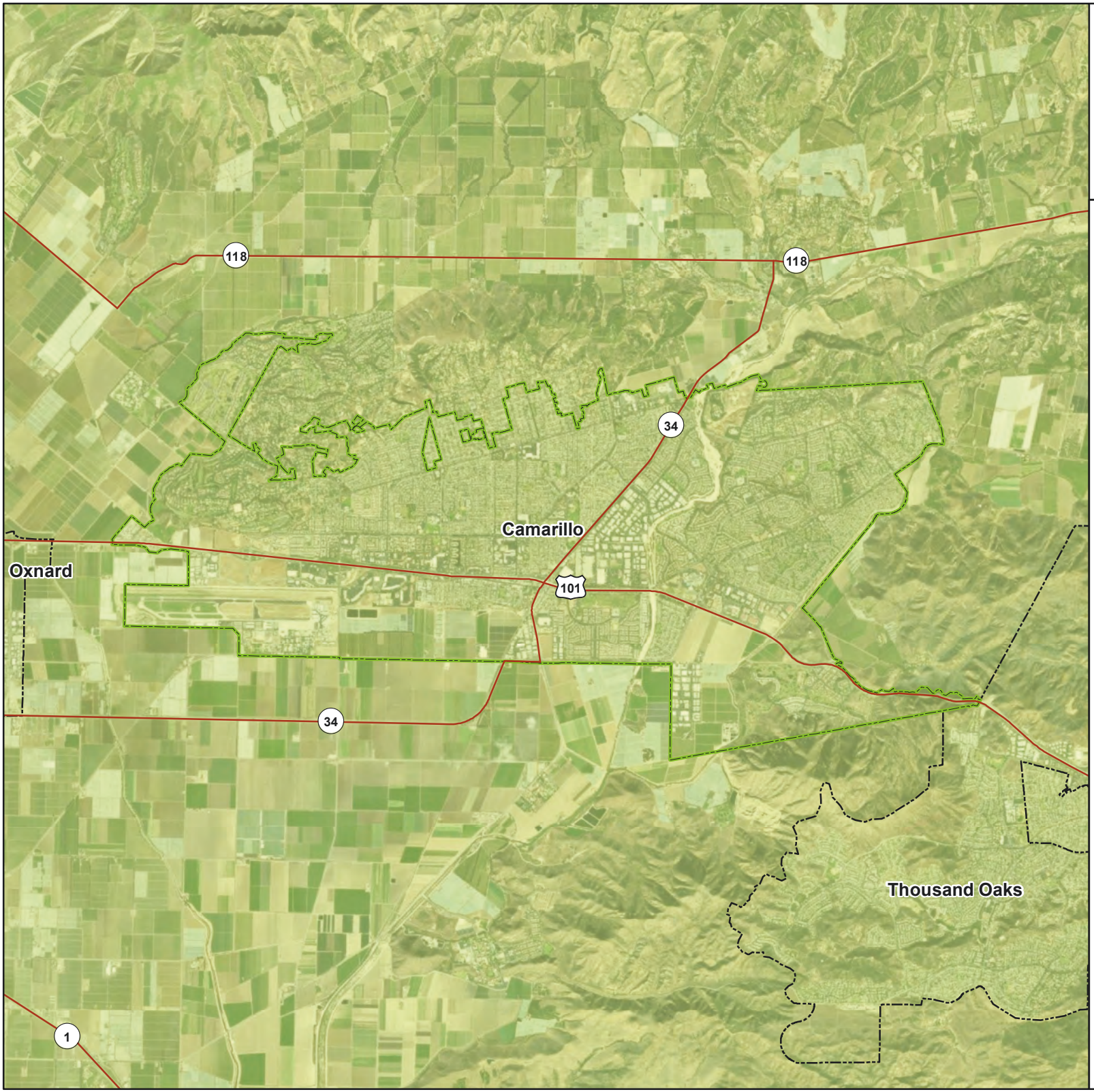
101
34
1
Camarillo
Oxnard
Thousand Oaks



Camarillo

S. San Andreas M8.03 Earthquake Scenario

Mercalli Intensity Scale

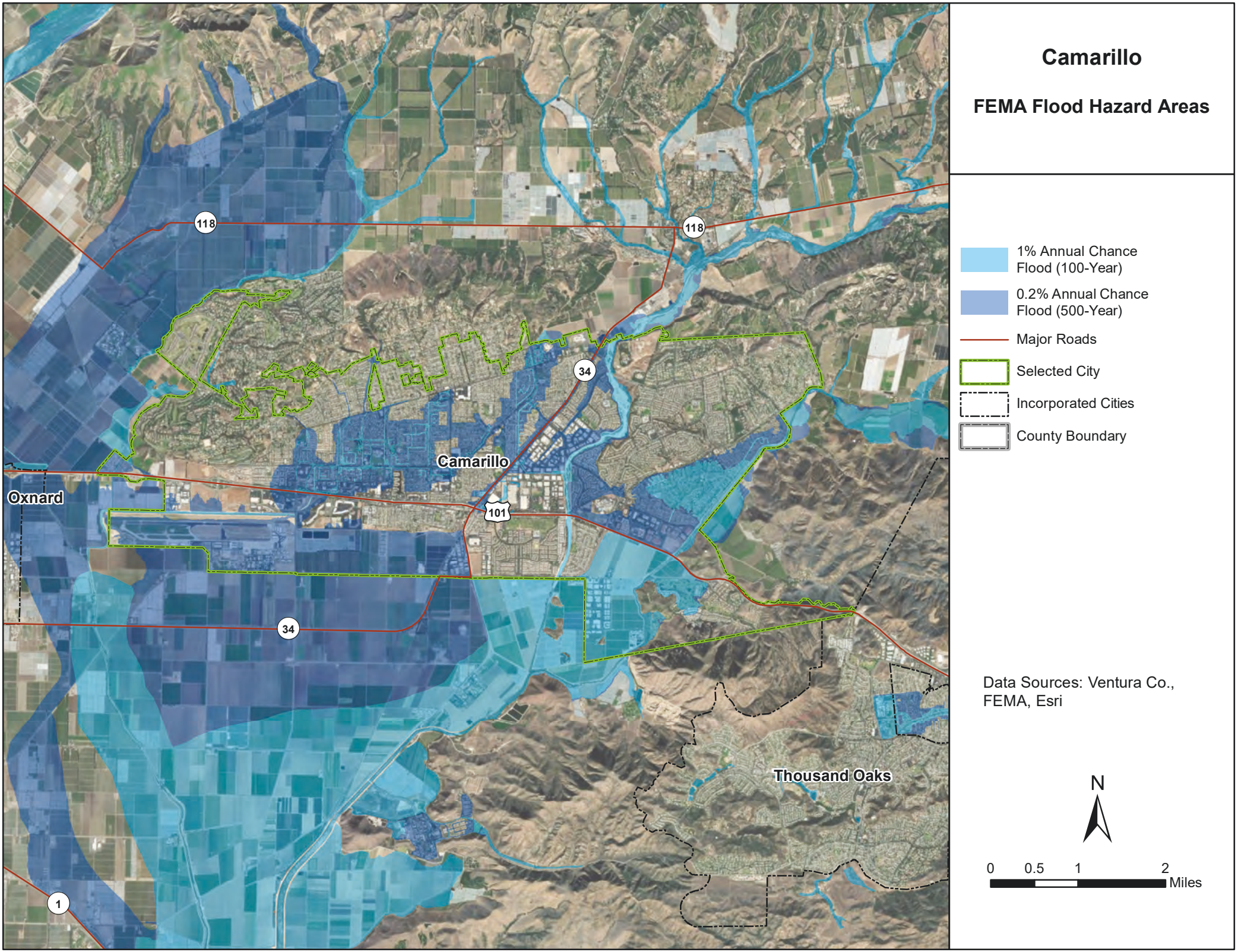
- VI (Strong/Light)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

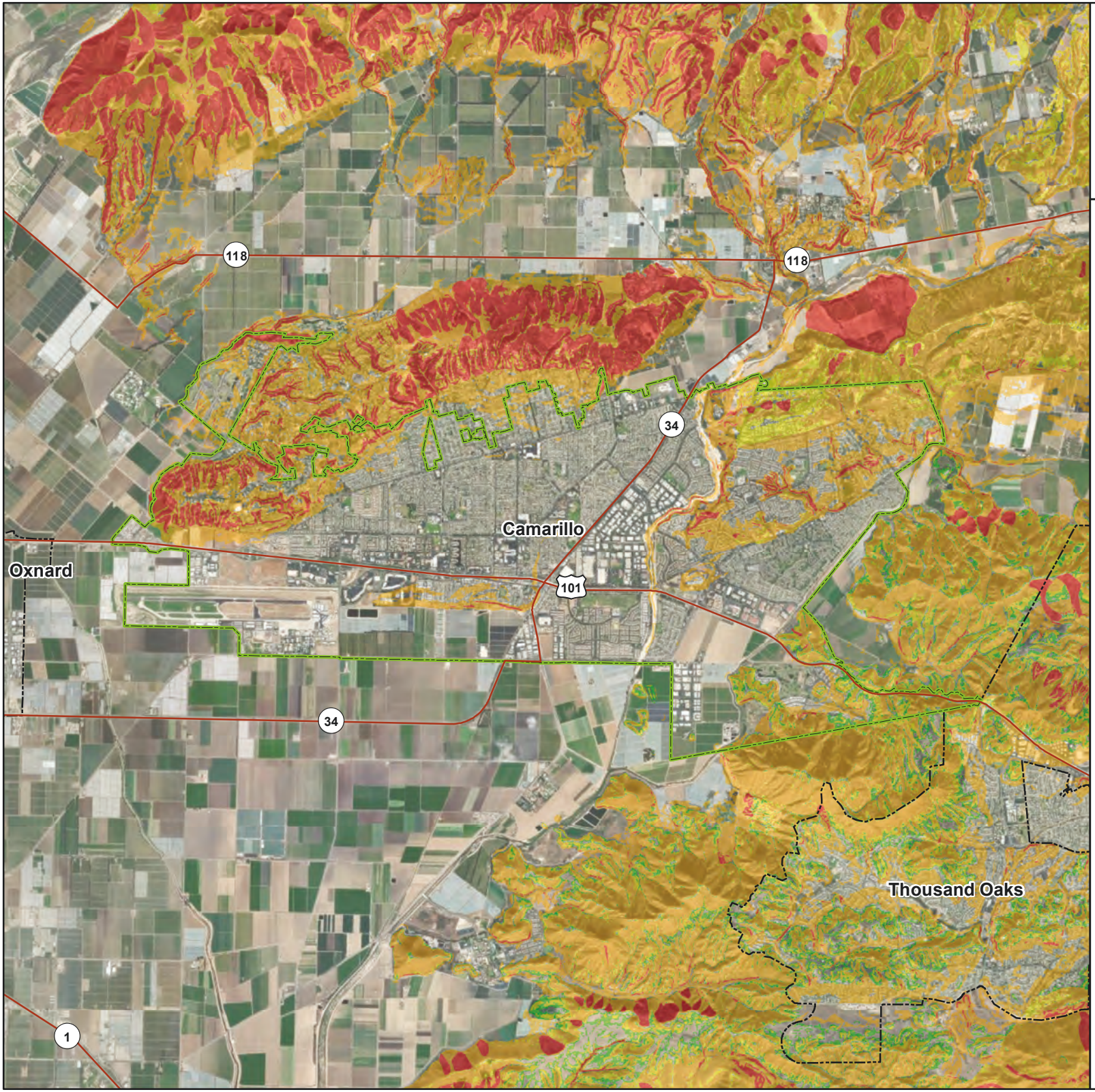
Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.5 1 2 Miles


Camarillo
FEMA Flood Hazard Areas
1% Annual Chance Flood (100-Year)
0.2% Annual Chance Flood (500-Year)
Major Roads
Selected City
Incorporated Cities
County Boundary
Data Sources: Ventura Co., FEMA, Esri
N
0 0.5 1 2
Miles
Camarillo
Oxnard
Thousand Oaks
118
34
101
1



Camarillo

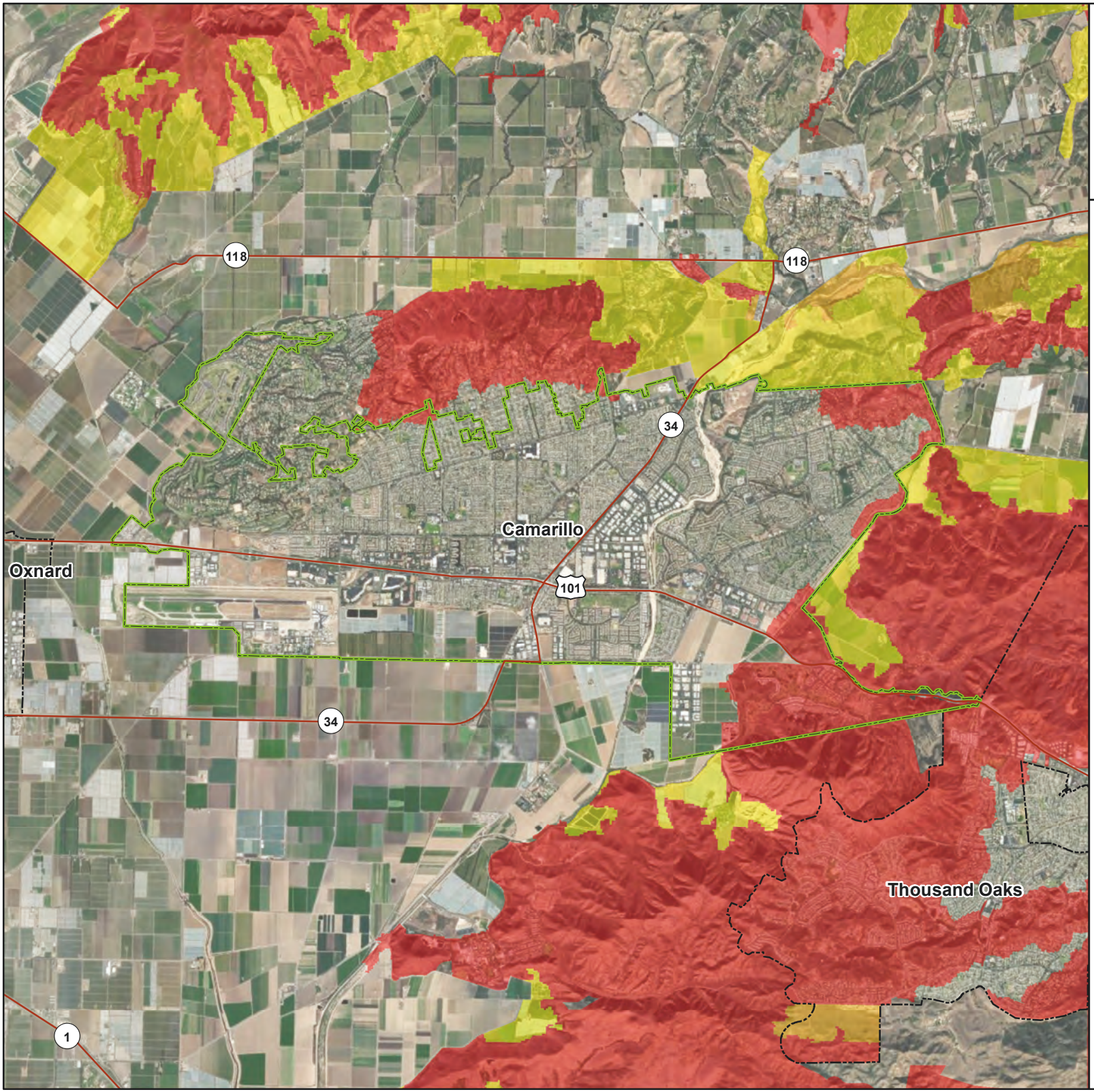
Susceptibility to Deep-Seated Landslides

- Low
- Moderate
- High
- Very High
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Data Sources: Ventura Co., CGS, Esri

N

0 0.5 1 2 Miles



Camarillo

Wildfire Hazard Severity Zones

- Moderate
- High
- Very High
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Data Sources: Ventura Co., CAL FIRE, Esri

N

0 0.5 1 2 Miles

3. CITY OF FILLMORE

3.1 LOCAL HAZARD MITIGATION PLANNING TEAM

Primary Point of Contact
D. Keith Gurrola, Fire Chief
250 Central Ave
Fillmore, CA 93015
805-524-1500
keithg@fillmoreca.gov

Alternate Point of Contact
David Rowlands, City Manager
250 Central Ave
Fillmore, CA 93015
805-524-1500
drowlands@fillmoreca.gov

This annex was developed by the local hazard mitigation planning team, whose members are listed in Table 3-1.

Table 3-1. Local Mitigation Planning Team Members

Name	Title
D. Keith Gurrola	Fire Chief
David Rowlands	City Manager
Kevin McSweeney	City Planning Director
Ines Ebell	Planning Department Admin Assistant

3.2 JURISDICTION PROFILE

3.2.1 Location and Features

The City of Fillmore is in the western portion of the County of Ventura, California.

The current boundaries generally extend from the Santa Clara River going north, the Sespe Creek going east, slightly east of Pole Creek going west and the northern city boundary is the start of the foothills to the Los Padres National Forest. Fillmore is bordered on three sides by waterways, encompassing an area of 4.3 square miles.

Fillmore is located in the historic Santa Clara River Valley which is primarily all agricultural land, used to grow a wide variety of fair weather crops. As mentioned, the City is bordered by three separate waterways and open wildlands to the north

3.2.2 History

The City of Fillmore was incorporated in 1914. The town was established in the late 1800s and was known primarily as a railroad stop for travelers. With its fertile soils, the town quickly became an agricultural community. Oil was discovered years later in the hills that surround the Community and Fillmore started supporting businesses associated with oil production and support services. With the decline of the oil industry, Fillmore was able to diversify with light industry. The agricultural image of Fillmore has never gone away and is still quite robust. Fillmore is now known as a "bedroom community" where the majority of its working class residents commute to other near-by cities to work.

3.2.3 Governing Body Format

The City of Fillmore is governed by a Council–Manager form of government.

The Fillmore City Council assumes responsibility for the adoption of this plan; the Fillmore City Manager will oversee its implementation through the oversight of the various City Departments.

3.3 CURRENT TRENDS

3.3.1 Population

According to the California Department of Finance, the population of the City of Fillmore as of January 2020 was 15,566. Since 2010, the population has grown at an average annual rate of 0.37 percent.

3.3.2 Development

General development, overall has been primarily single family dwellings with an occasional multi-family unit. An industrial business park has had only one project developed. Currently there are several plans for in-fill of multi-family structures.

Table 3-2 summarizes development trends in the period since the preparation of the previous hazard mitigation plan, as well as expected future development trends.

3.4 CAPABILITY ASSESSMENT

This section describes an assessment of existing capabilities for implementing hazard mitigation strategies. The introduction at the beginning of this volume of the hazard mitigation plan describes the components included in the capability assessment and their significance for hazard mitigation planning.

Findings of the capability assessment were reviewed to identify opportunities to expand, initiate or integrate capabilities to further hazard mitigation goals and objectives. Where such opportunities were identified and determined to be feasible, they are included in the action plan. The "Analysis of Mitigation Actions" table in this annex identifies these as community capacity building mitigation actions.

Table 3-2. Recent and Expected Future Development Trends

Criterion	Response					
Has your jurisdiction annexed any land since the preparation of the previous hazard mitigation plan? • **If yes, give the estimated area annexed and estimated number of parcels or structures.**	Yes 3 acres, 0 structures					
Is your jurisdiction expected to annex any areas during the performance period of this plan?	No					
Are any areas targeted for development or major redevelopment in the next five years? • **If yes, briefly describe, including whether any of the areas are in known hazard risk areas**	Yes Industrial Park, no known hazard areas					
How many permits for new construction were issued in your jurisdiction since the preparation of the previous hazard mitigation plan?		**2016**	**2017**	**2018**	**2019**	**2020**
	Single Family	30	73	19	124	133
	Multi-Family	0	0	0	0	0
	Other (commercial, mixed use, etc.)	0	1	0	0	0
	Total	**30**	**74**	**19**	**124**	**133**
Provide the number of new-construction permits for each hazard area or provide a qualitative description of where development has occurred.	All of the permits issued were in the flood hazard area. There was no new development in the wildland-urban interface zone.					
Describe the level of buildout in the jurisdiction, based on your jurisdiction's buildable lands inventory. If no such inventory exists, provide a qualitative description.	85%					

The findings of the assessment are presented as follows:

- An assessment of planning and regulatory capabilities is presented in Table 3-3.
- Development and permitting capabilities are presented in Table 3-4.
- An assessment of fiscal capabilities is presented in Table 3-5.
- An assessment of administrative and technical capabilities is presented in Table 3-6.
- An assessment of education and outreach capabilities is presented in Table 3-7.
- Information on National Flood Insurance Program (NFIP) compliance is presented in Table 3-8.
- Classifications under various community mitigation programs are presented in Table 3-9.
- The community's adaptive capacity for the impacts of climate change is presented in Table 3-10.

Table 3-3. Planning and Regulatory Capability

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity?
Codes, Ordinances, & Requirements				
Building Code	Yes	Yes	Yes	Yes
Comment: *2019 CA Building Code, (Ord. No. 20-925, § 2, 1-28-2020)*				
Zoning Code	Yes	No	Yes	Yes
Comment: *Chapter 6.04, (Ord. No. 19-904, § 1, 3-26-2019)*				
Subdivisions	Yes	No	Yes	No
Comment: *Chapter 6.08, (Ord 467 § 1 (part), 1975)*				
Stormwater Management	Yes	No	Yes	Yes
Comment: *Chapter 8.06, (Ord. No. 14-845, §§ 2, 3, 2-25-2014)*				
Post-Disaster Recovery	Yes	No	Yes	Yes
Comment: *1994 City of Fillmore Zoning Code, County of Ventura Disaster Management Plan*				
Real Estate Disclosure	No	Yes	Yes	Yes
Comment: *California State Civil Code 1102 requires full disclosure on natural hazard exposure of the sale/re-sale of any and all real property. 1994 City of Fillmore Zoning Code*				
Growth Management	Yes	Yes	No	Yes
Comment: *Chapter 6.09 (Ord. 509 § 1 (part), 1980), County Green Belt Agreement Ventura County Ordinance No. 4512 (Adopted November 7, 2017)*				
Site Plan Review	Yes	No	Yes	Yes
Comment: *Chapter 6.08, Title IV (Ord. 467 § 1 (part), 1975)*				
Environmental Protection	Yes	No	Yes	Yes
Comment: *Chapter 6.08.070 (Ord. 467 § 1 (part), 1975)*				
Flood Damage Prevention	Yes	No	Yes	Yes
Comment: *Chapter 6.16 (Ord. 602 § 1 (part), 1988)*				
Emergency Management	Yes	No	Yes	Yes
Comment: *Chapter 15.04.050 (Ord. 401 § 5, 1971)*				
Climate Change	No	No	No	No
Comment: *None*				
Planning Documents				
General Plan	Yes	No	Yes	Yes
Is the plan compliant with Assembly Bill 2140? *No* ***Comment:*** *2003 Plan Needs Updating*				
Capital Improvement Plan	Yes	No	Yes	Yes
How often is the plan updated? *Every 5 Years* ***Comment:*** *City of Fillmore*				
Disaster Debris Management Plan	No	Yes	Yes	Yes
Comment: *Ventura County Disaster Recovery Plan, Adopted by BOS in April 2019*				
Floodplain or Watershed Plan	Yes	No	Yes	Yes
Comment: *City of Fillmore participates in the National Flood Insurance Program (NFIP)*				
Stormwater Plan	No	No	No	No
Comment: *None*				
Urban Water Management Plan	Yes	No	Yes	Yes
Comment: *City of Fillmore 2015 Urban Water Management Plan*				
Habitat Conservation Plan	No	No	No	No
Comment: *None*				

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity?
Economic Development Plan	Yes	No	No	No
Comment: *Economic Development Collaborative of Ventura County Partnership*				
Shoreline Management Plan	No	No	No	No
Comment: *N/A*				
Community Wildfire Protection Plan	No	No	No	No
Comment: *None*				
Forest Management Plan	No	No	No	No
Comment: *N/A*				
Climate Action Plan	No	No	No	No
Comment: *None*				
Emergency Operations Plan	Yes	Yes	Yes	Yes
Comment: *City of Fillmore Emergency Operations Plan (EOP)*				
Threat & Hazard Identification & Risk Assessment (THIRA)	No	No	No	No
Comment: *None*				
Post-Disaster Recovery Plan	Yes	No	Yes	Yes
Comment: *Covered in the EOP*				
Continuity of Operations Plan	Yes	No	No	Yes
Comment: *Covered in the EOP*				
Public Health Plan	No	Yes	Yes	Yes
Comment: *County of Ventura Health Care Agency Public Health Emergency Response Plan (ERP)*				

Table 3-4. Development and Permitting Capability

Criterion	Response
Does your jurisdiction issue development permits?	Yes
If no, who does? If yes, which department? Planning, Building, Fire	
Does your jurisdiction have the ability to track permits by hazard area?	Yes
Does your jurisdiction have a buildable lands inventory?	Yes

Table 3-5. Fiscal Capability

Financial Resource	Accessible or Eligible to Use?
Community Development Block Grants	Yes
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for Specific Purposes	Yes
User Fees for Water, Sewer, Gas or Electric Service	Yes
If yes, specify: All utilities	
Incur Debt through General Obligation Bonds	Yes
Incur Debt through Special Tax Bonds	Yes
Incur Debt through Private Activity Bonds	No
Withhold Public Expenditures in Hazard-Prone Areas	Yes
State-Sponsored Grant Programs	Yes
Development Impact Fees for Homebuyers or Developers	Yes
Other	Yes (Maintenance Assessment Districts)

Table 3-6. Administrative and Technical Capability

Staff/Personnel Resource	Available?
Planners or engineers with knowledge of land development and land management practices ***If Yes, Department /Position:*** Planning, Engineering	Yes
Engineers or professionals trained in building or infrastructure construction practices ***If Yes, Department /Position:*** Planning, Engineering	Yes
Planners or engineers with an understanding of natural hazards ***If Yes, Department /Position:*** Planning, Engineering	Yes
Staff with training in benefit-cost analysis ***If Yes, Department /Position:*** Planning, Engineering, Finance	Yes
Surveyors ***If Yes, Department /Position:*** Engineering	Yes
Personnel skilled or trained in GIS applications ***If Yes, Department /Position:*** Engineering	Yes
Scientist familiar with natural hazards in local area	No
Emergency manager ***If Yes, Department /Position:*** Fire	Yes
Grant writers ***If Yes, Department /Position:*** Finance, Fire	Yes

Table 3-7. Education and Outreach Capability

Criterion	Response
Do you have a public information officer or communications office?	Yes
Do you have personnel skilled or trained in website development?	Yes
Do you have hazard mitigation information available on your website? ***If yes, briefly describe:*** Both the Police and Fire Department websites contain information.	Yes
Do you use social media for hazard mitigation education and outreach? ***If yes, briefly describe:*** Yes, the major providers are all used for information sharing	Yes
Do you have any citizen boards or commissions that address issues related to hazard mitigation?	No
Do you have any other programs in place that could be used to communicate hazard-related information? ***If yes, briefly describe:*** The City participates with County OES to disseminate emergency information	Yes
Do you have any established warning systems for hazard events? ***If yes, briefly describe:*** Yes, we utilize County OES along with neighborhood notification via Police/Fire	Yes

Table 3-8. National Flood Insurance Program Compliance

Criterion	Response
What local department is responsible for floodplain management?	Engineering
Who is your floodplain administrator? (department/position)	Engineering
Are any certified floodplain managers on staff in your jurisdiction?	No
What is the date that your flood damage prevention ordinance was last amended?	1998
Does your floodplain management program meet or exceed minimum requirements?	Meets
When was the most recent Community Assistance Visit or Community Assistance Contact?	unknown

Criterion	Response
Does your jurisdiction have any outstanding NFIP compliance violations that need to be addressed? ***If so, state what they are.***	No
Are any RiskMAP projects currently underway in your jurisdiction?	No
Do your flood hazard maps adequately address the flood risk within your jurisdiction? ***If no, state why.***	Yes
Does your floodplain management staff need any assistance or training to support its floodplain management program?	No
Does your jurisdiction participate in the Community Rating System (CRS)? ***If no, is your jurisdiction interested in joining the CRS program?*** Unknown, would have to learn more	No
How many flood insurance policies are in force in your jurisdiction?[a] ***What is the insurance in force?*** $22,517,800 ***What is the premium in force?*** $34,315	74
How many total loss claims have been filed in your jurisdiction?[a] ***What were the total payments for losses?*** $226,509	37

a. According to FEMA statistics as of March 31, 2021

Table 3-9. Community Classifications

	Participating?	Classification	Date Classified
FIPS Code	Yes	0611124092	N/A
DUNS #	Yes	363056201	N/A
Community Rating System	No	N/A	N/A
Building Code Effectiveness Grading Schedule	No	N/A	N/A
Public Protection	Yes	04/4X	2018
Storm Ready	No	N/A	N/A
Firewise	No	N/A	N/A
Tsunami Ready	No	N/A	N/A

Table 3-10. Adaptive Capacity for Climate Change

Criterion	Jurisdiction Rating[a]
Technical Capacity	
Jurisdiction-level understanding of potential climate change impacts ***Comment:*** *Members of City Staff participate in local, regional, state and national committees*	High
Jurisdiction-level monitoring of climate change impacts ***Comment:*** *Members of City Staff participate in local, regional, state and national committees*	High
Technical resources to assess proposed strategies for feasibility and externalities ***Comment:*** *Through committee contacts, unlimited to access via internet*	High
Jurisdiction-level capacity for development of greenhouse gas emissions inventory ***Comment:*** *Fillmore is a small geographical city with specifically known sources of emission*	High
Capital planning and land use decisions informed by potential climate impacts ***Comment:*** *Fillmore implements an extensive review process, the total number of projects are manageable*	High
Participation in regional groups addressing climate risks ***Comment:*** *City Staff participates at many levels*	High

Criterion	Jurisdiction Rating[a]
Implementation Capacity	
Clear authority/mandate to consider climate change impacts during public decision-making processes ***Comment:*** *Planning Commission and City Council advocate*	High
Identified strategies for greenhouse gas mitigation efforts ***Comment:*** *Currently addressing vehicle exhaust emissions*	Low
Identified strategies for adaptation to impacts ***Comment:*** *Costs effectiveness*	Medium
Champions for climate action in local government departments ***Comment:*** *Looking at opportunities for all new vehicles and equipment*	Medium
Political support for implementing climate change adaptation strategies ***Comment:*** *All levels of decision making are to embrace*	Medium
Financial resources devoted to climate change adaptation ***Comment:*** *Looking for grants, new purchases*	Medium
Local authority over sectors likely to be negative impacted ***Comment:*** *The City has full authority over all Departments*	High
Public Capacity	
Local residents' knowledge of and understanding of climate risk ***Comment:***	Low
Local residents' support of adaptation efforts ***Comment:*** *General support, no negative reports*	Medium
Local residents' capacity to adapt to climate impacts ***Comment:*** *General support, no negative reports*	Medium
Local economy current capacity to adapt to climate impacts ***Comment:*** *Limited impact in short term*	Medium
Local ecosystems capacity to adapt to climate impacts ***Comment:*** *Limited impact in short term, some impact from agriculture*	Medium

a. High = Capacity exists and is in use; Medium = Capacity may exist, but is not used or could use some improvement; Low = Capacity does not exist or could use substantial improvement; Unsure= Not enough information is known to assign a rating.

3.5 INTEGRATION REVIEW

For hazard mitigation planning, "integration" means that hazard mitigation information is used in other relevant planning mechanisms, such as general planning and capital facilities planning, and that relevant information from those sources is used in hazard mitigation. This section identifies where such integration is already in place, and where there are opportunities for further integration in the future. Resources listed at the end of this annex were used to provide information on integration. The progress reporting process described in Volume 1 of the hazard mitigation plan will document the progress of hazard mitigation actions related to integration and identify new opportunities for integration.

3.5.1 Existing Integration

Some level of integration has already been established between local hazard mitigation planning and the following other local plans and programs:

- Fillmore Municipal Code

- Developer Impact Fees
- 1994 City of Fillmore Zoning Code
- 2015 County of Ventura Disaster Management Plan
- General Plan Land Use Element 2005

3.5.2 Opportunities for Future Integration

The capability assessment in this annex indicates opportunities to integrate this mitigation plan with other jurisdictional planning/regulatory capabilities. Capabilities were identified as integration opportunities if they can support or enhance the actions identified in this plan or be supported or enhanced by components of this plan. The capability assessment identified the following plans and programs that do not currently integrate hazard mitigation information but provide opportunities to do so in the future:

- Central Ventura County Regional Fire Safe Council Wildland Fire Mitigation Plan
- City of Fillmore Capital Improvement Plan 2021

Taking action to integrate each of these programs with the hazard mitigation plan was considered as a mitigation action to include in the action plan in this annex.

3.6 RISK ASSESSMENT

3.6.1 Jurisdiction-Specific Natural Hazard Event History

Table 3-11 lists past occurrences of natural hazards for which specific damage was recorded in this jurisdiction Other hazard events that broadly affected the entire planning area, including this jurisdiction, are listed in the risk assessments in Volume 1 of this hazard mitigation plan.

3.6.2 Hazard Risk Ranking

Table 3-12 presents a local ranking of all hazards of concern for which this hazard mitigation plan provides complete risk assessments. As described in detail in Volume 1, the ranking process involves an assessment of the likelihood of occurrence for each hazard, along with its potential impacts on people, property, and the economy. Mitigation actions primarily target hazards with high and medium rankings.

3.6.3 Jurisdiction-Specific Vulnerabilities

Volume 1 of this hazard mitigation plan provides complete risk assessments for each identified hazard of concern. This section provides information on a few key vulnerabilities for this jurisdiction. Available jurisdiction-specific risk maps of the hazards are provided at the end of this annex.

Table 3-11. Past Natural Hazard Events

Type of Event	FEMA Disaster #	Date	Damage Assessment
COVID-19 Pandemic	DR-4482	Jan 20, 2020-current	N/A
Thomas Fire	FM-5302	Dec 4, 2017-Jan 2018	No structural damage, but air quality issues and provided mutual aid. Opened evacuation centers at the high school and the recreation facility.
Guiberson Fire	FM-2839	Sept 2009	No structural damage, but air quality issues and provided mutual aid.
Day Fire	FM-2677	Sept 2006	No structural damage, but air quality issues and provided mutual aid.
Wildfires	DR-1498	Oct 2003	No structural damage, but air quality issues and provided mutual aid.
Severe Fires	EM-3120	Oct 1996	No structural damage, but air quality issues and provided mutual aid.
Winter Storm	DR-1046	Feb 1995	Economic impacts affecting agricultural packinghouses
Northridge Earthquake	DR-1008	Jan 1994	$50 million in damage and building inspectors red-tagged about 200 buildings and homes as too dangerous to inhabit.
Severe Storm	DR-935	Feb, 1992	N/A
Severe Storm	DR-615	Jan 1980	N/A
Flooding	DR-547	Feb 1978	Evacuations
Sylmar Earthquake	N/A	Feb 9, 1971	N/A
Brush Fires	DR-295	Sept 1970	Packing house within the city limits burned, but may have been an arson of opportunity.
Flooding	DR-253	Jan 1969	Evacuations
Flooding	N/A	Numerous pre 1964	N/A
St Francis Dam Disaster		March 12, 1928	$7 Million (1928)—Inundation of nearly the entire city, flooding, debris flows, destruction of infrastructure, high loss of life

Table 3-12. Hazard Risk Ranking

Rank	Hazard	Risk Ranking Score	Risk Category
1	Dam Failure	36	High
2	Earthquake	32	Medium
3	Severe Storm	24	Medium
4	Severe Weather	24	Medium
5	Wildfire	18	Medium
6	Flooding	18	Medium
7	Landslide	18	Medium
8	Drought	9	Low

Repetitive Loss Properties

Repetitive loss records are as follows:

- Number of FEMA-identified Repetitive-Loss Properties: 0
- Number of FEMA-identified Severe-Repetitive-Loss Properties: 0
- Number of Repetitive-Loss Properties or Severe-Repetitive-Loss Properties that have been mitigated: 0

Other Noted Vulnerabilities

The following jurisdiction-specific issues have been identified based on a review of the results of the risk assessment, public involvement strategy, and other available resources: N/A

- Two large-scale evacuations due to hazardous material fires. Both events triggered evacuations of 25 percent of the city's population.
- City recreation facility is used as an evacuation center but lacks showers.

Mitigation actions addressing these issues were prioritized for consideration in the action plan in this annex.

3.7 STATUS OF PREVIOUS PLAN ACTIONS

Table 3-13 summarizes the actions that were recommended in the previous version of the hazard mitigation plan and their implementation status at the time this update was prepared.

Table 3-13. Status of Previous Plan Actions

Action Item	Completed	Removed; No Longer Feasible	Carried Over to Plan Update: Check if Yes	Carried Over to Plan Update: Action # in Update
F 1—Construction of Pole Creek Debris Basin. The basin is awaiting Ventura County Watershed District approval for improvements to Final and to accept construction. The Basin will accept mud and debris flow from the Pole Creek watershed in a 100 year rain event and protect all future homes in the Heritage Valley Parks Specific Plan consisting of 750 residential units. The debris basin project includes levees, basin maintenance roads and water flow to the Santa Clara River. The Basin is proposed to be owned and operated by Ventura County Water Shed Protection District.	✓			
Comment: The Basin was completed in 2009, it is maintained by the Developer until Ventura County Watershed accepts				
F 2—Completion of the Heritage Valley Parks Levees. Over 1.5 miles of soil cement levee was constructed for protection of a 100 year storm and water flow from the Santa Clara River. Parks and streets about the levee in order to avoid any emergency conflict with proposed residential units. The Levee system protects the 750 proposed residential units in the Heritage Valley Parks Specific Plan and a proposed 110 condominium project proposed by KB Homes.	✓			
Comment: The levee was completed in 2006 but not yet certified, awaiting final construction of the last few remaining residential units				
F 3—Completion of the Lower Sespe Creek Levee. A ½ mile in length soil cement levee was constructed south of Hwy 23 to protect the newly constructed Water Recycling Plant and protect the future Business Park Master Plan.	✓			
Comment: This levee was completed in 2008 from Hy 126 south to the City limits				
F 4—Completion of the Central Avenue Storm Drain. A large storm drain was installed in Central Ave to protect the Central Business District from floods that historically threatened downtown.	✓			
Comment: This storm drain project was completed in 2008 and drains into the Santa Clara River, improvements will be made on last 100 yards				
F 5—Continue to monitor the need to demolish abandoned and dilapidated buildings.	✓			
Comment: This is an ongoing project, numerous buildings have been demolished, looking for opportunities as they present themselves for additional structures				

3.8 HAZARD MITIGATION ACTION PLAN

Table 3-14 lists the identified actions, which make up the hazard mitigation action plan for this jurisdiction. Table 3-15 identifies the priority for each action. Table 3-16 summarizes the mitigation actions by hazard of concern and mitigation type.

Table 3-14. Hazard Mitigation Action Plan Matrix

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action FIL-1—Where appropriate, support retrofitting, purchase or relocation of structures located in hazard areas, prioritizing those that have experienced repetitive losses and/or are located in high- or medium-risk hazard areas.						
Hazards Mitigated:	Dam Failure, Earthquake, Severe Storm, Severe Weather, Wildfire, Flooding, Landslide					
Existing	2, 6, 9, 10, 11	Public Works.	Community Development	High	Grant Funding-FEMA HMA (BRIC, FMA, HMGP)	Short-term
Action FIL-2—Integrate the hazard mitigation plan into other plans, ordinances and programs that dictate land use decisions in the community.						
Hazards Mitigated:	Dam Failure, Earthquake, Severe Storm, Severe Weather, Wildfire, Flooding, Landslide, Drought					
New & Existing	1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 17, 19	Community Development	Public Works	Low	Staff Time, General Funds	Ongoing
Action FIL-3—Actively participate in the plan maintenance protocols outlined in Volume 1 of this hazard mitigation plan.						
Hazards Mitigated:	Dam Failure, Earthquake, Severe Storm, Severe Weather, Wildfire, Flooding, Landslide, Drought					
New & Existing	1, 2, 4, 6, 7, 8, 9, 11, 12, 13, 14, 15	Public Works	Community Development	Low	Staff Time, General Funds	Short-term
Action FIL-4—Continue to maintain good standing and compliance under the NFIP through implementation of floodplain management programs that, at a minimum, meet the NFIP requirements: • Enforce the flood damage prevention ordinance. • Participate in floodplain identification and mapping updates. • Provide public assistance/information on floodplain requirements and impacts.						
Hazards Mitigated:	Flooding					
New & Existing	1, 2, 6, 7, 17	Public Works	Community Development	Low	Staff Time, General Funds	Ongoing
Action FIL-5—Identify and pursue strategies to increase adaptive capacity to climate change.						
Hazards Mitigated:	Severe Storm, Severe Weather, Wildfire, Flooding, Drought					
New & Existing	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 19	Community Development	Public Works	Low	Staff Time, General Funds, Grant Funding-FEMA HMA (BRIC, FMA, HMGP)	Short-term
Action FIL-6—Purchase generators for critical facilities and infrastructure that lack adequate backup power.						
Hazards Mitigated:	Dam Failure, Earthquake, Severe Storm, Severe Weather, Wildfire, Flooding, Landslide					
Existing	2, 19	Public Works	Community Development	High	Grant Funding-FEMA HMA (BRIC and HMGP)	Short-term
Action FIL-7—Study feasibility of developing a resilience hub in the city to provide the resources residents need to enhance their own individual capacity while also supporting and strengthening the community before and during a disaster event.						
Hazards Mitigated:	Dam Failure, Earthquake, Severe Storm, Severe Weather, Wildfire, Flooding, Landslide					
New	2, 3, 7, 8, 12, 17	Community Development		High	Staff Time, General Funds, Grant Funding-FEMA HMA (BRIC, FMA, HMGP)	Short-term

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action FIL-8—Study feasibility of developing an alternative Emergency Operations Center (EOC) location to use during a disaster.						
Hazards Mitigated: Earthquake, Severe Storm, Severe Weather, Wildfire, Flooding, Terrorism						
New	2, 3, 7, 8, 12, 17	Community Development		High	Staff Time, Grant Funding-FEMA HMA (BRIC, FMA, HMGP)	Long-term
Action FIL-9—Hardening of the City Water Delivery System and computerized upgrade.						
Hazards Mitigated: Dam Failure, Severe Storm, Severe Weather, Drought, Wildfire, Flooding, Terrorism						
New	2, 6, 9, 10, 11	Public Works		High	Staff Time, Grant Funding-FEMA HMA (BRIC, FMA, HMGP)	Short-term
Action FIL-10—Continue and enhance the public outreach program for wildfire education and prevention among school children and the general community.						
Hazards Mitigated: Wildfire						
New & Existing	2, 5, 7, 8, 10, 11, 12, 13, 14, 15, 17	Fillmore Fire Department	Fire Safe Council	Low	Staff Time, Fillmore Volunteer Firefighter Foundation, Grant Funding—Edison International Utility Grant	Ongoing
Action FIL-11—Maintain wildfire hazard fuel reduction program for areas that have been identified with overgrown or dead brush, trees and weeds to reduce the potential for tree-to-tree ignition. Ensure that a "maintenance now" component to provide continued fire resistance is part of the program. (Coordinates with VCFPD Action VFP-6)						
Hazards Mitigated: Wildfire						
New & Existing	2, 4, 5, 6, 8, 10, 11, 13, 14, 15, 18, 19	Fillmore Fire Department	CAL FIRE, Ventura County Fire Protection District, Fire Safe Council	Low	FEMA HMA (BRIC, FMAP and HMGP), Staff Time & General Funds	Ongoing

a. Short-term = Completion within 5 years; Long-term = Completion within 10 years; Ongoing= Continuing new or existing program with no completion date

Acronyms used here are defined at the beginning of this volume.

Table 3-15. Mitigation Action Priority

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Cost?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Implementation Priority[a]	Grant Pursuit Priority[a]
1	5	High	High	Yes	Yes	No	Medium	High
2	16	Medium	Low	Yes	No	Yes	High	Low
3	12	Low	Low	Yes	No	Yes	High	Low
4	5	Medium	Low	Yes	No	Yes	High	Low
5	17	Medium	Low	Yes	No	Yes	High	Medium
6	2	High	Medium	Yes	Yes	No	Medium	High
7	6	Medium	High	No	Yes	No	Low	Medium
8	6	Medium	High	No	Yes	No	Low	Medium
9	5	Medium	High	No	Yes	No	Low	Medium
10	11	Medium	Low	Yes	Yes	Yes	High	High
11	12	High	Low	Yes	Yes	Yes	High	High

a. See the introduction to this volume for explanation of priorities.

Table 3-16. Analysis of Mitigation Actions

Hazard Type	Action Addressing Hazard, by Mitigation Type[a]							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilience	Community Capacity Building
High-Risk Hazards								
Dam Failure	FIL-2	FIL-1, 9	FIL-3		FIL-6			FIL-2, 3, 7
Medium-Risk Hazards								
Earthquake	FIL-2	FIL-1	FIL-3		FIL-6			FIL-2, 3, 7, 8
Severe Storm	FIL-2	FIL-1, 9	FIL-3		FIL-6		FIL-5	FIL-2, 3, 7, 8
Severe Weather	FIL-2	FIL-1, 9	FIL-3		FIL-6		FIL-5	FIL-2, 3, 7, 8
Wildfire	FIL-2	FIL-1, 9	FIL-3, 10	FIL-10, 11	FIL-6		FIL-5	FIL-2, 3, 7, 8
Flooding	FIL-2, 4	FIL-1, 9	FIL-3, 4		FIL-6		FIL-5	FIL-2, 3, 4, 7, 8
Landslide	FIL-2	FIL-1	FIL-3		FIL-6			FIL-2, 3, 7
Low-Risk Hazards								
Drought	FIL-2	FIL-9	FIL-3				FIL-5	FIL-2, 3

a. See the introduction to this volume for explanation of mitigation types.

3.9 PUBLIC OUTREACH

Table 3-17 lists public outreach activities for this jurisdiction.

Table 3-17. Local Public Outreach

Local Outreach Activity	Date	Number of People Involved
Disaster preparedness	Every September	500
Earth Day	Every April	500
Hazardous vegetation chipping days	May & September	100
Fire department children education	10 times a year	10,000

3.10 INFORMATION SOURCES USED FOR THIS ANNEX

The following technical reports, plans, and regulatory mechanisms were reviewed to provide information for this annex.

- **City of Fillmore Municipal Code**—The municipal code was reviewed for the full capability assessment and for identifying opportunities for action plan integration.
- **City of Fillmore Flood Damage Prevention Ordinance**—The flood damage prevention ordinance was reviewed for compliance with the National Flood Insurance Program.
- **City of Fillmore General Plan**—The GP was reviewed for the capability assessment.
- **City of Fillmore Capital Improvement Program**—The CIP was reviewed for identifying opportunities for action plan integration.

The following outside resources and references were reviewed:

- **Hazard Mitigation Plan Annex Development Toolkit**—The toolkit was used to support the identification of past hazard events and noted vulnerabilities, the risk ranking, and the development of the mitigation action plan.

Fillmore

Critical Facilities (1 of 2)

Food, Water, Shelter

Safety and Security

Major Roads

Selected City

Incorporated Cities

County Boundary

Data Sources: Ventura Co., VCFD, Casitas MWD, Calleguas MWD, City of Camarillo, CA Energy Commission, Cal Trans, EPA, HIFLD, Esri

N

0 0.175 0.35 0.7 Miles

Fillmore

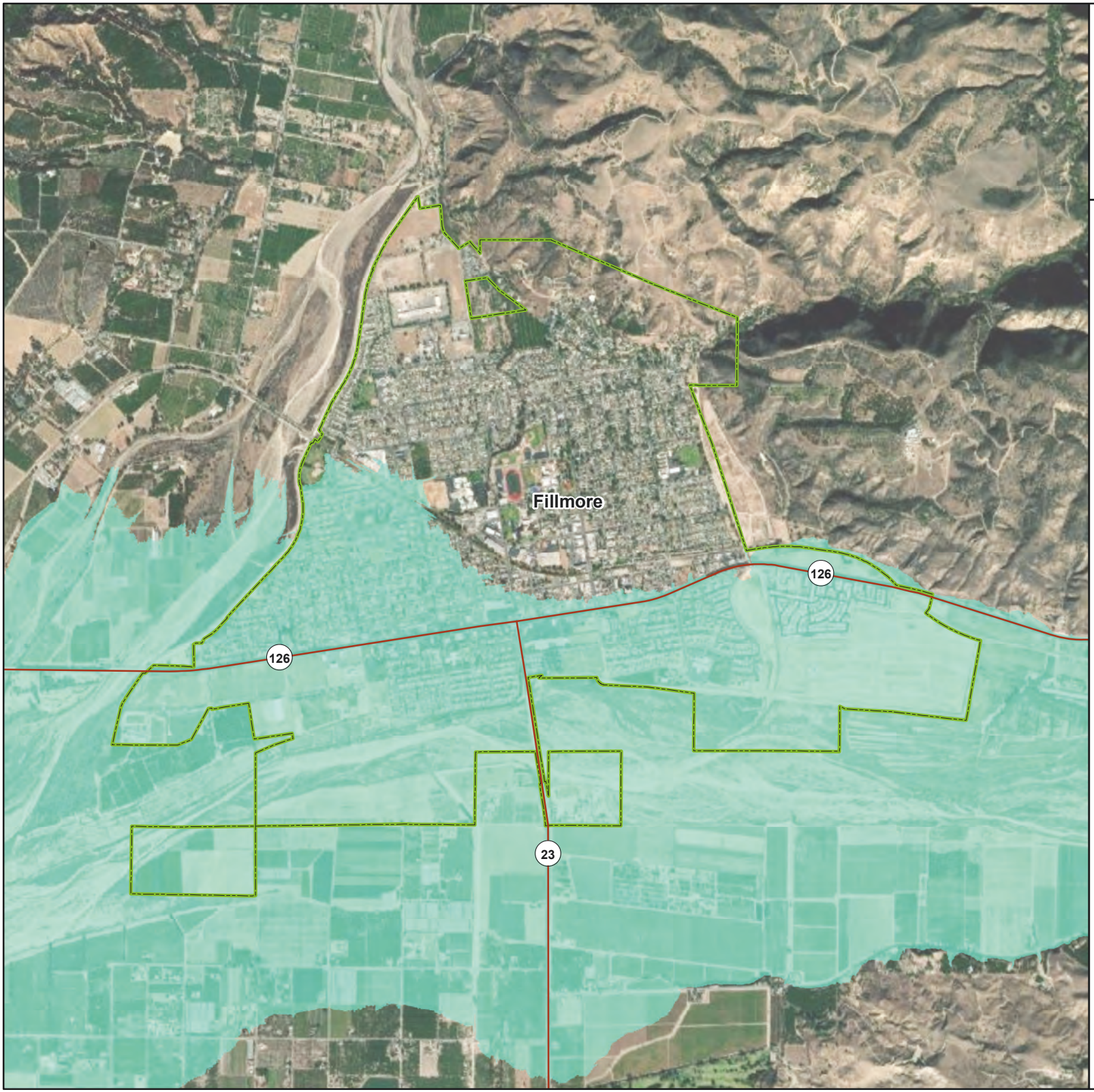
Critical Facilities (1 of 2)

- Communications
- Energy
- Hazardous Material
- Transportation
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Data Sources: Ventura Co., VCFD, Casitas MWD, Calleguas MWD, City of Camarillo, CA Energy Commission, Cal Trans, EPA, HIFLD, Esri

N

0 0.175 0.35 0.7 Miles



Fillmore

Dam Failure Inundation Areas

Combined Inundation Areas

Major Roads

Selected City

Incorporated Cities

County Boundary

Data Sources: Ventura Co., CA DWR, Esri

N

0 0.175 0.35 0.7 Miles

Fillmore

NEHRP Soil Class

C (Dense soil/soft rock)

D (Stiff soil)

Major Roads

Selected City

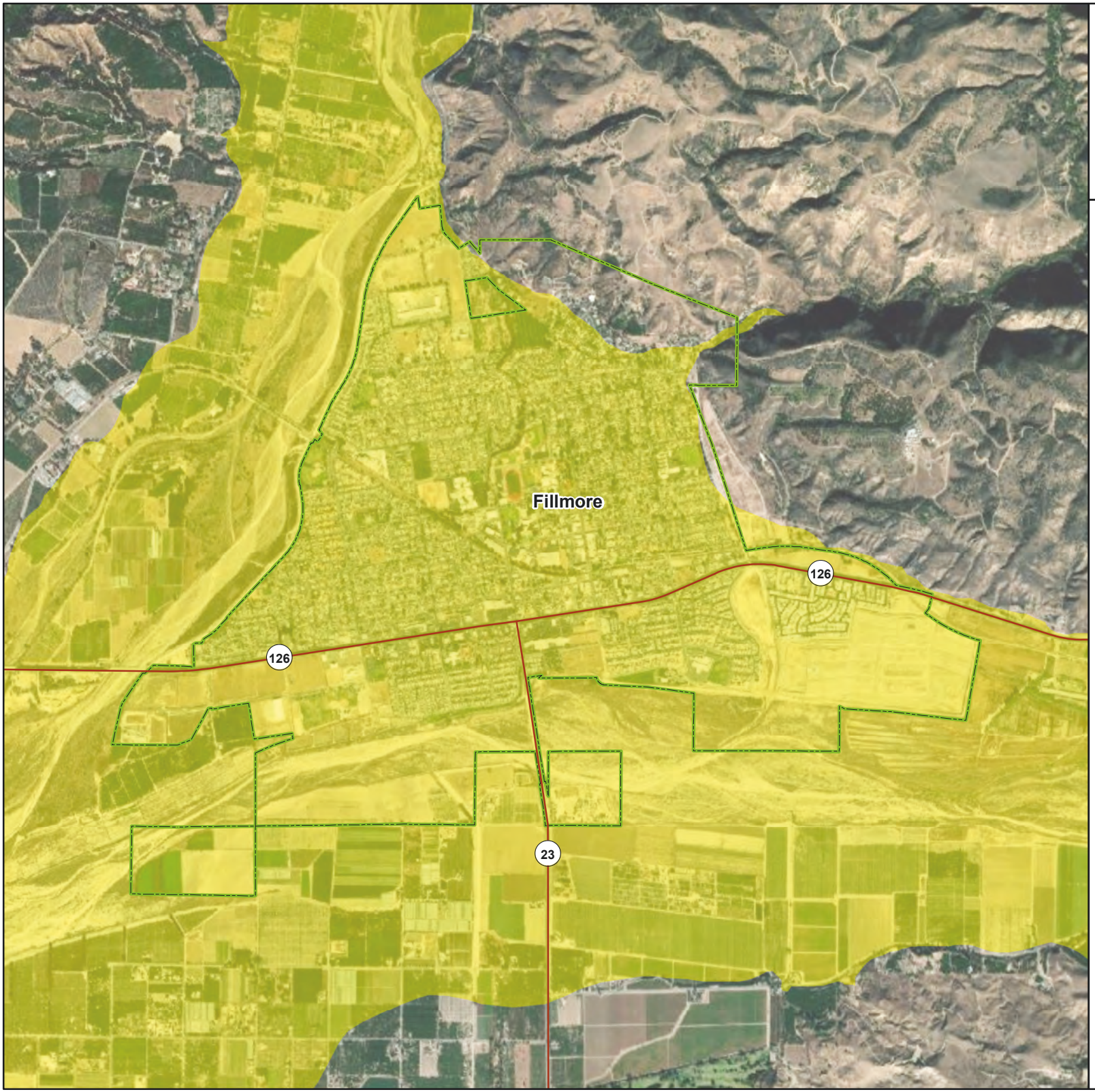
Incorporated Cities

County Boundary

Data Sources: Ventura Co., CGS, Esri

N

0 0.175 0.35 0.7 Miles



Fillmore

Liquefaction Susceptibility

Liquefaction zone

Major Roads

Selected City

Incorporated Cities

County Boundary

Data Sources: Ventura Co., Esri

N

0 0.175 0.35 0.7 Miles

Fillmore

100-Year Probabilistic Earthquake Scenario

Mercalli Intensity Scale

- VII (Very Strong/Moderate)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.175 0.35 0.7 Miles

Fillmore

Oak Ridge M7.16 Earthquake Scenario

Mercalli Intensity Scale

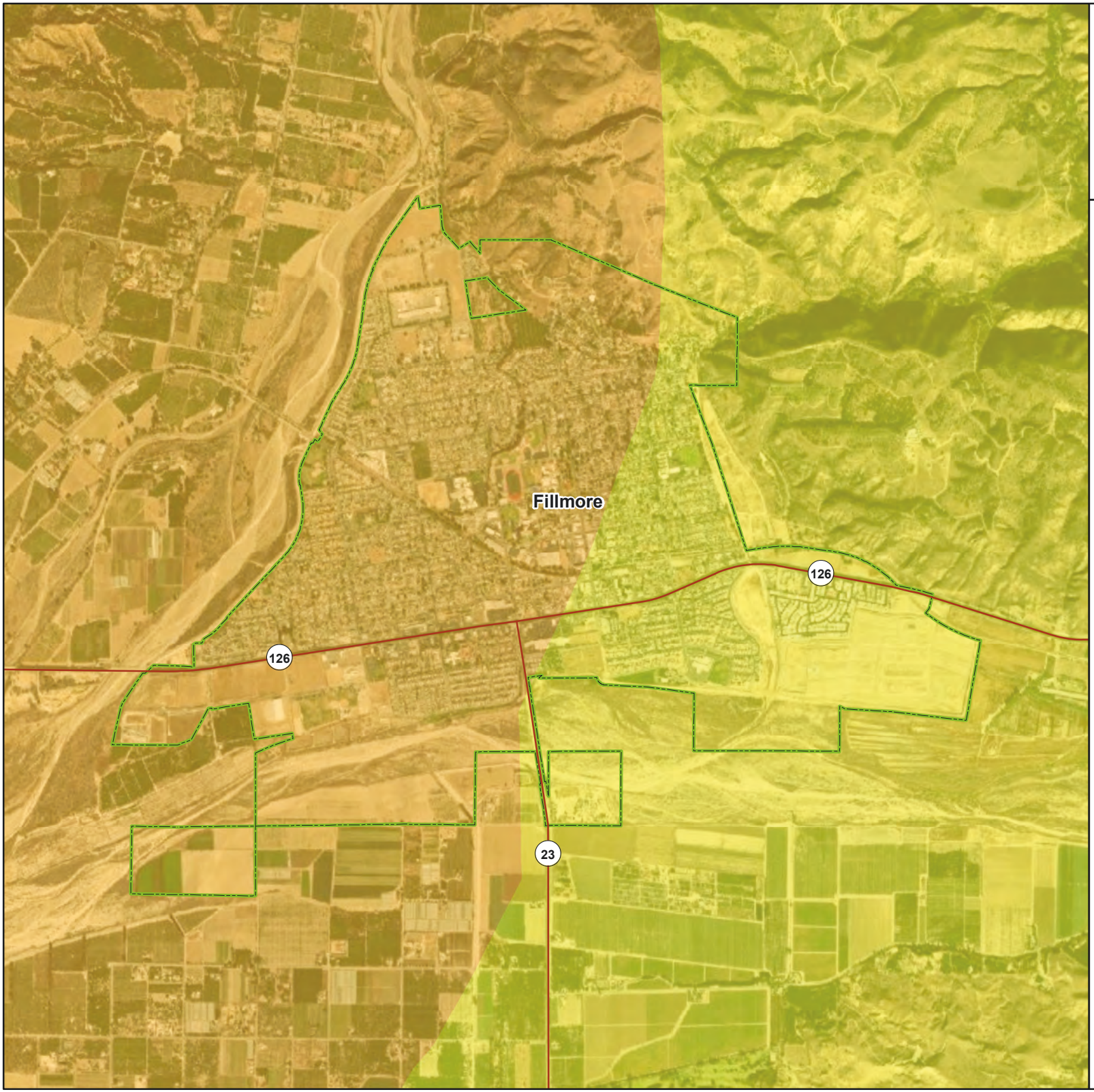
- VIII (Severe/Moderate-Heavy)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.175 0.35 0.7 Miles



Fillmore

Pitas Point M7.12 Earthquake Scenario

Mercalli Intensity Scale

- VII (Very Strong/Moderate)
- VIII (Severe/Moderate-Heavy)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.175 0.35 0.7
Miles

Fillmore

San Cayetano M7.16 Earthquake Scenario

Mercalli Intensity Scale

- VIII (Severe/Moderate-Heavy)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.175 0.35 0.7 Miles

Fillmore

S. San Andreas M8.03 Earthquake Scenario

Mercalli Intensity Scale

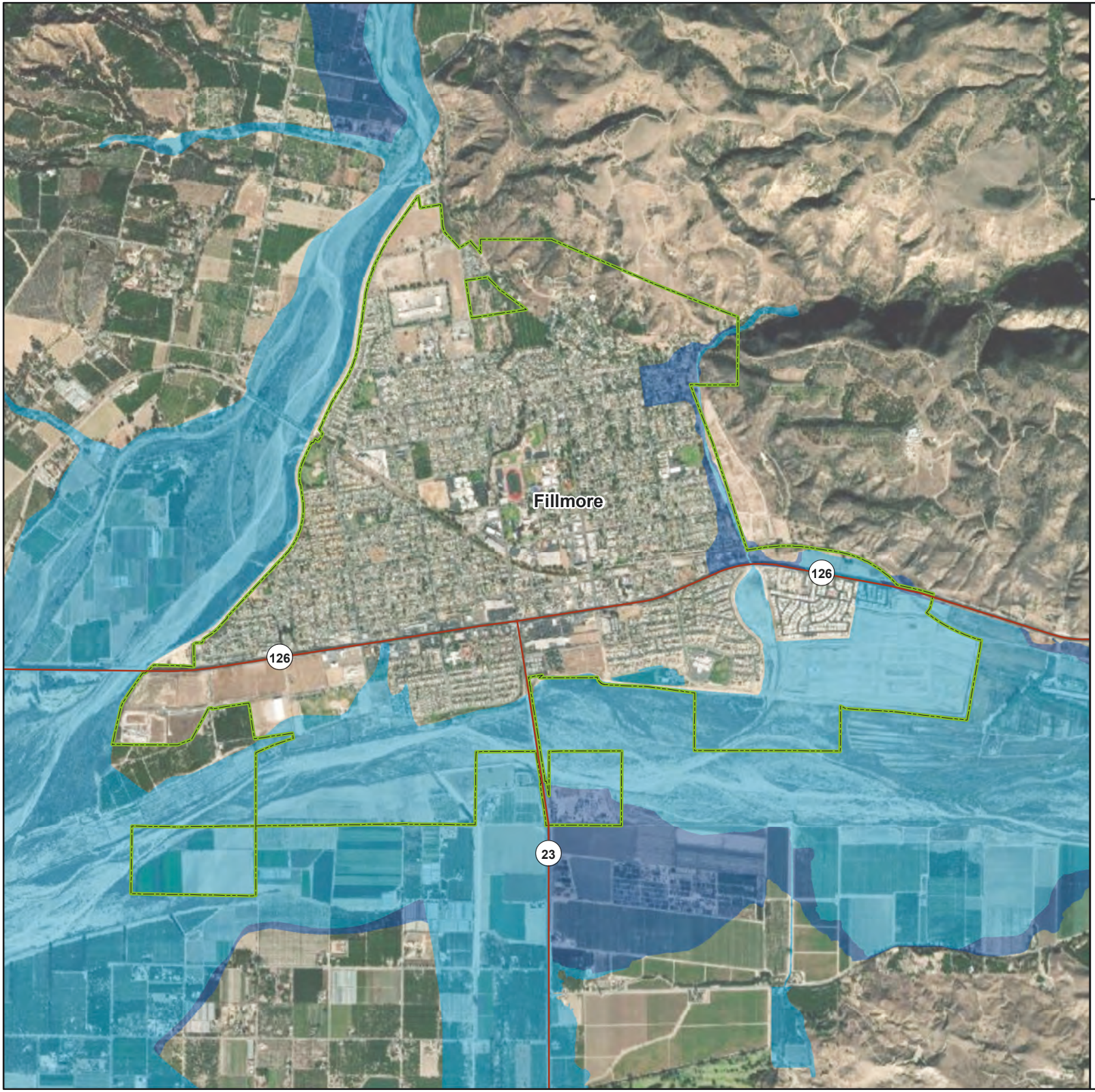
- VI (Strong/Light)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.175 0.35 0.7 Miles



Fillmore

FEMA Flood Hazard Areas

1% Annual Chance Flood (100-Year)

0.2% Annual Chance Flood (500-Year)

Major Roads

Selected City

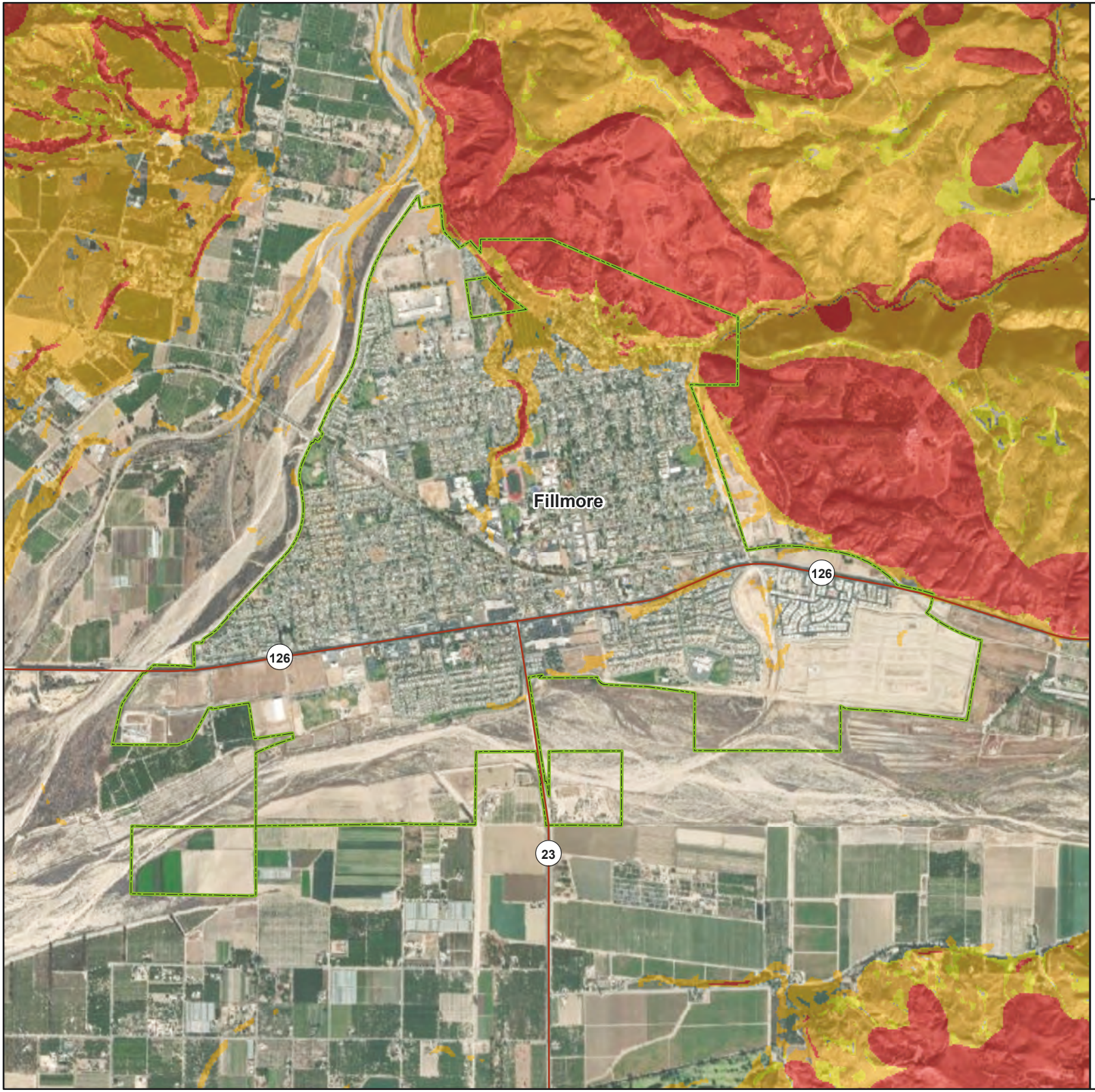
Incorporated Cities

County Boundary

Data Sources: Ventura Co., FEMA, Esri

N

0 0.175 0.35 0.7 Miles



Fillmore

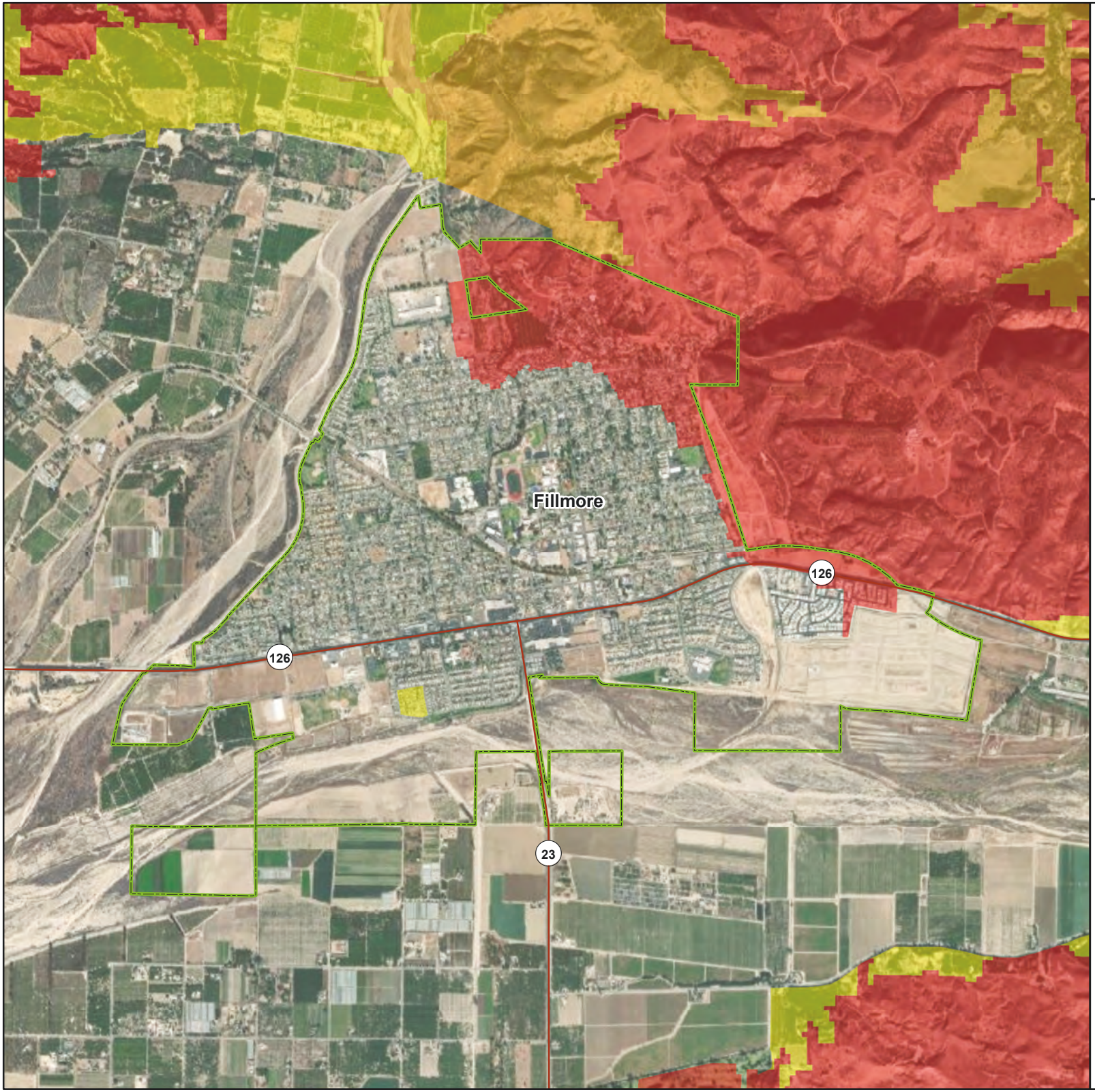
Susceptibility to Deep-Seated Landslides

- Low
- Moderate
- High
- Very High
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Data Sources: Ventura Co., CGS, Esri

N

0 0.175 0.35 0.7 Miles



Fillmore

Wildfire Hazard Severity Zones

- Moderate
- High
- Very High
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Data Sources: Ventura Co., CAL FIRE, Esri

N

0 0.175 0.35 0.7 Miles

4. CITY OF MOORPARK

4.1 LOCAL HAZARD MITIGATION PLANNING TEAM

Primary Point of Contact
Mack Douglass, Program Manager
799 Moorpark Ave.
Moorpark, CA 93021
Telephone: 805-517-6241
e-mail Address: mdouglass@Moorparkca.gov

Alternate Point of Contact
Kambiz Borhani, Finance Director
799 Moorpark Ave.
Moorpark, CA 93021
Telephone: 805-517-6249
e-mail Address:
kborhani@Moorparkca.gov

This annex was developed by the local hazard mitigation planning team, whose members are listed in Table 4-1.

Table 4-1. Local Mitigation Planning Team Members

Name	Title
Mack Douglass	Program Manager, Emergency Management
Robert Valery	Parks and Facilities Supervisor
Leonard Mendez	Public Works Supervisor
PJ Gagajena	Assistant City Manager
Douglas Spondello	Interim Community Development Director

4.2 JURISDICTION PROFILE

4.2.1 Location and Features

Founded by Robert Poindexter in 1900 and incorporated in July 1983, the City of Moorpark is one of ten incorporated cities of Ventura County and is located in the eastern portion of the County. The City encompasses approximately 12.4 square miles and a population of 36,278 as of 2020. It is generally bounded by the City of Simi Valley to the east, the Tierra Rejada Valley and City of Thousand Oaks to the south, and unincorporated lands to the west and north. Lands west of the city are largely agricultural and protected from development by the Save Open Space and Agricultural Resources voter approved initiatives requiring the public's vote before any agricultural or open space lands are rezoned for development. Lands to the north of City's boundary are largely mountainous. It is connected to the region by two freeways, SR-118 to the east and SR-23 to the south, and Los Angeles Avenue (SR-118) to the west. Moorpark is home to Moorpark Community College, and is served by the Moorpark Unified School District for grades K-12.

Significant geographical features include the Arroyo Simi, which runs from east to west through central Moorpark. The City is also bisected by State Routes 118 and 23.

4.2.2 History

What is known about the settled history of Moorpark begins with the Chumash tribe of Native Americans, who lived and traded in the area prior to the arrival of Spanish explorers in the 16th century and missionaries in the centuries that followed. The Chumash village of Quimisac was located northeast of present-day Moorpark in the vicinity of what is now known as Happy Camp Canyon Park. Permanent settlement of the area can be traced back to successive eras of land ownership, starting with the gifting of the Rancho San Jose de Nuestra Señora de Altagarcia y Simi (Rancho Simi) to Francisco Javier Pico and his brothers by Governor Diego de Borica in 1795. When Moorpark was founded, the small farming communities of Fremontville and Epworth were already established in the area. In 1900, Robert W. and Madeleine Poindexter established a town site in anticipation of the arrival of the Southern Pacific Railroad and named it Moorpark, after the apricot variety that grew in the region. A depot was constructed that year, and several buildings originally constructed in Fremontville and Epworth were relocated to the burgeoning town. Growth began in earnest after 1904, when the railroad tunnels through the Santa Susana Mountains were completed to the east, connecting the area to the Los Angeles basin. Early development in Moorpark was concentrated in the downtown area along High Street, with the area south of the railroad tracks remaining largely farmland for many years.

The railroad and its connection to faraway markets facilitated the growth of the agriculture industry, the economic lifeblood of Moorpark. In the City's early years, dry land crops such as apricots, black-eyed beans, hay, and lima beans were the primary farming staples. Though agriculture remained an economic engine after World War II, the growth of turkey, chicken, and egg ranches fed the development of the poultry industry and a diversifying economy.

Moorpark became one of the first cities in the world to run off commercial nuclear power in 1957. Moorpark Community College opened on September 11, 1967.

Moorpark was incorporated as a city on July 1, 1983, marking the most dramatic period of growth of new homes and businesses in the City's history. This period saw a substantial shift in the Moorpark's center of activity, with large-scale development occurring in many areas that had heretofore been used for agriculture. High Street and the surrounding area remained the social and retail center of Moorpark through the 1980s until commercial activity began to shift to the south and suburban-style, multitenant retail centers grew along Los Angeles Avenue. Significant growth in home construction began in the late 1970s and accelerated through the 1980s as subdivisions such as Mountain Meadows and Peach Hill expanded the city's built footprint from the flatlands into the surrounding hillsides. Despite this growth, vestiges of the City's history still remain. Moorpark contains three locally significant resources, nine Points of Historic Interest, and one built environment resource listed in the California Register of Historical Resources (CRHR). Locally significant resources include the Taylor House, the First Southern Baptist Church and High Street's Pepper Trees. The highest level of significance conferred on a historical resource in the City is applied to Tanner's Corner, which is listed in the CRHR as an individual property.

4.2.3 Governing Body Format

The City of Moorpark operates under a council-manager form of government. The City Council assumes responsibility for the adoption of this plan; the City of Moorpark will oversee its implementation.

4.3 CURRENT TRENDS

4.3.1 Population

According to the California Department of Finance, the population of the City of Moorpark as of January 2020 was 36,278. Since 2010, the population has grown at an average annual rate of 0.54 percent. Moorpark's median age of 37.6 is close to the County median of 37.9, but younger that the neighboring cities. The percentage of the population under 18 years old is 23.1 percent, close to the state and County and higher than its three neighbors. Its percentage of population 65 years and above is lower than the state and County and substantially lower than the neighboring cities.

4.3.2 Development

Table 4-2 summarizes development trends in the period since the preparation of the previous hazard mitigation plan, as well as expected future development trends. Figure 4-1 describes the existing land uses and development characteristics within the City of Moorpark.

Table 4-2. Recent and Expected Future Development Trends

Criterion	Response					
Has your jurisdiction annexed any land since the preparation of the previous hazard mitigation plan?	No					
Is your jurisdiction expected to annex any areas during the performance period of this plan?	No					
Are any areas targeted for development or major redevelopment in the next five years? • **If yes, briefly describe, including whether any of the areas are in known hazard risk areas**	Yes There are several major development projects that have been entitled in various locations within Moorpark, including approximately 1,200 housing units, commercial and industrial projects. There are also several significant applications that are pending entitlement. Each site is unique but generally potential risks that have been assessed and mitigated with each project include areas of known liquefaction, potential flooding, and designated Very High Fire Hazard Severity Zones. The Moorpark Community Development Department maintains a list of pending development projects on the City's website.					
How many permits for new construction were issued in your jurisdiction since the preparation of the previous hazard mitigation plan?		**2016**	**2017**	**2018**	**2019**	**2020**
	Single Family	87	66	27	4	21
	Multi-Family	0	0	0	0	185
	Other (commercial, mixed use, etc.)	16	10	7	6	10
	Total	**103**	**76**	**34**	**10**	**216**

Criterion	Response
Provide the number of new-construction permits for each hazard area or provide a qualitative description of where development has occurred.	The majority of the City is within a designated Very High Fire Hazard Severity Zone. Many properties near the Arroyo Simi are also within a FEMA Special Flood Hazard Area. Large areas of the City are also vulnerable to liquefaction, primarily along the Arroyo Simi and tributary streams.
Describe the level of buildout in the jurisdiction, based on your jurisdiction's buildable lands inventory. If no such inventory exists, provide a qualitative description.	Moorpark is approaching build out, with infill and redevelopment projects comprising the bulk of our construction activity. Limited numbers of development projects located around the periphery of the City, such as Hitch Ranch are moving through the entitlement process, but may not break ground in the near future.

LAND USES BY ACREAGE

Land Use	Acres	Percent
Residential	2,274	28%
• Single-Family	1,744	22%
• Multifamily	202	3%
• Mobile Home	41	.5%
• Rural Residential	287	4%
Right of Way	1,155	14%
Office	37	0.5%
Commercial and Services	152	2%
Public Facilities and Quasi-Public	101	1%
Education	296	4%
Industrial	280	4%
Transportation, Communications, and Utilities	217	3%
Open Space and Recreation	2,240	28%
Agriculture	29	.5%
Vacant	1,069	13%
Water	141	2%
TOTAL	7,991	100%

RESIDENTIAL BUILDOUT*

Type	Dwelling Units	Percent
Single-Family Residential	9,859	86%
Multifamily Residential	1,412	12%
Mobile Homes	144	1%
TOTAL	11,415	100%

Source: SCAG and PlaceWorks 2020
*California Department of Finance, E-5 2020.

Figure 4-1. Moorpark Land Use and Development Characteristics

4.4 CAPABILITY ASSESSMENT

This section describes an assessment of existing capabilities for implementing hazard mitigation strategies. The introduction at the beginning of this volume of the hazard mitigation plan describes the components included in the capability assessment and their significance for hazard mitigation planning.

Findings of the capability assessment were reviewed to identify opportunities to expand, initiate or integrate capabilities to further hazard mitigation goals and objectives. Where such opportunities were identified and determined to be feasible, they are included in the action plan. The "Analysis of Mitigation Actions" table in this annex identifies these as community capacity building mitigation actions. The findings of the assessment are presented as follows:

- An assessment of planning and regulatory capabilities is presented in Table 4-3.
- Development and permitting capabilities are presented in Table 4-4.
- An assessment of fiscal capabilities is presented in Table 4-5.
- An assessment of administrative and technical capabilities is presented in Table 4-6.
- An assessment of education and outreach capabilities is presented in Table 4-7.
- Information on National Flood Insurance Program (NFIP) compliance is presented in Table 4-8.
- Classifications under various community mitigation programs are presented in Table 4-9.
- The community's adaptive capacity for the impacts of climate change is presented in Table 4-10.

Table 4-3. Planning and Regulatory Capability

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity?
Codes, Ordinances, & Requirements				
Building Code	Yes	Yes	Yes	Yes
Comment: *California Building Code, 2019 Edition, adopted in Moorpark Municipal Code, Chapter 15.08 Building Code (Ord. 474 § 3, 2019)*				
Zoning Code	Yes	No	Yes	Yes
Comment: *Moorpark Municipal Code Title 17, (Ord. 189 § 3 (8101-0), 1994)*				
Subdivisions	Yes	No	Yes	Yes
Comment: *Moorpark Municipal Code Title 16, (Ord. 334 § 1 Exh. A, 2006)*				
Stormwater Management	Yes	No	No	Yes
Comment: *Moorpark Municipal Code Title 8, (Ord. 240 § 2, 1997)*				
Post-Disaster Recovery	Yes	No	No	Yes
Comment: *City of Moorpark Emergency Operations Plan. Last updated 2015, update currently underway*				
Real Estate Disclosure	No	Yes	Yes	Yes
Comment: *California State Civil Code 1102 requires full disclosure on natural hazard exposure of the sale/re-sale of any and all real property.*				
Growth Management	Yes	No	No	No
Comment: *City of Moorpark General Plan. Last updated in 1992, comprehensive update is currently underway*				
Site Plan Review	Yes	No	No	Yes
Comment: *Moorpark Municipal Code Chapter 17.44 Application Review Procedures. (Ord. 297 Exh. A, 2003)*				

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity?
Environmental Protection	Yes	Yes	Yes	No
Comment: *CEQA (California Code of Regulations Title 14, Division 6, Chapter 3) is implemented by the City for all land use impacts. On July 21, 2004, the City Council adopted Resolution Number 2004-2224 and on September 15, 2004, the Moorpark Redevelopment Agency adopted Resolution Number 2004-142, establishing Procedures of the City of Moorpark and Moorpark Redevelopment Agency to Implement the California Environmental Quality Act (CEQA).The ongoing Comprehensive General Plan Update will include a program EIR.*				
Flood Damage Prevention	Yes	Yes	Yes	Yes
Comment: *Moorpark Municipal Code Section 15.24 Floodplain Management (Ord. 279 § 1, 2002)*				
Emergency Management	Yes	Yes	Yes	Yes
Comment: *Moorpark Municipal Code Chapter 2.48 (Ord. 89-106 § 1, 1989)*				
Climate Change	Yes	Yes	Yes	Yes
Comment: *Comprehensive General Plan update will contain a climate change element.*				
Planning Documents				
General Plan	Yes	Yes	Yes	Yes
Is the plan compliant with Assembly Bill 2140? *Yes* ***Comment:*** *Comprehensive General Plan update is currently underway*				
Capital Improvement Plan	Yes	Yes	Yes	Yes
How often is the plan updated? *CIP is approved by City Council every seven years and updated by staff annually* ***Comment:*** *City of Moorpark Capital Improvement Program FY 2016/17-2022/23*				
Disaster Debris Management Plan	No	Yes	No	No
Comment: *Ventura County Disaster Recovery Plan, Adopted by BOS in April 2019*				
Floodplain or Watershed Plan	Yes	No	Yes	Yes
Comment: *Moorpark Municipal Code Section 15.24. This code is current through Ordinance 20-488 and the March 2021 code supplement. The City participates in the National Flood Insurance Program (NFIP)*				
Stormwater Plan	Yes	No	Yes	Yes
Comment: *Moorpark Municipal Code Section 8.52 This code is current through Ordinance 20-488 and the March 2021 code supplement.*				
Urban Water Management Plan	N/A	N/A	N/A	N/A
Comment: *City of Moorpark is not a water purveyor*				
Habitat Conservation Plan	No	No	No	No
Comment:				
Economic Development Plan	Yes	No	Yes	No
Comment: *Comprehensive General Plan update will contain an economic development chapter.*				
Shoreline Management Plan	N/A	N/A	N/A	N/A
Comment: N/A				
Community Wildfire Protection Plan	No	No	No	No
Comment: *The city does not have this plan*				
Forest Management Plan	N/A	N/A	N/A	N/A
Comment: N/A				
Climate Action Plan	Yes	No	Yes	Yes
Comment: *Climate Action Plan Element will be part of the ongoing General Plan Update*				
Emergency Operations Plan	Yes	No	Yes	Yes
Comment: *2014 Moorpark Emergency Operations Plan. Comprehensive EOP Update currently underway.*				
Threat & Hazard Identification & Risk Assessment (THIRA)	No	Yes	No	No
Comment: *The city does not have this assessment*				
Post-Disaster Recovery Plan	Yes	No	No	Yes
Comment: *This is part of the City of Moorpark Emergency Operations Plan (EOP) 2014*				

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity?
Continuity of Operations Plan	Yes	No	Yes	Yes
Comment: *2014 Moorpark Emergency Operations Plan. Comprehensive EOP Update currently underway.*				
Public Health Plan	No	Yes	Yes	No
Comment: *The General Plan Update will include an Element regarding Public Health however the City does not currently have a Public Health Plan. County of Ventura Health Care Agency Public Health Emergency Response Plan (ERP)*				

Table 4-4. Development and Permitting Capability

Criterion	Response
Does your jurisdiction issue development permits?	Yes
If no, who does? If yes, which department? Community Development	
Does your jurisdiction have the ability to track permits by hazard area?	No
Does your jurisdiction have a buildable lands inventory?	Yes

Table 4-5. Fiscal Capability

Financial Resource	Accessible or Eligible to Use?
Community Development Block Grants	Yes
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for Specific Purposes	Yes
User Fees for Water, Sewer, Gas or Electric Service	No
Incur Debt through General Obligation Bonds	Yes
Incur Debt through Special Tax Bonds	Yes
Incur Debt through Private Activity Bonds	Yes
Withhold Public Expenditures in Hazard-Prone Areas	Yes
State-Sponsored Grant Programs	Yes
Development Impact Fees for Homebuyers or Developers	Yes

Table 4-6. Administrative and Technical Capability

Staff/Personnel Resource	Available?
Planners or engineers with knowledge of land development and land management practices	Yes
If Yes, Department /Position: Community Development and Public Works	
Engineers or professionals trained in building or infrastructure construction practices	Yes
If Yes, Department /Position: Public Works	
Planners or engineers with an understanding of natural hazards	Yes
If Yes, Department /Position: Community Development and Public Works	
Staff with training in benefit-cost analysis	Yes
If Yes, Department /Position: Finance	
Surveyors	No
Personnel skilled or trained in GIS applications	No
Scientist familiar with natural hazards in local area	No
Emergency manager	Yes
If Yes, Department /Position: Program Manager, Finance Department	
Grant writers	No

Table 4-7. Education and Outreach Capability

Criterion	Response
Do you have a public information officer or communications office?	Yes
Do you have personnel skilled or trained in website development?	Yes
Do you have hazard mitigation information available on your website?	No
Do you use social media for hazard mitigation education and outreach?	No
Do you have any citizen boards or commissions that address issues related to hazard mitigation?	No
Do you have any other programs in place that could be used to communicate hazard-related information?	Yes
If yes, briefly describe: Community Emergency Response Team	
Do you have any established warning systems for hazard events?	No
If yes, briefly describe:	

Table 4-8. National Flood Insurance Program Compliance

Criterion	Response
What local department is responsible for floodplain management?	Public Works
Who is your floodplain administrator? (department/position)	Public Works Director
Are any certified floodplain managers on staff in your jurisdiction?	No
What is the date that your flood damage prevention ordinance was last amended?	2002
Does your floodplain management program meet or exceed minimum requirements?	Meets
When was the most recent Community Assistance Visit or Community Assistance Contact?	Unknown
Does your jurisdiction have any outstanding NFIP compliance violations that need to be addressed?	No
Are any RiskMAP projects currently underway in your jurisdiction?	No
Do your flood hazard maps adequately address the flood risk within your jurisdiction?	Yes
Does your floodplain management staff need any assistance or training to support its floodplain management program?	No
Does your jurisdiction participate in the Community Rating System (CRS)? ***If no, is your jurisdiction interested in joining the CRS program?*** No	No
How many flood insurance policies are in force in your jurisdiction?[a] ***What is the insurance in force?*** $39,692,000 ***What is the premium in force?*** $114,239	117
How many total loss claims have been filed in your jurisdiction?[a] ***What were the total payments for losses?*** $33,576	2

a. According to FEMA statistics as of March 31, 2021

Table 4-9. Community Classifications

	Participating?	Classification	Date Classified
FIPS Code	Yes	0611149138	N/A
DUNS #	Yes	628053464	N/A
Community Rating System	No	N/A	N/A
Building Code Effectiveness Grading Schedule	No	N/A	N/A
Public Protection	No	N/A	N/A
Storm Ready	No	N/A	N/A
Firewise	No	N/A	N/A
Tsunami Ready	No	N/A	N/A

Table 4-10. Adaptive Capacity for Climate Change

Criterion	Jurisdiction Rating[a]
Technical Capacity	
Jurisdiction-level understanding of potential climate change impacts	Medium
Comment: *Staff and elected officials understand potential climate change impacts.t*	
Jurisdiction-level monitoring of climate change impacts	Low
Comment:	
Technical resources to assess proposed strategies for feasibility and externalities	Low
Comment:	
Jurisdiction-level capacity for development of greenhouse gas emissions inventory	Low
Comment:	
Capital planning and land use decisions informed by potential climate impacts	High
Comment: *General Plan Update will include a climate action plan element.*	
Participation in regional groups addressing climate risks	Low
Comment:	
Implementation Capacity	
Clear authority/mandate to consider climate change impacts during public decision-making processes	High
Comment: *City Council and the City Manager have the authority to consider and direct action to address potential climate change impacts*	
Identified strategies for greenhouse gas mitigation efforts	High
Comment: *City Council recently enacted an SB 1383 compliant ordinance, which will reduce GHG emissions from organic waste*	
Identified strategies for adaptation to impacts	Low
Comment:	
Champions for climate action in local government departments	Unsure
Comment:	
Political support for implementing climate change adaptation strategies	Unsure
Comment:	
Financial resources devoted to climate change adaptation	Low
Comment:	
Local authority over sectors likely to be negative impacted	Low
Comment:	
Public Capacity	
Local residents' knowledge of and understanding of climate risk	Medium
Comment: *Evidence of climate change is obvious in Moorpark and directly affects the lives of residents through sustained droughts, frequent wildfires, high wind events and Public Safety Power Shutoffs.*	
Local residents' support of adaptation efforts	Unsure
Comment:	
Local residents' capacity to adapt to climate impacts	Unsure
Comment:	
Local economy current capacity to adapt to climate impacts	Low
Comment:	
Local ecosystems capacity to adapt to climate impacts	Unsure
Comment:	

a. High = Capacity exists and is in use; Medium = Capacity may exist, but is not used or could use some improvement; Low = Capacity does not exist or could use substantial improvement; Unsure= Not enough information is known to assign a rating.

4.5 INTEGRATION REVIEW

For hazard mitigation planning, “integration” means that hazard mitigation information is used in other relevant planning mechanisms, such as general planning and capital facilities planning, and that relevant information from those sources is used in hazard mitigation. This section identifies where such integration is already in place, and where there are opportunities for further integration in the future. Resources listed at the end of this annex were used to provide information on integration. The progress reporting process described in Volume 1 of the hazard mitigation plan will document the progress of hazard mitigation actions related to integration and identify new opportunities for integration.

4.5.1 Existing Integration

Some level of integration has already been established between local hazard mitigation planning and the following other local plans and programs:

- **County of Ventura Hazard Mitigation Plan**
- **City of Moorpark Emergency Operations Plan**
- **City of Moorpark General Plan, Safety Element (2001)**

4.5.2 Opportunities for Future Integration

The capability assessment in this annex indicates opportunities to integrate this mitigation plan with other jurisdictional planning/regulatory capabilities. Capabilities were identified as integration opportunities if they can support or enhance the actions identified in this plan or be supported or enhanced by components of this plan. The capability assessment identified the following plans and programs that do not currently integrate hazard mitigation information but provide opportunities to do so in the future:

- **City of Moorpark General Plan**—The City of Moorpark is engaged in a comprehensive update to the General Plan and zoning ordinance that will include a full evaluation of potential hazards, climate issues, and Program Environmental Impact Report.

Taking action to integrate each of these programs with the hazard mitigation plan was considered as a mitigation action to include in the action plan in this annex.

4.6 RISK ASSESSMENT

4.6.1 Jurisdiction-Specific Natural Hazard Event History

Table 4-11 lists past occurrences of natural hazards for which specific damage was recorded in this jurisdiction Other hazard events that broadly affected the entire planning area, including this jurisdiction, are listed in the risk assessments in Volume 1 of this hazard mitigation plan.

Table 4-11. Past Natural Hazard Events

Type of Event	FEMA Disaster #	Date	Damage Assessment
COVID-19 Pandemic	DR-4482	January 20, 2020 and continuing	COVID-19 Pandemic
Maria Fire	FM-5302-CA	11/1/2019	$6,199,112.56
Easy Fire	FM-5298-CA	10/30/2019	$2,833,870.64
Heat Event	N/A	7/4/2018 to 7/6/2018	Extreme 2-day heat event broke records across the county.
Thomas Fire	FM-5224	December 4, 2017	Unknown
Winter Storms	N/A	2/17/2017 to 2/18/2017	Rainfall amounts from 2 to 6 inches across coastal areas with up to around 10 inches in the local mountains produced numerous reports of flash flooding as well as mud and debris flows. Strong southerly winds with gusts up to 70 mph reported in some areas.
Guiberson Fire	FM-2839-CA	9/22/2009	$8,033,270.01
Flash Flood	N/A	January 25, 2008	California Highway Patrol reported heavy rain and flash flooding near the community of Moorpark. Reports indicated flash flooding along Tierra Rejada Drive at Hillside Drive.
Severe Freeze Event	DR-1689	1/11/2007 to 1/17/2007	4 nights of below freezing temperatures.
Shekell Fire	FM-2681-CA	12/3/2006	$1,153,198.47
Winter Storms	DR1577	1/7/2005 to 1/11/2005	Major roads including Highways 101, 126, 33 and 150 were closed for more than a week due to severe flooding
Wildfires, Flooding, Mudflow and Debris Flow	DR-1498	October 21, 2003 – March 31, 2003	Unknown
1928 St. Francis Dam Failure	N/A	3/12/1928	>530 people died; bridges, orchards, farms, homes all eradicated in flood's path down the Santa Clara river valley to the Pacific Ocean.

4.6.2 Hazard Risk Ranking

Table 4-12 presents a local ranking of all hazards of concern for which this hazard mitigation plan provides complete risk assessments. As described in detail in Volume 1, the ranking process involves an assessment of the likelihood of occurrence for each hazard, along with its potential impacts on people, property, and the economy. Mitigation actions primarily target hazards with high and medium rankings.

Table 4-12. Hazard Risk Ranking

Rank	Hazard	Risk Ranking Score	Risk Category
1	Wildfire	36	High
1	Landslide	36	High
3	Earthquake	32	Medium
4	Dam Failure	26	Medium
5	Severe Weather	24	Medium
5	Severe Storms	24	Medium
7	Flooding	18	Medium
8	Drought	9	Low

4.6.3 Jurisdiction-Specific Vulnerabilities

Volume 1 of this hazard mitigation plan provides complete risk assessments for each identified hazard of concern. This section provides information on a few key vulnerabilities for this jurisdiction. Available jurisdiction-specific risk maps of the hazards are provided at the end of this annex.

Repetitive Loss Properties

Repetitive loss records are as follows:

- Number of FEMA-identified Repetitive-Loss Properties: 0
- Number of FEMA-identified Severe-Repetitive-Loss Properties: 0
- Number of Repetitive-Loss Properties or Severe-Repetitive-Loss Properties that have been mitigated: 0

Other Noted Vulnerabilities

The following jurisdiction-specific issues have been identified based on a review of the results of the risk assessment, public involvement strategy, and other available resources:

- Loss of power due to human action (PSPS).
  - At least 10 PSPS events affected the city during 2020, including several events that lasted for multiple days.
  - Traffic signals were affected.
  - City Hall itself was left on backup power for several days.
  - Police Service Facility has a lack of reliable power due to a faulty power switchover device.
  - City was unable to provide a cooling center to residents due to a lack of power.
  - A charity using a City Facility to conduct food bank operations is susceptible to loss of perishable items due to power outages.
- Frequent urban flooding at the intersection of Millard St. and Sherman Ave.

Mitigation actions addressing these issues were prioritized for consideration in the action plan in this annex.

4.7 STATUS OF PREVIOUS PLAN ACTIONS

Table 4-13 summarizes the actions that were recommended in the previous version of the hazard mitigation plan and their implementation status at the time this update was prepared.

Table 4-13. Status of Previous Plan Actions

Action Item	Completed	Removed; No Longer Feasible	Carried Over to Plan Update: Check if Yes	Carried Over to Plan Update: Action # in Update
OA 1—Integrate the hazard analysis and mitigation strategy with the General Plan's Safety Element.			✓	MPK-2
Comment: General Plan update including safety element is underway.				
OA 6—Develop a public outreach program that informs property owners located in the dam and levee failure inundation areas about voluntary flood insurance.			✓	MPK-7
Comment: Public Works requires additional staff resources to complete this Action.				
OA 7—Develop a water conservation public outreach program to increase awareness about the drought, fines and penalties for overuse and solutions for conserving water.	✓			
Comment: Done in concert with Calleguas MWD. Most recently implemented a drought impact plan on 7/01/15.				
OA 8—Adopt emergency water conservation measures and/or water conservation ordinance to limit irrigation.	✓			
Comment: MMC 15.23.010 was amended most recently on 12/18/19.				
OA 10—Seismically retrofit or upgrade seismically deficient government facilities and pre-identified shelter facilities.			✓	MPK-1
Comment: City Hall will likely be changing location to a seismically suitable facility in the near future				
OA 19—Maintain vegetation management program that provides vegetation management services to elderly, disabled, or low-income property owners who lack the resources to remove flammable vegetation from around their homes.			✓	MPK-8
Comment: City requires additional staff resources to complete this action item.				
MP 1—Generators: Purchase and install back-up generators for 3 facilities, one of which is often used by Ventura County Fire and Sheriff as an Incident Command Center and serves as an alternate Emergency Operation Center (EOC) for the City (Capital Improvement Project 7710)	✓			
Comment: Completed in 2009.				
MP 2—Hazardous Mitigation Planning: Modify current Neighborhood and Business Watch Programs with focus on electronic format including real-time information exchange between law enforcement and the community	✓			
Comment: Completed in 2016.				
MP 3—Wildfire Mitigation: Work with Ventura County Fire to consider siting/planning for a new fire station by Moorpark College (east end of City)	✓			
Comment: Placement of new fire station under consideration by City and VCFPD.				
MP 4—Mitigation Reconstruction: Reconstruct fire sprinkler system for the Community Center facility		✓		
Comment: Use of Community Center Facility may be modified or discontinued when City Hall changes location so this action is no longer feasible.				

4.8 HAZARD MITIGATION ACTION PLAN

Table 4-14 lists the identified actions, which make up the hazard mitigation action plan for this jurisdiction. Table 4-15 identifies the priority for each action. Table 4-16 summarizes the mitigation actions by hazard of concern and mitigation type.

Table 4-14. Hazard Mitigation Action Plan Matrix

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action MPK-1—Where appropriate, support retrofitting, purchase or relocation of structures located in hazard areas, prioritizing those that have experienced repetitive losses and/or are located in high- or medium-risk hazard areas.						
Hazards Mitigated: Wildfire, Landslide, Earthquake, Dam Failure, Severe Weather, Severe Storms, Flooding						
Existing	2, 6, 9, 10, 11	City of Moorpark	N/A	High	Grant Funding-FEMA HMA (BRIC, FMA, HMGP)	Short-term
Action MPK-2—Integrate the hazard mitigation plan into other plans, ordinances and programs that dictate land use decisions in the community, including the City's Emergency Operations Plan and General Plan.						
Hazards Mitigated: Wildfire, Landslide, Flooding						
New & Existing	1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 17, 19	City of Moorpark	N/A	Low	Staff Time, General Funds	Ongoing
Action MPK-3—Actively participate in the plan maintenance protocols outlined in Volume 1 of this hazard mitigation plan.						
Hazards Mitigated: Wildfire, Landslide, Earthquake, Dam Failure, Severe Weather, Severe Storms, Flooding, Drought						
New & Existing	1, 2, 4, 6, 7, 8, 9, 11, 12, 13, 14, 15	City of Moorpark	N/A	Low	Staff Time, General Funds	Short-term
Action MPK-4—Continue to maintain good standing and compliance under the NFIP through implementation of floodplain management programs that, at a minimum, meet the NFIP requirements: • Enforce the flood damage prevention ordinance. • Participate in floodplain identification and mapping updates. • Provide public assistance/information on floodplain requirements and impacts.						
Hazards Mitigated: Flooding, Dam Failure						
New & Existing	1, 2, 6, 7, 17	City of Moorpark	N/A	Low	Staff Time, General Funds	Ongoing
Action MPK-5—Identify and pursue strategies to increase adaptive capacity to climate change including but not limited to the following: • Climate Action Element of General Plan Update. • Consider a goal or policy to establish Reach Building Codes with the General Plan Update • Consider inclusion of a Climate Action Plan following the General Plan Update						
Hazards Mitigated: Severe Weather, Severe Storms, Wildfire, Flooding, Drought						
New & Existing	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 19	City of Moorpark	N/A	Low	Staff Time, General Funds	Short-term
Action MPK-6—Purchase generators for critical facilities and infrastructure that lack adequate backup power.						
Hazards Mitigated: Dam Failure, Earthquake, Flooding, Landslide, Severe Weather, Wildfire, Severe Storms						
Existing	2, 6, 19	City of Moorpark	N/A	Medium	Grant Funding-FEMA HMA (BRIC, HMGP), Staff Time, General Funds	Short-term
Action MPK-7—Provide reliable back up power for the Police Service Facility.						
Hazards Mitigated: Wildfire, Landslide, Earthquake, Dam Failure, Severe Weather, Severe Storms, Flooding						
Existing	2, 6, 19	City of Moorpark	N/A	Medium	Grant Funding-FEMA HMA (BRIC, HMGP), Staff Time, General Funds	Short-term
Action MPK-8—Develop a public outreach program that informs property owners located in the dam and levee failure inundation areas about voluntary flood insurance.						
Hazards Mitigated: Flooding						
New & Existing	7, 17	City of Moorpark	N/A	Low	Staff Time, General Funds	Ongoing

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action MPK-9—Maintain vegetation management program that provides vegetation management services to elderly, disabled, or low-income property owners who lack the resources to remove flammable vegetation from around their homes.						
Hazards Mitigated: Wildfire						
New & Existing	5, 10, 13, 17	City of Moorpark	VCFPD	Medium	Staff Time, General Funds	Ongoing
Action MPK-10—Proceed with construction of a storm drain to address flooding issues at Millard St. and Sherman Ave (CIP #504)						
Hazards Mitigated: Flooding						
Existing	2, 6, 8	City of Moorpark	Caltrans	Medium	Grant Funding-FEMA HMA (BRIC, FMA, HMGP), Staff Time, General Funds	Long-term

a. Short-term = Completion within 5 years; Long-term = Completion within 10 years; Ongoing= Continuing new or existing program with no completion date

Acronyms used here are defined at the beginning of this volume.

Table 4-15. Mitigation Action Priority

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Cost?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Implementation Priority[a]	Grant Pursuit Priority[a]
1	5	High	High	Yes	Yes	No	Medium	High
2	16	Medium	Low	Yes	No	Yes	High	Low
3	12	Low	Low	Yes	No	Yes	High	Low
4	5	Medium	Low	Yes	No	Yes	High	Low
5	17	Medium	Low	Yes	No	Yes	High	Medium
6	3	High	Medium	Yes	Yes	No	Medium	High
7	3	High	Medium	Yes	Yes	No	Medium	High
8	2	Low	Low	Yes	No	Yes	High	Low
9	4	Medium	Medium	Yes	No	Yes	High	Low
10	3	Medium	Medium	Yes	Yes	Yes	High	Medium

a. See the introduction to this volume for explanation of priorities.

Table 4-16. Analysis of Mitigation Actions

Hazard Type	Action Addressing Hazard, by Mitigation Type[a]							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilience	Community Capacity Building
High-Risk Hazards								
Wildfire	MPK-2	MPK-1	MPK-2, 3	MPK-9	MPK-6, 7		MPK-5	MPK-2, 3, 5, 9
Landslide	MPK-2	MPK-1	MPK-2, 3		MPK-6, 7			MPK-2, 3
Medium-Risk Hazards								
Earthquake		MPK-1	MPK-3		MPK-6, 7			MPK-3
Dam Failure	MPK-4	MPK-1	MPK-3		MPK-6, 7			MPK-3, 4

Hazard Type	Action Addressing Hazard, by Mitigation Type[a]							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilience	Community Capacity Building
Severe Weather		MPK-1	MPK-3		MPK-6, 7		MPK-5	MPK-3, 5
Severe Storms		MPK-1	MPK-3		MPK-6, 7		MPK-5	MPK-3, 5
Flooding	MPK-2, 4	MPK-1	MPK-2, 3, 8		MPK-6, 7	MPK-10	MPK-5	MPK-2, 3, 4, 5
Low-Risk Hazards								
Drought			MPK-3				MPK-5	MPK-3, 5

a. See the introduction to this volume for explanation of mitigation types.

4.9 PUBLIC OUTREACH

Table 4-17 lists public outreach activities for this jurisdiction.

Table 4-17. Local Public Outreach

Local Outreach Activity	Date	Number of People Involved
Community Emergency Response Team	Ongoing	10-20

4.10 INFORMATION SOURCES USED FOR THIS ANNEX

The following technical reports, plans, and regulatory mechanisms were reviewed to provide information for this annex.

- **Moorpark Municipal Code**—The municipal code was reviewed for the full capability assessment and for identifying opportunities for action plan integration.
- **Moorpark Flood Damage Prevention Ordinance**—The flood damage prevention ordinance was reviewed for compliance with the National Flood Insurance Program.
- **Moorpark Emergency Operations Plan**—the Emergency Operations plan was examined for consistency with the County EOP and this Hazard Mitigation Plan.

The following outside resources and references were reviewed:

- **Hazard Mitigation Plan Annex Development Toolkit**—The toolkit was used to support the identification of past hazard events and noted vulnerabilities, the risk ranking, and the development of the mitigation action plan.

Moorpark

Critical Facilities (1 of 2)

- Food, Water, Shelter
- Safety and Security
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Data Sources: Ventura Co., VCFD, Casitas MWD, Calleguas MWD, City of Camarillo, CA Energy Commission, Cal Trans, EPA, HIFLD, Esri

N

0 0.325 0.65 1.3 Miles

Moorpark

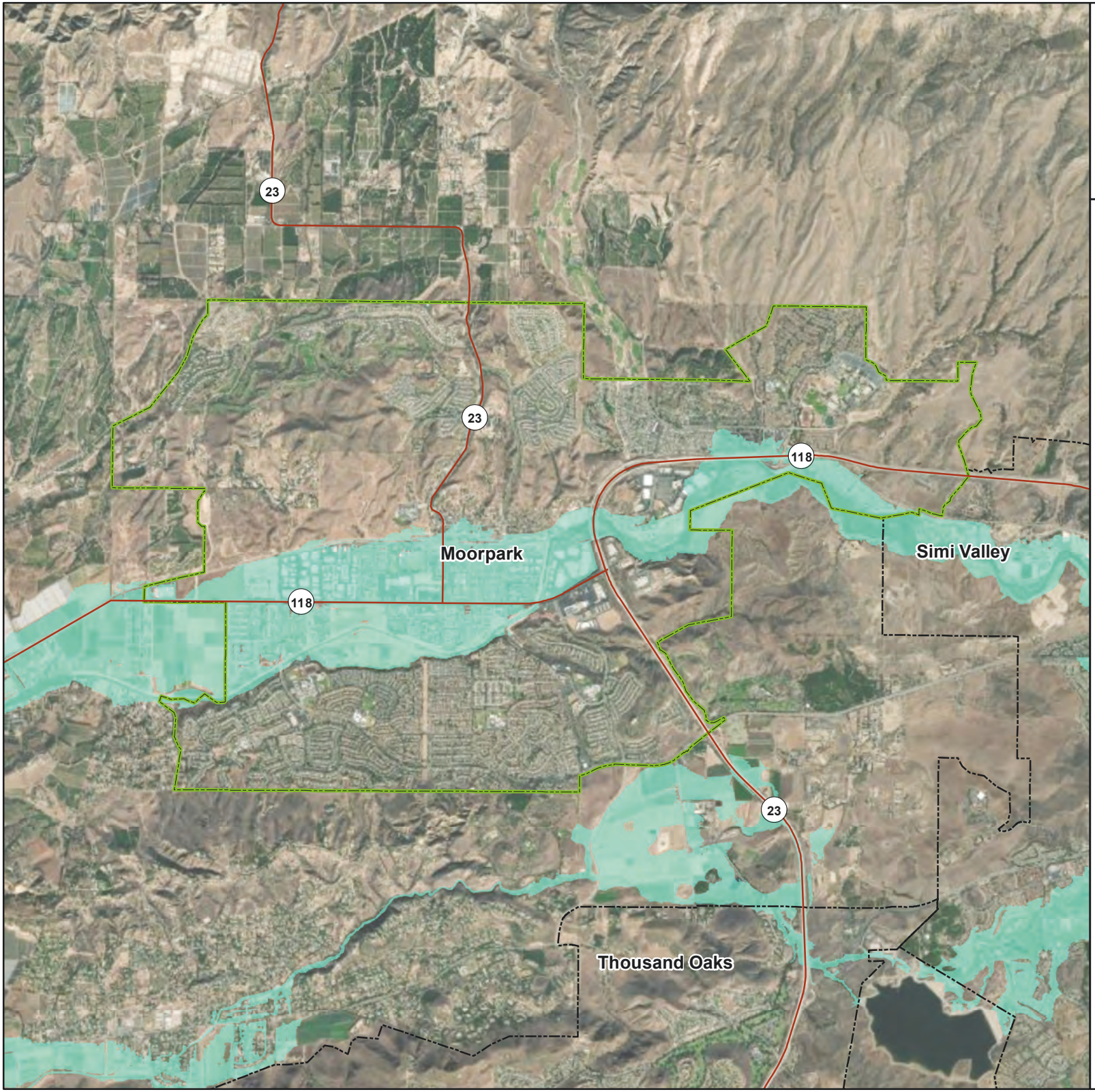
Critical Facilities (1 of 2)

- Communications
- Energy
- Hazardous Material
- Transportation
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Data Sources: Ventura Co., VCFD, Casitas MWD, Calleguas MWD, City of Camarillo, CA Energy Commission, Cal Trans, EPA, HIFLD, Esri

N

0 0.325 0.65 1.3 Miles



Moorpark

Dam Failure Inundation Areas

Combined Inundation Areas

Major Roads

Selected City

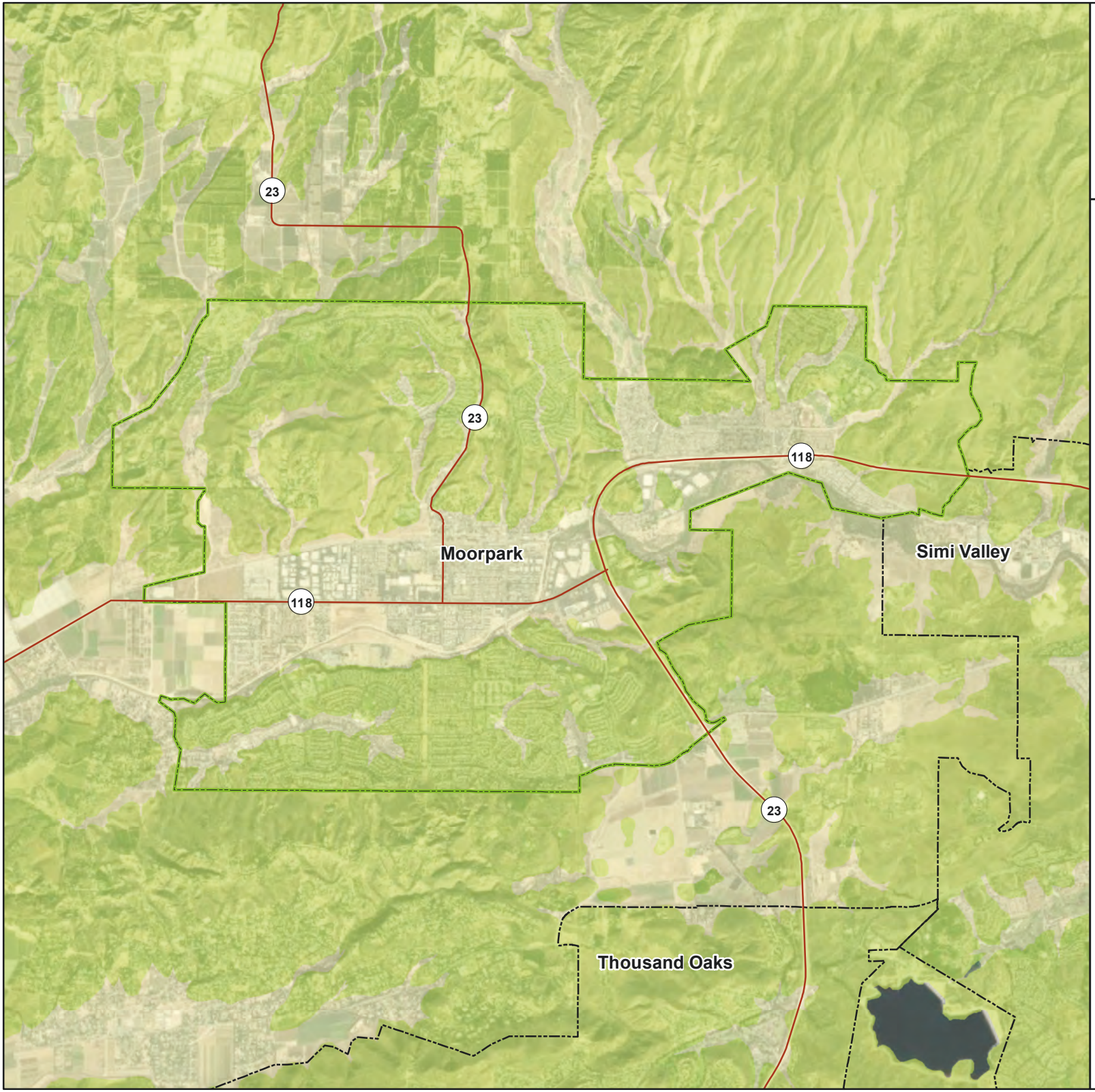
Incorporated Cities

County Boundary

Data Sources: Ventura Co., CA DWR, Esri

N

0 0.325 0.65 1.3 Miles



Moorpark

NEHRP Soil Class

C (Dense soil/soft rock)

D (Stiff soil)

Major Roads

Selected City

Incorporated Cities

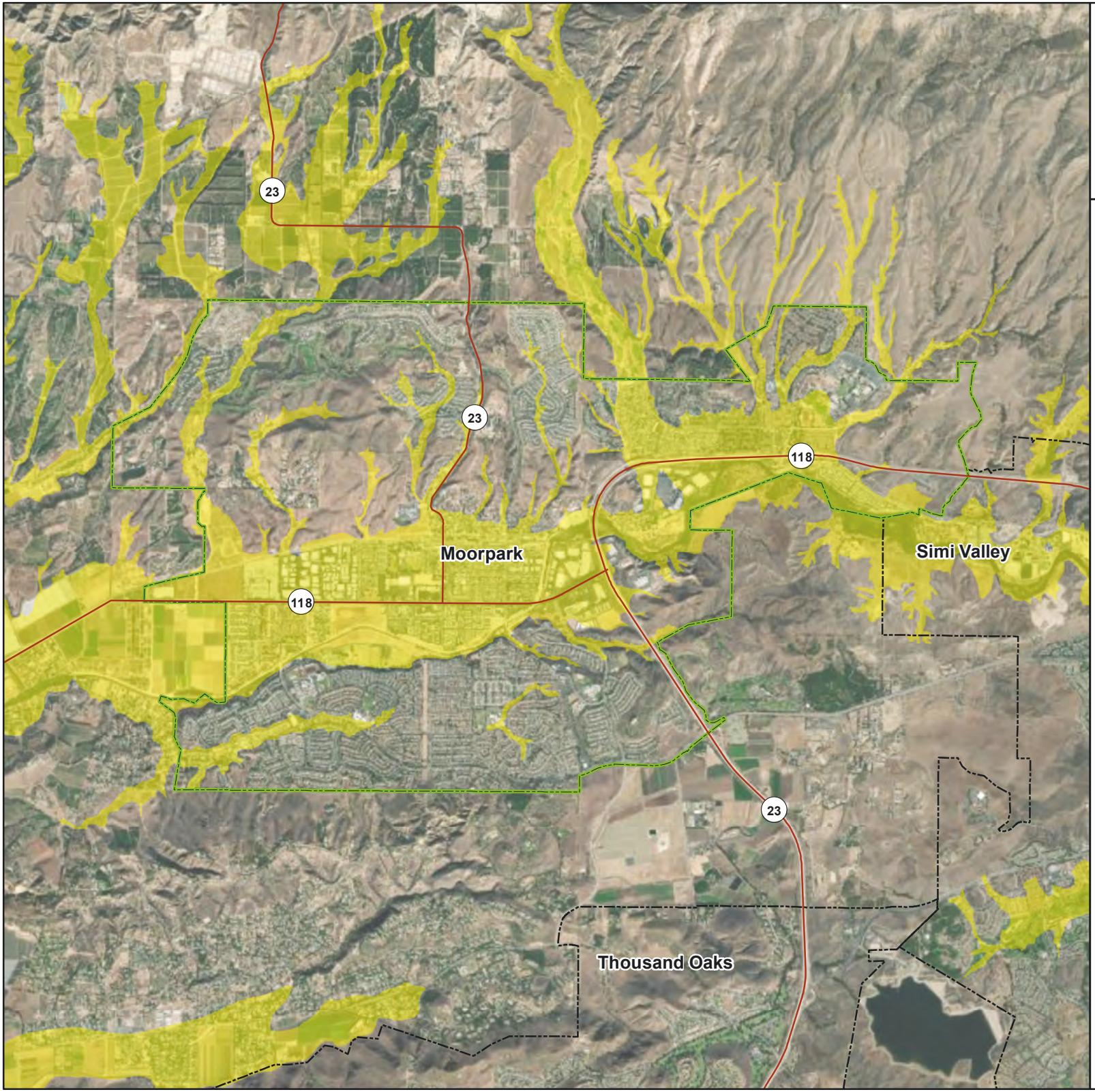
County Boundary

Data Sources: Ventura Co., CGS, Esri

N

0 0.325 0.65 1.3

Miles



Moorpark

Liquefaction Susceptibility

Liquefaction zone

Major Roads

Selected City

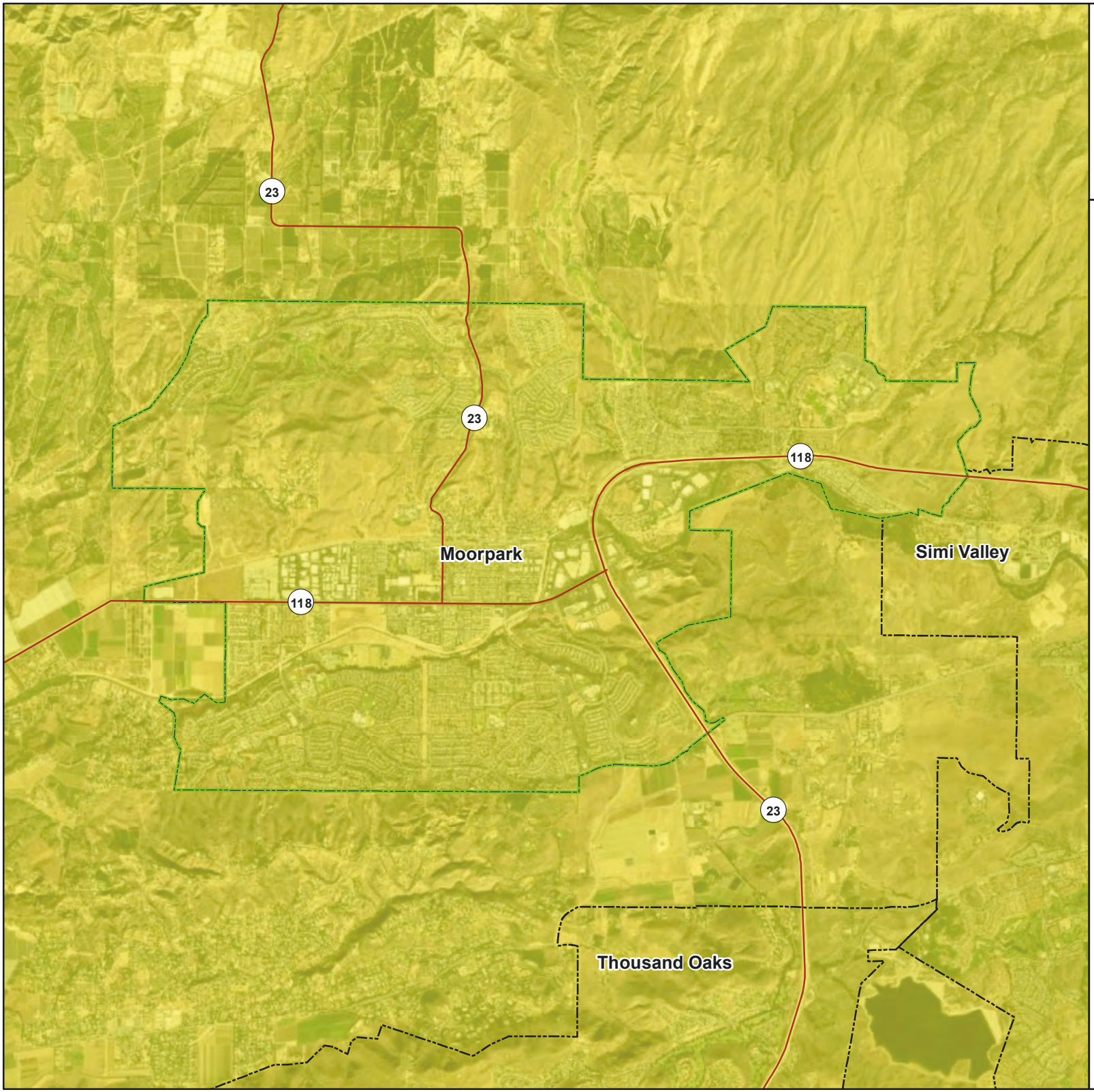
Incorporated Cities

County Boundary

Data Sources: Ventura Co., Esri

N

0 0.325 0.65 1.3 Miles



Moorpark

100-Year Probabilistic Earthquake Scenario

Mercalli Intensity Scale

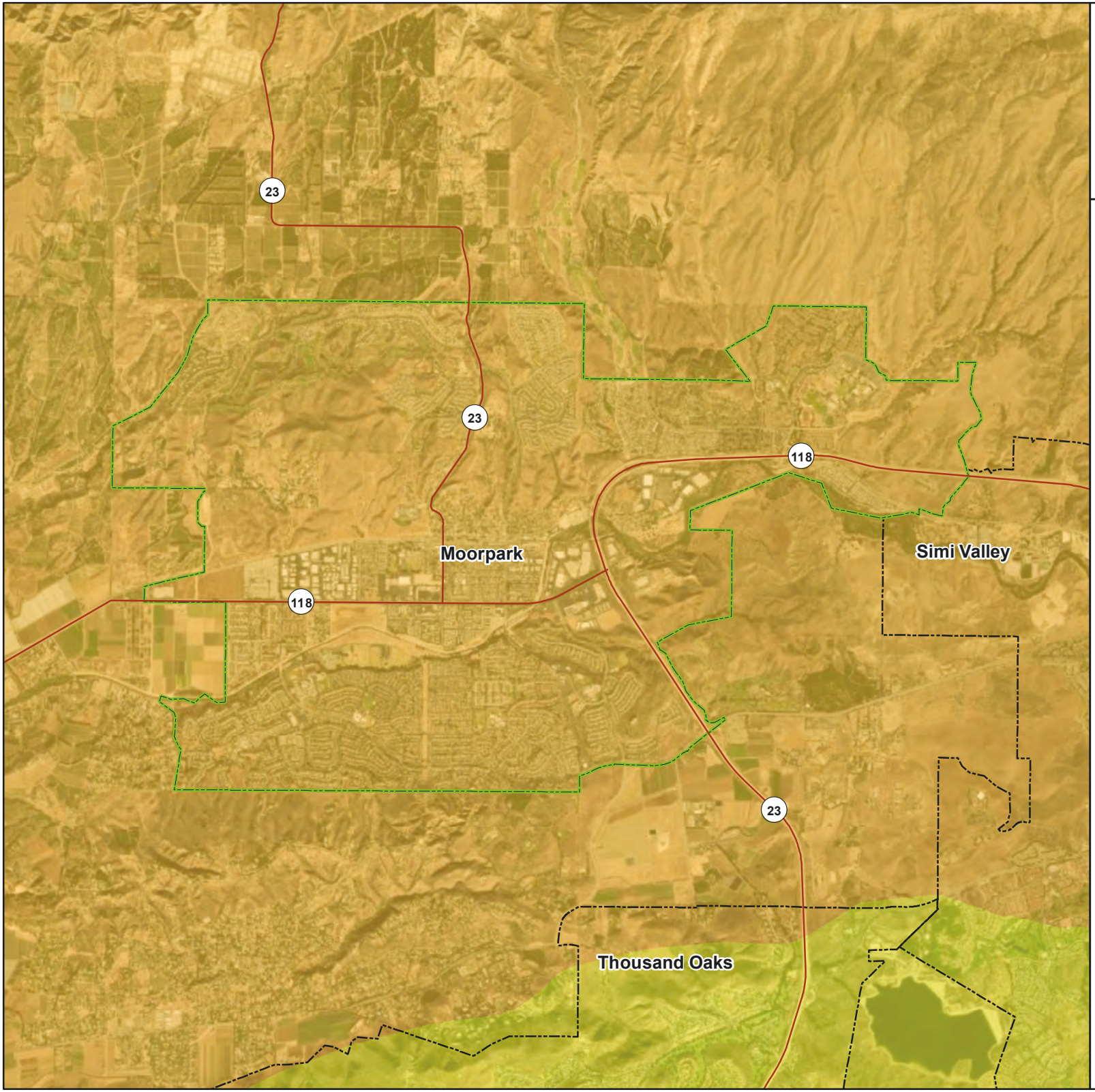
- VII (Very Strong/Moderate)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.325 0.65 1.3
Miles



Moorpark

Oak Ridge M7.16 Earthquake Scenario

Mercalli Intensity Scale

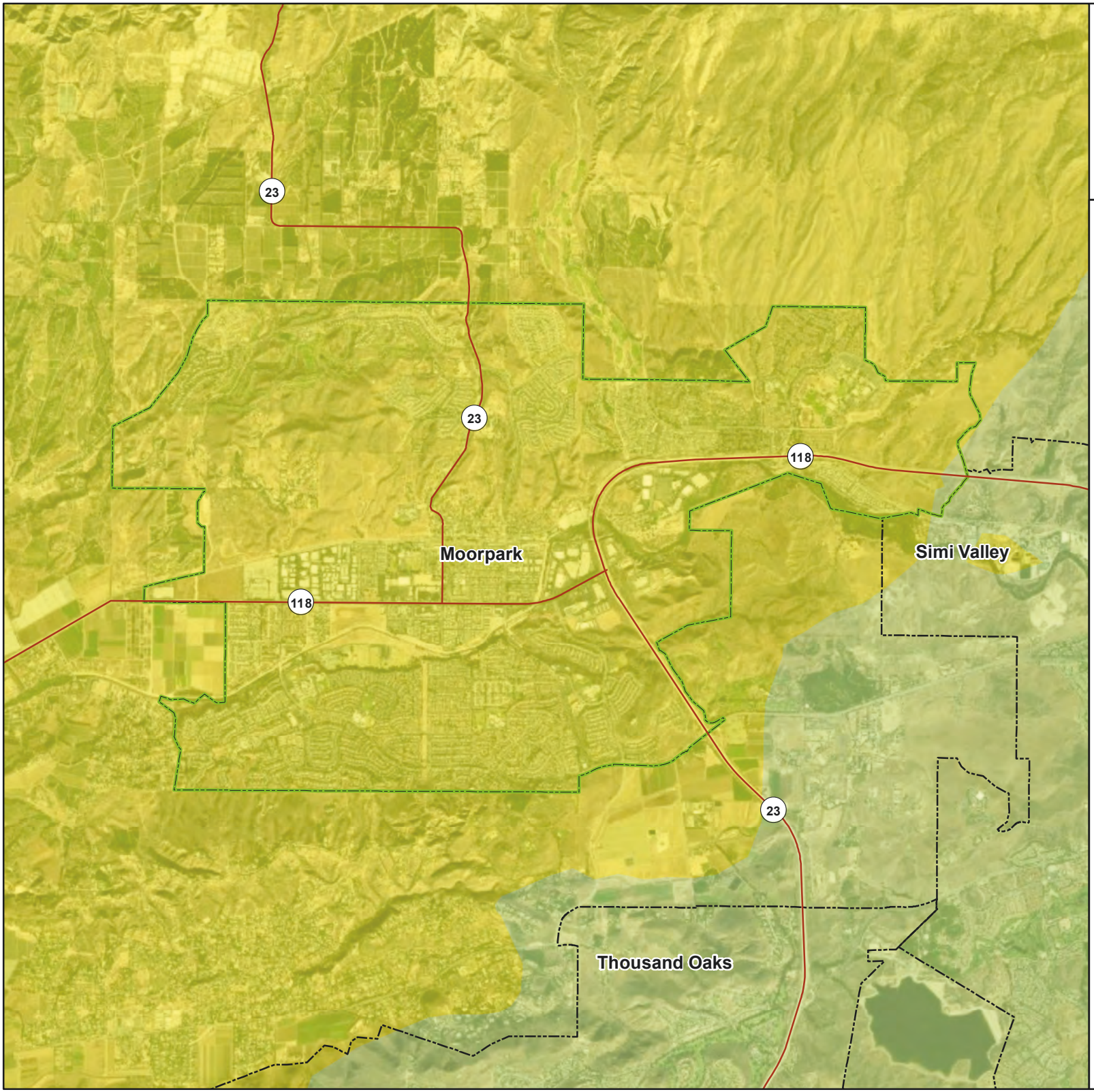
- VII (Very Strong/Moderate)
- VIII (Severe/Moderate-Heavy)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.325 0.65 1.3
Miles



Moorpark

Pitas Point M7.12 Earthquake Scenario

Mercalli Intensity Scale

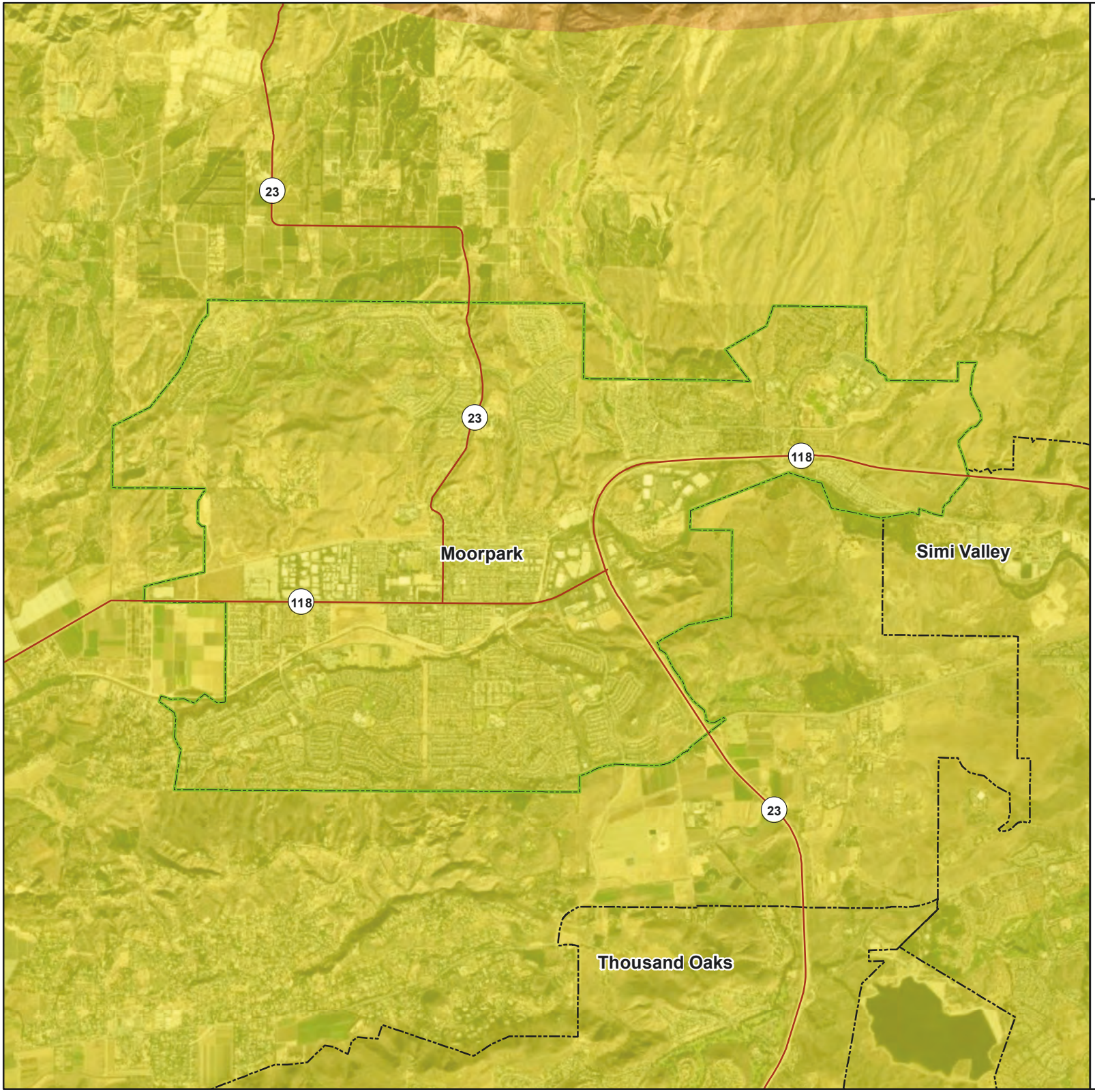
- VI (Strong/Light)
- VII (Very Strong/Moderate)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.325 0.65 1.3
Miles



Moorpark

San Cayetano M7.16 Earthquake Scenario

Mercalli Intensity Scale

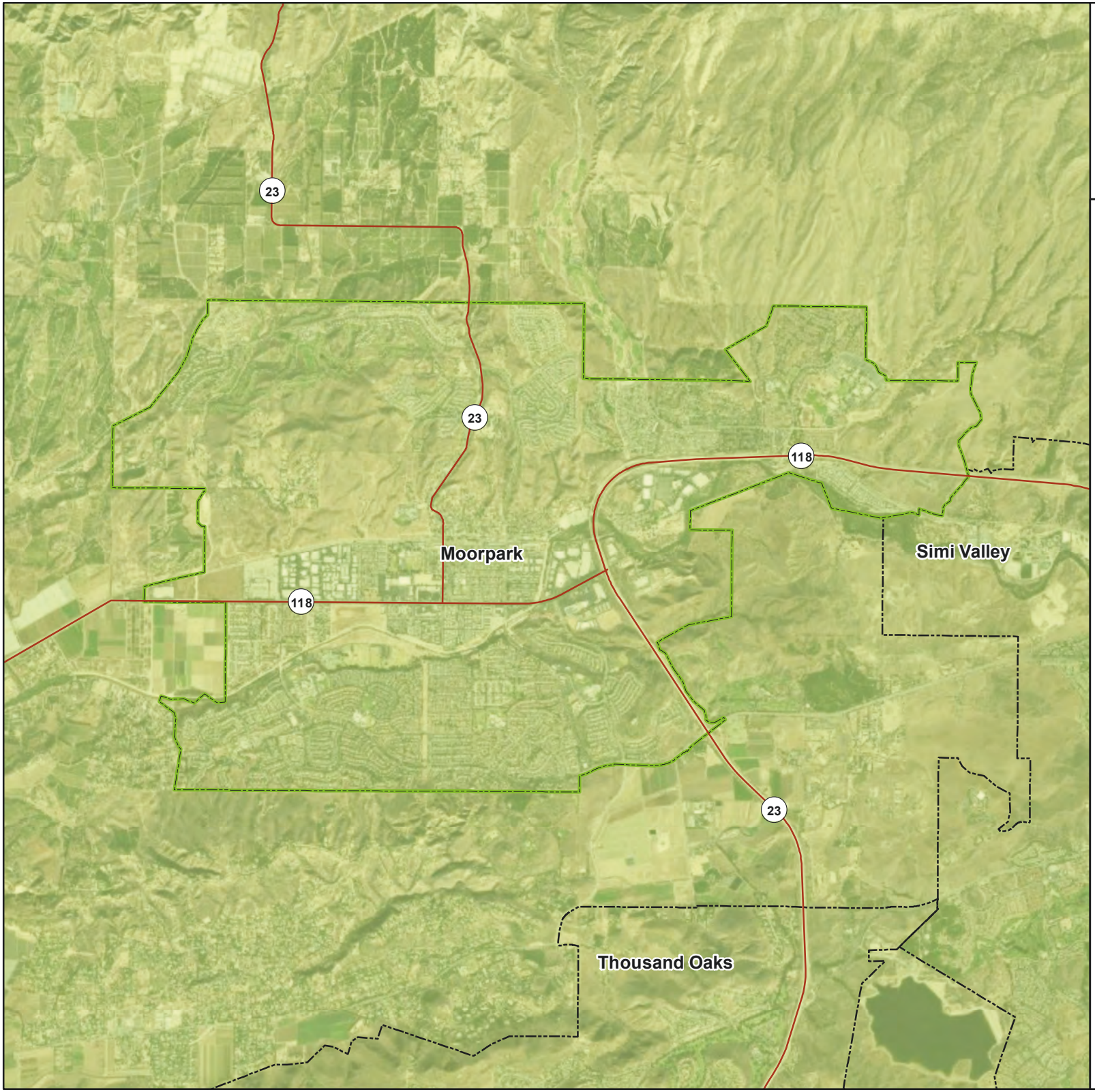
- VII (Very Strong/Moderate)
- VIII (Severe/Moderate-Heavy)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.325 0.65 1.3
Miles



Moorpark

S. San Andreas M8.03 Earthquake Scenario

Mercalli Intensity Scale

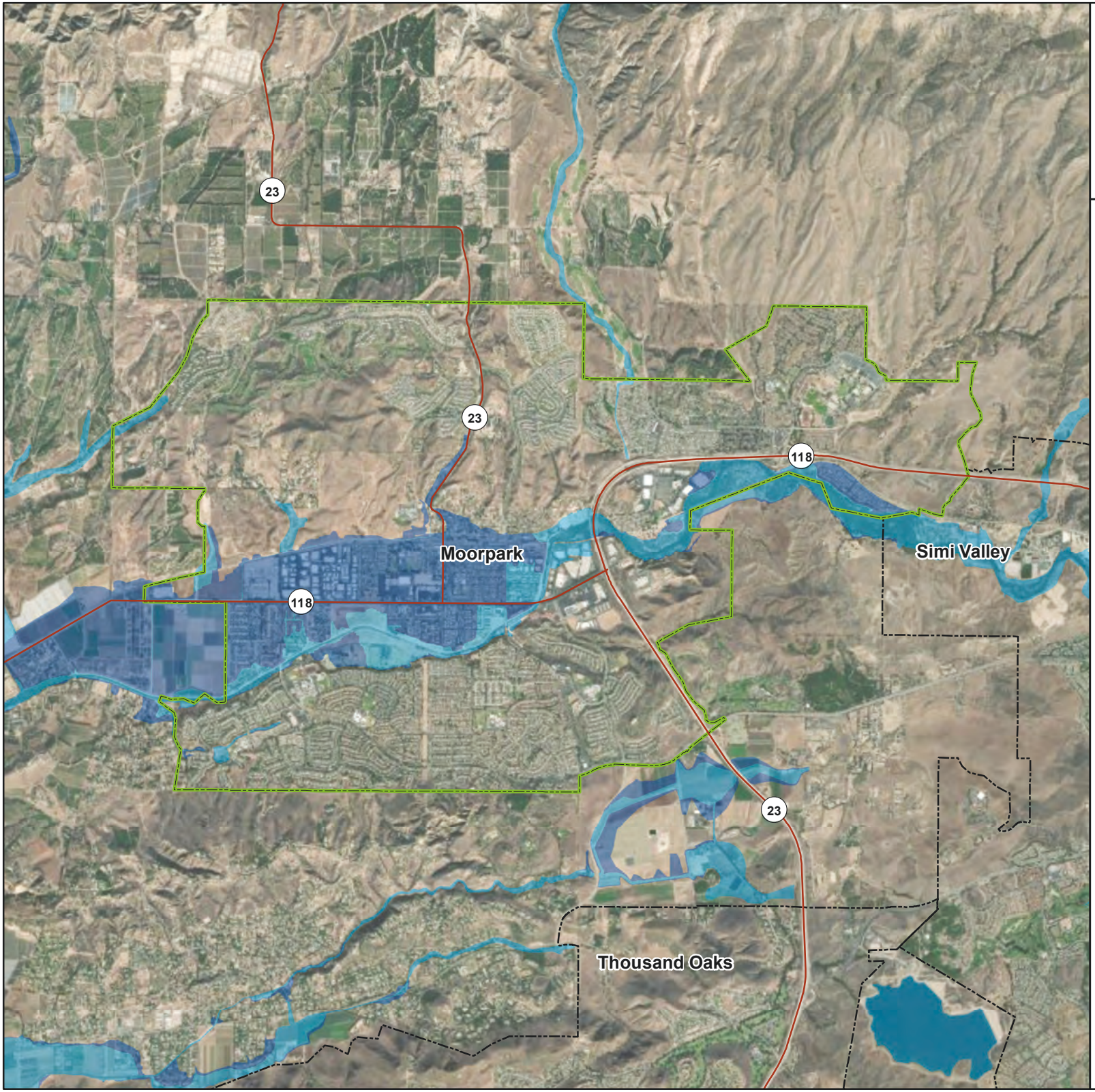
- VI (Strong/Light)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.325 0.65 1.3
Miles



Moorpark

FEMA Flood Hazard Areas

1% Annual Chance Flood (100-Year)

0.2% Annual Chance Flood (500-Year)

Major Roads

Selected City

Incorporated Cities

County Boundary

Data Sources: Ventura Co., FEMA, Esri

N

0 0.325 0.65 1.3 Miles

Moorpark

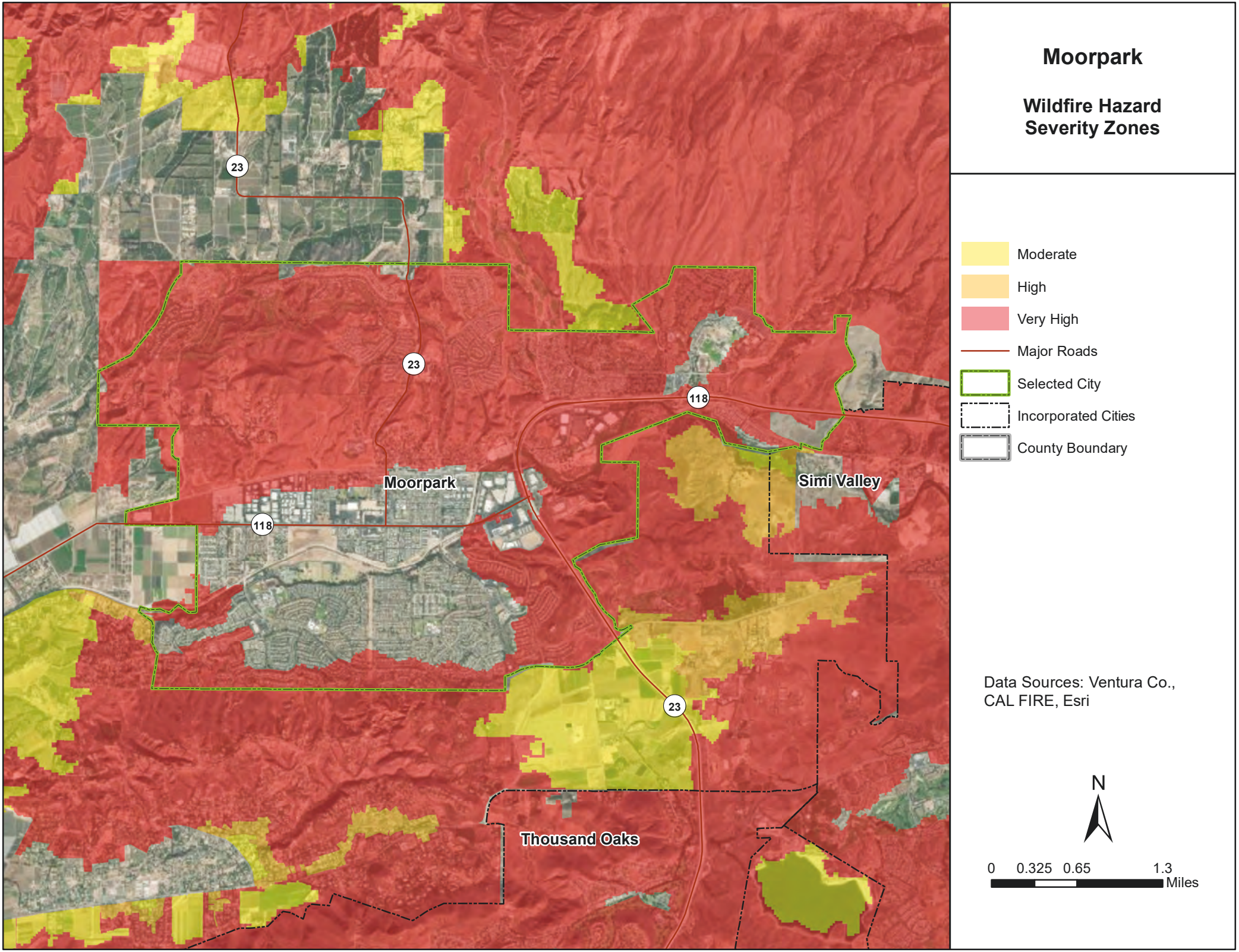
Susceptibility to Deep-Seated Landslides

- Low
- Moderate
- High
- Very High
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Data Sources: Ventura Co., CGS, Esri

N

0 0.325 0.65 1.3 Miles


Moorpark
Wildfire Hazard
Severity Zones
Moderate
High
Very High
Major Roads
Selected City
Incorporated Cities
County Boundary
Data Sources: Ventura Co.,
CAL FIRE, Esri
N
0 0.325 0.65 1.3
Miles
23
23
118
118
23
Moorpark
Simi Valley
Thousand Oaks

5. CITY OF OJAI

5.1 LOCAL HAZARD MITIGATION PLANNING TEAM

Primary Point of Contact
James Vega, City Manager
401 S. Ventura Street
Ojai, CA 93023
Telephone: (805) 646-5581 ext. 102
e-mail Address: james.vega@ojai.ca.gov

Alternate Point of Contact
Alma Quezada, Interim Public Works Director
408 S. Signal Street
Ojai, CA 93023
Telephone: (805) 646-5581 ext. 209
e-mail Address: alma.quezada@ojai.ca.gov

This annex was developed by the local hazard mitigation planning team, whose members are listed in Table 5-1.

Table 5-1. Local Mitigation Planning Team Members

Name	Title
James Vega	City Manager
Lucas Seibert	Community Development Director
Alma Quezada	Interim Public Works Director
Andrea Mackey	Management Analyst
James Hahn	Technical Support Specialist
Juan Morales	Interim Public Works Supervisor

5.2 JURISDICTION PROFILE

5.2.1 Location and Features

The City of Ojai is located in the Ojai Valley. The current boundaries generally extend from Villanova Road to Boardman Road, encompassing an area of 4.37 square miles.

Ojai is a small town that is a known as a tourist destination for its boutique hotels, recreation opportunities, hiking, and farmer's market of local organic agriculture. It is home to the annual Ojai Music Festival and the Ojai Tennis Tournament.

5.2.2 History

City of Ojai was incorporated in 1921. The town was originally named Nordhoff in 1874 but was later changed to Ojai in 1917. Edward Libbey of Libbey Glass Company built the Spanish-style downtown Arcade and park that exist today.

5.2.3 Governing Body Format

The City of Ojai is a Council-Manager form of government with five Council members elected by district. The City consists of five departments: Community Development, Finance, Public Works, Recreation, and the City Manager's office. The City Council assumes responsibility for the adoption of this plan; the City Manager will oversee its implementation.

5.3 CURRENT TRENDS

5.3.1 Population

According to the California Department of Finance, the population of the City of Ojai as of January 2020 was 7,450. Since 2010, the population has grown at an average annual rate of 0.13 percent.

5.3.2 Development

Anticipated future development for the City of Ojai is low to moderate. Recent development has been mostly infill. There has been a focus on accessory dwelling units. Future growth in the City will be managed as identified in the City's upcoming General Plan. City Actions such as those relating to land use, annexations, zoning, subdivision and design review, redevelopment, and capital improvements, must be consistent with the plan.

Table 5-2 summarizes development trends in the period since the preparation of the previous hazard mitigation plan, as well as expected future development trends.

5.4 CAPABILITY ASSESSMENT

This section describes an assessment of existing capabilities for implementing hazard mitigation strategies. The introduction at the beginning of this volume of the hazard mitigation plan describes the components included in the capability assessment and their significance for hazard mitigation planning.

Findings of the capability assessment were reviewed to identify opportunities to expand, initiate or integrate capabilities to further hazard mitigation goals and objectives. Where such opportunities were identified and determined to be feasible, they are included in the action plan. The "Analysis of Mitigation Actions" table in this annex identifies these as community capacity building mitigation actions.

Table 5-2. Recent and Expected Future Development Trends

Criterion	Response
Has your jurisdiction annexed any land since the preparation of the previous hazard mitigation plan?	No
Is your jurisdiction expected to annex any areas during the performance period of this plan?	No
Are any areas targeted for development or major redevelopment in the next five years? • **If yes, briefly describe, including whether any of the areas are in known hazard risk areas**	Yes Chaparral School site at 414 E. Ojai Avenue DESIGN CONCEPT Ojai Town Square development celebrates Ojai as the unique and special place that it is. The development responds to this character as a bookend to the Arcade and town center, enhancing the pedestrian neighborhood linked with outdoor spaces and surrounding public-oriented program uses. The architectural expression is inspired by historic structures on the site as well as the statement of theme defined by City Ordinance. The concept finds the balance of history and future in a way that is distinctly ‘‘of Ojai.” PROGRAM HIGHLIGHTS • Establish a ±200 room hotel. • Provide Residential Housing: Market Senior, Affordable. • Creating pedestrian-friendly gardens throughout the site. • Activate historic structures on Ojai Avenue for retail and restaurant use. • Provide ample parking to support the on-site activities. • Maintain the skate park as built • Provide additional community programming opportunities. • Maintain 35 height limit to new structures.
How many permits for new construction were issued in your jurisdiction since the preparation of the previous hazard mitigation plan?	**2016**: 437; **2017**: 419; **2018**: 438; **2019**: 432; **2020**: 23
Provide the number of new-construction permits for each hazard area or provide a qualitative description of where development has occurred.	One replacement single-family dwelling, 22 Accessory Dwelling Units, 2 by new construction, 7 by conversion, 13 legalized through the Compliance program.
Describe the level of buildout in the jurisdiction, based on your jurisdiction’s buildable lands inventory. If no such inventory exists, provide a qualitative description.	The City is largely built out within city limits. The remaining pockets of infill land development opportunities within city limits are sprinkled throughout the City and respective zoning districts with smaller lots, which typically present some level of developable challenges.

The findings of the capability assessment are presented as follows:

- Table 5-3 presents an assessment of planning and regulatory capabilities
- Table 5-4 presents development and permitting capabilities
- Table 5-5 presents an assessment of fiscal capabilities
- Table 5-6 presents an assessment of administrative and technical capabilities
- Table 5-7 presents an assessment of education and outreach capabilities
- Table 5-8 presents information on National Flood Insurance Program (NFIP) compliance
- Table 5-9 presents classifications under various community mitigation programs
- Table 5-10 presents the community’s adaptive capacity for the impacts of climate change

Table 5-3. Planning and Regulatory Capability

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity?
Codes, Ordinances, & Requirements				
Building Code	Yes	No	Yes	Yes
Comment: *OMC 9-1.102 (§ 1, Ord. 718, eff. April 25, 1997)*				
Zoning Code	Yes	No	No	Yes
Comment: *OMC 10-2.202 (§ 3, Ord. 771, eff. February 13, 2004, as amended by § 1, Ord. 787, eff. February 10, 2006, § 2, Ord. No. 827, eff. June 28, 2013)*				
Subdivisions	Yes	Yes	Yes	No
Comment: *OMC 10-3.301 (§ 2, Ord. 637, eff. January 9, 1986)*				
Stormwater Management	Yes	Yes	Yes	Yes
Comment: *OMC 5-12.101 Co-permittee with the Ventura County Flood Control District*				
Post-Disaster Recovery	No	No	No	No
Comment: *None*				
Real Estate Disclosure	No	Yes	Yes	No
Comment: *OMC 4-11.12 (§ 1, Ord. 738, eff. July 22, 1999, as amended by § 1, Ord. 744, eff. March 24, 2000, as renumbered by § 2, Ord. 800, eff. August 8, 2008)*				
Growth Management	Yes	No	No	Yes
Comment: *OMC 10-6.101 (§ 1, Ord. 769, eff. January 8, 2004)*				
Site Plan Review	Yes	No	No	Yes
Comment: *OMC 10-2.101 (§ 3, Ord. 771, eff. February 13, 2004)*				
Environmental Protection	No	No	No	No
Comment: *None*				
Flood Damage Prevention	Yes	Yes	No	Yes
Comment: *OMC 9-9.101 (§ 1, Ord. 655, eff. May 19, 1988, as amended by § 2, Ord. 914, eff. March 24, 2021)*				
Emergency Management	Yes	Yes	Yes	Yes
Comment: *OMC 3-1.01 (Part 2, Ord. 468, eff. March 29, 1973)*				
Climate Change	No	No	No	No
Comment: *None*				
Planning Documents				
General Plan	Yes	No	Yes	Yes
Is the plan compliant with Assembly Bill 2140? *No* ***Comment:*** *Currently being updated*				
Capital Improvement Plan	Yes	No	No	Yes
How often is the plan updated? *Annually* ***Comment:***				
Disaster Debris Management Plan	No	No	No	No
Comment: *None*				
Floodplain or Watershed Plan	Yes	Yes	No	Yes
Comment: *The city participates in the NFIP.*				
Stormwater Plan	Yes	Yes	Yes	Yes
Comment: *Ventura Countywide Storm Water Quality Management Program to discharge wastes for municipal storm water and urban runoff discharges under waste discharge requirements contained in Order No. 94-082, adopted on July 27, 2000*				
Urban Water Management Plan	No	Yes	Yes	No
Comment: *Casitas Municipal Water District*				
Habitat Conservation Plan	No	No	No	No
Comment: *None*				

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity?
Economic Development Plan	Yes	No	No	No
Comment: *General Plan guides economic growth*				
Shoreline Management Plan	No	No	No	No
Comment: *None*				
Community Wildfire Protection Plan	No	Yes	No	No
Comment: *Ventura County Community Wildfire Protection Plan, 2010*				
Forest Management Plan	Yes	No	No	No
Comment: *City of Ojai Community Forest Management Plan*				
Climate Action Plan	No	No	No	No
Comment: *None*				
Comprehensive Emergency Management Plan	Yes	Yes	Yes	Yes
Comment: *Emergency Operations Plan (EOP), 2013*				
Threat & Hazard Identification & Risk Assessment (THIRA)	No	No	No	No
Comment: *Not a stand-alone plan, but addressed in the EOP*				
Post-Disaster Recovery Plan	No	No	No	No
Comment: *None*				
Continuity of Operations Plan	No	No	No	No
Comment: *Not a stand-alone plan, but addressed in the EOP*				
Public Health Plan	No	Yes	Yes	No
Comment: *Ventura County Public Health Emergency Response Plan, 2019*				

Table 5-4. Development and Permitting Capability

Criterion	Response
Does your jurisdiction issue development permits?	Yes
If no, who does? If yes, which department? Community Development Department	
Does your jurisdiction have the ability to track permits by hazard area?	Yes
Does your jurisdiction have a buildable lands inventory?	No

Table 5-5. Fiscal Capability

Financial Resource	Accessible or Eligible to Use?
Community Development Block Grants	Yes
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for Specific Purposes	Yes
User Fees for Water, Sewer, Gas or Electric Service	No
Incur Debt through General Obligation Bonds	No
Incur Debt through Special Tax Bonds	No
Incur Debt through Private Activity Bonds	No
Withhold Public Expenditures in Hazard-Prone Areas	No
State-Sponsored Grant Programs	Yes
Development Impact Fees for Homebuyers or Developers	Yes

Table 5-6. Administrative and Technical Capability

Staff/Personnel Resource	Available?
Planners or engineers with knowledge of land development and land management practices ***If Yes, Department /Position:*** *Community Development Dept./ City Planner*	Yes
Engineers or professionals trained in building or infrastructure construction practices ***If Yes, Department /Position:*** *Community Development Dept./ Building Official*	Yes
Planners or engineers with an understanding of natural hazards ***If Yes, Department /Position:*** *Community Development Dept. / City Planner*	Yes
Staff with training in benefit-cost analysis ***If Yes, Department /Position:*** Finance Dept./ Finance Director	Yes
Surveyors	No
Personnel skilled or trained in GIS applications	No
Scientist familiar with natural hazards in local area	No
Emergency manager ***If Yes, Department /Position:*** City Manager's Office/ City Manager	Yes
Grant writers	No
Other ***If Yes, Department /Position:***	No

Table 5-7. Education and Outreach Capability

Criterion	Response
Do you have a public information officer or communications office?	No
Do you have personnel skilled or trained in website development?	No
Do you have hazard mitigation information available on your website? ***If yes, briefly describe:*** ojai.ca.gov › emergency-preparedness	Yes
Do you use social media for hazard mitigation education and outreach? ***If yes, briefly describe:*** Post pertinent information as required	Yes
Do you have any citizen boards or commissions that address issues related to hazard mitigation? ***If yes, briefly describe:*** The City of Ojai Disaster Council	Yes
Do you have any other programs in place that could be used to communicate hazard-related information? ***If yes, briefly describe:*** City Website, City smart phone App, government access TV channel, AM radio station	Yes
Do you have any established warning systems for hazard events? ***If yes, briefly describe:*** City Website, City smart phone App, government access TV channel, AM radio station	Yes

Table 5-8. National Flood Insurance Program Compliance

Criterion	Response
What local department is responsible for floodplain management?	Public Works Department
Who is your floodplain administrator? (department/position)	Public Works Dept. / Public Works Director
Are any certified floodplain managers on staff in your jurisdiction?	No
What is the date that your flood damage prevention ordinance was last amended?	3/24/2021
Does your floodplain management program meet or exceed minimum requirements?	Meet
When was the most recent Community Assistance Visit or Community Assistance Contact?	N/A

Criterion	Response
Does your jurisdiction have any outstanding NFIP compliance violations that need to be addressed?	No
Are any RiskMAP projects currently underway in your jurisdiction?	No
Do your flood hazard maps adequately address the flood risk within your jurisdiction?	Yes
Does your floodplain management staff need any assistance or training to support its floodplain management program? ***If so, what type of assistance/training is needed?*** Ongoing training	Yes
Does your jurisdiction participate in the Community Rating System (CRS)? ***If no, is your jurisdiction interested in joining the CRS program?*** Possibly	No
How many flood insurance policies are in force in your jurisdiction?[a] ***What is the insurance in force?*** $25,299,000 ***What is the premium in force?*** $41,007	79
How many total loss claims have been filed in your jurisdiction?[a] ***What were the total payments for losses?*** $223,301	43

a. According to FEMA statistics as of March 31, 2021

Table 5-9. Community Classifications

	Participating?	Classification	Date Classified
FIPS Code	Yes	0611153476	N/A
DUNS #	Yes	085921781	N/A
Community Rating System	No	N/A	N/A
Building Code Effectiveness Grading Schedule	No	N/A	N/A
Public Protection, contract with VCFPD	Yes	03/3X	12/21/2018
Storm Ready	No	N/A	N/A
Firewise	No	N/A	N/A
Tsunami Ready	No	N/A	N/A

Table 5-10. Adaptive Capacity for Climate Change

Criterion	Jurisdiction Rating[a]
Technical Capacity	
Jurisdiction-level understanding of potential climate change impacts ***Comment:*** *City is aware of current drought issues and potential wildfire issues*	High
Jurisdiction-level monitoring of climate change impacts ***Comment:***	Low
Technical resources to assess proposed strategies for feasibility and externalities ***Comment:***	Low
Jurisdiction-level capacity for development of greenhouse gas emissions inventory ***Comment:***	Low
Capital planning and land use decisions informed by potential climate impacts ***Comment:***	Low
Participation in regional groups addressing climate risks ***Comment:***	Low

Criterion	Jurisdiction Rating[a]
Implementation Capacity	
Clear authority/mandate to consider climate change impacts during public decision-making processes ***Comment:***	Low
Identified strategies for greenhouse gas mitigation efforts ***Comment:***	Low
Identified strategies for adaptation to impacts ***Comment:***	Low
Champions for climate action in local government departments ***Comment:***	Low
Political support for implementing climate change adaptation strategies ***Comment:***	Low
Financial resources devoted to climate change adaptation ***Comment:***	Low
Local authority over sectors likely to be negative impacted ***Comment:***	Low
Public Capacity	
Local residents' knowledge of and understanding of climate risk ***Comment:*** *Water use reduction due to drought*	High
Local residents' support of adaptation efforts ***Comment:*** *Installation and use of solar power*	High
Local residents' capacity to adapt to climate impacts ***Comment:*** *Water conservation*	High
Local economy current capacity to adapt to climate impacts ***Comment:***	Low
Local ecosystems capacity to adapt to climate impacts ***Comment:***	Unsure

a. High = Capacity exists and is in use; Medium = Capacity may exist, but is not used or could use some improvement; Low = Capacity does not exist or could use substantial improvement; Unsure= Not enough information is known to assign a rating.

5.5 INTEGRATION REVIEW

For hazard mitigation planning, "integration" means that hazard mitigation information is used in other relevant planning mechanisms, such as general planning and capital facilities planning, and that relevant information from those sources is used in hazard mitigation. This section identifies where such integration is already in place, and where there are opportunities for further integration in the future. Resources listed at the end of this annex were used to provide information on integration. The progress reporting process described in Volume 1 of the hazard mitigation plan will document the progress of hazard mitigation actions related to integration and identify new opportunities for integration.

5.5.1 Existing Integration

Some level of integration has already been established between local hazard mitigation planning and the following other local plans and programs:

- Building Code *9-1.102*
- Capital Improvement Plan—Includes projects that can help mitigate potential hazards.

5.5.2 Opportunities for Future Integration

The capability assessment in this annex indicates opportunities to integrate this mitigation plan with other jurisdictional planning/regulatory capabilities. Capabilities were identified as integration opportunities if they can support or enhance the actions identified in this plan or be supported or enhanced by components of this plan. The capability assessment identified the following plans and programs that do not currently integrate hazard mitigation information but provide opportunities to do so in the future:

- **General Plan**—Consider new update to the Housing Element
- **Emergency Operations Plan (EOP), 2013—**Assesses threats from natural hazards that could impact the City.

Taking action to integrate each of these programs with the hazard mitigation plan was considered as a mitigation action to include in the action plan in this annex.

5.6 RISK ASSESSMENT

5.6.1 Jurisdiction-Specific Natural Hazard Event History

Table 5-11 lists past occurrences of natural hazards for which specific damage was recorded in this jurisdiction Other hazard events that broadly affected the entire planning area, including this jurisdiction, are listed in the risk assessments in Volume 1 of this hazard mitigation plan.

Table 5-11. Past Natural Hazard Events

Type of Event	FEMA Disaster #	Date	Damage Assessment
COVID-19 Pandemic	DR-4482	1/20/2020 and continuing	$3-4 million in lost revenue
Thomas Fire	FM-5224	12/4/2017	No structures lost, City activated Emergency Operation Center, major impact to City
Pine Fire		6/30/2016	Unknown
Severe Storms, Flooding, Debris Flows, and Mudslides	DR-1577	1/9/2005	Impacted City. Daly park and surrounding homes in neighborhood affected by mud
Wolf Fire		6/1/2002	Unknown
Lightning Strike		4/18/2000	One residential home struck
Flood/Landslide		2/20/2000	Unknown
Ranch Fire		12/21/1999	Unknown

5.6.2 Hazard Risk Ranking

Table 5-12 presents a local ranking of all hazards of concern for which this hazard mitigation plan provides complete risk assessments. As described in detail in Volume 1, the ranking process involves an assessment of the likelihood of occurrence for each hazard, along with its potential impacts on people, property, and the economy. Mitigation actions primarily target hazards with high and medium rankings. The drought hazard has been increased from low to high to match Casitas Municipal Water District, City of Ojai's water purveyor, and to better reflect local knowledge. The City is vulnerable to drought as it is dependent on Lake Casitas for water. As of October 2021, Lake Casitas is at 33% capacity—a Stage 3 drought. If lake level is reduced to 30% or less, CMWD would implement Stage 4.

Table 5-12. Hazard Risk Ranking

Rank	Hazard	Risk Ranking Score	Risk Category
1	Landslide	33	High
2	Earthquake	32	High
3	Drought	30	High
4	Severe Storms	24	Medium
5	Severe Weather	24	Medium
6	Wildfire	18	Medium
7	Flooding	18	Medium
8	Dam Failure	12	Low

5.6.3 Jurisdiction-Specific Vulnerabilities

Volume 1 of this hazard mitigation plan provides complete risk assessments for each identified hazard of concern. This section provides information on a few key vulnerabilities for this jurisdiction. Available jurisdiction-specific risk maps of the hazards are provided at the end of this annex.

Repetitive Loss Properties

Repetitive loss records are as follows:

- Number of FEMA-identified Repetitive-Loss Properties: 0
- Number of FEMA-identified Severe-Repetitive-Loss Properties: 0
- Number of Repetitive-Loss or Severe-Repetitive-Loss Properties that have been mitigated: 0

Other Noted Vulnerabilities

The following jurisdiction-specific issues have been identified based on a review of the results of the risk assessment, public involvement strategy, and other available resources:

- The City Recreation Department is the only Cooling Center in the City. If there is a Public Safety Power Shut-off (PSPS) then a generator is necessary.
- Urban flooding with storm drain issues

Mitigation actions addressing these issues were prioritized for consideration in the action plan in this annex.

5.7 STATUS OF PREVIOUS PLAN ACTIONS

Table 5-13 summarizes the actions that were recommended in the previous version of the hazard mitigation plan and their implementation status at the time this update was prepared.

Table 5-13. Status of Previous Plan Actions

Action Item	Completed	Removed; No Longer Feasible	Carried Over to Plan Update	
			Check if Yes	Action # in Update
OA 10—Seismically retrofit or upgrade seismically deficient government facilities and pre-identified shelter facilities.			✓	OJC-1
Comment: No action. Lack of funding				
OA 11—Develop and implement plans to increase the building owner's general knowledge of and appreciation for the value of seismic upgrading of the building's structural and nonstructural elements.			✓	OJC-2
Comment: No action. Lack of staffing				
OA 14—Acquire, relocate, or elevate residential structures, in particular those that have been identified as RL properties, within the 100-year floodplain.			✓	OJC-1
Comment: No action. Lack of funding/staff				
OA 21—Maintain hazards fuel treatment program for areas that have been identified with overgrown/dead brush/trees to reduce the potential for tree-to-tree ignition. Ensure that a "maintenance now" component to provide continued fire resistance is part of the program.			✓	OJC-8
Comment: Ongoing tree and brush clearing for fire abatement				

5.8 HAZARD MITIGATION ACTION PLAN

Table 5-14 lists the identified actions, which make up the hazard mitigation action plan for this jurisdiction. Table 5-15 identifies the priority for each action. Table 5-16 summarizes the mitigation actions by hazard of concern and mitigation type.

Table 5-14. Hazard Mitigation Action Plan Matrix

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action OJC-1—Where appropriate, support retrofitting, purchase or relocation of structures located in hazard areas, prioritizing those that have experienced repetitive losses and/or are located in high- or medium-risk hazard areas.						
Hazards Mitigated: Landslide, Earthquake, Severe Storms, Severe Weather, Wildfire, Flooding, Dam Failure						
Existing	1, 2, 4, 6, 9, 10, 11, 16	Community Development Dept	Public Works Dept	High	FEMA HMA (BRIC, FMA, PDM and HMGP)	Short-term
Action OJC-2—Develop and implement plans to increase the building owner's general knowledge of and appreciation for the value of seismic upgrading of the building's structural and nonstructural elements.						
Hazards Mitigated: Earthquake						
Existing	1, 9, 12, 16, 17	Community Development Dept	Public Works Dept	Low	Staff Time, General Funds	Short-term
Action OJC-3—Integrate the hazard mitigation plan into other plans, ordinances and programs that dictate land use decisions in the community, including General Plan Update, Emergency Action Plan						
Hazards Mitigated: Landslide, Earthquake, Severe Storms, Severe Weather, Wildfire, Flooding, Dam Failure						
New & Existing	1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 17, 19	Community Development Dept	Public Works Dept	Low	Staff Time, General Funds	Ongoing

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action OJC-4—Actively participate in the plan maintenance protocols outlined in Volume 1 of this hazard mitigation plan.						
Hazards Mitigated: Landslide, Earthquake, Severe Storms, Severe Weather, Wildfire, Flooding, Dam Failure, Drought						
New & Existing	1, 2, 4, 6, 7, 8, 9, 11, 12, 13, 14, 15	City of Ojai	Community Development Dept	Low	Staff Time, General Funds	Short-term
Action OJC-5—Continue to maintain good standing and compliance under the NFIP through implementation of floodplain management programs that, at a minimum, meet the NFIP requirements: • Enforce the flood damage prevention ordinance. • Participate in floodplain identification and mapping updates. • Provide public assistance/information on floodplain requirements and impacts.						
Hazards Mitigated: Flooding						
New & Existing	1, 2, 6, 7, 17	Public Works Dept		Low	Staff Time, General Funds	Ongoing
Action OJC-6—Identify and pursue strategies to increase adaptive capacity to climate change.						
Hazards Mitigated: Severe Storms, Severe Weather, Wildfire, Flooding, Drought						
New & Existing	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 19	Enter Response	Enter Response	Low	FEMA HMA (BRIC, FMA, HMGP), Staff Time, General Funds	Short-term
Action OJC-7—Purchase generators for critical facilities and infrastructure that lack adequate backup power, including Public Works Dept. and Recreation Dept.						
Hazards Mitigated: Earthquake, Flooding, Landslide, Severe Weather, Wildfire						
Existing	2, 19	Public Works Dept	Enter Response	High	FEMA HMA (BRIC and HMGP), Staff Time, General Funds	Short-term
Action OJC-8—Maintain wildfire hazard fuel reduction program for areas that have been identified with overgrown or dead brush, trees and weeds to reduce the potential for tree-to-tree ignition. Ensure that a "maintenance now" component to provide continued fire resistance is part of the program. (Coordinates with VCFPD Action VFP-6)						
Hazards Mitigated: Wildfire						
New & Existing	2, 4, 5, 6, 8, 10, 11, 13, 14, 15, 18, 19	VCFPD	City of Ojai, CAL FIRE & USDA	Medium	FEMA HMA (BRIC, FMAP and HMGP), Staff Time & General Funds	Ongoing
Action OJC-9—Determine feasibility of the City of Ojai joining the Community Rating System (CRS) program to enhance public safety, reduce flood damage to property and infrastructure, and reduce flood insurance rates in the community.						
Hazards Mitigated: Flooding						
New & Existing	1, 2, 19	City of Ojai	None	Low	Staff Time & General Funds	Short-term

a. Short-term = Completion within 5 years; Long-term = Completion within 10 years; Ongoing= Continuing new or existing program with no completion date

Acronyms used here are defined at the beginning of this volume.

Table 5-15. Mitigation Action Priority

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Cost?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Implementation Priority[a]	Grant Pursuit Priority[a]
1	8	High	High	Yes	Yes	No	Medium	High
2	5	Medium	Low	Yes	No	Yes	High	Low
3	16	Medium	Low	Yes	No	Yes	High	Low
4	12	Low	Low	Yes	No	Yes	High	Low
5	5	Medium	Low	Yes	No	Yes	High	Low
6	17	Medium	Low	Yes	Yes	Yes	High	Medium
7	2	High	High	Yes	Yes	No	Medium	High
8	12	High	Medium	Yes	Yes	Yes	High	High
9	3	Medium	Low	Yes	No	Yes	High	Low

a. See the introduction to this volume for explanation of priorities.

Table 5-16. Analysis of Mitigation Actions

Hazard Type	Action Addressing Hazard, by Mitigation Type[a]							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilience	Community Capacity Building
High-Risk Hazards								
Landslide	OJC-3	OJC-1	OJC-4		OJC-7			OJC-4
Medium-Risk Hazards								
Earthquake	OJC-3	OJC-1	OJC-2, 4		OJC-7			OJC-4
Severe Storms	OJC-3	OJC-1	OJC-4				OJC-6	OJC-4
Severe Weather	OJC-3	OJC-1	OJC-4		OJC-7		OJC-6	OJC-4
Wildfire	OJC-3	OJC-1	OJC-4	OJC-8	OJC-7		OJC-6	OJC-4
Flooding	OJC-3, 5	OJC-1	OJC-4, 5		OJC-7		OJC-6	OJC-4, 5, 9
Low-Risk Hazards								
Dam Failure	OJC-3	OJC-1	OJC-4					OJC-4
Drought			OJC-4				OJC-6	OJC-4

a. See the introduction to this volume for explanation of mitigation types.

5.9 PUBLIC OUTREACH

Table 5-17 lists public outreach activities for this jurisdiction.

Table 5-17. Local Public Outreach

Local Outreach Activity	Date	Number of People Involved
Social Media	8/2020	1,000

5.10 INFORMATION SOURCES USED FOR THIS ANNEX

The following technical reports, plans, and regulatory mechanisms were reviewed to provide information for this annex.

- **City of Ojai Municipal Code**—The municipal code was reviewed for the full capability assessment and for identifying opportunities for action plan integration.
- **City of Ojai Flood Damage Prevention Ordinance**—The flood damage prevention ordinance was reviewed for compliance with the National Flood Insurance Program.
- **Capital Improvement Projects Program**—The municipal code was reviewed for the full capability assessment.

The following outside resources and references were reviewed:

- **Hazard Mitigation Plan Annex Development Toolkit**—The toolkit was used to support the identification of past hazard events and noted vulnerabilities, the risk ranking, and the development of the mitigation action plan.

Ojai

Critical Facilities (1 of 2)

- Food, Water, Shelter
- Health and Medical
- Safety and Security
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Data Sources: Ventura Co., VCFD, Casitas MWD, Calleguas MWD, City of Camarillo, CA Energy Commission, Cal Trans, EPA, HIFLD, Esri

N

0 0.175 0.35 0.7
Miles

Ojai

Critical Facilities (1 of 2)

- Communications
- Energy
- Transportation
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Data Sources: Ventura Co., VCFD, Casitas MWD, Calleguas MWD, City of Camarillo, CA Energy Commission, Cal Trans, EPA, HIFLD, Esri

N

0 0.175 0.35 0.7
Miles

Ojai

Dam Failure Inundation Areas

Combined Inundation Areas

Major Roads

Selected City

Incorporated Cities

County Boundary

Data Sources: Ventura Co., CA DWR, Esri

N

0 0.175 0.35 0.7 Miles

Ojai

NEHRP Soil Class

C (Dense soil/soft rock)

D (Stiff soil)

Major Roads

Selected City

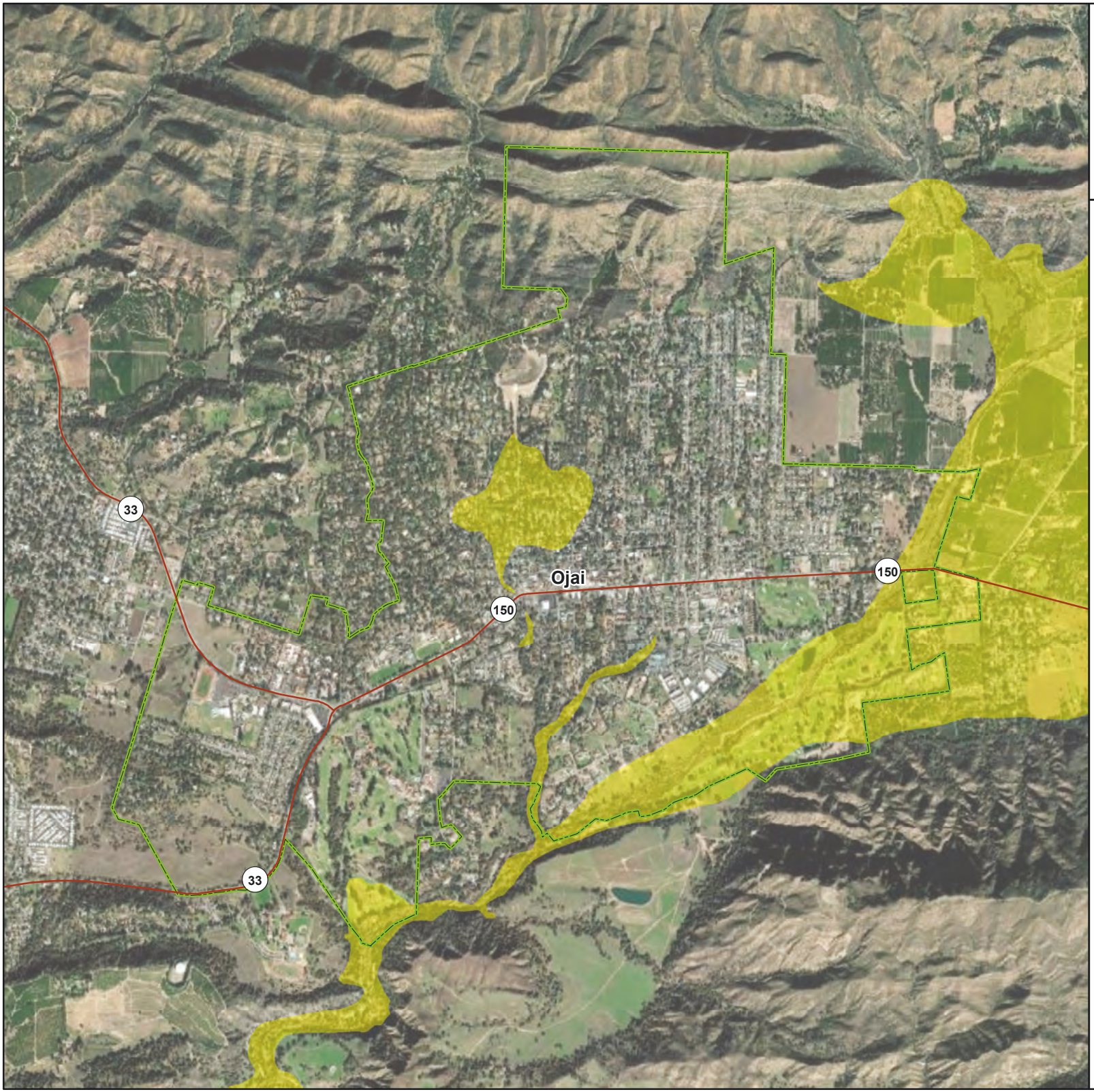
Incorporated Cities

County Boundary

Data Sources: Ventura Co., CGS, Esri

N

0 0.175 0.35 0.7 Miles



Ojai

Liquefaction Susceptibility

Liquefaction zone

Major Roads

Selected City

Incorporated Cities

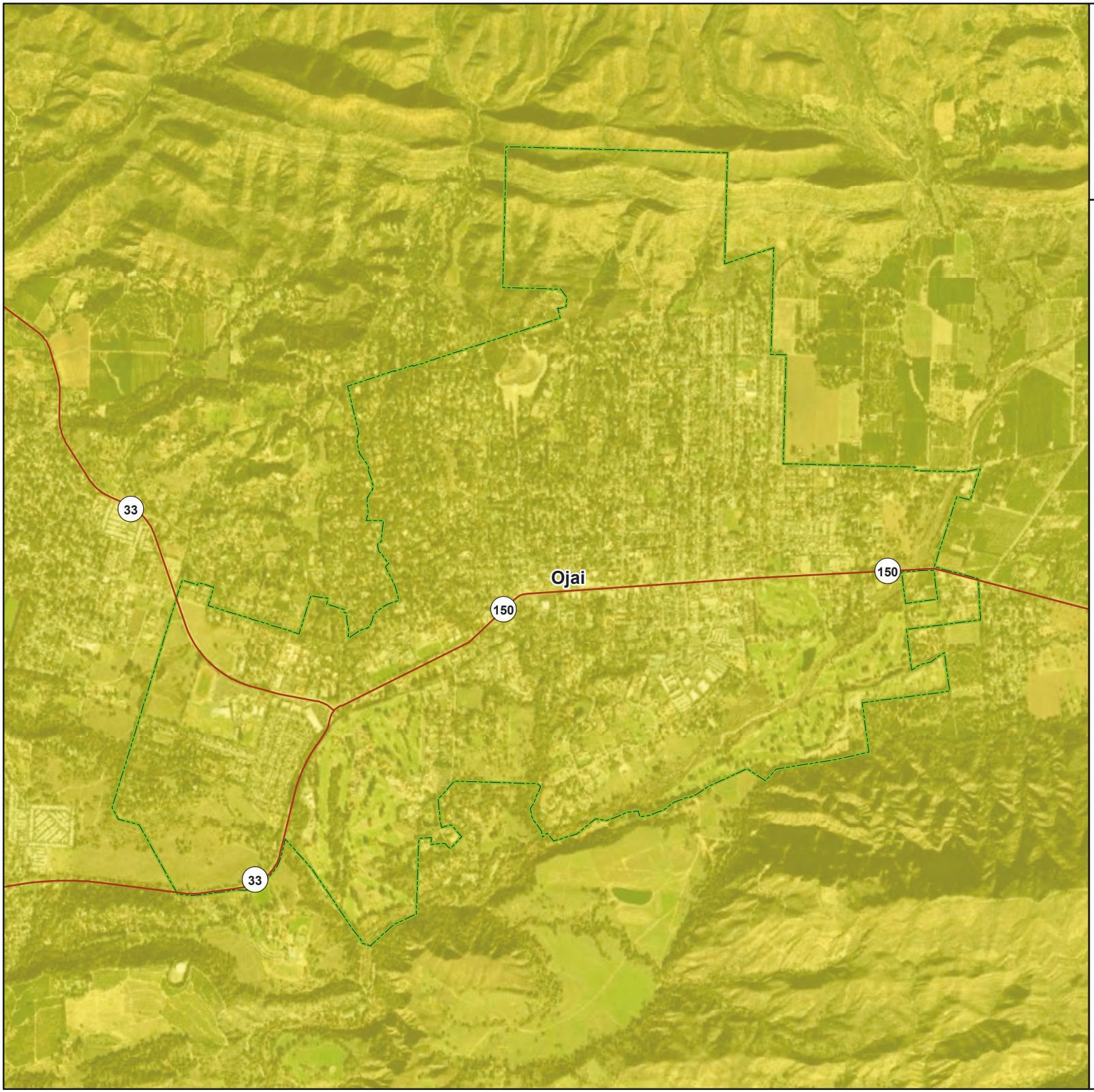
County Boundary

Data Sources: Ventura Co., Esri

N

0 0.175 0.35 0.7

Miles



Ojai

100-Year Probabilistic Earthquake Scenario

Mercalli Intensity Scale

- VII (Very Strong/Moderate)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.175 0.35 0.7 Miles

Ojai

Oak Ridge M7.16 Earthquake Scenario

Mercalli Intensity Scale

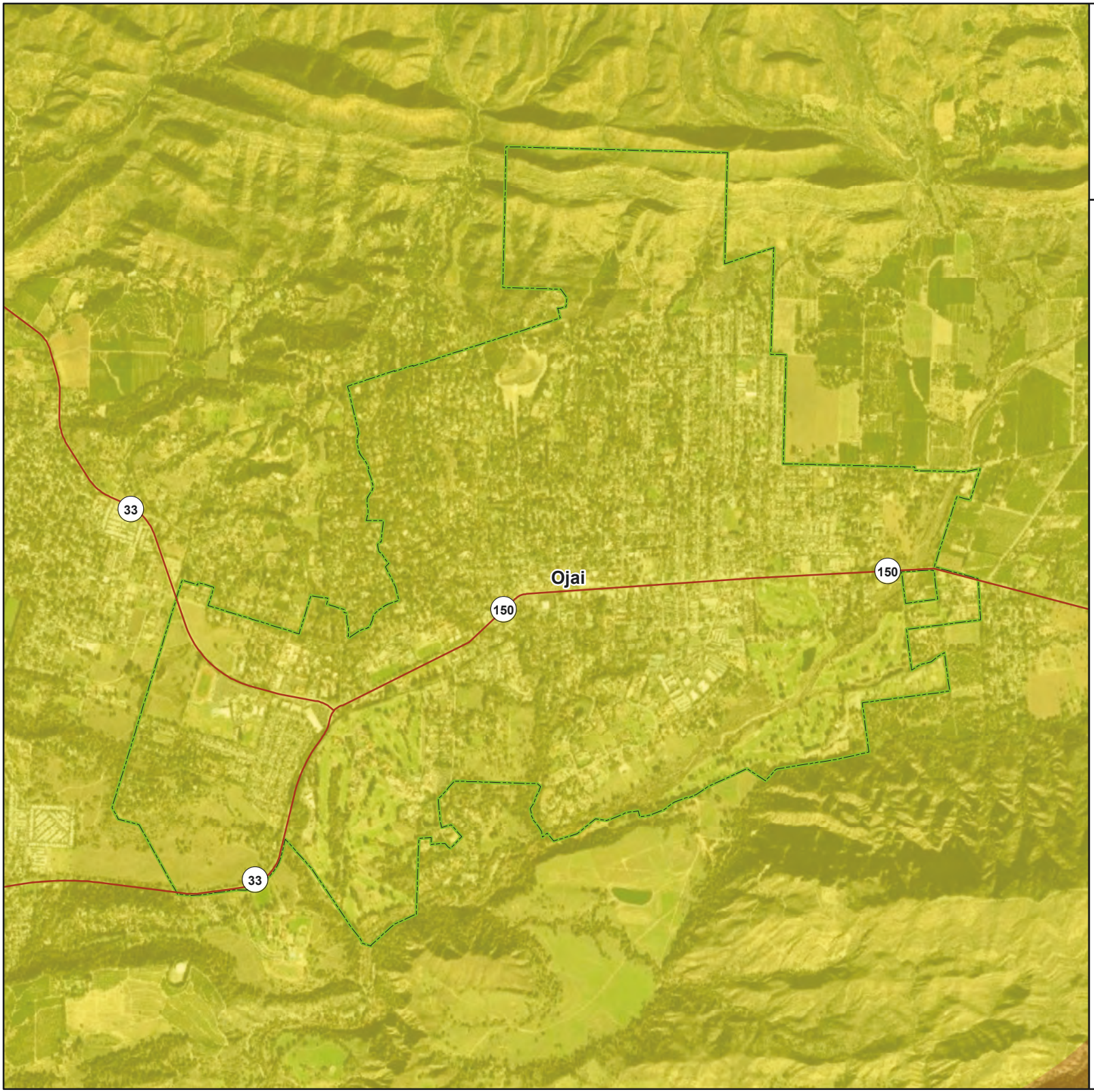
- VI (Strong/Light)
- VII (Very Strong/Moderate)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.175 0.35 0.7
Miles



Ojai

Pitas Point M7.12 Earthquake Scenario

Mercalli Intensity Scale

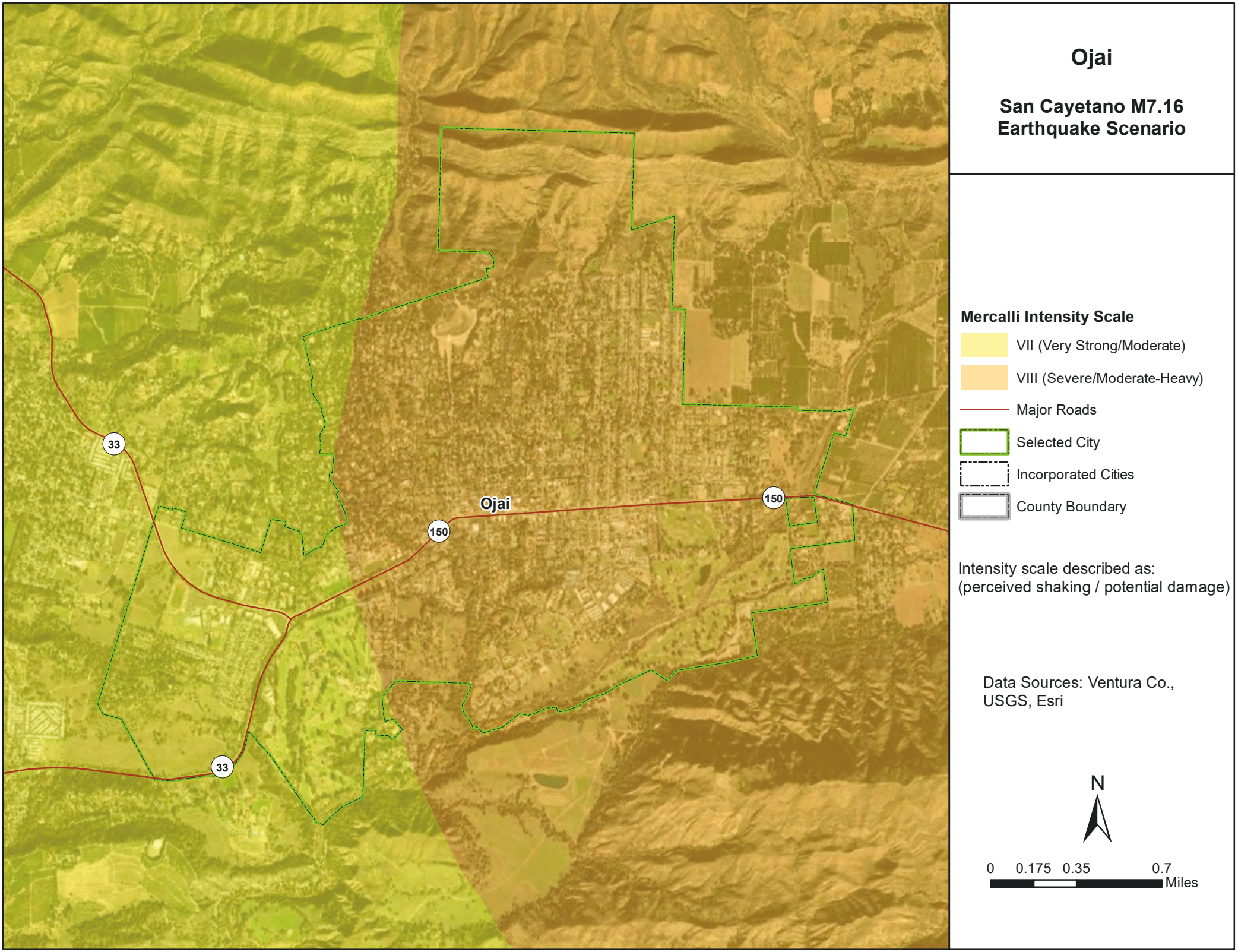
- VII (Very Strong/Moderate)
- VIII (Severe/Moderate-Heavy)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.175 0.35 0.7 Miles



Ojai

San Cayetano M7.16 Earthquake Scenario

Mercalli Intensity Scale

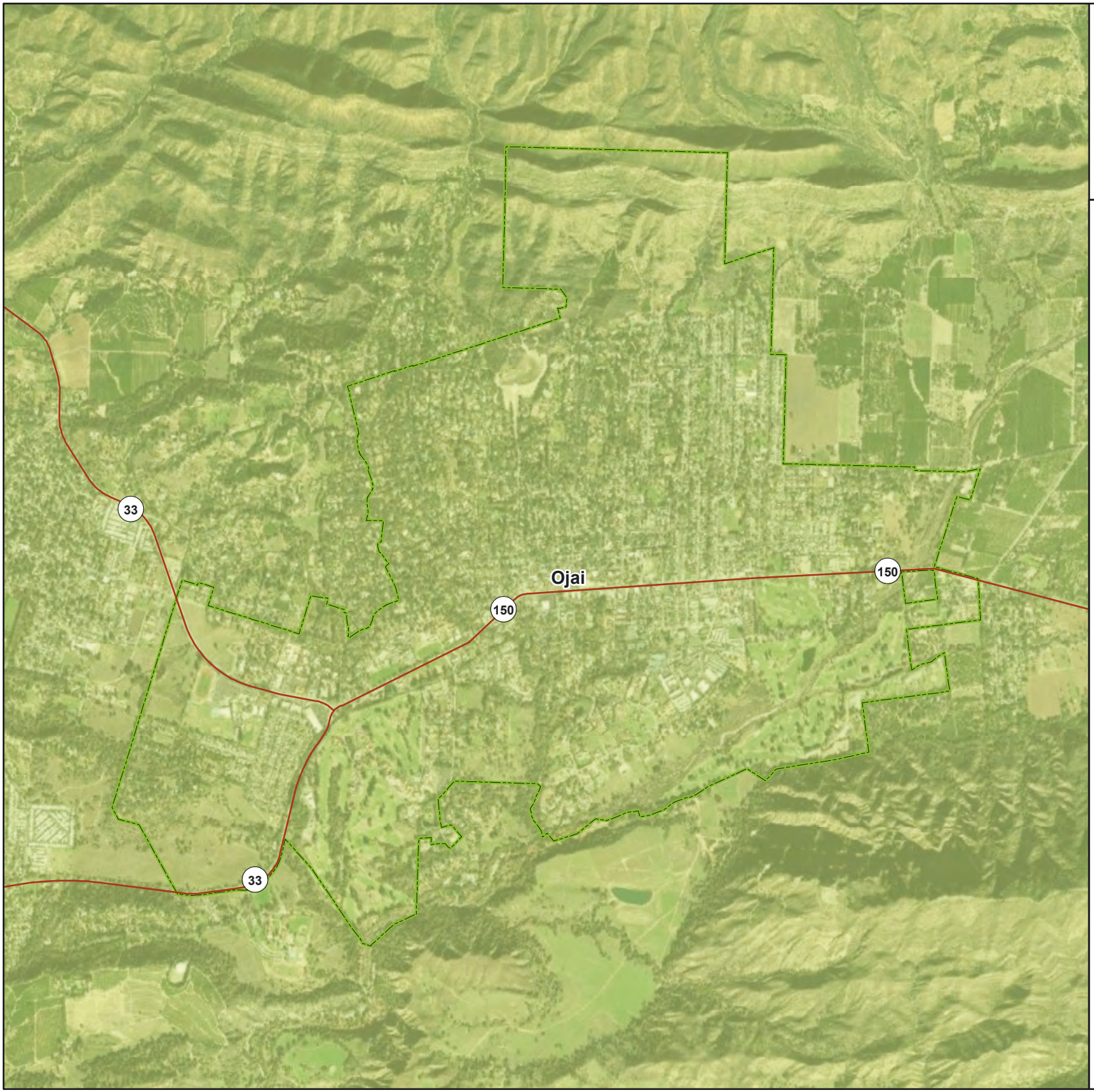
- VII (Very Strong/Moderate)
- VIII (Severe/Moderate-Heavy)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.175 0.35 0.7 Miles



Ojai

S. San Andreas M8.03 Earthquake Scenario

Mercalli Intensity Scale

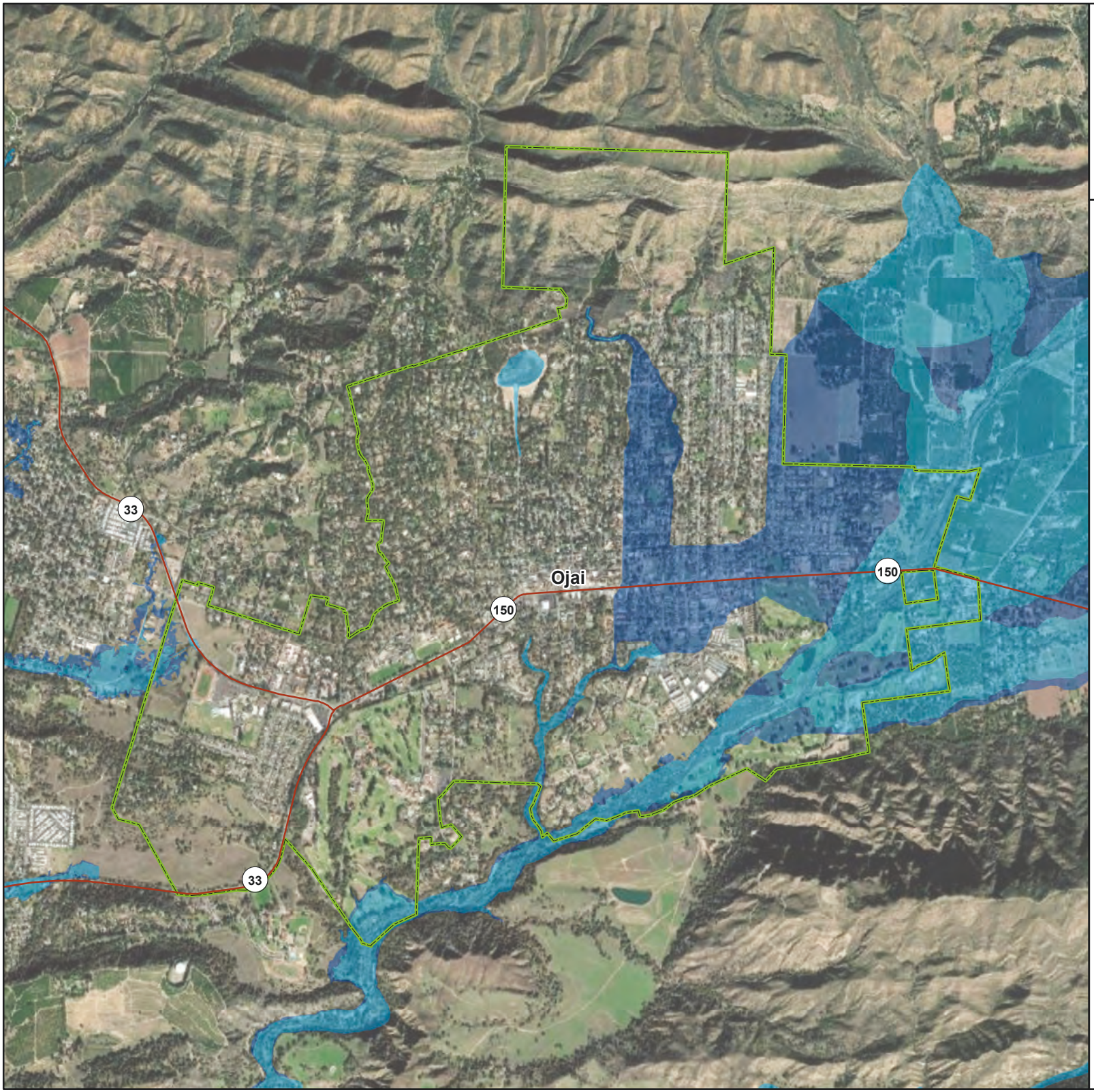
- VI (Strong/Light)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.175 0.35 0.7
Miles



Ojai

FEMA Flood Hazard Areas

1% Annual Chance Flood (100-Year)

0.2% Annual Chance Flood (500-Year)

Major Roads

Selected City

Incorporated Cities

County Boundary

Data Sources: Ventura Co., FEMA, Esri

N

0 0.175 0.35 0.7 Miles

Ojai

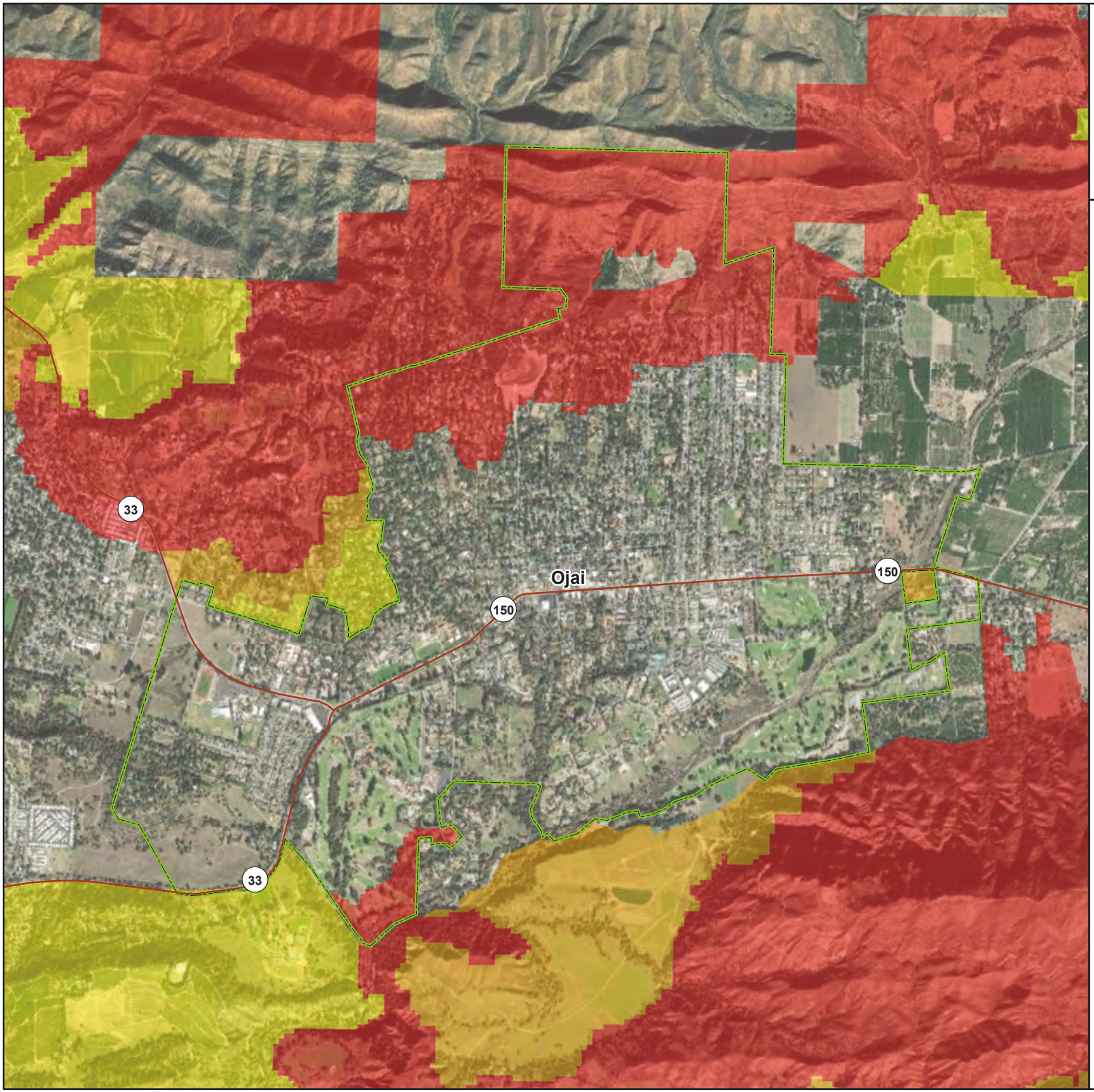
Susceptibility to Deep-Seated Landslides

- Low
- Moderate
- High
- Very High
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Data Sources: Ventura Co., CGS, Esri

N

0 0.175 0.35 0.7 Miles



Ojai

Wildfire Hazard Severity Zones

Moderate
High
Very High
Major Roads
Selected City
Incorporated Cities
County Boundary

Data Sources: Ventura Co., CAL FIRE, Esri

N

0 0.175 0.35 0.7
Miles

6. CITY OF OXNARD

6.1 LOCAL HAZARD MITIGATION PLANNING TEAM

Primary Point of Contact
Scott Brewer, Emergency Services Manager
360 West Second Street
Oxnard, CA 93030
Telephone: 805-385-7717
e-mail Address: scott.brewer@oxnard.org

Alternate Point of Contact
Alexander Hamilton, Fire Chief
360 West Second Street
Oxnard, CA 93030
Telephone: 805-385-7700
e-mail Address:
alexander.hamilton@oxnard.org

This annex was developed by the local hazard mitigation planning team, whose members are listed in Table 6-1.

Table 6-1. Local Mitigation Planning Team Members

Name	Title
Alexander Nguyen	City Manager
Jason Benites	Police Chief
Eric Sonstegard	Assistant Police Chief
Alexander Hamilton	Fire Chief
John Colamarino	Assistant Fire Chief
Brian Yanez	Assistant Public Works Director
Mike More	Risk Manager
Scott Kolwitz	Planning Manager
Betsy George	Chief Financial Officer
Terrel Harrison	Cultural/Community Services Director
Stephen Fischer	City Attorney
Tatiana Arnaout	City Engineer/Floodplain Manager
Mike Shaffer	GIS Manager
Katie Casey	Communications Manager
Kathleen Mallory	Planning & Sustainability Manager
Scott Brewer	Emergency Services Manager

6.2 JURISDICTION PROFILE

6.2.1 Location and Features

The City is located about 60 miles northwest of Los Angeles along a beautiful stretch of the Pacific Ocean coastline. The largest city within Ventura County, Oxnard is the center of a regional agricultural industry and a progressive business center while, at the same time, a relaxed seaside destination with a variety of neighborhoods and community services. Bordered by mountains and the Pacific Ocean, West Ventura County provides a seaside environment with expansive mountain views. Oxnard incorporates both of these attributes through its pattern of relatively compact urban development focused on the downtown, coastline and harbor, and the Highway 101 corridor. The moderate Mediterranean climate, fertile topsoil, and generally adequate groundwater supply lead to year-round agricultural production in the surrounding Oxnard Plain.

The City of Oxnard is located in the County of Ventura. The current boundaries generally extend from the Santa Clara River on the west to Del Norte Blvd on the east, as well as just north of the Highway 101 to the Pacific Ocean on the South, encompassing an area of 27.12 square miles.

6.2.2 History

Oxnard Incorporated: The City Oxnard was incorporated in 1903 by the Ventura County Board of Supervisors, who officially named the city after the Oxnard brothers. The city grew steadily into what is now the largest city in Ventura County, with a population of just over 207,000 residents.

Oxnard History: In 1896, local farmers began experimenting with sugar beets in addition to barley and lima beans. A prominent local farmer, Albert Maulhardt, visited Henry T. Oxnard and his three brothers' American Beet Sugar factory in Chino, which led him to plant sugar beets for shipment to the plant. Maulhardt's success persuaded other ranchers to switch from grain to sugar beets.

Encouraged by a pledge of 18,000 acres of sugar beets from local farmers, the Oxnard brothers completed construction of a sugar beet factory adjacent to the beet fields in 1898 on what was then known as Rancho Colonia. The massive brick factory, with its 150-foot smokestacks, was located a few blocks northeast of a town-site that, five years later, would become the City of Oxnard.

The sugar beet factory was responsible for another significant event—bringing a spur line of the Southern Pacific Railroad to the plant site and passenger service to the community.

6.2.3 Governing Body Format

The City of Oxnard was incorporated as a general law city on June 30, 1903 and operates under a council-manager form of government. The City Council consists of the Mayor and six other Councilmembers. The term of office is four years for all elected officials, with elections held every two years for three City Council seats at a time. All Councilmembers are elected by district except for the Mayor, who is elected at large during presidential election years. The City Treasurer, who is elected Citywide at the same time as the Mayor, invests idle cash and manages the City's investment portfolio. The City Clerk, also elected Citywide at the same time as the Mayor and City Treasurer, manages the City Council and Committee meeting agenda process, official records, and elections.

The Oxnard City Council assumes responsibility for the adoption of this plan; the Oxnard Fire Department along with designated City departments will oversee its implementation.

6.3 CURRENT TRENDS

6.3.1 Population

According to the United States Census Bureau, the population of the City of Oxnard as of January 2020 was 207,887. Since 2010, the population has grown at an average annual rate of 0.48 percent.

6.3.2 Development

The Planning Division coordinates the City's review of residential, commercial, office, and industrial development projects. This includes working with property owners, developers, business owners, and residents to ensure that their development proposals conform to City policies and guidelines.

Table 6-2 summarizes development trends in the period since the preparation of the previous hazard mitigation plan, as well as expected future development trends.

Table 6-2. Recent and Expected Future Development Trends

Criterion	Response
Has your jurisdiction annexed any land since the preparation of the previous hazard mitigation plan?	Yes
• ***If yes, give the estimated area annexed and estimated number of parcels or structures.***	Local Agency Formation Commission 18-07, Ocean View School District: 5.31 Acres, 1 Parcel Local Agency Formation Commission 16-01, City of Oxnard Reorganization: 0.77 Acres, 1 Parcel
Is your jurisdiction expected to annex any areas during the performance period of this plan?	Yes
• ***If yes, describe land areas and dominant uses.***	Teal Club Annexation—990 single and multifamily dwelling units, 132,000 square-feet of business park, 60,000 square-feet of commercial space, 17.76 acres of parks and open space. The project also includes annexation of 11.4 acres that is pre-zoned for light manufacturing uses. Rio Urbana Annexation—The Rio Urbana annexation would allow the construction of a new mixed-use development that includes 182 condominium residential units and a 15,000-square-foot office building containing the Rio School District administrative offices.
• ***If yes, who currently has permitting authority over these areas?***	The County of Ventura currently has permitting authority over the Teal Club area and the Rio Urbana project site.
Are any areas targeted for development or major redevelopment in the next five years?	Yes
• ***If yes, briefly describe, including whether any of the areas are in known hazard risk areas***	Downtown adding up to 2800 units, The Village Specific Plan buildout, Northshore Development, Riverpark Specific Plan buildout, continued industrial development in Sakioka Farms Specific Plan. All areas are within city limits and all areas are in the liquefaction zone. One annexation approval with 167 housing units is expected in 2021. One large specific plan annexation (Teal Club) with 990 units is under consideration.

Criterion	Response					
How many permits for new construction were issued in your jurisdiction since the preparation of the previous hazard mitigation plan?		**2016**	**2017**	**2018**	**2019**	**2020**
	Single Family	140	86	36	59	19
	Multi-Family	26	27	18	34	42
	Other (commercial, mixed use, etc.)	17	12	10	7	7
	Total	**183**	**125**	**64**	**100**	**68**
Provide the number of new-construction permits for each hazard area or provide a qualitative description of where development has occurred.	• Special Flood Hazard Areas: 0—Based on FEMA National Flood Hazard Layer (NFHL) downloaded June 9, 2021 Using zones A, A99 , AE, AH, AO, & VE as SFHA and excluding zones X & D • Landslide: 0—Based on Webservice of Seismic Hazard Zone Maps for Landslides produced by the Seismic Hazards Program, California Geological Survey, California Department of Conservation and downloaded from open data site on June 17, 2021 • High Liquefaction Areas: 540—Based on information contained hereon was obtained from California Department of Conservation, Division of Mines and Geology via the County of Ventura GIS • Tsunami Inundation Area: 51—Based on information contained hereon was obtained from California Department of Conservation, Division of Mines and Geology via the County of Ventura GIS • Wildfire Risk Areas: 0					
Describe the level of buildout in the jurisdiction, based on your jurisdiction's buildable lands inventory. If no such inventory exists, provide a qualitative description.	Almost entire city (26 sq miles) is first or second generation construction. About 500 acres of farming remain within city limits in areas zoned for industrial or housing but not yet built. Planning capacity for about 8,000 units and 8 million sf industrial/commercial remains under the 2030 General Plan.					

6.4 CAPABILITY ASSESSMENT

This section describes an assessment of existing capabilities for implementing hazard mitigation strategies. The introduction at the beginning of this volume of the hazard mitigation plan describes the components included in the capability assessment and their significance for hazard mitigation planning.

Findings of the capability assessment were reviewed to identify opportunities to expand, initiate or integrate capabilities to further hazard mitigation goals and objectives. Where such opportunities were identified and determined to be feasible, they are included in the action plan. The "Analysis of Mitigation Actions" table in this annex identifies these as community capacity building mitigation actions. The findings of the assessment are presented as follows:

- An assessment of planning and regulatory capabilities is presented in Table 6-3.
- Development and permitting capabilities are presented in Table 6-4.
- An assessment of fiscal capabilities is presented in Table 6-5.
- An assessment of administrative and technical capabilities is presented in Table 6-6.
- An assessment of education and outreach capabilities is presented in Table 6-7.
- Information on National Flood Insurance Program (NFIP) compliance is presented in Table 6-8.
- Classifications under various community mitigation programs are presented in Table 6-9.
- The community's adaptive capacity for the impacts of climate change is presented in Table 6-10.

Table 6-3. Planning and Regulatory Capability

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity?
Codes, Ordinances, & Requirements				
Building Code	Yes	No	Yes	No
Comment: *2019 California Building Code as adopted by the City of Oxnard Ordinance No. 2968*				
Zoning Code	Yes	No	Yes	No
Comment: *Chapter 16 (Inland Zoning Ordinance) and Chapter 17(Coastal Zoning Ordinance) of the Oxnard City Code (OCC) Pursuant to the California Coastal Act (Public Resources Code Division 20, Chapter 6, Article 1, 30500), the City shall prepare a Local Coastal Program for the portion of the coastal zone within its jurisdiction. The LCP is comprised of a Land Use Plan and a Local Implementation Plan which is the Coastal Zoning Ordinance.*				
Subdivisions	Yes	No	Yes	No
Comment: *Chapter 15 of the OCC regulates and control the design and improvement of subdivisions of land within the city and supplement the provisions of the Subdivision Map Act of the State of California set forth at Government Code Section 66410 et seq. concerning the design, improvement and survey data of subdivisions, the form and content of all maps provided for by the Subdivision Map Act, and the procedure to be followed in securing the official approval of the City regarding the maps.*				
Stormwater Management	Yes	No	No	Yes
Comment: *Chapter 22, Article 12 implements the Federal Water Pollution Control Act (the Clean Water Act), 33 U.S.C. Section 1251 et seq., as amended, and Division 7 of the California Water Code by prohibiting the discharge of any pollutant to navigable waters of the United States from a point source unless the discharge is authorized by a permit issued pursuant to the* **Metropolitan** *required by Clean Water Act Section 402 (33 U.S.C. Section 1342), and by prohibiting non-storm water discharges into the storm drain system.*				
Post-Disaster Recovery	Yes	No	Yes	Yes
Comment: *The City of Oxnard does not have a separate disaster recovery plan, guidance and direction for disaster recovery is provided in the Oxnard Emergency Operations Plan (EOP)*				
Real Estate Disclosure	No	Yes	Yes	Yes
Comment: *California State Civil Code 1102 requires full disclosure on natural hazard exposure of the sale/re-sale of any and all real property. To be implemented by sellers and realtors. City of Oxnard Ordinance 2383 requires that at the time of entering into an agreement of sale or exchange of any building, the owner or authorized representative shall obtain from the city a report of the building record showing the regularly authorized use, occupancy and zoning classification of such property.*				
Growth Management	Yes	No	Yes	Yes
Comment: *California state law requires that every county and city prepare and adopt a comprehensive long-range plan to serve as a guide for community development. The General Plan for the City of Oxnard was amended and adopted in July 2011. The General Plan contains 10 elements that address many aspects of the community including: land use, housing, parks and open space, community design, circulation, infrastructure, safety, sustainability and conservation of resources. The General Plan is the City's overarching policy document. All City policies and ordinances must be consistent with the General Plan. The Planning Division is responsible for maintaining the General Plan and preparing amendments to the document as directed by the City Council. The City is preparing a Climate Action and Adaptation Plan consistent with SB39.*				
Site Plan Review	Yes	No	No	No
Comment: *Chapter 15 of the OCC regulates the form and contents, submittal and approval of tentative tract maps for the subdivision of five (5) or more parcels and tentative parcel maps for the subdivision of four (4) or fewer parcels shall be governed by the provisions of this chapter. Chapters 16 and 17 of the OCC identify allowed uses and provide development standards that regulate development within the City.*				

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity?
Environmental Protection	Yes	No	Yes	Yes
Comment: *The California Environmental Quality Act (CEQA) requires state and local agencies to identify the significant environmental impacts of their actions and to avoid or mitigate those impacts, if feasible. On June 28, 2017, the City Council adopted Resolution 15,040 approving an update to the California Environmental Quality Act (CEQA) Guidelines.* *Chapter 22 ,Article 12 implements the Federal Water Pollution Control Act (the Clean Water Act), 33 U.S.C. Section 1251 et seq., as amended, and Division 7 of the California Water Code by prohibiting the discharge of any pollutant to navigable waters of the United States from a point source unless the discharge is authorized by a permit issued pursuant to the National Pollutant Discharge Elimination System required by the Clean Water Act Section 402 (33 U.S.C. Section 1342), and by prohibiting non-storm water discharges into the storm drain system.* *Chapter 18, Article 4 recently updated in December 2020 with the authority conferred by Cal. Gov't Code sections 65302, 65560 and 65800 to adopt regulations designed to promote the public health, safety, and general welfare.*				
Flood Damage Prevention	Yes	No	Yes	Yes
Comment: *Chapter 18, Article 4 recently updated in December 2020 with the authority conferred by Cal. Gov't Code sections 65302, 65560 and 65800 to adopt regulations designed to promote the public health, safety and general welfare.*				
Emergency Management	Yes	No	Yes	Yes
Comment: *Oxnard Emergency Operations Plan—City Ordinance No. 2916*				
Climate Change	Yes	No	Yes	Yes
Comment: *The City is currently preparing a Climate Action and Adaptation Plan which intends to be comprehensive, robust and innovative to help the City plan for future climate goals and develop vision for how sustainability should be implemented in the City. The Climate Action and Adaptation Plan is anticipated to culminate with adoption by the City Council in mid/late-2022.*				
Planning Documents				
General Plan	Yes	No	Yes	Yes
Is the plan compliant with Assembly Bill 2140? *Yes* ***Comment:*** *The City's current 2030 General Plan contains Safety Element that includes goals and policies that address liquefaction and subsidence risk; coastline and beach preservation; emergency preparedness; and hazardous materials and uses.*				
Capital Improvement Plan	Yes	No	Yes	Yes
How often is the plan updated? *Once a year* ***Comment:*** *The City Council adopts a 5-year Capital Improvement Plan with the City Council making amendments on an annual basis.*				
Disaster Debris Management Plan	Yes	Yes	Yes	Yes
Comment: *Ventura County Disaster Recovery Plan, Adopted by BOS in April 2019*				
Floodplain or Watershed Plan	Yes	No	Yes	No
Comment: *Chapter 18, Article 4 recently updated in December 2020 with the authority conferred by Cal. Gov't Code sections 65302, 65560 and 65800 to adopt regulations designed to promote the public health, safety and general welfare. The City participates in the National Flood Insurance Program (NFIP) Community Rating System (CRS)Class 7*				
Stormwater Plan	Yes	No	Yes	Yes
Comment: *The City is developing the Public Works Integrated Master Plan to develop long-term recommendations for policies, programs, and projects that successfully address and respond to immediate drought conditions while also planning for long-term water needs, reducing dependence upon costly imported water, addressing aging infrastructure and reliability concerns, pursuing aggressive goals for energy efficiency and sustainable solutions, maintaining compliance with changing regulatory requirements, and the ongoing loss of seasoned staff and personnel.*				

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity?
Urban Water Management Plan	Yes	No	Yes	Yes
Comment: *The City has an adopted Urban Water Management Plan. The plan details long-term resource planning to ensure that adequate water supplies are available to meet existing and future water needs. In conjunction with the Urban Water Management Plan, a separate Water Shortage Contingency Plan, is also being prepared. The Water Shortage Contingency Plan outlines how an urban water supplier will respond to various stages of a drought or a prolonged shortage caused by other events.*				
Habitat Conservation Plan	No	No	No	No
Comment: *Not applicable for the City of Oxnard*				
Economic Development Plan	Yes	No	Yes	No
Comment: *The City's 2030 General Plan contains an Economic Development Chapter within the Community Development Element. The City created a draft strategic plan which was presented to the Housing and Economic Development Committee and the Chamber of Commerce in 2020 before the pandemic. However, given that COVID significantly impacted the business landscape, staff will be working on a new strategic plan to emphasize business retention, workforce development, and site-based development.*				
Shoreline Management Plan	Yes	No	Yes	No
Comment: *The City of Oxnard is currently updating the City's Local Coastal Program to address Sea Level Rise and coastal hazards.*				
Community Wildfire Protection Plan	No	No	No	No
Comment: *Not applicable for the City of Oxnard*				
Forest Management Plan	No	Yes	No	Yes
Comment: *Not applicable for the City of Oxnard*				
Climate Action Plan	Yes	No	Yes	Yes
Comment: *The City is currently preparing a Climate Action and Adaptation Plan which intends to be comprehensive, robust and innovative to help the City plan for future climate goals and develop vision for how sustainability should be implemented in the City. The Climate Action and Adaptation Plan is anticipated to culminate with adoption by the City Council in mid 2022.*				
Emergency Operations Plan	Yes	No	Yes	Yes
Comment: *Oxnard Emergency Operations Plan*				
Threat & Hazard Identification & Risk Assessment (THIRA)	No	Yes	No	Yes
Comment: *We are currently evaluating the need to complete a THIRA for the City of Oxnard.*				
Post-Disaster Recovery Plan	Yes	No	Yes	Yes
Comment: *Disaster Recovery Operations are covered in the Oxnard Emergency Operations Plan*				
Continuity of Operations Plan	Yes	No	Yes	Yes
Comment: *Continuity of Government—Section within the Oxnard Emergency Operation Plan*				
Public Health Plan	No	Yes	Yes	Yes
Comment: *County of Ventura Health Care Agency Public Health Emergency Response Plan (ERP)*				
Other—Countywide Tsunami Plan	No	Yes	Yes	Yes
Comment: *The County of Ventura has an existing plan that describes each City's role and has been adopted locally. A revision of this document is required within the coming year.*				

Table 6-4. Development and Permitting Capability

Criterion	Response
Does your jurisdiction issue development permits?	Yes
If no, who does? If yes, which department? Building and Safety Division of the Community Development Department	
Does your jurisdiction have the ability to track permits by hazard area?	No The City does not currently track building permits issued by hazard area.
Does your jurisdiction have a buildable lands inventory?	No

Table 6-5. Fiscal Capability

Financial Resource	Accessible or Eligible to Use?
Community Development Block Grants	Yes
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for Specific Purposes	No. Requires a vote of the people
User Fees for Water, Sewer, Gas or Electric Service ***If yes, specify:*** Water and Sewer	Yes
Incur Debt through General Obligation Bonds	No. Requires a vote of the people
Incur Debt through Special Tax Bonds	Yes
Incur Debt through Private Activity Bonds	Yes
Withhold Public Expenditures in Hazard-Prone Areas	Yes
State-Sponsored Grant Programs	Yes
Development Impact Fees for Homebuyers or Developers	Yes
Other ***If yes, specify:*** Federal-sponsored grant programs	Yes

Table 6-6. Administrative and Technical Capability

Staff/Personnel Resource		Available?
Planners or engineers with knowledge of land development and land management practices		Yes
If Yes, Department /Position:	Community Development, all Planners) Public Works—City Engineer; Supervising Civil Engineer	
Engineers or professionals trained in building or infrastructure construction practices		Yes
If Yes, Department /Position:	Public Works—City Engineer; Supervising Civil Engineer; Project Manager; Senior Civil Engineer; Construction Inspector; Project Coordinator; Engineering Tech	
Planners or engineers with an understanding of natural hazards		Yes
If Yes, Department /Position:	Public Works—City Engineer	
Staff with training in benefit-cost analysis		Yes
If Yes, Department /Position:	Public Works—Transportation Planner and Grants Coordinator	
Surveyors		Yes
If Yes, Department /Position:	Public Works (Consultant)	
Personnel skilled or trained in GIS applications		Yes
If Yes, Department /Position:	Information Technology—GIS Manager, GIS Technician III, GIS Systems Analyst, GIS Programmer Analyst	
Scientist familiar with natural hazards in local area		No
If Yes, Department /Position:	None	
Emergency manager		Yes
If Yes, Department /Position:	Fire Department—City Emergency Services Manager	
Grant writers		Yes
If Yes, Department /Position:	Public Works—Grants Coordinator and Transportation Planner	

Table 6-7. Education and Outreach Capability

Criterion	Response
Do you have a public information officer or communications office?	Yes
Do you have personnel skilled or trained in website development?	Yes
Do you have hazard mitigation information available on your website?	Yes
If yes, briefly describe: City website has disaster preparedness and fire prevention information in English and Spanish	
Do you use social media for hazard mitigation education and outreach?	Yes
If yes, briefly describe: We have in the past used social media to address specific hazard mitigation issues.	
Do you have any citizen boards or commissions that address issues related to hazard mitigation?	Yes
If yes, briefly describe: Yes, the Fire Chief has an advisory "Team" that address emergency preparedness and hazard reduction issues. Organized "Neighborhood Councils" are also used to disseminate emergency preparedness and hazard mitigation information.	
Do you have any other programs in place that could be used to communicate hazard-related information?	Yes
If yes, briefly describe: Community events such as: neighborhood fairs, emergency preparedness fairs, CERT training, neighborhood council meetings, homeowners' association meetings are all used to disseminate emergency preparedness and hazard mitigation information.	
Do you have any established warning systems for hazard events?	Yes
If yes, briefly describe: "Alert and Warning" procedures as described in the Oxnard Emergency Operations Plan and the VC Alert System	

Table 6-8. National Flood Insurance Program Compliance

Criterion	Response
What local department is responsible for floodplain management?	Public Works
Who is your floodplain administrator? (department/position)	City Engineer
Are any certified floodplain managers on staff in your jurisdiction?	No
What is the date that your flood damage prevention ordinance was last amended?	December 2020
Does your floodplain management program meet or exceed minimum requirements? ***If exceeds, in what ways?***	Meets
When was the most recent Community Assistance Visit or Community Assistance Contact?	2017 Community Assistance Visit
Does your jurisdiction have any outstanding NFIP compliance violations that need to be addressed? ***If so, state what they are.***	No
Are any RiskMAP projects currently underway in your jurisdiction? ***If so, state what they are.*** RiskMAP, Ventura County Levees	Yes
Do your flood hazard maps adequately address the flood risk within your jurisdiction? ***If no, state why.***	Yes
Does your floodplain management staff need any assistance or training to support its floodplain management program? ***If so, what type of assistance/training is needed?*** Admin training	Yes
Does your jurisdiction participate in the Community Rating System (CRS)? ***If yes, is your jurisdiction interested in improving its CRS Classification?*** No ***If no, is your jurisdiction interested in joining the CRS program?*** N/A	Yes, Class 7
How many flood insurance policies are in force in your jurisdiction?[a] ***What is the insurance in force?*** $166,210,700 ***What is the premium in force?*** $323,235	497
How many total loss claims have been filed in your jurisdiction?[a] ***What were the total payments for losses?*** $244,574	71

a. According to FEMA statistics as of March 31, 2021

Table 6-9. Community Classifications

	Participating?	Classification	Date Classified
FIPS Code	Yes	06-111-54652	N/A
DUNS #	Yes	081790214	N/A
Community Rating System	Yes	7	N/A
Building Code Effectiveness Grading Schedule	Yes	Residential: 3 Commercial Industrial: 2	2015/2016
Public Protection	Yes	02/2X	December 1, 2017
Storm Ready	Yes	N/A	July 2021
Firewise	No	N/A	N/A
Tsunami Ready	Yes	N/A	July 2021

Table 6-10. Adaptive Capacity for Climate Change

Criterion	Jurisdiction Ratings
Technical Capacity	
Jurisdiction-level understanding of potential climate change impacts	Medium
Comment: *The City is preparing a Climate Action and Adaptation Plan (CAAP). Community engagement has highlighted interest in and knowledge of climate impacts.*	
Jurisdiction-level monitoring of climate change impacts	Low
Comment: *The CAAP will establish programs and monitoring protocols.*	
Technical resources to assess proposed strategies for feasibility and externalities	Low
Comment: *Documentation prepared for CAAP and SLR and vulnerability study*	
Jurisdiction-level capacity for development of greenhouse gas emissions inventory	High
Comment: *Through the CAAP this has occurred.*	
Capital planning and land use decisions informed by potential climate impacts	Medium
Comment: *This will come out of the CAAP.*	
Participation in regional groups addressing climate risks	High
Comment: *Professional planner and focused position*	
Implementation Capacity	
Clear authority/mandate to consider climate change impacts during public decision-making processes	Medium
Comment: *This will come out of CAAP implementation.*	
Identified strategies for greenhouse gas mitigation efforts	High
Comment: *The CAAP includes this information including strategies*	
Identified strategies for adaptation to impacts	High
Comment: *The CAAP includes this information including strategies*	
Champions for climate action in local government departments	High
Comment: *The CAAP includes this information including strategies*	
Political support for implementing climate change adaptation strategies	High
Comment: *Financial support for CAAP study.*	
Financial resources devoted to climate change adaptation	Low
Comment: *The CAAP includes this information including strategies*	
Local authority over sectors likely to be negative impacted	Medium
Comment: *Addressed in CAAP engagement*	

Criterion	Jurisdiction Ratings
Public Capacity	
Local residents' knowledge of and understanding of climate risk ***Comment:*** *Addressed in CAAP engagement*	Medium
Local residents' support of adaptation efforts ***Comment:*** *Addressed through CAAP engagement*	Medium
Local residents' capacity to adapt to climate impacts ***Comment:*** *Input provided during sea level rise engagement and CAAP efforts*	Low
Local economy current capacity to adapt to climate impacts ***Comment:***	Low
Local ecosystems capacity to adapt to climate impacts ***Comment:***	**Low**

a. High = Capacity exists and is in use; Medium = Capacity may exist, but is not used or could use some improvement; Low = Capacity does not exist or could use substantial improvement; Unsure= Not enough information is known to assign a rating.

6.5 INTEGRATION REVIEW

For hazard mitigation planning, "integration" means that hazard mitigation information is used in other relevant planning mechanisms, such as general planning and capital facilities planning, and that relevant information from those sources is used in hazard mitigation. This section identifies where such integration is already in place, and where there are opportunities for further integration in the future. Resources listed at the end of this annex were used to provide information on integration. The progress reporting process described in Volume 1 of the hazard mitigation plan will document the progress of hazard mitigation actions related to integration and identify new opportunities for integration.

6.5.1 Existing Integration

Some level of integration has already been established between local hazard mitigation planning and the following other local plans and programs:

- **Oxnard Emergency Operations Plan (EOP)**—The Emergency Operations Plan addresses the City of Oxnard's planned response to extraordinary emergency situations associated with natural disasters, technological incidents, and national security emergencies.
- **Ventura County Mass Care and Shelter Plan**—This document is intended for use during the preparedness phase to help guide care and shelter planning. It provides all the planning information and guidelines that are relevant for government's consideration before opening disaster shelters. This document is intended to help cities plan for shelter operations, while also providing an overview of the complete scope of care and shelter services.
- **Ventura County Operational Area Emergency Operations Plan**—The County of Ventura Emergency Operations Plan (EOP) provides the structure and processes that all key partner agencies within the county use to respond to, and initially recover from, a major emergency or disaster event.
- **California Tsunami Evacuation Playbook (Ventura County, City of Oxnard)—**This playbook is designed to help the emergency managers with tsunami evacuation and

response activities. The goal is to protect the residents within the local Tsunami Inundation Zone by providing guidance for early warning and coordinated evacuations.

- **2030 City of Oxnard General Plan**—The General plan contains a Safety Element that includes goals and policies that address liquefaction and subsidence risk; coastline and beach preservation; emergency preparedness; and hazardous materials and uses.

6.5.2 Opportunities for Future Integration

The capability assessment in this annex indicates opportunities to integrate this mitigation plan with other jurisdictional planning/regulatory capabilities. Capabilities were identified as integration opportunities if they can support or enhance the actions identified in this plan or be supported or enhanced by components of this plan. The capability assessment identified the following plans and programs that do not currently integrate hazard mitigation information but provide opportunities to do so in the future:

- **2030 City of Oxnard General Plan**: The 2030 General Plan should be revised to address hazard mitigation plan elements as needed in the 2022 HMP program and consider integration opportunities by adopting relevant policies in future Safety Element. updates
- **Local Coastal Program (LCP) Update:** The City is in the process of a comprehensive LCP update. One of the goals of the City's LCP update is to consider and address Sea Level Rise (SLR) and to ensure that policies to implement adaptation options occur in a way that protects the City's coastal economic vitality, community character, public and private property, coastal resources and public safety.

Taking action to integrate each of these programs with the hazard mitigation plan was considered as a mitigation action to include in the action plan in this annex.

6.6 RISK ASSESSMENT

6.6.1 Jurisdiction-Specific Natural Hazard Event History

Table 6-11 lists past occurrences of natural hazards for which specific damage was recorded in this jurisdiction Other hazard events that broadly affected the entire planning area, including this jurisdiction, are listed in the risk assessments in Volume 1 of this hazard mitigation plan.

6.6.2 Hazard Risk Ranking

Table 6-12 presents a local ranking of all hazards of concern for which this hazard mitigation plan provides complete risk assessments. As described in detail in Volume 1, the ranking process involves an assessment of the likelihood of occurrence for each hazard, along with its potential impacts on people, property, and the economy. Mitigation actions primarily target hazards with high and medium rankings.

Table 6-11. Past Natural Hazard Events

Type of Event	FEMA Disaster #	Date	Damage Assessment
Rain and High Wind Event		January 19, 2021	Trees down, road closures, power outages, damage to structures
Pandemic Influenza COVID-19	4482-DR-CA	January 20, 2020 Continuing	Ongoing
Atmospheric River Storm System	CA Disaster 109	January/February 2019	Local stream and street flooding, trees down, power outages
Wildfires, Flooding, Mudflows, and Debris Flows	DR-4353	December 4, 2017- January 31, 2018	Post Thomas Fire debris flows in local rivers, large deposits of debris on local beaches, road closures
Thomas Fire	4224-DR-CA	December 4, 2017	Public Health issues due to smoke, power outages, sewage spill due to power outage
February Winter Storm	CA Disaster 77.1	February 2017	Local stream and street flooding, trees down, power outages, debris deposits in local stream and on beaches
January Winter Storm	CA Disaster 77	January 2017	Local stream and street flooding, trees down, power outages, debris deposits in local stream and on beaches
Extreme Windstorm		February 2016	Trees down, power outages, street closures, damage to structures, debris
Erratic Weather (frost, heat, drought)		Winter 2013	Damage to crops, economic loss
Tsunami (7.1 earthquake in Japan)		March 11, 2011	Damage to local harbors, marinas and docks
Tsunami (8.8 Quake in Chile)		February 27, 2010	Damage to local harbors, marinas and docks
Storm and Flood		January 18 – 22, 2010.	Local stream and street flooding, trees down, power outages
Wildfires, Flooding, Mudflows, and Debris Flows	DR-1731	October 21 – March 31, 2008	Post burn, flooding, debris and mud flows.
Severe Storm	DR-1267	January 7 – 11, 2005	Flooding and debris flows
"El Nino" Storm and Flood		February 1998	Street and stream flooding, debris flows
Storms and Floods		January and March, 1995	Unknown
Northridge Earthquake	DR-1008	January 17 – November 30, 1994	Power and communications disruptions, damage to structures
Storm and Flood		February 10-15, 1992	Street and stream flooding, debris flows
Earthquake (Whittier Narrows Earthquake)		October 1, 1987	Unknown
Storm and Flood		February 25-March 3, 1983	Street and stream flooding, debris flows
Storm and Flood		February 13-22, 1980	Street and stream flooding, debris flows
Sespe Creek Flood		March 4, 1978	Street and stream flooding, debris flows
Storms and Floods (Calleguas Creek Flood)		February 28-March 5, 1978	Street and stream flooding, debris flows
St Francis Dam Disaster		March 12, 1928	$7 Million (1928)—Inundation of nearly the entire city, flooding, debris flows, destruction of infrastructure, high loss of life

Table 6-12. Hazard Risk Ranking

Rank	Hazard	Risk Ranking Score	Risk Category
1	Dam Failure	36	High
2	Earthquake	32	Medium
3	Severe Storm	24	Medium
4	Severe Weather	24	Medium
5	Flooding	18	Medium
6	Landslide	18	Medium
7	Sea Level Rise	18	Medium
8	Tsunami	12	Low
9	Drought	9	Low
10	Wildfire	0	Low

6.6.3 Jurisdiction-Specific Vulnerabilities

Volume 1 of this hazard mitigation plan provides complete risk assessments for each identified hazard of concern. This section provides information on a few key vulnerabilities for this jurisdiction. Available jurisdiction-specific risk maps of the hazards are provided at the end of this annex.

Repetitive Loss Properties

Repetitive loss records are as follows:

- Number of FEMA-identified Repetitive-Loss Properties: 7
- Number of FEMA-identified Severe-Repetitive-Loss Properties: N/A
- Number of Repetitive-Loss or Severe-Repetitive-Loss Properties that have been mitigated: N/A

Other Noted Vulnerabilities

The following jurisdiction-specific issues have been identified based on a review of the results of the risk assessment, public involvement strategy, and other available resources:

- **Unreinforced Masonry and Soft Story Structures**—Oxnard has numerous unreinforced masonry and soft story buildings within the city limits. These buildings are subject to severe damage or structural collapse during a moderate to severe earthquake.
- **Homeless Population—**A significant number of persons commonly defined as “Homeless” live in the Santa Clara River and other undeveloped areas. During wildland fires, storms and flooding these individuals are at great risk.
- **Street and Urban Flooding**—There are numerous areas of the city that flood to varying degrees during periods of high rain. The effects of this flooding range from street closures to damage to property, vehicles and buildings.
- **Power Outages/Emergency Power**—Local power outages have resulted from high winds and storm conditions as well as from the effects of wildland fire in the region. Many key city buildings including the Main City Hall and Council Chambers buildings have no back-up power or emergency generators.

- **Debris Flows—**Following heavy rains and winter storms, substantial debris flows have occurred in the Santa Clara River as well as other local streams and culverts. Debris flows following wildland fires are particularly bad and can require removal of material from streams, streets, culverts and beaches.
- **Liquefaction Potential—**Nearly the entire City of Oxnard is located in a "Liquefaction Zone". The effects and damage caused by seismic activities can be amplified resulting in increased damage to buildings and infrastructure.
- **Tsunami Awareness and Notification**—Oxnard has a large visitor and tourist population who may not be aware of the tsunami risk.
- **Sea Level Rise (SLR)—**SLR is an identified flooding threat to the future of the City of Oxnard. Therefore, planning for local adaptation and resiliency is an identified City Council priority and part of the Local Coastal Program update. It is a complex and difficult issue that will require strong coordination at the federal, State, and local level over the long term to effectively plan for and adapt to changing variables over time. Adaptation strategies are based upon various SLR projections anticipated to occur in years 2030, 2060, and 2100.
- **Drought**—Much of California, Ventura County and the City of Oxnard has been experiencing a multiyear drought. Continued drought can directly impact land use, development options, as well as economic development in the city. This includes negatively impacting business development, including expansion and retention and support for agricultural resources and industries. More prolonged and severe drought conditions could potentially impact potable water supplies to the point of creating a public health and safety emergency.
    - For background: The City of Oxnard purchases 40-50% of its total water supply from Calleguas Municipal Water District. This water is State Water Project water supplied by Metropolitan Water District. In addition to State water, the City of Oxnard supplements its remaining water needs from groundwater that is pumped by the City (20-30%) and by the United Water Conservation District (20-30%). According to the 2021 Groundwater Sustainability Plan (GSP), the Oxnard Subbasin water has experienced drier than average conditions since 2015 and anticipates little change to the water elevation level due to the current drought. The subbasin is currently at a level categorized as being in overdraft per the GSP.

Mitigation actions addressing these issues were prioritized for consideration in the action plan in this annex.

6.7 STATUS OF PREVIOUS PLAN ACTIONS

The following table summarizes the actions that were recommended in the previous version of the hazard mitigation plan and their implementation status at the time this update was prepared.

Table 6-13. Status of Previous Plan Actions

Action Item	Completed	Removed; No Longer Feasible	Carried Over to Plan Update	
			Check if Yes	Action # in Update
OX 3—Increase participation in the NFIP by maintaining a CRS rating Class 9, which through enhanced floodplain management activities would allow property owners to receive a discount on their flood insurance.	✓			
Comment: Increased participation by upgrading CRS rating from Class 9 to Class 7. The City will continue to maintain CRS rating Class 7.				
OX 4—Develop a tool to collect and analyze post-flood disaster risk assessment information to allow the City of Oxnard to analyze the effects of the flood and implement future mitigation projects. Information to be collected will include: number and location of structures, including RL properties, flooded; identification of flooded areas outside of the SFHA and floodwater heights at these locations; number and location of failed gages; etc.			✓	OXN-19
Comment: Information is being collected as required by CRS program. The tool is to be developed once funding is available. Funding was requested in FY 21-22 for this purpose				
OX 5—Continue to participate in the NWS TsunamiReady Program through continued implementation of Guideline 4: Community Preparedness measures, including public outreach material and curriculum.			✓	OXN-10
Comment: Oxnard continues to participate in the TsunamiReady Program and will be updating and renewing its application again this year. This is an ongoing program.				
OX 6—Evaluate Santa Clara Levees 1, 2 and 3 for upgrade and construction.	✓			
Comment: Evaluations have been completed by the County of Ventura. Levees are County-owned.				
OX 7—Construct a Mandalay Beach storm drainage system to the Channel Islands Harbor. During rain events, stormwater accumulation along Mandalay Beach Road is caused by wind and sand blocking the drainage to the ocean outfall.			✓	OXN-20
Comment: This is currently being mitigated with a dedicated portable pump that is deployed and turned on during storm events. Pump station construction is estimated at $30M+ and has not been completed due to lack of funding.				
OX 8—Construct a permanent lift station for Ventura Road @ Wagon Wheel Road. Water in the low point in the roadway must be manually pumped with each rain event.	✓			
Comment: The improvements are currently in the design phase. Wagon Wheel Development conditioned to construct.				
OX 9—Construct a stormwater lift station at Perkins Road. Flooding occurs at the point in Perkins Road which is caused by an undersized sump pump. The proposed stormwater lift system will transport stormwater to the Advanced Water Purification Facility and recycle the storm water for agricultural use along Hueneme Road.			✓	OXN-20
Comment: Currently being mitigated with a portable pump that is turned on during storm events. Pump station has not been completed due to lack of funding. The discharge location may change so discharge location is not included in the updated action plan.				
OX 10—Construct a permanent flood protection pump station at Dodge Road. Flooding occurs at the low point in Dodge Road at the intersection with Maulhardt Road.			✓	OXN-20
Comment: Currently being mitigated with a portable pump that is turned on during storm events. Pump station has not been completed due to lack of funding.				

Action Item	Completed	Removed; No Longer Feasible	Carried Over to Plan Update	
			Check if Yes	Action # in Update
OX 11—As part of the Memorandum of Agreement / Memorandum of Understanding with The Nature Conservancy (TNC): continue to partner with TNC on acquisition, restoration and mitigation planning processes; partner on grant proposals; participate in negotiations with land use owners; carry-out restoration projects; hold titles to floodplain properties as appropriate; and hold or co-hold with TNC multipurpose easements.			✓	OXN-21
Comment: In 2016, the California State Coastal Conservancy, City of Oxnard, and The Nature Conservancy (collectively known as the Ormond Beach Partners) entered into a Memorandum of Understanding to actively coordinate and collaborate across the Ormond Beach Partners' respective properties that total over 630 acres in order to protect, manage, and restore the Ormond Beach Area. The Project Partners are leading the Ormond Beach Restoration and Public Access Plan (OBRAP), with the goals of restoring the natural ecosystem and habitats and improving public access and enjoyment of Ormond Beach while protecting nature. The Ormond Beach Partners have held two public outreach meetings soliciting public input on the OBRAP in 2017 and 2019. The Ormond Beach Partners will conduct a public outreach meeting in 2021 to highlight the Preferred Alternative and Preliminary Design. The next phases of the OBRAP will be the environmental review, gap assessment, final design, permitting, funding and construction.				

6.8 HAZARD MITIGATION ACTION PLAN

Table 6-14 lists the identified actions, which make up the hazard mitigation action plan for this jurisdiction. Table 6-15 identifies the priority for each action. Table 6-16 summarizes the mitigation actions by hazard of concern and mitigation type.

Table 6-14. Hazard Mitigation Action Plan Matrix

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline
Action OXN-1—Where appropriate, support retrofitting, purchase or relocation of structures located in hazard areas, prioritizing those that have experienced repetitive losses and/or are located in high- or medium-risk hazard areas.						
Hazards Mitigated: Dam Failure, Earthquake, Flooding, Landslide, Sea Level Rise, Tsunami						
Existing	2, 6, 9, 10, 11	Public Works.	Community Development	High	HMGP, PDM, FMA	Short-term
Action OXN-2—Amend General Plan Safety and Hazard Element text and as needed hazard maps, to reflect updated mapping of hazard areas identified by this Hazard Mitigation Plan, FEMA, Cal Fire, or the CA Seismic Hazard Mapping Program, in addition to background data associated with Local Coastal Plan update and background work associated with the City's Climate Action and Adaptation Plan (CAAP)						
Hazards Mitigated: Dam Failure, Drought, Earthquake, Flooding, Sea Level Rise, Severe Weather, Tsunami, Wildfire						
New & Existing	1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 17, 19	Community Development	Public Works	$500,000	Staff Time, General Fund, Grant Funding, FEMA HMA, BRICK, Pre and Post Disaster Mitigation Grant Funding	Short-term
Action OXN-3—Actively participate in the plan maintenance protocols outlined in Volume 1 of this Hazard Mitigation Plan.						
Hazards Mitigated: Dam Failure, Drought, Earthquake, Flooding, Sea Level Rise, Severe Weather, Tsunami, Wildfire						
New & Existing	1, 2, 4, 6, 7, 8, 9, 11, 12, 13, 14, 15	Public Works	Community Development	Low	Staff Time, General Funds	Short-term

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline
Action OXN-4—Continue to maintain good standing and compliance under the National Flood Insurance Program (NFIP) through implementation of floodplain management programs that, at a minimum, meet the NFIP requirements: ● Enforce the flood damage prevention ordinance. ● Participate in floodplain identification and mapping updates. ● Provide public assistance/information on floodplain requirements and impacts. *Hazards Mitigated:* Dam Failure, Severe Storm, Severe Weather, Flooding						
New & Existing	1, 2, 6, 7, 17	Public Works	Community Development	Low	Staff Time, General Funds	Short term and ongoing
Action OXN-5—Develop, approve, and implement the City's Climate Action and Adaptation Plan (CAAP); including adaptive strategies to address hazards. *Hazards Mitigated:* Sea Level Rise, Flooding, Wildfire, Severe Storms, Severe Weather, Drought						
New & Existing	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 19	Community Development	Public Works	High	Staff Time, General Funds	Short-term and on going
Action OXN-6—Purchase generators for critical facilities and infrastructure that lack adequate backup power, & as recommended by the City's CAAP . *Hazards Mitigated:* Dam Failure, Earthquake, Flooding, Landslide, Severe Weather, Tsunami, Wildfire						
New & Existing	2, 19	Public Works	Community Development	Estimated: $500,000 per generator (avg.)	Staff Time, General Funds, Enterprise Funds, HMGP, PDM	Short-term
Action OXN-7—Retrofit existing Seawalls at Mandalay Bay in order to withstand seismic events per the latest provisions in the California Building Code (CBC, 2019) *Hazards Mitigated:* Earthquake						
Existing	2, 4, 6, 9, 11, 19	Public Works	Community Development	Estimated: $200,000,000	Staff Time, General Funds, HMGP, PDM, FMA	Short-term
Action OXN-8—Replace existing 45-inch diameter water transmission main that is critical as a lifeline for residents, industry, and national defense, including the region's military base. This project will prevent seismic-related failure of the transmission line of State Water Project water that provides potable water to a population of approximately 245,000. This pipeline supplies 60% of the City of Oxnard's water and 50% of the City of Port Hueneme's water which is then purveyed to Naval Base Ventura County's Point Mugu and Port Hueneme installations. *Hazards Mitigated:* Earthquake						
Existing	2, 4, 6, 9, 11, 19	City of Oxnard	City of Port Hueneme	Estimated: $50,000,000	Staff Time, Enterprise Funds, HMGP, PDM, FMA	Short-term
Action OXN-9—Develop a comprehensive Sea Level Rise (SLR) Adaptation Plan to be implemented in the four identified coastal planning areas located within the City's coastal zone to adopt long term adaptation policies and strategies to identify, manage, and reduce SLR impacts on coastal resources, private property and critical City facilities. The SLR adaptation policies and strategies included in the Local Coastal Program update would also be coordinated with the Climate Action and Adaptation Plan to address SLR vulnerabilities. *Hazards Mitigated:* Sea Level Rise						
New & Existing	Enter Response 1, 2, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19	Public Works	Community Development; County of Ventura and Harbor Department; City of Port Hueneme; U.S. Department of Defense (Navy)	High	Grant State Federal	Long Term

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline
Action OXN-10—Continue to participate in the NWS TsunamiReady Program through continued implementation of Guidelines for Community Preparedness measures, including public outreach material and curriculum. In 2021 Oxnard updated its application and has received approval from the NWS as a TsunamiReady Community. This is an ongoing program *Hazards Mitigated:* Tsunami						
New & Existing	1, 2, 6, 7, 8, 12, 17, 18, 19	Emergency Services Manager	Oxnard Fire and Public Works Departments	Low	Staff Time, Enterprise Funds, EMPG, DHS	Ongoing
Action OXN-11—Construction of Aquifer Storage and Recovery (ASR) wells in order to ensure future reliable and affordable supply of high-quality water for the Oxnard Plain. *Hazards Mitigated:* Drought						
Existing	2, 4, 6, 9, 11, 19	City of Oxnard	State Division of Drinking Water	High	Staff Time, Enterprise Funds, HMGP, PDM, FMA	Short-term
Action OXN-12—Develop and implement a resident and visitor tsunami awareness and safety public education and outreach program. Provide tsunami awareness, hazard, safety, and evacuation information at visitor locations including hotels, vacation rentals, campgrounds and day use recreational areas. Program would include signs, posters, handouts and public presentations. *Hazards Mitigated:* Tsunami						
New	1, 2, 7, 8, 10, 12, 17, 18, 19	Oxnard Police and Fire Departments	Oxnard Community Development	Low	Staff Time, Enterprise Funds, EMPG, DHS	Short-term
Action OXN-13—Engage in a study to determine the best methods and strategies to communicate hazards and warnings to the city's homeless population, particularly those living in undeveloped areas such as fields, creeks and riverbeds. Warnings would include notification of impending or immediate dangers. *Hazards Mitigated:* Dam Failure, Earthquake, Flooding, Landslide, Severe Weather, Tsunami, Wildfire						
New	1, 2, 7, 8, 10, 12, 17, 18, 19	City of Oxnard		High	Grant Funding-FEMA HMA (BRIC, FMA, HMGP), Staff Time, Enterprise Funds	Short-Term
Action OXN-14—Engage in a feasibility study to determine if Oxnard Fire Station 6 can be retrofitted, replaced or relocated due to seismic and tsunami hazards. *Hazards Mitigated:* Earthquake, Tsunami						
Existing	1, 2, 6, 7, 8, 9, 18, 19	Oxnard Fire Department	City Planning Department	High	Grant Funding-FEMA HMA (BRIC, HMGP), Staff Time, Enterprise Funds	Short-Term
Action OXN-15—Engage in a feasibility study to determine if Oxnard Fire Stations 2, 3, 4 & 5 can be retrofitted, replaced or relocated due to seismic hazards. *Hazards Mitigated:* Earthquake						
Existing	1, 2, 6, 7, 8, 9, 18, 19	Oxnard Fire Department	City Planning Department	High	Grant Funding-FEMA HMA (BRIC, HMGP), Staff Time, Enterprise Funds	Short-Term
Action OXN-16—Implement the findings of the feasibility studies with retrofits to, relocation of, or replacement of existing City Fire Stations including, Stations # 2, 3, 4, 5, 6. These stations were built between 1954 and 1978 prior to current building standards. Damage to these stations could seriously impact fire, rescue and EMS service within the City. *Hazards Mitigated:* Earthquake, Tsunami						
Existing	1, 2, 6, 7, 8, 9, 18, 19	Oxnard Fire Department	City Planning Department	High	Grant Funding-FEMA HMA (BRIC, HMGP), Staff Time, Enterprise Funds	Short-Term

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline
Action OXN-17—Engage in a feasibility study to determine if the Oxnard Police Headquarters building, including the Dispatch facilility, can be retrofitted or should be replaced due to seismic hazards.						
Hazards Mitigated: Earthquake						
New	1, 2, 7, 8, 10, 12, 17, 18, 19	City of Oxnard	Oxnard Police Department	High	Grant Funding-FEMA HMA (BRIC,HMGP), Staff Time, Enterprise Funds	Short-Term
Action OXN-18—Implement the findings of the feasibility study by retrofitting or replacing Oxnard Police Headquarters building. This will include expansion of the Dispatch facility to accommodate equipment for the radio and data traffic needed to support disaster response communications.						
Hazards Mitigated: Earthquake, Tsunami, Severe Storms, Dam Failure, Wildfires, Flooding						
Existing	1, 2, 6, 7, 8, 9, 18, 19	Oxnard Police Department	Oxnard Fire Department	High	Grant Funding-FEMA HMA (BRIC, HMGP), Staff Time, Enterprise Funds	Short-Term
Action OXN-19—Develop a tool to collect and analyze post-flood disaster risk assessment information to allow the City of Oxnard to analyze the effects of the flood and implement future mitigation projects. Information to be collected will include: number and location of structures, including RL properties, flooded; identification of flooded areas outside of the SFHA and floodwater heights at these locations; number and location of failed gages; etc.						
Hazards Mitigated: Flooding						
New & Existing	1, 2, 17	City of Oxnard		High	Grant Funding-FEMA HMA (BRIC, FMA, HMGP), Staff Time, Enterprise Funds	Short-Term
Action OXN-20—Construct pump stations for roadway areas affected by chronic flooding including, but not limited to: • Mandalay Beach storm drainage system to the Channel Islands Harbor. During rain events, stormwater accumulation along Mandalay Beach Road is caused by wind and sand blocking the drainage to the ocean outfall. • Construct a stormwater lift station at Perkins Road. Flooding occurs at the point in Perkins Road which is caused by an undersized sump pump. • Construct a permanent flood protection pump station at Dodge Road. Flooding occurs at the low point in Dodge Road at the intersection with Maulhardt Road.						
Hazards Mitigated: Flooding, Severe Storms						
Existing	2, 6, 10, 11	Public Works		High	Grant Funding-FEMA HMA (BRIC, FMA, HMGP), Staff Time, Enterprise Funds	Short-Term

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline
Action OXN-21—As part of the Memorandum of Agreement / Memorandum of Understanding with The Nature Conservancy (TNC): • Continue to partner with TNC on acquisition, restoration and mitigation planning processes • Partner on grant proposals • Participate in negotiations with land use owners • Carry-out restoration projects • Hold titles to floodplain properties as appropriate • Hold or co-hold with TNC multipurpose easements. Secure a Consolidated Coastal Development Permit to cover conservation and preservation activities over the next five years (2021-2026) that consist of the following: • Nesting shorebird protection activities • Invasive plant removal activities • Access road and trail maintenance activities • Field data collection and research. Collaborate with Ventura County Public Works Agency-Watershed Protection, TNC, and State Coastal Conservancy to advance planning, design, and implementation of the Ormond Beach Restoration and Access Plan (OBRAP), particularly those components alleviating flooding along the Ormond Lagoon Waterway and creating public access along tšumaš Creek. This supports the VCPWA-WP Action VCPWA-13. *Hazards Mitigated:* Drought, Flood, Severe Weather, Severe Storms, Sea Level Rise, Tsunami						
Existing and New	1, 2, 3, 9, 12, 13, 14, 15, 17, 18, 19	City of Oxnard	VCPWA-WP	Medium	Staff Time, Enterprise Funds, FEMA Grants (BRIC), CDFG	Ongoing

a. Short-term = Completion within 5 years; Long-term = Completion within 10 years; Ongoing= Continuing new or existing program with no completion date

Acronyms used here are defined at the beginning of this volume.

Table 6-15. Mitigation Action Priority

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Cost?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Implementation Priority	Grant Pursuit Priority
OXN 1	5	High	High	Yes	Yes	No	Medium	High
OXN 2	16	Medium	Low	Yes	No	Yes	High	Low
OXN 3	12	Low	Low	Yes	No	Yes	High	Low
OXN 4	5	Medium	Low	Yes	No	Yes	High	Low
OXN 5	17	Medium	Low	Yes	No	Yes	High	Medium
OXN 6	2	High	Medium	Yes	Yes	No	Medium	High
OXN 7	6	High	High	Yes	Yes	No	High	High
OXN 8	6	High	High	Yes	Yes	No	High	High
OXN 9	17	Medium	High	No	Yes	No	Low	Medium
OXN 10	9	High	Low	Yes	Yes	Yes	High	Low
OXN 11	6	High	High	Yes	Yes	No	High	High
OXN 12	9	High	Low	Yes	Yes	No	High	High
OXN 13	9	Low	Medium	Yes	Yes	No	Medium	High
OXN 14	8	Medium	Medium	Yes	Yes	No	Medium	High
OXN 15	8	Medium	Medium	Yes	Yes	No	Medium	High

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Cost?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Implementation Priority	Grant Pursuit Priority
OXN 16	8	High	High	Yes	Yes	No	Medium	High
OXN 17	9	Medium	Medium	Yes	Yes	No	Medium	High
OXN 18	8	High	High	Yes	Yes	No	Medium	High
OXN 19	3	Medium	High	No	Yes	No	Medium	Medium
OXN 20	4	High	High	Yes	Yes	No	Medium	High
OXN 21	11	Medium	Medium	Yes	Yes	Yes	High	Medium

a. See the introduction to this volume for an explanation of priorities.

Table 6-16. Analysis of Mitigation Actions

Hazard Type	Action Addressing Hazard, by Mitigation Types[a]							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilience	Community Capacity Building
High-Risk Hazards								
Dam Failure	OXN-1, 2, 3, 4, 6	OXN-1, 2, 3, 4, 6, 18	OXN-2, 3, 4, 13	OXN-1, 2, 3, 4, 6	OXN-2, 3, 4, 6, 13, 18	OXN-1, 2, 3, 4, 6, 18	OXN-1, 2, 3, 4, 6	OXN-4, 13, 18
Medium-Risk Hazards								
Earthquake	OXN-2, 3, 6, 8, 14, 15, 16	OXN-2, 3, 6, 8, 14, 15, 16, 17, 18	OXN-2, 3, 8, 13	OXN-2, 3, 6	OXN-2, 3, 6, 8, 16, 17, 18	OXN-3, 6, 14, 15, 16, 17, 18	OXN-2, 6	OXN-8, 13, 14, 15, 16, 17, 18
Severe Storm	OXN-1, 2, 3, 4, 20, 21	OXN-1, 2, 3, 4, 5, 18, 20	OXN-2, 3, 4, 5, 21	OXN-1, 2, 3, 4, 5, 20, 21	OXN-1, 2, 3, 4, 5, 18, 20	OXN-1, 2, 3, 18, 20	OXN-1, 2, 4, 5, 20, 21	OXN-4, 5, 18, 21
Severe Weather	OXN-1, 2, 3, 4, 5, 6, 21	OXN-1, 2, 3, 4, 5, 6	OXN-3, 4, 5, 6, 21	OXN-1, 2, 3, 4, 5, 6, 21	OXN-1, 2, 3, 4, 6	OXN-1, 3, 5	OXN-1, 2, 3, 4, 5, 6, 21	OXN-4, 5, 6, 21
Flooding	OXN-1, 2, 3, 4, 5, 6, 7, 20, 21	OXN-1, 2, 3, 4, 5, 6, 7, 18 , 20, 21	OXN-2, 3, 4, 5, 6, 7, 13, 19	OXN-1, 2, 3, 4, 5, 6, 7, 20, 21	OXN-1, 2, 3, 4, 5, 6, 18, 20	OXN-1, 2, 3, 4, 7, 18, 20	OXN-1, 2, 3, 4, 5, 6, 20, 21	OXN-4, 5, 6, 7, 13, 15, 18, 19, 21
Sea Level Rise	OXN-1, 2, 5, 9, 21	OXN-1, 2, 3, 5, 9, 21	OXN-1, 2, 3, 5, 9	OXN-1, 2, 3, 5, 9, 21	OXN-2, 3	OXN-1, 2, 3, 5, 9	OXN-1, 2, 3, 5, 9, 21	OXN-1, 2, 3, 5, 9, 21
Low-Risk Hazards								
Drought	OXN-5, 11, 21	OXN-21	OXN-2, 5	OXN-2, 5, 11, 21	OXN-5		OXN-2, 3, 5, 11, 21	OXN-2, 3, 5, 11, 21
Wildfire	OXN-1, 2, 3, 6	OXN-1, 2, 3, 6	OXN-2, 3, 5, 6, 20	OXN-2, 3, 5, 6	OXN-2, 5, 6, 13		OXN-2, 3, 5, 6	OXN-2, 3, 5, 6, 13
Tsunami	OXN-1, 2, 3, 6, 10, 14, 16, 21	OXN-1, 2, 3, 6, 10, 14, 16, 18, 21	OXN-1, 2, 3, 6, 10, 12, 13	OXN-1, 2, 3, 6, 10, 21	OXN-1, 2, 3, 6 10, 13, 14, 16, 18	OXN-1, 2, 3 10, 14, 16, 18	OXN-1, 2, 3, 6, 10, 21	OXN-1, 2, 3, 6, 10, 13, 14, 16, 18, 21

a. See the introduction to this volume for an explanation of mitigation types.

6.9 PUBLIC OUTREACH

Table 6-17 lists public outreach activities for this jurisdiction.

Table 6-17. Local Public Outreach

Local Outreach Activity	Date	Number of People Involved
Virtual Emergency Preparedness Worship	September 16, 2021	70
Adaptation Plan, outreach		
Sea Level Rise Vulnerability Assessment Report Results and Adaptation Strategies Workshop	August 9, 2017	Approximately 25
Sea Level Rise Adaptation Strategy Results & Conceptual Policies	March 14, 2018	Approximately 25

6.10 INFORMATION SOURCES USED FOR THIS ANNEX

The following technical reports, plans, and regulatory mechanisms were reviewed to provide information for this annex.

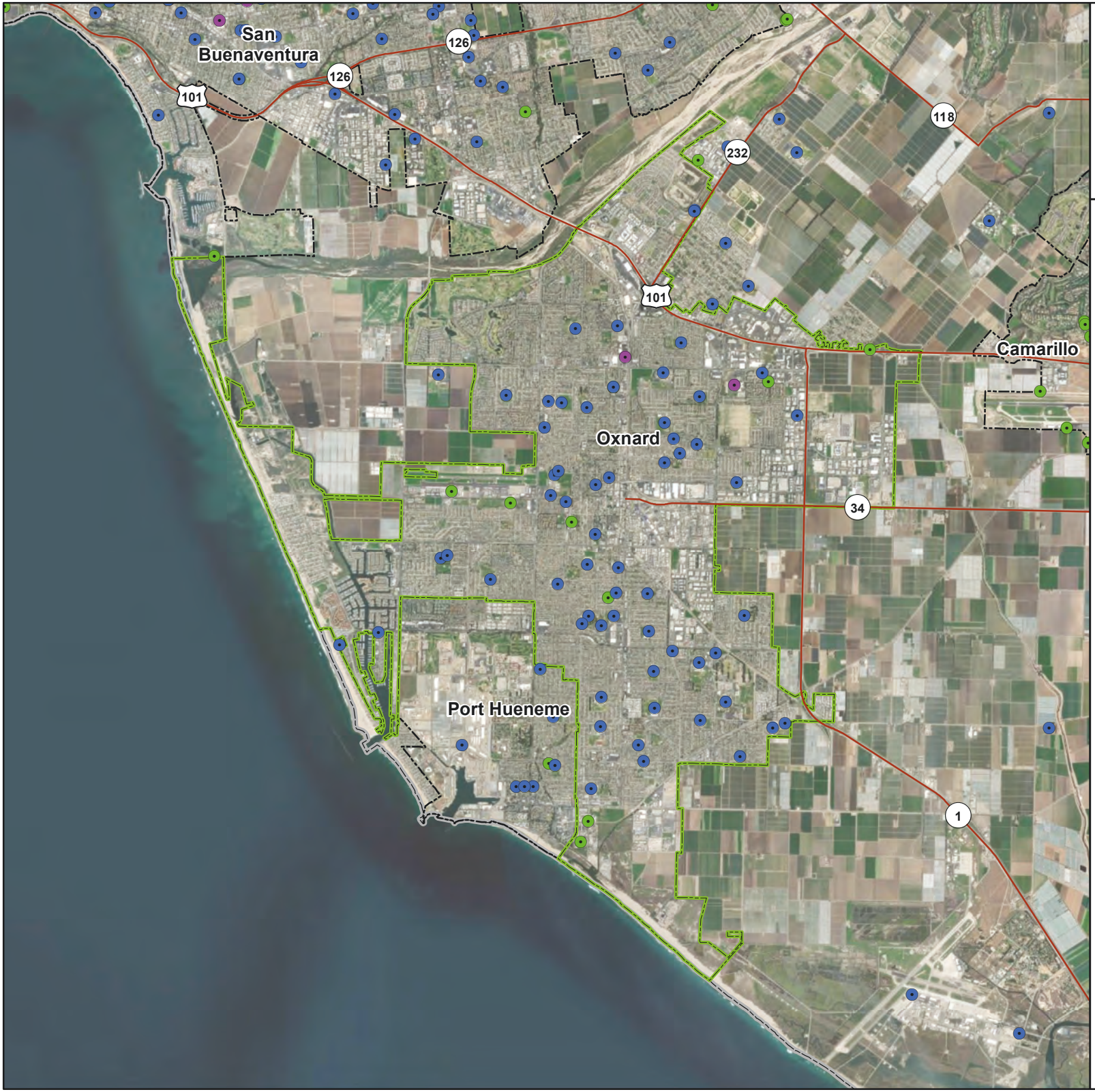
- **City of Oxnard Municipal Code**—The municipal code was reviewed for the full capability assessment and for identifying opportunities for action plan integration.
- **City of Oxnard Flood Damage Prevention Ordinance**—The flood damage prevention ordinance was reviewed for compliance with the National Flood Insurance Program.
- **City of Oxnard 2021-2026 Five Year Capital Improvement Program (CIP)**—The CIP was reviewed for identifying opportunities for action plan integration.
- **Flood Info Community Rating System Website (Ventura County):** https://www.vcfloodinfo.com/programs/flooding-and-flood-risk/vc-flood-history
- **City of Oxnard Sea Level Rise Atlas:** As required by the adopted California Coastal Commission Sea Level Rise Guidance Policy, a risk and vulnerability assessment using the best-available information and science regarding coastal erosion, flooding, wave impacts, tidal inundation and tsunamis is needed to identify potential physical impacts in the City's coastal zone. In this way, the City can determine what areas are vulnerable to impacts from these five coastal hazards individually and combined, and with projected sea level rise. https://www.oxnard.org/wp-content/uploads/2021/06/OXNARD-FINAL-LCP-Sea-Level-Rise-Map-Atlas-Task-2.pdf
- **Sea Level Rise Vulnerability Assessment and Fiscal Impact Report:** This study included a cost-benefit analysis of the adaptation strategies to allow comparison. The aim of the economic analysis was to provide a common metric against which the trade-offs between the costs and benefits of each adaptation strategy may be evaluated. The analysis accounts for the physical changes, economic benefits, and damages associated with each adaptation strategy, including th
- **City of Oxnard Emergency Operations Plan (EOP)—**The EOP was used to obtain the listing of official natural hazards that can impact the City, reference materials such as tsunami and dam inundation maps as well emergency management priorities, and public alert and warning procedures.

The following outside resources and references were reviewed:

- **Hazard Mitigation Plan Annex Development Toolkit**—The toolkit was used to support the identification of past hazard events and noted vulnerabilities, the risk ranking, and the development of the mitigation action plan.

6.11 FUTURE NEEDS TO BETTER UNDERSTAND RISK/VULNERABILITY

The City of Oxnard Fire Department is currently developing a Strategic Plan composed of numerous elements including a community risk analysis, infrastructure assessment, and community planning prioritization process. These elements are being created with significant input from key stakeholders including Fire Department personnel, City departments, external agencies, and the residential and business communities. It is anticipated that the Department's Strategic Plan, anticipated for release in 2022, will strengthen the City's understanding of risk and vulnerabilities and serve as a foundation for additional hazard mitigation project development during the next planning cycle.



Oxnard

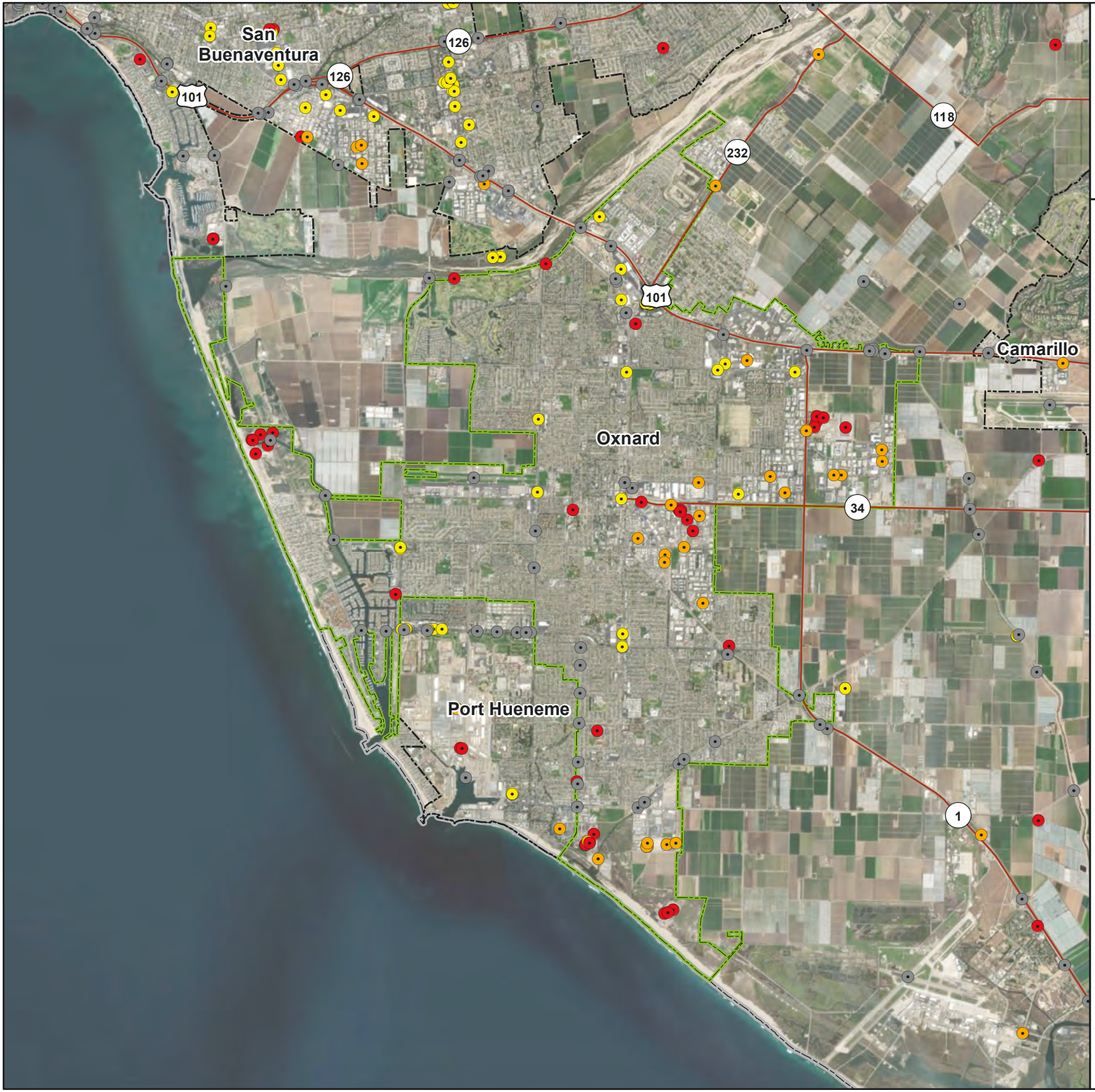
Critical Facilities (1 of 2)

- Food, Water, Shelter
- Health and Medical
- Safety and Security
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Data Sources: Ventura Co., VCFD, Casitas MWD, Calleguas MWD, City of Camarillo, CA Energy Commission, Cal Trans, EPA, HIFLD, Esri

N

0 0.5 1 2 Miles



Oxnard

Critical Facilities (1 of 2)

- Communications
- Energy
- Hazardous Material
- Transportation
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Data Sources: Ventura Co., VCFD, Casitas MWD, Calleguas MWD, City of Camarillo, CA Energy Commission, Cal Trans, EPA, HIFLD, Esri

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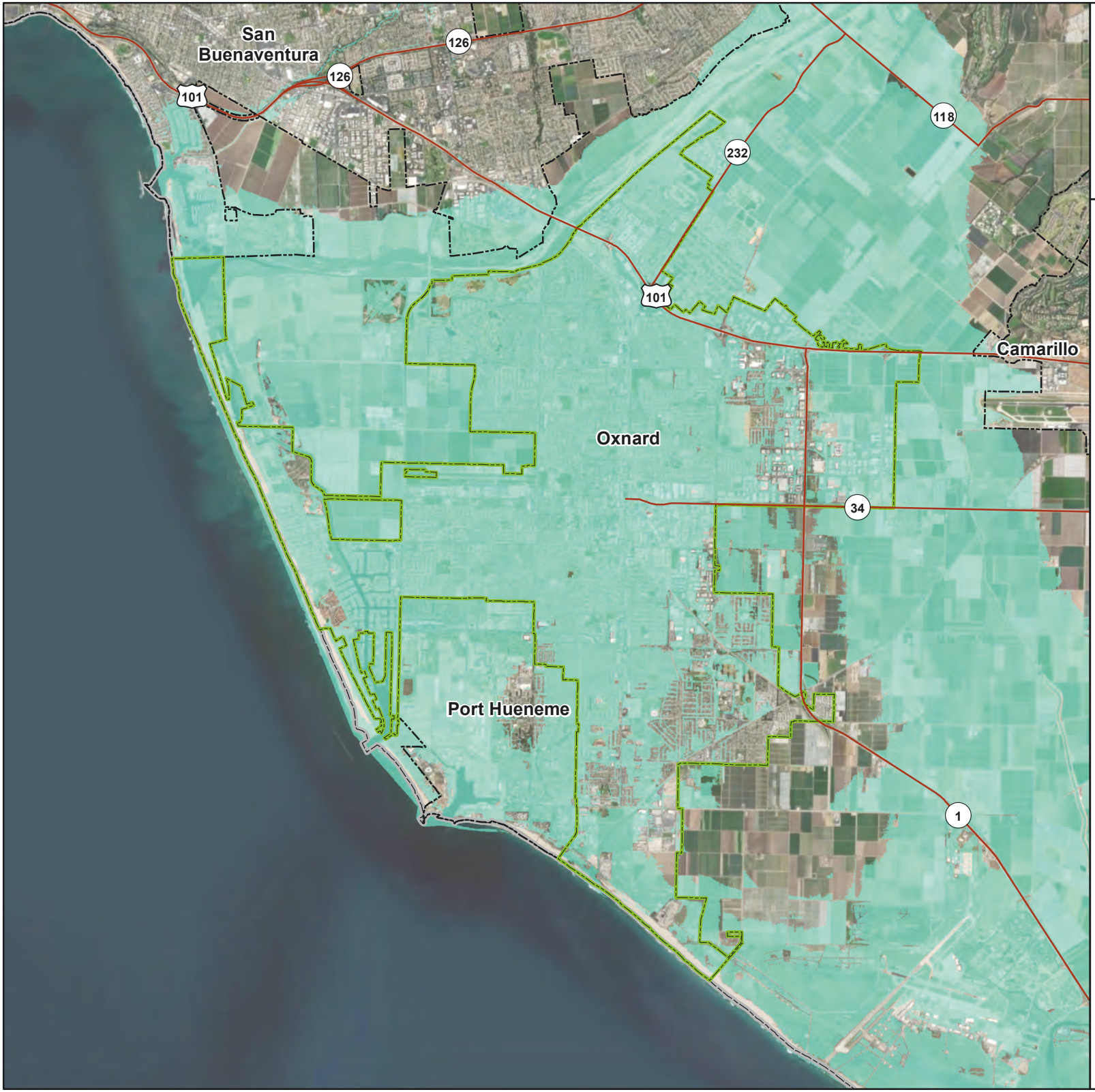

Oxnard

Dam Failure Inundation Areas

Combined Inundation Areas

Major Roads

Selected City

Incorporated Cities

County Boundary

Data Sources: Ventura Co., CA DWR, Esri

N

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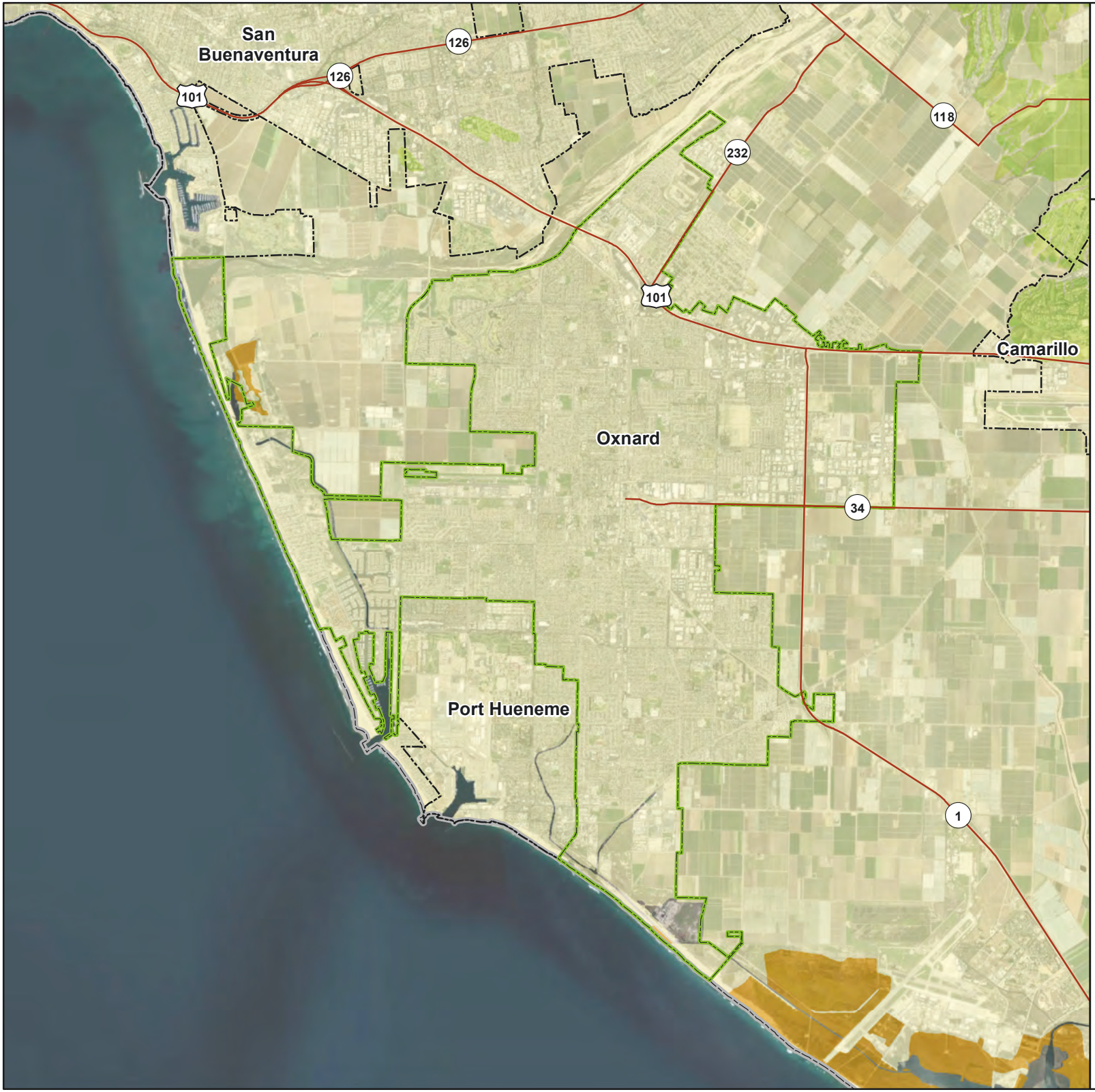


Oxnard

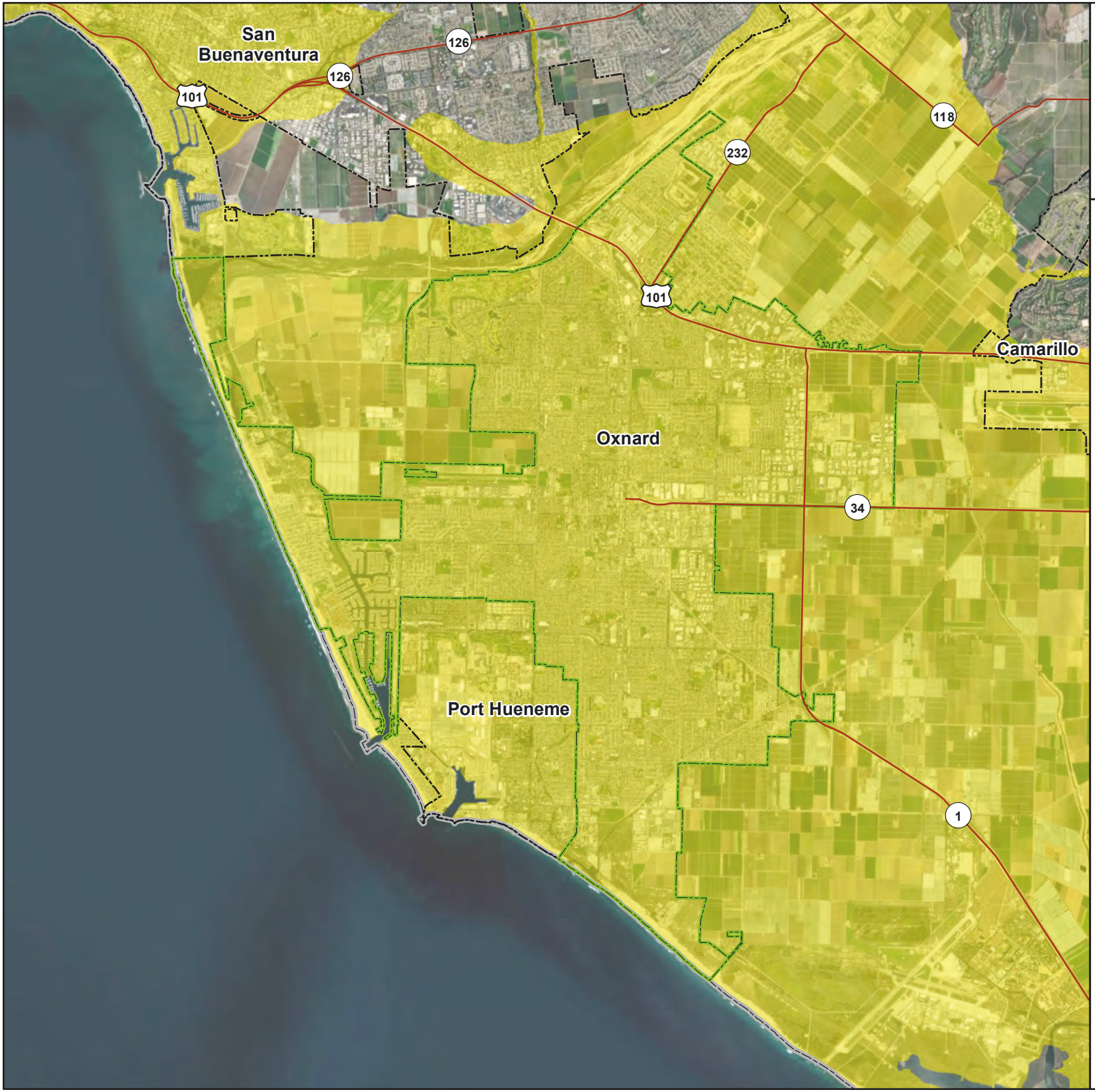
NEHRP Soil Class

- C (Dense soil/soft rock)
- D (Stiff soil)
- E (Soft clay)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Data Sources: Ventura Co., CGS, Esri

N

0 0.5 1 2 Miles



Oxnard

Liquefaction Susceptibility

Liquefaction zone

Major Roads

Selected City

Incorporated Cities

County Boundary

Data Sources: Ventura Co., Esri

N

0 0.5 1 2 Miles

Oxnard

100-Year Probabilistic Earthquake Scenario

Mercalli Intensity Scale

- VII (Very Strong/Moderate)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.5 1 2 Miles

Oxnard

Oak Ridge M7.16 Earthquake Scenario

Mercalli Intensity Scale

- VII (Very Strong/Moderate)
- VIII (Severe/Moderate-Heavy)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

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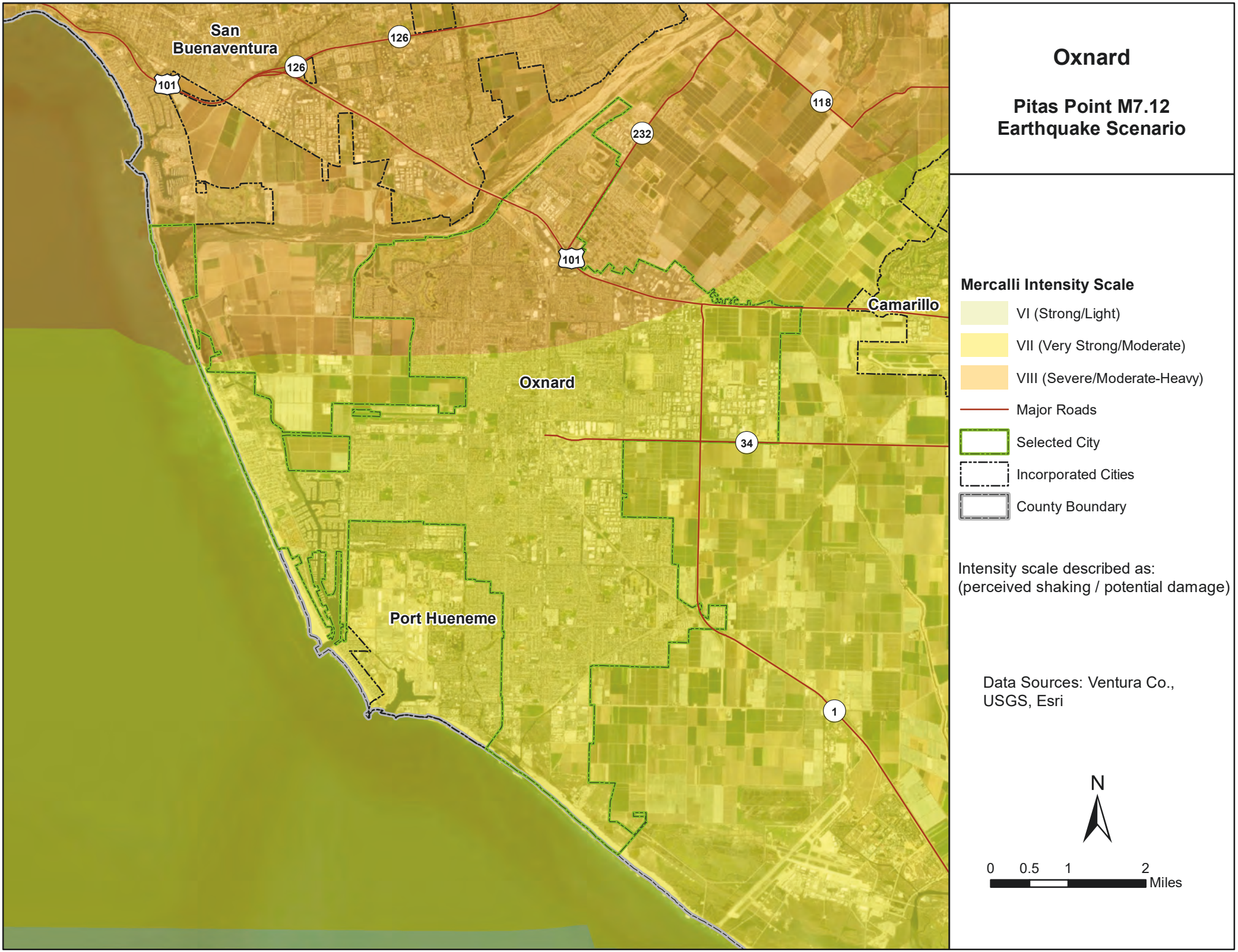

Oxnard

Pitas Point M7.12 Earthquake Scenario

Mercalli Intensity Scale

- VI (Strong/Light)
- VII (Very Strong/Moderate)
- VIII (Severe/Moderate-Heavy)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.5 1 2 Miles

Oxnard

San Cayetano M7.16 Earthquake Scenario

Mercalli Intensity Scale

- V (Moderate/Very Light)
- VI (Strong/Light)
- VII (Very Strong/Moderate)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.5 1 2 Miles

Oxnard

S. San Andreas M8.03 Earthquake Scenario

Mercalli Intensity Scale

- V (Moderate/Very Light)
- VI (Strong/Light)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

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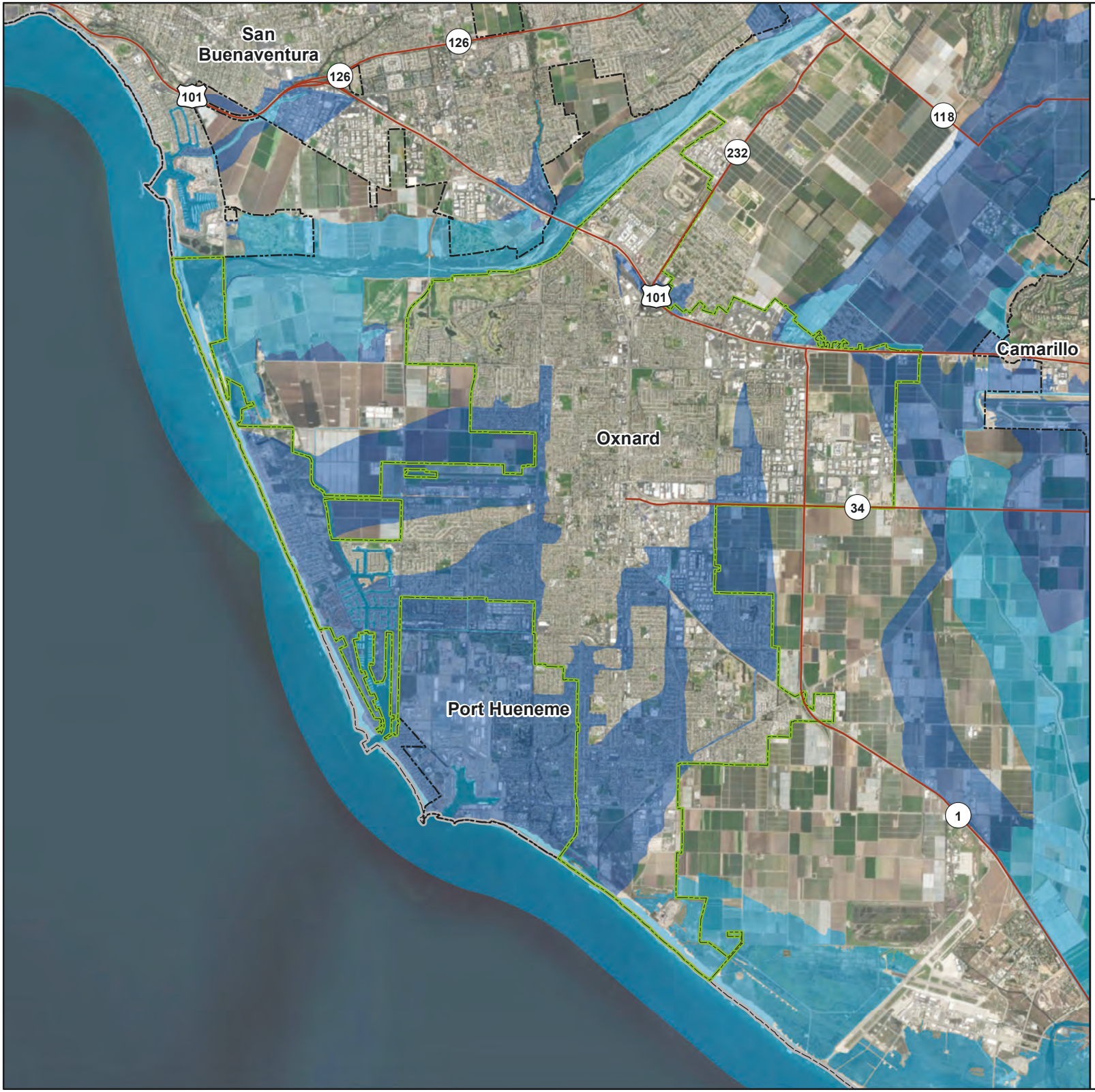


Oxnard

FEMA Flood Hazard Areas

1% Annual Chance Flood (100-Year)

0.2% Annual Chance Flood (500-Year)

Major Roads

Selected City

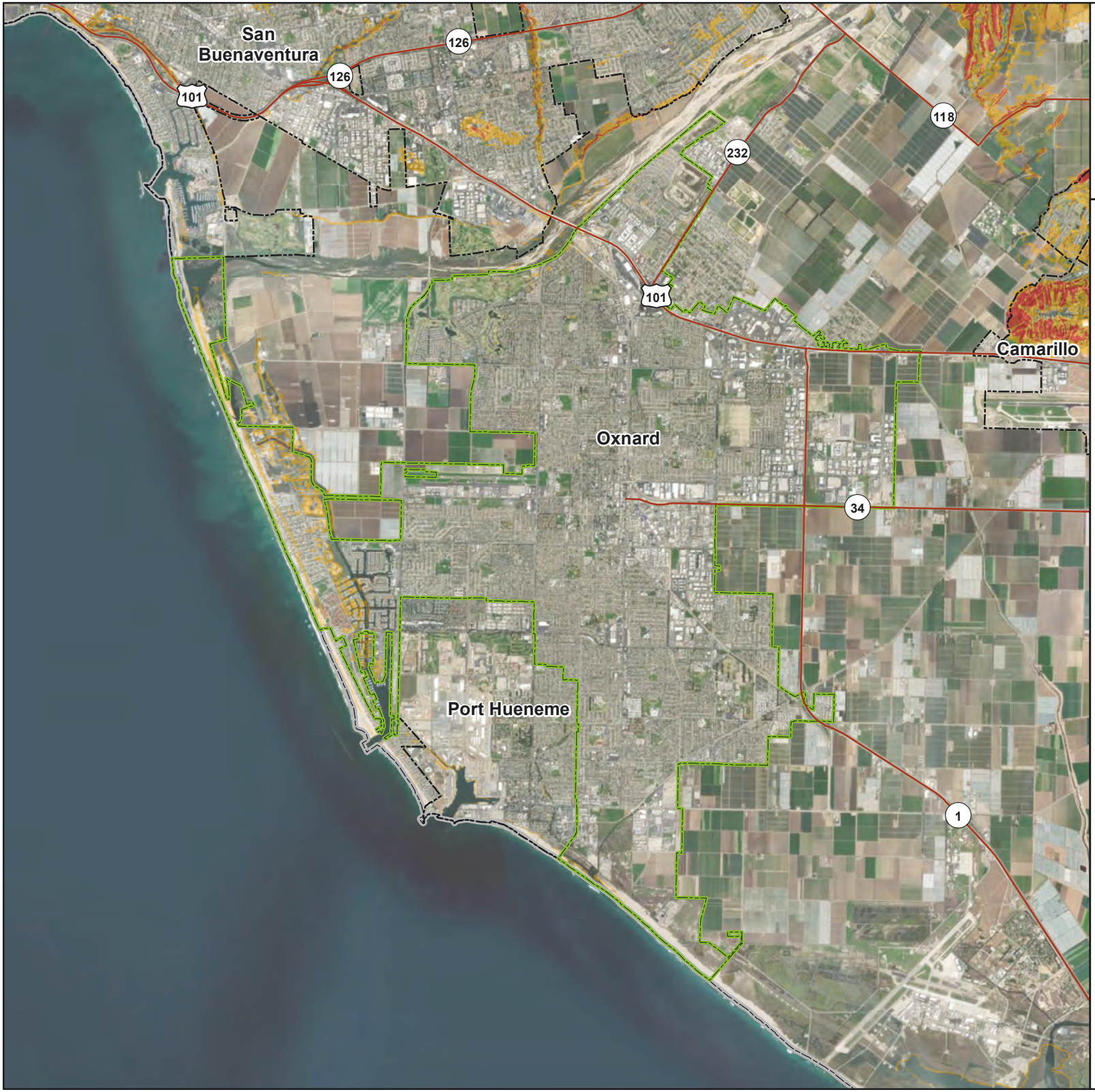
Incorporated Cities

County Boundary

Data Sources: Ventura Co., FEMA, Esri

N

0 0.5 1 2 Miles



Oxnard

Susceptibility to Deep-Seated Landslides

- Low
- Moderate
- High
- Very High
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Data Sources: Ventura Co., CGS, Esri

N

0 0.5 1 2 Miles

Oxnard

Sea Level Rise of 25 cm (9.8 in.)

Sea Level Rise Inundation Area

Major Roads

Selected City

Incorporated Cities

County Boundary

Data Sources: Ventura Co., OCOF, Esri

N

0 0.5 1 2 Miles

Oxnard

Sea Level Rise of 100 cm (39.4 in.)

Sea Level Rise Inundation Area

Major Roads

Selected City

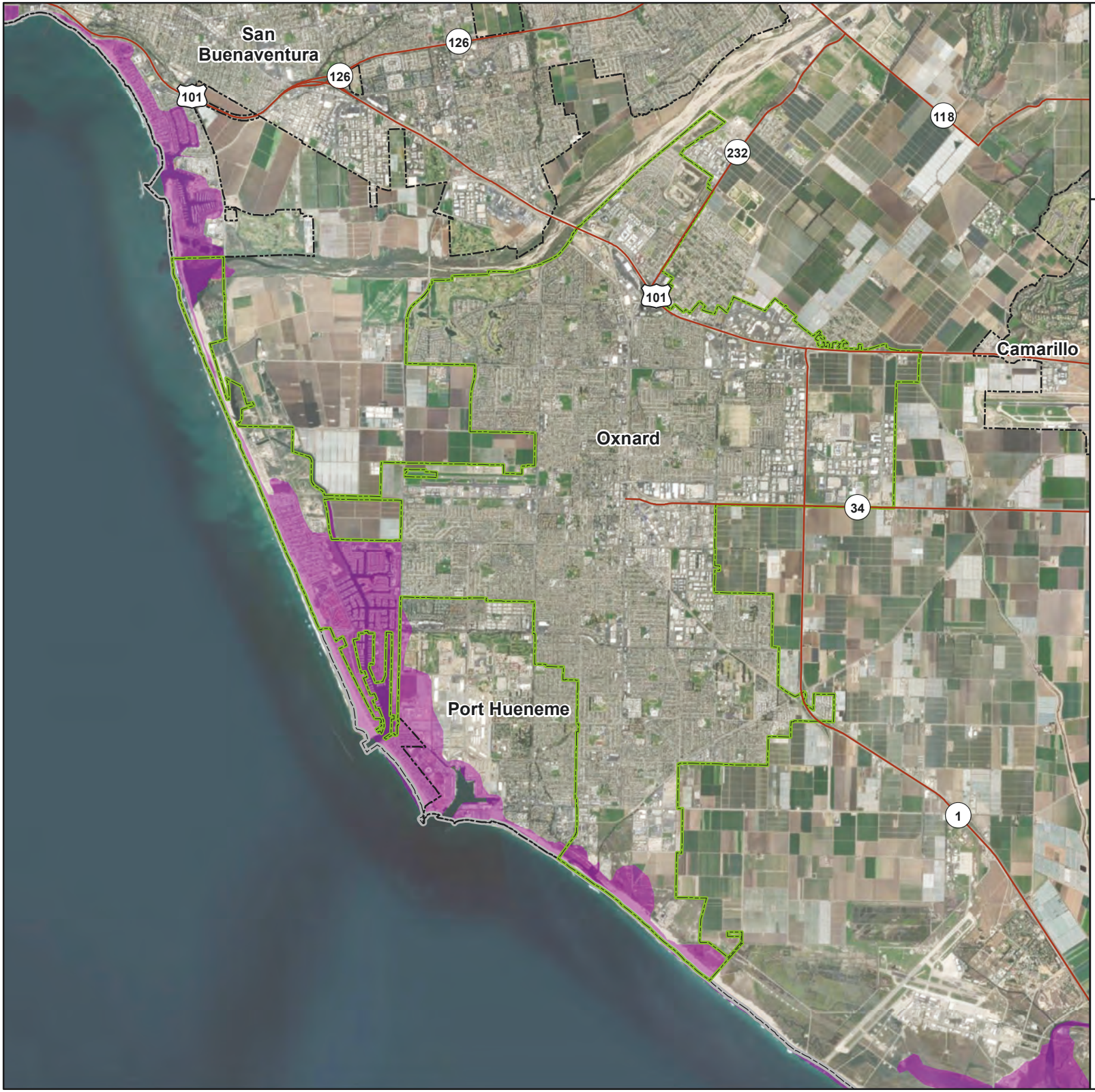
Incorporated Cities

County Boundary

Data Sources: Ventura Co., OCOF, Esri

N

0 0.5 1 2 Miles



Oxnard

Tsunami Inudation Zones

Inundation Zones
Major Roads
Selected City
Incorporated Cities
County Boundary

Data Sources: Ventura Co., CGS, Esri

N

0 0.5 1 2 Miles

7. CITY OF PORT HUENEME

7.1 LOCAL HAZARD MITIGATION PLANNING TEAM

Primary Point of Contact
Brad Conners, City Manager
250 N. Ventura Road
Port Hueneme, CA 93041
Telephone: 805-986-6501
e-mail Address: BConners@ci.port-hueneme.ca.us

Alternate Point of Contact
Charles Peretz, Deputy City Manager
250 N. Ventura Road
Port Hueneme, CA 93041
Telephone: 805-986-6501
e-mail Address: CPeretz@ci.port-hueneme.ca.us

This annex was developed by the local hazard mitigation planning team, whose members are listed in Table 7-1.

Table 7-1. Local Mitigation Planning Team Members

Name	Title
Don Villafana	Public Works Director
Lupe Acero	Deputy Finance Director
Andrew Salinas	Chief of Police
Tony Stewart	Director of Community Development
Scott Matalon	Emergency Preparedness Manager
Brad Conners	City Manager
Charles Peretz	Deputy City Manager

7.2 JURISDICTION PROFILE

7.2.1 Location and Features

Port Hueneme is a small coastal town located in Ventura County, just south of the City of Oxnard and east of Channel Islands Harbor. The City is home to Naval Base Ventura County (NBVC) and the Port of Hueneme and about five miles to the south is Naval Air Station Point Mugu. Port Hueneme is primarily built out and has a total land area of 4.5 square miles with a population of 23,647 people. Regional access to the City is provided by Highway 101 and State Route 1. The City also includes beach front properties, parks, and public beaches visited from residents and non-residents alike.

7.2.2 History

The City of Port Hueneme was incorporated on March 24, 1948. The City of Port Hueneme (pronounced “Why-nee-mee”) is a unique community along Ventura County’s Gold Coast just south of the City of Oxnard and Channel Islands Harbor. Port Hueneme is unique because of its rich history, culture, and traditions, dating back to the Chumash Indians who made their home here for centuries and because of its long-established, close relationship with the U.S. Navy’s Port Hueneme and Point Mugu naval facilities.

7.2.3 Governing Body Format

The City of Port Hueneme is governed by a five-member city council. The City consists of six departments: Finance, Housing and Facilities, Community Development, Public Works, Police, and the City Manager’s Office. The City has 2 commissions which report to the City Council. The City currently employs a total of 170 employees (full-time equivalent).

The City Council assumes responsibility for the adoption of this plan; the City Manager will oversee its implementation.

7.3 CURRENT TRENDS

7.3.1 Population

According to the California Department of Finance, the population of the City of Port Hueneme as of January 2020 was 23,607. Since 2010, the population has grown at an average annual rate of 0.85 percent.

7.3.2 Development

Anticipated future development for Port Hueneme includes creating and sustaining a strong, viable economic base for the City. The City encourages development of diversified housing types that will meet our community’s needs. This includes establishing a mix of housing types in local neighborhoods to avoid economic stratification and enhance community diversity. Future growth in the City will be managed as identified in the City’s 2045 general plan. City actions, such as those relating to land use, annexations, zoning, subdivision and design review, redevelopment, and capital improvements, must be consistent with the plan.

Table 7-2 summarizes development trends in the period since the preparation of the previous hazard mitigation plan, as well as expected future development trends.

7.4 CAPABILITY ASSESSMENT

This section describes an assessment of existing capabilities for implementing hazard mitigation strategies. The introduction at the beginning of this volume of the hazard mitigation plan describes the components included in the capability assessment and their significance for hazard mitigation planning.

Findings of the capability assessment were reviewed to identify opportunities to expand, initiate or integrate capabilities to further hazard mitigation goals and objectives. Where such opportunities were

identified and determined to be feasible, they are included in the action plan. The "Analysis of Mitigation Actions" table in this annex identifies these as community capacity building mitigation actions.

Table 7-2. Recent and Expected Future Development Trends

Criterion	Response					
Has your jurisdiction annexed any land since the preparation of the previous hazard mitigation plan?	No					
Is your jurisdiction expected to annex any areas during the performance period of this plan?	No					
Are any areas targeted for development or major redevelopment in the next five years? • **If yes, briefly describe, including whether any of the areas are in known hazard risk areas**	Yes Parcel located Victoria and Channel Islands, not in hazard area.					
How many permits for new construction were issued in your jurisdiction since the preparation of the previous hazard mitigation plan?		**2016**	**2017**	**2018**	**2019**	**2020**
	Single Family	0	0	0	0	0
	Multi-Family	0	0	0	0	0
	Other (commercial, mixed use, etc.)	0	0	0	0	0
	Total	**0**	**0**	**0**	**0**	**0**
Provide the number of new-construction permits for each hazard area or provide a qualitative description of where development has occurred.	From 2016 to current, there have been zero new permits issued as the City of Port Hueneme is built out to capacity.					
Describe the level of buildout in the jurisdiction, based on your jurisdiction's buildable lands inventory. If no such inventory exists, provide a qualitative description.	99.5%					

The findings of the assessment are presented as follows:

- An assessment of planning and regulatory capabilities is presented in Table 7-3.
- Development and permitting capabilities are presented in Table 7-4.
- An assessment of fiscal capabilities is presented in Table 7-5.
- An assessment of administrative and technical capabilities is presented in Table 7-6.
- An assessment of education and outreach capabilities is presented in Table 7-7.
- Information on National Flood Insurance Program (NFIP) compliance is presented in Table 7-8.
- Classifications under various community mitigation programs are presented in Table 7-9.
- The community's adaptive capacity for the impacts of climate change is presented in Table 7-10.

Table 7-3. Planning and Regulatory Capability

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity?
Codes, Ordinances, & Requirements				
Building Code	Yes	Yes	Yes	Yes
Comment: *Article 8 Municipal Code starting 8001. (Ord. 637 § 5 Exh. A (part), 2001) "California Building Code", the "California Residential Building Code", and the "California Green Building Standards Code", 2019 Editions*				
Zoning Code	Yes	Yes	Yes	Yes
Comment: *Article 10 Section 10,000 (Ord. 579 § 6 (1), 1992)*				
Subdivisions	Yes	Yes	Yes	Yes
Comment: *Article 9, Section 9,000 (Ord. 579 § 5 (1), 1992)*				
Stormwater Management	Yes	Yes	Yes	Yes
Comment: *Follow County's Reports*				
Post-Disaster Recovery	No	Yes	Yes	Yes
Comment: *No Official plan*				
Real Estate Disclosure	Yes	Yes	Yes	Yes
Comment: *Report of Building Records. California State Civil Code 1102 requires full disclosure on natural hazard exposure of the sale/re-sale of any and all real property. To be implemented by sellers and realtors.*				
Growth Management	No	No	No	No
Comment: *City is built out*				
Site Plan Review	Yes	No	No	Yes
Comment: *Section 10350*				
Environmental Protection	Yes	Yes	Yes	Yes
Comment: *The California Environmental Quality Act (CEQA) requires state and local agencies to identify the significant environmental impacts of their actions and to avoid or mitigate those impacts, if feasible.*				
Flood Damage Prevention	Yes	Yes	Yes	Yes
Comment: *Section 10590*				
Emergency Management	Yes	Yes	Yes	Yes
Comment: *Police Department Emergency Manager*				
Climate Change	No	Yes	Yes	Yes
Comment: *In Development*				
Planning Documents				
General Plan	Yes	No	Yes	Yes
Is the plan compliant with Assembly Bill 2140? *1998 Not Compliant* ***Comment:*** *2045 Will Be set for October 2021 Release*				
Capital Improvement Plan	Yes	No	Yes	Yes
How often is the plan updated? *5 years* ***Comment:*** *Under Development*				
Disaster Debris Management Plan	No	Yes	Yes	Yes
Comment:				
Floodplain or Watershed Plan	No	Yes	Yes/No	No
Comment: The Ventura County Watershed Protection creates and maintains countywide plans				
Stormwater Plan	Yes	No	Yes	Yes
Comment: *Ordinance #775*				
Urban Water Management Plan	Yes	No	Yes	Yes
Comment: *City of Port Hueneme Urban Water Management Plan*				

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity?
Habitat Conservation Plan	Yes	No	Yes	Yes
Comment: *Local Costal Program*				
Economic Development Plan	No	No	No	No
Comment: *No Official*				
Shoreline Management Plan	No	No	No	No
Comment: *General Plan*				
Community Wildfire Protection Plan	No	Yes	Yes	No
Comment: *Not in wildfire area, no current plan*				
Forest Management Plan	No	Yes	No	No
Comment: *Urban Forestry*				
Climate Action Plan	Yes	No	No	Yes
Comment: *In Process for General Plan 2045*				
Comprehensive Emergency Management Plan	Yes	Yes	Yes	Yes
Comment: *EOP Plan Scheduled to finished 12/21*				
Threat & Hazard Identification & Risk Assessment (THIRA)	No	Yes	No	No
Comment: *The County of Ventura has performed a THIRA within the past 5 years. We are currently assessing the timing and requirements for the City of Ventura.*				
Post-Disaster Recovery Plan	Yes	No	Yes	Yes
Comment: *EOP December 2021*				
Continuity of Operations Plan	No	Yes/No	Yes/No	Yes/No
Comment: *EOP December 2021*				
Public Health Plan	No	Yes	No	No
Comment: *County of Ventura Public Health Department has a plan*				
Other: Tsunami Plan	No	Yes	Yes	Yes
Comment: *The County of Ventura has an existing plan that describes each City role and has been adopted locally. A revision of this document is required within the coming year 2022.*				

Table 7-4. Development and Permitting Capability

Criterion	Response
Does your jurisdiction issue development permits?	Yes
If no, who does? If yes, which department? Community Development	
Does your jurisdiction have the ability to track permits by hazard area?	No
Does your jurisdiction have a buildable lands inventory?	Yes

Table 7-5. Fiscal Capability

Financial Resource	Accessible or Eligible to Use?
Community Development Block Grants	Yes
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for Specific Purposes	Yes
User Fees for Water, Sewer, Gas or Electric Service ***If yes, specify:*** Water/Sewer	Yes
Incur Debt through General Obligation Bonds	Yes
Incur Debt through Special Tax Bonds	No
Incur Debt through Private Activity Bonds	No
Withhold Public Expenditures in Hazard-Prone Areas	No
State-Sponsored Grant Programs	Yes
Development Impact Fees for Homebuyers or Developers	No

Table 7-6. Administrative and Technical Capability

Staff/Personnel Resource	Available?
Planners or engineers with knowledge of land development and land management practices ***If Yes, Department /Position:*** Community Development	Yes
Engineers or professionals trained in building or infrastructure construction practices ***If Yes, Department /Position:*** Public Works, Charles Cable, Don Villafana	Yes
Planners or engineers with an understanding of natural hazards ***If Yes, Department /Position:*** Community Development and Don Villafana	Yes
Staff with training in benefit-cost analysis ***If Yes, Department /Position:*** City Contractor	Yes
Surveyors	No
Personnel skilled or trained in GIS applications	No
Scientist familiar with natural hazards in local area	No
Emergency manager ***If Yes, Department /Position:*** Emergency and Communications Manager, Police Department	Yes
Grant writers	No

Table 7-7. Education and Outreach Capability

Criterion	Response
Do you have a public information officer or communications office?	Yes
Do you have personnel skilled or trained in website development?	Yes
Do you have hazard mitigation information available on your website?	No
Do you use social media for hazard mitigation education and outreach? ***If yes, briefly describe:*** Facebook Postings	Yes
Do you have any citizen boards or commissions that address issues related to hazard mitigation? ***If yes, briefly describe:*** Currently re-developing our CERT team.	Yes
Do you have any other programs in place that could be used to communicate hazard-related information? ***If yes, briefly describe:*** VC Alert, Everbridge, email, Door Knocking, Website	Yes
Do you have any established warning systems for hazard events? ***If yes, briefly describe:*** VC Alert	Yes

Table 7-8. National Flood Insurance Program Compliance

Criterion	Response
What local department is responsible for floodplain management?	Community Dev, PW
Who is your floodplain administrator? (department/position)	Tony Stewart, Charles Cable
Are any certified floodplain managers on staff in your jurisdiction?	No
What is the date that your flood damage prevention ordinance was last amended?	1/21
Does your floodplain management program meet or exceed minimum requirements?	Meets
When was the most recent Community Assistance Visit or Community Assistance Contact?	Not had one
Does your jurisdiction have any outstanding NFIP compliance violations that need to be addressed?	No
Are any RiskMAP projects currently underway in your jurisdiction?	No
Do your flood hazard maps adequately address the flood risk within your jurisdiction? ***If no, state why.***	Yes
Does your floodplain management staff need any assistance or training to support its floodplain management program?	No
Does your jurisdiction participate in the Community Rating System (CRS)? ***If no, is your jurisdiction interested in joining the CRS program?*** Yes	No
How many flood insurance policies are in force in your jurisdiction?[a] ***What is the insurance in force?*** $17,732,000 ***What is the premium in force?*** $37,235	57
How many total loss claims have been filed in your jurisdiction?[a] ***What were the total payments for losses?*** $846	7

a. According to FEMA statistics as of March 31, 2021

Table 7-9. Community Classifications

	Participating?	Classification	Date Classified
FIPS Code	Yes	0611158296	N/A
DUNS #	Yes	157675430	N/A
Community Rating System	No	N/A	N/A
Building Code Effectiveness Grading Schedule	No	N/A	N/A
Public Protection	Yes	03/3X	12/21/2018
Storm Ready	Yes	N/A	N/A
Firewise	No	N/A	N/A
Tsunami Ready	Yes	N/A	N/A

Table 7-10. Adaptive Capacity for Climate Change

Criterion	Jurisdiction Rating[a]
Technical Capacity	
Jurisdiction-level understanding of potential climate change impacts ***Comment:*** *Addressed in 2045 Plan*	Low
Jurisdiction-level monitoring of climate change impacts ***Comment:*** *No current ability / Port of Hueneme itself conducts studies and publishes results to public*	Low
Technical resources to assess proposed strategies for feasibility and externalities ***Comment:*** *No resources identified at this time.*	Low
Jurisdiction-level capacity for development of greenhouse gas emissions inventory ***Comment:*** *None available at this time*	Low
Capital planning and land use decisions informed by potential climate impacts ***Comment:*** *Community Development/Public Works*	Medium
Participation in regional groups addressing climate risks ***Comment:*** *Public Works / Environmental Sustainability*	Low
Implementation Capacity	
Clear authority/mandate to consider climate change impacts during public decision-making processes ***Comment:*** *Considerations outlined in General Plan*	Low
Identified strategies for greenhouse gas mitigation efforts ***Comment:*** *Continued research for adoption is needed for General Plan*	Low
Identified strategies for adaptation to impacts ***Comment:*** *The current update to the General plan has addressed strategies for adaptation to impacts.*	High
Champions for climate action in local government departments ***Comment:*** *Local non-profits and groups address issues*	Low
Political support for implementing climate change adaptation strategies ***Comment:*** *City Council is supportive as well as many local organizations*	Medium
Financial resources devoted to climate change adaptation ***Comment:*** *Non identified, however grants could be looked into*	Low
Local authority over sectors likely to be negative impacted ***Comment:*** *None that we are aware of at this time*	Low
Public Capacity	
Local residents' knowledge of and understanding of climate risk ***Comment:*** *Many environmentalists in our community who monitor and report*	Low
Local residents' support of adaptation efforts ***Comment:*** *Local residences are concerned with issues and are generally supportive*	Low
Local residents' capacity to adapt to climate impacts ***Comment:*** *High likelihood to adapt based on our environmental position*	Medium
Local economy current capacity to adapt to climate impacts ***Comment:*** *None seen.*	Low
Local ecosystems capacity to adapt to climate impacts ***Comment:*** *Not a lot of ecosystems*	Medium

a. High = Capacity exists and is in use; Medium = Capacity may exist, but is not used or could use some improvement; Low = Capacity does not exist or could use substantial improvement; Unsure= Not enough information is known to assign a rating.

7.5 INTEGRATION REVIEW

For hazard mitigation planning, “integration” means that hazard mitigation information is used in other relevant planning mechanisms, such as general planning and capital facilities planning, and that relevant information from those sources is used in hazard mitigation. This section identifies where such integration is already in place, and where there are opportunities for further integration in the future. Resources listed at the end of this annex were used to provide information on integration. The progress reporting process described in Volume 1 of the hazard mitigation plan will document the progress of hazard mitigation actions related to integration and identify new opportunities for integration.

7.5.1 Existing Integration

Some level of integration has already been established between local hazard mitigation planning and the following other local plans and programs:

- **City of Port Hueneme:** General Plan
- **City of Port Hueneme:** Emergency Operations Plan (EOP)
- **Ventura County:** Operational Area Emergency Operations Plan

7.5.2 Opportunities for Future Integration

The capability assessment in this annex indicates opportunities to integrate this mitigation plan with other jurisdictional planning/regulatory capabilities. Capabilities were identified as integration opportunities if they can support or enhance the actions identified in this plan or be supported or enhanced by components of this plan. The capability assessment identified the following plans and programs that do not currently integrate hazard mitigation information but provide opportunities to do so in the future:

- **City of Port Hueneme: General Plan—**This comprehensive effort is underway and will be integrated into this effort to be compliant with AB2140.
- **City of Port Hueneme: Citizen Emergency Response Team (CERT)**—This effort will be a collaboration between the following: CERT volunteers, City staff, community-based organizations, with the existing CERT team manual.

Taking action to integrate each of these programs with the hazard mitigation plan was considered as a mitigation action to include in the action plan in this annex.

7.6 RISK ASSESSMENT

7.6.1 Jurisdiction-Specific Natural Hazard Event History

Table 7-11 lists past occurrences of natural hazards for which specific damage was recorded in this jurisdiction Other hazard events that broadly affected the entire planning area, including this jurisdiction, are listed in the risk assessments in Volume 1 of this hazard mitigation plan.

Table 7-11. Past Natural Hazard Events

Type of Event	FEMA Disaster #	Date	Damage Assessment
Erosion Events	N/A	Biennially, 2021 most recent	Every two years 2 million cubic yards of sand is dredged from the Port of Hueneme and deposited onto the east side of the Port. This erosion is ongoing and threatens roads and other infrastructure and leads to habitat disruption of local species of birds.
Pandemic COVID-19	4482-DR	January 20, 2020 Continuing	Ongoing
High Wind	N/A	2020	Strong surface high pressure in the Great Basin along with strong north to northeast flow aloft generated strong Santa Ana winds across Ventura and Los Angeles counties. North to northeast wind gusts up to 83 mph were reported in the mountains while gusts to 59 mph were reported across the coastal plain.
Wind Event	N/A	2018	Strong surface high pressure building in the Great Basin generated strong and gusty Santa Ana winds across sections of Ventura and Los Angeles counties.
Winter Storm	N/A	2018	Strong surface high pressure in the Great Basin helped to generate a moderate Santa Ana wind event across Southern California. Strong northeast winds were reported across the mountains and valleys of Ventura and Los Angeles Counties.
Tornado	N/A	2018	A powerful winter storm brought significant rain, snow and wind to the area. Rainfall totals ranged from 1 to 2 inches across coastal and valleys areas with 2 to 4 inches in the foothills and mountains. With snow levels dropping to between 2500 and 3500 feet, significant snowfall was reported in the mountains (up to 1 to 2 feet) and even the Antelope Valley (4 to 8 inches). Numerous road closures due to winter storm conditions were reported, including Interstate 5 through the Grapevine as well as Highways 14 and 138. Additionally, thunderstorms generated a waterspout over the coastal waters as well as a very weak tornado over Ventura Harbor.
Flash Flood	N/A	2018	High pressure over the four-corners region resulted in an extended monsoonal flow pattern across Southern California. For several days, strong thunderstorms produced heavy rain, flash flooding and large hail across parts of Southern California.
Debris Flow	N/A	2018	A powerful early-season winter storm moves across Southwestern California on Halloween night. The storm produced some significant rainfall with amounts in the coastal areas ranging from 0.25 to 1.50 while the mountains received up to 2.00. In the Camarillo area, near the Springs burn scar, a mud/debris flow occurred. Otherwise just some minor nuisance flooding was reported.
Thunderstorm	N/A	2017	A powerful winter storm brought heavy rain and snow, flash flooding and gusty winds to the area. Rainfall totals from this storm generally ranged between 2 and 6 inches with locally higher amounts in some foothill areas. With such rainfall amounts, there was significant snowfall totals in the local mountains with up to 28 inches of snow reported at the resort level. Additionally, the heavy rain did generate several flash flooding events including several mud and debris flows.
High Surf	N/A	4/2014	High tides and strong surf damaged the pier, beach and local streets causing road damage, pipe damage and damage to the pier.
Tsunami		March 11, 2011	7.1 earthquake in Japan. Damage to local harbors, marinas and docks
Tsunami		February 27, 2010	8.8 Quake in Chile. Damage to local harbors, marinas and docks
Northridge Earthquake	DR-1008	January 17 – November 30, 1994	Power and communications disruptions, damage to structures
St Francis Dam Disaster		March 12, 1928	$7 Million (1928)—Inundation of nearly the entire city, flooding, debris flows, destruction of infrastructure, high loss of life

7.6.2 Hazard Risk Ranking

Table 7-12 presents a local ranking of all hazards of concern for which this hazard mitigation plan provides complete risk assessments. As described in detail in Volume 1, the ranking process involves an assessment of the likelihood of occurrence for each hazard, along with its potential impacts on people, property, and the economy. Mitigation actions primarily target hazards with high and medium rankings.

Table 7-12. Hazard Risk Ranking

Rank	Hazard	Risk Ranking Score	Risk Category
1	Dam Failure	36	High
2	Earthquake	32	Medium
3	Severe Storms	24	Medium
4	Severe Weather	24	Medium
5	Landslide	18	Medium
6	Flooding	15	Low
7	Tsunami	14	Low
8	Drought	9	Low
9	Sea Level Rise	6	Low

7.6.3 Jurisdiction-Specific Vulnerabilities

Volume 1 of this hazard mitigation plan provides complete risk assessments for each identified hazard of concern. This section provides information on a few key vulnerabilities for this jurisdiction. Available jurisdiction-specific risk maps of the hazards are provided at the end of this annex.

Repetitive Loss Properties

Repetitive loss records are as follows:

- Number of FEMA-identified Repetitive-Loss Properties: 0
- Number of FEMA-identified Severe-Repetitive-Loss Properties: 0
- Number of Repetitive-Loss Properties or Severe-Repetitive-Loss Properties that have been mitigated: 0

Other Noted Vulnerabilities

The following jurisdiction-specific issues have been identified based on a review of the results of the risk assessment, public involvement strategy, and other available resources:

- **Street and Urban Flooding**—There are numerous areas of the city that flood to varying degrees during periods of high rain. The effects of this flooding range from street closures to damage to property, vehicles and buildings.
- **Power Outages/Emergency Power**—Local power outages have resulted from high winds and storm conditions as well as from the effects of wildland fire in the region. Many key city buildings including the Main City Hall and Council Chambers buildings have no backup power or emergency generators.

- **Debris Flows-** Following heavy rains and winter storms, substantial debris flows have occurred in the Santa Clara River, Ventura River, as well as local streams and culverts. Debris flows following wildland fires are particularly bad and can require removal of material from streams, streets, culverts and beaches.
- **Liquefaction Potential—**Nearly the entire City of Port Hueneme is in a "Liquefaction Zone". The effects and damage caused by seismic activities can be amplified resulting in increased damage to buildings and infrastructure.
- **Homeless Population-** A significant number of persons commonly defined as "Homeless" live on and around our local beach. During high tides and significant tidal pushes, the homeless are at greater risk.
- **Tsunami Awareness and Notification—**Port Hueneme has many visitors to its beach who may not be aware of the tsunami risk. The City does not have tsunami warning sirens.
- **Wildfire Smoke—**During wildfire events in the region the air quality in the City can become hazardous, especially when the Santa Ana winds push wildfire smoke toward the coast. Wildfire can trigger PSPS events, which amplify the hazard when city buildings lacking backup power cannot operate air conditioning systems.

Actions addressing these issues were prioritized for consideration in the action plan in this annex.

7.7 STATUS OF PREVIOUS PLAN ACTIONS

Table 7-13 summarizes the actions that were recommended in the previous version of the hazard mitigation plan and their implementation status at the time this update was prepared.

Table 7-13. Status of Previous Plan Actions

Action Item	Completed	Removed; No Longer Feasible	Carried Over to Plan Update	
			Check if Yes	Action # in Update
OA 6—Develop a public outreach program that informs property owners located in the dam and levee failure inundation areas about voluntary flood insurance. **Comment:** *Action status unknown due to staff turnover*			✓	PHE-7
OA 10—Seismically retrofit or upgrade seismically deficient government facilities and pre-identified shelter facilities. **Comment:** *Not completed due to lack of funding and staff capacity*			✓	PHE-1
OA 11—Develop and implement plans to increase the building owner's general knowledge of and appreciation for the value of seismic upgrading of the building's structural and nonstructural elements. **Comment:** *Action status unknown due to staff turnover*			✓	PHE-9
OA 13—Reinforce roads/bridges from flooding through protection activities, including elevating the roads/bridges and installing/widening culverts beneath the roads/bridges or upgrading storm drains. **Comment:** *City does not have bridges but storm drain upgrades are in process in the location of the beach. Continued work needs to continue on other parts of the city.*			✓	PHE-10
OA 18—Continue to participate in the NWS TsunamiReady Program through continued implementation of Guideline 4: Community Preparedness measures, including public outreach material and curriculum. **Comment:** *Continued participation in the program*			✓	PHE-11

7.8 HAZARD MITIGATION ACTION PLAN

Table 7-14 lists the identified actions, which make up the hazard mitigation action plan for this jurisdiction. Table 7-15 identifies the priority for each action. Table 7-16 summarizes the mitigation actions by hazard of concern and mitigation type.

Table 7-14. Hazard Mitigation Action Plan Matrix

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action PHE-1—Mitigate beach erosion to protect shoreline roads, properties, harbor facilities, and the natural habitat, including endangered species.						
Hazards Mitigated: Flooding, Sea Level Rise, Tsunami, Severe Storms						
New & Existing	2, 13, 14, 18	USACE	Public Works	Medium	General Funds, FEMA HMA (BRIC, FMA, HMGP)	Ongoing
Action PHE-2—Where appropriate, support retrofitting, purchase or relocation of structures located in hazard areas, prioritizing those that have experienced repetitive losses and/or are located in high- or medium-risk hazard areas.						
Hazards Mitigated: Landslide, Earthquake, Severe Storms, Severe Weather, Flooding, Wildfire, Dam Failure, Sea Level Rise, Tsunami						
Existing	1, 4, 6, 9, 10, 11, 16	Public Works	Community Development	High	FEMA HMA (BRIC, FMA, HMGP)	Short-term
Action PHE-3—Integrate the hazard mitigation plan into other plans, ordinances and programs that dictate land use decisions in the community, including shoreline development.						
Hazards Mitigated: Landslide, Earthquake, Severe Storms, Severe Weather, Flooding, Wildfire, Dam Failure, Sea Level Rise, Tsunami, Drought						
New & Existing	1, 2, 10, 11, 12, 15, 16, 19	Community Development	Public Works	Low	Staff Time, General Funds	Ongoing
Action PHE-4—Actively participate in the plan maintenance protocols outlined in Volume 1 of this hazard mitigation plan.						
Hazards Mitigated: Landslide, Severe Storms, Severe Weather, Flooding, Wildfire, Dam Failure, Sea Level Rise, Tsunami, Drought						
New & Existing	1, 2, 3, 4, 6, 10, 15, 17, 19	Community Development	Public Works	Low	Staff Time, General Funds	Short-term
Action PHE-5—Continue to maintain good standing and compliance under the NFIP through implementation of floodplain management programs that, at a minimum, meet the NFIP requirements: • Enforce the flood damage prevention ordinance. • Participate in floodplain identification and mapping updates. • Provide public assistance/information on floodplain requirements and impacts.						
Hazards Mitigated: Severe Storms, Severe Weather, Flooding, Dam Failure, Sea Level Rise, Tsunami						
New & Existing	1, 2, 4, 6, 9, 10, 11, 13, 14, 15, 17, 18, 19	Public Works		Low	Staff Time, General Funds	Ongoing
Action PHE-6—Identify and pursue strategies to increase adaptive capacity to climate change including but not limited to the following: • Adopt a Climate Action Plan to reflect new State legislation, changing priorities, and environmental sustainability and greenhouse gas (GHG) reduction policies and goals. • Adopt modifications to existing plans and procedures to meet climate change issues and impacts.						
Hazards Mitigated: Landslide, Severe Storms, Severe Weather, Flooding, Wildfire, Dam Failure, Sea Level Rise, Tsunami, Drought						
New & Existing	1, 3, 4, 9, 10, 13, 14, 15, 16, 17, 19	Community Development	Public Works	Low	Staff Time, General Funds	Short-term
Action PHE-7—Purchase generators for critical facilities and infrastructure that lack adequate backup power, including the Emergency Operations Center and other critical facilities throughout the city.						
Hazards Mitigated: Dam Failure, Earthquake, Flooding, Landslide, Severe Weather, Tsunami, Wildfire						
Existing	1, 2, 7, 10	Public Works	City Manager	Medium	General Funds, FEMA HMA (BRIC, HMGP)	Long-term

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action PHE-8—Develop a public outreach program that informs property owners located in the dam and levee failure inundation areas about voluntary flood insurance.						
Hazards Mitigated: Severe Storms, Severe Weather, Flooding, Dam Failure, Sea Level Rise, Tsunami						
Existing	1, 2, 7, 10, 17, 19	Community Development		Low	Staff Time/ General Funds	Short-Term
Action PHE-9-- Develop and implement plans to increase the building owner's general knowledge of and appreciation for the value of seismic upgrading of the building's structural and nonstructural elements.						
Hazards Mitigated: Earthquake						
Existing	1, 2, 7, 10, 17, 19	Community Development	Public Works	Low	Staff Time / General Fund	Short-Term
Action PHE-10—Reinforce roads from flooding through protection activities, including elevating the roads and installing/widening culverts beneath the roads/bridges or upgrading storm drains.						
Hazards Mitigated: Severe Storms, Severe Weather, Flood, Sea Level Rise, Tsunami						
Existing	2, 4, 6, 9, 11	Public Works		Medium	FEMA HMA (BRIC, FMA, HMGP)	Long-Term
Action PHE-11—Continue to participate in the NWS TsunamiReady and StormReady Programs through continued implementation of Guideline 4: Community Preparedness measures, including public outreach material and curriculum.						
Hazards Mitigated: Severe Storms, Severe Weather, Flood, Sea Level Rise, Tsunami						
New & Existing	1, 2, 6, 7, 8, 12, 17, 18, 19	Public Works		Low	General Funds	Ongoing
Action PHE-12—Install City tsunami warning siren network.						
Hazards Mitigated: Tsunami						
New & Existing	1, 2, 7	Public Works		Medium	FEMA HMA (BRIC, FMA, HMGP)	Short-Term

a. Short-term = Completion within 5 years; Long-term = Completion within 10 years; Ongoing= Continuing new or existing program with no completion date

Acronyms used here are defined at the beginning of this volume.

Table 7-15. Mitigation Action Priority

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Cost?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Implementation Priority[a]	Grant Pursuit Priority[a]
1	4	High	Medium	Yes	Yes	Yes	High	High
2	7	High	High	Yes	Yes	No	Medium	High
3	8	Medium	Low	Yes	No	Yes	High	Low
4	9	Medium	Low	Yes	No	Yes	High	Low
5	13	Medium	Low	Yes	No	Yes	High	Low
6	11	Medium	Low	Yes	No	Yes	High	Medium
7	4	High	Medium	Yes	Yes	No	Medium	High
8	6	Low	Low	Yes	No	Yes	High	Low
9	6	Low	Low	Yes	No	Yes	High	Low
10	5	High	Medium	Yes	Yes	No	Medium	High
11	9	Medium	Low	Yes	No	Yes	High	Medium
12	3	Medium	Medium	Yes	Yes	No	Medium	Medium

a. See the introduction to this volume for explanation of priorities.

Table 7-16. Analysis of Mitigation Actions

Hazard Type	Action Addressing Hazard, by Mitigation Type[a]							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilience	Community Capacity Building
High-Risk Hazards								
Dam Failure	PHE-5	PHE-2	PHE-8		PHE-7		PHE-6	PHE-3, 4, 6
Medium-Risk Hazards								
Earthquake		PHE-2	PHE-9		PHE-7		PHE-6	PHE-3, 4, 6
Severe Storms	PHE-5	PHE-2, 10	PHE-8	PHE-1		PHE-10	PHE-6	PHE-3, 4, 6, 11
Severe Weather	PHE-5	PHE-2, 10	PHE-8		PHE-7	PHE-10	PHE-6	PHE-3, 4, 6, 11
Landslide		PHE-2			PHE-7		PHE-6	PHE-3, 4, 6
Low-Risk Hazards								
Flooding	PHE-5	PHE-2, 10	PHE-8	PHE-1	PHE-7	PHE-10	PHE-6	PHE-3, 4, 6, 11
Tsunami	PHE-5, 12	PHE-2, 10	PHE-8, 12	PHE-1	PHE-7, 12	PHE-10	PHE-6	PHE-3, 4, 6, 11
Drought		PHE-2					PHE-6	PHE-3, 4, 6
Sea Level Rise	PHE-5	PHE-2, 10	PHE-8	PHE-1			PHE-6	PHE-3, 4, 6, 11

a. See the introduction to this volume for explanation of mitigation types.

7.9 PUBLIC OUTREACH

Table 7-17 lists public outreach activities for this jurisdiction.

Table 7-17. Local Public Outreach

Local Outreach Activity	Date	Number of People Involved
Social media and website (in coordination with General Plan)	9-02	45

7.10 INFORMATION SOURCES USED FOR THIS ANNEX

The following technical reports, plans, and regulatory mechanisms were reviewed to provide information for this annex.

- **City of Port Hueneme Municipal Code**—The municipal code was reviewed for the full capability assessment and for identifying opportunities for action plan integration.
- **City of Port Hueneme General Plan—**The General Plan is under revision and had been aligned to be compliant with AB2140. It was reviewed for the capability assessment and action plan development.

The following outside resources and references were reviewed:

Hazard Mitigation Plan Annex Development Toolkit—The toolkit was used to support the identification of past hazard events and noted vulnerabilities, the risk ranking, and the development of the mitigation action plan.

Port Hueneme

Critical Facilities (1 of 2)

Food, Water, Shelter

Safety and Security

Selected City

Incorporated Cities

County Boundary

Data Sources: Ventura Co., VCFD, Casitas MWD, Calleguas MWD, City of Camarillo, CA Energy Commission, Cal Trans, EPA, HIFLD, Esri

N

0 0.175 0.35 0.7 Miles

Port Hueneme

Critical Facilities (1 of 2)

- Communications
- Energy
- Hazardous Material
- Transportation
- Selected City
- Incorporated Cities
- County Boundary

Data Sources: Ventura Co., VCFD, Casitas MWD, Calleguas MWD, City of Camarillo, CA Energy Commission, Cal Trans, EPA, HIFLD, Esri

N

0 0.175 0.35 0.7 Miles

Port Hueneme

Dam Failure Inundation Areas

Combined Inundation Areas

Selected City

Incorporated Cities

County Boundary

Data Sources: Ventura Co., CA DWR, Esri

N

0 0.175 0.35 0.7 Miles

Port Hueneme

NEHRP Soil Class

D (Stiff soil)
Selected City
Incorporated Cities
County Boundary

Data Sources: Ventura Co., CGS, Esri

N

0 0.175 0.35 0.7
Miles

Port Hueneme

Liquefaction Susceptibility

Liquefaction zone
Selected City
Incorporated Cities
County Boundary

Data Sources: Ventura Co., Esri

N

0 0.175 0.35 0.7 Miles

Port Hueneme

100-Year Probabilistic Earthquake Scenario

Mercalli Intensity Scale

- VII (Very Strong/Moderate)
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.175 0.35 0.7 Miles

Port Hueneme

Oak Ridge M7.16 Earthquake Scenario

Mercalli Intensity Scale

- VII (Very Strong/Moderate)
- VIII (Severe/Moderate-Heavy)
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.175 0.35 0.7 Miles

Port Hueneme

Pitas Point M7.12 Earthquake Scenario

Mercalli Intensity Scale

- VII (Very Strong/Moderate)
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.175 0.35 0.7 Miles

Port Hueneme

San Cayetano M7.16 Earthquake Scenario

Mercalli Intensity Scale

- VI (Strong/Light)
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.175 0.35 0.7 Miles

Port Hueneme

S. San Andreas M8.03 Earthquake Scenario

Mercalli Intensity Scale

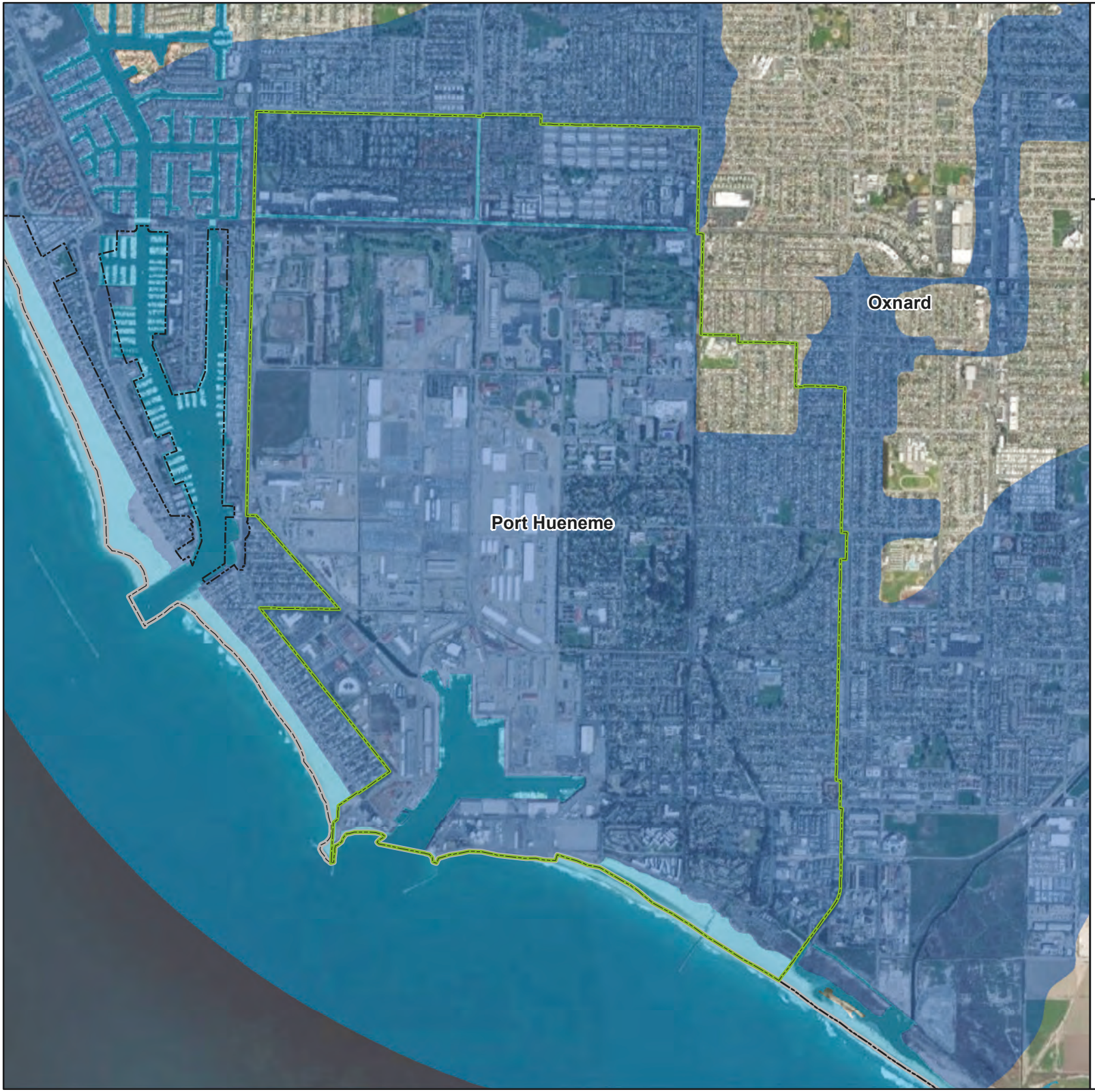
- V (Moderate/Very Light)
- VI (Strong/Light)
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.175 0.35 0.7 Miles



Port Hueneme

FEMA Flood Hazard Areas

1% Annual Chance Flood (100-Year)

0.2% Annual Chance Flood (500-Year)

Selected City

Incorporated Cities

County Boundary

Data Sources: Ventura Co., FEMA, Esri

N

0 0.175 0.35 0.7 Miles

Port Hueneme

Susceptibility to Deep-Seated Landslides

- Low
- Moderate
- High
- Very High
- Selected City
- Incorporated Cities
- County Boundary

Data Sources: Ventura Co., CGS, Esri

N

0 0.175 0.35 0.7 Miles

Port Hueneme

Sea Level Rise of 25 cm (9.8 in.)

Sea Level Rise Inundation Area

Selected City

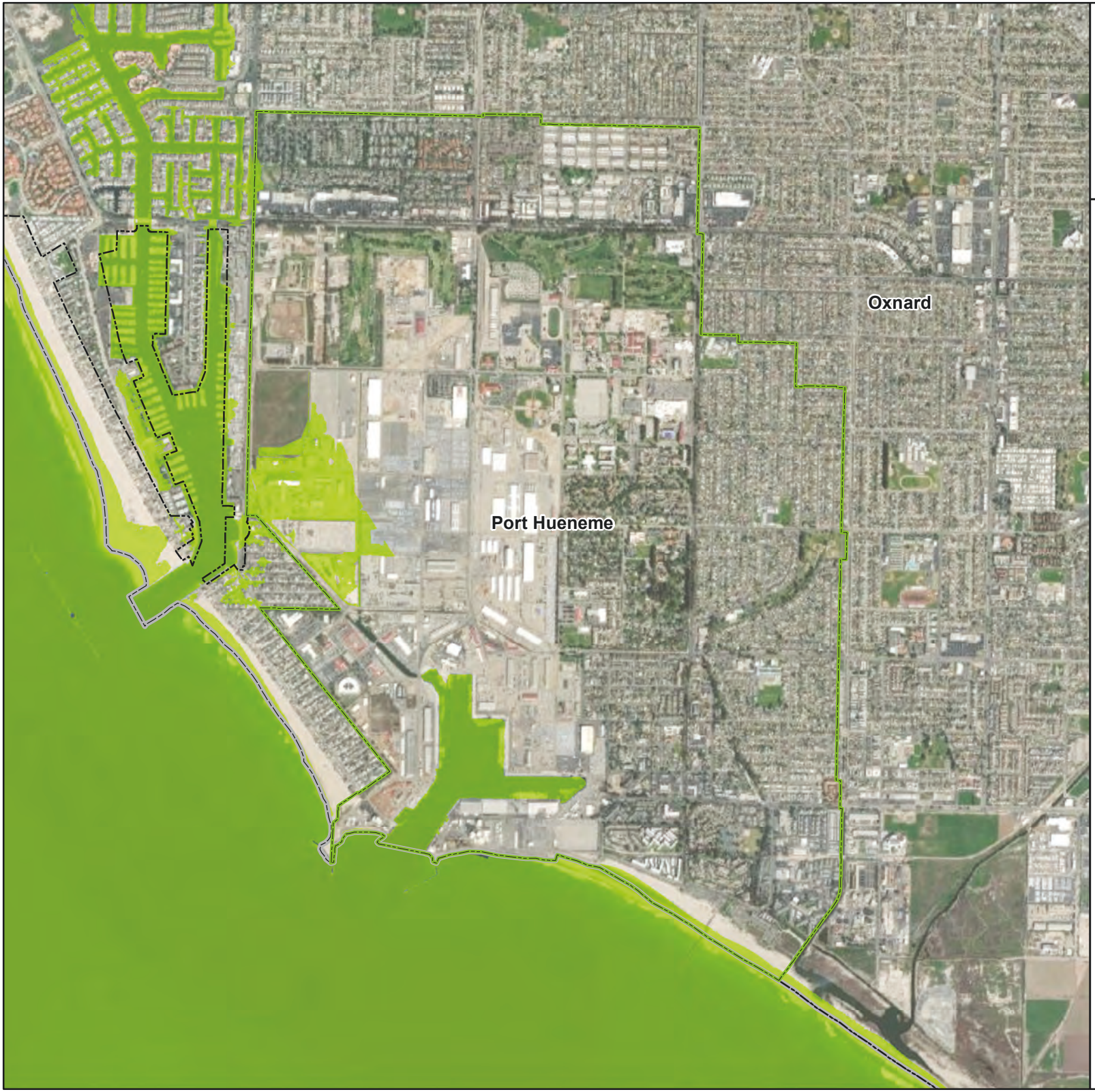
Incorporated Cities

County Boundary

Data Sources: Ventura Co., OCOF, Esri

N

0 0.175 0.35 0.7 Miles



Port Hueneme

Sea Level Rise of 100 cm (39.4 in.)

Sea Level Rise Inundation Area

Selected City

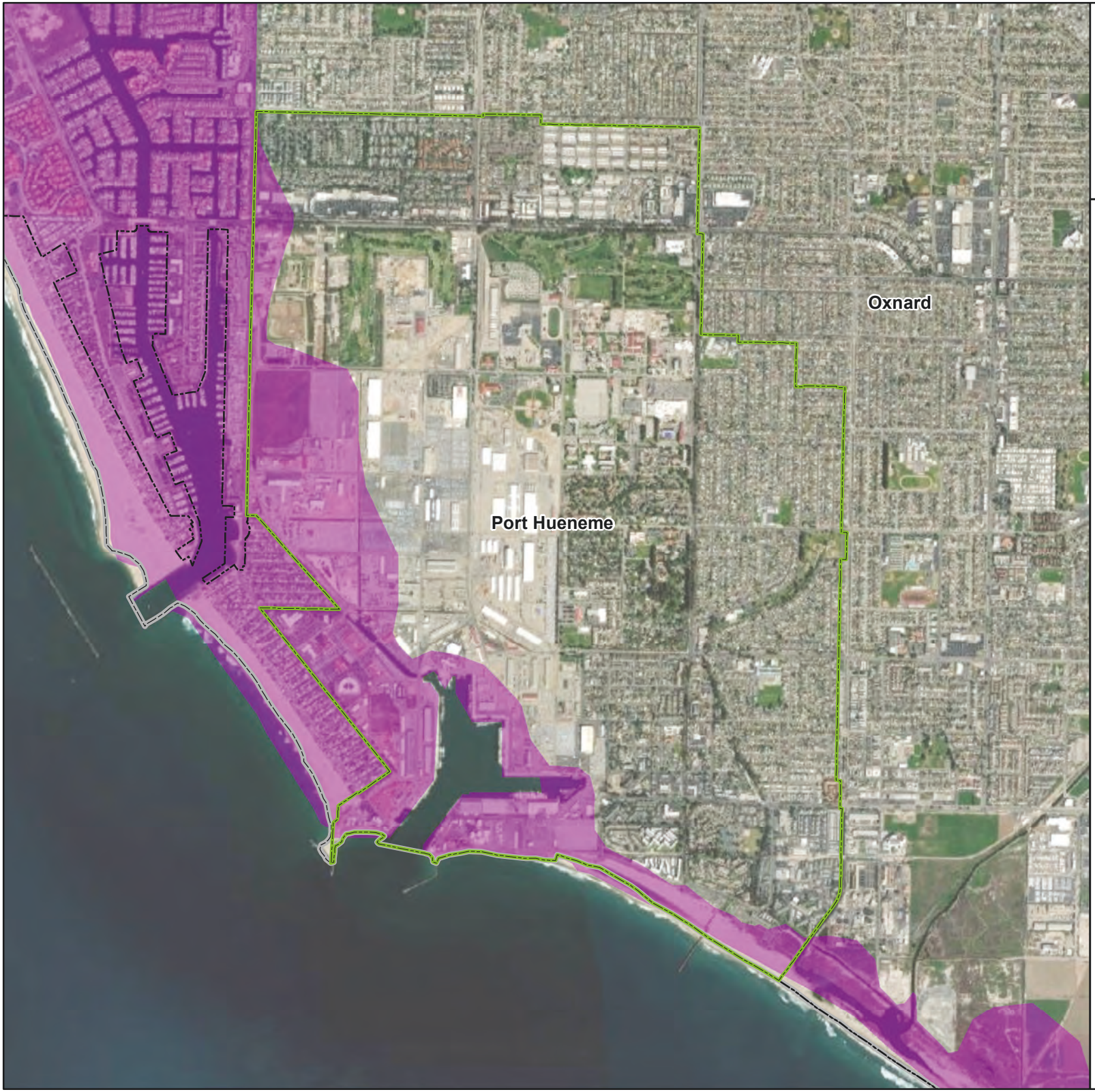
Incorporated Cities

County Boundary

Data Sources: Ventura Co., OCOF, Esri

N

0 0.175 0.35 0.7 Miles



Port Hueneme

Tsunami Inudation Zones

Inundation Zones
Selected City
Incorporated Cities
County Boundary

Data Sources: Ventura Co., CGS, Esri

N

0 0.175 0.35 0.7
Miles

8. CITY OF SANTA PAULA

8.1 LOCAL HAZARD MITIGATION PLANNING TEAM

Primary Point of Contact
Scott Varner, Support Services Commander
214 S. 10th Street
Santa Paula, CA 93060
805-525-4474 ext. 105
svarner@spcity.org

Alternate Point of Contact
Kate Bader, CSO
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Santa Paula, CA 93060
805-525-4474 ext. 113
kbader@spcity.org

This annex was developed by the local hazard mitigation planning team, whose members are listed in Table 8-1.

Table 8-1. Local Mitigation Planning Team Members

Name	Title
Dan Singer	City Manager
James Mason	Community & Economic Development Director
Jeff Mitchem	Planning Manager
Tom Tarantino	Associate Planner
Alexander Wallsten	Administrative Analyst

8.2 JURISDICTION PROFILE

8.2.1 Location and Features

The City of Santa Paula is in Ventura County, California, United States.

The current boundaries generally extend out from 34.3542° N, 119.0593° W, encompassing an area of 5.69 square miles.

The City of Santa Paula, California is located 65 miles northwest of Los Angeles and 14 miles east of Ventura and the coastline of the Pacific Ocean. Santa Paula is near the geographical center of Ventura County, situated in the rich agricultural Santa Clara River Valley. The City is surrounded by rolling hills and rugged mountain peaks in addition to orange, lemon, and avocado groves. In fact, Santa Paula is referred to as the “Citrus Capital of the World.”

8.2.2 History

The city of Santa Paula was incorporated in 1902. The original community that has become known as Santa Paula was established by the Chumash Indians as the villages of Mupu and Srswa. The land was later given away as part of a Spanish land grant to Rancho Santa Paula and Saticoy in 1840. In the 1860s the area was subdivided into small farms. In 1880, oil was discovered in Santa Paula leading to the formation of the Union Oil Company in 1890. The City of Santa Paula was incorporated on April 22, 1902. In the early 1900s Santa Paula was considered the pre-Hollywood film capital, the “Queen of the Silver Screen.” Even today, Santa Paula is noted for its movie personalities (silent and sound) who resided in and adjacent to the city and a TV or movie crew is not an unusual sight in the community.

8.2.3 Governing Body Format

The City of Santa Paula assumes responsibility for the adoption of this plan; the City Manager will oversee its implementation.

The City of Santa Paula is governed by a five-member city council. The City consists of eight departments: Administration, City Clerk, Community and Economic Development, Finance, Human Resources, Parks & Recreation, Police, and Public Works. The city has 10 commissions and task forces, which report to the City Council. The City currently employs a total of 126 employees, 98 of which are full-time.

8.3 CURRENT TRENDS

8.3.1 Population

According to the California Department of Finance, the population of the Santa Paula as of January 2020 was 30,389. Since 2010, the population has grown at an average annual rate of 0.27 percent.

8.3.2 Development

Development interest in Santa Paula has greatly increased in recent years, particularly since construction began on the highly visible East Area 1 / Harvest at Limoneira project. As Santa Paula is surrounded by a mix of greenbelt and urban curb restrictions, the majority of development proposals are for infill and adaptive reuse projects—areas where Santa Paula offers numerous opportunities. Recent legislation aimed at streamlining the entitlement process for housing projects has also generated a great deal of interest from developers.

Table 8-2 summarizes development trends in the period since the preparation of the previous hazard mitigation plan, as well as expected future development trends.

Table 8-2. Recent and Expected Future Development Trends

Criterion	Response
Has your jurisdiction annexed any land since the preparation of the previous hazard mitigation plan?	No
Is your jurisdiction expected to annex any areas during the performance period of this plan? ***If yes, describe land areas and dominant uses.***	Yes, Santa Paula West Business Park The Santa Paula West Business Park is located on 53 acres of agricultural land, currently zoned AE-40 (Agricultural Exclusive, 40 acre minimum parcel size) in the County of Ventura, on the southwestern boundary of the City of Santa Paula. It is bound to the north by Telegraph Road and residential property (zoned MHP and R-2), to the east by existing industrial and commercial development (zoned CG and C-LI), to the south by agriculture (zoned AE 40 in the County of Ventura) and to the west by the Adams Creek and agriculture (zoned AE-40 in the County of Ventura). The area is identified as SP-6, West Area 2 in the City of Santa Paula's General Plan. It is within the Sphere of Influence and the city urban restriction boundary of the City of Santa Paula with frontage along State Route 126 and Telegraph Road and is bisected by the railroad right-of-way. While it is just west of the Santa Paula City limits, the area is outside of the Santa Paula -Ventura Greenbelt. Annexation of the Santa Paula West Business Park into the City of Santa Paula has been approved by the City Council, and is currently under review by Ventura County LAFCo. County of Ventura
Are any areas targeted for development or major redevelopment in the next five years? ***If yes, briefly describe, including whether any of the areas are in known hazard risk areas***	Yes Santa Paula West Business Park (SP-6/West Area 2), see above. East Area 1 / Harvest at Limoneira—500-acres on eastern end of the City. Remaining 1,100 homes (of approved 1,500) to be constructed under adopted Specific Plan, along with commercial areas and park facilities. Hazard mitigation included in EA1 Specific Plan (SP-3)/EIR.
How many permits for new construction were issued in your jurisdiction since the preparation of the previous hazard mitigation plan?	

	2016	2017	2018	2019	2020
Single Family	4	10	2	41	174
Multi-Family	8	0	11	0	0
Other (commercial, mixed use, etc.)	1	2	1	1	0
Total	**13**	**12**	**14**	**42**	**174**

Provide the number of new-construction permits for each hazard area or provide a qualitative description of where development has occurred.	Hillside residences along northerly city boundary are either within or abutting high-fire risk areas as defined by CAL FIRE/VCFPD. Residences and businesses, including a portion of those in the new East Area 1/Harvest at Limoneira development, on the east end of the city are within FEMA flood hazard areas of Santa Paula Creek and/or Santa Clara River. These flood/liquefaction hazards have been mitigated by requirements of applicable Specific Plan(s) or development conditions.
Describe the level of buildout in the jurisdiction, based on your jurisdiction's buildable lands inventory. If no such inventory exists, provide a qualitative description.	Santa Paula is largely built-out within city limits. Remaining pockets of developable land within city limits are situated near the southeast and southwest corners. These areas either have development proposals (with hazard mitigation) under review, or an adopted Specific Plan (also including hazard mitigation).

8.4 CAPABILITY ASSESSMENT

This section describes an assessment of existing capabilities for implementing hazard mitigation strategies. The introduction at the beginning of this volume of the hazard mitigation plan describes the components included in the capability assessment and their significance for hazard mitigation planning.

Findings of the capability assessment were reviewed to identify opportunities to expand, initiate or integrate capabilities to further hazard mitigation goals and objectives. Where such opportunities were identified and determined to be feasible, they are included in the action plan. The "Analysis of Mitigation Actions" table in this annex identifies these as community capacity building mitigation actions. The findings of the assessment are presented as follows:

- An assessment of planning and regulatory capabilities is presented in Table 8-3.
- Development and permitting capabilities are presented in Table 8-4.
- An assessment of fiscal capabilities is presented in Table 8-5.
- An assessment of administrative and technical capabilities is presented in Table 8-6.
- An assessment of education and outreach capabilities is presented in Table 8-7.
- Information on National Flood Insurance Program (NFIP) compliance is presented in Table 8-8.
- Classifications under various community mitigation programs are presented in Table 8-9.
- The community's adaptive capacity for the impacts of climate change is presented in Table 8-10.

Table 8-3. Planning and Regulatory Capability

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity?
Codes, Ordinances, & Requirements				
Building Code ***Comment:*** *2019 California Building Code*	Yes	No	Yes	No
Zoning Code ***Comment:*** *COSP Municipal Code, Chapter 16*	Yes	No	Yes	Yes
Subdivisions ***Comment:*** *State Subdivision Map Act* *COSP Municipal Code, Chapter 16.80 Subdivision Regulations*	Yes	No	Yes	Yes
Stormwater Management ***Comment:*** *COSP Municipal Code, Chapter 54*	Yes	No	Yes	No
Post-Disaster Recovery ***Comment:*** *COSP Municipal Code, Chapter 150*	Yes	No	Yes	Yes
Real Estate Disclosure ***Comment:*** *COSP Municipal Code, Chapter 156.043*	Yes	No	Yes	No
Growth Management ***Comment:*** *COSP Municipal Code, Chapter 16.106 (7-19-04)*	Yes	No	Yes	No
Site Plan Review ***Comment:*** *COSP Municipal Code, Chapter 16.226*	Yes	No	Yes	Yes
Environmental Protection ***Comment:*** *COSP Municipal Code, Chapter*	Yes	No	Yes	No

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity?
Flood Damage Prevention	Yes	No	Yes	Yes
Comment: *COSP Municipal Code, Chapter 151*				
Emergency Management	Yes	No	Yes	Yes
Comment: *COSP Emergency Operations Plan 2019*				
Climate Change	Yes	No	Yes	No
Comment: *COSP 2040 General Plan 4-6 Environmental and Cultural Resources, C. Air Quality and Greenhouse Gases*				
Planning Documents				
General Plan	Yes	No	Yes	Yes
Is the plan compliant with Assembly Bill 2140? *Yes* ***Comment:*** *COSP 2040 General Plan*				
Capital Improvement Plan	Yes	No	Yes	Yes
How often is the plan updated? *Annually (Five Years)* ***Comment:*** *California Government Code §65103(c); COSP 2040 General Plan*				
Disaster Debris Management Plan	Yes	Yes	Yes	Yes
Comment: *Ventura County Disaster Recovery Plan, Adopted by BOS in April 2019*				
Floodplain or Watershed Plan	Yes	No	Yes	Yes
Comment: *The City participates in the National Flood Insurance Program (NFIP)*				
Stormwater Plan	Yes	No	Yes	No
Comment: *Ventura County Storm Water Quality Management Program, COSP 2024 General Plan 4-6 Environmental and Cultural Resources, H. Water Quality*				
Urban Water Management Plan	Yes	No	Yes	No
Comment: *COSP 2020 Urban Water Management Plan*				
Habitat Conservation Plan	No	No	No	Yes
Comment: *N/A*				
Economic Development Plan	Yes	No	No	Yes
Comment: *City Council Strategic Goals Approved July 2021//Economic Development Strategic Plan under development*				
Shoreline Management Plan	No	No	No	No
Comment: *N/A*				
Community Wildfire Protection Plan	Yes	Yes	Yes	Yes
Comment: *COSP Emergency Operations Plan 2019, Section 8, Threat Assessments 8—Wildland Fire*				
Forest Management Plan	No	Unknown	Unknown	Yes
Comment: *No forest area, unknown on plans or jurisdiction if required.*				
Climate Action Plan	No	Unknown	Unknown	Yes
Comment: *N/A*				
Comprehensive Emergency Management Plan	Yes	No	Yes	No
Comment: *COSP Emergency Operations Plan 2019*				
Threat & Hazard Identification & Risk Assessment (THIRA)	Yes	No	Yes	No
Comment: *COSP Emergency Operations Plan 2019 Section 8, Threat Summary and Assessments*				
Post-Disaster Recovery Plan	Yes	Yes	Yes	Yes
Comment: *COSP Emergency Operations Plan 2019*				
Continuity of Operations Plan	Yes	Yes	Yes	Yes
Comment: *COSP Emergency Operations Plan 2019 Part one-35*				
Public Health Plan	No	Yes	Yes	Yes
Comment: *COSP Emergency Operations Plan 2019 addressed Public Health Emergencies, County of Ventura Health Care Agency Public Health Emergency Response Plan (ERP)*				

Table 8-4. Development and Permitting Capability

Criterion	Response
Does your jurisdiction issue development permits? ***If no, who does? If yes, which department?*** *Building and Safety*	Yes
Does your jurisdiction have the ability to track permits by hazard area?	Yes
Does your jurisdiction have a buildable lands inventory?	Currently being developed

Table 8-5. Fiscal Capability

Financial Resource	Accessible or Eligible to Use?
Community Development Block Grants	Yes
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for Specific Purposes	Yes
User Fees for Water, Sewer, Gas or Electric Service ***If yes, specify:*** Water and Sewer	Yes
Incur Debt through General Obligation Bonds	Yes
Incur Debt through Special Tax Bonds	Yes
Incur Debt through Private Activity Bonds	No
Withhold Public Expenditures in Hazard-Prone Areas	No
State-Sponsored Grant Programs	Yes
Development Impact Fees for Homebuyers or Developers	Yes

Table 8-6. Administrative and Technical Capability

Staff/Personnel Resource	Available?
Planners or engineers with knowledge of land development and land management practices ***If Yes, Department /Position:*** Public Works/Assistant City Engineer/Community Development /Director & Manager	Yes
Engineers or professionals trained in building or infrastructure construction practices ***If Yes, Department /Position:*** Public Works/City Engineer	Yes
Planners or engineers with an understanding of natural hazards	No
Staff with training in benefit-cost analysis	No
Surveyors	No
Personnel skilled or trained in GIS applications ***If Yes, Department /Position:*** *Planning Department / Associate Planner*	Yes
Scientist familiar with natural hazards in local area	No
Emergency manager ***If Yes, Department /Position:*** Scott Varner, Commander, Santa Paula PD	Yes
Grant writers	No

Table 8-7. Education and Outreach Capability

Criterion	Response
Do you have a public information officer or communications office?	Yes
Do you have personnel skilled or trained in website development?	Yes
Do you have hazard mitigation information available on your website? ***If yes, briefly describe:*** Will be in development	No
Do you use social media for hazard mitigation education and outreach? ***If yes, briefly describe:*** In process of developing education	Yes
Do you have any citizen boards or commissions that address issues related to hazard mitigation? ***If yes, briefly describe:*** Although not a decision making body, the Citizen Corp meets monthly	Yes
Do you have any other programs in place that could be used to communicate hazard-related information? ***If yes, briefly describe:*** Social Media, Nixle	Yes
Do you have any established warning systems for hazard events? ***If yes, briefly describe:*** 1610 AM, Social Media, County reverse 911, Nixle	Yes

Table 8-8. National Flood Insurance Program Compliance

Criterion	Response
What local department is responsible for floodplain management?	Public Works
Who is your floodplain administrator? (department/position)	Public Works/Public Works Director
Are any certified floodplain managers on staff in your jurisdiction?	No
What is the date that your flood damage prevention ordinance was last amended?	May 4, 2009
Does your floodplain management program meet or exceed minimum requirements? ***If exceeds, in what ways?*** Enter Response	Meets
When was the most recent Community Assistance Visit or Community Assistance Contact?	June 18, 2018
Does your jurisdiction have any outstanding NFIP compliance violations that need to be addressed? ***If so, state what they are.*** Enter Response	No
Are any RiskMAP projects currently underway in your jurisdiction? ***If so, state what they are.*** Enter Response	No
Do your flood hazard maps adequately address the flood risk within your jurisdiction? ***If no, state why.*** The current FIRM's received from FEMA are being appealed for a variety of reasons, including significant A99 zones within the City's jurisdictional boundary. The City will be conducting its own flood study in the coming months.	No
Does your floodplain management staff need any assistance or training to support its floodplain management program? ***If so, what type of assistance/training is needed?*** Enter Response	No
Does your jurisdiction participate in the Community Rating System (CRS)? ***If no, is your jurisdiction interested in joining the CRS program?*** Yes	No
How many flood insurance policies are in force in your jurisdiction?[a] ***What is the insurance in force?*** $306,954,400 ***What is the premium in force?*** $604,233	1,021
How many total loss claims have been filed in your jurisdiction?[a] ***What were the total payments for losses?*** $134,387	63

a. According to FEMA statistics as of March 31, 2021

Table 8-9. Community Classifications

	Participating?	Classification	Date Classified
FIPS Code	Yes	0611170042	N/A
DUNS #	Yes	085937027	N/A
Community Rating System	No	N/A	N/A
Building Code Effectiveness Grading Schedule	Yes	Unknown	Unknown
Public Protection	Yes	03/3X	12/21/2018
Storm Ready	N/A	N/A	N/A
Firewise	N/A	N/A	N/A
Tsunami Ready	N/A	N/A	N/A

Table 8-10. Adaptive Capacity for Climate Change

Criterion	Jurisdiction Rating[a]
Technical Capacity	
Jurisdiction-level understanding of potential climate change impacts	Medium
Comment: *City's General Plan acknowledges understanding of potential climate change impacts. The City does not currently have an adaptation plan. However, per the General Plan, the City has policies and procedures that will be in force for future developments, entailing strict rules that will not allow for development or construction in high risk wildfire and flood areas, respectively (HPS 2.1 & 3.1). The City's Storm Drain Master Plan was also created to address deficiencies in existing drainage systems and identify proposed facilities needed to address deficiencies. The City also participates in the National Flood Insurance Program (HPS 2.2) which covers over 1,000 residences and has CIPs addressing potential climate change hazards such as the Water Recycling Facility Floodwall, project #9039, funded through SB1.*	
Jurisdiction-level monitoring of climate change impacts	Low
Comment: *City itself does not have a committee or task force that monitors climate change impacts. The City does however make informed decisions based on risk zones identified by external sources, such as FEMA, CAL Fire, Ventura County Fire, and USGS. The City updates risk zones as new data is supplied by these external sources and applies the updated information to future decision-making and land use.*	
Technical resources to assess proposed strategies for feasibility and externalities	Low
Comment: *City does not have any resources specifically dedicated to climate change impacts. City works in collaboration with Ventura County Watershed Protection to protect watercourses, public highways, life, and property from damage or destruction from floodwaters, and Ventura County Fire District in efforts to mitigate future fire risks as guided by the Ventura County Unit Strategic Fire Plan.*	
Jurisdiction-level capacity for development of greenhouse gas emissions inventory	Low
Comment: *City does not have resources dedicated to greenhouse gas inventory. City would cooperate with Ventura County Air Pollution Control District under guidelines imposed by AB 617 to develop and implement emissions reporting, monitoring, and reduction plans and measures.*	
Capital planning and land use decisions informed by potential climate impacts	Medium
Comment: *City's General Plan outlines policies and procedures that will be in force for future development that bars construction in designated high risk zones, and for other developments outside those zones requires current Federal, State, and City parameters be met during construction (HPS 2.1 & 3.1). The City has been informed of risk zones as have been identified in FEMA's Flood Hazard Zones map (2018), Ventura County's Countywide Dam Failure Inundation Areas map (2014), Santa Paula Safety Element Fire History map (2015) detailing Wildland Fire History, and CAL Fire's Wildland Fire Hazard Areas (2020) detailing fire risk zones in the Santa Paula area.*	
Participation in regional groups addressing climate risks	Low
Comment: *City complies with Ventura County ordinances and participates in the Ventura County Watershed Protection Program to protect watercourses and property from damage or destruction from floodwaters and the Ventura County Unit Strategic Fire Plan to mitigate future fire risks.*	

Criterion	Jurisdiction Rating[a]
Implementation Capacity	
Clear authority/mandate to consider climate change impacts during public decision-making processes	Low
Comment: *City does not have a direct mandate that states decision-making must consider climate change impacts. Notwithstanding, the City's General Plan outlines policies and procedures for future development and CIPs that take into account and seek to mitigate climate change hazards. City Council meets every other week and is open to the public to vote on city budgetary and CIP related issues. The Public Works Director is present to provide and inform Council and the public of climate related information as it pertains to project proposals and budge dispensations.*	
Identified strategies for greenhouse gas mitigation efforts	Low
Comment: *City is in the process of exploring EV technology options and allowing third party alternative energy companies licenses to operate to install and maintain EV charging stations and solar panels.*	
Identified strategies for adaptation to impacts	Medium
Comment: *City General Plan outlines risk zones and policies for development going forward. Land use policies outlined will bar new development in areas deemed high risk flood zones or high risk wildfire zones (HPS 2.1 & 3.1). The General Plan outlines CIPs to be developed and funded that address climate induced hazards related to flooding (HPS 2.c), programs to be .*	
Champions for climate action in local government departments	Low
Comment: *City does not have a dedicated department or staff to climate action initiatives. Although there are no direct committees dedicated to this task, Public Works is focused on complying with federal, state, and county regulations. PW has developed a General Plan that acknowledges and plans around known risk zones with the goal of mitigating future hazards and restricting further development into high risk zones.*	
Political support for implementing climate change adaptation strategies	Medium
Comment: *City Council is on board with climate change adaptation projects if they are projects that would reduce energy usage and increase energy efficiency. An Energy Efficiency Program will go before Council in Dec 2021 to vote on energy programs to implement. Council members are supportive of projects and initiatives if they will provide the community with a measurable return value or if they will directly aid further development of the city.*	
Financial resources devoted to climate change adaptation	Low
Comment: *City does not allocate resources specifically to climate change adaptation projects. Portions of the budget may be spent on future CIPs related to climate change adaptation.*	
Local authority over sectors likely to be negative impacted	Medium
Comment: *City has emergency shelters in place that have basic resources that have been used in the recent past during the Thomas Fire. Santa Paula Police have developed evacuation protocols that are enacted when necessary and in coordination with Ventura County Office of Emergency Services and Ventura County Human Services Agency.*	
Public Capacity	
Local residents' knowledge of and understanding of climate risk	Medium
Comment: *The City does not currently send out informational media content related to climate risks. City residents pay into the National Flood Insurance Program and are aware of the potential flood risks in their area.*	
Local residents' support of adaptation efforts	Medium
Comment: *Residents are supportive of adaptation efforts that directly benefit them. Residents may not be as supportive if these adaptation efforts were to take funding from projects that would impact them in a short term time frame, such as repaving of streets that are in a state of disrepair.*	
Local residents' capacity to adapt to climate impacts	Low
Comment: *The City's per capita income is 68% of the national, and the poverty rate is greater than the national average at 14.2% (Census Bureau). Residents have a limited capacity for adaptation and are reliant upon the city to make preparations and fund projects that would mitigate climate induced hazards such as floods or wildfires.*	
Local economy current capacity to adapt to climate impacts	Low
Comment: *Scope of climate impact will dictate the economy's capacity to adapt. Based on FEMA's updated Ventura County flood maps for communities along Santa Clara River the base floodplain level has risen and portions of the city south of Hwy 126 now exist in a FEMA identified base floodplain zone. Significant portions of the city to the west and east of Santa Paula Creek as well as to the north of Hwy 126 fall within a federally protected A99 zone having met specific requirements. The breaking of the one of four dams located northeast of the city could incur significant cost damages. Also the breaking of a levee could incur damages and rebuilding of said levee would require significant public funding that may not be readily reallocated.*	

Criterion	Jurisdiction Rating[a]
Local ecosystems capacity to adapt to climate impacts	Low
Comment: *The local ecosystem consists largely of the Santa Clara River watershed which is protected in cooperation with Ventura County Watershed Protection. Wildfires have burned through the foothills to the north and east of the city, including the Thomas Fire (2017) and Simi Fire (2003), respectively. Extensive research and study has not been conducted to ascertain the long-term ecosystem damage or recovery of the region.*	

a. High = Capacity exists and is in use; Medium = Capacity may exist, but is not used or could use some improvement; Low = Capacity does not exist or could use substantial improvement; Unsure= Not enough information is known to assign a rating.

8.5 INTEGRATION REVIEW

For hazard mitigation planning, "integration" means that hazard mitigation information is used in other relevant planning mechanisms, such as general planning and capital facilities planning, and that relevant information from those sources is used in hazard mitigation. This section identifies where such integration is already in place, and where there are opportunities for further integration in the future. Resources listed at the end of this annex were used to provide information on integration. The progress reporting process described in Volume 1 of the hazard mitigation plan will document the progress of hazard mitigation actions related to integration and identify new opportunities for integration.

8.5.1 Existing Integration

Some level of integration has already been established between local hazard mitigation planning and the following other local plans and programs:

- **2040 General Plan—**four-year update process recently completed (late 2021).
- **Draft Urban Water Management Plan (UWMP) and Water Shortage Contingency Plan—** updated documents in final stages of review.

8.5.2 Opportunities for Future Integration

The capability assessment in this annex indicates opportunities to integrate this mitigation plan with other jurisdictional planning/regulatory capabilities. Capabilities were identified as integration opportunities if they can support or enhance the actions identified in this plan or be supported or enhanced by components of this plan. The capability assessment identified the following plans and programs that do not currently integrate hazard mitigation information but provide opportunities to do so in the future:

- **2029 Housing Element—**draft HE Update currently under review w/CA HCD

Taking action to integrate each of these programs with the hazard mitigation plan was considered as a mitigation action to include in the action plan in this annex.

8.6 RISK ASSESSMENT

8.6.1 Jurisdiction-Specific Natural Hazard Event History

Table 8-11 lists past occurrences of natural hazards for which specific damage was recorded in this jurisdiction Other hazard events that broadly affected the entire planning area, including this jurisdiction, are listed in the risk assessments in Volume 1 of this hazard mitigation plan.

Table 8-11. Past Natural Hazard Events

Type of Event	FEMA Disaster #	Date	Damage Assessment
Thomas Fire	FM-5224	2017	281,893 acres burned over the course of 38 days across the Santa Barbara and Ventura Counties. 280 structures were damaged and 1,063 structures were destroyed. Residents were evacuated and significant smoke covered the area. A hazard shelter was set up with basic resources in Santa Paula for evacuees.
Simi Fire	N/A	2003	108,204 acres burned over the course of 10 days in the Simi Valley. Significant smoke billowed over the valley.11 structures were damaged, 315 structures destroyed, 21 injuries. No property damages in Santa Paula.
Maria Fire	FM-5302	November 1, 2019	9,999 acres burned over 5 days. 4 structures were destroyed. Residents were evacuated and diverted by Santa Paula PD. Significant smoke lingering causing respiratory irritation.
Flash Flood	N/A	January 4, 2008	Rainfall totals between January 4th and 6th ranged from 5 to 11 inches in the foothills and mountains. The total amount of rainfall, combined with rainfall rates around 1 inch per hour, produced numerous reports of flooding as well as mud and debris flows.
SC River Flood/SP Airport	DR-1585	2005	Flooding closed all ingress and egress from the city. Santa Paula airport was closed for several months due to flood damage to the runway--southern portion of the airport and runway was washed away by flood waters.
Flash Flood	N/A	November 30, 2002	An intense thunderstorm produced heavy rain and flash flooding near the community of Santa Paula. Law enforcement officials reported the intersection of Foothill Boulevard and Briggs Road as well as the intersection of Telegraph Road and Briggs Road were inundated with over 2 feet of water.
Wildfire	N/A	December 25, 2000	Gusty Santa Ana winds fueled a wildfire in the hills between the cities of Santa Paula and Somis. The fire, which burned over 360 acres, was started by downed power lines.
Northridge Earthquake	DR-1008	1994	6.7 magnitude earthquake centered in Northridge. 57 fatalities reported during caused by earthquake with injuries over the thousands. Damages caused were over $20 billion in costs with double that in economic loss. Marked the costliest earthquake in U.S. history.
SC River Flood	DR-253	1969	13 reported deaths. 5 bridge crossings destroyed. Property damage was estimated at $60 million.
St. Francis Dam Flood	N/A	1928	Countywide, more than 530 people died; bridges, orchards, farms, homes all eradicated in flood's path down the Santa Clara river valley to the Pacific Ocean.

8.6.2 Hazard Risk Ranking

Table 8-12 presents a local ranking of all hazards of concern for which this hazard mitigation plan provides complete risk assessments. As described in detail in Volume 1, the ranking process involves an assessment of the likelihood of occurrence for each hazard, along with its potential impacts on people, property, and the economy. Mitigation actions primarily target hazards with high and medium rankings.

Table 8-12. Hazard Risk Ranking

Rank	Hazard	Risk Ranking Score	Risk Category
1	Flooding	48	High
2	Dam Failure	36	High
3	Earthquake	32	Medium
4	Severe Storms	24	Medium
5	Severe Weather	24	Medium
6	Landslide	18	Medium
7	Wildfire	12	Low
8	Drought	9	Low

8.6.3 Jurisdiction-Specific Vulnerabilities

Volume 1 of this hazard mitigation plan provides complete risk assessments for each identified hazard of concern. This section provides information on a few key vulnerabilities for this jurisdiction. Available jurisdiction-specific risk maps of the hazards are provided at the end of this annex.

Repetitive Loss Properties

Repetitive loss records are as follows:

- Number of FEMA-identified Repetitive-Loss Properties: 3
- Number of FEMA-identified Severe-Repetitive-Loss Properties: 0
- Number of Repetitive-Loss Properties or Severe-Repetitive-Loss Properties that have been mitigated: 0

Other Noted Vulnerabilities

No jurisdiction-specific issues were identified by the results of the risk assessment, public involvement strategy, or other available resources.

8.7 STATUS OF PREVIOUS PLAN ACTIONS

Table 8-13 summarizes the actions that were recommended in the previous version of the hazard mitigation plan and their implementation status at the time this update was prepared.

8.8 HAZARD MITIGATION ACTION PLAN

Table 8-14 lists the identified actions, which make up the hazard mitigation action plan for this jurisdiction. Table 8-15 identifies the priority for each action. Table 8-16 summarizes the mitigation actions by hazard of concern and mitigation type.

Table 8-13. Status of Previous Plan Actions

Action Item	Completed	Removed; No Longer Feasible	Carried Over to Plan Update: Check if Yes	Carried Over to Plan Update: Action # in Update
OA 6—Develop a public outreach program that informs property owners located in the dam and levee failure inundation areas about voluntary flood insurance.			✓	SP-4
Comment: Ongoing initiative, Public Works				
OA 7—Develop a water conservation public outreach program to increase awareness about the drought, fines and penalties for overuse and solutions for conserving water.			✓	SP-11
Comment: Ongoing initiative, Public Works				
OA 11—Develop and implement plans to increase the building owner's general knowledge of and appreciation for the value of seismic upgrading of the building's structural and nonstructural elements.			✓	SP-1
Comment: Ongoing initiative, Building & Safety / Public Works				
OA 14—Acquire, relocate, or elevate residential structures, in particular those that have been identified as RL properties, within the 100-year floodplain.			✓	SP-1
Comment: Ongoing initiative, Public Works				

Table 8-14. Hazard Mitigation Action Plan Matrix

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action SP-1—Where appropriate, support retrofitting, purchase or relocation of structures located in hazard areas, prioritizing those that have experienced repetitive losses and/or are located in high- or medium-risk hazard areas.						
Hazards Mitigated: Flooding, Dam Failure, Earthquake, Severe Storms, Severe Weather, Landslide, Wildfire						
Existing	2, 6, 9, 10, 11	City of Santa Paula	None	High	FEMA HMA (BRIC, FMA, PDM and HMGP)	Short-term
Action SP-2—Integrate the hazard mitigation plan into other plans, ordinances and programs that dictate land use decisions in the community, including the East Area 1 development.						
Hazards Mitigated: Flooding, Dam Failure, Earthquake, Severe Storms, Severe Weather, Landslide, Wildfire, Drought						
New & Existing	1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 17, 19	City of Santa Paula	None	Low	Staff Time, General Funds	Ongoing
Action SP-3—Actively participate in the plan maintenance protocols outlined in Volume 1 of this hazard mitigation plan.						
Hazards Mitigated: Flooding, Dam Failure, Earthquake, Severe Storms, Severe Weather, Landslide, Wildfire, Drought						
New & Existing	1, 2, 4, 6, 7, 8, 9, 11, 12, 13, 14, 15	City of Santa Paula	None	Low	Staff Time, General Funds	Short-term
Action SP-4—Continue to maintain good standing and compliance under the NFIP through implementation of floodplain management programs that, at a minimum, meet the NFIP requirements: • Enforce the flood damage prevention ordinance. • Participate in floodplain identification and mapping updates. • Provide public assistance/information on floodplain requirements and impacts.						
Hazards Mitigated: Flooding						
New & Existing	1, 2, 6, 7, 17	City of Santa Paula	None	Low	Staff Time, General Funds	Ongoing

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action SP-5—Identify and pursue strategies to increase adaptive capacity to climate change including but not limited to the following: • Outlining floodplains and identifying areas under threat of liquefaction and subsidence that border the Santa Clara River *Hazards Mitigated:* Flooding, Severe Storms, Severe Weather, Wildfire, Drought						
New & Existing	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 19	City of Santa Paula	VCPWA-WP	Low	FEMA HMA (BRIC, FMA, HMGP), Staff Time, General Funds	Short-term
Action SP-6—Purchase generators for critical facilities and infrastructure that lack adequate backup power, including City Hall, Police Station, Community Center, City facilities yards, water pumping stations, sewer lift stations. *Hazards Mitigated:* Dam Failure, Earthquake, Flooding, Landslide, Severe Storms, Severe Weather, Wildfire						
Existing	2, 19	City of Santa Paula		High	FEMA HMA (BRIC and HMGP), Staff Time, General Funds	Short-term
Action SP-7—Policies and procedures (HPS 1.1-4 & HPS 1.a-i) to reduce severity and damage caused by geologic hazards, including seismic upgrade of unreinforced masonry buildings as required by State regulations, annual review of building codes to ensure State codes are used in reviewing development proposals, establishing of geotechnical investigation standards and requirements to be followed by development applicants *Hazards Mitigated:* Earthquake						
New & Existing	1, 2, 4, 6, 9, 10, 11, 12, 16	City of Santa Paula	None	Medium	FEMA HMA (BRIC, HMGP), Staff Time & General Funds	Ongoing
Action SP-8—Policies and procedures (HPS 2.1-6 & HPS 2.a-f) to address dam failure and storm water flood hazards, including but not limited to flood hazard mitigation planning that locates development areas where such risk can be mitigated to acceptable levels, locating development for any new public or emergency facilities outside flood hazard zones, participation in the National Flood Insurance Program and the Community Rating System to ensure the city is incentivized to reduce risk of damage from flooding and improve flood preparedness, support of flood control projects on the Santa Clara River, Santa Paula Creek, and other waterways, inter-agency cooperation with Army Corps of Engineers and VCPWA-WP *Hazards Mitigated:* Flooding, Dam Failure						
New & Existing	1, 2, 4, 6, 9, 10, 11, 12, 16	City of Santa Paula	VCPWA-WP	Medium	FEMA HMA (BRIC, FMA, HMGP), Staff Time & General Funds	Ongoing
Action SP-9—Policies and procedures (HPS 3.1-4 & HPS 3.a-i) to address risk of wildland fire including but not limited to locating development in areas where wildland fire risks can be mitigated to an acceptable level, locating new public and emergency facilities outside high fire hazard zones, enforcement of new State fire safe and defensible space regulations and standards (Public Resource Code Sec. 4290-4291 and Government Code Sec. 51182), ensuring adequate water supply for firefighting is available in all new development, consideration of a future fire station along the urban wildland interface along State Route 150, identification of effective methods to establish buffer zones separating residential development in foothills from chaparral and other native vegetation. *Hazards Mitigated:* Wildfire						
New & Existing	1, 2, 4, 5, 6, 9, 10, 11, 12, 16	City of Santa Paula	Ventura County	Medium	FEMA HMA (BRIC, FMAP and HMGP), Staff Time & General Funds	Ongoing
Action SP-10—Maintain wildfire hazard fuel reduction program for areas that have been identified with overgrown or dead brush, trees and weeds to reduce the potential for tree-to-tree ignition. Ensure that a "maintenance now" component to provide continued fire resistance is part of the program. (Coordinates with VCFPD Action VFP-6) *Hazards Mitigated:* Wildfire						
New & Existing	2, 4, 5, 6, 8, 10, 11, 13, 14, 15, 18, 19	VCFPD	City of Santa Paula, CAL FIRE & USDA	Medium	FEMA HMA (BRIC, FMAP and HMGP), Staff Time & General Funds	Ongoing

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action SP-11—Continue developing the water conservation public outreach program to increase awareness about the drought, fines and penalties for overuse and solutions for conserving water.						
Hazards Mitigated: Drought						
New & Existing	2, 12, 14, 16, 17	City of Santa Paula	None	Low	Staff Time & General Funds	Ongoing
Action SP-12—Determine feasibility of the City of Santa Paula joining the Community Rating System (CRS) program to enhance public safety, reduce flood damage to property and infrastructure, and reduce flood insurance rates in the community.						
Hazards Mitigated: Flooding						
New & Existing	1, 2, 19	City of Santa Paula	None	Low	Staff Time & General Funds	Short-term
Action SP-13—Water Recycling Facility Floodwall. Construct a Floodwall to protect the Water Recycling Facility, as required by FEMA. The project will cost an estimated $550,000 with funds fully secured from the Sewer budget.						
Hazards Mitigated: Flooding						
Existing	2, 6, 11	City of Santa Paula	None	High	FEMA HMA (BRIC, FMA, HMGP), Staff Time & General Funds	Short-term
Action SP-14—Water Main Replacement Program. Replace water mains deficient in capacity and not up to current seismic standards, as outlined in the City's Potable Water System Master Plan.						
Hazards Mitigated: Earthquake, Flooding, Severe Storms						
Existing	2, 6, 9, 11, 19	City of Santa Paula	None	Low	Sewer Budget, FEMA HMA (BRIC, FMA, HMGP)	Ongoing
Action SP-15—Construct an Advanced Reverse Osmosis Treatment Facility. The project is part of a mandate by the Los Angeles Area Regional Water Quality Board to construct a recycled water delivery system to be completed no later than May 1, 2022. A Water Discharge Permit was issued to the city Feb. 8, 2019, covering a 10-year period with mandated milestones. The City completed infrastructure design, CEQA/Permitting, and additional Administrative/Financing in the amount of $1,490,000 in FY 2019/2020 for the proposed transmission line, as required by the LARWQCB in the Waste Discharge Requirements and Cease and Desist Order. Funding partially (43%) secured through Sewer budget.						
Hazards Mitigated: Drought						
New & Existing	2, 3, 8, 14	City of Santa Paula	None	Medium	Sewer Budget, FEMA HMA (BRIC, FMA, HMGP)	Short-term
Action SP-16—Well Rehabilitation Program. Rehabilitate groundwater wells [18, 11, 12, 13, 14] as recommended by the City's Potable Water System Master Plan. The Decant Pump will require rebuilding or replacement of one well per year. Funding is fully secured through Water Department budget from FY 2021/2022 to FY 2025/2026.						
Hazards Mitigated: Drought						
Existing	2, 3, 14, 19	City of Santa Paula	None	Low	Sewer Budget, FEMA HMA (BRIC, FMA, HMGP)	Short-term
Action SP-17—Water Recycling Facility Capital Expenditures. Replacement of or plant improvements to critical equipment for the Water Recycling Facility. Past emergency events have identified a need to upgrade and raise elevation of the motor control center and improve water pump and wastewater processing operation sustainability during emergency events and power outage. Funding is fully secured through Sewer budget.						
Hazards Mitigated: Flooding, Drought						
Existing	2, 3, 11, 14	City of Santa Paula	None	Low	Sewer Budget, FEMA HMA (BRIC, FMA, HMGP)	Ongoing

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action SP-18—FEMA Floodplain Restudy. Develop alternative floodplain study with associated hydrologic and hydraulic analysis to address deficiencies in current FEMA study in key areas of the City. This project will take 6 months to complete and will provide specific detail that builds upon the more general countywide study that was performed by Ventura County.						
Hazards Mitigated: Flooding						
New & Existing	1, 8, 19	City of Santa Paula	None	High	FEMA HMA (BRIC, FMA, HMGP), Staff Time & General Funds	Short-term
Action SP-19—Foothill/Cameron Drainage Improvements. Construct drainage and retaining wall improvements to address safety issues at intersection. Construct: approximately 75' of a 6' maximum height retaining wall to match existing adjacent wall along Foothill Dr; debris inlet and associated piping to address drainage and debris flows from steep adjacent agricultural property. Remove existing concrete barrier from roadway and restore two-way vehicular travel. This area has been identified as a critically affected area during flooding events.						
Hazards Mitigated: Flooding						
Existing	6, 11, 14, 18	City of Santa Paula	None	Low	FEMA HMA (BRIC, FMA, HMGP), Staff Time & General Funds	Short-term

a. Short-term = Completion within 5 years; Long-term = Completion within 10 years; Ongoing= Continuing new or existing program with no completion date

Acronyms used here are defined at the beginning of this volume.

Table 8-15. Mitigation Action Priority

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Cost?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Implementation Priority[a]	Grant Pursuit Priority[a]
1	5	High	High	Yes	Yes	No	Medium	High
2	16	Medium	Low	Yes	No	Yes	High	Low
3	12	Low	Low	Yes	No	Yes	High	Low
4	5	Medium	Low	Yes	No	Yes	High	Low
5	17	Medium	Low	Yes	Yes	Yes	High	Medium
6	2	High	High	Yes	Yes	No	Medium	High
7	9	High	Medium	Yes	Yes	Yes	High	High
8	9	High	Medium	Yes	Yes	Yes	High	High
9	10	High	Medium	Yes	Yes	Yes	High	High
10	12	High	Medium	Yes	Yes	Yes	High	High
11	5	Low	Low	Yes	No	Yes	High	Low
12	3	Medium	Low	Yes	No	Yes	High	Low
13	3	High	High	Yes	Yes	No	Medium	High
14	5	Medium	Low	Yes	Yes	Yes	High	Medium
15	4	High	Medium	Yes	Yes	No	Medium	High
16	4	Medium	Low	Yes	Yes	Yes	High	Medium
17	4	Medium	Low	Yes	Yes	Yes	High	Medium
18	3	Medium	High	Yes	Yes	No	Medium	High
19	4	High	Low	Yes	Yes	No	Medium	High

a. See the introduction to this volume for explanation of priorities.

Table 8-16. Analysis of Mitigation Actions

Hazard Type	Action Addressing Hazard, by Mitigation Type[a]							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilience	Community Capacity Building
High-Risk Hazards								
Flooding	SP-2, 4, 8	SP-1, 8, 17			SP-6	SP-8, 13, 14, 19	SP-5, 17	SP-3, 12, 18
Dam Failure	SP-2, 8	SP-1, 8			SP-6	SP-8		SP-3
Medium-Risk Hazards								
Earthquake	SP-2, 7	SP-1, 7			SP-6	SP-14		SP-3
Severe Storms	SP-2	SP-1			SP-6	SP-14	SP-5	SP-3
Severe Weather	SP-2	SP-1			SP-6		SP-5	SP-3
Landslide	SP-2	SP-1			SP-6			SP-3
Low-Risk Hazards								
Wildfire	SP-2, 9	SP-1		SP-9, 10	SP-6		SP-5	SP-3
Drought	SP-2		SP-11			SP-15	SP-5, 15, 16, 17	SP-3

a. See the introduction to this volume for explanation of mitigation types.

8.9 PUBLIC OUTREACH

Table 8-17 lists public outreach activities for this jurisdiction.

Table 8-17. Local Public Outreach

Local Outreach Activity	Date	Number of People Involved
Seismic Upgrade Handouts/Guides, Building & Safety	Ongoing	Citywide
Water Conservation Handouts/Guides, Building & Safety	Ongoing	Citywide
Participant, California State 'Save Our Water' Program	Ongoing	Citywide

8.10 INFORMATION SOURCES USED FOR THIS ANNEX

The following technical reports, plans, and regulatory mechanisms were reviewed to provide information for this annex.

- **City of Santa Paula Municipal Code**—The municipal code was reviewed for the full capability assessment and for identifying opportunities for action plan integration.
- **City of Santa Paula Flood Damage Prevention Ordinance**—The flood damage prevention ordinance was reviewed for compliance with the National Flood Insurance Program.
- **City of Santa Paula 2040 General Plan**—The 2040 General Plan (focusing on Section 5, Hazards & Public Safety Element) was reviewed for opportunities for action plan integration. 2040-General-Plan-Section-5---Hazards-and-Public-Safety-Element (spcity.org)
- **City of Santa Paula Fiscal Year 2021/2022 & 2022/2023 Proposed Budget**—The budget was reviewed for capability assessment and for identifying opportunities for action plan integration.

The following outside resources and references were reviewed:

- **Hazard Mitigation Plan Annex Development Toolkit**—The toolkit was used to support the identification of past hazard events and noted vulnerabilities, the risk ranking, and the development of the mitigation action plan.
- **Census Bureau, Santa Paula** U.S. Census Bureau QuickFacts: United States
- **CAL FIRE Incidents** Welcome to Stats & Events (ca.gov)
- **Department of Conservation** Northridge Earthquake, January 17, 1994 (ca.gov)
- **Ventura County Public Works** Santa Clara River, Ventura County Public Works Agency (vcpublicworks.org)
- **Ventura County Flood Info** VC Flood History (vcfloodinfo.com)
- **Ventura County Community Air Protection AB 617, 2020 Annual Report** Ventura County Air Pollution Control District Community Air Protection (AB 617)
- **Tetra Tech Loss Matrix—**risk assessment spreadsheet provided by consultant.

Santa Paula

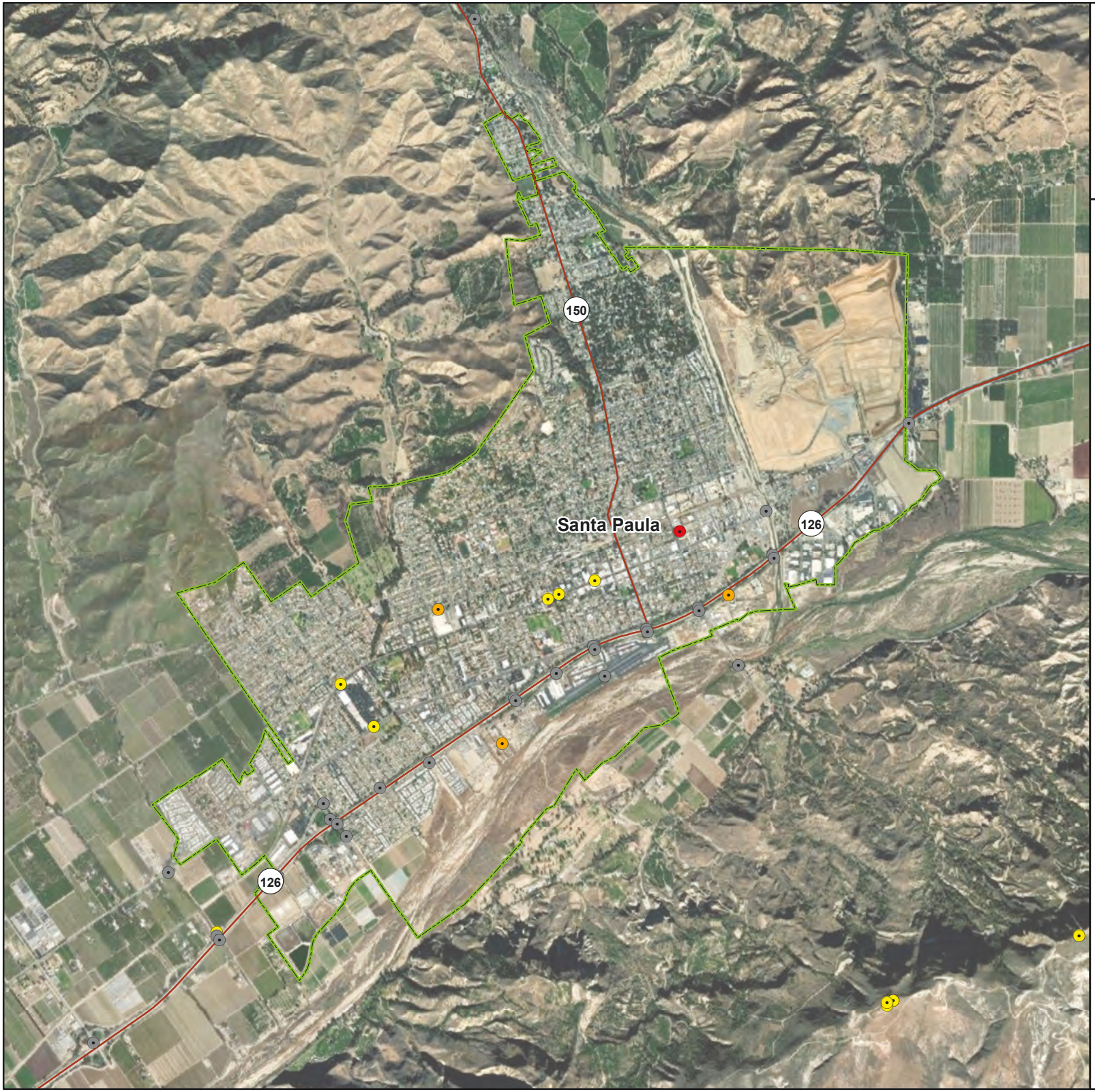
Critical Facilities (1 of 2)

- Food, Water, Shelter
- Health and Medical
- Safety and Security
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Data Sources: Ventura Co., VCFD, Casitas MWD, Calleguas MWD, City of Camarillo, CA Energy Commission, Cal Trans, EPA, HIFLD, Esri

N

0 0.225 0.45 0.9 Miles



Santa Paula

Critical Facilities (1 of 2)

- Communications
- Energy
- Hazardous Material
- Transportation
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Data Sources: Ventura Co., VCFD, Casitas MWD, Calleguas MWD, City of Camarillo, CA Energy Commission, Cal Trans, EPA, HIFLD, Esri

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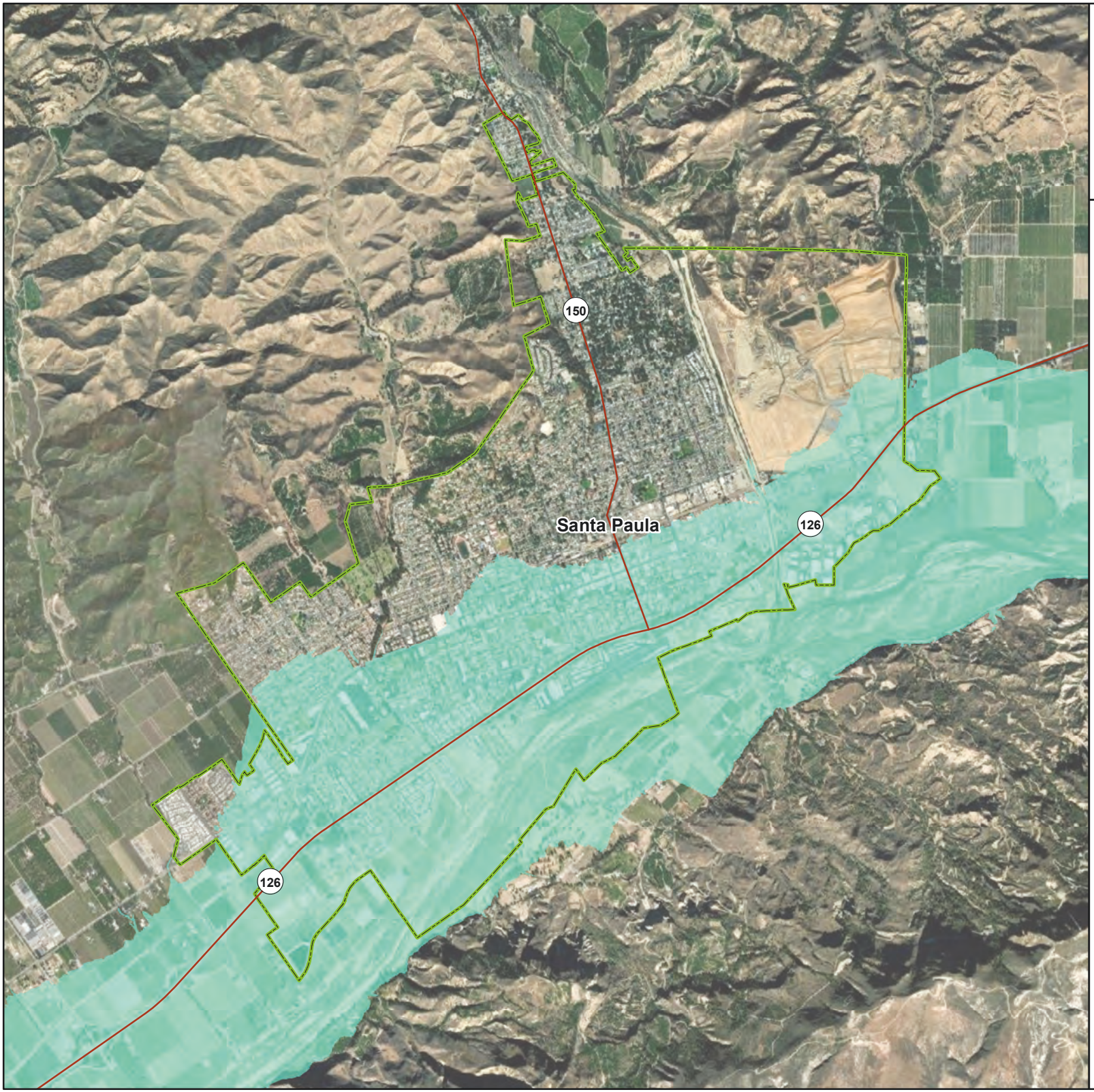

Santa Paula

Dam Failure Inundation Areas

Combined Inundation Areas

Major Roads

Selected City

Incorporated Cities

County Boundary

Data Sources: Ventura Co., CA DWR, Esri

N

0 0.225 0.45 0.9 Miles

Santa Paula

NEHRP Soil Class

C (Dense soil/soft rock)

D (Stiff soil)

Major Roads

Selected City

Incorporated Cities

County Boundary

Data Sources: Ventura Co., CGS, Esri

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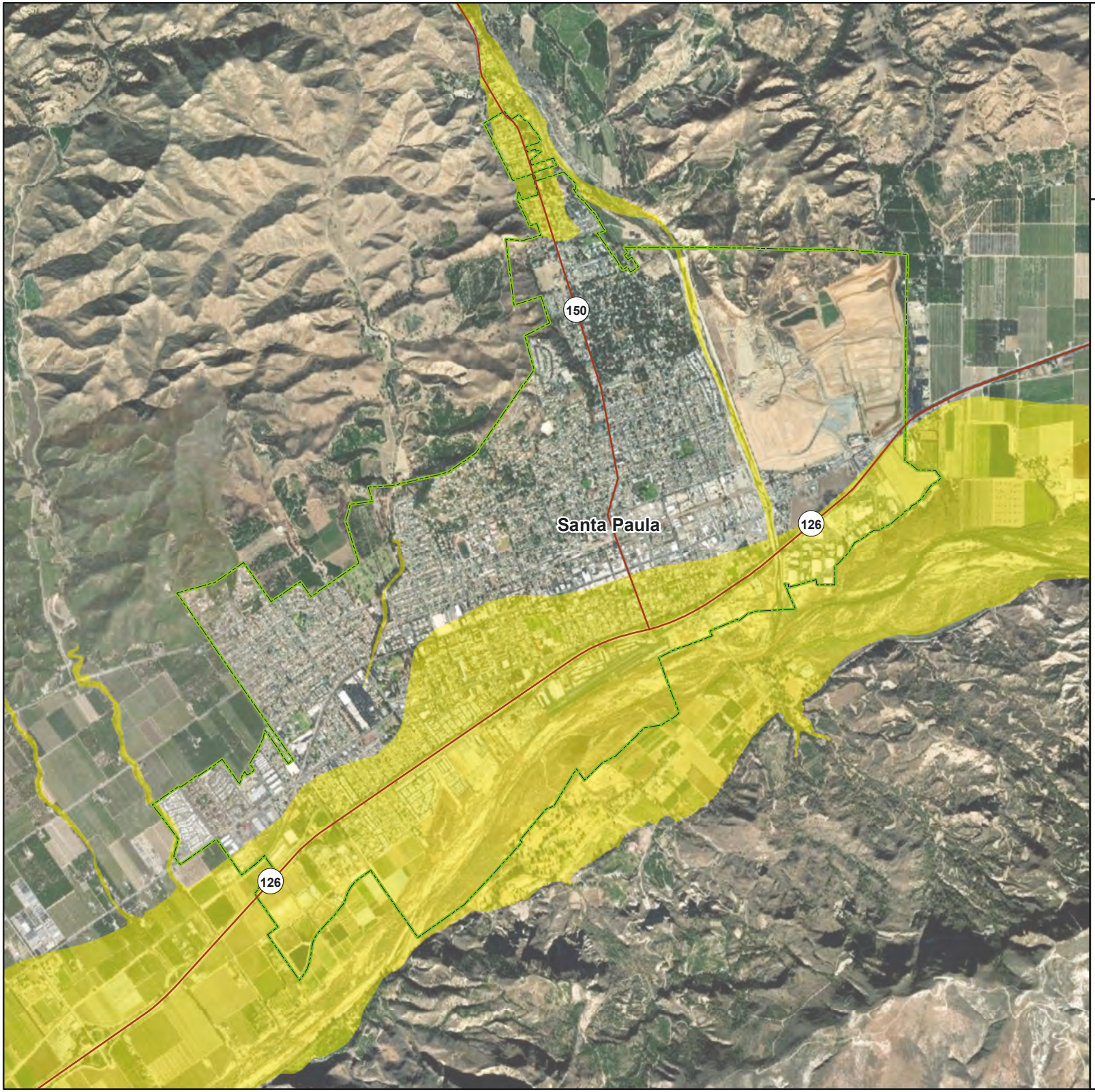

Santa Paula

Liquefaction Susceptibility

Liquefaction zone
Major Roads
Selected City
Incorporated Cities
County Boundary

Data Sources: Ventura Co., Esri

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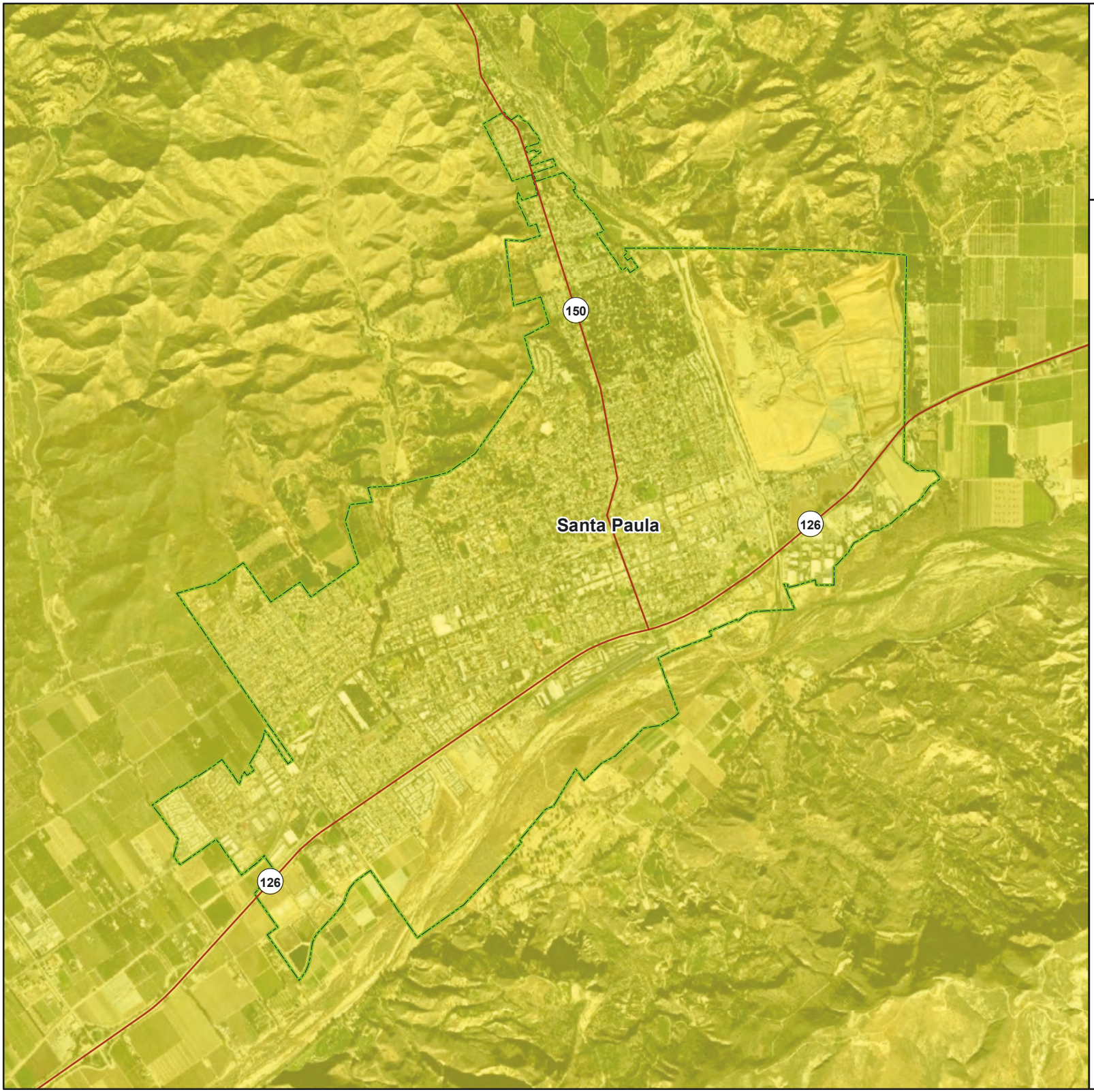
Miles



Santa Paula

100-Year Probabilistic Earthquake Scenario

Mercalli Intensity Scale

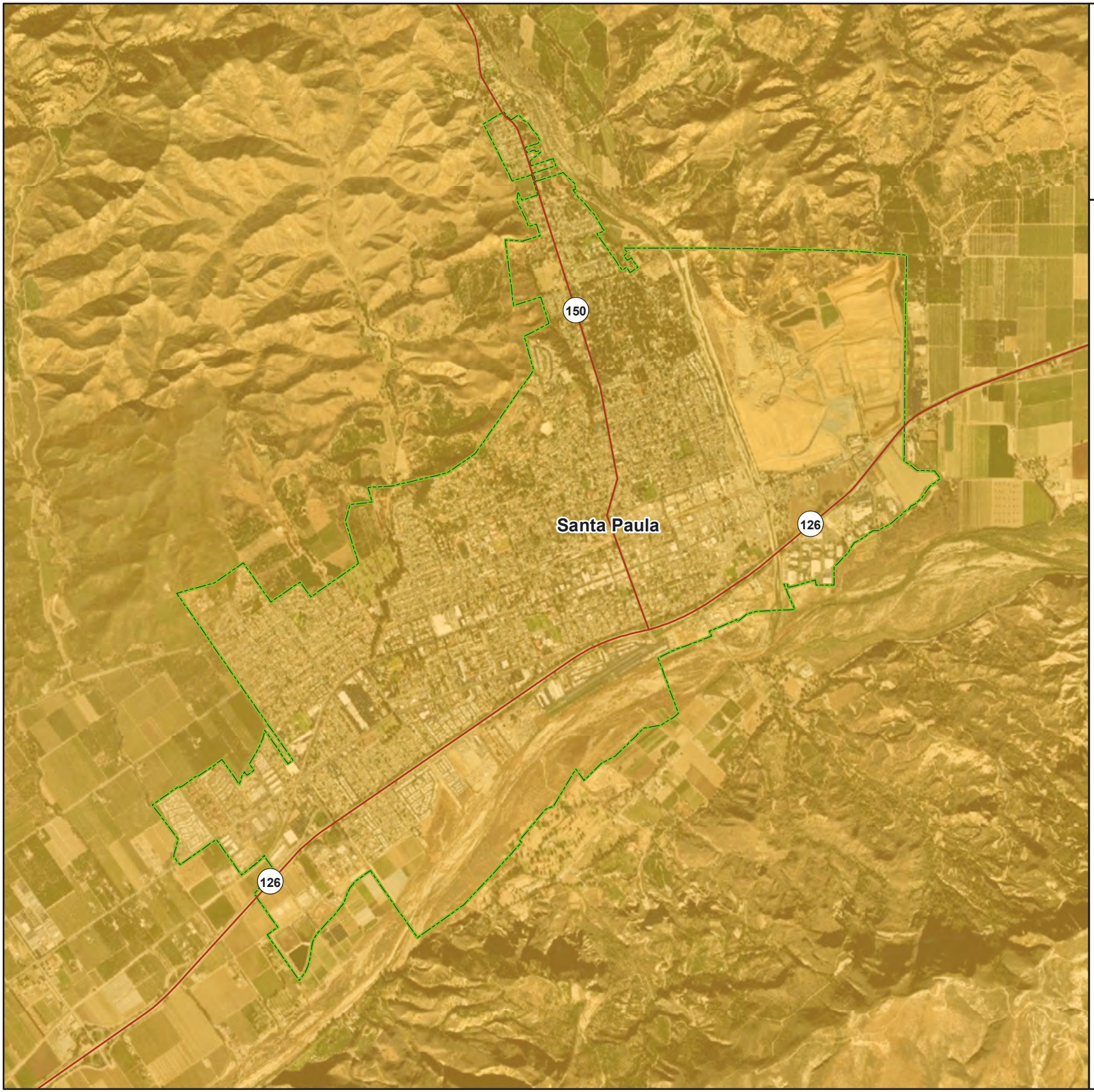
- VII (Very Strong/Moderate)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.225 0.45 0.9 Miles



Santa Paula

Oak Ridge M7.16 Earthquake Scenario

Mercalli Intensity Scale

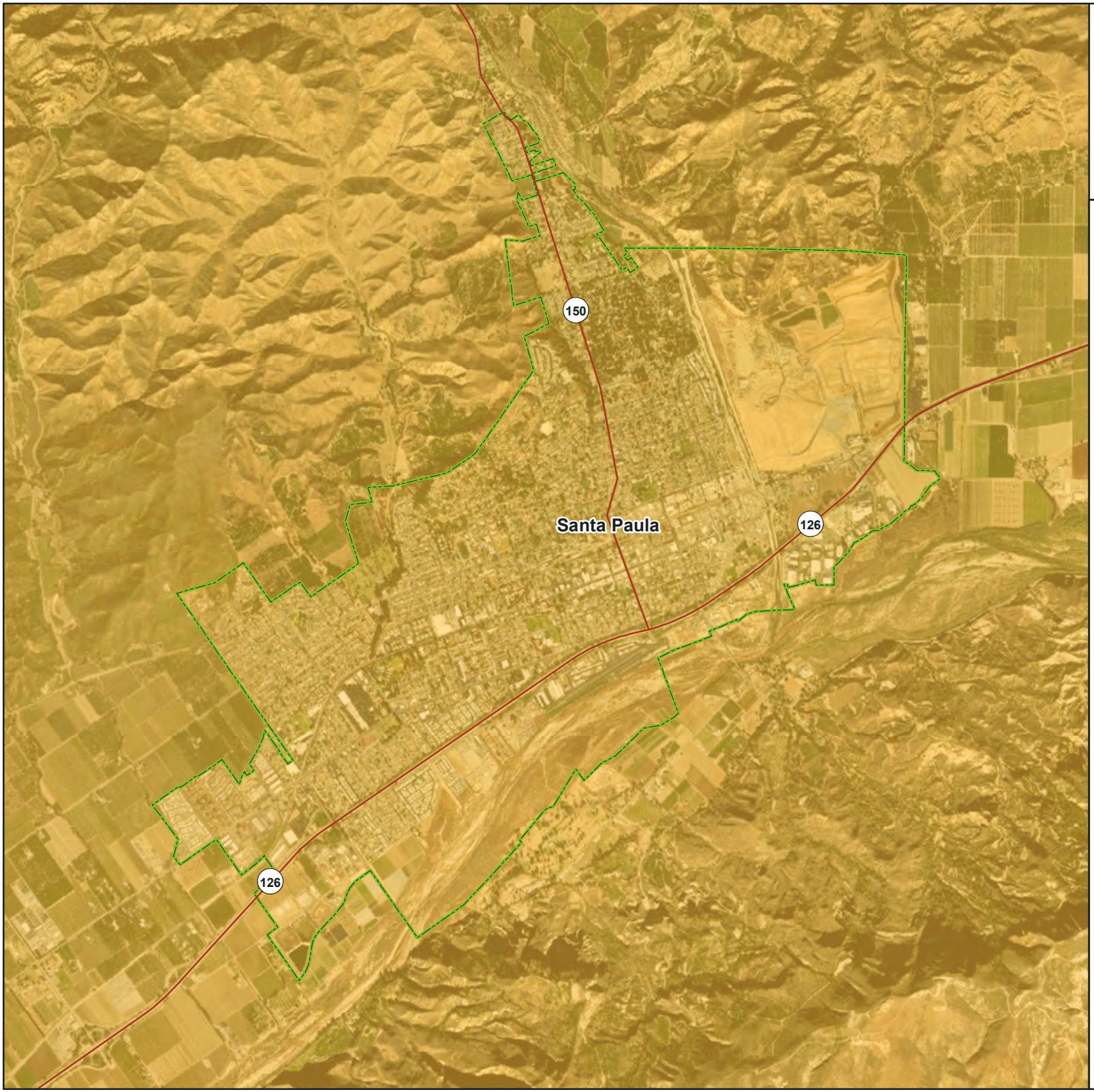
- VIII (Severe/Moderate-Heavy)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.225 0.45 0.9 Miles



Santa Paula

Pitas Point M7.12 Earthquake Scenario

Mercalli Intensity Scale

- VIII (Severe/Moderate-Heavy)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.225 0.45 0.9 Miles

Santa Paula

San Cayetano M7.16 Earthquake Scenario

Mercalli Intensity Scale

- VII (Very Strong/Moderate)
- VIII (Severe/Moderate-Heavy)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.225 0.45 0.9
Miles

Santa Paula

S. San Andreas M8.03 Earthquake Scenario

Mercalli Intensity Scale

- VI (Strong/Light)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

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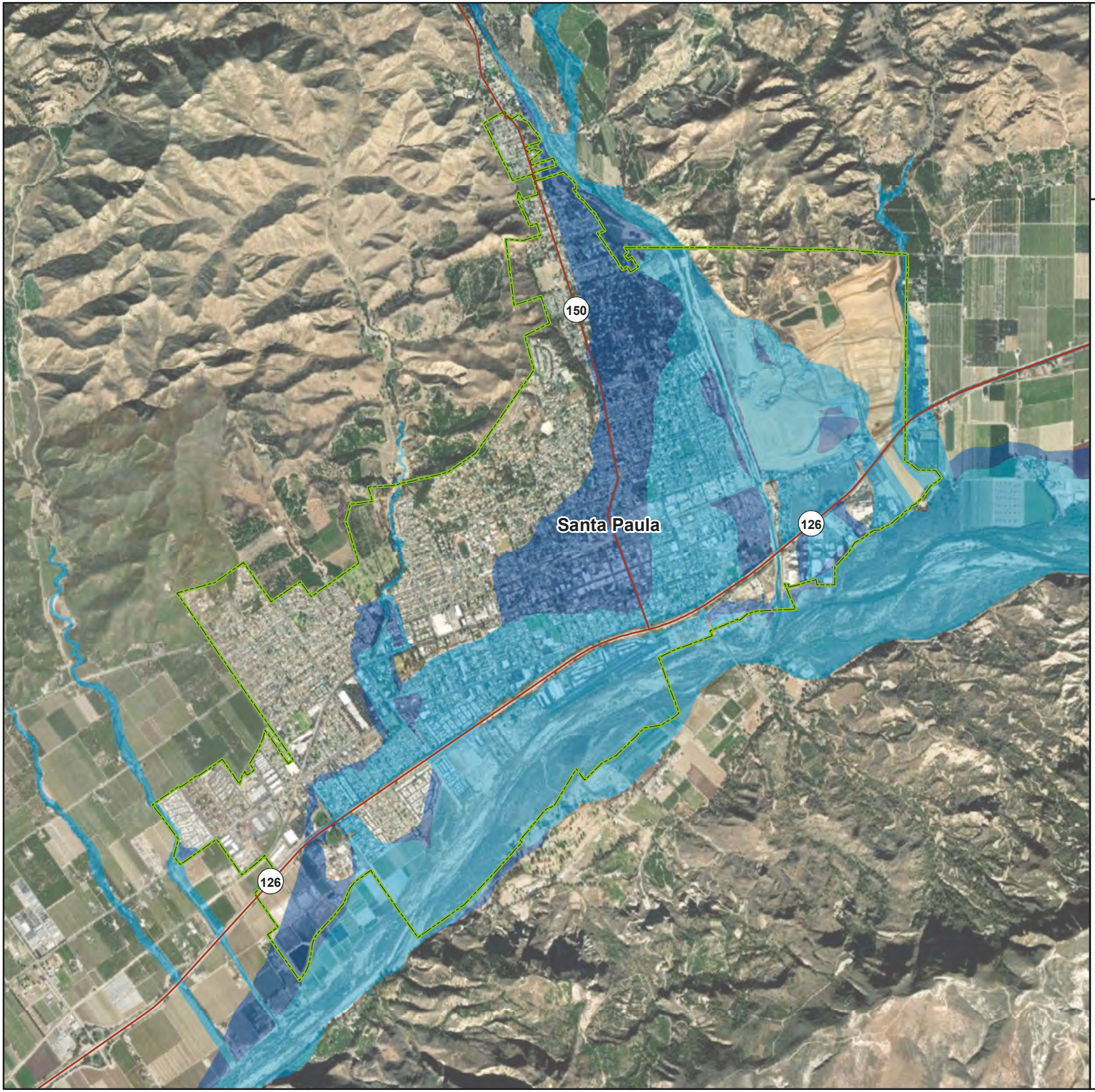

Santa Paula

FEMA Flood Hazard Areas

1% Annual Chance Flood (100-Year)

0.2% Annual Chance Flood (500-Year)

Major Roads

Selected City

Incorporated Cities

County Boundary

Data Sources: Ventura Co., FEMA, Esri

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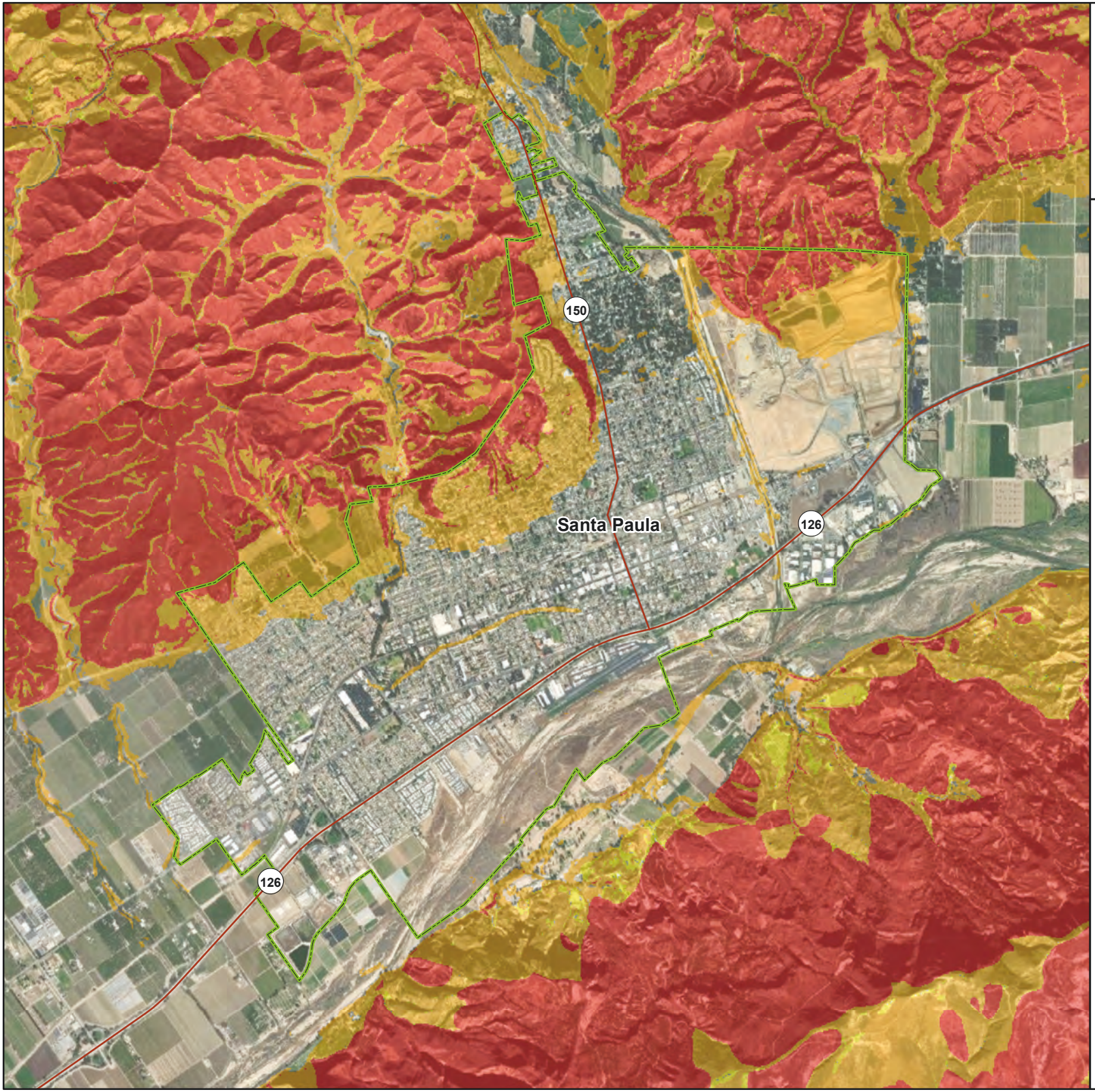

Santa Paula

Susceptibility to Deep-Seated Landslides

- Low
- Moderate
- High
- Very High
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Data Sources: Ventura Co., CGS, Esri

N

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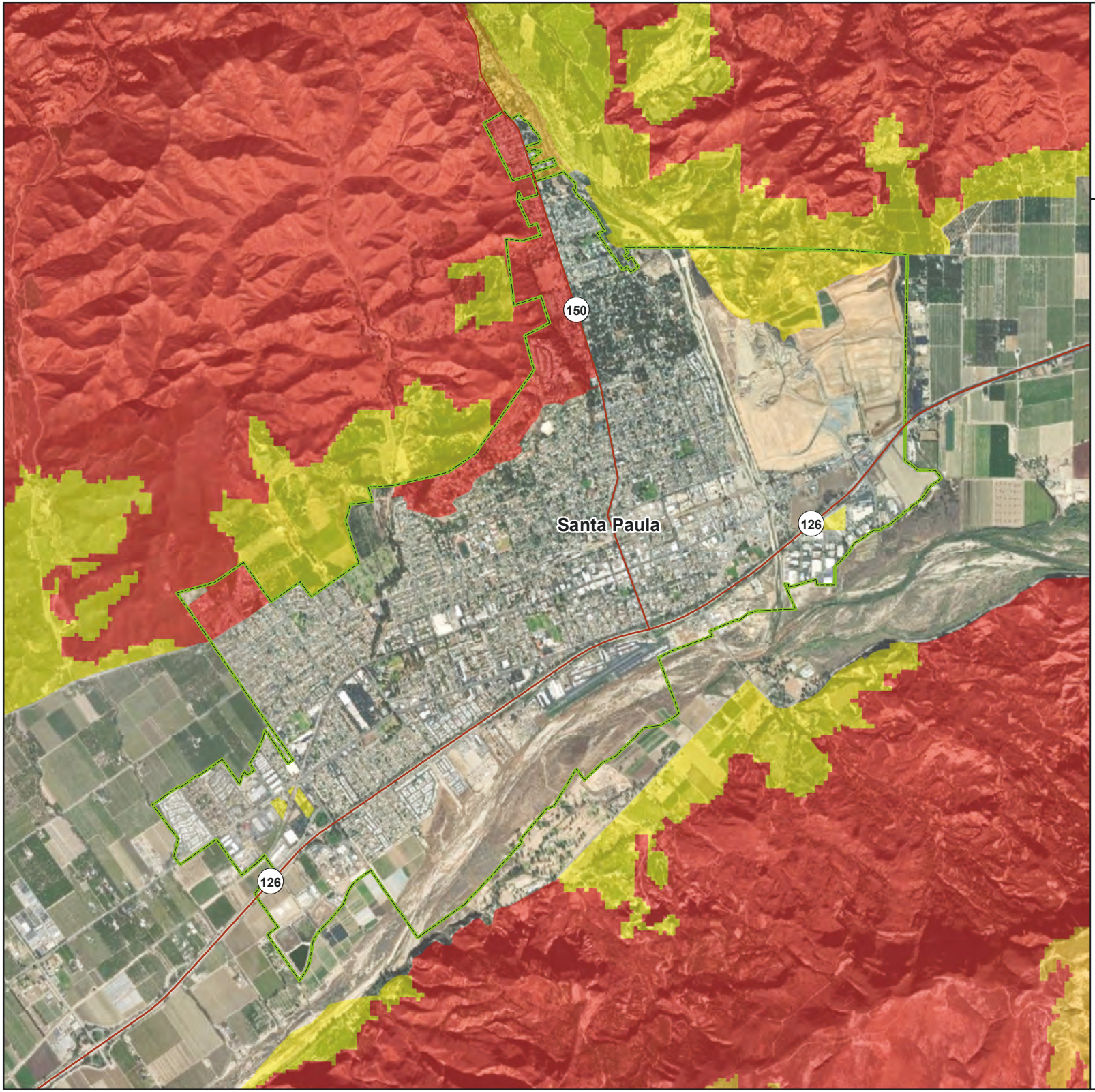


Santa Paula

Wildfire Hazard Severity Zones

- Moderate
- High
- Very High
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Data Sources: Ventura Co., CAL FIRE, Esri

N

0 0.225 0.45 0.9 Miles

9. CITY OF SIMI VALLEY

9.1 LOCAL HAZARD MITIGATION PLANNING TEAM

Primary Point of Contact
Eileen Connors, Emergency Services Manager
3901 Alamo Street
Simi Valley, CA 93063
Telephone: 805-583-6982
e-mail Address: econnors@simivalley.org

Alternate Point of Contact
Sean Gibson, Deputy ES Director/City Planner
2929 Tapo Canyon Rd.
Simi Valley, CA 93063
Telephone: 805-583-6383
email Address: sgibson@simivalley.org

This annex was developed by the local hazard mitigation planning team, whose members are listed in Table 9-1.

Table 9-1. Local Mitigation Planning Team Members

Name	Title
Chris Oberender	Deputy Public Works Director
Brent Siemer	Deputy Public Works Director
Samantha Argabrite	Deputy City Manager, City Manager's Office
Sean Gibson	Deputy ES Director/City Planner, Planning
Eileen Connors	Emergency Services Manager
Alison Phagan	Deputy Director, Administrative Services
Marvin Lopez	Administrative Services
Jeff Pike	Ventura County Fire Dept.

9.2 JURISDICTION PROFILE

9.2.1 Location and Features

The City of Simi Valley is in southeast Ventura County.

The current boundaries generally extend from the Santa Susana Mountains in the north to the Simi Hills in the south and east to the San Fernando Valley, encompassing an area of forty-two square miles.

Located just minutes from Los Angeles, Simi Valley offers a vibrant city full of cultural diversity, historical landmarks and beautiful rolling hills with the charm of a small town close to Southern California's most famous attractions. Simi Valley is Southern California's best kept secret, the perfect choice for a getaway, meeting, or wedding. The City is home to a variety of business industries,

including Aerospace, Commercial Aircraft, and Defense Manufacturing, software and technology, warehouse and distribution and auto and transportation.

9.2.2 History

The City of Simi Valley was incorporated in 1969 under the general laws of the State of California. It is believed that the name of the Chumash Indian Village “Shimiji” is the origin of the City’s name. Ta’apu is the origin of the names of Tapo Street and Tapo Canyon. The official City tree is the Coast Live Oak, whose acorns were used by the Chumash Indians for food. The official City flower is the California Wild Rose, from which the Chumash Indians ate vitamin-rich rosehips. In 1795, San José de Nuestra Señora de Altagracia y Simí was granted to Santiago Pico, one of 240 colonists from Mexico, by Spanish Governor Diego de Borica. This land grant, approximately 113,000 acres in size, was one of the largest ever made.

9.2.3 Governing Body Format

The City of Simi Valley operates under a General-Law/council-manager form of government.

The City Council of Simi Valley assumes responsibility for the adoption of this plan; the Emergency Services department will oversee its implementation.

9.3 CURRENT TRENDS

9.3.1 Population

According to the California Department of Finance, the population of the City of Simi Valley as of January 2020, was 125,115. Since 2010, the population has grown at an average annual rate of 0.06 percent.

9.3.2 Development

Early development in Simi Valley was agricultural in nature with a variety of crops and cattle grazing on much of the valley floor. As the City grew, development on the valley floor was characterized by a continuous pattern of suburban construction dominated by one and two-story buildings, schools, housing, shopping centers, community facilities, and places of employment, interspersed with parks and open spaces. As growth continued, available vacant land on the valley floor became more limited, and outward expansion of residential development into nearby hillsides occurred. Specific plans have been prepared for several larger-scale projects, in order to preserve the hillside areas as an important natural and visual resource and to provide for the orderly growth of these areas. Examples include the Wood Ranch Specific Plan, Runkle Canyon Specific Plan, and the Whiteface Specific Plan. Commercial development has also occurred in the community, the most recent being the region-serving Simi Valley Town Center.

The City has developed a region-serving shopping center, the Simi Valley Town Center, and a large residential development in the north-central part of the City called the Big Sky Ranch. Both projects incorporated significant hazard mitigation in the development process; they represent a major success story in the use of hazard mitigation policies to build a safe community. The North Simi Detention basin

was built to mitigate flooding in both developments, and in the process, removed downstream homes from the FEMA FIRM areas. The strict enforcement of building codes in the developments incorporated current seismic, fire, and flooding mitigation standards.

Simi Valley's land use pattern reflects the City's identity as a residential community with significant protected open space and parklands. Residential development represents the predominant land use in the City, making up more than 71 percent of its total land area. Parks and other public and semi-public uses such as schools, cemeteries, a regional landfill, and transportation rights-of-way make up just over 20 percent of the land uses. Industrial and commercial are the remaining land uses in the City, occupying approximately 5 percent and 3 percent, respectively, and represent the smallest component of the City's overall land use pattern.

Table 9-2 summarizes development trends in the period since the preparation of the previous hazard mitigation plan, as well as expected future development trends.

Table 9-2. Recent and Expected Future Development Trends

Criterion	Response					
Has your jurisdiction annexed any land since the preparation of the previous hazard mitigation plan?	No					
• **If yes, give the estimated area annexed and estimated number of parcels or structures.**	N/A					
Is your jurisdiction expected to annex any areas during the performance period of this plan?	Yes					
• **If yes, describe land areas and dominant uses.**	Approximately 486 acres of land spread across 447 parcels located on the north west of the City the north east of the City and around Sinaloa Lake. The uses in these areas include vacant and agricultural land as well as land improved with single family residences.					
• **If yes, who currently has permitting authority over these areas?**	Ventura County					
Are any areas targeted for development or major redevelopment in the next five years?	Yes					
• **If yes, briefly describe, including whether any of the areas are in known hazard risk areas**	The Lost Canyons Residential Development consisting of 364 single-family dwellings located on the northern outskirts of the City Limits is located in a Very High Fire Hazard Severity Zone and pockets of landslide and liquefaction hazards. These areas have been studied in the project's Environmental Impact Report and Mitigation Measures are in place to protect the public safety. The 210-unit North Canyons Ranch Project located adjacent to the northern City Boundary is located in a Very High Fire Hazard Severity Zone and small areas of landslide and liquefaction hazard areas. The project's EIR will address safety issues and mitigation measures to address these hazards					
How many permits for new construction were issued in your jurisdiction since the preparation of the previous hazard mitigation plan?		**2016**	**2017**	**2018**	**2019**	**2020**
	Single Family	101	87	91	51	53
	Multi-Family	35	8	29	27	3
	Other (commercial, mixed use, etc.)	16	5	6	5	3
	Total	**152**	**100**	**126**	**83**	**59**

Criterion	Response
Provide the number of new-construction permits for each hazard area or provide a qualitative description of where development has occurred.	• Special Flood Hazard Areas: 0 (New development is prohibited in the SFHA) • Landslide: * • High Liquefaction Areas: * • Tsunami Inundation Area: 0 • Wildfire Risk Areas: * *The City of Simi Valley includes substantial areas of earthquake-induced landscape and liquefaction areas, and wildfire-risk areas. Pursuant to the General Plan, Building Codes and geotechnical standards have been adopted to provide protection for new and renovated structures in these hazard areas. For Special Flood Hazard Areas, all new construction, substantial repair/improvements, and grading are prohibited. The City does not have any Tsunami Inundation Areas.
Describe the level of buildout in the jurisdiction, based on your jurisdiction's buildable lands inventory. If no such inventory exists, provide a qualitative description.	The City is virtually built out, with little undeveloped land remaining. The hillside open space areas surrounding the community are expected to remain substantially unchanged as development in these areas is regulated through the City's Hillside Performance Standards, which are designed to preserve the natural resources surrounding the community.

9.4 CAPABILITY ASSESSMENT

This section describes an assessment of existing capabilities for implementing hazard mitigation strategies. The introduction at the beginning of this volume of the hazard mitigation plan describes the components included in the capability assessment and their significance for hazard mitigation planning.

Findings of the capability assessment were reviewed to identify opportunities to expand, initiate or integrate capabilities to further hazard mitigation goals and objectives. Where such opportunities were identified and determined to be feasible, they are included in the action plan. The "Analysis of Mitigation Actions" table in this annex identifies these as community capacity building mitigation actions. The findings of the assessment are presented as follows:

- An assessment of planning and regulatory capabilities is presented in Table 9-3.
- Development and permitting capabilities are presented in Table 9-4.
- An assessment of fiscal capabilities is presented in Table 9-5.
- An assessment of administrative and technical capabilities is presented in Table 9-6.
- An assessment of education and outreach capabilities is presented in Table 9-7.
- Information on National Flood Insurance Program (NFIP) compliance is presented in Table 9-8.
- Classifications under various community mitigation programs are presented in Table 9-9.
- The community's adaptive capacity for the impacts of climate change is presented in Table 9-10.

Table 9-3. Planning and Regulatory Capability

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity?
Codes, Ordinances, & Requirements				
Building Code	Yes	No	Yes	Yes
Comment: ***Simi Valley Municipal Code, Title 8, Simi Valley Building Code; California Building Codes, Title 24 of the California Code of Regulations***				
Zoning Code	Yes	No	Portions	Yes
Comment: ***Simi Valley Municipal Code, Title 9, Planning and Zoning***				
Subdivisions	Yes	No	Yes	Yes
Comment: ***Simi Valley Municipal Code, Title 9, Planning and Zoning/ State Subdivision Map Act (Govt. Code Sec. 66410-66499.58), Title 7, Chapter 5 Flood Damage Prevention***				
Stormwater Management	Yes	Yes	Yes	Yes
Comment: ***Simi Valley Municipal Code, Title 7, Chapter 5 Flood Damage Prevention, National Flood Insurance Program (NFIP), NFIP Community Rating System, California State Water Quality Control Board MS4 Permit***				
Post-Disaster Recovery	Yes	No	Yes	Yes
Comment: ***Mandated by CalOES and FEMA for funding.***				
Real Estate Disclosure	Yes	No	Yes	Yes
Comment: ***SFHA & All-Hazards declaration (State, City)***				
Growth Management	Yes	No	Yes	Yes
Comment: ***Simi Valley General Plan***				
Site Plan Review	Yes	Yes	No	Yes
Comment: ***(Rancho Simi Recreation and Park District, VC Fire, VCPWA-WP) Simi Valley Municipal Code, Title 9, Planning and Zoning***				
Environmental Protection	Yes	Yes	Yes	Yes
Comment: ***CEQA***				
Flood Damage Prevention	Yes	Yes	No	Yes
Comment: ***Simi Valley Municipal Code, Title 7, Chapter 5 Flood Damage Prevention, National Flood Insurance Program (NFIP), NFIP Community Rating System SFHA (FEMA, City)***				
Emergency Management	Yes	No	Yes	Yes
Comment: ***Mandated by CalOES and FEMA for funding.***				
Climate Change	Yes	Yes	Yes	Yes
Comment: ***CEQA***				
Planning Documents				
General Plan	Yes	No	Yes	Yes
Is the plan compliant with Assembly Bill 2140? *Yes* ***Comment:*** ***Once Safety Element is updated in October 2021, this will comply with AB2140.***				
Capital Improvement Plan ***How often is the plan updated?*** ***Every Year*** ***Comment:*** ***City of Simi Valley Proposed Five Year Capital Improvement Plan***	Yes	No	No	Yes
Disaster Debris Management Plan	Yes	No	No	Yes
Comment: ***Must meet requirements for CalOES and FEMA funding***				
Floodplain or Watershed Plan	No	No	No	Yes
Comment: ***Both plans are in currently in conceptual form (FEMA, VCPWA-WP, City)***				
Stormwater Plan	Yes	No	No	No
Comment: ***2016 Master Plan of Drainage requires update (City)***				
Urban Water Management Plan	Yes	No	Yes	No
Comment: ***2020 Plan recently adopted***				

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity?
Habitat Conservation Plan	Yes	No	Yes	Yes
Comment: General Plan/CEQA addresses portions of this				
Economic Development Plan	Yes	No	No	Yes
Comment: City of Simi Valley Economic Development Plan				
Shoreline Management Plan	No	No	No	No
Comment: The City doesn't have shoreline.				
Community Wildfire Protection Plan	Yes	No	No	Yes
Comment: VCFPD's Ready, Set, Go! Wildfire Action Plan; Ventura County Fire Code Section W106- Fire Protection, Fuel Modification and Vegetation Management Plans and FHRP				
Forest Management Plan	No	No	No	No
Comment: The City doesn't have forests.				
Climate Action Plan	Yes	No	Yes	Yes
Comment: General Plan/CEQA addresses portions of this.				
Comprehensive Emergency Management Plan	Yes	No	Yes	Yes
Comment: Updating in 2022. Required by CalOES and FEMA for funding.				
Threat & Hazard Identification & Risk Assessment (THIRA)	Yes	No	No	Yes
Comment: The City relies on Ventura County's THIRA.				
Post-Disaster Recovery Plan	Yes	No	Yes	Yes
Comment: Opportunity to expand it in 2022 EOP update. Required by CalOES and FEMA for funding.				
Continuity of Operations Plan	Yes	No	Yes	Yes
Comment: Opportunity to expand it in 2022 EOP update. Required by CalOES and FEMA for funding.				
Public Health Plan	Yes	Yes	Yes	Yes
Comment: Opportunity to expand it in 2022 EOP update				

Table 9-4. Development and Permitting Capability

Criterion	Response
Does your jurisdiction issue development permits?	Yes
If no, who does? If yes, which department? Public Works issues Flood Area Development Permits for development within the SFHA. Environmental Services.	
Does your jurisdiction have the ability to track permits by hazard area?	No
Does your jurisdiction have a buildable lands inventory?	Yes

Table 9-5. Fiscal Capability

Financial Resource	Accessible or Eligible to Use?
Community Development Block Grants	Yes
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for Specific Purposes	Yes
User Fees for Water, Sewer, Gas or Electric Service	Yes
If yes, specify: Water and Sewer Fees	
Incur Debt through General Obligation Bonds	Yes
Incur Debt through Special Tax Bonds	Yes
Incur Debt through Private Activity Bonds	Yes
Withhold Public Expenditures in Hazard-Prone Areas	Yes

Financial Resource	Accessible or Eligible to Use?
State-Sponsored Grant Programs	Yes
Development Impact Fees for Homebuyers or Developers	Yes
Other	Yes (**Traffic Mitigation fees**)

Table 9-6. Administrative and Technical Capability

Staff/Personnel Resource	Available?
Planners or engineers with knowledge of land development and land management practices	Yes
If Yes, Department /Position: **Public Works/Deputy Director (Development Services) Public Works/Senior Engineer (Development Services) Environmental Services/Planning Division**	
Engineers or professionals trained in building or infrastructure construction practices	Yes
If Yes, Department /Position: **Public Works/Deputy Director (Development Services) Public Works/Senior Engineer (Development Services)**	
Planners or engineers with an understanding of natural hazards	Yes
If Yes, Department /Position: **Public Works/Deputy Director (Development Services)**	
Staff with training in benefit-cost analysis	Yes
If Yes, Department /Position: **Public Works/Deputy Director (Development Services)**	
Surveyors	Yes
If Yes, Department /Position: The City contracts surveying services with outside consultants.	
Personnel skilled or trained in GIS applications	Yes
If Yes, Department /Position: Public Works/GIS Coordinator, Police Dept/Emergency Services Manager	
Scientist familiar with natural hazards in local area	Yes
If Yes, Department /Position: **Public Works/Deputy Director (Development Services)**	
Emergency manager	Yes
If Yes, Department /Position: Police Dept/Emergency Services Manager	
Grant writers	Yes
If Yes, Department /Position: Police Dept/Emergency Services Manager. Administrative Services also contracts these services through an outside consultant	

Table 9-7. Education and Outreach Capability

Criterion	Response
Do you have a public information officer or communications office?	Yes
Do you have personnel skilled or trained in website development?	Yes
Do you have hazard mitigation information available on your website?	Yes
If yes, briefly describe: The City's 2015 Multi-Hazard Mitigation Plan is posted.	
Do you use social media for hazard mitigation education and outreach?	Yes
If yes, briefly describe: The City and SVPD use Twitter, Next Door and other outlets.	
Do you have any citizen boards or commissions that address issues related to hazard mitigation?	Yes
If yes, briefly describe: **NFIP CRS Program for Public Information Program and Committee; CERT and Disaster Service Worker volunteer teams.**	
Do you have any other programs in place that could be used to communicate hazard-related information?	Yes
If yes, briefly describe: **NFIP CRS Program for Public Information Program and Committee; AM530 Radio; Portable digital signs and SVTV cable channel.**	
Do you have any established warning systems for hazard events?	Yes
If yes, briefly describe: **The County of Ventura uses VC Alert and we encourage residents to sign up.**	

Table 9-8. National Flood Insurance Program Compliance

Criterion	Response
What local department is responsible for floodplain management?	Public Works
Who is your floodplain administrator? (department/position)	Public Works/Public Works Director
Are any certified floodplain managers on staff in your jurisdiction?	Yes
What is the date that your flood damage prevention ordinance was last amended?	February 27, 2017
Does your floodplain management program meet or exceed minimum requirements?	Exceeds
If exceeds, in what ways? All development within the SFHA, including fill, is prohibited. Additional higher regulatory design and construction standards have been codified in the SVMC.	
When was the most recent Community Assistance Visit or Community Assistance Contact?	December 3, 2021
Does your jurisdiction have any outstanding NFIP compliance violations that need to be addressed?	No
Are any RiskMAP projects currently underway in your jurisdiction?	No
Do your flood hazard maps adequately address the flood risk within your jurisdiction?	No
If no, state why. The Flood Insurance Study and FIRMs do not accurately represent true flood risk and are overtly conservative. The City is working with FEMA Region 9 to identify funding for either a RiskMap to correct these mapping issues or a Flood Hazard Study to support a subsequent City sponsored mapping change application to FEMA.	
Does your floodplain management staff need any assistance or training to support its floodplain management program?	Yes
If so, what type of assistance/training is needed? City staff needs training in grant management (NDGrants) and the Mapping Information Platform (MIP) in order to pursue FEMA grant funding for mapping projects.	
Does your jurisdiction participate in the Community Rating System (CRS)?	Yes
If yes, is your jurisdiction interested in improving its CRS Classification? Yes	
How many flood insurance policies are in force in your jurisdiction?	1,624
What is the insurance in force? $425,325,500	
What is the premium in force? $1,337,947	
How many total loss claims have been filed in your jurisdiction?	82
What were the total payments for losses? $116,840	

a. According to FEMA statistics as of March 31, 2021

Table 9-9. Community Classifications

	Participating?	Classification	Date Classified
FIPS Code	Yes	0611172016	N/A
DUNS #	Yes	076238211	N/A
Community Rating System	Yes	5	10/01/19
Building Code Effectiveness Grading Schedule	Yes	2	10/2/17
Public Protection	Yes	03/3X	12/21/2018
Storm Ready	No	N/A	N/A
Firewise	No	N/A	N/A
Tsunami Ready	N/A	N/A	N/A

Table 9-10. Adaptive Capacity for Climate Change

Criterion	Jurisdiction Rating
Technical Capacity	
Jurisdiction-level understanding of potential climate change impacts	Medium
Comment: *The General Plan Safety & Noise Chapter update was adopted on October 25, 2021, and includes new Emergency Preparedness Goals and Policies to respond to climate change.*	
Jurisdiction-level monitoring of climate change impacts	High
Comment: *City of Simi Valley Climate Action Plan*	
Technical resources to assess proposed strategies for feasibility and externalities	High
Comment: *City of Simi Valley Greenhouse Gas Inventory Policy, Climate Action Plan; City of Sim Valley Green Community Action Plan*	
Jurisdiction-level capacity for development of greenhouse gas emissions inventory	High
Comment: *City of Simi Valley Climate Action Plan*	
Capital planning and land use decisions informed by potential climate impacts	High
Comment: *Appendix A of General Plan, Policies Addressing Climate Change*	
Participation in regional groups addressing climate risks	Medium
Comment: *Ventura County Fire Protection District, Ventura County Health Department, Ventura County OES*	
Implementation Capacity	
Clear authority/mandate to consider climate change impacts during public decision-making processes	High
Comment: *General Plan was adopted on October 25, 2021*	
Identified strategies for greenhouse gas mitigation efforts	High
Comment: *City of Simi Valley Climate Action Plan*	
Identified strategies for adaptation to impacts	High
Comment: *City of Simi Valley Climate Action Plan*	
Champions for climate action in local government departments	High
Comment: *Planning, Public Works and City Manager's Office staff through the implementation of the General Plan, Climate Action Plan and efforts to enhance resiliency of City Buildings.*	
Political support for implementing climate change adaptation strategies	High
Comment: *The City Council voted to join the Clean Power Alliance, a Community Choice Aggregator, focused On providing clean energy to communities in Southern California.*	
Financial resources devoted to climate change adaptation	High
Comment: *The City has undertaken a multi-million dollar project at the Wastewater Treatment Plant to Enhance the City's resiliency; has invested in solar, battery back-up systems for City facilities, LED lighting, and similar projects.*	
Local authority over sectors likely to be negative impacted	High
Comment: *Businesses must abide by the California Green Building Code, the City's General Plan. However, Many sectors are regulated by the State and Federal government.*	
Public Capacity	
Local residents' knowledge of and understanding of climate risk	Medium
Comment: *Staff does consistent outreach to the community regarding the need for water conservation due to Drought, preparation for PSPS events due to severe weather and possible Wildfire, but there is opportunity for improvement.*	
Local residents' support of adaptation efforts	Medium
Comment: *Some Simi Valley residents have adopted the use of solar panels to be less reliant on the grid but there are other opportunities that can be explored.*	
Local residents' capacity to adapt to climate impacts	Medium
Comment: *Residents have been installing solar panels and buying electric vehicles, but there are other opportunities that can be explored.*	

Criterion	Jurisdiction Rating
Local economy current capacity to adapt to climate impacts	Medium
Comment: *The City has a diversified economy, which can adapt to climate impacts, but much of the workforce needs training to stay current.*	
Local ecosystems capacity to adapt to climate impacts	Low
Comment: *The City does not have the specialized staff and funding to revamp the ecosystem to be more resilient.*	

a. High = Capacity exists and is in use; Medium = Capacity may exist, but is not used or could use some improvement; Low = Capacity does not exist or could use substantial improvement; Unsure= Not enough information is known to assign a rating.

9.5 INTEGRATION REVIEW

For hazard mitigation planning, "integration" means that hazard mitigation information is used in other relevant planning mechanisms, such as general planning and capital facilities planning, and that relevant information from those sources is used in hazard mitigation. This section identifies where such integration is already in place, and where there are opportunities for further integration in the future. Resources listed at the end of this annex were used to provide information on integration. The progress reporting process described in Volume 1 of the hazard mitigation plan will document the progress of hazard mitigation actions related to integration and identify new opportunities for integration.

9.5.1 Existing Integration

Some level of integration has already been established between local hazard mitigation planning and the following other local plans and programs:

- **2016 Master Plan of Drainage—**SVMC 7-5.605, Flood Damage Prevention, Standards for subdivisions and other proposed development.
- **NFIP CRS Program for Public Information—**NFIP CRS PPI Plan adopted by the City Council.
- **Emergency Operations Plan—**The EOP explains how the City will plan for, respond to and recover from hazards and disasters. Disaster Debris Management is included in the EOP.
- **Simi Valley General Plan—**Safety Element addresses integration of hazard mitigation into the overall development of the City's and identifies policies and implantation programs.
- **Simi Valley Municipal Code, Title 9, Planning and Zoning—**Planning and Building Code integrate safe building and land use practices to mitigate risk.
- **California Environmental Quality Act—**Requires the assessment of wildlife risk, climate change impacts and environmental impacts on land development projects in the City of Simi Valley.

9.5.2 Opportunities for Future Integration

The capability assessment in this annex indicates opportunities to integrate this mitigation plan with other jurisdictional planning/regulatory capabilities. Capabilities were identified as integration opportunities if they can support or enhance the actions identified in this plan or be supported or enhanced by components of this plan. The capability assessment identified the following plans and

programs that do not currently integrate hazard mitigation information but provide opportunities to do so in the future:

- **Post-Disaster Recovery Plan—**The City can expand the 2015 HMP recovery plan into a more detailed version.
- **Continuity of Operations Plan**—The City can expand the current recovery plan to build on the goals and objectives identified in the hazard mitigation plan.
- **Public Health Plan**—The City can expand the current recovery plan to build on the goals and objectives identified in the hazard mitigation plan.
- **Economic Development Plan**—The City can look for mitigation opportunities in private sector partnerships.
- **Home Rehabilitation Program—**The City can investigate expanding the program to incorporate clean energy technology.

Taking action to integrate each of these programs with the hazard mitigation plan was considered as a mitigation action to include in the action plan in this annex.

9.6 RISK ASSESSMENT

9.6.1 Jurisdiction-Specific Natural Hazard Event History

Table 9-11 lists past occurrences of natural hazards for which specific damage was recorded in this jurisdiction Other hazard events that broadly affected the entire planning area, including this jurisdiction, are listed in the risk assessments in Volume 1 of this hazard mitigation plan.

Table 9-11. Past Natural Hazard Events

Type of Event	FEMA Disaster #	Date	Damage Assessment
COVID-19 Pandemic	DR-4482	01/20/20 – continuing	N/A
Severe Weather	N/A	02/28/2021	Strong and gusty Santa Ana winds impacted the coastal valleys of Ventura County. Some peak north to northeast wind reports from the local mesonet included east Simi Valley (gust 61 mph).
Wildfire (Easy Fire)	FM-5298	10/30-11/2/2019	The three-day fire burned 1,806 acres in west Simi Valley and threatened the Reagan Presidential Library.
Wildfire (Woolsey Fire)	DR-4407	11/8-25/2018	This fire was active for 56 days in Ventura and LA counties. It burned over 96,000 acres south of Simi Valley and is the eighth most destructive fire in California history.
Wildfire (Peak Fire)	N/A	11/12/2018	This one-day fire burned 186 acres east of Simi Valley off Hwy 118 and Rocky Peak Road.
Wildfire, Flooding, Landslide	DR-4353	12/4/2017-1/31/2018	Wildfire, Mudflows and Debris Flows

Type of Event	FEMA Disaster #	Date	Damage Assessment
Wildfire (Thomas Fire)	FM-5224	12/4/2017	Rancho Simi Recreation and Park District $4M, SVPD $35K in SVPD overtime. This fire was active for 38 days in Ventura and Santa Barbara counties. It was started by power lines and burned over 280,000 acres and destroyed 1,063 structures. Rye Fire burned 12/5-12/2017 in Santa Clarita but didn't reach Simi Valley.
Wildfire (Kuehner Fire)	N/A	7/1/2016	This one-day fire burned 45 acres off Hwy 118 at Rocky Peak Road, northeast of Simi Valley.
Wildfire (Rustic Fire)	N/A	8/16/2015	This one-day fire threatened 500 homes in southwest Simi Valley before being extinguished. Residents were advised to prepare to evacuate their animals, especially livestock, but no evacuation orders were issued.
Flooding	N/A	12/12/2014	Heavy rain produced flash flooding and mud and debris flows in the community of Simi Valley. Law enforcement reported mud flows across Hwy 118 at Kuehner Drive.
Wildfire (Springs Fire)	FM-5024	5/2-11/2013	Impacted Ventura County.
Severe Storm and Flooding	N/A	1/18-22/2010	Heavy rain, gusty winds, and heavy snow were witnessed in Ventura County. Rainfall totals ranged from 4-8 inches over coastal areas to 8-16 inches in the foothills and mountains. Flash flood watches were issued in areas of Ventura County that were damaged by wildfires in 2008.
Wildfire, Flooding, Landslide	DR-1731	10/21/2007-3/31/2008	Minor flooding of streets; First Street bridge flooded, which is common with heavy rain. Los Angeles Ave/Madera Road intersection flooded. A blocked storm drain near Santa Susana Park at Katherine Road resulted in the flooding of a few homes.
Wildfire (Sesnon Fire)	N/A	10/13-18/2008	EOC activated 10/13-15/2008. Fire active from 10/13 – 18/2008.
Severe Weather	DR-1689	1/11-17/2007	Freeze.
Wildfire (Day Fire)	FM-2677	9/25-30/2006	Burned 162,000 acres over 28 days north of Simi Valley.
Wildfire (School Fire)	FM-2586	11/18-23/2005	Burned almost 4,000 acres over four days near the City of Ventura.
Wildfire (Topanga Fire)	FM-2583	9/28-10/10/2005	This Chatsworth-area fire burned along the LA/Ventura counties border for seven days, destroying over 24,000 acres.
Flooding	DR-1585	2/16-23/2005	Madera Rd/Los Angeles Ave flooded
Severe Storms and Flooding	DR-1577	12/27/2004-1/11/2005 (Simi Valley: 1/7-11/2005)	$21,588. In January 2005, winter storms brought heavy rains to the region. The Ventura River reached a maximum stage of 17.5 feet and maximum discharge of 152,560 cfs. High water flows, scouring, and washouts in the Ventura River damaged several water wells and exposed water lines owned by the Ojai Valley Sanitary District. Severe erosion occurred along both embankments of the Ventura River. The Calleguas Creek topped its banks near the state hospital in Camarillo. Damage from the January 2005 storms totaled more than $200 million.
Wildfire (Simi Fire)	FM-2504	10/24 – 11/11/2003	Per CAL FIRE: 108K acres burned, 315 structures destroyed, 11 structures damaged.
Wildfire	DR-1498	10/21/2003-3/31/2004	Impacted Ventura County.

Type of Event	FEMA Disaster #	Date	Damage Assessment
Severe Storms, Tornado, High Winds and Flooding	DR-1267	12/20-28/1998	Impacted Ventura County.
Severe Winter Storms and Flooding ("El Nino" winter)	DR-1203	2/2 – 4/30/1998	In this "El Nino" winter, Simi Valley received 17.2 inches of rain during February. The maximum flow in Calleguas Creek as recorded at the California State University Channel Islands was 21,600 ft^3/s, which caused overtopping of the bridges at Pacific Coast Highway.
Wildfires (Calabasas/Malibu Fires)	EM-3120	10/21-31/1996	Impacted Ventura County.
Severe Storms and Flooding	DR-1046	2/13-4/19/1995 (Simi Valley: 1/3-10/1995; 3/10/1995)	Rainfall intensities in some locations were equivalent or greater than 100-year frequency precipitation. Significant local flooding occurred as a result of channels and local storm drains being overtaxed. On March 10, a cooler winter storm brought significant amounts of precipitation with damaging results due to the saturated soil conditions. The peak flow recorded on Calleguas Creek at the stream gauge above Highway 101 was 9,120 ft^3/s and at the CSUCI gauge, it was 14,900 ft^3/s.
Earthquake (Northridge)	DR-1008	1/17-11/30/1994	The Simi Valley Police station was badly damaged and eventually had to be abandoned. Hwy 118 was badly damaged and unusable for months. In the greater Los Angeles area, the 6.7 earthquake caused 57 deaths; 9,253 injuries and displaced over 20,000 people.
Wildfires, Mud & Landslides, Soil Erosion & Flooding	DR-1005	10/26-4/22/1994	Impacted Ventura County.
Severe Storm, Mud & Landslides, Flooding	DR-979	1/5-3/20/1993	Impacted Ventura County.
Severe Storm, Severe Weather, Flooding, Mud & Landslide	DR-935	2/10-19/1992	The storm lasted five days, leaving flood control structures damaged, full of debris, and vulnerable to future storms. Of primary concern in Ventura County was erosion of channels and removal of debris following flood flows. The seven-day depths in Ventura County ranged from 6 to 13 inches, which represented about 60-65 percent of the mean annual rainfall. Although the peak flow in Calleguas Creek was estimated to be about a 10-year event, approximately one million cubic yards of sediment was deposited in the channel system. Conejo Creek contributed much of the sediment, as it was running higher than Calleguas Creek at the confluence of the two streams. On Calleguas Creek, the Lewis Street bridge abutments were undermined and required stone placement on them to prevent further damage.
Severe Weather (Severe Freeze)	DR-894	12/19/1990-1/3/1991	Minor flooding of streets, including the First Street bridge and Los Angeles Ave/Madera Road.
Severe Storm and Flooding	DR-677	1/21-3/30/1983 (Ventura County: 2/25-3/3/1983)	With the ground wet from a January storm, heavy precipitation produced high flows in most creeks in southern California. On Collogues Creek, at the CSUCI stream gage, Madera St. stream gauge, and the stream gauge above Highway 101, the peak discharges of record occurred, 26,600 ft^3/s, 10,570 ft^3/s and 17,200 ft^3/s, respectively. As in 1980, the Calleguas Creek levee was breached. The maximum peak discharge on Conejo Creek at the stream gauge above Highway 101 was 14,000 ft^3/s.

Type of Event	FEMA Disaster #	Date	Damage Assessment
Severe Storm and Flooding	N/A	2/13-22/1980	A series of varying intensity fronts coming from the west soaked southern California with eight days of nearly continuous rain. Six storms moved through southern California during February 13-22. The strongest front passed the area midday on Saturday February 16, producing the second highest peak discharge of record on Calleguas Creek of 25,300 ft³/s at the CSUCI stream gauge, 9,310 ft³/s at the Madera St. stream gauge, and 14,000 ft³/s at the stream gauge above Highway 101. This storm caused a breach of the west levee of Calleguas Creek below Hueneme Road, with an estimated total of 24,000 acre-ft of water flowing through the breach before it was repaired. The maximum peak discharge on Conejo Creek at the stream gauge above Highway 101 was 11,800 ft³/s.
Severe Storms and Flooding	DR-547	2/15/1978 (Simi Valley: 2/28-3/5/1978)	Storms and accompanying flooding throughout February saturated the ground. A last front on March 4 brought heavy rain, thunderstorms and gale force winds. Measurements were 7,730 ft³/s at the Madera St. stream gauge and 8,600 ft³/s at the Moorpark stream gauge.
Severe Storms and Flooding	DR-364	2/8/1973	Impacted Ventura County.
Wildfire	DR-295	9/29/1970	Impacted Ventura County.

9.6.2 Hazard Risk Ranking

Table 9-12 presents a local ranking of all hazards of concern for which this hazard mitigation plan provides complete risk assessments. As described in detail in Volume 1, the ranking process involves an assessment of the likelihood of occurrence for each hazard, along with its potential impacts on people, property, and the economy. Mitigation actions primarily target hazards with high and medium rankings.

Table 9-12. Hazard Risk Ranking

Rank	Hazard	Risk Ranking Score	Risk Category
1	Wildfire	36	High
1	Landslide	36	High
3	Earthquake	32	Medium
4	Flooding	24	Medium
4	Severe Storms	24	Medium
4	Severe Weather	24	Medium
5	Dam Failure	22	Medium
6	Drought	9	Low

9.6.3 Jurisdiction-Specific Vulnerabilities

Volume 1 of this hazard mitigation plan provides complete risk assessments for each identified hazard of concern. This section provides information on a few key vulnerabilities for this jurisdiction. Available jurisdiction-specific risk maps of the hazards are provided at the end of this annex.

Repetitive Loss Properties

Repetitive loss records are as follows:

- Number of FEMA-identified Repetitive-Loss Properties: 0
- Number of FEMA-identified Severe-Repetitive-Loss Properties: 0
- Number of Repetitive-Loss Properties or Severe-Repetitive-Loss Properties that have been mitigated: 0

Other Noted Vulnerabilities

The following jurisdiction-specific issues have been identified based on a review of the results of the risk assessment, public involvement strategy, and other available resources:

- Water tanks and system could be attacked by terrorists using chemical, biological, radiological, nuclear, explosive or other weapons.
- Frequent wildfires along the 118 Freeway, mostly caused by humans.

Mitigation actions addressing these issues were prioritized for consideration in the action plan in this annex.

9.7 STATUS OF PREVIOUS PLAN ACTIONS

Table 9-13 summarizes the actions that were recommended in the previous version of the hazard mitigation plan and their implementation status at the time this update was prepared.

Table 9-13. Status of Previous Plan Actions

Action Item	Completed	Removed; No Longer Feasible	Carried Over to Plan Update	
			Check if Yes	Action # in Update
1.A.1 Modify the City's zoning ordinance as necessary to address development in hazard areas and reflect changes in the General Plan.			✓	SIM-2
Comment: *This is an ongoing process. Safety Element of the Simi Valley General Plan update was adopted in October, 2021. In the update, this action has been reworded for a broader application.*				
1.B.1 Modify local building codes to address development issues in hazard areas. *In the update, this action has been reworded for a broader application.*			✓	SIM-2
Comment: *This is an ongoing process. Ordinance 1268 was adopted in 2017 rewriting and significantly expanding the Flood Damage Prevention Ordinance to codify historic City policy and practice as higher regulatory standards for development citywide and particularly within the Special Flood Hazard Areas.*				
1.B.2 Actively participate in the state and national building code development groups to ensure that development issues in hazard areas are properly addressed.			✓	SIM-2
Comment: *This is an ongoing process. In the update, this action has been reworded for a broader application.*				
1.B.3 Require site-specific studies to evaluate specific hazards in hazard-prone areas and identify alternative site design criteria to mitigate hazards to the maximum extent possible.			✓	SIM-8
Comment: *Geotechnical, Soils, and Drainage studies are required for all development. The Planning process requires site-specific studies mostly through the CEQA process to evaluate hazards and promote alternative site design criteria. SVMC 9-64.100, Development Code, Geotechnical (Soils) Reports, SVMC 7-5.602, Flood Damage Prevention, Standards of Construction. This is an ongoing action. In the update, this action has been reworded for a broader application.*				

Action Item	Completed	Removed; No Longer Feasible	Carried Over to Plan Update	
			Check if Yes	Action # in Update
1.C.1 Review General Plan, Zoning Codes, Fire Codes, Subdivision Ordinance, and Building Code for consistency.			✓	SIM-2
Comment: *The municipal code is routinely reviewed to ensure consistency with NFIP and CRS standards and requirements along with current floodplain management state of practice. This is an ongoing action. In the update, this action has been reworded for a broader application.*				
1.C.2 Establish hazard mitigation training for development staff.			✓	SIM-8
Comment: *PW Development Services staff maintains competency in floodplain management through continual training and at least one staff member holds a Certified Floodplain Manager certificate from the American Society of Floodplain Managers. This is an ongoing action. In the update, this action has been reworded for a broader application.*				
1.D.1 Update databases/Geographic Information System (GIS), with particular attention to maintaining hazard overlay layers.			✓	SIM-8
Comment: *The City's NFIP SFHA GIS layers are updated whenever FEMA issues FIRM updates and on an ongoing basis. ESRI will perform annual maintenance on GIS system. In the update, this action has been reworded for a broader application.*				
2.A.1 Assist local mobile home parks with their community preparedness plans.			✓	SIM-10
Comment: *SVOES can conduct outreach via a preparedness campaign. Not completed due to lack of staff capacity. In the update, this action has been reworded for a broader application.*				
2.A.2 Develop and conduct a variety of community workshops to educate about earthquake preparedness and the benefits of retrofitting buildings for improved seismic performance. *In the update, this action has been reworded for a broader application.*			✓	SIM-10
Comment: *SVOES can conduct outreach via a preparedness campaign in partnership with Building & Safety. Not completed due to lack of staff capacity.*				
2.A.3 Increase awareness among at-risk populations of emerging earthquake damage mitigation techniques.			✓	SIM-10
Comment: *SVOES can conduct outreach via a preparedness campaign. Not completed due to lack of staff capacity. In the update, this action has been reworded for a broader application.*				
2.A.4 Develop a program that identifies the needs of senior citizens and assists them to meet those needs.		✓		
Comment: *The County is responsible for keeping updated records on seniors who may need assistance evacuating in an emergency. This is not a responsibility of the City.*				
2.B.1 Provide hazard mitigation links on the Chamber of Commerce's website and the City's website.			✓	SIM-10
Comment: *SVOES can conduct outreach via a preparedness campaign. Not completed due to lack of staff capacity. In the update, this action has been reworded for a broader application.*				
3.A.1 Promote the upgrade of buildings to provide acceptable performance during an earthquake and adopt cost-effective mitigation techniques for both structural and non-structural elements.			✓	SIM-1 SIM-9
Comment: *SVOES can conduct outreach via a preparedness campaign in partnership with Building & Safety. Not completed due to lack of staff capacity. In the update, this action has been reworded for a broader application.*				
3.A.2 Conduct a seismic safety survey/assessment of the City's facilities to ensure that heavy furniture and equipment are properly secured. ***Comment:*** *Ongoing as personnel are added and moved. In the update, this action has been reworded for a broader application.*			✓	SIM-9

Action Item	Completed	Removed; No Longer Feasible	Carried Over to Plan Update	
			Check if Yes	Action # in Update
3.A.3 Support legislative efforts to provide funding for hospital earthquake retrofit projects.		✓		
Comment: *This is not currently in our Legislative Platform and would need to be included in order for the City to take action on legislation without going to the Council for approval first.*				
3.B.1 Retrofit water system infrastructure to seismic safety standards.			✓	SIM-9
Comment: *A seismic evaluation of water system infrastructure was completed in 2021. The District will schedule projects to improve and replace facilities based on public safety and operational importance. In the update, this action has been reworded for a broader application.*				
3.B.2 Retrofit sanitation system infrastructure to seismic safety standards	✓			SIM-1
Comment: *The building seismic retrofit projects that were identified in the 2011 Sanitation Asset Reliability Assessment have been completed. In the update, this action has been reworded for a broader application.*				
3.B.3 Conduct seismic non-structural and structural retrofit of critical facilities and infrastructure.			✓	SIM-1 SIM-9
Comment: *Construction has begun on a project to repair and replace structural elements at the City's Public Services Center and Garage Facility. Anticipated completion is Spring 2022. In the update, this action has been reworded for a broader application.*				
3.C.1 Identify multi-unit buildings (e.g. soft story construction) that may suffer structural failures in earthquakes.			✓	SIM-9
Comment: *This is an opportunity for earthquake mitigation. Not completed due to lack of staff capacity and funding. In the update, this action has been reworded for a broader application.*				
4.A.1 Implement a fuel reduction program, such as the collection and disposal of dead fuel, within open spaces and around critical facilities and residential structures with high or very high wildfire zones.			✓	SIM-12
Comment: *VCFPD Ordinance 31 and Fire Hazard Reduction Program, which is an ongoing program. In the update, this action has been reworded for a broader application and to align with VCFPD's lead.*				
4.A.2 Create a vegetation management program that provides vegetation management services to the elderly, disabled, or low income property owners who lack the resources to remove flammable vegetation near their homes.			✓	SIM-12
Comment: *This is an opportunity for wildfire mitigation. Not completed due to lack of staff capacity. In the update, this action has been reworded for a broader application and to align with VCFPD's lead.*				
4.A.3 Implement a fuel modification program that includes maintenance requirements, plan submittal and approval process and enforcement.	✓			SIM-12
Comment: *Ventura County Fire Code Section W106- Fire Protection, Fuel Modification and Vegetation Management Plans and FHRP Ongoing program. In the update, this action has been reworded for a broader application and to align with VCFPD's lead.*				
5.A.1 Limit uses in floodways to those tolerant of occasional flooding, including but not limited to agriculture, outdoor recreation and natural resource areas.			✓	SIM-4
Comment: *Development within floodways is prohibited. Maintenance of open space as a natural resource area and/or for recreation and agriculture is encouraged. SVMC 7-5.601, Flood Damage Prevention, Prohibitions. Simi Valley General Plan Open Space Element. Ongoing. In the update, this action has been reworded for a broader application.*				
5. B.1 Discourage the disruption of natural flowage patterns and encourage the use of natural drainage ways in new development.			✓	SIM-4
Comment: *Disruption of natural flowage patterns is prohibited and maintenance of natural drainage ways within new development is enforced. SVMC 9-32.120, Development Code, Drainage Standards. Ongoing. In the update, this action has been reworded for a broader application.*				

Action Item	Completed	Removed; No Longer Feasible	Carried Over to Plan Update: Check if Yes	Carried Over to Plan Update: Action # in Update
5.C.1 Submit Letters of Map Revision/ Letters of Map Amendment to FEMA within a prescribed period of time upon completion of drainage improvements or flood-proofing. SVMC 7-5.605, Flood Damage Prevention, Standards for subdivisions and other proposed development			✓	SIM-4
Comment: *SVMC 7-5.605, Flood Damage Prevention, Standards for subdivisions and other proposed development. Ongoing. In the update, this action has been reworded for a broader application.*				
6.A.1 Create and maintain a mailing list of all addresses with dam inundation areas for mailings and public information documents.			✓	SIM-14
Comment: *Creation of the mailing list is pending CalOES approval of VCPWA-WP EAPs for each of the 3 State jurisdictional dams within the City. Inundation maps and EAPs for jurisdictional dams owned by the Calleguas Municipal Water District and the Sinaloa Lake homeowners' association are also pending. In the update, this action has been reworded for a broader application.*				
6.A.2 Create and maintain a special grouping for emergency notification system users within the dam inundation areas for emergency information delivery. ***Comment:*** *OES will leverage VC Alert. Ongoing. In the update, this action has been reworded for a broader application.*			✓	SIM-14
7.A.1 Increase field personnel's awareness of hazardous materials incidents and the proper response.			✓	SIM-11
Comment: *SVPD conducts regular trainings during briefings and will continue these. In the update, this action has been reworded for a broader application.*				
7.B.1 Establish and maintain relationships with operators and regulators involved in the transport, extraction, processing and use of hazardous materials.			✓	SIM-11
Comment: *City code Title 6 Chapter 10 addresses hazardous wastes. Title 9 Chapter 9-26.070 regulates industrial storage. Title 6 Chapter 13 describes the need for plans to prevent releases of hazardous materials/wastes into the sewer system. Dept. Of Transportation regulates rail cars. The Ventura County Certified Unified Program Agency regulates the storage of hazardous materials on commercial properties. Ongoing. In the update, this action has been reworded for a broader application.*				

9.8 HAZARD MITIGATION ACTION PLAN

Table 9-14 lists the identified actions, which make up the hazard mitigation action plan for this jurisdiction. Table 9-15 identifies the priority for each action. Table 9-16 summarizes the mitigation actions by hazard of concern and mitigation type.

Table 9-14. Hazard Mitigation Action Plan Matrix

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline
Action SIM-1—Where appropriate, support retrofitting, purchase or relocation of structures located in hazard areas, prioritizing those that have experienced repetitive losses and/or are located in high- or medium-risk hazard areas.						
Hazards Mitigated: Wildfire, Landslide, Earthquake, Flooding, Severe Storms, Severe Weather, Dam Failure						
Existing	9, 10, 11, 16	City of Simi Valley	Ventura County OES	High	FEMA HMA (BRIC, FMA, PDM and HMGP)	Short-term
Action SIM-2—Integrate the hazard mitigation plan into other plans, ordinances and programs that dictate land use decisions in the community, including Simi Valley General Plan, Municipal Code, Zoning Ordinance.						
Hazards Mitigated: Wildfires, Landslides, Earthquakes, Flooding, Dam Failure						
New & Existing	1, 2, 4, 5, 6, 9, 10, 11, 13, 14, 15, 16	City of Simi Valley	Ventura County Fire Dept, VCSOES	Low	Staff Time, General Funds	Ongoing

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline
Action SIM-3—Actively participate in the plan maintenance protocols outlined in Volume 1 of this hazard mitigation plan.						
Hazards Mitigated: Wildfire, Landslide, Earthquake, Flooding, Severe Storms, Severe Weather, Dam Failure, Drought						
New & Existing	1-19	City of Simi Valley	Ventura County Fire Dept, VCSOES	Low	Staff Time, General Funds	Short-term
Action SIM-4—Continue to maintain good standing and compliance under the NFIP through implementation of floodplain management programs that, at a minimum, meet the NFIP requirements: • Enforce the flood damage prevention ordinance. • Participate in floodplain identification and mapping updates. • Provide public assistance/information on floodplain requirements and impacts.						
Hazards Mitigated: Flooding, Dam Failure, Severe Storms						
New & Existing	1, 4, 11	City of Simi Valley	Public Works	Low	Staff Time, General Funds	Ongoing
Action SIM-5—Identify and pursue strategies to increase adaptive capacity to climate change including but not limited to the following: • Update the Climate Action Plan and other City plans, when necessary and applicable to remain in compliance and leverage opportunities. • Explore clean air technologies for City equipment and infrastructure.						
Hazards Mitigated: Wildfire, Landslide, Flooding, Drought						
New & Existing	1, 3, 4	City of Simi Valley	Interdepartmental	Low	Staff Time, General Funds	Short-term
Action SIM-6—Purchase generators for critical facilities and infrastructure that lack adequate backup power, including City Hall, Police Station and Senior Center.						
Hazards Mitigated: Wildfire, Landslide, Earthquake, Flooding, Severe Storms, Severe Weather, Dam Failure						
Existing	2, 6, 9	City Manager's Office	Public Works	High	Staff time, General and enterprise funds, HMGP, BRIC	Long-term
Action SIM-7—Develop evacuation routes and plans, partnering with neighboring cities and counties.						
Hazards Mitigated: Wildfire, Landslide, Earthquake, Flooding, Dam Failure						
Existing	1, 2, 8, 17	City of Simi Valley	Cities of Thousand Oaks & Moorpark; VCSOES; VCFPD	Low	Staff Time, CDBG20, FEMA HMA (BRIC, FMA, HMGP),	Short-term
Action SIM-8—Increase knowledge of hazard areas and understanding of vulnerability and risk to life and property in hazard-prone areas, including but not limited to these items: • Conduct site-specific studies to evaluate hazards and identify alternative site design criteria. • Continue ongoing training for development staff. • Update GIS hazard overlay layers. • Map new earth movement hazards and make information available to staff, developers, and residents so that soil types, slope percentage, drainage, or other critical factors are used to identify landslide prone areas • Develop flood-after-fire scenarios after wildland fires to identify risks and develop mitigation measures						
Hazards Mitigated: Earthquake, Wildfire, Landslide, Flooding, Dam Failure, Severe Storms, Severe Weather						
New & Existing	1, 2, 3, 5, 6, 7, 8, 9, 12, 14, 15, 16, 17, 19	Public Works	Environmental Services	Medium	General Fund/Staff time, HMGP, BRIC, FMA	Ongoing
Action SIM-9—Perform structure-specific, all-risk, vulnerability assessment of all City-owned critical facilities (including bridge, water, sanitation and storm drain infrastructure). Identify potentially vulnerable private utility systems including electric, gas, oil, water, sewer, communications and internet.						
Hazards Mitigated: Earthquake, Flooding, Severe Storms, Severe Weather, Dam Failure						
Existing	1, 2, 4, 6, 9, 18, 19	Building & Safety	Public Works	Low	General Fund/Staff time, HMGP, BRIC, FMA	Long-term

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline
Action SIM-10—Create and conduct hazard mitigation and emergency preparedness outreach campaigns for the low-to-moderate income and Spanish-speaking communities then adapt and expand these campaigns to other demographics and the whole community. *Hazards Mitigated:* Earthquake, Wildfire, Landslide, Flooding, Dam Failure, Severe Storms, Severe Weather						
Existing	1, 2, 4, 5, 7, 10, 12, 13, 14, 15, 16, 17, 18	SVOES	City of Simi Valley, VCSOES, VCFPD	Low	Staff Time, CDBG20, HMGP	Short-term, Ongoing
Action SIM-11—The City shall continue to provide inspections, emergency response, and enforcement of hazardous materials and waste compliance procedures in the community. The City shall continue to work with relevant agencies regarding enforcement of hazardous materials regulations and continue to conduct household hazardous waste collection events. *Hazards Mitigated:* Earthquake, Wildfire, Flooding, Dam Failure						
Existing	1, 4, 16, 18, 19	Public Works	Ventura County Certified Unified Program Agency	Low	Staff Time	Ongoing
Action SIM-12—Maintain wildfire hazard fuel reduction program for areas that have been identified with overgrown or dead brush, trees and weeds to reduce the potential for tree-to-tree ignition. Ensure that a "maintenance now" component to provide continued fire resistance is part of the program. (Coordinates with Ventura County Fire Protection District Action VFP-6) *Hazards Mitigated:* Wildfire						
New & Existing	2, 4, 5, 6, 8, 10, 11, 13, 14, 15, 18, 19	VCFPD	CAL FIRE & USDA	Medium	FEMA HMA (BRIC, FMAP and HMGP), Staff Time & General Funds	Ongoing
Action SIM-13—The City shall amend the local building code to account for additional climate change-induced stressors on buildings, such as including flood proofing for intermittent inundation, building materials to reduce the impacts of high heat days, and fireproofing in preparation for increased wildfire risk. *Hazards Mitigated:* Wildfire, Flooding, Severe Storm, Severe Weather						
New & Existing	4, 9, 10, 11, 12, 16, 17	Environmental Services	Public Works	Low	Staff time, HMGP, BRIC, FMA	Ongoing
Action SIM-14—Create a levee and dam failure element for the City's emergency response plan, including but not limited to these items: Assess downstream impacts associated with dam incidents. Develop a public outreach program that informs property owners located in the dam and levee failure inundation areas about voluntary flood insurance. *Hazards Mitigated:* Dam Failure						
New & Existing	1, 7, 9, 17, 19	SVOES, Public Works	Calleguas Water, Ventura County Watershed Protection	Low	GF/Staff Time, HMGP, BRIC, FMA	Short-Term; Ongoing
Action SIM-15—Assess and retrofit or upgrade City-owned facilities with identified risks, including but not limited to these items: Retrofit or upgrade at-risk and deficient government facilities and public utility systems to ensure the operation and timely restoration of essential systems to reasonable levels of service. Reinforce roads/bridges from flooding through protection activities, including elevating the roads/bridges and installing/widening culverts beneath the roads/bridges or upgrading storm drains. *Hazards Mitigated:* Earthquake, Flooding, Severe Storms, Severe Weather, Dam Failure						
New & Existing	1, 2, 4, 6, 9, 18, 19	Environmental Services, Public Works	FEMA, CalOES	High	General Fund, Staff Time, HMGP, BRIC, FMA	Long Term

a. Short-term = Completion within 5 years; Long-term = Completion within 10 years; Ongoing= Continuing new or existing program with no completion date

Acronyms used here are defined at the beginning of this volume.

Table 9-15. Mitigation Action Priority

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Cost?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Implementation Priority	Grant Pursuit Priority
1	4	High	High	Yes	Yes	No	Medium	High
2	12	Medium	Low	Yes	No	Yes	High	Low
3	19	Low	Low	Yes	No	Yes	High	Low
4	3	Medium	Low	Yes	No	Yes	High	Low
5	3	Medium	Low	Yes	No	Yes	High	Low
6	3	High	Medium	Yes	Yes	No	Low	Medium
7	4	Medium	Low	Yes	Yes	Yes	High	Medium
8	14	Medium	Low	Yes	Yes	Yes	High	Low
9	7	Medium	High	No	Yes	No	Low	Medium
10	13	Medium	Low	Yes	Yes	Yes	High	Medium
11	5	Medium	Low	Yes	No	Yes	High	Low
12	12	High	Medium	Yes	Yes	Yes	High	High
13	7	High	Medium	Yes	Yes	No	Medium	High
14	5	Medium	Low	Yes	Yes	Yes	High	Medium
15	7	High	High	Yes	Yes	No	Low	Medium

a. See the introduction to this volume for explanation of priorities.

Table 9-16. Analysis of Mitigation Actions

Hazard Type	Action Addressing Hazard, by Mitigation Type							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilience	Community Capacity Building
High-Risk Hazards								
Wildfire	SIM-1, 2, 3, 5, 10, 11, 12, 13	SIM-1, 2, 3, 5, 10, 11, 12, 13	SIM-2, 3, 5, 7, 10, 11, 12, 13	SIM-2, 3, 11	SIM-3, 6, 7, 10, 11, 12	SIM-1, 2, 3, 5, 13	SIM-3, 5, 13	SIM-3, 5, 6, 7, 8, 10
Landslide	SIM-1, 2, 3, 5, 14	SIM-1, 2, 3, 5	SIM-2, 3, 5, 7	SIM-2, 3, 5	SIM-3, 6, 7	SIM-1, 2, 3, 5	SIM-3, 5	SIM-3, 5, 7, 8
Medium-Risk Hazards								
Earthquake	SIM-1, 2, 3, 9, 10, 11, 15	SIM-1, 2, 3, 10, 11, 15	SIM-3, 7, 10, 11, 15	SIM-3, 11	SIM-3, 6, 7, 10, 11	SIM-1, 2, 3, 9, 15	SIM-3	SIM-3, 6, 7, 8, 10, 15
Flooding	SIM-1, 2, 3, 4, 5, 9, 10, 11, 13, 15	SIM-1, 2, 3, 4, 5, 10, 11, 13, 15	SIM-3, 4, 5, 7, 10, 11 13, 15	SIM-3, 5, 11	SIM-3, 6, 7, 10, 11	SIM-1, 2, 3, 4, 5, 9, 13, 15	SIM-3, 5	SIM-3, 4, 5, 6, 7, 8, 10, 15
Severe Storms	SIM-3, 4, 9, 10, 13, 15	SIM-3, 4, 10, 13, 15	SIM-3, 4, 10, 13 15	SIM-3	SIM-3, 6, 10	SIM-3, 4, 6, 9, 15	SIM-3	SIM-3, 4, 6, 8, 10, 15
Severe Weather	SIM-3, 9, 10, 13, 15	SIM-3, 10, 13, 15	SIM-3, 10, 13, 15	SIM-3	SIM-3, 6, 10	SIM-3, 6, 9, 15	SIM-3	SIM-3, 6, 8, 10, 15

Hazard Type	Action Addressing Hazard, by Mitigation Type							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilience	Community Capacity Building
Dam Failure	SIM-3, 4, 9, 10, 11, 14, 15	SIM-3, 4, 10, 11, 15	SIM-3, 4, 8, 10, 11, 14, 15	SIM-3, 11	SIM-3, 6, 7, 8, 10, 11, 14, 15	SIM-3, 4, 6, 9, 15	SIM-3	SIM-3, 4, 6, 7, 8, 10, 14, 15
Low-Risk Hazards								
Drought	SIM-3, 5	SIM-3, 5	SIM-3, 5	SIM-3, 5	SIM-3, 5	SIM-3, 5	SIM-3, 5	SIM-3, 5

a. See the introduction to this volume for explanation of mitigation types.

9.9 PUBLIC OUTREACH

Table 9-17 lists public outreach activities for this jurisdiction.

Table 9-17. Local Public Outreach

Local Outreach Activity	Date	Number of People Involved
Presented at four Neighborhood Council meetings	9/9, 9/14, 9/16, 9/21	N/A
HMP info & survey link via SVPD Nixle sent to residents and posted on social media	7/27/21	N/A
HMP info & survey link via SVPD Tweet	8/17/21	N/A
HMP info & survey link sent to Neighborhood Councils 1-4 E-Notify List.	8/18/21	1, 400
Emergency Services Manager discussed HMP in radio interview	10/25/21	N/A

9.10 INFORMATION SOURCES USED FOR THIS ANNEX

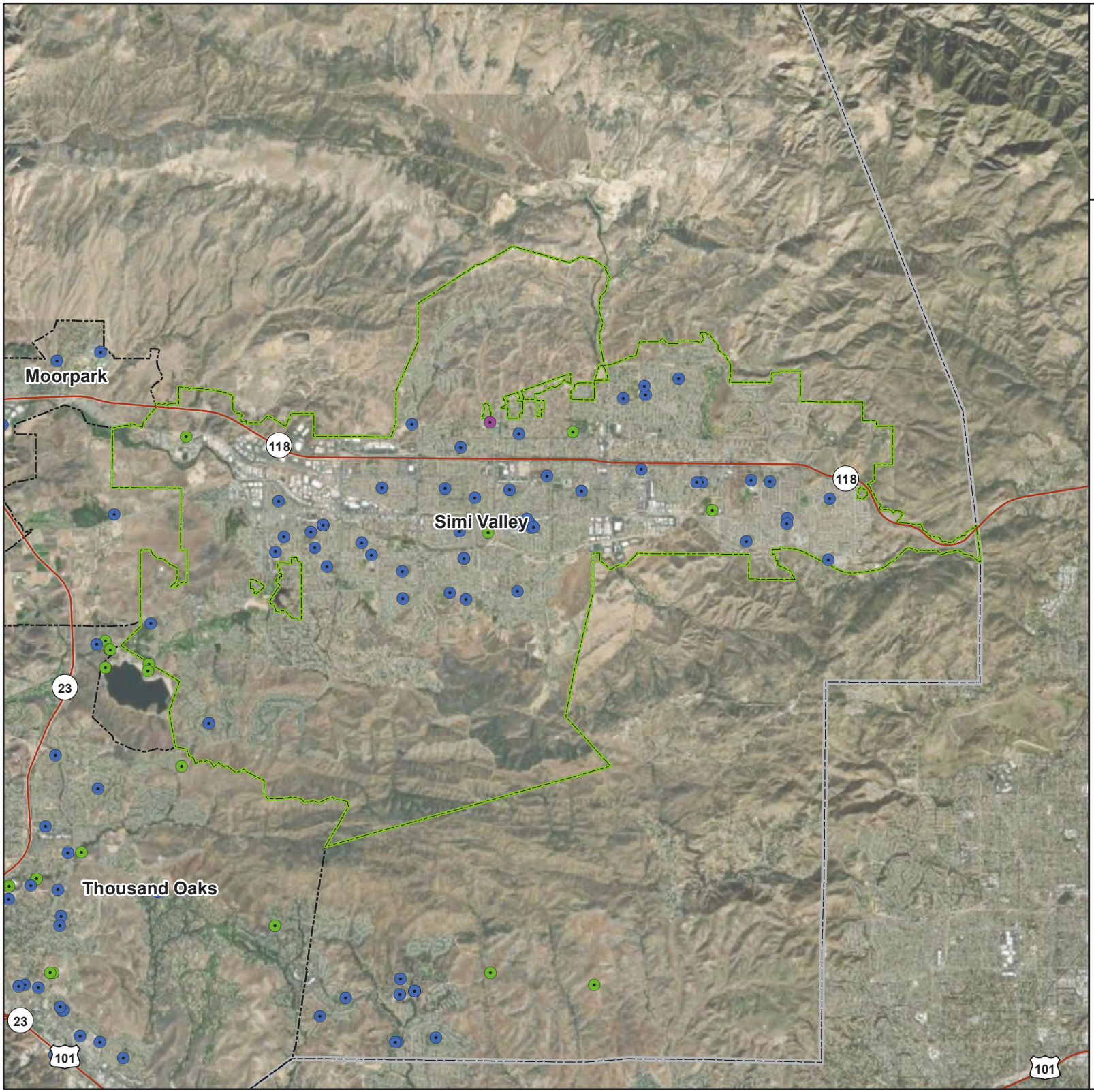
The following technical reports, plans, and regulatory mechanisms were reviewed to provide information for this annex.

- **Simi Valley Municipal Code**—The municipal code was reviewed for the full capability assessment and for identifying opportunities for action plan integration.
- **City of Simi Valley Flood Damage Prevention Ordinance**—The flood damage prevention ordinance was reviewed for compliance with the National Flood Insurance Program.
- **2015 Hazard Mitigation Plan**—The mitigation strategy action items were used to assess planning and regulatory capabilities and for identifying opportunities for action plan integration.
- **2018 Emergency Operations Plan**—The EOP was reviewed for the full capability assessment and for identifying opportunities for action plan integration and improvement.
- **Simi Valley General Plan**—The General Plan was reviewed for the full capability assessment and for identifying opportunities for action plan integration

The following outside resources and references were reviewed:

- **Hazard Mitigation Plan Annex Development Toolkit**—The toolkit was used to support the identification of past hazard events and noted vulnerabilities, the risk ranking, and the development of the mitigation action plan.

- **FIPS Code**—https://www.census.gov/geographies/reference-files/2018/demo/popest/2018-fips.html
- **DUNS #**—https://www.dnb.com/duns-number.html
- **Community Rating System**—https://www.fema.gov/floodplain-management/community-rating-system
- **Building Code Effectiveness Grading Schedule**—https://www.isomitigation.com/bcegs/iso-s-building-code-effectiveness-grading-schedule-bcegs.html
- **Public Protection Classification**—https://www.isomitigation.com/ppc/
- **Storm Ready**—https://www.weather.gov/stormready/communities
- **Firewise**—http://www.firewise.org/usa-recognition-program/map-of-active-participants.aspx
- **Tsunami Ready**—https://www.weather.gov/tsunamiready/communities
- **CEQA statute** (Public Resources Code Section 21000 and following), the **CEQA Guidelines** (California Code of Regulations, Title 14, Section 15000 and following)
- **State Subdivision Map Act** (Govt. Code Sec. 66410-66499.58)



Simi Valley

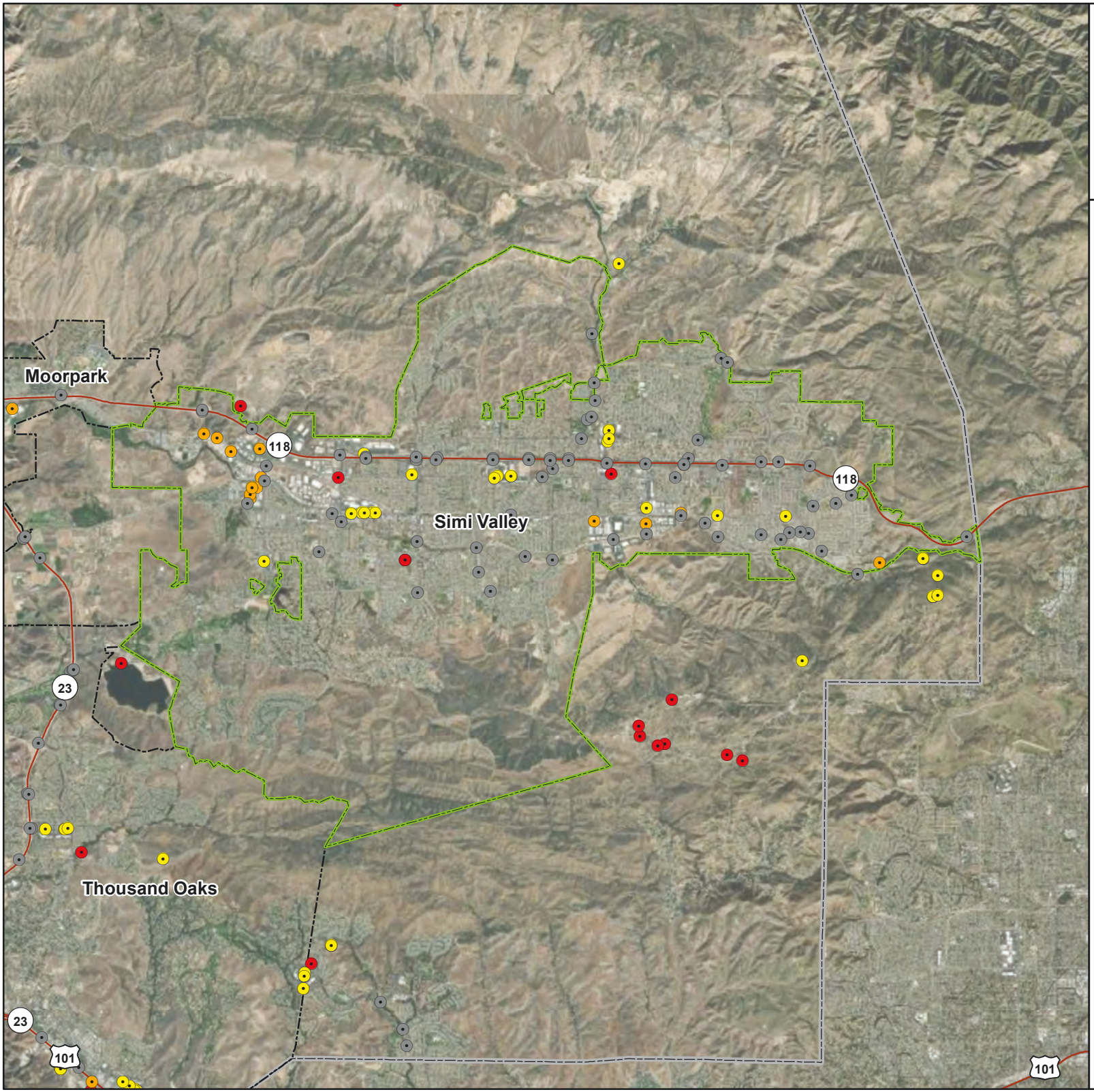
Critical Facilities (1 of 2)

- Food, Water, Shelter
- Health and Medical
- Safety and Security
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Data Sources: Ventura Co., VCFD, Casitas MWD, Calleguas MWD, City of Camarillo, CA Energy Commission, Cal Trans, EPA, HIFLD, Esri

N

0 0.5 1 2 Miles



Simi Valley

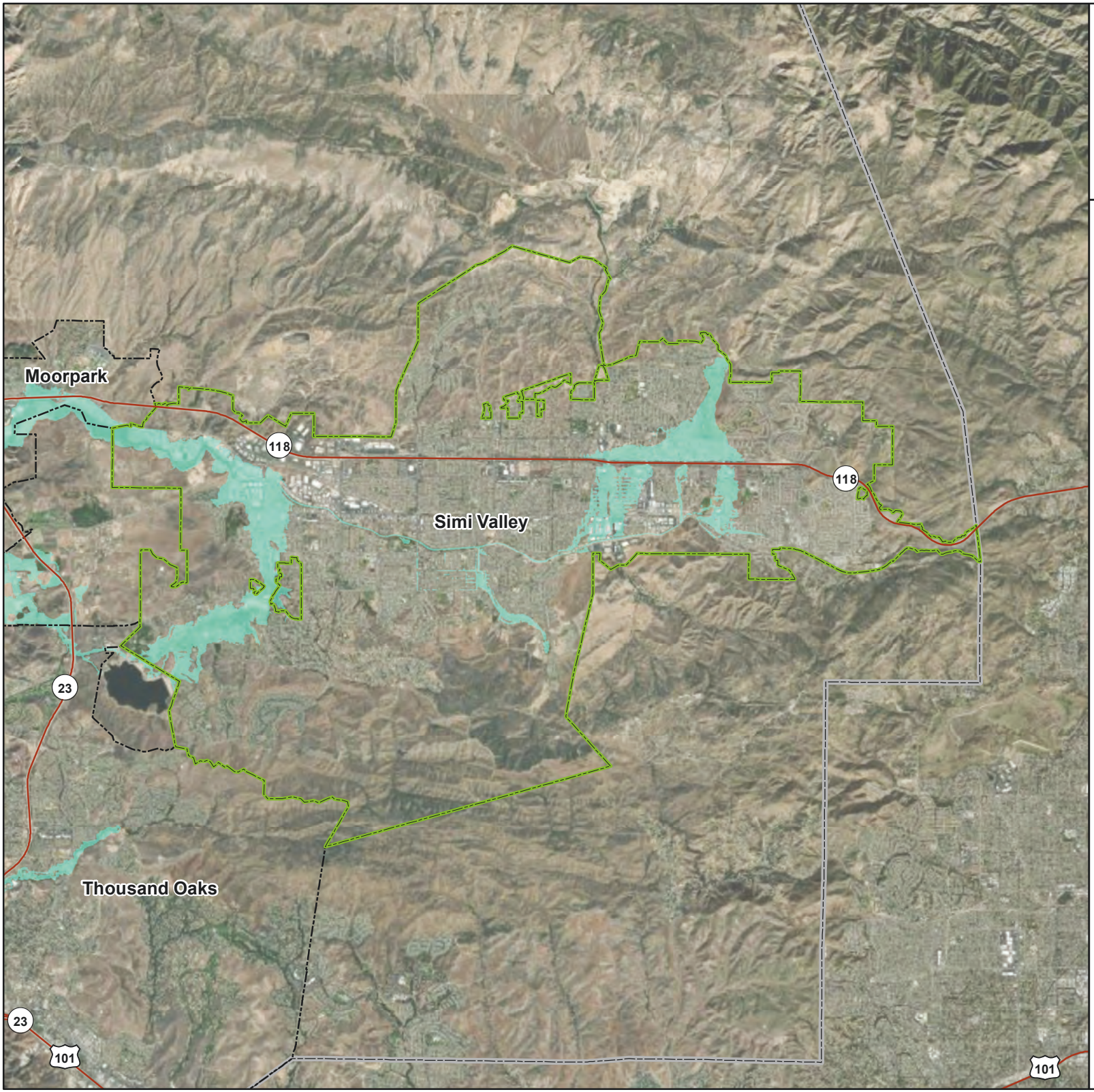
Critical Facilities (1 of 2)

- Communications
- Energy
- Hazardous Material
- Transportation
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Data Sources: Ventura Co., VCFD, Casitas MWD, Calleguas MWD, City of Camarillo, CA Energy Commission, Cal Trans, EPA, HIFLD, Esri

N

0 0.5 1 2 Miles



Simi Valley

Dam Failure Inundation Areas

Combined Inundation Areas

Major Roads

Selected City

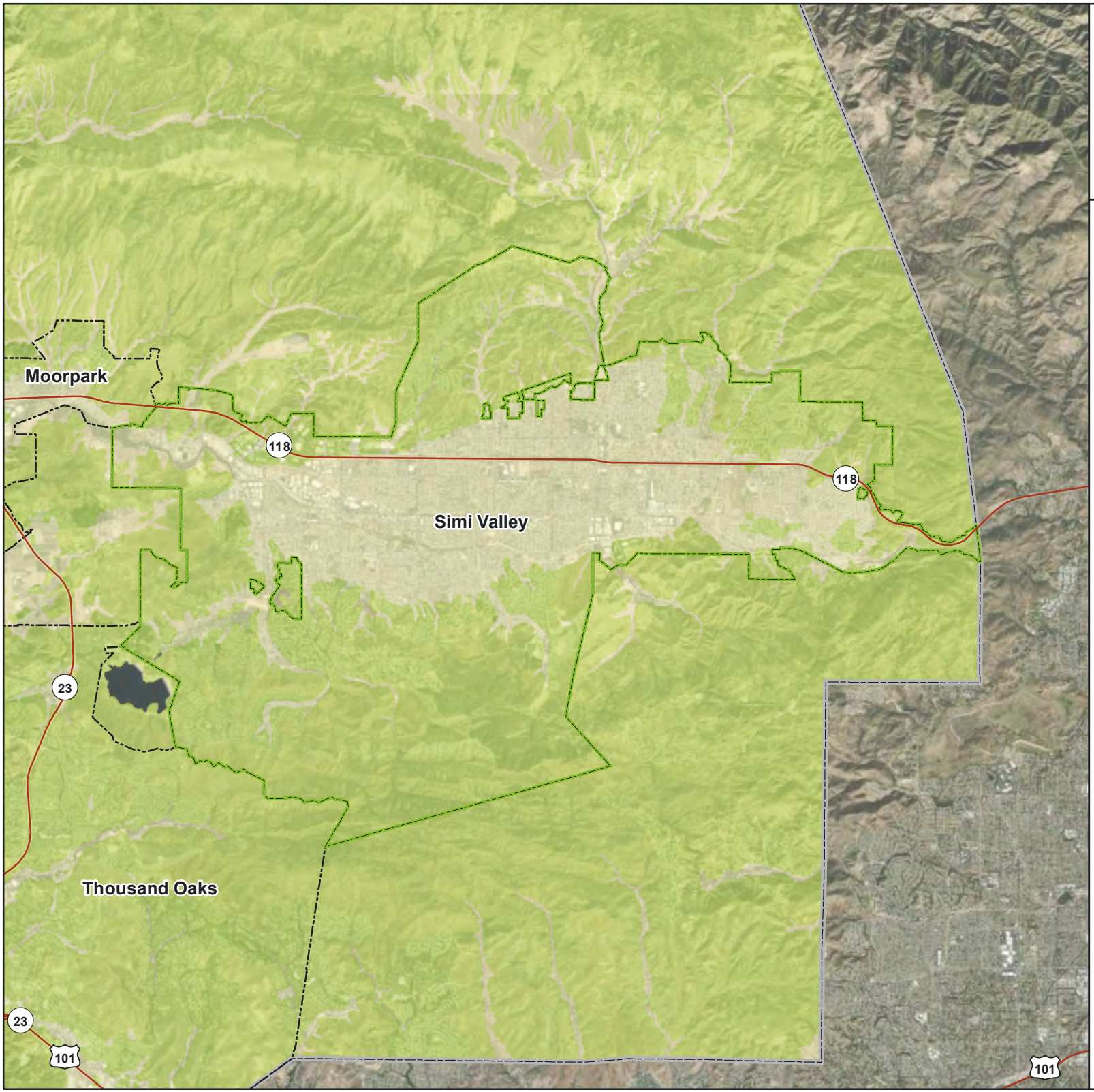
Incorporated Cities

County Boundary

Data Sources: Ventura Co., CA DWR, Esri

N

0 0.5 1 2 Miles



Simi Valley

NEHRP Soil Class

C (Dense soil/soft rock)

D (Stiff soil)

Major Roads

Selected City

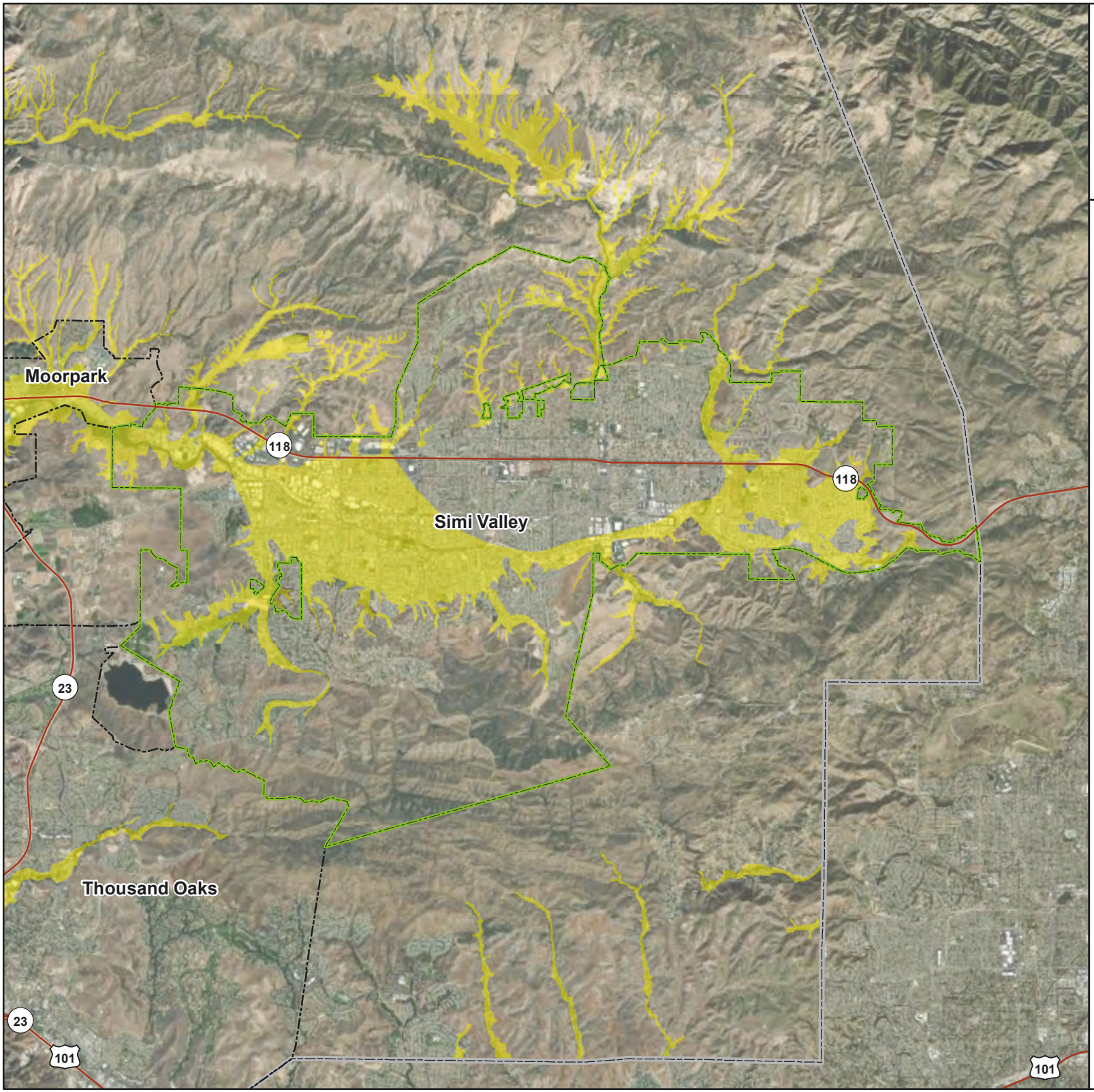
Incorporated Cities

County Boundary

Data Sources: Ventura Co., CGS, Esri

N

0 0.5 1 2 Miles



Simi Valley

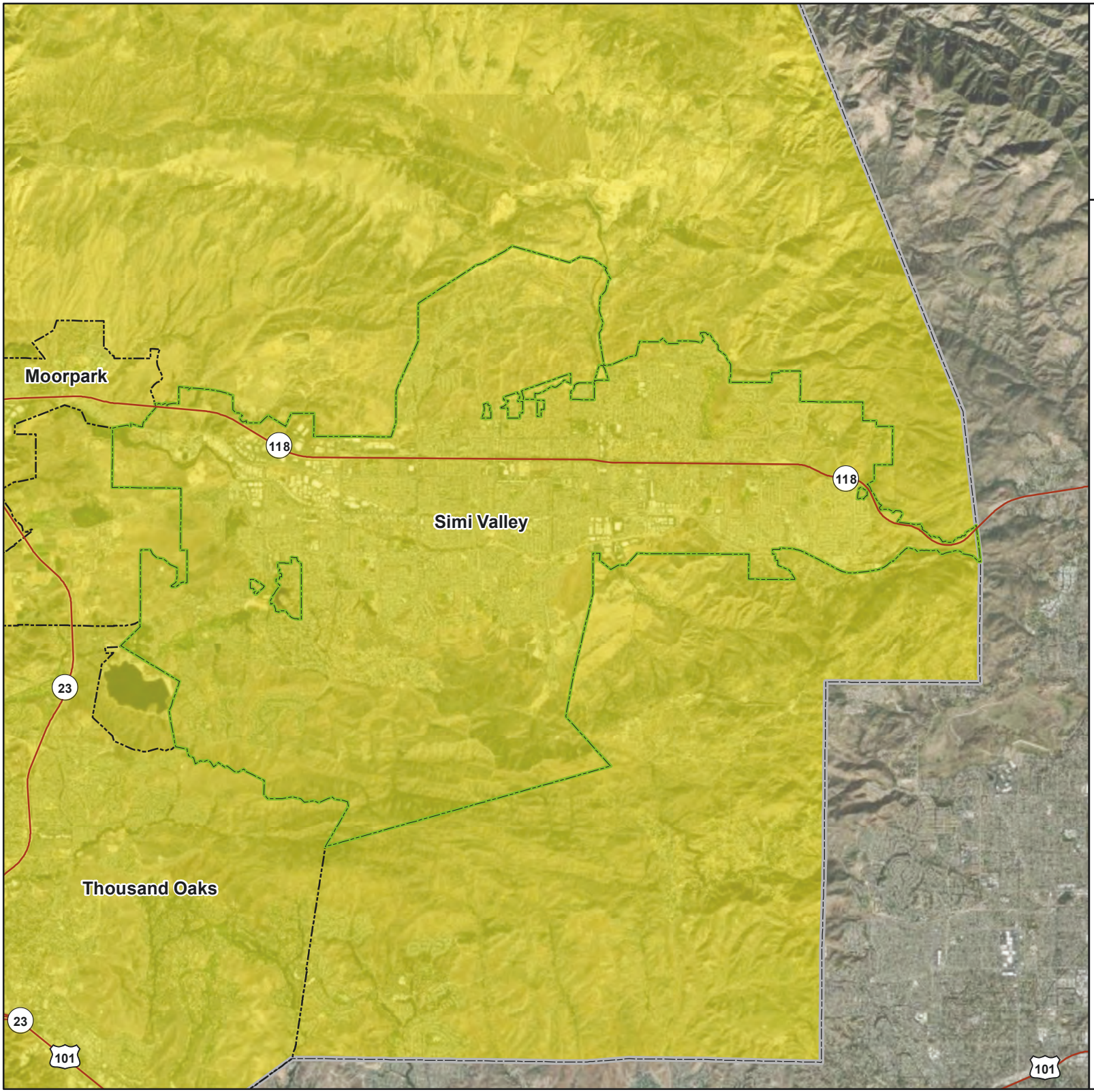
Liquefaction Susceptibility

Liquefaction zone
Major Roads
Selected City
Incorporated Cities
County Boundary

Data Sources: Ventura Co., Esri

N

0 0.5 1 2
Miles



Simi Valley

100-Year Probabilistic Earthquake Scenario

Mercalli Intensity Scale

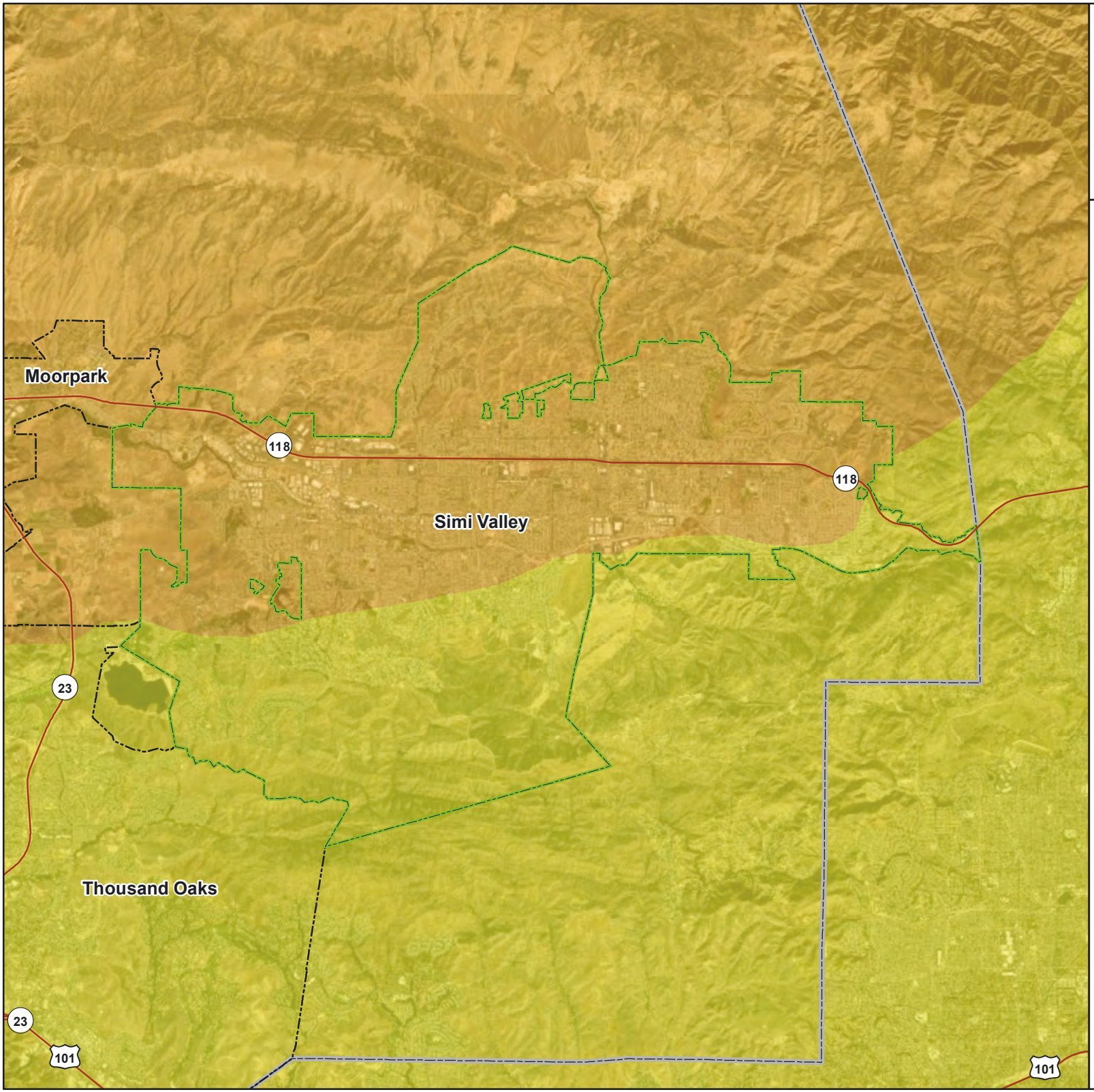
- VII (Very Strong/Moderate)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.5 1 2 Miles



Simi Valley

Oak Ridge M7.16 Earthquake Scenario

Mercalli Intensity Scale

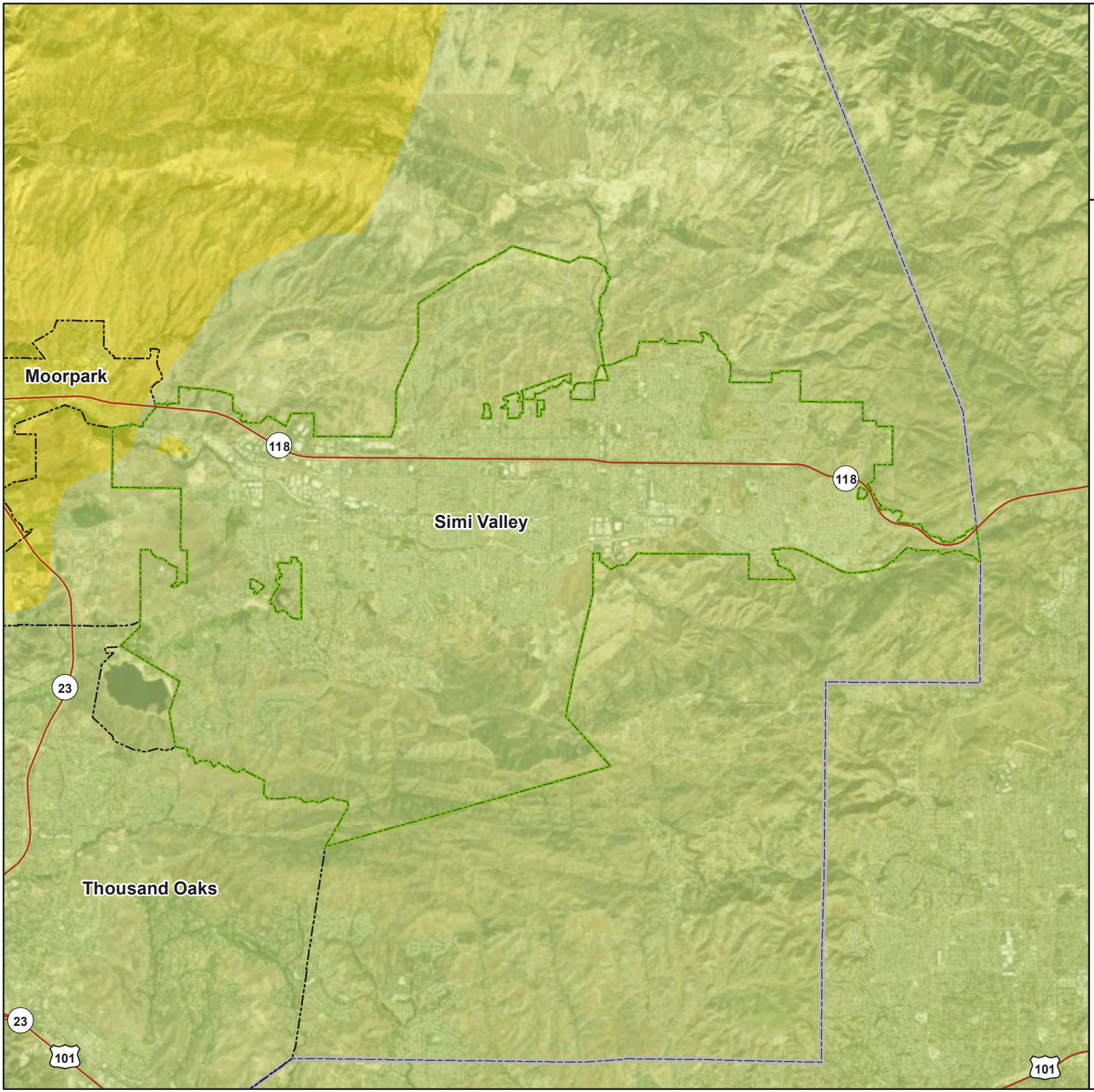
- VII (Very Strong/Moderate)
- VIII (Severe/Moderate-Heavy)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.5 1 2 Miles



Simi Valley

Pitas Point M7.12 Earthquake Scenario

Mercalli Intensity Scale

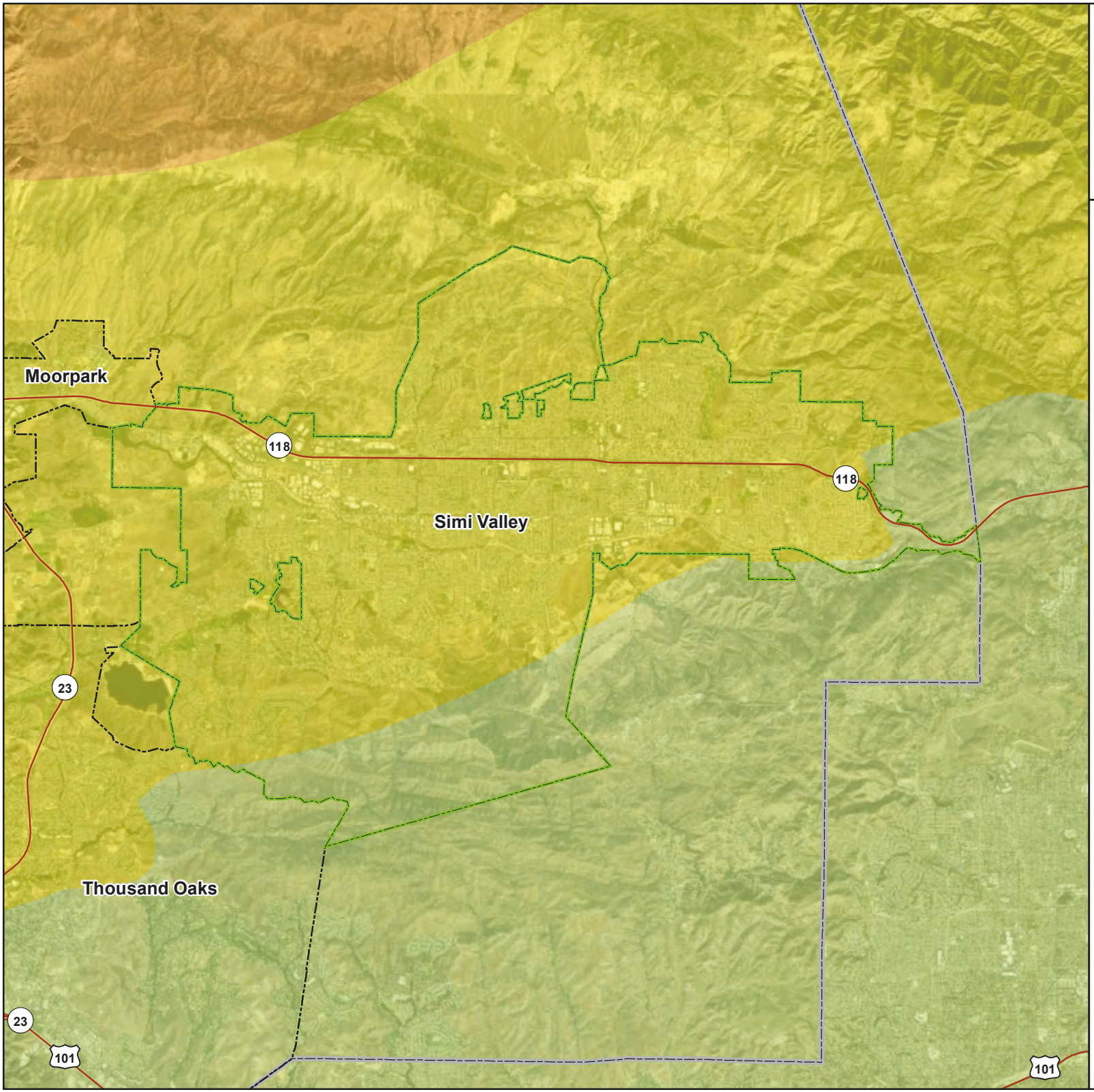
- VI (Strong/Light)
- VII (Very Strong/Moderate)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.5 1 2 Miles



Simi Valley

San Cayetano M7.16 Earthquake Scenario

Mercalli Intensity Scale

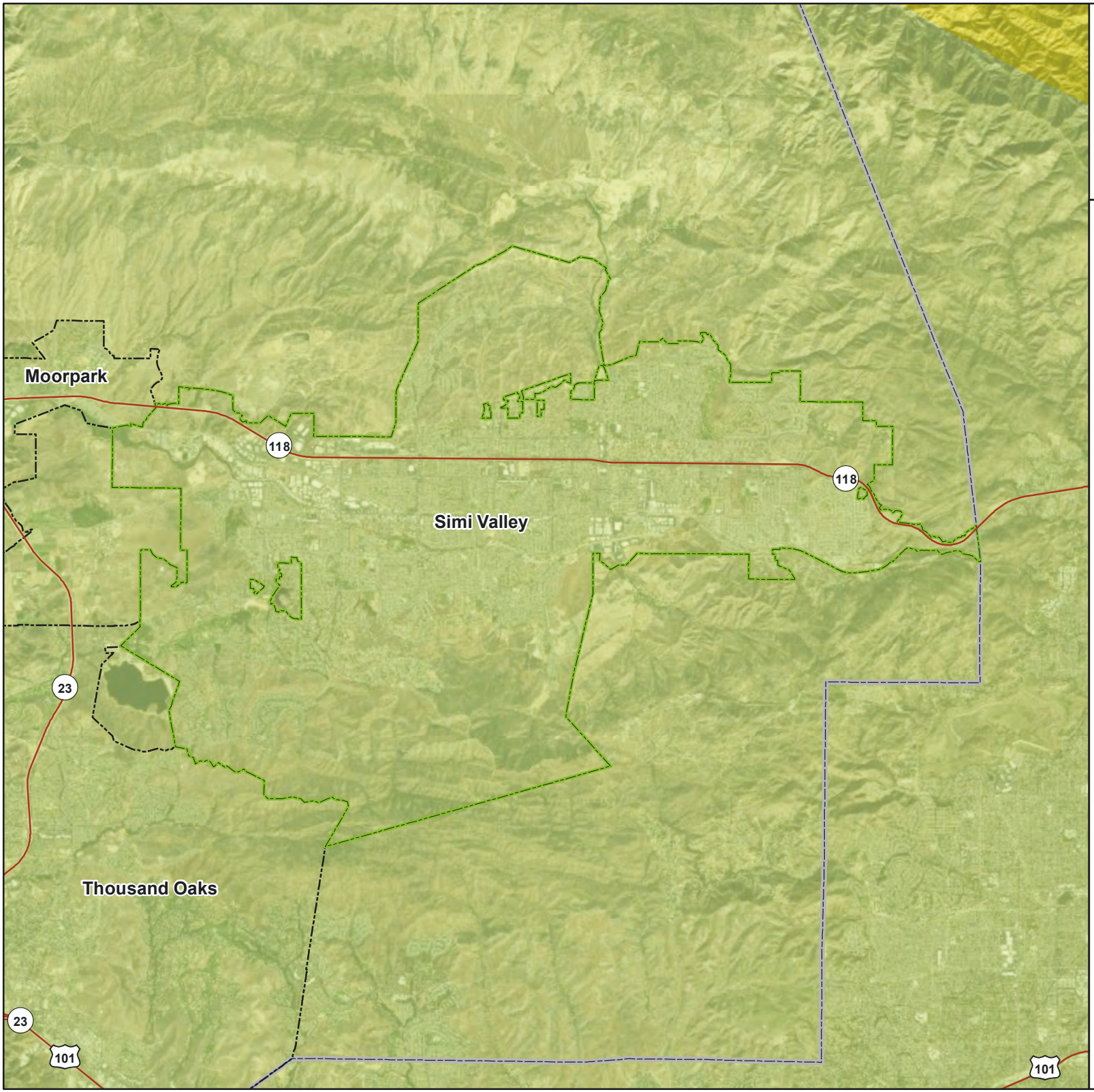
- VI (Strong/Light)
- VII (Very Strong/Moderate)
- VIII (Severe/Moderate-Heavy)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.5 1 2 Miles



Simi Valley

S. San Andreas M8.03 Earthquake Scenario

Mercalli Intensity Scale

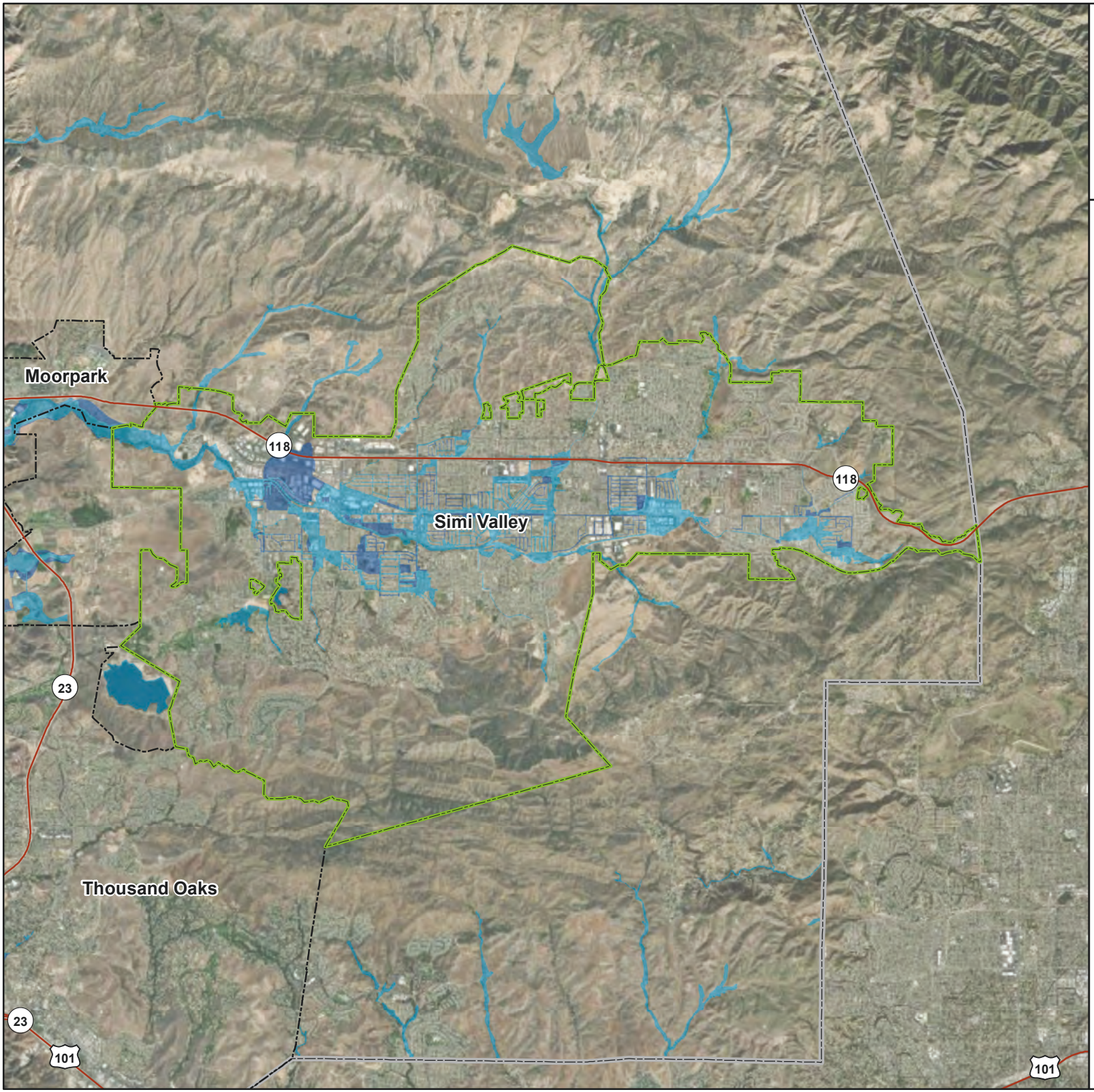
- VI (Strong/Light)
- VII (Very Strong/Moderate)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.5 1 2 Miles



Simi Valley

FEMA Flood Hazard Areas

1% Annual Chance Flood (100-Year)

0.2% Annual Chance Flood (500-Year)

Major Roads

Selected City

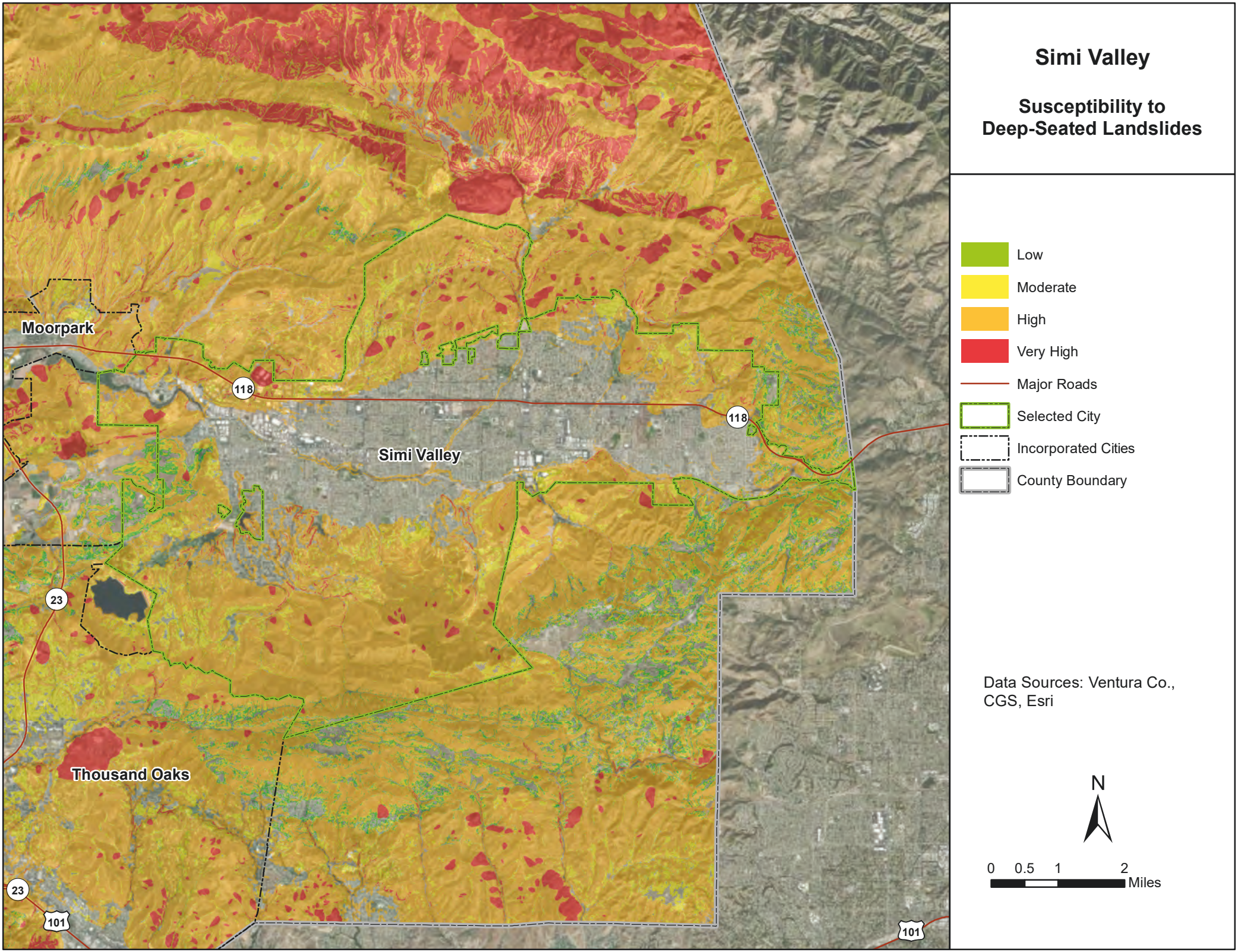
Incorporated Cities

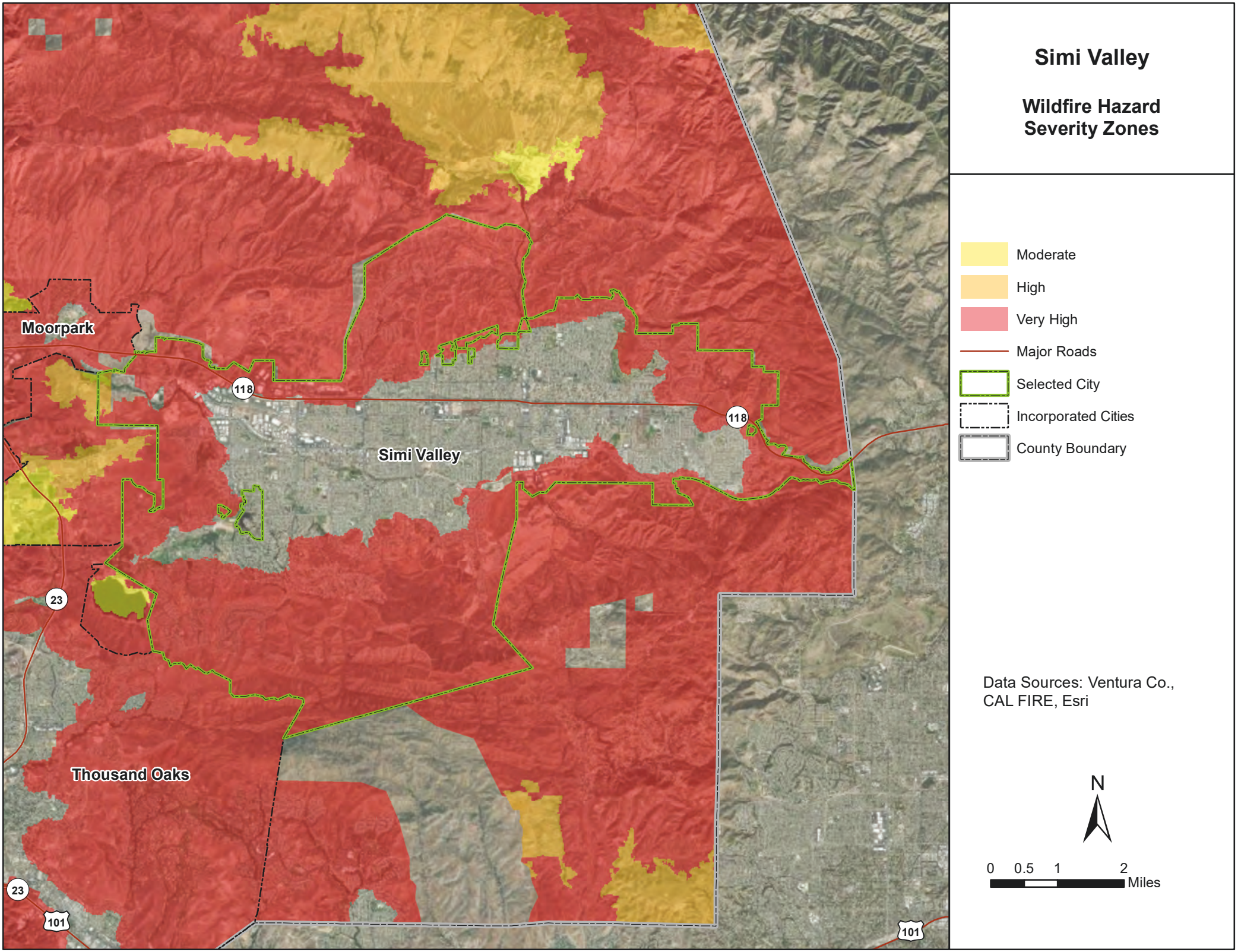
County Boundary

Data Sources: Ventura Co., FEMA, Esri

N

0 0.5 1 2 Miles


Simi Valley
Susceptibility to
Deep-Seated Landslides
Low
Moderate
High
Very High
Major Roads
Selected City
Incorporated Cities
County Boundary
Moorpark
Simi Valley
Thousand Oaks
118
118
23
23
101
101
Data Sources: Ventura Co.,
CGS, Esri
N
0 0.5 1 2
Miles



Simi Valley

Wildfire Hazard Severity Zones

Moderate
High
Very High
Major Roads
Selected City
Incorporated Cities
County Boundary

Data Sources: Ventura Co., CAL FIRE, Esri

N

0 0.5 1 2
Miles

10. CITY OF THOUSAND OAKS

10.1 LOCAL HAZARD MITIGATION PLANNING TEAM

Primary Point of Contact
Grahame Watts, Emergency Services Manager
2100 Thousand Oaks Blvd.
Thousand Oaks, CA 91362
805-449-2453
gwatts@toaks.org

Alternate Point of Contact
Nader Heydari, Deputy Public Works Director
2100 Thousand Oaks Blvd.
Thousand Oaks, CA 91362
805-449-2392
nheydari@toaks.org

This annex was developed by the local hazard mitigation planning team, whose members are listed in Table 10-1.

Table 10-1. Local Mitigation Planning Team Members

Name	Title
Grahame Watts	Emergency Services Manager (Project Manager)
Jim Taylor	Senior Civil Engineer
John Brooks	Senior Analyst
Michael Devlahovich	Utilities Maintenance Supervisor
Kari Finley	Planning Division Manager
Iain Holt	Senior Planner
David Chavez	Landscape Maintenance Supervisor

10.2 JURISDICTION PROFILE

10.2.1 Location and Features

Thousand Oaks is the second-largest city in Ventura County and is 40 miles northwest of Downtown Los Angeles. The City is named after the many oak trees present in the area. The City forms the central populated core of the Conejo Valley and includes two-thirds of master-planned community of Westlake Village and most of Newbury Park, which were annexed by the city during the late 1960s and 1970s.

The City of Thousand Oaks has a population of 126,484 and is nearly built out, placing emphasis upon in-fill development, redevelopment and maintenance of aging infrastructure. The Downtown Core Master Plan provides the blueprint for a centralized, walkable shopping, dining and entertainment area adjacent to the Civic Arts Plaza/City Hall, and land use alternatives under the General Plan were

updated for increased density and mixed-use development along the Thousand Oaks Boulevard corridor.

10.2.2 History

Thousand Oaks was incorporated in 1964 and has evolved from a rural Ventura County settlement into an attractive and desirable Southern California city. Thousand Oaks offers the ideal mixture of commercial, industrial, residential and recreational space in an exceptional location.

The City's history dates to the Chumash Native Americans who dwelled in the Conejo Valley hundreds of years ago. In 1542, the area was discovered by Spanish explorer Juan Rodriguez Cabrillo, who claimed the land for his Spanish king. The area remained virtually unsettled until the early 1800s when the Spanish governor granted 48,671 acres of land grants to loyal soldiers—land which included the Conejo Valley (Conejo is the Spanish word for rabbit which are abundant in the area).

Throughout the 19th Century, early pioneers migrated to the area. The first post office was built in 1875, and the small settlement became a stop on the stagecoach route between Los Angeles and San Francisco. With the invention of the motor car and the construction of a highway between those two major cities, the Conejo Valley began to evolve.

10.2.3 Governing Body Format

Thousand Oaks is a General Law city with a Council/Manager form of government. This type of government structure designates the City Council as the policy making body, who appoint the City Manager to carrying out Council policy.

The Council consists of five members elected from residents at large. Council members serve four-year staggered terms. Municipal elections are held in November of even numbered years. The City Council annually selects a Mayor who serves as the presiding officer during City Council meetings that are scheduled on Tuesdays approximately two times per month.

The Thousand Oaks City Council is responsible for the adoption of this plan and the Public Works Department oversees its implementation.

10.3 CURRENT TRENDS

10.3.1 Population

According to the California Department of Finance, the population of the Thousand Oaks as of January 2020 was 126,484. Since 2010, the population has decreased at an average annual rate of 0.02 percent.

10.3.2 Development

The development mission of Thousand Oaks is to be stewards of the City's General Plan, and to assist the community with land development, housing, construction, code compliance, open space, and regional issues, all of which are balanced with the City's environment and resources.

Table 10-2 summarizes development trends in the period since the preparation of the previous hazard mitigation plan, as well as expected future development trends.

Table 10-2. Recent and Expected Future Development Trends

Criterion	Response
Has the City annexed any land since the preparation of the previous hazard mitigation plan? • **If yes, give the estimated area annexed and estimated number of parcels or structures.**	Yes 2015—Kelly Estates A & B: Parcel; "A" = 20.32 ac., Parcel "B" = 1.26 ac. (existing developed single-family lots in former County "island") 2021—Edward-Ventu Park Parcels A & B: Parcel "A" = 0.18 ac., Parcel "B" = 0.22 ac. (2- single-family lots)
Is the City expected to annex any areas during the performance period of this plan?	No
Are any areas targeted for development or major redevelopment in the next five years? • **If yes, briefly describe, including whether any of the areas are in known hazard risk areas**	Yes These areas primarily consist of larger scale residential projects along Thousand Oaks Boulevard as included in the Community Development Department's Development Activity Report (May 2021). Projects in the High Fire Severity Hazard Zone include The Lakes Residential, One Baxter Way residential and the Shapell Industrial Project (49.64 acres and 754,222 SF of building floor area) at northern section of Rancho Conejo Blvd..

How many permits for new construction were issued in your jurisdiction since the preparation of the previous hazard mitigation plan?

	2016	2017	2018	2019	2020
Single Family	2,124	1,984	1,870	1,947	1,870
Multi-Family	315	239	244	369	154
Other (commercial, mixed use, etc.)	501	427	379	381	285
Total	**2,940**	**2,650**	**2,493**	**2,697**	**2,179**

Provide the number of new-construction permits for each hazard area or provide a qualitative description of where development has occurred.	• Special Flood Hazard Areas: 75 • Landslide: 274 • High Liquefaction Areas: 132 • Tsunami Inundation Area: 0 • Wildfire Risk Areas: 9,934
Describe the level of buildout in the jurisdiction, based on your jurisdiction's buildable lands inventory. If no such inventory exists, provide a qualitative description.	Currently, the City does not have an inventory of buildable lands. There is a theoretical residential capacity for the City of 81,124 dwelling units based on an evaluation of 1996 General Plan land use map governed by Measure E. This maximum capacity does not consider constraints that may result in less buildable area. Based on SCAG's 2020 Regional Transportation Plan/Sustainable Communities Strategy growth projections out to 2045, Thousand Oaks population will increase by 15,229, households will increase by 5,269 and employment will increase 9,897. The City is currently undergoing a General Plan Update and the Environmental Impact Report will evaluate new growth projections based on the revised land use map and economic analysis. The anticipated adoption date of the General Plan is in FY 2022-23.

10.4 CAPABILITY ASSESSMENT

This section describes an assessment of existing capabilities for implementing hazard mitigation strategies. The introduction at the beginning of this volume of the hazard mitigation plan describes the components included in the capability assessment and their significance for hazard mitigation planning.

Findings of the capability assessment were reviewed to identify opportunities to expand, initiate or integrate capabilities to further hazard mitigation goals and objectives. Where such opportunities were

identified and determined to be feasible, they are included in the action plan. The "Analysis of Mitigation Actions" table in this annex identifies these as community capacity building mitigation actions. The findings of the assessment are presented as follows:

- An assessment of planning and regulatory capabilities is presented in Table 10-3.
- Development and permitting capabilities are presented in Table 10-4.
- An assessment of fiscal capabilities is presented in Table 10-5.
- An assessment of administrative and technical capabilities is presented in Table 10-6.
- An assessment of education and outreach capabilities is presented in Table 10-7.
- Information on National Flood Insurance Program (NFIP) compliance is presented in Table 10-8.
- Classifications under various community mitigation programs are presented in Table 10-9.
- The community's adaptive capacity for the impacts of climate change is presented in Table 10-10.

Table 10-3. Planning and Regulatory Capability

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity?
Codes, Ordinances, & Requirements				
Building Code	Yes	Yes	Yes	Yes
Comment: TOMC Title 8 Ch.1 Building Code amended to reflect 2019 California Building Code				
Zoning Code	Yes	Yes	Yes	No
Comment: TOMC Title 9 Chapter 1 Flood Control requires building permit fees for Ventura County flood control facilities TOMC Title 9 Chapter 4 Zoning and Chapter 5 Environmental Impact Assessment				
Subdivisions	Yes	Yes	Yes	No
Comment: TOMC Title 9 Chapter 3 Subdivisions. Article 14 Environmental Impact and Grading and Erosion Control				
Stormwater Management	Yes	Yes	Yes	Yes
Comment: TOMC 4-7 (Public Safety, Flood Damage Prevention)				
Post-Disaster Recovery	Yes	Yes	Yes	Yes
Comment: The City Emergency Operations Plan was adopted on February 25, 2020, which includes a section on Disaster Recovery.				
Real Estate Disclosure	No	Yes	No	No
Comment: The Community Development Department Building Division prepares residential re-sale disclosure reports per TOMC Title 8 Chapter 12.				
Growth Management	Yes	Yes	Yes	Yes
Comment: Measure E requires voter approval for any amendment to the Land Use Element of the City's General Plan that: increases residential land use density beyond the City's General Plan of November 5, 1996 or increases the amount of commercial acreage beyond the City's General Plan of November 5, 1996. City Council Ordinance No. 1280-NS				
Site Plan Review	Yes	Yes	Yes	Yes
Comment: The Community Development Department Planning Division and Public Works Engineering Division reviews land use entitlements and subdivisions. County Fire and Police Departments are contracted for project review.				
Environmental Protection	Yes	Yes	Yes	Yes
Comment: The result of a completed Visioning 2064 process was the development of a Climate and Environmental Action Plan that is expected to be adopted in FY 2022-23 . The Plan is for the City to be an environmental leader and promote climate change adaptation, zero waste, zero net energy usage, reduced water use, and greenhouse gas reduction, including allocation of the necessary resources. New development is subject to environmental review in accordance with CEQA.				

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity?
Flood Damage Prevention	Yes	Yes	Yes	Yes
Comment: The City's Water Emergency Operations Plan was adopted in June of 2021, which includes a section on Flood Damage Prevention. The City and County of Ventura Public Works also developed a Flood Prevention & Preparedness manual that is posted on the City website. The Flood Damage Prevention Ordinance comprises the TOMC 4-7 (Public Safety, Flood Damage Prevention).				
Emergency Management	Yes	Yes	Yes	Yes
Comment: The City completed a Risk and Resiliency Assessment as part of America's Water Infrastructure Act (2018) that was submitted to the EPA in December 2020. The City's Water Emergency Operations Plan was certified through the EPA in June 2021. . Thousand Oaks Municipal Code Title 4 Section 404.01 describes the City emergency organization, functions and authorities.				
Climate Change	Yes	Yes	Yes	Yes
Comment: An anticipated City goal is to reduce greenhouse gas by a minimum of 40 percent by 2030 and 80 percent by 2050 to match or exceed the State goals. The City's Climate and Environmental Action Plan is expected to be adopted in FY 2022-23				
Planning Documents				
City General Plan	Yes	Yes	Yes	Yes
Is the City's plan compliant with Assembly Bill 2140? Yes *Comment:* The Thousand Oaks City General Plan is being updated and is expected to be adopted in FY 2022-23.				
Capital Improvement Plan	Yes	Yes	No	No
How often is the plan updated? *Comment:* The City's Capital Improvement Plan is part of the City Budget process and is updated every two years.				
Disaster Debris Management Plan	Yes	Yes	Yes	Yes
Comment: The City has a Disaster Debris Management procedure in its adopted EOP, which is complimentary to the County's Disaster Debris Management Plan.				
Floodplain Plan	Yes	Yes	Yes	Yes
Comment: In January 2010, the FEMA National Flood Insurance Program mapped the City's 100-year "Areas of Special Flood Hazard" (floodplains). The City's Capital Improvement Plan does not directly address a strategized approach to reducing or eliminating 100-year floodplains.				
Stormwater Plan	Yes	Yes	Yes	Yes
Comment: The City is participating in a Watershed Management Program and the Countywide Stormwater Quality Management Program that are being developed and implemented in compliance with the new State Regional Board Municipal Stormwater Permit.				
Urban Water Management Plan	Yes	Yes	Yes	Yes
Comment: In June 2021, the City adopted the 1) 2020 Urban Water Management Plan, 2) 2020 Water Shortage Contingency Plan, and 3) Addendum to the 2015 Urban Water Management Plan. Included in the 2020 UWMP are past, present, and projected water use data through 2045: a description of current and future water supply sources and allocations, information on the City's water conservation program, and background information on the City water system and service area.				
Habitat Conservation Plan	No	No	No	No
Comment: The City does not have a Habitat Conservation Plan but relies on policies within the Conservation Element of the General Plan. State and Federal agencies are involved as part CEQA review and permitting process. The Conejo Open Space Conservancy Agency (COSCA), a joint-powers authority between the City and the Conejo Recreation and Park District that implements conservation projects and manages habitat lands.				
Economic Development Plan	Yes	Yes	No	No
Comment: The City Council adopted its Economic Development Plan on November 7, 2017				
Shoreline Management Plan	No	No	No	No
Comment: Thousand Oaks is inland and does not have a shoreline.				
Community Wildfire Protection Plan	Yes	Yes	Yes	Yes
Comment: Wildfire protection is described in the City's EOP in addition to fire protection services provided by the Ventura County Fire Protection District. The City's Water Emergency Operations Plan and Risk and Resiliency Assessment addresses wildfire zones, specifically within the City's water infrastructure.				

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity?
Forest Management Plan	Yes	Yes	Yes	Yes
Comment: The City Forestry Master Plan was adopted in 2017 and applies to City-maintained plantings and provides historical background, design and management and community participation.				
Climate Action Plan	Yes	Yes	Yes	Yes
Comment: The City goal is to reduce greenhouse gas by a minimum of 40 percent by 2030 and 80 percent by 2050 to meet or exceed the State goals. The City's Climate and Environmental Action Plan is expected to be adopted in FY 2022-23.				
Emergency Management Planning	Yes	Yes	Yes	Yes
Comment: The City's Water Emergency Operations Plan was adopted in June 2021. Thousand Oaks Municipal Code Title 4 Section 404.01 describes the City emergency organization, functions and authorities.				
Threat & Hazard Identification & Risk Assessment (THIRA)	Yes	No	No	No
Comment: In December 2017 the City contracted for the completion of a City facilities security for the two City Theaters. In September 2019, a similar assessment was completed for the Civic Arts Plaza/City Hall, both libraries, Municipal Service Center and the Hill Canyon Treatment Plant. The City completed a Risk and Resiliency Assessment in December 2020.				
Post-Disaster Recovery Plan	Yes	Yes	Yes	No
Comment: The City's Water Emergency Operations Plan was adopted in June 2021, which includes a section on Disaster Recovery				
Continuity of Operations Plan	Yes	Yes	Yes	No
Comment: The City's Water Emergency Operations Plan was adopted in June 2021 which includes a section on Continuity of Operations.				
Public Health Planning	No	Yes	Yes	No
Comment: The City's Water Emergency Operations Plan was adopted in June 2021, which includes a section on public health which as managed by the Ventura County Public Health Department.				

Table 10-4. Development and Permitting Capability

Criterion	Response
Does the City issue development permits?	Yes
If no, who does? If yes, which department?	Public Works Department, Community Development Department
Does the City have the ability to track permits by hazard area?	Yes
Does the City have a buildable lands inventory?	No

Table 10-5. Fiscal Capability

Financial Resource	Accessible or Eligible to Use?
Community Development Block Grants	Yes- City Council approval of application/acceptance and award by U.S. Department of Housing and Urban Development
Capital Improvements Project Funding	Yes-City Council approval.
Authority to Levy Taxes for Specific Purposes	Yes-City Council and voter approval.
User Fees for Water, Sewer, Gas or Electric Service	Yes City Council approval and Proposition 218 protest ballot.
Incur Debt through General Obligation Bonds	Yes City Council and voter approval.
Incur Debt through Special Tax Bonds	Yes City Council and voter approval.
Incur Debt through Private Activity Bonds	Yes City Council approval.
Withhold Public Expenditures in Hazard-Prone Areas	No
State-Sponsored Grant Programs	Yes City Council approval of application/acceptance and award by State
Development Impact Fees for Homebuyers or Developers	Yes City Council approval.
Other	Yes
If yes, specify: Incur debt through Lease Revenue Bonds with City Council approval. Public-Private Partnerships with City Council approval.	

Table 10-6. Administrative and Technical Capability

Staff/Personnel Resource	Available?
Planners or engineers with knowledge of land development and land management practices	Yes
If Yes, Department /Position: Community Development Department & Public Works Department. Senior Planners, Senior Engineers and Division Managers.	
Engineers or professionals trained in building or infrastructure construction practices	Yes
If Yes, Department /Position: Community Development Department, Building and Safety Division plan checkers and inspectors	
Planners or engineers with an understanding of natural hazards	Yes
If Yes, Department /Position: Community Development Department and Public Works Department. Senior Planners, Senior Engineers and Division Managers.	
City staff with training in benefit-cost analysis	No
Surveyors	Yes
If Yes, Department /Position: Public Works Department, Engineering Services Division	
City personnel skilled or trained in GIS applications	Yes
If Yes, Department /Position: Public Works Department and Finance Department, IT Division	
Scientist familiar with natural hazards in local area	No
Emergency Services Manager	Yes
If Yes, Department /Position: Public Works Department, Emergency Services Manager.	
Grant writers	Yes
If Yes, Department /Position: Public Works, Community Development, Finance & Library Departments—The City has several staff in multiple departments that are skilled in writing and administering state and federal grant funded programs.	

Table 10-7. Education and Outreach Capability

Criterion	Response
Does City have a public information officer or communications office?	Yes
Does City have personnel skilled or trained in website development?	Yes
Does City have hazard mitigation information available on your website?	Yes
If yes, briefly describe: Hazard mitigation is part of the City's Emergency Management Program administered by the Public Works Department, which includes the posting of the City's current Hazard Mitigation Plan	
Does City use social media for hazard mitigation education and outreach?	Yes
If yes, briefly describe: The City utilizes several electronic community newsletters as well as Social Media for Facebook, Instagram, LinkedIn and Twitter.	
Does City have any citizen boards or commissions that address issues related to hazard mitigation?	Yes
If yes, briefly describe: The Thousand Oaks Police Department administers a Disaster Assistance Response Team Program and the City Public Works Department and Ventura County Fire Protection District coordinate a Community Emergency Response Team (CERT) Program.	
Does City have any other programs in place that could be used to communicate hazard-related information?	Yes
If yes, briefly describe: Social media posts, newsletters and the City website	
Does City have any established warning systems for hazard events?	Yes
If yes, briefly describe: The Cities and County of Ventura all subscribe to VC Alert, a mass notification system for local and statewide emergency warnings, incidents and hazards.	

Table 10-8. National Flood Insurance Program Compliance

Criterion	Response
What City I department is responsible for floodplain management?	Public Works Department
Who is your City floodplain administrator? (department/position)	Jim Taylor, Senior Civil Engineer, Public Works
Are any certified floodplain managers on staff for your City?	Yes; Jim Taylor, Senior Civil Engineer
What is the date that your flood damage prevention ordinance was last amended?	February 11, 2010
Does the City floodplain management program meet or exceed minimum requirements? ***If exceeds, in what ways?*** Pursuant to Thousand Oaks Municipal Code Ordinance 1995-20, the City ensures newly-developed building pads are protected from a 100-year flooding event, regardless of whether the location is within a FEMA NFIP-designated floodplain	Exceeds
When was the most recent Community Assistance Visit or Community Assistance Contact? Salomon Miranda, California DWR	April 24, 2018
Does the City have any outstanding NFIP compliance violations that need to be addressed?	No
Are any Risk MAP projects currently underway in your jurisdiction?	No
Do your flood hazard maps adequately address the flood risk within your jurisdiction? ***If no, state why.***	Yes
Does the City floodplain management staff need any assistance or training to support its floodplain management program?	No
Does the City participate in the Community Rating System (CRS)? ***If no, is your jurisdiction interested in joining the CRS program?*** No	No
How many flood insurance policies are in force in the City? [a] ***What is the insurance in force?*** $109,948,800 ***What is the premium in force?*** $253,564	336
How many total loss claims have been filed in the City? [a] ***What were the total payments for losses?*** $341,390	62

a. According to FEMA statistics as of March 31, 2021

Table 10-9. Community Classifications

	Participating?	Classification	Date Classified
FIPS Code	Yes	95-2367314	N/A
DUNS No.	Yes	055751937	N/A
Community Rating System	No	N/A	N/A
Building Code Effectiveness Grading Schedule	No	N/A	N/A
Public Protection (VCFPD)	Yes	03/3X	12/21/18
Storm Ready	Yes	N/A	N/A
Firewise	No	N/A	N/A
Tsunami Ready	No	N/A	N/A

Table 10-10. Adaptive Capacity for Climate Change

Criterion	Jurisdiction Rating[a]
Technical Capacity	
City-level understanding of potential climate change impacts	Medium
Comment: Staff and City Council are aware of potential climate change impacts and actions to address these issues will be included in the General Plan update and the City's Climate and Environmental Action Plan.	
City -level monitoring of climate change impacts	Medium
Comment: Staff and the City Council are aware of potential climate change impacts and actions to address these issues will be included in the General Plan update and Climate and Environmental Action Plan.	
Technical resources to assess proposed strategies for feasibility and externalities	High
Comment: The City has capacity internally and the ability to engage consultants for specialized tasks.	
City -level capacity for development of greenhouse gas (GHG) emissions inventory	High
Comment: The City has an internally developed GHG inventory.	
Capital planning and land use decisions informed by potential climate impacts	Medium
Comment: The City's General Plan will include Sustainability components throughout the document and is being developed in coordination with the City's Climate & Environmental Action Plan	
Participation in regional groups addressing climate risks	Medium
Comment: The City is a member of the Ventura County Regional Energy Alliance which addresses climate change issues within Thousand Oaks and Ventura County.	
Implementation Capacity	
Clear authority/mandate to consider climate change impacts during public decision-making processes	Medium
Comment: On January 12, 2021 the City Council meeting directed staff to develop a Climate and Environmental Action Plan that exceeds the state goals. Concurrently, the General Plan is being updated to include strategies and recommendations related to climate change mitigation.	
Identified strategies for greenhouse gas mitigation efforts	Medium
Comment: Staff has drafted green-house gas mitigation strategies after hosting four stakeholder meetings and additional community events to receive recommendations and input from the public.	
Identified strategies for adaptation to impacts	Medium
Comment: Staff has drafted the strategies now after hosting four stakeholder meetings and additional community events to receive recommendations and input from the public.	
Champions for climate action in local government departments	Medium
Comment: The City Public Works Department established an internal green team of employees from City departments to assist in the development and rollout of internal green policies.	
Political support for implementing climate change adaptation strategies	Medium
Comment: The City Council adopts goals annually and environmental leadership is always included as shown by the following goal. "Provide and enhance essential infrastructure to ensure the goals and policies of the City's General Plan are carried out and the City retains its role and reputation as a leader in protecting the environment and preserving limited natural resources." The City Council also approved participation in the Clean Power Alliance at the 100% renewable level which dramatically lowered GHG emissions.	
Financial resources devoted to climate change adaptation	Medium
Comment: The City is supportive of cost-effective environmental initiatives.	
Local authority over sectors likely to be negative impacted	Low
Comment: The City has local authority over housing, water resources and land use issues.	

Criterion	Jurisdiction Rating[a]
Public Capacity	
Local resident's knowledge of and understanding of climate risk	Medium
Comment: Thousand Oaks residents and business owners are knowledgeable and engaged.	
Local resident's support of adaptation efforts	Medium
Comment: Thousand Oaks residents are informed and active on climate and environmental issues.	
Local resident's capacity to adapt to climate impacts	Medium
Comment: The City's Climate & Environmental Action Plan documents residents' interests and priorities.	
Local economy current capacity to adapt to climate impacts	Medium
Comment: Many residents have the resources to make GHG reduction and resiliency reduction measures at home. However, Thousand Oaks also has an aging population with many seniors on a fixed income and unable to complete home improvements on their own.	
Local ecosystems capacity to adapt to climate impacts	Unsure
Comment:	

a. High = Capacity exists and is in use; Medium = Capacity may exist, but is not used or could use some improvement; Low = Capacity does not exist or could use substantial improvement; Unsure= Not enough information is known to assign a rating.

10.5 INTEGRATION REVIEW

For hazard mitigation planning, "integration" means that hazard mitigation information is used in other relevant planning mechanisms, such as general planning and capital facilities planning, and that relevant information from those sources is used in hazard mitigation. This section identifies where such integration is already in place, and where there are opportunities for further integration in the future. Resources listed at the end of this annex were used to provide information on integration. The progress reporting process described in Volume 1 of the hazard mitigation plan will document the progress of hazard mitigation actions related to integration and identify new opportunities for integration.

10.5.1 Existing Integration

Integration has been established between local hazard mitigation planning and the following local plans and programs:

- **City Emergency Operations Plan**—Adopted in 2020, this Plan describes the City's preparedness, response, mitigation and recovery from local and national emergency incidents
- **City General Plan**—Scheduled for adoption in FY 2022-23, this Plan describes the long-term goals, policies and development of Thousand Oaks, including a Safety Element that addresses hazard mitigation.
- **City Climate & Environmental Action Plan—**Scheduled for adoption in FY 2022-23, this Plan describes the City's on-term strategies for reducing greenhouse gas emissions**,** reduce air pollution and improve public health.
- **Building Code—**The City routinely updates the Thousand Oaks Municipal Code (TOMC) and as part of a review of the hazard mitigation in the Building Section of the TOMC.
- **Stormwater Management—**The City is part of a Countywide Stormwater Pollution Management Plan and when possible the Cities and County of Ventura collaborate upon local stormwater management with hazard mitigation policies.

- **Post-Disaster Recovery—**The City addresses disaster recovery in its Emergency Operations Plan (EOP), which includes hazard mitigation as part of the Plan.
- **Growth Management—**The General Plan addresses future growth in Thousand Oaks and during the update, hazard mitigation is incorporated into the final Plan.
- **Site Plan Review—**The Community Development Department and the Public Works Department jointly consider hazard mitigation issues as part of each project review.
- **Environmental Protection—**Hazard mitigation is part of the City's review of programs, policies and projects as they relate to land, air, water and waste.
- **Flood Damage Protection—**All existing and proposed development projects are reviewed to address existing and future hazards.
- **Disaster Debris Plan—**The County has a Disaster Debris Plan and the City addressees' disaster debris in its Emergency Operations Plan in addition to hazard mitigation.
- **Floodplain Management—** The City EOP addresses flooding as well as the TOMC which is updated routinely
- **Urban Watershed Plan—**As part of a 2021 update, urban watershed policies and the City's program was updated, and hazard mitigation issues are part of that review.
- **Wildfire Protection Plan—** The City's EOP includes a wildfire protection element that includes hazard mitigation.
- **Forest Management Plan—**The 2017 adopted plan addresses City-maintained plantings, background, design and management. Hazard mitigation will continue to be part of the Plan.

10.5.2 Opportunities for Future Integration

The capability assessment in this annex indicates opportunities to integrate this mitigation plan with other jurisdictional planning/regulatory capabilities. Capabilities were identified as integration opportunities if they can support or enhance the actions identified in this plan or be supported or enhanced by components of this plan. The capability assessment identified the following plans and programs that do not currently integrate hazard mitigation information but provide opportunities to do so in the future:

- **Countywide Stormwater Pollution Control Plan**—This Plan describes how the Cities and County of Ventura will reduce pollution of local waterways. The integration of this Plan with hazard mitigation includes a review of policies and programs of both plans to ensure consistency and compliance.
- **Urban Water Management Plan** -This Plan describes the City's long-term water resource and planning principles for reducing water use. The integration of this Plan with hazard mitigation includes a review of policies and programs of both plans to ensure consistency and compliance.
- **Economic Development Strategic Plan**—This Plan was developed as a policy guide for guiding the City's short, medium and long-term economic development planning. The integration of this Plan with hazard mitigation includes a review of policies and programs of both plans to ensure consistency and compliance.

Acting to integrate each of these programs with the hazard mitigation plan was considered as a mitigation action to include in the action plan in this annex.

10.6 RISK ASSESSMENT

10.6.1 Jurisdiction-Specific Natural Hazard Event History

Table 10-11 lists past occurrences of natural hazards for which specific damage was recorded in this jurisdiction Other hazard events that broadly affected the entire planning area, including this jurisdiction, are listed in the risk assessments in Volume 1 of this hazard mitigation plan.

Table 10-11. Past Natural Hazard Events

Type of Event	FEMA Disaster #	Date	Damage Assessment
Wind/PSPS Event	N/A	1/20	$2 million
Hill Fire	DR 4407	11/8/18 -11/9/18	$1 million
Woolsey Fire	DR 4407	11/8/18-11/9/18	$8 million
Borderline Active Shooter	N/A	11/18/18	$5 million
Winter Storm Event	DR 4353	12/4/17- 1/31/18	$2 million
Springs Fire	DR 5024	5/2/13 – 5/11/13	$10 million
Wildwood I Fire	N/A	1995	$ 500,000
Northridge Earthquake	DR 1008	1/17/94	$6 million
Green Meadow Fire	N/A	10/26/93 – 11/3/93	$12 million
Sherwood Fire	N/A	1985	$ 1 million
Dayton Canyon Fire	N/A	10/25/82	$4 million
Winter Storm Event	N/A	2/21/80	$2 million
Winter Storm Event	N/A	2/15/78	$1.5 million
Winter Storm Event	N/A	1/26/69	$200,000
Winter Storm Event	N/A	12/7/65	$100,000
Wind/PSPS Event	N/A	1/20	$2 million

10.6.2 Hazard Risk Ranking

Table 10-12 presents a local ranking of all hazards of concern for which this hazard mitigation plan provides complete risk assessments. As described in detail in Volume 1, the ranking process involves an assessment of the likelihood of occurrence for each hazard, along with its potential impacts on people, property, and the economy. Mitigation actions primarily target hazards with high and medium rankings.

Table 10-12. Hazard Risk Ranking

Rank	Hazard	Risk Ranking Score	Risk Category
1	Landslide	51	High
2	Wildfire	36	High
3	Earthquake	32	Medium
4	Severe Storm	24	Medium
5	Severe Weather	24	Medium
6	Flooding	18	Medium
7	Dam Failure	12	Low
8	Drought	9	Low

10.6.3 Jurisdiction-Specific Vulnerabilities

Volume 1 of this hazard mitigation plan provides complete risk assessments for each identified hazard of concern. This section provides information on a few key vulnerabilities for Thousand Oaks. Available Thousand Oaks-specific risk maps of the hazards are provided at the end of this annex.

Repetitive Loss Properties

Repetitive loss records are as follows:

- Number of FEMA-identified Repetitive-Loss Properties: 5
- Number of FEMA-identified Severe-Repetitive-Loss Properties: N/A
- Number of Repetitive-Loss Properties or Severe-Repetitive-Loss Properties mitigated: N/A

Other Noted Vulnerabilities

The following jurisdiction-specific issues have been identified based on a review of the results of the risk assessment, public involvement strategy, and other available resources:

- **Urban Area Flooding**—Urban area flooding of specific neighborhoods in Thousand Oaks is an ongoing hazard that continues to be addressed through the City's Capital Improvement Program. The Public Works Department has identified hazard priorities and through City, State and Federal funding resources, many of the known hazards are being mitigated. Each project includes a public outreach component before, during and after the completion of each project.
- **Power Outages**—Scheduled and un-scheduled SCE power outages continue to be a hazard in Thousand Oaks, especially during excessive heat and wind. The Public Works Department has implemented a Red Flag-PSPS Policy that includes the use of permanent and portable back-up generators at critical City facilities. The City also encourages residents and business owners to secure back-up power.

Mitigation actions addressing these issues were prioritized for consideration in the action plan in this annex.

10.7 STATUS OF PREVIOUS PLAN ACTIONS

Table 10-13 summarizes the actions that were recommended in the previous version of the hazard mitigation plan and their implementation status at the time this update was prepared.

10.8 HAZARD MITIGATION ACTION PLAN

Table 10-14 lists the identified actions, which make up the hazard mitigation action plan for this jurisdiction. Table 10-15 identifies the priority for each action. Table 10-16 summarizes the mitigation actions by hazard of concern and mitigation type.

Table 10-13. Status of Previous Plan Actions

Action Item	Completed	Removed; No Longer Feasible	Carried Over to Plan Update	
			Check if Yes	Action # in Update
TO 1—Develop a water conservation public outreach program to increase awareness about the drought, fines and penalties for overuse and methods for conserving water.	✓			
Comment: The Public Works Department developed a public outreach program over the last decade that includes a monthly e-newsletter to over 10,500 recipients and use of Facebook, Instagram and Twitter. The Sustainability Division in the Public Works Department maintains the City's Water webpage which provides updates related to drought conditions, fines and penalties for overuse and strategies for conserving water. The City finished its Automatic Meter Reader Upgrade in June 2021 which provides customer access to water consumption data and monitoring of customer water leaks. The City's annual Arbor/Earth Day event includes water conservation booths from all three local water purveyors. During periods of significant water shortage, the City hosts monthly meetings with the three local water purveyors to coordinate programs and messaging. The City is also a member of the California Data Collaborative and has access to a dashboard that identifies high water users in Thousand Oaks that have accepted water rebates. Currently the City is preparing a Climate and Environmental Action Plan, which includes a water conservation component. The plan is being developed in conjunction with an update to the City's General Plan and it will be CEQA qualified. Several stakeholder meetings were held in 2021 and the Plan is expected to be adopted by 2023.				
TO 2—Adopt emergency water conservation measures and/or water conservation ordinance to reduce irrigation.	✓			
Comment: The City's Urban Water Management Plan (UWMP) was adopted by City Council in June 2021. Municipal code update conservation measures (3 tier to 6 tier) November 2021. Update of water conservation levels from 3 to 6 tiers with Water Shortage Contingency Plan and municipal code updates.				
TO 3—Evaluate City bridges for structural, seismic, functional, and safety adequacy.	✓			
Comment: Caltrans performs biennial evaluation of all City and State's bridges for structural, seismic, functional and safety adequacy. Caltrans provides inspection reports and repair and maintenance recommendations for each bridge that was inspected. In November 2020 Caltrans inspected City of Thousand Oaks bridges and rated them to indicate deficiencies, structural adequacy, safe load carrying capacity and general condition.				
TO 4—Update Supervisory Control and Data Acquisition (SCADA) Master Plan with seismic improvements, including design, integration of new Programmable Logic Controllers and communication systems at City pump stations, reservoirs, and turnouts.	✓			
Comment: CI 5284 SCADA Upgrades—New SCADA program, update of seismic equipment programmable logic controllers and programing. New communications system. Project completion target date: June 2022.				
TO 5—Remove and/or repair the interior of reservoir tanks and perform analysis, identify causes, and mitigate hazards to ensure tanks achieve seismic standards.	✓			
Comment: Water reservoirs are inspected and cleaned every 5 years and rehabilitated every 20-25 years. Rehabilitation project priorities include 2019 Lang Ranch Reservoir, 2020 Tara Reservoir Seismic upgrades, ventilation and structural safety were addressed at these sites and all reservoir rehabilitation projects. As part of CIP 5284, SCADA Upgrades				

Table 10-14. Hazard Mitigation Action Plan Matrix

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action CTO-1—Where appropriate, support retrofitting, purchase or relocation of structures located in hazard areas, prioritizing those that have experienced repetitive losses and/or located in high- or medium-risk hazard areas.						
Hazards Mitigated: Landslides, Wildfire, Earthquake, Severe Storms, Severe Weather, Flooding, Dam Failure						
New & Existing	4, 6, 8, 9, 10, 11, 19	City Public Works Department	City Community Development Department	High	Grant Funding- FEMA HMA (BRIC, FMA, HMGP)	Ongoing
Action CTO-2—Integrate the hazard mitigation plan into other plans, ordinances and programs that dictate land use decisions in the community, including Urban Water Management Plan, General Plan Update, Climate & Environmental Action Plan						
Hazards Mitigated Flooding, Earthquakes, Climate Change						
New & Existing	4, 8, 9, 11, 19	City Public Works Department	City Community Development Department	Low	Staff Time, General Fund	Ongoing
Action CTO-3—Actively participate in the plan maintenance protocols outlined in Volume 1 of this hazard mitigation plan.						
Hazards Mitigated: Landslides, Wildfire, Earthquake, Severe Storms, Severe Weather, Flooding, Dam Failure, Drought						
New & Existing	9, 10, 11	City Public Works Department	City Community Development Department	Low	Staff Time, General Fund	Short-term
Action CTO-4—Continue to maintain good standing and compliance under the NFIP through implementation of floodplain management programs that, at a minimum, meet the NFIP requirements that include enforcing the City flood damage prevention ordinance, participate in floodplain identification and mapping updates, and provide public assistance/information on floodplain requirements and impacts.						
Hazards Mitigated: Flooding						
New & Existing	8, 9, 10, 13, 14, 15, 19	Public Works	Ventura County Water Protection District	Low	Staff Time, General Fund	Ongoing
Action CTO-5—Identify and pursue strategies to increase adaptive capacity to climate change including but not limited to the following projects: • CI 5395, Groundwater Utilization Project—Alternative source of water. • CI 5450, Emergency Water Interconnects—2 new interconnects with California American Water Service (Adrian Drive & Avenida de los Arboles).						
Hazards Mitigated: Drought, Earthquake						
New & Existing	1, 13, 14, 19	City Public Works Department		Low	Staff Time, General Fund	Short-term
Action CTO-6—Purchase generators for critical facilities and infrastructure that lack adequate backup power, including the following projects: • CI 5292, La Granada Reservoir Improvements—Redundant supply pumps, emergency fire pump (Pump #3) and emergency backup generator installed at La Granada Reservoir. • CI 5454, Pressure Reducing Stations—1 new PRS & existing upgrade. Water supply redundancy, reduced pumping. • CI 5452, Lone Oak Emergency Generator—Install new generator at Lone Oak Pump Station with an automatic transfer switch and connection to SCADA System. • CI 5520, Site Improvements at Reservoir and Pump Stations—Erbes Road Emergency backup generator.						
Hazards Mitigated: Dam Failure, Earthquakes, Flooding, Landslide, Severe Weather, Wildfires						
New and Existing	2, 8, 10, 19	City Public Works Department	Community Development Department		Grant Funding- FEMA HMA (BRIC, FMA, HMGP)	Short-term

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action CTO-7—Maintain wildfire hazard fuel reduction program for areas that have been identified with overgrown or dead brush, trees and weeds to reduce the potential for tree-to-tree ignition. Ensure that a "maintenance now" component to provide continued fire resistance is part of the program. (Coordinates with Ventura County Fire Protection District Action VFP-6 and Conejo Recreation and Parks District Action CRP-1)						
Hazards Mitigated:	Wildfire					
New & Existing	2, 4, 5, 6, 8, 10, 11, 13, 14, 15, 18, 19	VCFPD	City of Thousand Oaks, Conejo Recreation and Parks District, CAL FIRE & USDA	Medium	Grant Funding- FEMA HMA (BRIC, FMAP and HMGP), Staff Time & General Funds	Ongoing
Action CTO-8—The City is developing plans to install two City Hall emergency power battery backup systems. Two other emergency backup power systems include the Erbes Road Pump Station Battery Back-Up Project and the Pederson Battery Back Up Project. Both projects are funded by state HMGP funding.						
Hazards Mitigated:	Landslides, Wildfire, Earthquake, Severe Storms, Severe Weather, Flooding, Dam Failure					
New and Existing	1, 6, 11, 19	City Public Works Department	VCPWA-WP	Low	Grant Funding- FEMA HMA (BRIC, FMA, HMGP) and General Fund	Short-term
Action CTO-9— The Lake Eleanor (Banning) Dam was built in 1889 is operated by COSCA and is 37 feet high and has a storage capacity of 128-acre-feet. Dam failure would be a flood risk for the Westlake community and has a sentiment load that cannot be released downstream. The reduction of water storage volume would help mitigate the hazard potential of the Dam.						
Hazards Mitigated:	Dam Failure, Earthquakes, Flooding, Severe Weather					
New and existing	4, 5, 8, 9, 11, 14, 15, 16, 17, 19	City Public Works Department	COSCA, CRPD	Low	Grant Funding- FEMA HMA (BRIC, FMA, HMGP)	Long Term
Action CTO-10—Community outreach program for wildfire safety. Home losses associated with wildfires. COSCA contracts with the Ventura Regional Fire Safe Council to provide educational outreach and services promoting wildfire safety. These include webinars on fire safety, defensible space, and home hardening. Also offered are Home Ignition Zone assessments for homeowners in COSCA's service area. Currently, these are funded through COSCA Board appropriations for funding from COSCA's Woolsey Fire Recovery Fund.						
Hazards Mitigated:	Wildfire					
New and Existing	1, 5, 8, 11, 14, 17	City Community Development	COSCA	Low	Grant Funding- FEMA HMA (BRIC, FMAP and HMGP) & Cal-OES	Ongoing
Action CTO-11—Westlake Boulevard Flood Damage Mitigation. Install retaining walls and upgrade the drainage inlet along the west side of Westlake Boulevard at Cloverleaf Street to mitigate debris and mud flows from adjacent hillsides from entering the roadway.						
Hazards Mitigated:	Dam Failure, Earthquakes, Flooding, Severe Weather.					
New and Existing	4, 14, 11, 15, 16, 19	City Public Works Department	N/A	Medium	General Fund, Grant Funding- FEMA HMA (BRIC, FMAP and HMGP)	Ongoing

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action CTO-12- Continue implementation of City Drainage Protection Program. Positive drainage away from structures is achieved in accordance with the City's adopted building codes development discharges to be safely conveyed to stable channels and/or dispersed into natural channels via energy dissipators/rip-rap to avoid scour of unstable areas in accordance with TOMC 1995-20 Section 4 (Commercial/Industrial) and Section 5 (Residential).						
Hazards Mitigated: Dam Failure, Earthquake, Flooding, Severe Weather						
New and Existing	1, 11, 15, 16, 19	City Public Works Department	City Community Development Department	Low	General Fund	Ongoing
Action CTO-13—Continue to participate in Countywide FEMA Coordination by meeting quarterly to discuss program enhancements, studies, and other floodplain matters.						
Hazards Mitigated: Flooding						
New and Existing	1, 8, 10, 13	City Public Works Department	N/A	Low	General Fund	Ongoing

a. Short-term = Completion within 5 years; Long-term = Completion within 10 years; Ongoing= Continuing new or existing program with no completion date

Acronyms used here are defined at the beginning of this volume.

Table 10-15. Mitigation Action Priority

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Cost?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Implementation Priority[a]	Grant Pursuit Priority[a]
1	7	High	High	Yes	Yes	No	High	High
2	5	High	Low	Yes	No	Yes	High	Low
3	3	Medium	Medium	Yes	No	Yes	Medium	Low
4	7	High	Low	Yes	No	Yes	Low	Low
5	4	High	Medium	Yes	No	Yes	Medium	Low
6	4	High	Medium	Yes	Yes	Yes	Medium	High
7	12	High	Low	Yes	Yes	Yes	High	High
8	4	Medium	High	Yes	Yes	No	Medium	Medium
9	10	High	Low	Yes	Yes	Yes	High	High
10	6	Low	Low	Yes	Yes	Yes	Low	Medium
11	5	Medium	Low	Yes	Yes	Yes	Low	Medium
12	5	Low	Low	Yes	No	Yes	Low	Low
13	4	Low	Low	Yes	No	Yes	Low	Low

a. See the introduction to this volume for explanation of priorities.

Table 10-16. Analysis of Mitigation Actions

Hazard Type	Action Addressing Hazard, by Mitigation Type[a]							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilience	Community Capacity Building
High-Risk Hazards								
Landslide	CTO-6, 11	CTO-1, 2, 6		CTO-1, 3, 5	CTO-6, 8	CTO-5, 6, 8	CTO-1, 5	CTO-3, 8
Wildfire	CTO-6, 7, 8, 10	CTO-1, 3, 6, 7, 10	CTO-7, 10	CTO-1, 7	CTO-6, 8, 10	CTO-3, 6, 7	CTO-10	CTO-3, 7, 10
Medium-Risk Hazards								
Earthquake	CTO-2, 3, 6, 8, 9	CTO-1, 2, 6, 8, 9	CTO-5, 10	CTO-1, 2, 5, 9, 11, 12	CTO-1, 2, 6, 8, 9	CTO-1, 2, 3, 8, 9, 12	CTO-5, 7, 9, 11	CTO-1, 3, 8, 12
Severe Storms	CTO-3, 6, 8, 11	CTO-1, 3, 6, 8		CTO-1	CTO-8	CTO-1, 6, 8		CTO-1, 3, 6
Severe Weather	CTO-3, 6, 9, 11, 12	CTO-1, 6, 9, 11, 12	CTO-10, 13	CTO-1, 9, 12	CTO-1, 6, 8, 11	CTO-1, 6, 8, 11, 12	CTO-9	CTO-1, 3, 9, 12
Flooding	CTO-2, 3, 4	CTO-1, 2, 4, 8, 9	CTO-7, 11	CTO-1, 2, 9, 11, 12	CTO-6, 8, 11, 12	CTO-1, 2, 6, 8, 9, 11, 12	CTO-2, 9, 11, 12, 13	CTO-1, 2, 3, 4, 9, 12, 13
Low-Risk Hazards								
Dam Failure	CTO-11, 12	CTO-1, 3, 6, 8, 9, 11, 12	CTO-9	CTO-1, 8, 9	CTO-1, 6, 8	CTO-1, 6, 11, 12	CTO-8, 9	CTO-1, 3, 6, 8
Drought					CTO-5	CTO-5		CTO-3

a. See the introduction to this volume for explanation of mitigation types.

10.9 PUBLIC OUTREACH

Table 10-17 lists public outreach activities for Thousand Oaks which includes citywide communications and civic engagement activities for City departments, the press, and community members. Public outreach includes:

- City Websites
- Social Media
- Emergency Communications
- Media Relations
- Citywide Branding
- Press Releases
- Community Relations
- City Newsletters
- TOTV—Government Access Television
- Community Attitude Survey

Table 10-17. Local Public Outreach

Local Outreach Activity	Date	Number of People Involved
City Emergency Management E-Newsletter	6/29/21	1,100 subscribers
City Sustainability E-Newsletter & Blog	6/29/21	10,400 subscribers
City Scene E-Newsletter	7/1/21	1,500 subscribers
Hazard Mitigation Description/Survey Link on City Website	7/1/21	N/A
Chamber of Commerce E-Newsletter	8/21/21	2,500 subscribers
American Public Works Association, Ventura County Chapter	8/22/21	900 subscribers

10.10 INFORMATION SOURCES USED FOR THIS ANNEX

The following technical reports, plans, and regulatory mechanisms were reviewed to provide information for this annex.

- **Thousand Oaks Municipal Code**—The municipal code was reviewed for the full capability assessment and for identifying opportunities for action plan integration.
- **Emergency Operations Plan**—The EOP was reviewed for the full capability assessment and for identifying opportunities for action plan integration.
- **Thousand Oaks General Plan**—This plan is being updated and is scheduled to be adopted by the City in FY 2022-23. Several sections of the Plan, including the Safety Element and its relation to the Climate and Environmental Action Plan were referenced in this Hazard Mitigation Plan.
- **Climate Action & Environmental Plan**—This plan was reviewed for the full capability assessment and for identifying opportunities for action plan integration.

The following outside resources and references were reviewed:

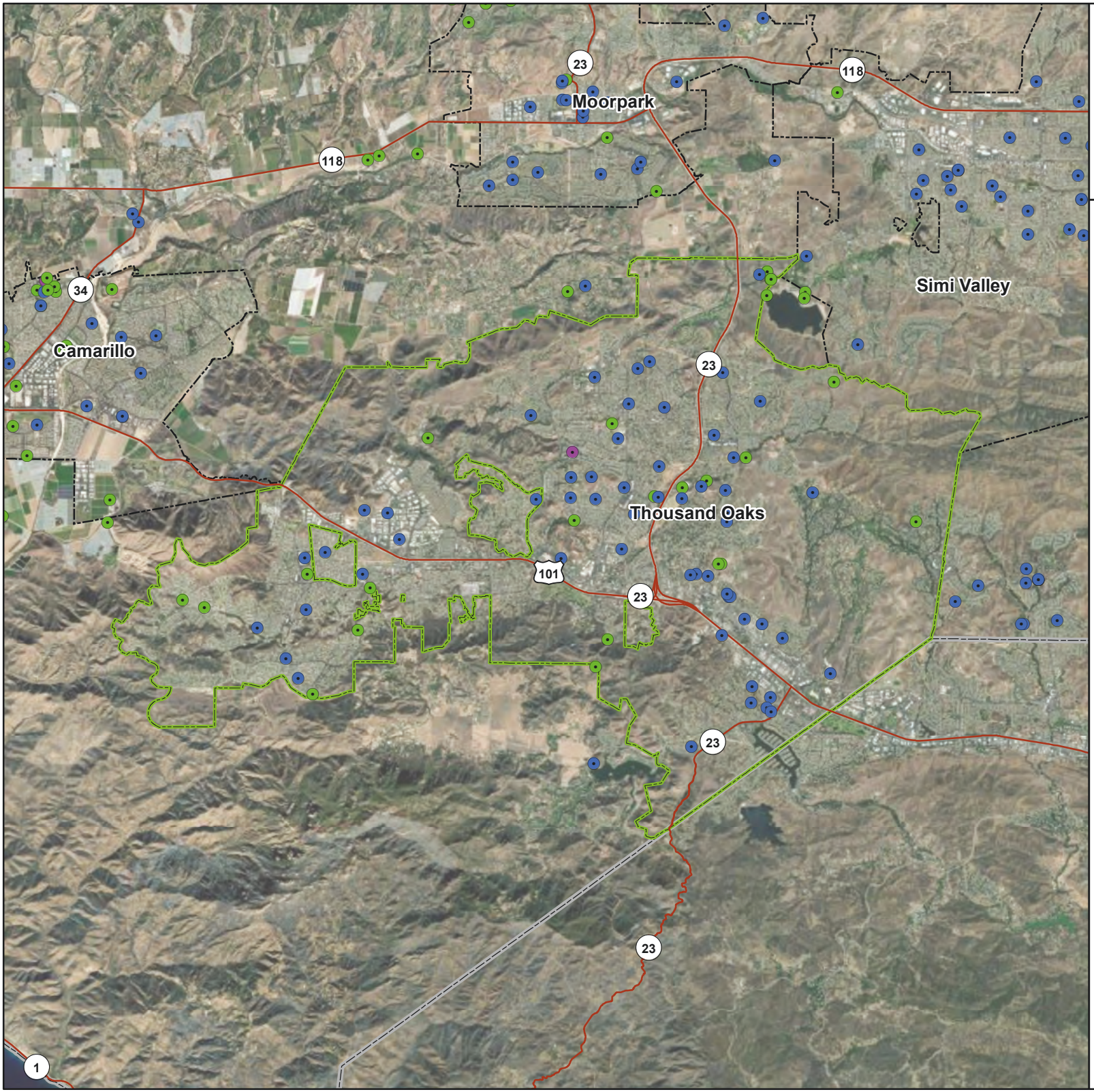
- **Hazard Mitigation Plan Annex Development Toolkit**—The toolkit was used to support the identification of past hazard events and noted vulnerabilities, the risk ranking, and the development of the mitigation action plan.

10.11 ADDITIONAL COMMENTS

The City transitioned to a new solid waste hauler (Athens) on January 1, 2022.The new residential and commercial hauler provides improved collection services and has added organics collection and composting. In addition, Athens offers pickup of household hazardous waste (HHW) from residences citywide. A new service that will reduce illegal HHW disposal and improve the City's recovery of unwanted chemicals out of the waste stream and homes.

The addition of residential HHW curbside supplements the existing City HHW facility at 2010 Conejo Center Drive, which offers free drop-off of HHW to Thousand Oaks residents and unincorporated county residents every Friday 9 am – 1 pm. Small businesses also use the facility 1-3 pm and pay for the cost of disposal further reducing the illegal disposal of toxic chemicals into the waste stream.

In November 2021 the City adopted a Water Shortage Contingency Ordinance and Resolution for a 15 percent voluntary water conservation level.



Thousand Oaks

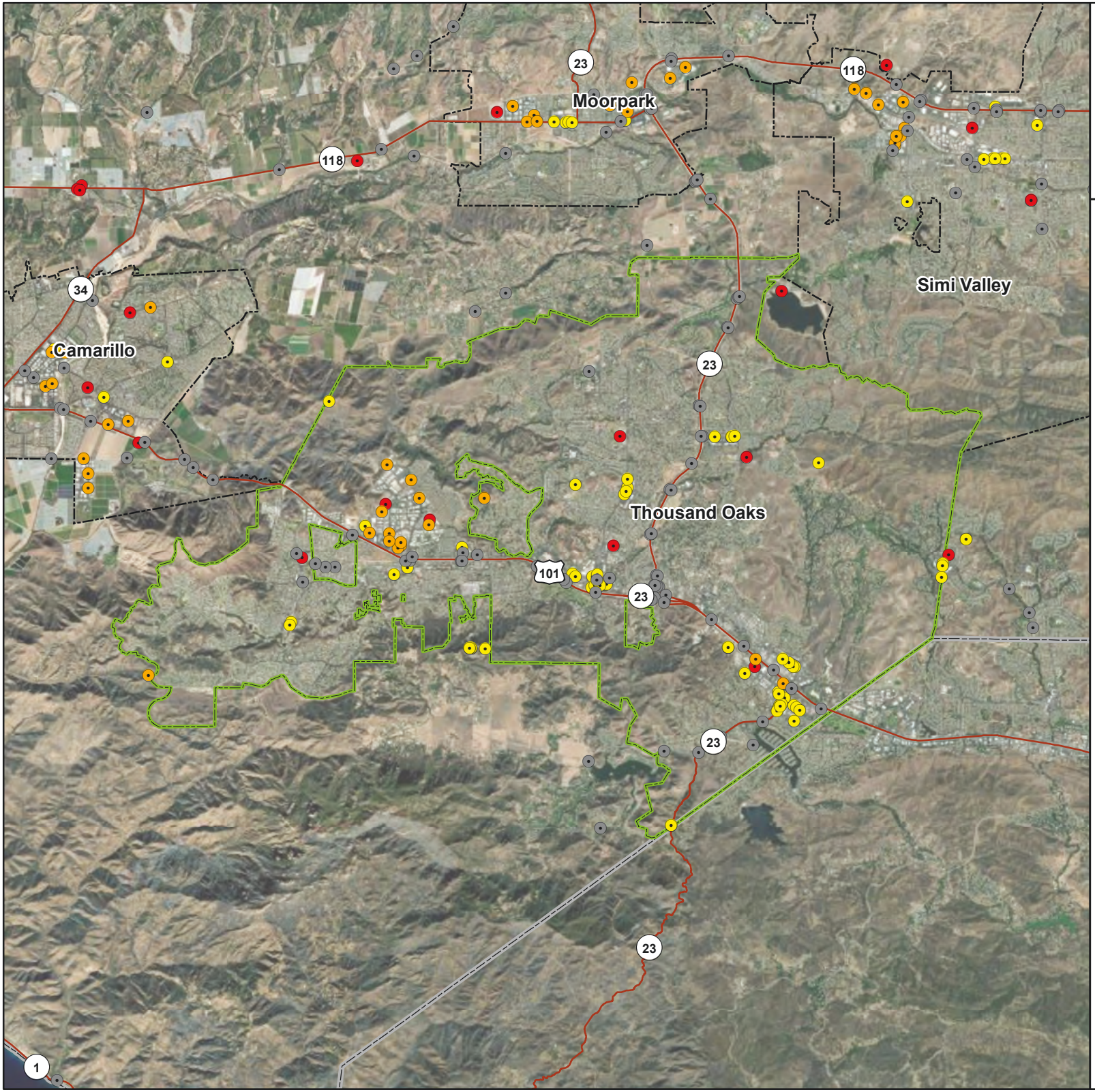
Critical Facilities (1 of 2)

- Food, Water, Shelter
- Health and Medical
- Safety and Security
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Data Sources: Ventura Co., VCFD, Casitas MWD, Calleguas MWD, City of Camarillo, CA Energy Commission, Cal Trans, EPA, HIFLD, Esri

N

0 0.75 1.5 3 Miles



Thousand Oaks

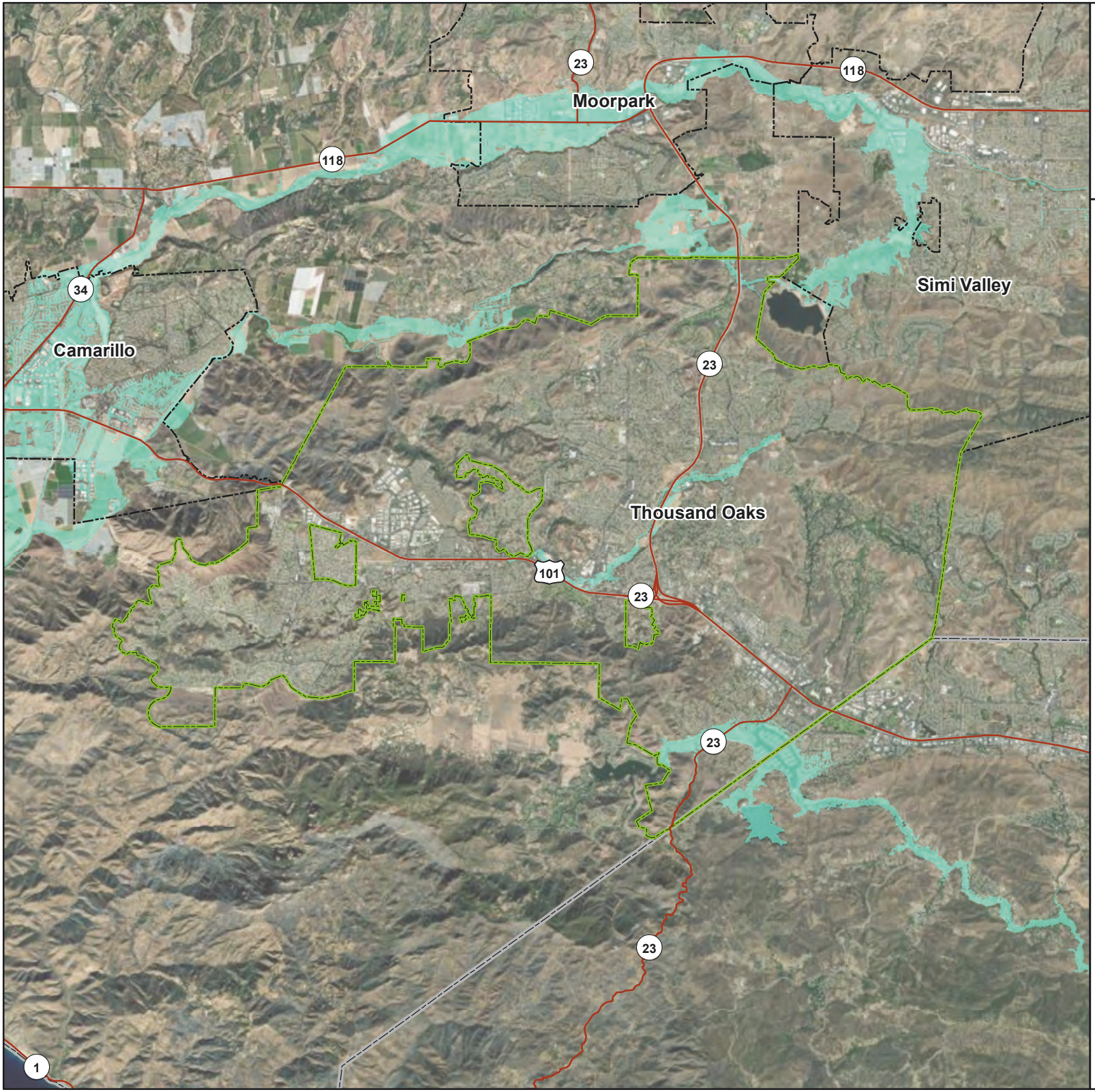
Critical Facilities (1 of 2)

- Communications
- Energy
- Hazardous Material
- Transportation
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Data Sources: Ventura Co., VCFD, Casitas MWD, Calleguas MWD, City of Camarillo, CA Energy Commission, Cal Trans, EPA, HIFLD, Esri

N

0 0.75 1.5 3 Miles



Thousand Oaks

Dam Failure Inundation Areas

Combined Inundation Areas

Major Roads

Selected City

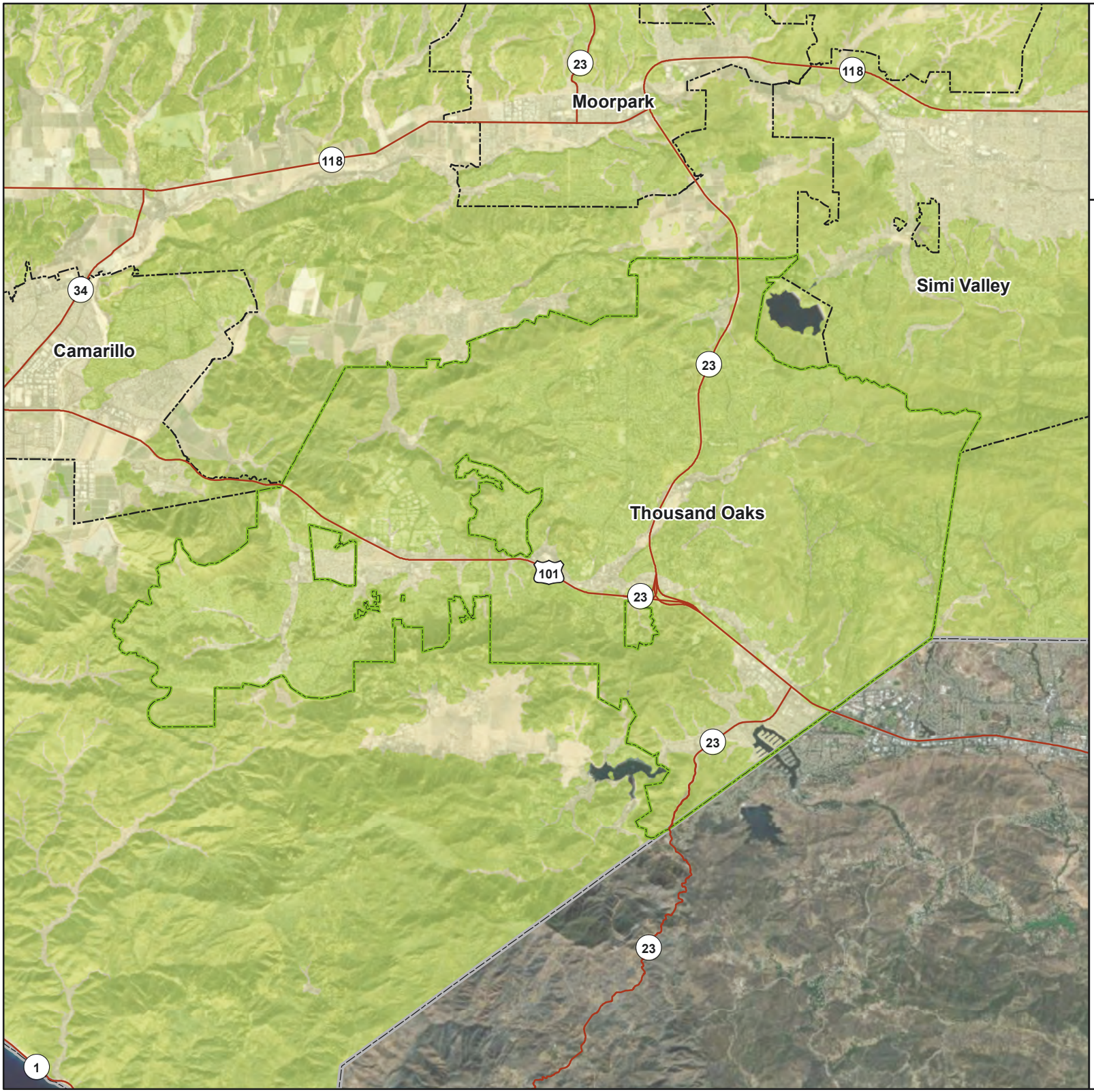
Incorporated Cities

County Boundary

Data Sources: Ventura Co., CA DWR, Esri

N

0 0.75 1.5 3 Miles



Thousand Oaks

NEHRP Soil Class

C (Dense soil/soft rock)

D (Stiff soil)

Major Roads

Selected City

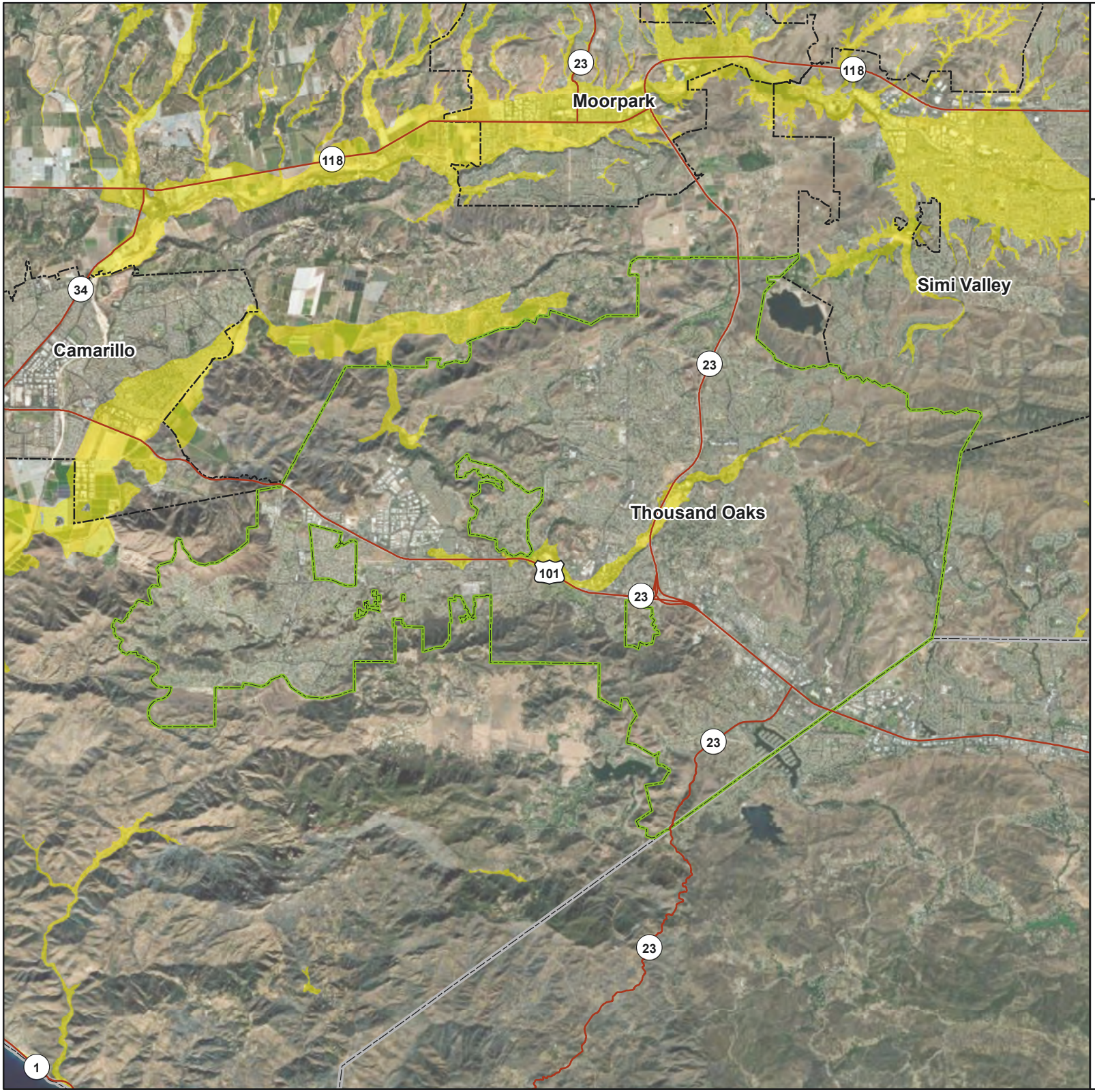
Incorporated Cities

County Boundary

Data Sources: Ventura Co., CGS, Esri

N

0 0.75 1.5 3 Miles



Thousand Oaks

Liquefaction Susceptibility

Liquefaction zone

Major Roads

Selected City

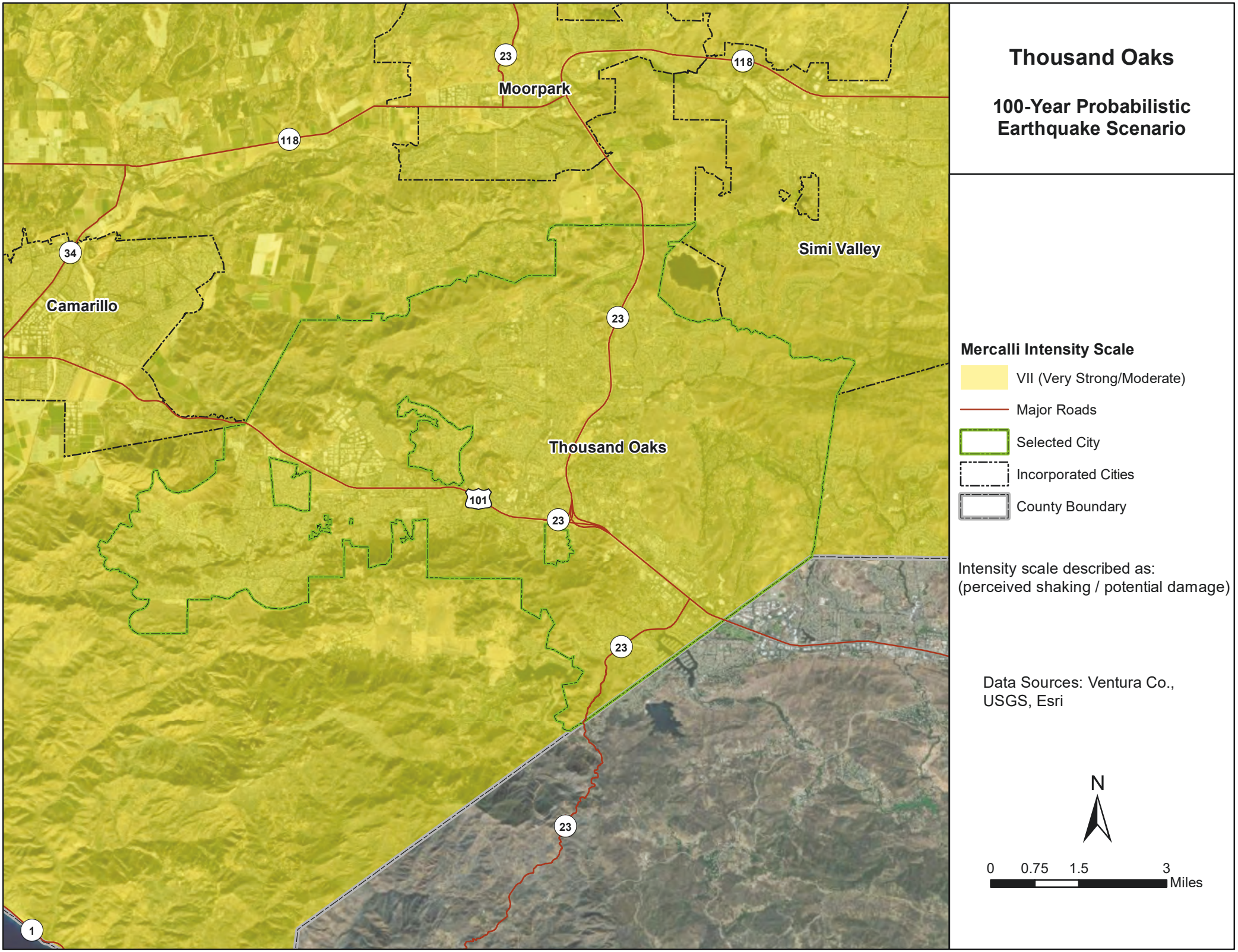
Incorporated Cities

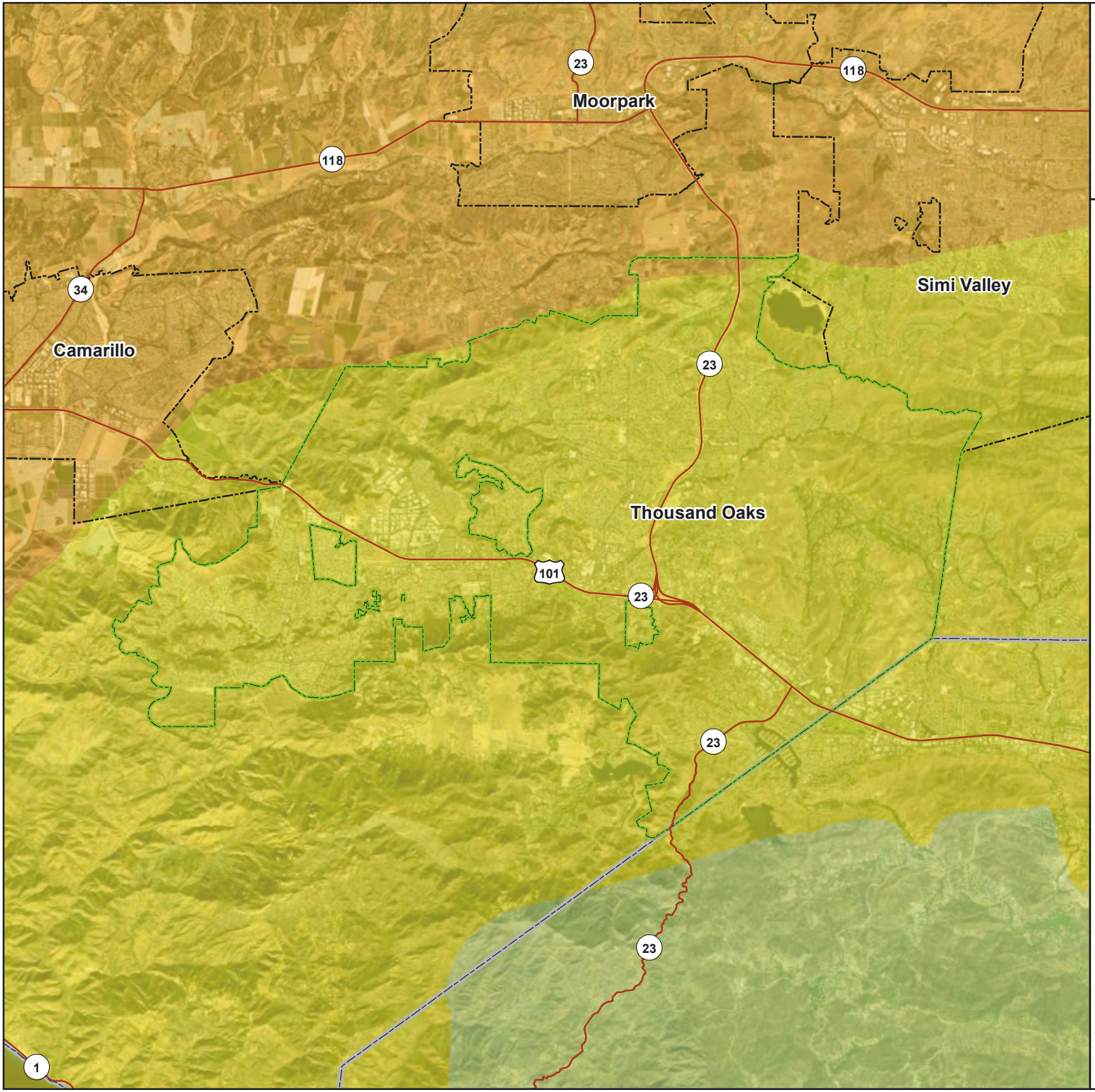
County Boundary

Data Sources: Ventura Co., Esri

N

0 0.75 1.5 3 Miles


Thousand Oaks
100-Year Probabilistic Earthquake Scenario
Moorpark
Simi Valley
Camarillo
Thousand Oaks
23
118
34
101
1
Mercalli Intensity Scale
VII (Very Strong/Moderate)
Major Roads
Selected City
Incorporated Cities
County Boundary
Intensity scale described as:
(perceived shaking / potential damage)
Data Sources: Ventura Co., USGS, Esri
N
0 0.75 1.5 3
Miles



Thousand Oaks

Oak Ridge M7.16 Earthquake Scenario

Mercalli Intensity Scale

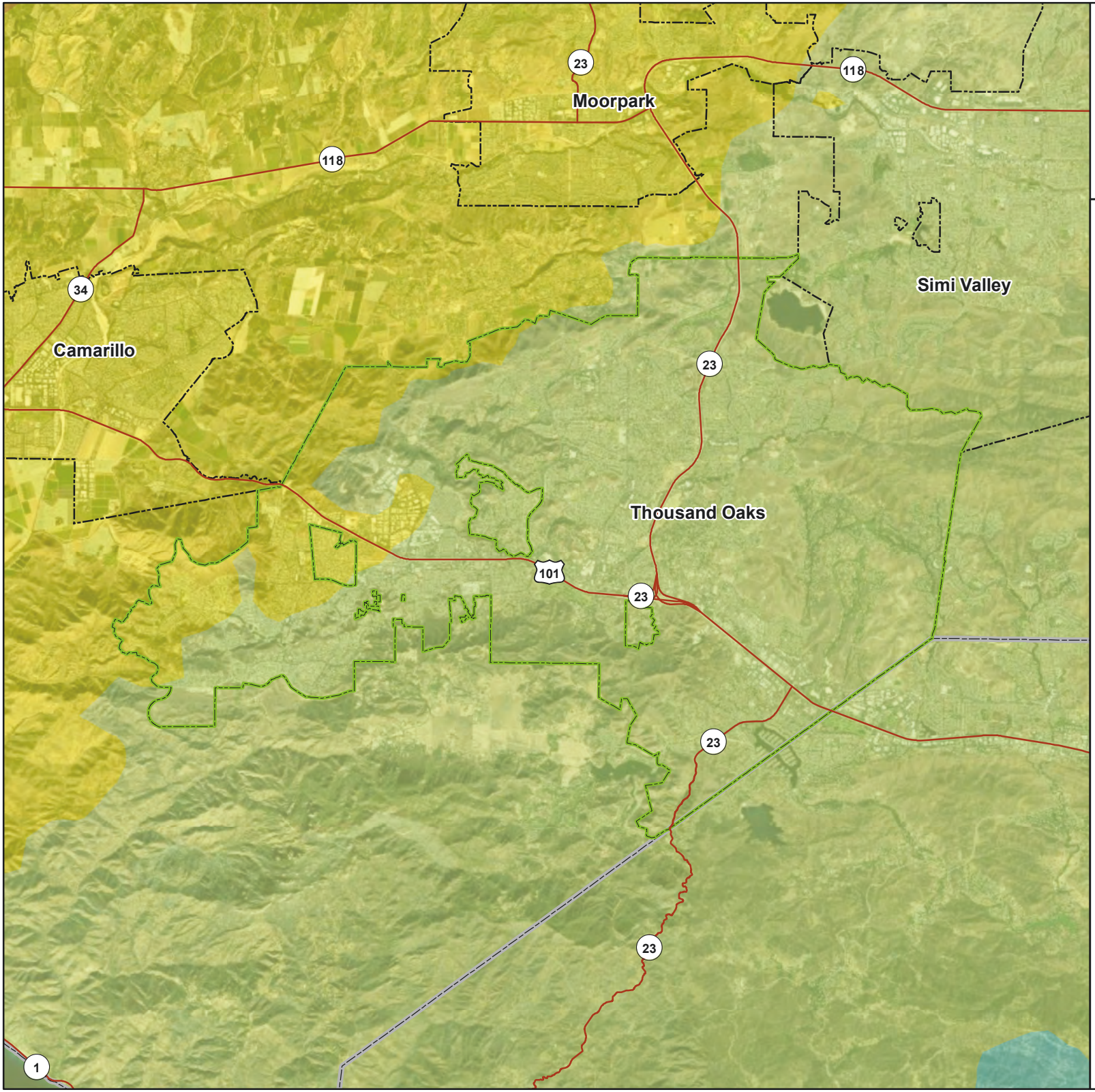
- VI (Strong/Light)
- VII (Very Strong/Moderate)
- VIII (Severe/Moderate-Heavy)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.75 1.5 3 Miles



Thousand Oaks

Pitas Point M7.12 Earthquake Scenario

Mercalli Intensity Scale

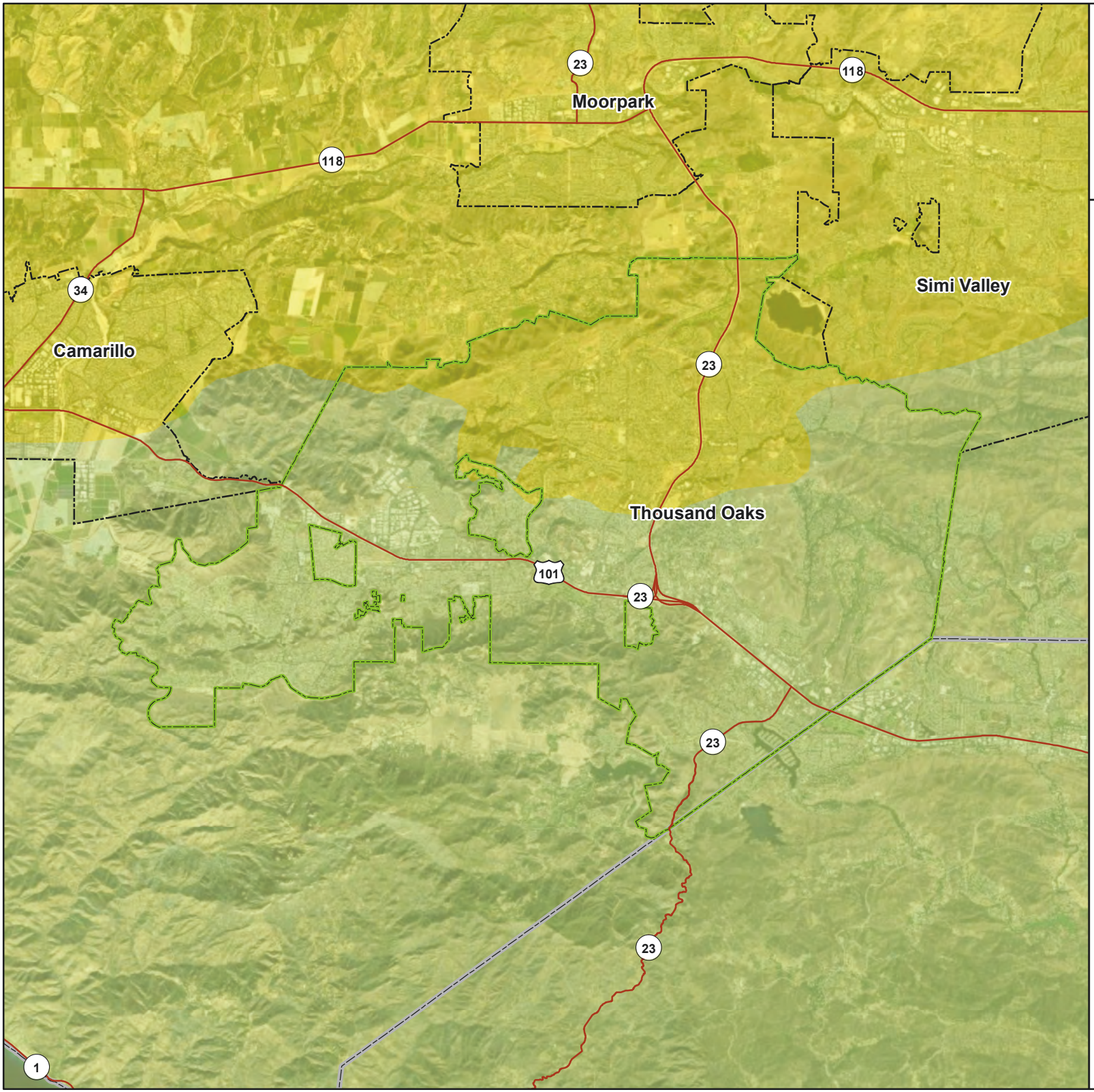
- V (Moderate/Very Light)
- VI (Strong/Light)
- VII (Very Strong/Moderate)
- VIII (Severe/Moderate-Heavy)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.75 1.5 3 Miles



Thousand Oaks

San Cayetano M7.16 Earthquake Scenario

Mercalli Intensity Scale

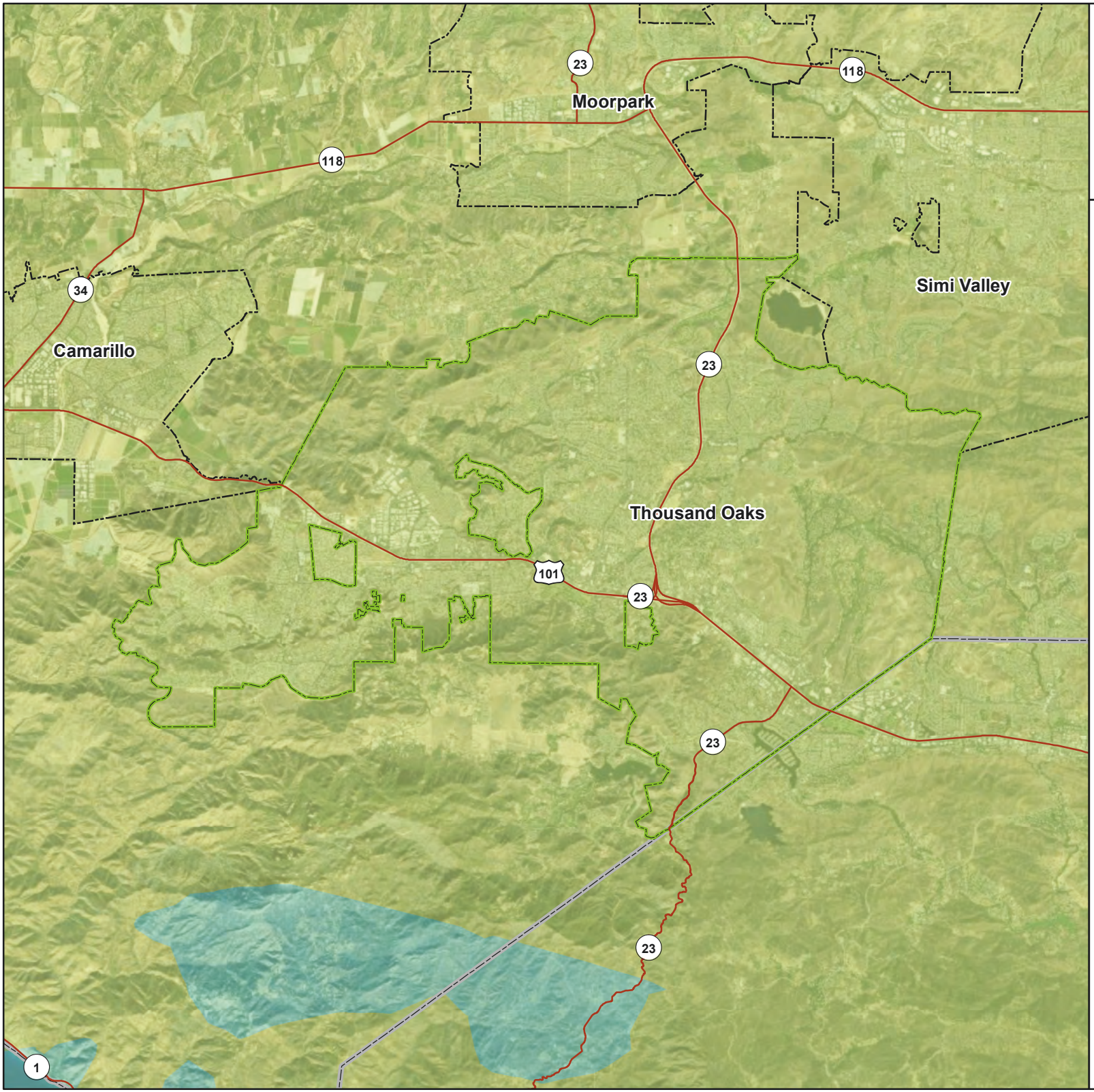
- VI (Strong/Light)
- VII (Very Strong/Moderate)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.75 1.5 3 Miles



Thousand Oaks

S. San Andreas M8.03 Earthquake Scenario

Mercalli Intensity Scale

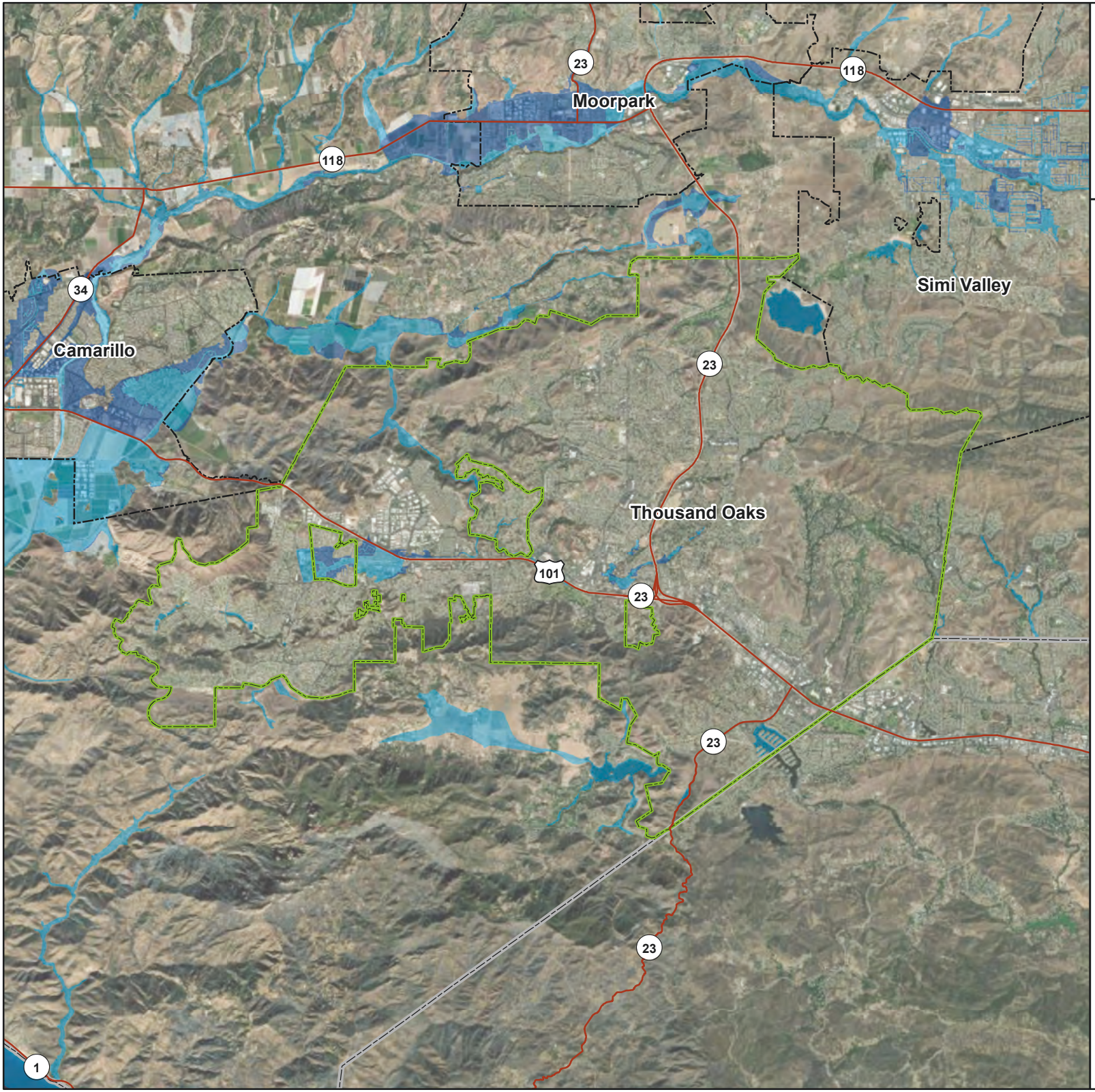
- V (Moderate/Very Light)
- VI (Strong/Light)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.75 1.5 3 Miles



Thousand Oaks

FEMA Flood Hazard Areas

1% Annual Chance Flood (100-Year)

0.2% Annual Chance Flood (500-Year)

Major Roads

Selected City

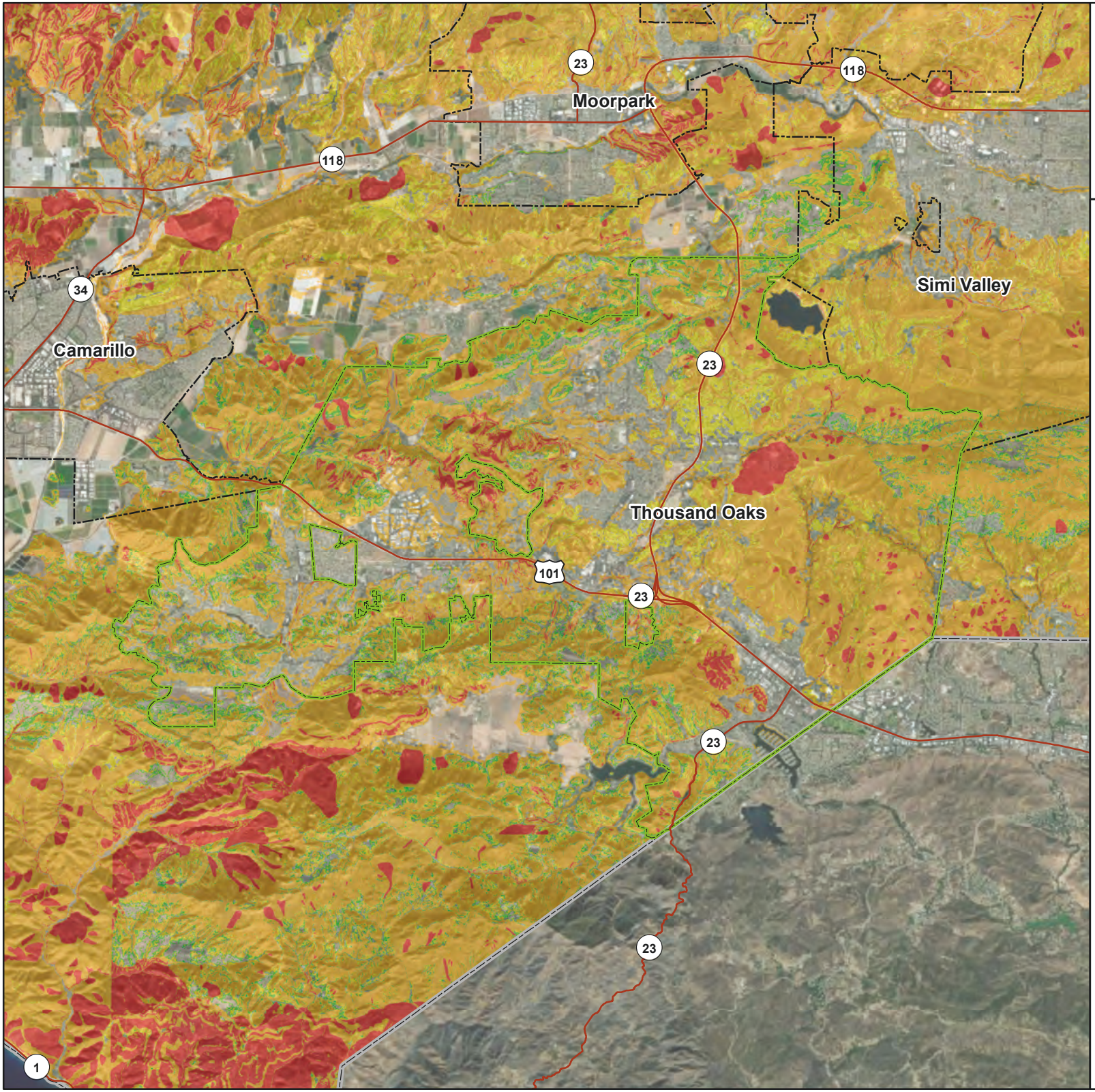
Incorporated Cities

County Boundary

Data Sources: Ventura Co., FEMA, Esri

N

0 0.75 1.5 3 Miles



Thousand Oaks

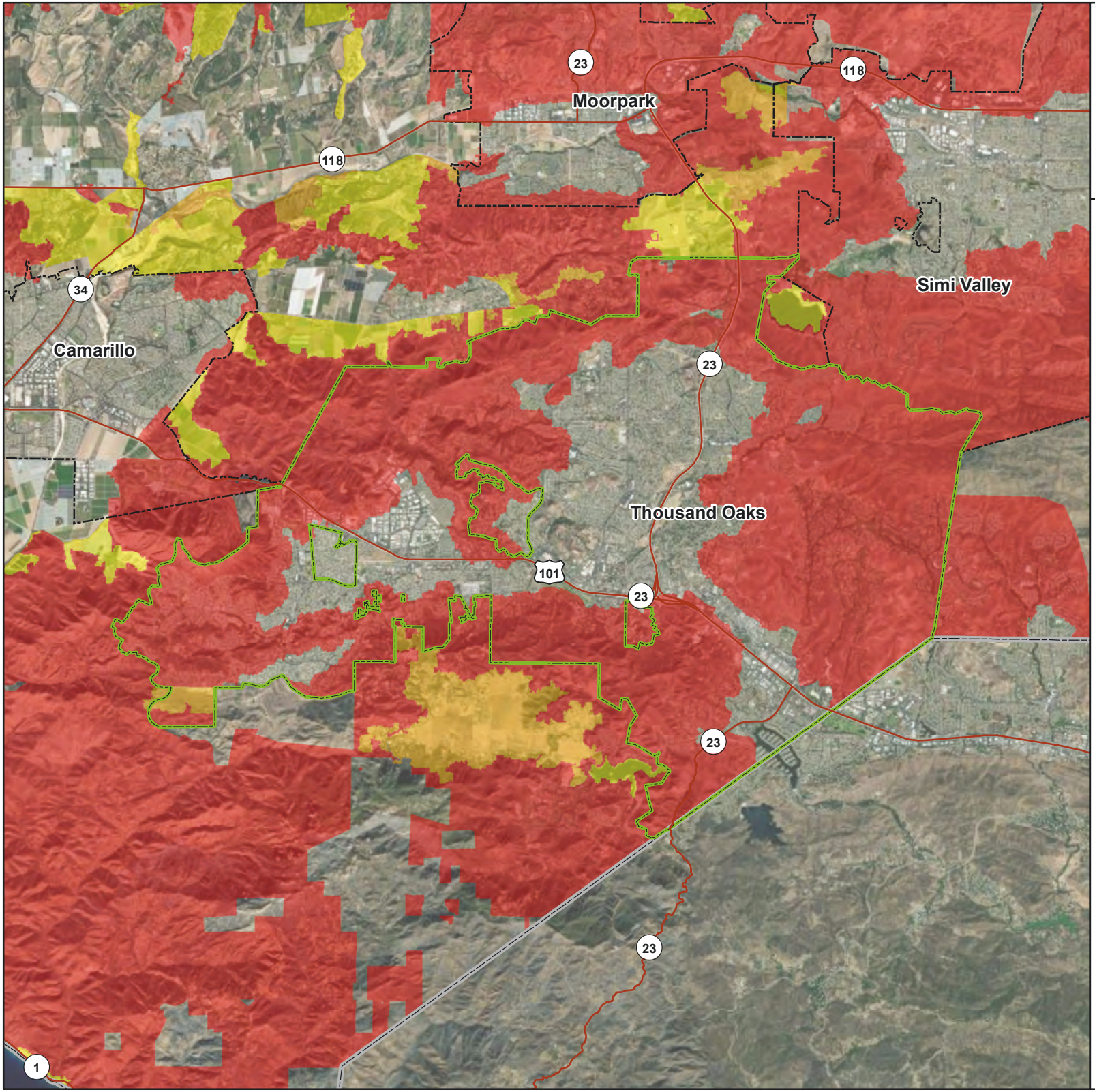
Susceptibility to Deep-Seated Landslides

- Low
- Moderate
- High
- Very High
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Data Sources: Ventura Co., CGS, Esri

N

0 0.75 1.5 3 Miles



Thousand Oaks

Wildfire Hazard Severity Zones

- Moderate
- High
- Very High
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Data Sources: Ventura Co., CAL FIRE, Esri

N

0 0.75 1.5 3 Miles

11. CITY OF VENTURA

11.1 LOCAL HAZARD MITIGATION PLANNING TEAM

Primary Point of Contact
Daniel Wall, Emergency Services Manager
501 Poli St.
Ventura, CA 93001
Telephone: 805-223-1030
email: dwall@cityofventura.ca.gov

Alternate Point of Contact
Barry Fisher, Deputy City Manager
501 Poli St.
Ventura, CA 93001
Telephone: 805-223-6873
Email: bfisher@cityofventura.ca.gov

This annex was developed by the local hazard mitigation planning team, whose members are listed in Table 11-1.

Table 11-1. Local Mitigation Planning Team Members

Name	Title
Peter Gilli	Director, Community Development
Neda Zayer	Deputy Director, Community Development
Jonathan Wood	Permit Services Manager, Planning Development
Phil Nelson	Director, Public Works
Mary Joyce Ivers	Deputy Director, Public Works
Jeff Hereford	Principal Civil Engineer
Cody Stults	Environmental
Susan Rungren	General Manager Ventura Water
Linda Sumansky	Director, Ventura Water Pure
Brett Reed	Fire Marshal, Ventura Fire Department

11.2 JURISDICTION PROFILE

11.2.1 Location and Features

The city of San Buenaventura is in Ventura County, California. The boundaries generally extend from Santa Barbara to Los Angeles along state route 101, the city, encompassing an area of 32.09 square miles. A California coastal community with its phenomenal climate, friendly people and spectacular coastline make Ventura a locale for those who appreciate and enjoy the outdoors.

11.2.2 History

Ventura is a coastal City, set against undeveloped hills and flanked by two free-flowing rivers, has been inhabited for thousands of years. Originally European explorers encountered the Chumash, while traveling along the Pacific coast. They witnessed the ocean navigation skill of the native people and their use of the abundant local resources from sea and land. In 1782, the eponymous Mission San Buenaventura was founded nearby, where it benefitted from the water of the Ventura River. The town grew around the mission compound and incorporated in 1866. The development of nearby oil fields began in the 1920s during which many designated landmark buildings were constructed. The mission and these buildings are at the center of a downtown that have become a cultural, retail, and residential district and visitor destination.

11.2.3 Governing Body Format

There are 7 members of the Ventura City Council, each serving a four-year term. Starting with the 2018 Election, four (4) Councilmembers were elected by Districts with the remaining three (3) Councilmembers elected by Districts in 2020. While elected by Districts, each member represents the interests of the City as a whole. The Ventura City Council assumes responsibility for the adoption of this plan; City Administration will oversee its implementation.

11.3 CURRENT TRENDS

11.3.1 Population

According to the California Department of Finance, the population of Ventura as of January 2020 was 106,276. Since 2010, the population has decreased at an average annual rate of 0.09 percent.

11.3.2 Development

Development trends in the City of Ventura are focused on infill development, versus new land/hillside development. The City is looking towards main corridors for increased density and mixed-use development to accommodate the balance of residential and commercial needs. Adaptative reuse of industrial properties is also being considered for last mile distribution centers. Increase housing demands with available property will likely result in more multi-family projects. More flexible zoning will increase commercial and industrial development.

Table 11-2 summarizes development trends in the period since the preparation of the previous hazard mitigation plan, as well as expected future development trends.

11.4 CAPABILITY ASSESSMENT

This section describes an assessment of existing capabilities for implementing hazard mitigation strategies. The introduction at the beginning of this volume of the hazard mitigation plan describes the components included in the capability assessment and their significance for hazard mitigation planning.

Table 11-2. Recent and Expected Future Development Trends

Criterion	Response					
Has your jurisdiction annexed any land since the preparation of the previous hazard mitigation plan?	No					
Is your jurisdiction expected to annex any areas during the performance period of this plan?	Yes					
If yes, describe land areas and dominant uses.	A 25.37-acre property located at the western terminus of Thille Street, just east of the Highway 101/ Highway 126 interchange and 75-acre property adjacent to Valentine road.					
If yes, who currently has permitting authority over these areas?	County of Ventura					
Are any areas targeted for development or major redevelopment in the next five years?	Yes					
If yes, briefly describe, including whether any of the areas are in known hazard risk areas	Most of the redevelopment is occurring within the downtown area and the major corridors such as Main Street and Thompson Blvd. The projects are occurring on infill sites that are building multi-story mixed use or residential projects. Some of the development in the downtown area is close to fault lines. Most of the redevelopment areas are generally outside of the high fire areas.					
How many permits for new construction were issued in your jurisdiction since the preparation of the previous hazard mitigation plan?		**2016**	**2017**	**2018**	**2019**	**2020**
	Single Family	56	255	60	7	4
	Multi-Family	31	59	11	14	36
	Other (commercial, mixed use, etc.)	1	1	5	0	4
	Total	**88**	**315**	**76**	**21**	**44**
Provide the number of new-construction permits for each hazard area or provide a qualitative description of where development has occurred.	• Special Flood Hazard Areas: 36 • Landslide: 12 • High Liquefaction Areas: 62 • Tsunami Inundation Area: 21 • Wildfire Risk Areas: 398					
Describe the level of buildout in the jurisdiction, based on your jurisdiction's buildable lands inventory. If no such inventory exists, provide a qualitative description.	Development trends in the City of Ventura are focused on infill development, (versus new land/hillside development). Looking towards main corridors for increased density and mixed-use development to accommodate to balance residential and commercial needs. Adaptative reuse of industrial properties for last mile distribution. Increase housing demands with available property will likely result in more multi-family projects. More flexible zoning will increase commercial and industrial development.					

Findings of the capability assessment were reviewed to identify opportunities to expand, initiate or integrate capabilities to further hazard mitigation goals and objectives. Where such opportunities were identified and determined to be feasible, they are included in the action plan. The "Analysis of Mitigation Actions" table in this annex identifies these as community capacity building mitigation actions.

The findings of the assessment are presented as follows:

- An assessment of planning and regulatory capabilities is presented in Table 11-3.
- Development and permitting capabilities are presented in Table 11-4.
- An assessment of fiscal capabilities is presented in Table 11-5.

- An assessment of administrative and technical capabilities is presented in Table 11-6.
- An assessment of education and outreach capabilities is presented in Table 11-7.
- Information on National Flood Insurance Program (NFIP) compliance is presented in Table 11-8.
- Classifications under various community mitigation programs are presented in Table 11-9.
- The community's adaptive capacity for the impacts of climate change is presented in Table 11-10.

Table 11-3. Planning and Regulatory Capability

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity?
Codes, Ordinances, & Requirements				
Building Code	Yes	Yes	Yes	Yes
Comment: *Sec. 12.115.010, Adoption of California Building Code, 2019 Edition. (Ord. No. 2019-011, § 2, 10-7-19)*				
Zoning Code	Yes	Yes	Yes	Yes
Comment: *Division 24 of the Municipal Code (Code 1971, updated numerous times, last updated Ord. No. 2020-021, § 1, 8-3-2020)*				
Subdivisions	Yes	Yes	Yes	Yes
Comment: *Division 26 of the Municipal Code (Code 1971, § 8211 through 8231.18, updated numerous times, last updated Ord. No. 2015-006, 6-8-15)*				
Stormwater Management	Yes	Yes	Yes	Yes
Comment: *Chapter 8.600, Stormwater Quality Management Ordinance 99-1 adopted 1-11-99*				
Post-Disaster Recovery	Yes	Yes	Yes	Yes
Comment: *Emergency Management Sec. 2.370.080., Emergency response May 2021*				
Real Estate Disclosure	Yes	No	Yes	Yes
Comment: *Division 24 of the Municipal Code (Code 1971, updated numerous times, last updated Ord. No. 2020-021, § 1, 8-3-2020)*				
Growth Management	Yes	No	No	Yes
Comment: *Save Open Space and Agricultural Resources initiative adopted 1995. Sec. 24.550.010 (Code 1971, § 15.850.010)*				
Site Plan Review	Yes	No	No	Yes
Comment: *Division 24 of the Municipal Code (Code 1971, updated numerous times, last updated Ord. No. 2020-021, § 1, 8-3-2020)*				
Environmental Protection	Yes	Yes	Yes	Yes
Comment: *Sec. 2R.450.750 (Res. No. 2002-57, § 4, 9-9-02)*				
Flood Damage Prevention	Yes	Yes	Yes	Yes
Comment: *Floodplain Regulations, Municipal Code Part 4 Chapter 12.430 (Ord. No. 2021-001, § 1, 1-11-21)*				
Emergency Management	Yes	Yes	Yes	Yes
Comment: *Emergency Management Sec. 2.370.080, Emergency response May 2021*				
Climate Change	No	No	No	Yes
Comment: *None*				
Planning Documents				
General Plan	Yes	No	Yes	Yes
Is the plan compliant with Assembly Bill 2140? *No*				
Comment: *Undergoing comprehensive General Plan that will bring the Plan into compliance with AB 2140*				
Capital Improvement Plan	Yes	No	Yes	Yes
How often is the plan updated? *Annually*				
Comment: *Current plan covers 6-year period from 2020-2026*				

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity?
Disaster Debris Management Plan	No	Yes	Yes	Yes
Comment: *Ventura County Disaster Recovery Plan, Adopted by BOS in April 2019*				
Floodplain or Watershed Plan	No	Yes	Yes	Yes
Comment: *The Ventura County Watershed Protection creates and maintains countywide plans*				
Stormwater Plan	Yes	Yes	Yes	Yes
Comment: *The City of Ventura has joined other jurisdictions to form the Ventura Countywide Stormwater Quality Management Program and is named as a co-permittee under a revised countywide municipal National Pollutant Discharge Elimination System permit for stormwater discharges issued by the Regional Water Quality Control Board in 2010 (Order R4-2010-0108)*				
Urban Water Management Plan	Yes	No	Yes	Yes
Comment: *2020 Urban Water Management Plan approved June 14, 2021*				
Habitat Conservation Plan	Yes	Yes	No	Yes
Comment: *The city does not have an existing habitat plan*				
Economic Development Plan	Yes	No	No	Yes
Comment: *Existing Gap plan developed 2018, funded Econ Dev plan request for proposals anticipated 2022 Spring*				
Shoreline Management Plan	Yes	Yes	Yes	Yes
Comment: *General Plan. Surfers Point Managed Retreat Project Chapter 24.310, Coastal Protection (CP) Overlay Zone*				
Community Wildfire Protection Plan	Yes	No	Yes	Yes
Comment: *Current effort to develop a plan due Jan 2022*				
Urban Forest Management Plan	Yes	No	No	Yes
Comment: *City of San Buenaventura Master Tree Plan, November 9, 2020*				
Climate Action Plan	Yes	No	No	No
Comment: *Preparation and adoption of a Climate Action Plan is part of the comprehensive General Plan update that is scheduled to be adopted in 2023.*				
Comprehensive Emergency Management Plan	Yes	No	Yes	Yes
Comment: *Emergency Operations Plan was published and approved May 10, 2021*				
Threat & Hazard Identification & Risk Assessment (THIRA)	Yes	No	No	Yes
Comment: *The city does not have a complete THIRA.*				
Post-Disaster Recovery Plan	Yes	No	Yes	Yes
Comment: *Incorporated into the EOP May 2021*				
Continuity of Operations Plan	Yes	No	Yes	Yes
Comment: *Incorporated into the EOP June 2021*				
Public Health Plan	No	Yes	Yes	Yes
Comment: *County of Ventura Health Care Agency Public Health Emergency Response Plan (ERP), 2019*				
Other—Tsunami Plan	No	Yes	Yes	Yes
Comment: *The County of Ventura has an existing plan that describes each City role and has been adopted locally. A revision of this document is required within the coming year 2022.*				

Table 11-4. Development and Permitting Capability

Criterion	Response
Does your jurisdiction issue development permits?	Yes
If no, who does? If yes, which department? *Community Development*	
Does your jurisdiction have the ability to track permits by hazard area?	Yes
Does your jurisdiction have a buildable lands inventory?	No

Table 11-5. Fiscal Capability

Financial Resource	Accessible or Eligible to Use?
Community Development Block Grants	Yes
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for Specific Purposes	Yes
User Fees for Water, Sewer, Gas or Electric Service	Yes
If yes, specify: Water, Sewer, Electrical Services fees for new construction	
Incur Debt through General Obligation Bonds	Yes
Incur Debt through Special Tax Bonds	Yes
Incur Debt through Private Activity Bonds	Yes
Withhold Public Expenditures in Hazard-Prone Areas	No
State-Sponsored Grant Programs	Yes
Development Impact Fees for Homebuyers or Developers	Yes

Table 11-6. Administrative and Technical Capability

Staff/Personnel Resource	Available?
Planners or engineers with knowledge of land development and land management practices	Yes
If Yes, Department /Position: Community Development / Chief Building Official and Public Works / Principal Civil Engineer	
Engineers or professionals trained in building or infrastructure construction practices	Yes
If Yes, Department /Position: Public Works/ Principal Civil Engineer, Community Development/Planner/inspector	
Planners or engineers with an understanding of natural hazards	Yes
If Yes, Department /Position: Public Works/ Principal Civil Engineer, Community Development/Planner/inspector	
Staff with training in benefit-cost analysis	Yes
If Yes, Department /Position: Finance / Finance Director	
Surveyors	Yes
If Yes, Department /Position: Public Works/ Surveyor	
Personnel skilled or trained in GIS applications	Yes
If Yes, Department /Position: Finance and Technology Department GIS/ Senior GIS Analyst	
Scientist familiar with natural hazards in local area	No
Emergency manager	Yes
If Yes, Department /Position: City Manager's Office, Emergency Services Manager	
Grant writers	Yes
If Yes, Department /Position: City Manager's Office and Multiple other departments	

Table 11-7. Education and Outreach Capability

Criterion	Response
Do you have a public information officer or communications office?	Yes
Do you have personnel skilled or trained in website development?	Yes
Do you have hazard mitigation information available on your website? ***If yes, briefly describe:*** On our website, there are references to the County OES website wherein centralized training and outreach can be found related to hazard mitigation education.	Yes
Do you use social media for hazard mitigation education and outreach? ***If yes, briefly describe:*** On our website, there are references to the County OES website wherein centralized training and outreach can be found related to hazard mitigation education.	Yes
Do you have any citizen boards or commissions that address issues related to hazard mitigation? ***If yes, briefly describe:*** The city of Ventura is currently developing a CERT team	Yes
Do you have any other programs in place that could be used to communicate hazard-related information? ***If yes, briefly describe:*** VCALERT, EVERBRIDGE, Email, Mail and Door Knocking	Yes
Do you have any established warning systems for hazard events? ***If yes, briefly describe:*** VCALERT, Emergency Notification System, VCSOES, WEA system	Yes

Table 11-8. National Flood Insurance Program Compliance

Criterion	Response
What local department is responsible for floodplain management?	Public Works
Who is your floodplain administrator? (department/position)	Public Works/Senior Engineer
Are any certified floodplain managers on staff in your jurisdiction?	Yes
What is the date that your flood damage prevention ordinance was last amended?	January 11, 2021
Does your floodplain management program meet or exceed minimum requirements?	Meets
When was the most recent Community Assistance Visit or Community Assistance Contact?	12-4-17 Thomas Fire
Does your jurisdiction have any outstanding NFIP compliance violations that need to be addressed?	No
Are any Risk MAP projects currently underway in your jurisdiction? ***If so, state what they are.*** FEMA has notified us that they will be studying the Ventura and Santa Clara River flooding	No
Do your flood hazard maps adequately address the flood risk within your jurisdiction?	Yes
Does your floodplain management staff need any assistance or training to support its floodplain management program?	No
Does your jurisdiction participate in the Community Rating System (CRS)? ***If no, is your jurisdiction interested in joining the CRS program?*** No	No
How many flood insurance policies are in force in your jurisdiction? [a] ***What is the insurance in force?*** $161.828,500 ***What is the premium in force?*** $374,421	471
How many total loss claims have been filed in your jurisdiction? ***What were the total payments for losses?*** $660,191	62

a. According to FEMA statistics as of March 31, 2021

Table 11-9. Community Classifications

	Participating?	Classification	Date Classified
FIPS Code	Yes	00611165042	N/A
DUNS #	Yes	039974761	N/A
Community Rating System	No	N/A	N/A
Building Code Effectiveness Grading Schedule	No	N/A	N/A
Public Protection	Yes	ISO3	2019
Storm Ready	No	N/A	N/A
Firewise	No	N/A	N/A
Tsunami Ready	Yes	N/A	2012

Table 11-10. Adaptive Capacity for Climate Change

Criterion	Jurisdiction Ratings
Technical Capacity	
Jurisdiction-level understanding of potential climate change impacts	Low
Comment:	
Jurisdiction-level monitoring of climate change impacts	Low
Comment:	
Technical resources to assess proposed strategies for feasibility and externalities	Low
Comment:	
Jurisdiction-level capacity for development of greenhouse gas emissions inventory	Medium
Comment: *City of Ventura has a current Greenhouse Gas inventory.*	
Capital planning and land use decisions informed by potential climate impacts	Medium
Comment: *Community Development/Public Works*	
Participation in regional groups addressing climate risks	Medium
Comment: *Public Works / Environmental Sustainability—The City has partnerships with a number of regional organizations that support greenhouse gas reduction efforts, including the Ventura County Regional Energy Alliance, Clean Power Alliance, and Tri-County Regional Energy Network (3CRen). The City has also partnered with the Beach Erosion Authority for Clean Oceans and Nourishment (BEACON), Surfrider and other organizations to complete the Surfers Point Managed Retreat Project.*	
Implementation Capacity	
Clear authority/mandate to consider climate change impacts during public decision-making processes	Low
Comment:	
Identified strategies for greenhouse gas mitigation efforts	Low
Comment: *Draft Energy Action Plan completed in July 2021*	
Identified strategies for adaptation to impacts	Medium
Comment: *The current update to the General plan has addressed strategies for adaptation to impacts.*	
Champions for climate action in local government departments	Low
Comment: *Environmental Sustainability leads the effort on behalf of the city.*	
Political support for implementing climate change adaptation strategies	Low
Comment: *City of Ventura city council is supportive as well as local community-based organizations and environmental organizations.*	
Financial resources devoted to climate change adaptation	Low
Comment:	
Local authority over sectors likely to be negative impacted	Unsure
Comment:	

Criterion	Jurisdiction Ratings
Public Capacity	
Local residents' knowledge of and understanding of climate risk	Low
Comment:	
Local residents' support of adaptation efforts	Medium
Comment: *Residents are supportive of adaptation efforts, but when implementation become restrictive, they are reticent to advance the course of action.*	
Local residents' capacity to adapt to climate impacts	Medium
Comment: *The vulnerable populations within the city may not be able to relocate out of a flood-prone area (homeless encampments), but residents with more resources may be more able to rebuild, retrofit, or otherwise protect their home.*	
Local economy current capacity to adapt to climate impacts	Medium
Comment: *The City has water shortage surcharge rates in addition to the base water rates. These surcharges help to fund the water budget during drought stages.*	
Local ecosystems capacity to adapt to climate impacts	Low
Comment:	

a. High = Capacity exists and is in use; Medium = Capacity may exist but is not used or could use some improvement; Low = Capacity does not exist or could use substantial improvement; Unsure= Not enough information is known to assign a rating.

11.5 INTEGRATION REVIEW

For hazard mitigation planning, "integration" means that hazard mitigation information is used in other relevant planning mechanisms, such as general planning and capital facilities planning, and that relevant information from those sources is used in hazard mitigation. This section identifies where such integration is already in place, and where there are opportunities for further integration in the future. Resources listed at the end of this annex were used to provide information on integration. The progress reporting process described in Volume 1 of the hazard mitigation plan will document the progress of hazard mitigation actions related to integration and identify new opportunities for integration.

11.5.1 Existing Integration

Some level of integration has already been established between local hazard mitigation planning and the following other local plans and programs:

- City of Ventura: General Plan
- City of Ventura: Emergency Operations Plan (EOP)
- Ventura County: Operational Area Emergency Operations Plan

11.5.2 Opportunities for Future Integration

The capability assessment in this annex indicates opportunities to integrate this mitigation plan with other jurisdictional planning/regulatory capabilities. Capabilities were identified as integration opportunities if they can support or enhance the actions identified in this plan or be supported or enhanced by components of this plan. The capability assessment identified the following plans and programs that do not currently integrate hazard mitigation information but provide opportunities to do so in the future:

- **City of Ventura: General Plan—**This comprehensive effort is underway and will be integrated into this effort to be compliant with AB2140.
- **City of Ventura: Evacuation plan—**This comprehensive effort is predicated on grant funds and will be initiated in FY20/21 and will encompass a multi-hazard perspective and routes with appropriate stakeholder/community input.
- **Visit Ventura: Tourist and Visitor disaster plan**—This effort will be a collaboration between the following: Visit Ventura, Chamber of Commerce, Hoteliers and City Emergency Management.
- **City of Ventura: Citizen Emergency Response Team (CERT)**—This effort will be a collaboration between the following: CERT volunteers, City staff, community-based organizations, with the existing DRAFT CERT team manual.

Taking action to integrate each of these programs with the hazard mitigation plan was considered as a mitigation action to include in the action plan in this annex.

11.6 RISK ASSESSMENT

11.6.1 Jurisdiction-Specific Natural Hazard Event History

Table 11-11 lists past occurrences of natural hazards for which specific damage was recorded in this jurisdiction Other hazard events that broadly affected the entire planning area, including this jurisdiction, are listed in the risk assessments in Volume 1 of this hazard mitigation plan.

Table 11-11. Past Natural Hazard Events

Type of Event	FEMA Disaster #	Date	Damage Assessment
Wind Event	N/A	January 19, 2021	Strong surface high pressure in the Great Basin helped to generate a moderate Santa Ana wind event across Southern California.
Wildfire	N/A	2020	Strong surface high pressure building in the Great Basin generated strong and gusty Santa Ana winds across sections of Ventura and Los Angeles counties.
COVID-19	DR-4482	January 20, 2020. Continuing	Ongoing
High Wind	N/A	2020	Strong surface high pressure in the Great Basin along with strong north to northeast flow aloft generated strong Santa Ana winds across Ventura and Los Angeles counties. North to northeast wind gusts up to 83 mph were reported in the mountains while gusts to 59 mph were reported across the coastal plain.
Wildfire	N/A	2019	Strong surface high pressure building in the Great Basin generated strong and gusty Santa Ana winds across sections of Ventura and Los Angeles counties.
Wind Event	N/A	2018	Strong surface high pressure building in the Great Basin generated strong and gusty Santa Ana winds across sections of Ventura and Los Angeles counties.

Type of Event	FEMA Disaster #	Date	Damage Assessment
Winter Storm	N/A	2018	Strong surface high pressure in the Great Basin helped to generate a moderate Santa Ana wind event across Southern California. Strong northeast winds were reported across the mountains and valleys of Ventura and Los Angeles Counties.
Tornado	N/A	2018	A powerful winter storm brought significant rain, snow and wind to the area. Rainfall totals ranged from 1 to 2 inches across coastal and valleys areas with 2 to 4 inches in the foothills and mountains. With snow levels dropping to between 2500 and 3500 feet, significant snowfall was reported in the mountains (up to 1 to 2 feet) and even the Antelope Valley (4 to 8 inches). Numerous road closures due to winter storm conditions were reported, including Interstate 5 through the Grapevine as well as Highways 14 and 138. Additionally, thunderstorms generated a waterspout over the coastal waters as well as a very weak tornado over Ventura Harbor.
Flash Flood	N/A	2018	High pressure over the four-corners region resulted in an extended monsoonal flow pattern across Southern California. For several days, strong thunderstorms produced heavy rain, flash flooding and large hail across parts of Southern California.
Debris Flow	N/A	2018	A powerful early-season winter storm moves across Southwestern California on Halloween night. The storm produced some significant rainfall with amounts in the coastal areas ranging from 0.25 to 1.50 while the mountains received up to 2.00. In the Camarillo area, near the Springs burn scar, a mud/debris flow occurred. Otherwise just some minor nuisance flooding was reported.
Wildfires, Flooding, Mudflows, and Debris Flows	DR-4353	December 4, 2017-January 31, 2018	Strong surface high pressure building in the Great Basin generated strong and gusty Santa Ana winds across sections of Ventura and Los Angeles counties. North to northeast wind gusts up to 73 mph were reported. During this event, the Thomas Fire ignited across Ventura County, eventually spreading into Santa Barbara County. The Thomas Fire burned 500+ homes in the City of Ventura and destroyed infrastructure including roads, utilities, and utility distribution networks including telecom.
Thunderstorm	N/A	2017	A powerful winter storm brought heavy rain and snow, flash flooding and gusty winds to the area. Rainfall totals from this storm generally ranged between 2 and 6 inches with locally higher amounts in some foothill areas. With such rainfall amounts, there was significant snowfall totals in the local mountains with up to 28 inches of snow reported at the resort level. Additionally, the heavy rain did generate several flash flooding events including several mud and debris flows.
Severe Storm	DR-1267	January 7 – 11, 2005	Flooding and debris flows
Northridge Earthquake	DR-1008	January 17 – November 30, 1994	Power and communications disruptions, damage to structures

11.6.2 Hazard Risk Ranking

Table 11-12 presents a local ranking of all hazards of concern for which this hazard mitigation plan provides complete risk assessments. As described in detail in Volume 1, the ranking process involves an assessment of the likelihood of occurrence for each hazard, along with its potential impacts on people, property, and the economy. Mitigation actions primarily target hazards with high and medium rankings.

Table 11-12. Hazard Risk Ranking

Rank	Hazard	Risk Ranking Score	Risk Category
1	Landslide	33	High
2	Earthquake	32	Medium
3	Severe Storm	24	Medium
4	Severe Weather	24	Medium
5	Flooding	18	Medium
6	Wildfire	18	Medium
7	Dam Failure	12	Low
8	Sea Level Rise	12	Low
9	Tsunami	10	Low
10	Drought	9	Low

11.6.3 Jurisdiction-Specific Vulnerabilities

Volume 1 of this hazard mitigation plan provides complete risk assessments for each identified hazard of concern. This section provides information on a few key vulnerabilities for this jurisdiction. Available jurisdiction-specific risk maps of the hazards are provided at the end of this annex.

Repetitive Loss Properties

Repetitive loss records are as follows:

- Number of FEMA-identified Repetitive-Loss Properties: 4
- Number of FEMA-identified Severe-Repetitive-Loss Properties: N/A
- Number of Repetitive-Loss or Severe-Repetitive-Loss Properties that have been mitigated: N/A

Other Noted Vulnerabilities

The following jurisdiction-specific issues have been identified based on a review of the results of the risk assessment, public involvement strategy, and other available resources:

- **Unreinforced Masonry and Soft Story Structures**—Ventura has several unreinforced masonry buildings and Soft Story buildings within the city limits. These buildings are subject to severe damage or structural collapse during a moderate to severe earthquake.
- **Street and Urban Flooding**—There are numerous areas of the city that flood to varying degrees during periods of high rain. The effects of this flooding range from street closures to damage to property, vehicles and buildings.
- **Power Outages/Emergency Power**—Local power outages including public safety power shutoffs (PSPS) have resulted from high winds and storm conditions as well as from the effects of wildland fire in the region. Many key city buildings including the Main City Hall and Council Chambers buildings have no back-up power or emergency generators.
- **Debris Flows—**Following heavy rains and winter storms, substantial debris flows have occurred in the Santa Clara River, Ventura River, as well as other local streams and culverts. Debris flows following wildland fires are particularly bad and can require removal of material from streams, streets, culverts and beaches.

- **Liquefaction Potential—**Nearly the entire City of Ventura is in a "Liquefaction Zone". The effects and damage caused by seismic activities can be amplified resulting in increased damage to buildings and infrastructure.
- **Homeless Population—**A significant number of persons commonly defined as "Homeless" live in the Santa Clara River and other undeveloped areas. During wildland fires, storms, and flooding these individuals are at great risk.
- **Tsunami Awareness and Notification**—Ventura has a large visitor and tourist population who may not be aware of the tsunami risk.

Mitigation actions addressing these issues were prioritized for consideration in the action plan in this annex.

11.7 STATUS OF PREVIOUS PLAN ACTIONS

Table 11-13 summarizes the actions that were recommended in the previous version of the hazard mitigation plan and their implementation status at the time this update was prepared.

Table 11-13. Status of Previous Plan Actions

Action Item	Completed	Removed; No Longer Feasible	Carried Over to Plan Update: Check if Yes	Carried Over to Plan Update: Action # in Update
OA 4—Relocate or reinforce bike trails, parking lots and other beach access amenities away from the shoreline to restore the beach/shoreline in sea-level rise/coastal erosion areas.			✓	VEN-1
Comment: The Surfers Point Managed Retreat Project Phase 1 has been completed. The Phase 2 design and permitting is nearly complete. The City is pursuing grants for construction. Seaside Wastewater Transfer Station relocation in exploratory phase.				
OA 9—Identify potentially vulnerable public and private utility systems including electric, gas, oil, water, sewer and communication. Upgrade vulnerable systems to ensure the operation and timely restoration of essential systems to reasonable levels of service.			✓	VEN-11
Comment: City of Ventura has multiple projects that meet criteria Southern California Edison has identified and is in the process of hardening their utility infrastructure. SoCalGas is also upgrading their facilities in the city. Water and Wastewater utilities are assessed through current Master Plan evaluations and projects developed for City CIP to address vulnerabilities.				
OA 11—Develop and implement plans to increase the building owner's general knowledge of and appreciation for the value of seismic upgrading of the building's structural and nonstructural elements. **Comment:** Due to staffing changes this action was not performed			✓	VEN-22
OA 19—Maintain vegetation management program that provides vegetation management services to elderly, disabled, or low-income property owners who lack the resources to remove flammable vegetation from around their homes.			✓	VEN-17
Comment: Due to limited funding this initiative was not completed.				

11.8 HAZARD MITIGATION ACTION PLAN

Table 11-14 lists the identified actions, which make up the hazard mitigation action plan for this jurisdiction. Table 11-15 identifies the priority for each action. Table 11-16 summarizes the mitigation actions by hazard of concern and mitigation type.

Table 11-14. Hazard Mitigation Action Plan Matrix

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline
Action VEN-1—Where appropriate, support retrofitting, purchase or relocation of structures located in hazard areas, prioritizing those that have experienced repetitive losses and/or are located in high- or medium-risk hazard areas.						
Hazards Mitigated: Landslide, Earthquake, Severe Storm, Severe Weather, Flooding, Wildfire, Dam Failure, Sea Level Rise, Tsunami						
New & Existing	1, 4, 6, 9, 10, 11, 16	Public Works		High	Grant Funding-FEMA HMA (BRIC, FMA, HMGP)	Long Term
Action VEN-2—Incorporate consideration of the FEMA 100-year tide and sea level rise, and climate change-driven extreme storms, into land use planning, shoreline development and dredging. This includes new policies by local jurisdictions, and County and City actions regarding their General Plans, visit Ventura tourist plan, Climate-related Plans, and the development applications.						
Hazards Mitigated: Severe Storm, Flooding, Sea Level Rise						
New & Existing	1, 2, 3, 4, 6, 10, 15, 17, 19	Community Development	Public Works	Medium	Staff Time, General Funds	Ongoing
Action VEN-3—Integrate the hazard mitigation plan into other plans, ordinances and programs that dictate land use decisions in the community, including Emergency Operations Plan, Community Climate Action plan, downtown specific plan, Citywide Evacuation Plan, General Plan, and ongoing plan maintenance						
Hazards Mitigated: Landslide, Earthquake, Severe Storm, Severe Weather, Flooding, Wildfire, Dam Failure, Sea Level Rise, Tsunami, Drought						
New & Existing	1, 2, 10, 11, 12, 15, 16, 19	Community Development	City Manager	Low	Staff Time, General Funds	Ongoing
Action VEN-4—Continue to maintain good standing and compliance under the NFIP through implementation of floodplain management programs that, at a minimum, meet the NFIP requirements: Enforce the flood damage prevention ordinance, participate in floodplain identification and mapping updates, and provide public assistance/information on floodplain requirements and impacts.						
Hazards Mitigated: Severe Storm, Severe Weather, Flooding, Dam Failure, Sea Level Rise, Tsunami						
New & Existing	1, 2, 4, 6, 9, 10, 11, 13, 14, 15, 17, 18, 19	Public works		Low	Staff Time, General Funds	Ongoing
Action VEN-5—Identify and pursue strategies to increase adaptive capacity to climate change including but not limited to the following: • Adopt a Climate Action Plan to reflect new State legislation, changing priorities, and environmental sustainability and greenhouse gas (GHG) reduction policies and goals. • Adopt modifications to existing plans and procedures to meet climate change issues and impacts.						
Hazards Mitigated: Severe Storm, Severe Weather, Flooding, Wildfire, Sea Level Rise, Drought						
New & Existing	1, 3, 4, 9, 10, 13, 14, 15, 16, 17, 19	Community Development (for the Climate Action Plan) Public Works	Ventura Water	Medium	Water and Sanitation Funds	Short Term
Action VEN-6—Advance long-term resilience to the population (including homeless individuals) to sea level rise and extreme storms for the communities and critical assets adjacent to San Buenaventura Beach, Santa Clara River, Ventura River, and nearby areas of the shoreline, as well as provide environmental, recreation, community/connectivity enhancements where possible.						
Hazards Mitigated: Landslide, Severe Storm, Severe Weather, Flooding, Sea Level Rise, Tsunami						
Existing	1, 3, 4, 9, 10, 13, 14, 15, 16, 17, 19	City Manager office		Medium	General Funds, Grant Funding-FEMA HMA (BRIC, FMA, HMGP)	Long Term
Action VEN-7—City Energy, Power, and Communication Systems Reliability. Ensure adequate emergency power and fuel at critical City facilities, including communications equipment, for continuity of government and services. Reliability will include but is not limited to purchasing stationary generators for critical facilities.						
Hazards Mitigated: Landslide, Earthquake, Severe Storm, Severe Weather, Flooding, Wildfire, Dam Failure, Tsunami						
New & Existing	1, 2, 7, 10, 19	City Manager		Medium	EMPG, DHS, Grant Funding-FEMA HMA (BRIC, HMGP), CDBG Mitigation, General Funds	Short Term

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline
Action VEN-8—Identify appropriate facility/location for of the City's Emergency Operations Center to ensure state of readiness and designate a back-up Emergency Operations Center and associated systems. This should include the rebuilding or replacement of the current facility to maintain the Emergency Operations Capacity.						
Hazards Mitigated: Landslide, Earthquake, Severe Storm, Severe Weather, Flooding, Wildfire, Dam Failure, Tsunami						
New & Existing	1, 8, 12, 17, 19	City Manager	N/A	Low	EMPG, DHS, BRIC, CDBG Mitigation, General Funds	Short Term
Action VEN-9—Consider participation in incentive-based programs such as Tree City, TsunamiReady, and StormReady.						
Hazards Mitigated: Severe Storm, Severe Weather, Flooding, Wildfire, Tsunami						
New	1, 2, 19	City Manager	N/A	Low	Staff Time, General Funds	Short Term
Action VEN-10—Develop and implement a program to capture perishable data after significant events (e.g., high water marks, preliminary damage estimates, damage photos, snapshot in time status) to support future mitigation efforts including the implementation and maintenance of the hazard mitigation plan						
Hazards Mitigated: Landslide, Earthquake, Severe Storm, Severe Weather, Flooding, Wildfire, Dam Failure, Tsunami						
New	1, 2, 4, 6, 8, 10, 11, 14, 15, 16, 17, 18, 19	City Manager	NA	Medium	EM Budget, Staff Time	Short Term
Action VEN-11—Identify and upgrade potentially vulnerable public and private utility systems, including electric, gas, oil, sewer, and communication, to ensure the operation and timely restoration of essential systems to reasonable levels of service. Including equipment, and critical facilities, (e.g. pump stations, generators, tide gates, stream gages, open channel, and culvert/pipeline infrastructure), to Improve community resilience and response to emergencies.						
Hazards Mitigated: Landslide, Earthquake, Severe Storm, Severe Weather, Flooding, Wildfire, Dam Failure, Tsunami						
New & Existing	9, 10, 11, 13	Public Works	NA	Medium	Grant Funding-FEMA HMA (BRIC, HMGP), City Capital Project Funding	Long-term
Action VEN-12—Support green infrastructure projects that enhance resiliency to natural disasters and incorporate green design elements into hazard mitigation projects where feasible.						
Hazards Mitigated: Severe Storm, Severe Weather, Flooding, Wildfire, Sea Level Rise, Drought						
New & Existing	1, 5, 13, 14, 15, 17	Public Works	N/A	Medium	DHS, EMPG, General Funds, Clean California, Grant Funding-FEMA HMA (BRIC, FMA, HMGP)	Short Term
Action VEN-13—CIP Complete construction and oversee ongoing operation, maintenance, and mitigation efforts for the Ventura Water Pure Program, which will result in the Identification of strategies to enhance potable reuse infrastructure planning/implementation.						
Hazards Mitigated: Drought						
New & Existing	1, 2, 3, 4, 9, 13, 15	Ventura Water	Community Development	Medium	General Funds, Water Grants, Grant Funding-FEMA HMA (BRIC, HMGP)	Long term
Action VEN-14—CIP Complete permitting and construction of the Hall Canyon Channel, Drainage Basin Improvement Project, which will address storm-related flooding.						
Hazards Mitigated: Severe Storm, Severe Weather, Flooding						
New & Existing	6, 9, 10, 11, 13, 14, 15	Public Works	N/A	Medium	General Funds, Grant Funding-FEMA HMA (BRIC, FMA, HMGP)	Long Term
Action VEN-15—CIP Emergency Egress. Main Street Bridge replacement project, Olivas Park drive extension and associated infrastructure. Existing bridge is not up to current seismic standards.						
Hazards Mitigated: Earthquake						
New & Existing	6, 9, 10, 11, 13, 14, 15	Public Works	N/A	High	General Funds, Staff Time, Grant Funding-FEMA HMA (BRIC, HMGP)	Long Term

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline
Action VEN-16—CIP Continue to Identify and plan upgrades to existing and potential water wells and resources.						
Hazards Mitigated: Landslide, Earthquake, Severe Storm, Severe Weather, Flooding, Wildfire, Dam Failure, Sea Level Rise, Tsunami, Drought						
New & Existing	3, 9, 10, 13	Ventura Water	N/A	High	Water Grants, State Grants, General Funds, Grant Funding-FEMA HMA (BRIC, FMA, HMGP)	Long Term
Action VEN-17—Develop a targeted wildfire awareness public information program for property owners, including managing potential fuel sources on their privately owned property. (e.g. Developing a program that assists elderly, disabled, or low-income property owners who lack the resources to remove flammable vegetation from around their homes)						
Hazards Mitigated: Wildfire						
New & Existing	2, 4, 5, 8, 10, 12	Fire	Parks	Medium	General Funds, Clean California Grant	Short Term
Action VEN-18—Impose mitigation measures on developers. Increase efforts to reduce landslides and erosion in existing and future development through continuing education of design professionals on mitigation strategies. • Educating design professionals and developers on mitigation strategies for existing development in identified hazard areas. • Adopting codes and standards to limit new development in areas identified as high-risk for landslides or erosion.						
Hazards Mitigated: Landslide, Severe Storm, Flooding, Sea Level Rise, Tsunami						
New & Existing	16, 17, 19	Community Development	Public Works	Low	Staff Time, General Funds, Grant Funding-FEMA HMA (BRIC, FMA, HMGP)	Short Term
Action VEN-19—Mutual Aid, Participate in general mutual-aid agreements with adjoining jurisdictions for cooperative response to fires, floods, earthquakes, and other disasters						
Hazards Mitigated: Landslide, Earthquake, Severe Storm, Flooding, Wildfire, Dam Failure, Tsunami						
New & Existing	1, 2, 3, 8, 12, 19	Fire	N/A	Low	Staff Time	Short Term
Action VEN-20—Through the City's Joint Powers Authority Fire/Rescue provider, the City of Ventura Fire Department, adopt the most current California codes and local regulations, conduct annual inspections of mandated occupies including multi-family dwellings (I.e. apartments, condos), hotels/motels, and schools to ensure compliance with fire/life safety and hazardous materials requirements, and including inspections of residential care facilities done as requested by of the Department of Social Services. Additionally, perform hazardous materials annual or three-year inspections of sites containing hazardous materials over specified thresholds as a Participating Agency in the California Unified Program Agency in compliance with applicable state laws.						
Hazards Mitigated: Wildfire						
New & Existing	1, 2, 12, 16, 17, 19	Fire	N/A	High	General Funds, Grant Funding-FEMA HMA (BRIC, HMGP), DHS, Fire funds	Long Term
Action VEN-21—Retrofit Fire Facilities in accordance with identified gaps found in the Fire Department facilities Structural Analysis, which shows each City fire facility and its associated compliance-related deficits related to local regulations and industry standards.						
Hazards Mitigated: Landslide, Earthquake, Severe Storm, Severe Weather, Flooding, Wildfire, Dam Failure, Sea Level Rise, Tsunami						
New & Existing	1, 2, 12, 16, 17, 19	Fire	N/A	High	Fire Budget, General Fund, Grant Funding-FEMA HMA (BRIC, HMGP), DHS grants	Short Term
Action VEN-22—Study the City's existing infrastructure, identify sources of potential funding to upgrade its older facilities, Unreinforced masonry , and soft story building, and install new infrastructure to the latest seismic standards under its Seismic Improvement Plan including but not limited to unreinforced masonry buildings.						
Hazards Mitigated: Earthquake						
New & Existing	1, 4, 6, 9, 10, 11, 19	Community Development	Public Works	High	General Funds, Grant Funding-FEMA HMA (BRIC, HMGP), DHS, Fire funds	Short Term

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline
Action VEN-23—Improve Tsunami Awareness and Notification capacity within population and visitors to the City of Ventura.						
Hazards Mitigated: Earthquake, Tsunami						
New & Existing	1, 4, 6, 9, 10, 11, 19	City Manager		High	General Funds, Grant Funding-FEMA HMA (BRIC, HMGP), DHS, Fire funds	Short Term

a. Short-term = Completion within 5 years; Long-term = Completion within 10 years; Ongoing= Continuing new or existing program with no completion date

Acronyms used here are defined at the beginning of this volume.

Table 11-15. Mitigation Action Priority

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Cost?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Implementation Priority[a]	Grant Pursuit Priority[a]
VEN-1	7	High	High	Yes	Yes	No	Low	Medium
VEN-2	9	Medium	Medium	Yes	No	No	Medium	Low
VEN-3	8	Medium	Low	Yes	No	Yes	High	Low
VEN-4	13	Medium	Low	Yes	No	Yes	High	Low
VEN-5	11	Medium	Medium	Yes	No	No	Medium	Low
VEN-6	11	Medium	Medium	Yes	Yes	No	Low	Medium
VEN-7	5	High	Medium	Yes	Yes	No	Medium	High
VEN-8	5	High	Medium	Yes	Yes	Yes	Medium	High
VEN-9	3	Medium	Low	Yes	No	Yes	High	Low
VEN-10	13	Medium	Medium	Yes	No	No	Medium	Low
VEN-11	4	High	Medium	Yes	Yes	No	Low	Medium
VEN-12	6	Medium	Medium	Yes	Yes	No	Medium	Medium
VEN-13	7	High	Medium	Yes	Yes	No	Low	Medium
VEN-14	7	High	Medium	Yes	Yes	No	Low	Medium
VEN-15	7	High	High	Yes	Yes	No	Low	Medium
VEN-16	4	High	High	Yes	Yes	No	Low	Medium
VEN-17	6	Low	Medium	No	Yes	No	Low	Medium
VEN-18	3	Medium	Low	Yes	Yes	Yes	High	Medium
VEN-19	6	Medium	Low	Yes	No	Yes	High	Low
VEN-20	6	Medium	High	No	Yes	No	Low	Medium
VEN-21	6	High	High	Yes	Yes	No	Medium	High
VEN-22	6	High	High	Yes	Yes	No	Low	High
VEN-23	3	High	High	Yes	Yes	No	Low	High

a. See the introduction to this volume for explanation of priorities.

Table 11-16. Analysis of Mitigation Actions

Hazard Type	Action Addressing Hazard, by Mitigation Type[a]							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilience	Community Capacity Building
High-Risk Hazards								
Landslide	VEN-18	VEN-1, 6, 11, 21	VEN-6, 18		VEN-7, 8, 19		VEN-16	VEN-3, 10
Medium-Risk Hazards								
Earthquake		VEN-1, 11, 15, 21, 22	VEN-23		VEN-7, 8, 19		VEN-16	VEN-3, 10, 22
Severe Storms	VEN-4, 18	VEN-1, 6, 11, 21	VEN-6, 18	VEN-12	VEN-7, 8, 19	VEN-14	VEN-12, 16	VEN-2, 3, 5, 9, 10
Severe Weather	VEN-4, 18	VEN-1, 6, 11, 21	VEN-6, 18	VEN-12	VEN-7, 8, 19	VEN-14	VEN-12, 16	VEN-3, 5, 9, 10
Flooding	VEN-4	VEN-1, 6, 11, 21	VEN-6, 18	VEN-12	VEN-7, 8, 19	VEN-14	VEN-12, 16	VEN-2, 3, 5, 9, 10
Wildfire	VEN-20	VEN-1, 11, 21	VEN-17	VEN-12	VEN-7, 8, 19		VEN-12, 16	VEN-3, 5, 9, 10
Low-Risk Hazards								
Dam Failure	VEN-4	VEN-1, 11, 21			VEN-7, 8, 19		VEN-16	VEN-3, 10
Sea Level Rise	VEN-4, 18	VEN-1, 6, 21	VEN-6, 18	VEN-12			VEN-12, 16	VEN-2, 3, 5
Tsunami	VEN-4, 18	VEN-1, 6, 11, 21	VEN-6, 18, 23		VEN-7, 8, 19	VEN-13		VEN-3, 9, 10
Drought				VEN-12			VEN-12, 16	VEN-3, 5

a. See the introduction to this volume for explanation of mitigation types.

11.9 PUBLIC OUTREACH

Table 11-17 lists public outreach activities in connection with this hazard mitigation plan update for this jurisdiction.

Table 11-17. Local Public Outreach

Local Outreach Activity	Date	Number of People Involved
Social media link and website outreach for the public survey	9-28	118

11.10 INFORMATION SOURCES USED FOR THIS ANNEX

The following technical reports, plans, and regulatory mechanisms were reviewed to provide information for this annex.

- **City of San Buenaventura General Plan**—The General plan is under revision and has been aligned to be compliant with AB2140.
- **City of San Buenaventura Municipal Code**—The municipal code was reviewed for the full capability assessment and for identifying opportunities for action plan integration.
- **Flood Damage Prevention Ordinance**—The flood damage prevention ordinance was reviewed for compliance with the National Flood Insurance Program.

- **Health and Safety Code Section 13146—**Specifies the inspections the Fire Department is mandated by state law to perform annually.
- **California Code of Regulations Title 27**—Specifies hazardous materials regulations enforced by the Ventura Fire Department as a Participating Agency in the statewide Certified Unified Program.
- **California Government Code 51179-82**—Specifies fire defensible requirements around structures.
- **California, Amending Division 12, Part 4, of the San Buenaventura Municipal Code, entitled "Floodplain Regulations"** to comply with FEMA revisions to those regulations to meet the FEMA Model Ordinance in conjunction with the new California Coastal Analysis and Mapping Project that provides new maps for the coastal communities in Southern California that will be adopted by FEMA on January 29, 2021
- **Hazard Mitigation Plan Annex Development Toolkit**—The toolkit was used to support the identification of past hazard events and noted vulnerabilities, the risk ranking, and the development of the mitigation action plan.

11.11 FUTURE NEEDS TO BETTER UNDERSTAND RISK/VULNERABILITY

The City of Ventura will perform a Threat and Hazard Identification and Risk Assessment (THIRA) process to help the community understand the normal set of risks it faces. By identifying and prioritizing those threats, a community can then prioritize revisions and realignment of actions in this plan over time.

11.12 ADDITIONAL COMMENTS

The City of Ventura intends to continuously review and adjust this document annually.

San Buenaventura

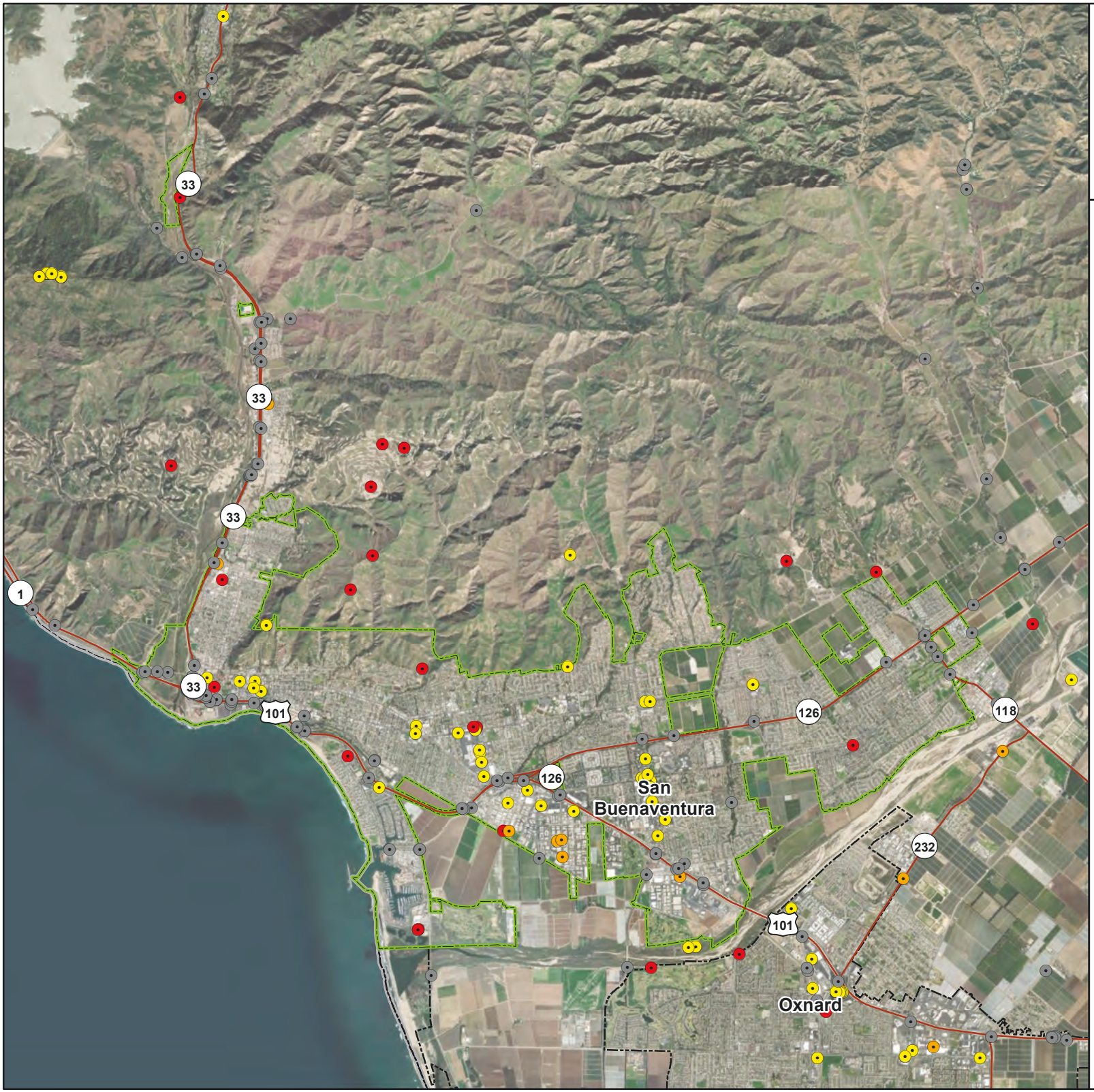
Critical Facilities (1 of 2)

- Food, Water, Shelter
- Health and Medical
- Safety and Security
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Data Sources: Ventura Co., VCFD, Casitas MWD, Calleguas MWD, City of Camarillo, CA Energy Commission, Cal Trans, EPA, HIFLD, Esri

N

0 0.5 1 2 Miles



San Buenaventura

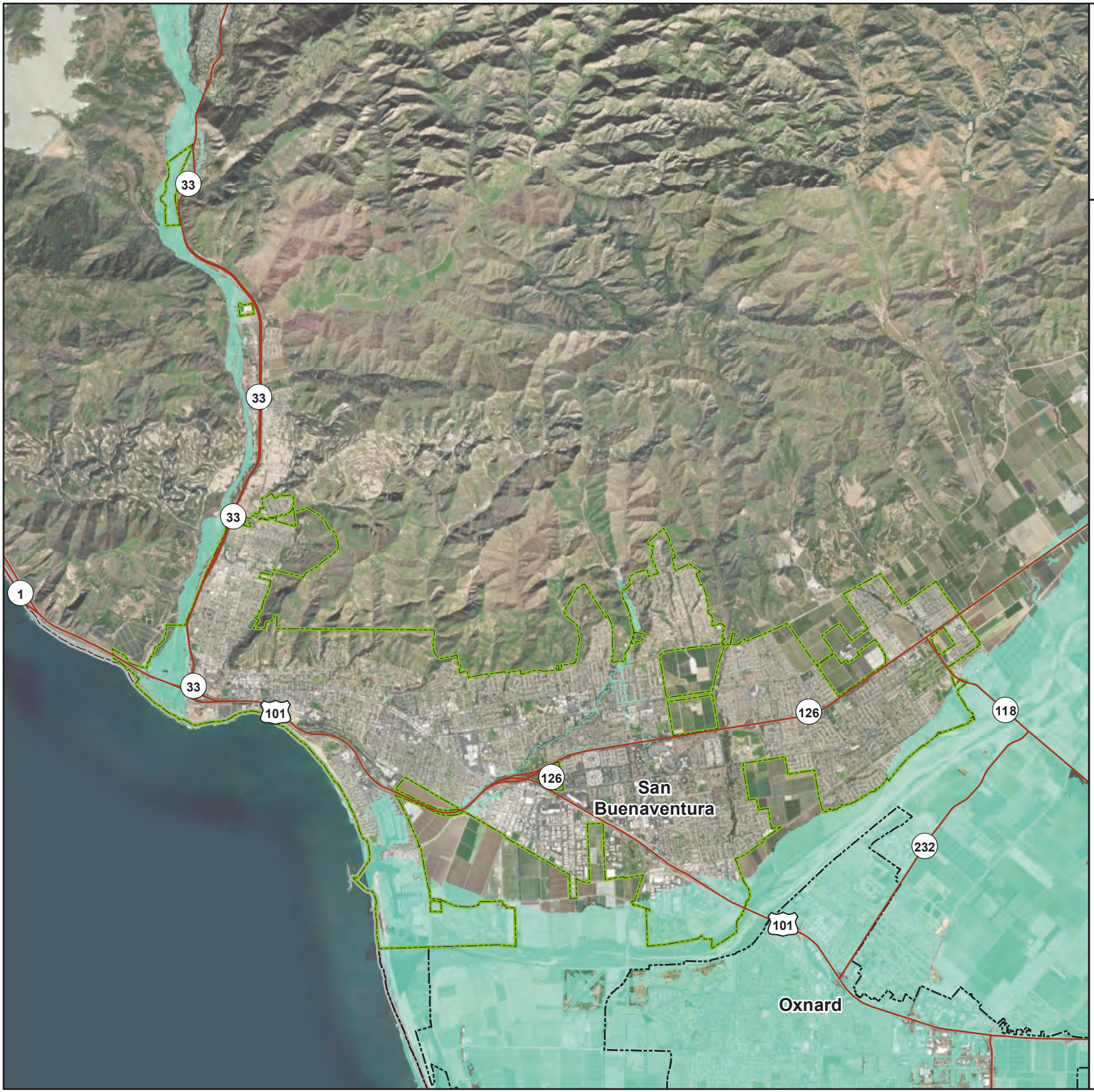
Critical Facilities (1 of 2)

- Communications
- Energy
- Hazardous Material
- Transportation
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Data Sources: Ventura Co., VCFD, Casitas MWD, Calleguas MWD, City of Camarillo, CA Energy Commission, Cal Trans, EPA, HIFLD, Esri

N

0 0.5 1 2 Miles



San Buenaventura

Dam Failure Inundation Areas

Combined Inundation Areas

Major Roads

Selected City

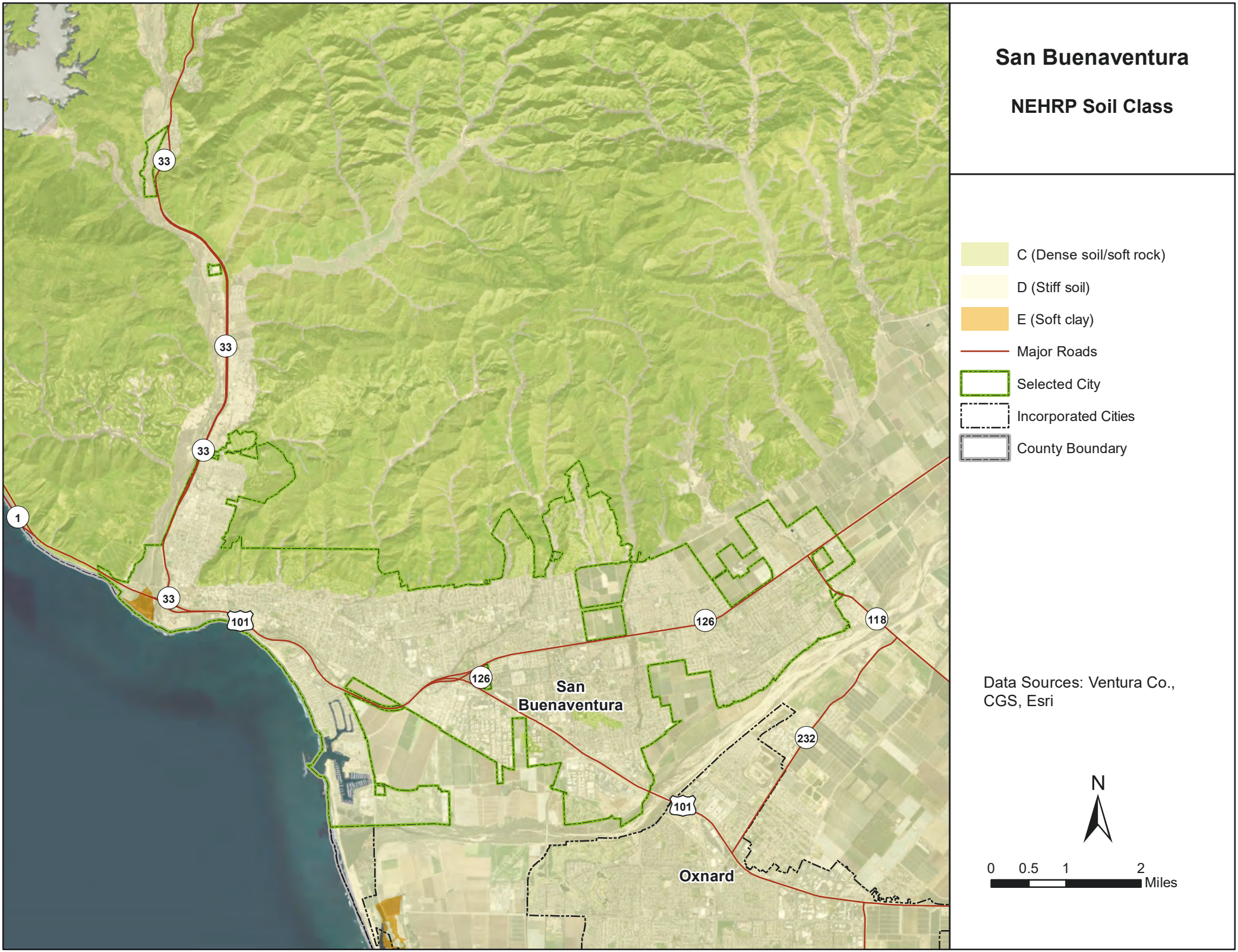
Incorporated Cities

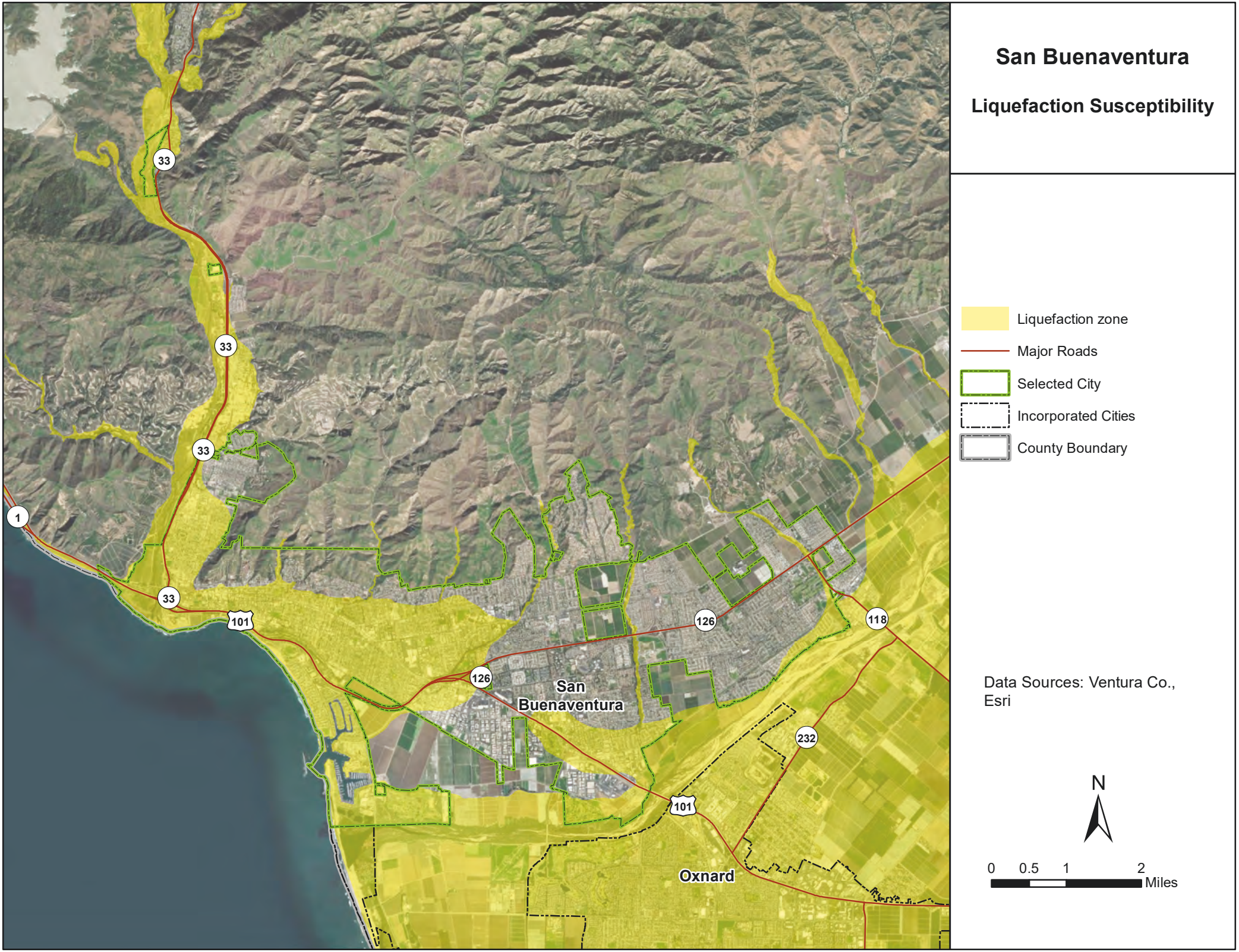
County Boundary

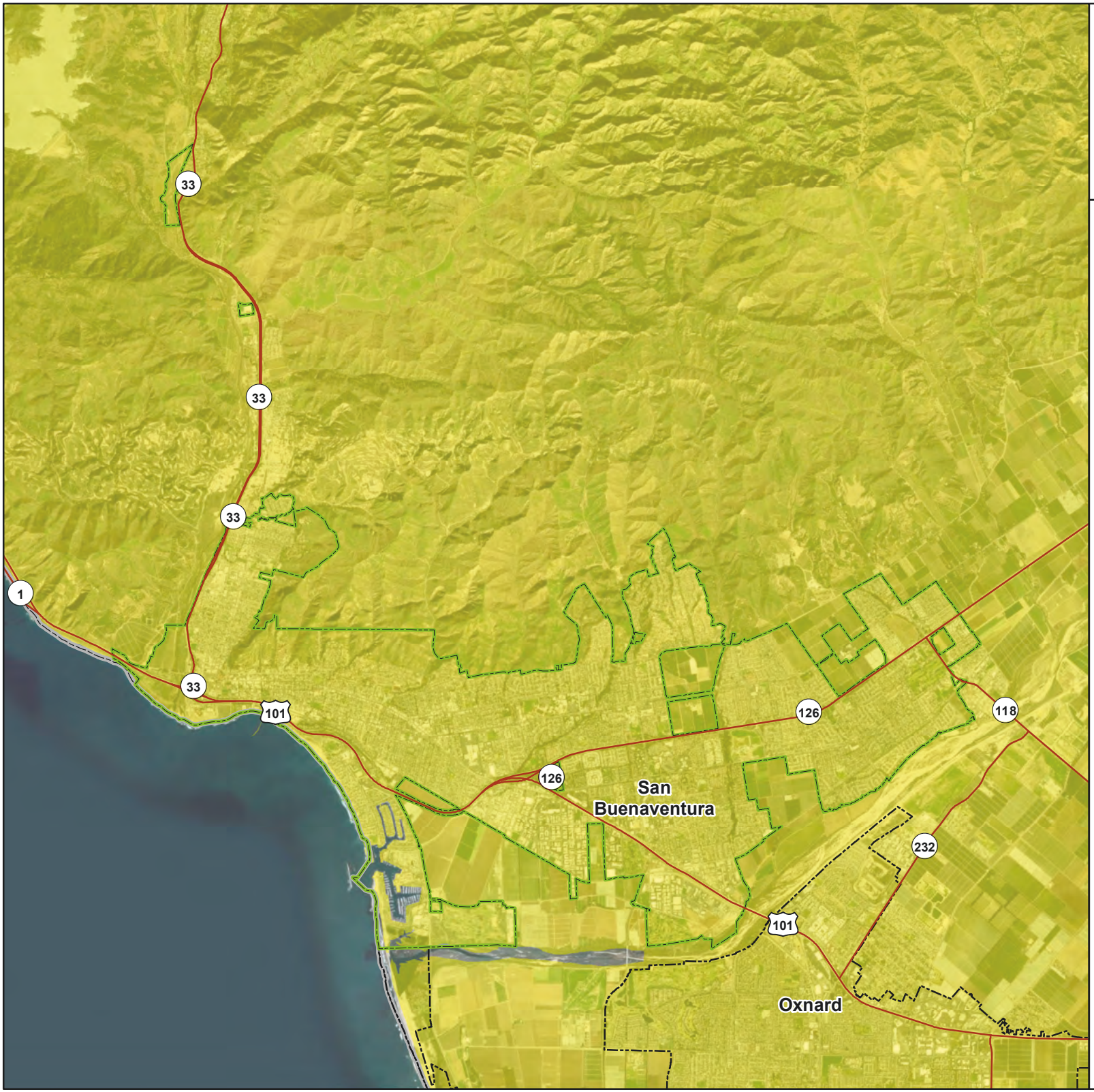
Data Sources: Ventura Co., CA DWR, Esri

N

0 0.5 1 2 Miles


San Buenaventura
NEHRP Soil Class
C (Dense soil/soft rock)
D (Stiff soil)
E (Soft clay)
Major Roads
Selected City
Incorporated Cities
County Boundary
Data Sources: Ventura Co., CGS, Esri
N
0 0.5 1 2
Miles
San Buenaventura
Oxnard
1
33
101
126
118
232


San Buenaventura
Liquefaction Susceptibility
Liquefaction zone
Major Roads
Selected City
Incorporated Cities
County Boundary
Data Sources: Ventura Co., Esri
N
0 0.5 1 2
Miles
San Buenaventura
Oxnard
1
33
33
33
33
101
101
126
126
118
232



San Buenaventura

100-Year Probabilistic Earthquake Scenario

Mercalli Intensity Scale

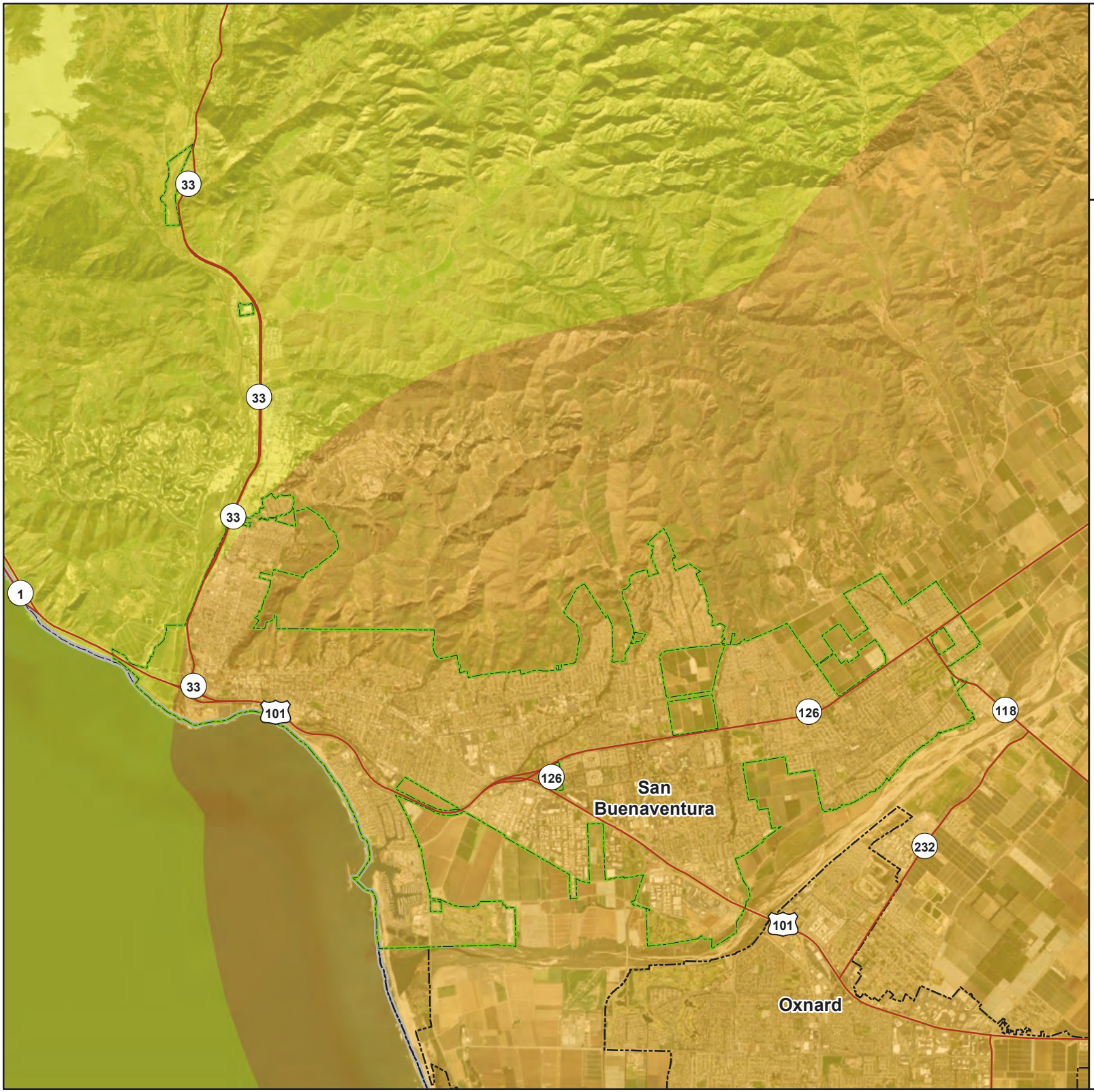
- VII (Very Strong/Moderate)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.5 1 2 Miles



San Buenaventura

Oak Ridge M7.16 Earthquake Scenario

Mercalli Intensity Scale

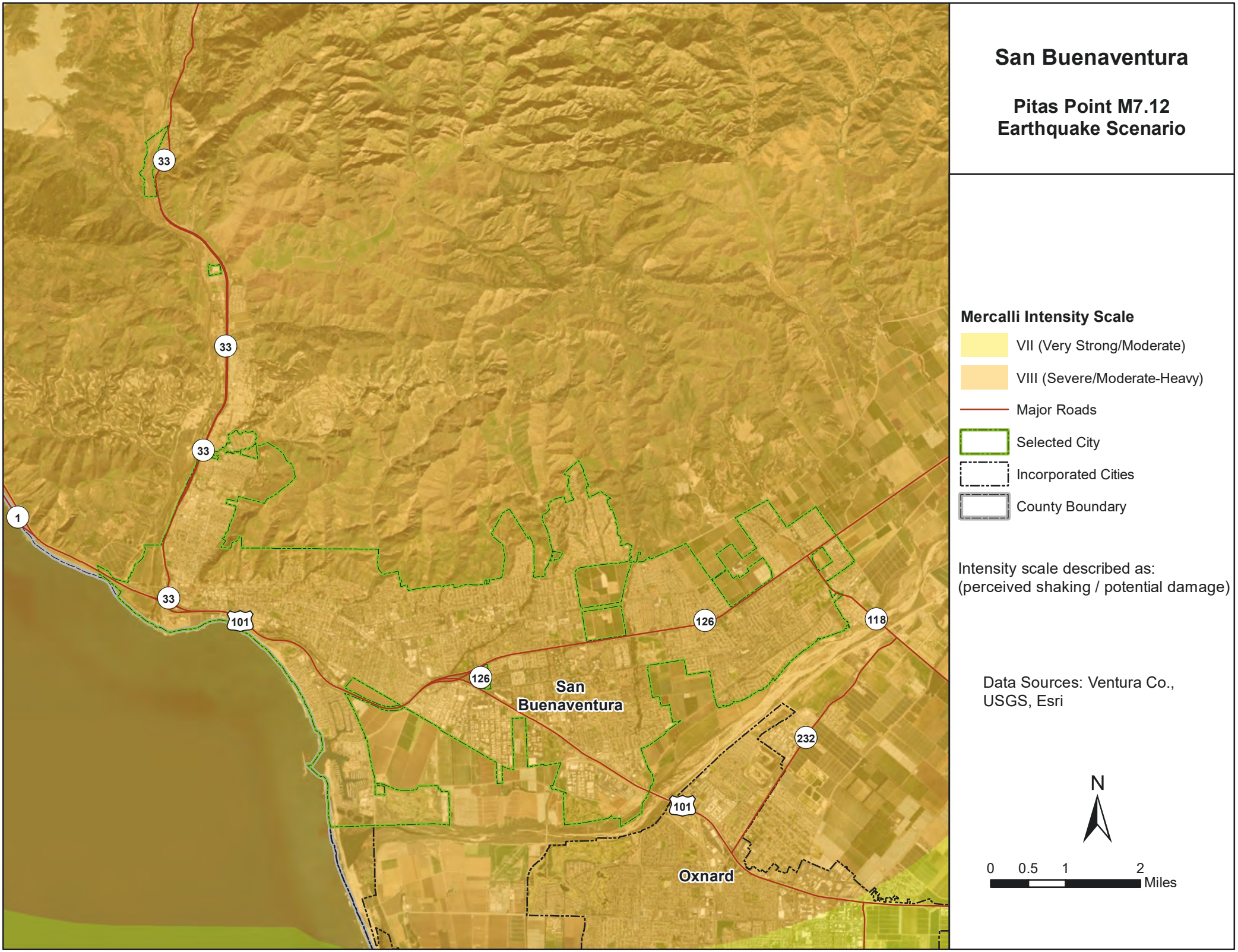
- VII (Very Strong/Moderate)
- VIII (Severe/Moderate-Heavy)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

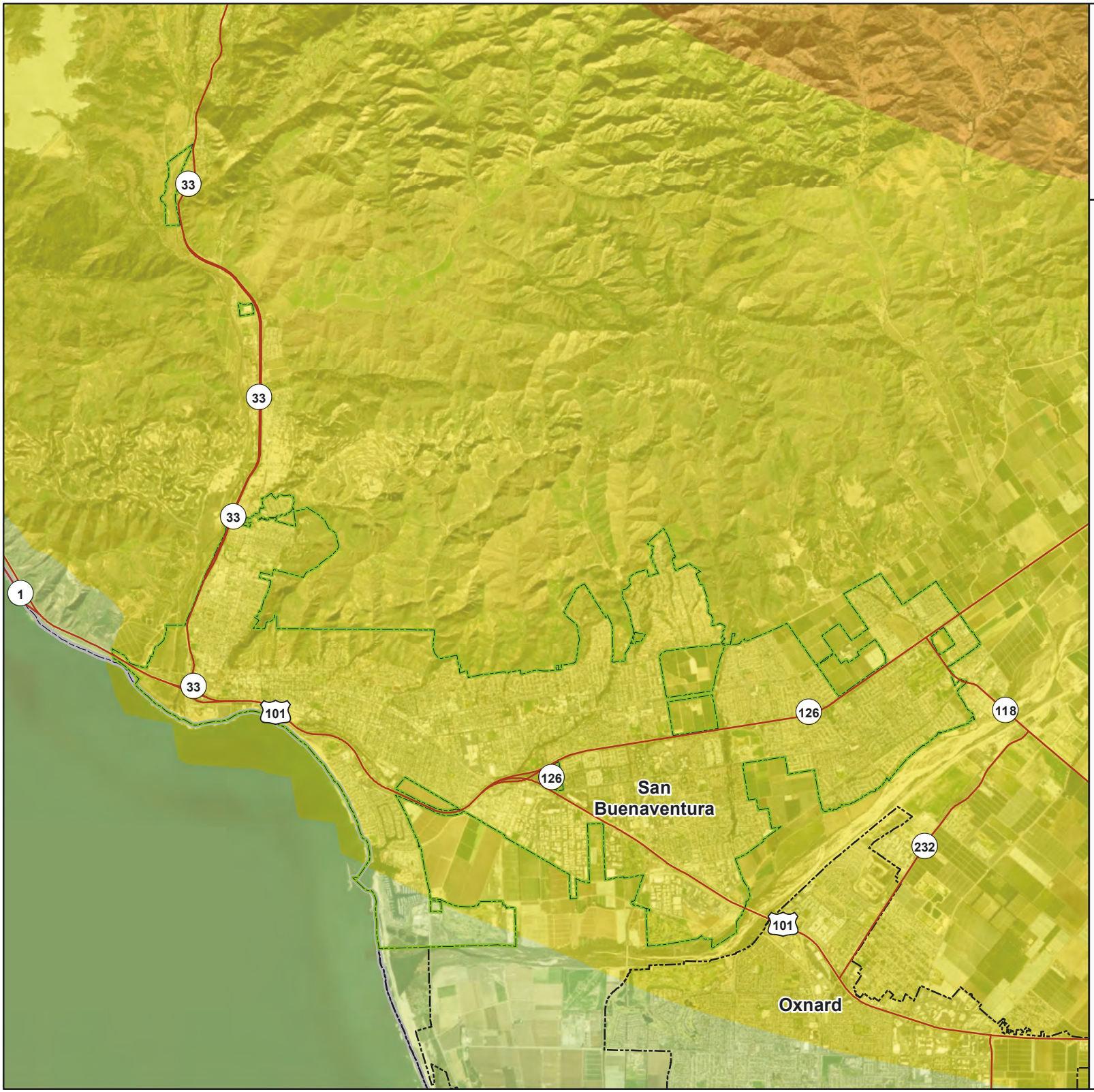
Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.5 1 2 Miles


San Buenaventura
Pitas Point M7.12 Earthquake Scenario
Mercalli Intensity Scale
VII (Very Strong/Moderate)
VIII (Severe/Moderate-Heavy)
Major Roads
Selected City
Incorporated Cities
County Boundary
Intensity scale described as:
(perceived shaking / potential damage)
Data Sources: Ventura Co., USGS, Esri
N
0 0.5 1 2
Miles
San Buenaventura
Oxnard
1
33
33
33
101
126
126
118
232
101



San Buenaventura

San Cayetano M7.16 Earthquake Scenario

Mercalli Intensity Scale

- VI (Strong/Light)
- VII (Very Strong/Moderate)
- VIII (Severe/Moderate-Heavy)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.5 1 2 Miles

San Buenaventura

S. San Andreas M8.03 Earthquake Scenario

Mercalli Intensity Scale

- V (Moderate/Very Light)
- VI (Strong/Light)
- Major Roads
- Selected City
- Incorporated Cities
- County Boundary

Intensity scale described as:
(perceived shaking / potential damage)

Data Sources: Ventura Co., USGS, Esri

N

0 0.5 1 2 Miles

San Buenaventura

FEMA Flood Hazard Areas

1% Annual Chance Flood (100-Year)

0.2% Annual Chance Flood (500-Year)

Major Roads

Selected City

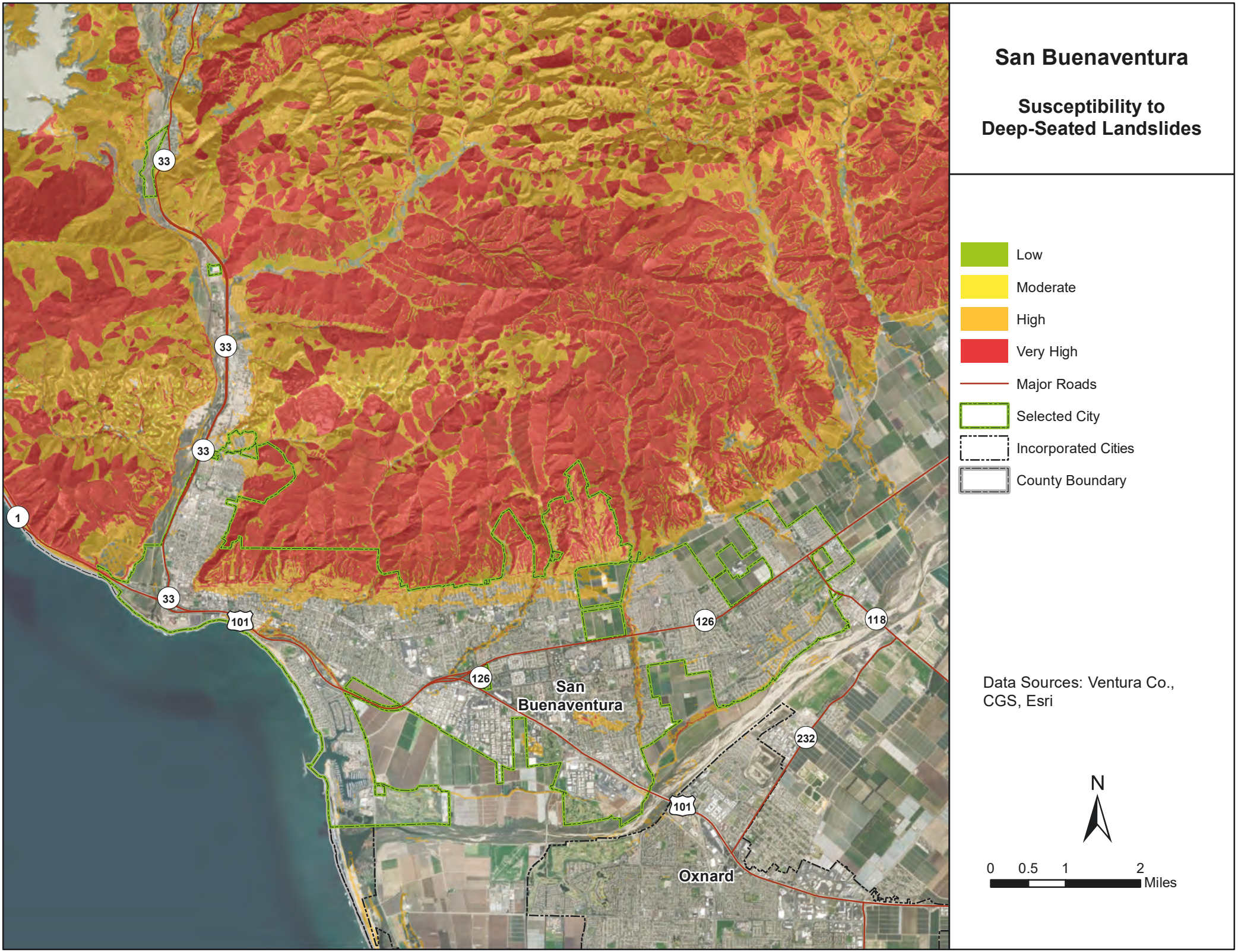
Incorporated Cities

County Boundary

Data Sources: Ventura Co., FEMA, Esri

N

0 0.5 1 2 Miles


San Buenaventura
Susceptibility to Deep-Seated Landslides
Low
Moderate
High
Very High
Major Roads
Selected City
Incorporated Cities
County Boundary
Data Sources: Ventura Co., CGS, Esri
N
0 0.5 1 2
Miles
San Buenaventura
Oxnard
1
33
101
126
118
232

San Buenaventura

Sea Level Rise of 25 cm (9.8 in.)

Sea Level Rise Inundation Area

Major Roads

Selected City

Incorporated Cities

County Boundary

Data Sources: Ventura Co., OCOF, Esri

N

0 0.5 1 2 Miles

San Buenaventura

Sea Level Rise of 100 cm (39.4 in.)

Sea Level Rise Inundation Area

Major Roads

Selected City

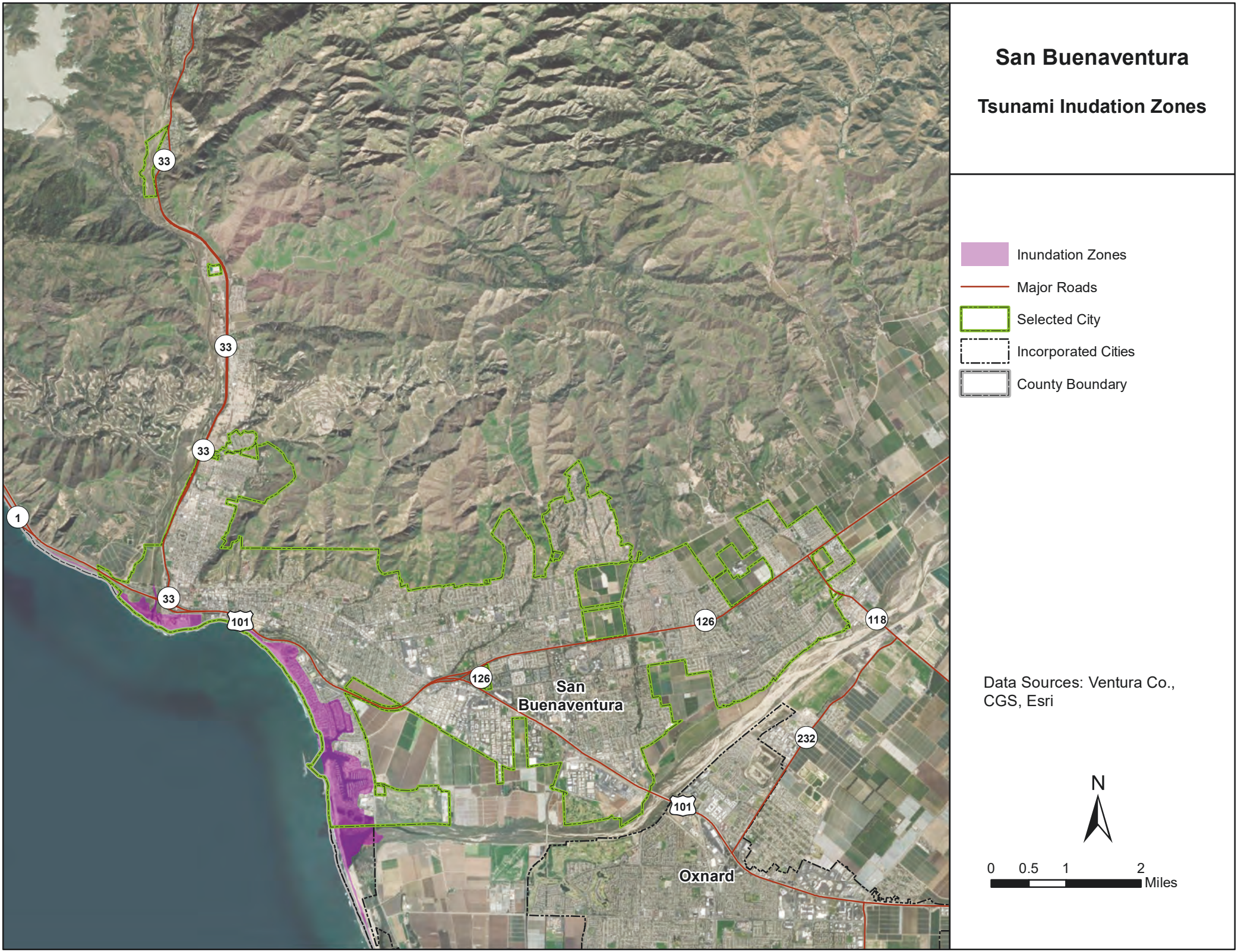
Incorporated Cities

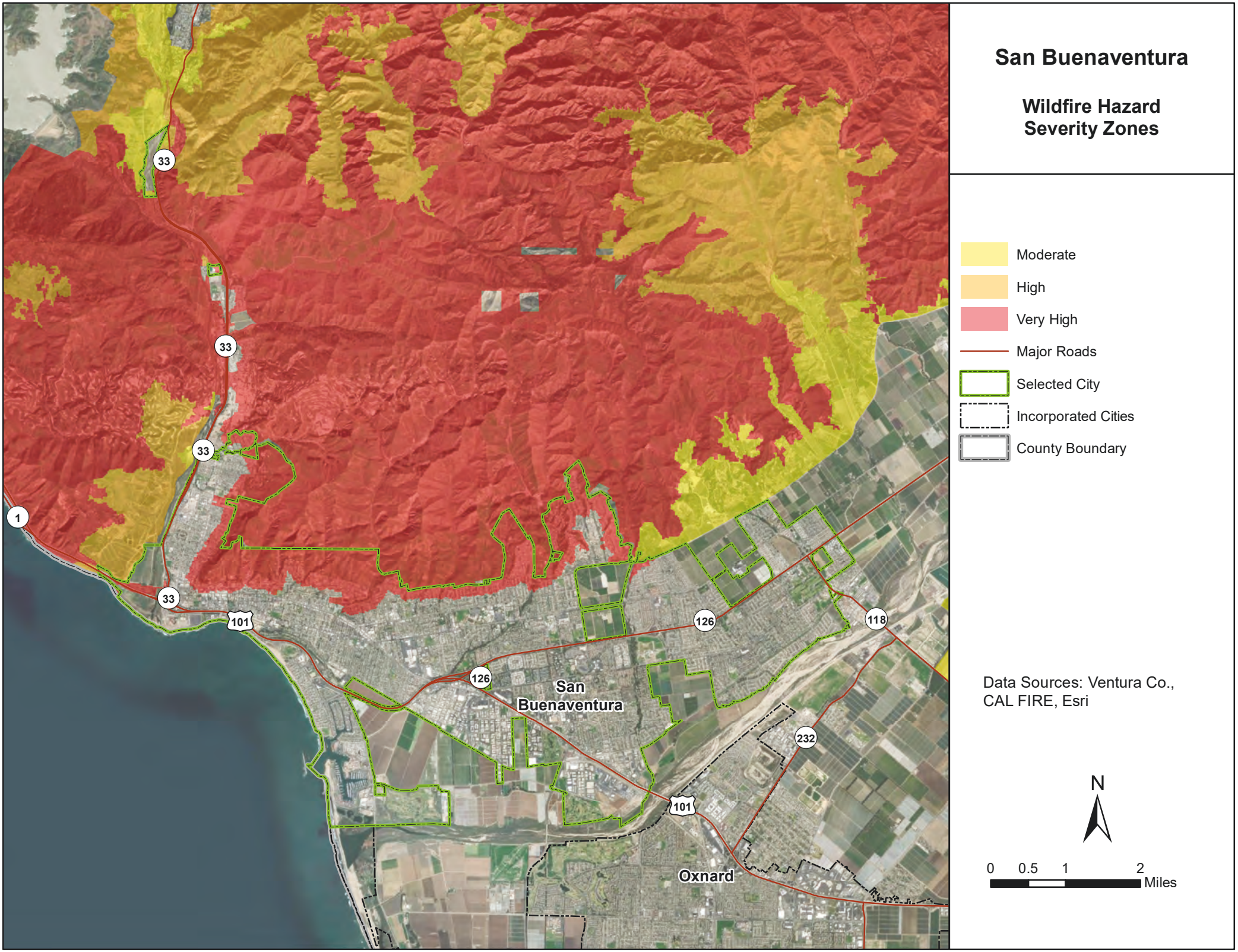
County Boundary

Data Sources: Ventura Co., OCOF, Esri

N

0 0.5 1 2 Miles


San Buenaventura
Tsunami Inudation Zones
Inundation Zones
Major Roads
Selected City
Incorporated Cities
County Boundary
Data Sources: Ventura Co., CGS, Esri
N
0 0.5 1 2
Miles
San Buenaventura
Oxnard
1
33
101
126
118
232


San Buenaventura
Wildfire Hazard Severity Zones
Moderate
High
Very High
Major Roads
Selected City
Incorporated Cities
County Boundary
Data Sources: Ventura Co., CAL FIRE, Esri
N
0 0.5 1 2
Miles
San Buenaventura
Oxnard
1
33
101
126
118
232

12. California State University, Channel Islands

12.1 LOCAL HAZARD MITIGATION PLANNING TEAM

Primary Point of Contact
Maggie Tougas, CSUCI Emergency Manager
One University Drive
Camarillo, CA 93012
Telephone: 805-415-0020
e-mail Address: Margaret.federico@csuci.edu

Alternate Point of Contact
David Carlson
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Camarillo, CA 93012
Telephone: 805-437-8472
e-mail Address: david.carlson@csuci.edu

This annex was developed by the local hazard mitigation planning team, whose members are listed in Table 12-1.

Table 12-1. Local Hazard Mitigation Planning Team Members

Name	Title
Maggie Tougas	Emergency Manager
Tom Hunt	Assistant Vice President Facilities Services
Joyce Spencer	Director, Environmental Health and Safety
Wesley Cooper	Senior Director, Facilities Services
Roxanne Coryell-Biegel	Sustainability and Energy Manager
Terry Tarr	Assoc. Architect
Carlos Miranda	Assoc. Director Information Security
Dave Carlson	Planning Design & Construction

12.2 JURISDICTION PROFILE

12.2.1 Overview

The California State University Channel Islands (CSUCI) is a public university in Ventura County, California. CSUCI opened in 2002 as the 23rd campus in the California State University system. CSUCI is located midway between Santa Barbara and Los Angeles near Camarillo, at the intersection of the Oxnard Plain and northernmost edge of the Santa Monica Mountains range. The Channel Islands are nearby where the university operates a scientific research station on Santa Rosa Island.

The campus is located about two miles south of the city of Camarillo, at the base of Long Grade Canyon. The school is set on rich agricultural land at the edge of the Oxnard Plain bordered by farms and nestled into the base of the Santa Monica Mountains. The flat site is marked by a lone peak called

Round Mountain (the Chumash name is Sathwiwa). The campus is situated on land historically inhabited by the Chumash.

The site was originally a state hospital and operated from 1936 to 1997. The state hospital was built in a remote area so roads were improved to provide for the campus traffic. The university developed a bus transit network to serve the campus with VISTA buses providing access to Gold Coast Transit in Oxnard and the Camarillo train station. After gaining official possession of the land in 1998, improvements began in 1999 on the 634-acre existing campus-style facility, primarily one to two-story buildings organized around three primary quads. In 2007, the campus acquired an additional 153 acres. Many of the buildings are in the Mission Revival and Spanish Colonial Revival architectural styles, although there are a few "modern" buildings. The campus is split into two primary sections: North Quad and South Quad. In 2012, Del Norte and Madera halls were opened in the North Quad; some of the buildings in the North Quad are still uninhabited and unsafe due to age, which became CSU Channel Islands University Park located adjacent to the campus. The university is a Hispanic-serving institution. Channel Islands offers 54 types of Bachelor's degrees, 6 different graduate (Master's) degrees, 19 teaching credentials, and an Ed.D degree. In the fall of 2018, the university enrolled the largest number of students in its history with 7,095 undergraduate and postgraduate students. Since its establishment, the university has awarded over 11,000 students with degrees.

CSUCI is the only four-year public university in Ventura County and in 2010 it received Hispanic Serving Institution status (HSI). The university achieved this status by moving past the threshold of having at least a 25 percent Hispanic student population. The Hispanic/Latino student population was 50% as of the fall of 2017.

Planning for the University began in 1965, when State Senator Robert J. Lagomarsino co-authored Senate Bill 288 calling for establishment of a four-year public college in Ventura County, and Governor Pat Brown signed a bill authorizing a study for a state college for the county. In 1974, Dr. Joyce Kennedy established the UC/CSU Ventura Learning Center in Ventura as a partnership between UC Santa Barbara and California State University, Northridge. The Ventura Learning Center became the CSU Northridge Ventura Campus in 1988.

In 1996, J Handel began as the campus planning president to begin development of a public four-year university for the region. In 1997 the CSU Board of Trustees voted to accept the former Camarillo State hospital site for the purpose of transforming it into the CSU's 23rd campus. At this time the hospital closed. In August 1999, the Ventura Learning Center moved to the Camarillo site as a CSU Northridge satellite facility.

In 2001, the CSU Board of Trustees appointed Richard R. Rush, Ph.D., as Founding President of California State University Channel Islands. While establishing the University structures, Dr. Rush has overseen and participated in the hiring of faculty and the university's senior staff. On August 16, 2002, CSUCI opened to upper division transfer students and in the fall of 2003, accepted its first freshman class.

The CSUCI Campus President assumes responsibility for the adoption of this plan; Public Safety Staff will oversee its implementation.

12.2.2 Service Area

The District service area covers 1.85 square miles serving a population of approximately 7,000 combined students, faculty, and staff.

12.2.3 Assets

Table 12-2 summarizes the assets of the District and their value.

Table 12-2. Special-Purpose District Assets

Asset	Value
Property	
1,187 acres of land	Unknown
Equipment	
2014 Chevrolet Impala, 1417560	$40,150
2012 Ford Crown Victoria, 139072	$6,000
2014 Chevrolet Tahoe, 1322719	$14,250
2015 Chevrolet Tahoe, 1463257	$65,000
2017 Chevrolet Tahoe, 1506693	$65,000
2017 Chevrolet Tahoe, 1526913	$65,000
2018 Chevrolet Tahoe, 1561135	$65,000
2011 Ford Crown Victoria, 1362925	$6,000
2018 Chevrolet Impala, 1551846	$48,550
2005 4 Seat GEM Cart 1172160	$4,000
2014 Chevrolet 2500, 1417575 Admin EOC Parking	$62,000
2016 Chevrolet Colorado, 14698 PSO	$37,050
Critical Facilities (all default to 1 University Drive, Camarillo)	
Aliso Hall (Science/Lab), West of Central Mall	$8,636,406
Anacapa Village (Student Housing A, B, C, Pool House), East of Petrero Road	$28,350,319
Arroyo Hall (Gym)	$6,121,457
Bell Tower Central (Education), West of South Quad	$27,368,019
Bell Tower East (Office of Dean Pena), East of South Quad	$7,276,728
Bell Tower West (Office of the Provost), West of South Quad	$6,531,890
Broome Library (Library/Classrooms), East of Central Mall	$60,337,738
Carden School, Camarillo Street	Unknown
Central Plant (HVAC/Facilities), Rear of Ironwood Hall	$2,778,517
Chaparral Hall (General)	$813,354
CI Power (Cogen), South of Central Plant	$15,905,657
Del Norte Hall (Fiscal Resources), South End of North Quad	$27,651,627
El Dorado Hall (Recreation Center)	$1,818,956
Ironwood Hall (Facilities Services), East of Central Plant	$6,300,580
Islands Cafe (Food Service), North of Topanga Hall	$3,172,669
Lindero Hall (Administration)	$2,490,846
Malibu Hall (General)	$4,769,335
Manzanita Hall (General)	$1,636,032
Martin V. Smith Decision Center (Lecture Hall, Conference Rooms)	$1,596,020
Modoc Hall (Science Labs, Classrooms)	$880,258

Asset	Value
Napa Hall (Administrative Office)	$5,055,083
Ojai Hall (Data/Tech/EOC), North of Bell Tower	Unknown
OPC Shops (Corp Yard)	$2,084,347
Placer Hall (General)	$3,421,414
PD and Dispatch, Placer Hall	Unknown
Sage Hall (General)	$8,014,973
Santa Cruz Village (Student Housing D, E, F) West of South Quad	$32,250,010
Santa Rosa Village (Student Housing), East of South Quad	$60,122,800
Sierra Hall (Science/Lab), East of Central Mall	$33,254,128
Solano Hall (HR/Employment), West of North Quad	$5,427,456
Student Union (Food/Recreation), North of Bell Tower West	$11,312,460
Topanga Hall (Art Studio)	$2,548,247
Town Center (Housing/Food Service), East of Broome Library	Unknown
University Hall (Office of the President), North of Central Mall	$6,027,735
Water Storage Tank, Channel Islands Drive/Camarillo Street	Unknown
Yuba Hall (Student Health Services), South of Rincon Drive	Unknown
Total:	***$383,955,061***

12.3 CURRENT TRENDS

The campus is under continuing construction to accommodate the projected growth of the university. While there are about 7,000 registered students, projected enrollment for the year 2025 is 15,000 full-time students.

12.4 CAPABILITY ASSESSMENT

This section describes an assessment of existing capabilities for implementing hazard mitigation strategies. The introduction at the beginning of this volume of the hazard mitigation plan describes the components included in the capability assessment and their significance for hazard mitigation planning.

Findings of the capability assessment were reviewed to identify opportunities to expand, initiate or integrate capabilities to further hazard mitigation goals and objectives. Where such opportunities were identified and determined to be feasible, they are included in the action plan. The “Analysis of Mitigation Actions” table in this annex identifies these as community capacity building mitigation actions. The findings of the assessment are presented as follows:

An assessment of planning and regulatory capabilities is presented in Table 12-3.

An assessment of fiscal capabilities is presented in Table 12-4.

An assessment of administrative and technical capabilities is presented in Table 12-5.

An assessment of education and outreach capabilities is presented in Table 12-6.

Classifications under various community mitigation programs are presented in Table 12-7.

The community’s adaptive capacity for the impacts of climate change is presented in Table 12-8.

Table 12-3. Planning and Regulatory Capability

Plan, Study or Program	Most Recent Update	Comment
Executive Order 987	2019	Building Operations and Maintenance
California Building Code	2019	Building design standards
Policy Number: FA.32.003 Strategic Risk Management	2019	Identifies and Assesses risks to the campus
Communicable Disease Response Plan	2020	Addresses communicable disease management.
CSU Channel Islands Exterior Building Management Plan	2014	Exterior buildings management; stormwater management.
Executive Order 1039	2017	Policy on Occupational Safety
Emergency Operations Plan	2018	Preparation, Response and Recovery.
Executive Order 1014	2017	Business Continuity Plan

Table 12-4. Fiscal Capability

Financial Resource	Accessible or Eligible to Use?
Community Development Block Grants	No
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for Specific Purposes	No
User Fees for Water, Sewer, Gas or Electric Service	No
Incur Debt through General Obligation Bonds	No
Incur Debt through Special Tax Bonds	No
Incur Debt through Private Activity Bonds	No
Withhold Public Expenditures in Hazard-Prone Areas	No
State-Sponsored Grant Programs	Yes
Development Impact Fees for Homebuyers or Developers	Yes

Table 12-5. Administrative and Technical Capability

Staff/Personnel Resource	Available?
Planners or engineers with knowledge of land development and land management practices ***If Yes, Department /Position:*** Facilities services, use consultants from Chancellor's Office	Yes
Engineers or professionals trained in building or infrastructure construction practices ***If Yes, Department /Position:*** Engineering consultants, Facilities Services Director. Enter Response	Yes
Planners or engineers with an understanding of natural hazards ***If Yes, Department /Position:*** Facilities Services, consultants.	Yes
Staff with training in benefit-cost analysis ***If Yes, Department /Position:*** Dept. of Business and Finance, Assistant Vice President Budget and Planning	Yes
Surveyors	No
Personnel skilled or trained in GIS applications ***If Yes, Department /Position:*** Facilities Services, Environmental Health and Safety	Yes
Scientist familiar with natural hazards in local area ***If Yes, Department /Position:*** Facilities Services, Environmental Health and Safety, CSUCI Faculty ESRM	Yes
Emergency Manager ***If Yes, Department /Position:*** Public Safety	Yes
Grant writers ***If Yes, Department /Position:*** Academic Affairs	Yes
Other ***If Yes, Department /Position:*** Facilities Services Environmental Impacts 2004	Yes

Table 12-6. Education and Outreach Capability

Criterion	Response
Do you have a public information officer or communications office?	Yes
Do you have personnel skilled or trained in website development?	Yes
Do you have hazard mitigation information available on your website? ***If yes, briefly describe:*** COVID prevention and mitigation, Evacuation Plan	Yes
Do you use social media for hazard mitigation education and outreach? ***If yes, briefly describe:*** Facebook, Twitter, and Instagram for emergency preparedness activities	Yes
Do you have any citizen boards or commissions that address issues related to hazard mitigation?	No
Do you have any other programs in place that could be used to communicate hazard-related information? ***If yes, briefly describe:*** Public Safety Fair, Flood and Fire Prevention	Yes
Do you have any established warning systems for hazard events? ***If yes, briefly describe:*** Informacast, CI Alert Notification Systems	No

Table 12-7. Community Classifications

	Participating?	Classification	Date Classified
FIPS Code	No	N/A	N/A
DUNS#	Yes	796879943	N/A
Community Rating System	No	N/A	N/A
Building Code Effectiveness Grading Schedule	No	N/A	N/A
Public Protection	No	N/A	N/A
Storm Ready	Yes	N/A	September 19, 2019
Firewise	No	N/A	N/A
Tsunami Ready	No	N/A	N/A

Table 12-8. Adaptive Capacity for Climate Change

Criterion	Jurisdiction Rating[a]
Technical Capacity	
Jurisdiction-level understanding of potential climate change impacts	Medium
Comment: *Climate change is taught in ESRM and biology classes, faculty have been doing research in climate change for a number of years, utilization of solar lighting, electric carts and buses, a climate change action plan is in process.*	
Jurisdiction-level monitoring of climate change impacts	Medium
Comment: *Faculty and staff are conducting research and continue to monitor and address impacts*	
Technical resources to assess proposed strategies for feasibility and externalities	Low
Comment:	
Jurisdiction-level capacity for development of greenhouse gas emissions inventory	High
Comment: *CI consistently conduits inventory for GH emissions . The CSU requires the campus to exceed California Green Building Code standards.*	
Capital planning and land use decisions informed by potential climate impacts	Medium
Comment: *Continued implementation of solar lighting, generators and batteries*	
Participation in regional groups addressing climate risks	Medium
Comment: *CI holds meetings discussing climate issues once a month, conducts research with the National Park 'Service and State parks, Dept. of Fish and Game*	

Criterion	Jurisdiction Rating[a]
Implementation Capacity	
Clear authority/mandate to consider climate change impacts during public decision-making processes	Medium
Comment: *There is a system-wide goal to reduce greenhouse gas emissions. Currently working on a plan. More classes will be offered on this subject in ESRM and biology.*	
Identified strategies for greenhouse gas mitigation efforts	Medium
Comment: *There is a system-wide goal to reduce greenhouse gas emissions. Currently working on a plan. More classes will be offered on this subject in ESRM and biology.*	
Identified strategies for adaptation to impacts	Low
Comment:	
Champions for climate action in local government departments	Low
Comment:	
Political support for implementing climate change adaptation strategies	Low
Comment:	
Financial resources devoted to climate change adaptation	Low
Comment: *We have no budget for this at CI.*	
Local authority over sectors likely to be negative impacted	Low
Comment:	
Public Capacity	
Local residents' knowledge of and understanding of climate risk	Medium
Comment: *Conducted presentations on climate impact to faculty, staff and students*	
Local residents' support of adaptation efforts	Low
Comment: *N/A*	
Local residents' capacity to adapt to climate impacts	Low
Comment: *Unknown*	
Local economy current capacity to adapt to climate impacts	Low
Comment: *Unknown*	
Local ecosystems capacity to adapt to climate impacts	Low
Comment: *Unknown*	

a. High = Capacity exists and is in use; Medium = Capacity may exist, but is not used or could use some improvement; Low = Capacity does not exist or could use substantial improvement; Unsure= Not enough information is known to assign a rating.

12.5 INTEGRATION REVIEW

For hazard mitigation planning, "integration" means that hazard mitigation information is used in other relevant planning mechanisms, such as capital facilities planning, and that relevant information from those sources is used in hazard mitigation. This section identifies where such integration is already in place, and where there are opportunities for further integration in the future. Resources listed at the end of this annex were used to provide information on integration. The progress reporting process described in Volume 1 of the hazard mitigation plan will document the progress of hazard mitigation actions related to integration and identify new opportunities for integration.

12.5.1 Existing Integration

Some level of integration has already been established between local hazard mitigation planning and the following other local plans and programs:

- **CSU Channel Islands Capital Improvement Plan, Facilities Plan—**Incorporate new and updated hazards information relevant to the CSUCI Campus sand University Glen Neighborhood. The hazard mitigation plan may identify new possible funding sources for capital improvement projects and may result in modifications to proposed projects based on results of the risk assessment.
- **CSUCI Emergency Operations Plan (EOP), 2018 (pending approval)—**Hazard Summary for the campus needs updating. Hazards referenced in the Ventura County Multi-Hazard Mitigation Plan for more specific information.
- **Wildfire Reduction and Preparedness Plan**—Year round recommendations for defensible space remediation and smoke intrusion into campus buildings**.**
- **Capital Improvement Plan**—The capital improvement plan includes projects that can help mitigate potential hazards.
- **Exterior Building Management Plan—**CSU Channel Islands property maintains a comprehensive exterior and hardscape management plan, using as a guideline, the standards developed by the US Green Building's Council's LEED program. The plan incorporates best management practices which significantly reduce the use of harmful chemicals, energy waste, water waste, air pollution, solid waste and/or chemical runoff as compared to traditional practices

12.5.2 Opportunities for Future Integration

The capability assessment in this annex indicates opportunities to integrate this mitigation plan with other jurisdictional planning/regulatory capabilities. Capabilities were identified as integration opportunities if they can support or enhance the actions identified in this plan or be supported or enhanced by components of this plan. The capability assessment identified the following plans and programs that do not currently integrate hazard mitigation information but provide opportunities to do so in the future:

- **Climate Action Plan—**Adopting a formal plan indicates the institution's commitment to reducing its global warming impact. Since multiple facets of an institution's operations can help reduce emissions, developing a climate action strategy can help an institution realize its sustainability goals as well as climate targets. Currently, the Campus is in the process of writing a Climate Action Plan.
- **Capital Improvement Projects**—Capital improvement project proposals may take into consideration hazard risks and provide mitigation recommendations as a means of evaluating project prioritization.
- **Post-Disaster Recovery Plan**—The campus addresses recovery and is part of the Ventura County Long Term Recovery Group and Ventura County VOAD (Voluntary Organizations Active in Disaster). The campus utilizes the specific goals, objectives and processes from the Long-Term Recovery Group and VC VOAD. The campus will also utilize particular aspects that are included in the Ventura County EOP.

Taking action to integrate each of these programs with the hazard mitigation plan was considered as a mitigation action to include in the action plan in this annex.

12.6 RISK ASSESSMENT

12.6.1 Jurisdiction-Specific Natural Hazard Event History

Table 12-9 lists past occurrences of natural hazards for which specific damage was recorded in this jurisdiction Other hazard events that broadly affected the entire planning area, including this jurisdiction, are listed in the risk assessments in Volume 1 of this hazard mitigation plan.

Table 12-9. Past Natural Hazard Events

Type of Event	FEMA Disaster #	Date	Damage Assessment
COVID-19 Pandemic	DR-4482	January 20, 2020 and continuing	The campus did not experience any property damages from COVID19 just emergency protective measures response related costs, telecommuting costs, testing, workplace safety inserts (plexiglass, HVAC upgrades) total approximately $5,000,000.00
Maria Fire	FM-5302	November 1, 2019	Campus was not directly impacted by this fire, however, The Arc of Ventura County opened a community shelter at the Camarillo Community Center.
Hill/Woolsey Fire		November 2018	Campus directly affected, Fire approached campus, campus impacted by smoke. Campus was closed for numerous days.
Wildfires, Flooding, Mudflows, and Debris Flows (Thomas Fire)	DR-4353	December 4, 2017-January 31, 2018	Although this fire burned 281,893 acres in both Ventura County and Santa Barbara County, the campus was only indirectly impacted by smoke, however, faculty, staff and students were unable to go to work or class due to the compromised 101 corridor in Montecito.
Flooding		February 18, 2017	Localized flooding of the campus due to a severe storm closed the campus for several days.
Springs Fire	FM-5024	May 2 – 11, 2013	24,251 acres burned; The campus was surrounded by fire, lots of smoke damage, melted cell towers and irrigation lines, one outbuilding destroyed and several buildings damaged. Campus was closed for numerous days.
Wildfires, Flooding, Mudflows, and Debris Flows; Springs Fire		December 14, 2014	Camarillo Springs near campus had a significant mudslide. Campus had moderate flooding on the roads in and out of campus.
Wildfires, Flooding, Mudflows, and Debris Flows	DR-1731	October 21 – March 31, 2008	Although Ventura County was impacted by the Ranch Fire, the campus was not directly impacted except for heavy smoke.
Shekell Fire	FM-2681	December 3 – 6, 2006	This fire burned in Fillmore and Moorpark. The campus had no direct impacts from the fire only indirectly from smoke.
Day Fire	FM-2677	September 25 – 30, 2006	The campus was not directly impacted except for heavy smoke.
Topanga Fire	FM-2583	September 28 – October 10, 2005	The campus was not directly impacted except for smoke.
Severe Storms, Flooding, Landslides, and Mud and Debris Flows	DR-1585	February 16 – 23, 2005	City experienced localized flooding. No significant losses were documented. The campus was affected due to road closures.

Type of Event	FEMA Disaster #	Date	Damage Assessment
Severe Storms, Flooding, Debris Flows, and Mudslides	DR-1577	December 27, 2004 – January 11, 2005	Water and mudslides damaged structures in the city.
Wildfires, Flooding, Mudflow and Debris Flow	DR-1498	October 21, 2003 – March 31, 2004	The campus was not directly impacted from the fires in Piru and Fillmore except for heavy smoke
CSUCI opened in 2002. Therefore, damage prior to 2002 affected the *area* now known as CSUCI.			
Severe Winter Storms and Flooding	DR-1203	February 2 – April 30, 1998	Backed up storm drains caused flooding.
Severe Winter Storms, Flooding, Landslides, Mud Flows	DR-1046	February 13 – April 19, 1995	Localized flooding and clogged storm drains.
Severe Winter Storms, Flooding, Landslides, Mud Flows	DR-1044	January 3 – February, 1995	Localized flooding and clogged storm drains.
Northridge Earthquake	DR-1008	January 17 – November 30,1994	Structure and infrastructure damages.
Fires, Mud & Landslides, Soil Erosion, Flooding	DR-1005	October 26 – April 22, 1994	Multiple fires around Ventura County and subsequent flooding. Smoke and flooding impacts
Severe Storm, Winter Storm, Mud & Landslides, Flooding	DR-979	January 5 – March 20, 1993	Localized street flooding.
Snow Storm, Heavy Rain, High Winds, Flooding, Mudslide	DR-935	February 10 – 19, 1992	City experienced localized street flooding.
Severe Freeze	DR-894	December 19, 1990 – January 3, 1991	Countywide damages.
Grass, Wildlands, Forest Fires	DR-739	June 26 – July 19, 1985	Area was not directly impacted except for heavy smoke.
Coastal Storms, Floods, Slides, Tornadoes	DR-677	January 21 – March 30, 1983	Flooding
Severe Storms, Mudslides, Flooding	DR-615	January 8, 1980	Flooding countywide.

12.6.2 Hazard Risk Ranking

Table 12-10 presents a local ranking of all hazards of concern for which this hazard mitigation plan provides complete risk assessments. As described in detail in Volume 1, the ranking process involves an assessment of the likelihood of occurrence for each hazard, along with its potential impacts on people, property, and district operations. Mitigation actions primarily target hazards with high and medium rankings.

Table 12-10. Hazard Risk Ranking

Rank	Hazard	Risk Ranking Score	Risk Category
1	Earthquake	32	Medium
2	Severe Storms	24	Medium
2	Severe Weather	24	Medium
4	Dam Failure	22	Medium
5	Flooding	18	Medium
5	Landslide	18	Medium
7	Wildfire	12	Medium
8	Drought	9	Low

12.6.3 Jurisdiction-Specific Vulnerabilities

Volume 1 of this hazard mitigation plan provides complete risk assessments for each identified hazard of concern. The following jurisdiction-specific issues have been identified based on a review of the results of the risk assessment, public involvement strategy, and other available resources:

- Wildfire frequently affects the campus. Campus structures and communication towers have been burned or been damaged. Smoke damage is the most frequent event.
- Flooding regularly occurs during periods of heavy rainfall. One campus dormitory regularly floods.
- Climate Change amplified in the future.

Mitigation actions addressing these issues were prioritized for consideration in the action plan in this annex.

12.7 HAZARD MITIGATION ACTION PLAN

Table 12-11 lists the actions that make up the hazard mitigation action plan for this jurisdiction. Table 12-12 identifies the priority for each action. Table 12-13 summarizes the mitigation actions by hazard of concern and mitigation type.

Table 12-11. Hazard Mitigation Action Plan Matrix

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action CSU-1—Where appropriate, support retrofitting, purchase or relocation of structures located in hazard areas, prioritizing those that have experienced repetitive losses and/or are located in high- or medium-risk hazard areas.						
Hazards Mitigated: Earthquake, Flooding, Severe Storms, Landslide						
Existing	9, 10, 11	Facilities Services		High	Staff Time, General Funds, Grant Funding- FEMA HMA (BRIC, FMA, HMGP)	Short-term
Action CSU-2—Actively participate in the plan maintenance protocols outlined in Volume 1 of this hazard mitigation plan.						
Hazards Mitigated: All hazards						
New & Existing	8, 19	Public Safety		Low	Staff Time, General Funds	Short-term
Action CSU-3—Purchase solar back up batteries and solar panels to sustain adequate power in campus buildings.						
Hazards Mitigated: All hazards						
New & Existing	2, 6	Facilities Services	Chancellor's Office	Medium	Staff Time, General Funds, Grant Funding- FEMA HMA (BRIC, FMA, HMGP)	Short-term

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action CSU-4—Harden earthen dam by way of debris basin infrastructure and spillway located above University Glen community and student housing in Town Center.						
Hazards Mitigated: Flooding, Severe Storms						
Existing	2, 9, 10, 11, 14, 15	Facilities Services		High	Staff Time, General Funds, Grant Funding- FEMA HMA (BRIC, FMA, HMGP)	Short-term
Action CSU-5—Replace undersized reclaimed water lines to increase capacity, create sustainability and mitigate flooding.						
Hazards Mitigated: Flooding, Severe Weather, Drought						
Existing	6, 9, 10, 11, 14	Facilities Services		High	Staff Time, General Funds, Grant Funding- FEMA HMA (BRIC, FMA, HMGP)	Short Term
Action CSU-6—Harden infrastructure of two bridges on campus. Bridges are compromised during storm events and rip rap is eroding at the base of the bridges.						
Hazards Mitigated: Flooding, Severe Weather						
Existing	6, 9, 10, 11, 15	Facilities Services		Medium	Staff Time, General Funds, Grant Funding- FEMA HMA (BRIC, FMA, HMGP)	Short Term
Action CSU-7—Create and maintain defensible space around structures and other infrastructure to coordinate with existing Emergency Operations Plan actions.						
Hazards Mitigated: Wildfire						
New & Existing	5, 6, 9	Facilities Services	Cal Fire, Chancellor's Office	Low	Staff Time, General Funds, Grant Funding- FEMA HMA (BRIC, FMAP and HMGP)	Short Term
Action CSU-8—Retrofit Modoc Hall by replacing windows with energy-efficient tempered glass that will not shatter during seismic activity or severe windstorms, and will reduce energy loss from heating and air conditioning.						
Hazards Mitigated: Earthquake, Severe Storms						
Existing	6, 9, 11	Facilities Services		High	Staff Time, General Funds, Grant Funding- FEMA HMA (BRIC, HMGP)	Short Term

a. Short-term = Completion within 5 years; Long-term = Completion within 10 years; Ongoing= Continuing new or existing program with no completion date

Acronyms used here are defined at the beginning of this volume.

Table 12-12. Mitigation Action Priority

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Cost?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Implementation Priority[a]	Grant Pursuit Priority[a]
1	3	High	High	Yes	Yes	No	Medium	High
2	2	Medium	Low	Yes	No	Yes	High	Low
3	2	High	Medium	Yes	Yes	No	Medium	High
4	6	High	High	Yes	Yes	No	Medium	High
5	5	High	High	Yes	Yes	No	Medium	High
6	5	High	Medium	Yes	Yes	No	Medium	High
7	3	High	Low	Yes	Yes	No	Medium	High
8	3	High	High	Yes	Yes	No	Medium	High

a. See the introduction to this volume for explanation of priorities.

Table 12-13. Analysis of Mitigation Actions

Hazard Type	Action Addressing Hazard, by Mitigation Type[a]							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilient	Community Capacity Building
Medium-Risk Hazards								
Earthquake		CSU-1, 8	CSU-2	CSU-3	CSU-3			CSU-2
Severe Storms		CSU-1, 8	CSU-2	CSU-3	CSU-3	CSU-4		CSU-2
Severe Weather		CSU-6	CSU-2	CSU-3, 5	CSU-3	CSU-5	CSU-5	CSU-2
Dam Failure			CSU-2	CSU-3	CSU-3			CSU-2
Flooding		CSU-1, 6	CSU-2	CSU-3, 5	CSU-3	CSU-4, 5	CSU-5	CSU-2
Landslide		CSU-1	CSU-2	CSU-3	CSU-3			CSU-2
Wildfire			CSU-2	CSU-3, 7	CSU-3			CSU-2
Low-Risk Hazards								
Drought			CSU-2	CSU-3, 5	CSU-3	CSU-5	CSU-5	CSU-2

a. See the introduction to this volume for explanation of mitigation types.

12.8 PUBLIC OUTREACH

Table 12-14 lists public outreach activities for this jurisdiction.

Table 12-14. Local Public Outreach

Local Outreach Activity	Date	Number of People Involved
VC VOAD General Membership Meeting	June 17, 2021	40
VC VOAD Executive Board Meeting	June 9, 2021	7
VC VOAD General Membership Meeting	September 16, 2021	50
Postings on Facebook, Twitter	July 2021-September 2021	400+

12.9 INFORMATION SOURCES USED FOR THIS ANNEX

The following technical reports, plans, and regulatory mechanisms were reviewed to provide information for this annex.

- **Executive Order 987, Building Operations and Maintenance**—Reviewed for the capabilities assessment and action plan development.
- **Policy Number: FA.32.003 Strategic Risk Management**—Reviewed for the capabilities assessment.
- **Communicable Disease Response Plan**—Reviewed for the capabilities assessment.
- **CSU Channel Islands Exterior Building Management Plan**—Reviewed for the capabilities assessment and action plan development.
- **Executive Order, Policy on Occupational Safety**—Reviewed for the capabilities assessment.
- **Emergency Operations Plan**—Reviewed for the capabilities assessment and action plan development.

- **Executive Order, Business Continuity Plan**—Reviewed for the capabilities assessment.

The following outside resources and references were reviewed:

- **Hazard Mitigation Plan Annex Development Toolkit**—The toolkit was used to support the identification of past hazard events and noted vulnerabilities, the risk ranking, and the development of the mitigation action plan.
- **Ventura County Hazard Mitigation Plan 2015**—The previous hazard mitigation plan was reviewed when developing mitigation actions.
- **Cal OES Hazard Mitigation Plan 2018**—The state hazard mitigation plan was reviewed when developing mitigation actions.

12.10 FUTURE NEEDS TO BETTER UNDERSTAND RISK/VULNERABILITY

- Workshops, training and education for the campus community.
- Develop and strengthen a campus Hazard Mitigation Planning Team.
- Hire a Risk Manager for the campus.

13. CALLEGUAS MUNICIPAL WATER DISTRICT

13.1 LOCAL HAZARD MITIGATION PLANNING TEAM

Primary Point of Contact
Daniel Cohen, Emergency Response Coordinator
2100 E. Olsen Road
Thousand Oaks, CA 91360
Telephone: 805-579-7134
e-mail Address: dcohen@calleguas.com

Alternate Point of Contact
Rob Peters, Manager of Operations and Maintenance
2100 E. Olsen Road
Thousand Oaks, CA 91360
Telephone: 805-579-7136
e-mail Address: rpeters@calleguas.com

This annex was developed by the local hazard mitigation planning team, whose members are listed in Table 13-1.

Table 13-1. Local Hazard Mitigation Planning Team Members

Name	Title
Daniel Cohen	Emergency Response Coordinator
Rob Peters	Manager of Operations and Maintenance
Kristine McCaffrey	Manager of Engineering
Dan Drugan	Manager of Resources
Sue Taylor	Accounting Supervisor
Julio Reyes	Operations Supervisor

13.2 JURISDICTION PROFILE

13.2.1 Overview

The Calleguas Municipal Water District (Calleguas, District) was formed in 1953 as voters in southern Ventura County were faced with limited local water supplies, recurring droughts, and an expanding population and economy. In 1960, Calleguas joined the Metropolitan Water District of Southern California (Metropolitan) as a way of securing water from the state water system. The District's mission is to provide its service area with a reliable supplemental supply of regional and locally developed water in an environmentally and economically responsible manner.

Calleguas is an independent special district with 70 employees who work in Administrative Services, Engineering, Operations and Maintenance, and Resources divisions. The District operates on funding that comes primarily through operating revenues and water rates, and is supplemented by non-operating revenues and investment earnings.

Calleguas is governed by an elected five-member Board of Directors, which assumes responsibility for the adoption of this plan. The General Manager will oversee the plan's implementation.

13.2.2 Service Area

Calleguas is a wholesale water provider that imports and distributes water from Metropolitan through the State Water Project. A majority of the District's water supply is treated at Metropolitan's Jensen Treatment Facility in Granada Hills and conveyed into Calleguas' distribution system. Calleguas does not deliver water directly to consumers, but serves high quality drinking water to 19 retail purveyors within its service area that then deliver water to residents and municipal and agricultural customers.

The District serves an area of approximately 366 square miles in southeast Ventura County and an estimated 635,000 residents, or roughly three quarters of Ventura County's population. Communities served by Calleguas include the cities of Camarillo, Moorpark, Oxnard, Port Hueneme, Simi Valley, and Thousand Oaks; and the unincorporated areas of Bell Canyon, Camarillo Estates, Camarillo Heights, Lake Sherwood, Naval Base Ventura County, Oak Park, Santa Rosa Valley, and Somis.

Calleguas' distribution system is made up of 140 miles of large diameter transmission pipelines, 12 potable water reservoirs, 6 potable water pump stations, 5 hydroelectric generators, 20 pressure regulating stations, and 91 service connections (turnouts). The District also owns and operates Lake Bard, an earthen open-surface reservoir, and associated water filtration plant, as well as an aquifer storage and recovery (ASR) project with 18 ASR wells and an associated disinfection facility.

13.2.3 Assets

Table 13-2 summarizes the assets of the District and their value.

Table 13-2. Special-Purpose District Assets

Asset	Value
Property	
887 acres	Unknown
Equipment	
Calleguas Conduit Surge Relief Facility	$267,749
Conejo Generating Station	$1,627,029
Conejo Mobile Standby Generators	Unknown
Conejo Standby Generators	$3,337,558
Crestview Interconnection	$1,560,585
Distribution System Pipelines: 140 miles, various diameters (14"-78")	Unknown
East Portal Standby Generator	$71,822
Emergency Pipe Yard	$1,759,356
Fairview Standby Generator	Unknown
Grandsen Generating Station	$1,166,850
Grandsen Standby Generators	$2,908,577
Grandsen Surge Tank	$612,825
Mesa Pressure Relief Station	$2,187,000
Pressure Regulating Station 1	$35,034

Asset	Value
Pressure Regulating Station 1A	$35,034
Pressure Regulating Station 2	$219,790
Pressure Regulating Station 3	$42,621
Pressure Regulating Station 4	$69,781
Pressure Regulating Station 5	$42,621
Pressure Regulating Station 6	$133,355
Pressure Regulating Station 6A	$42,621
Pressure Regulating Station 7	$42,621
Pressure Regulating Station 8	$42,621
Pressure Regulating Station 9	$52,286
Reg Station 6 Standby Generator	$9,965
Reg Station 9 Standby Generator	Unknown
Santa Rosa Generating Station	$952,557
Santa Susana Tunnel	Unknown
Salinity Management Pipeline (SMP) Phase 1A	$13,579,369
SMP Phase 1B	$13,617,662
SMP Phase 1C	$8,978,601
SMP Phase 1D	$4,858,495
SMP Phase 1E	$32,756,801
SMP Phase 2A	$8,636,675
SMP Phase 2B	$13,260,190
SMP Phase 2C	$5,743,806
SMP Phase 2D	$4,939,862
SMP Hueneme Outfall	$21,352,277
Springville Flow Control Facility	$1,440,415
Springville Generating Station	$3,053,878
Springville Standby Generators	Unknown
Vehicle Fleet	Unknown
Well 1	$777,480
Well 2	$777,480
Well 3	$777,480
Well 4	$777,480
Well 5	$773,964
Well 6	$1,143,577
Well 7	$1,141,924
Well 8	$836,705
Well 9	$1,154,833
Well 10	$881,306
Well 11	$768,269
Well 12	$773,964
Well 13	$774,560
Well 14	$836,705
Well 15	$1,066,882

Asset	Value
Well 16	$1,066,883
Well 17	$806,428
Well 18	$814,091
Wellfield Standby Generators	Unknown
Total:	**$165,388,300**
Critical Facilities	
Calleguas Administration Building	$4,909,768
Conejo Pump Station	$4,225,361
Conejo Reservoir	Unknown
East Portal	$3,513,041
Fairview Pump Station	$1,584,922
Grandsen Pump Station 1	$5,344,699
Grandsen Pump Station 2	$2,486,828
Grimes Canyon Disinfection Facility	$3,235,725
Lake Bard	$2,795,730
Lake Bard Water Filtration Plant	$14,377,027
Lake Sherwood Pump Station	Unknown
Lake Sherwood Reservoir	$1,503,910
Lindero Pump Station	$2,526,679
Lindero Reservoir	$3,198,563
Newbury Park Reservoir	$1,900,000
SMP Control Tank	$3,708,277
Springville Reservoir A	$1,109,000
Springville Reservoir B	$4,139,655
Thousand Oaks Reservoir	$12,980,000
TOD Pump Station	$2,064,923
West Portal Overflow Structure	$1,463,000
Westlake Reservoir	$12,745,905
Wood Ranch Dam	Unknown
Total:	**$89,813,013**

13.3 CURRENT TRENDS

When Calleguas joined Metropolitan in 1960, its service area was approximately 270 square miles. The Calleguas service area reached 366 square miles in 2010. Since 2000, the frequency and size of annexations into Calleguas' service boundary have slowed considerably. Future annexations are anticipated to continue at a relatively small size and rate, and Calleguas has no plans to significantly expand its service area.

13.4 CAPABILITY ASSESSMENT

This section describes an assessment of existing capabilities for implementing hazard mitigation strategies. The introduction at the beginning of this volume of the hazard mitigation plan describes the components included in the capability assessment and their significance for hazard mitigation planning.

Findings of the capability assessment were reviewed to identify opportunities to expand, initiate or integrate capabilities to further hazard mitigation goals and objectives. Where such opportunities were identified and determined to be feasible, they are included in the action plan. The "Analysis of Mitigation Actions" table in this annex identifies these as community capacity building mitigation actions. The findings of the assessment are presented as follows:

- An assessment of planning and regulatory capabilities is presented in Table 13-3.
- An assessment of fiscal capabilities is presented in Table 13-4.
- An assessment of administrative and technical capabilities is presented in Table 13-5.
- An assessment of education and outreach capabilities is presented in Table 13-6.
- Classifications under various community mitigation programs are presented in Table 13-7.
- The community's adaptive capacity for the impacts of climate change is presented in Table 13-8.

Table 13-3. Planning and Regulatory Capability

Plan, Study or Program	Date of Most Recent Update	Comment
Capital Improvement Program	2021	Updated at least annually, covers a 5-year timeframe.
Emergency Action Plan & Inundation Maps for Wood Ranch Dam	2020-21	Updated at least every 10 years in accordance with California Water Code 6160-6161.
Emergency Response Plan	2020	Updated regularly and self-certified with EPA at least every 5 years in accordance with America's Water Infrastructure Act of 2018.
Master Plan	2017	Updated as needed.
Risk and Resilience Assessment	2020	Updated and self-certified with EPA every 5 years in accordance with America's Water Infrastructure Act of 2018.
Urban Water Management Plan	2021	Updated every 5 years in accordance with the Urban Water Management Planning Act.
Water Supply Alternatives Study	Ongoing	Evaluation of potential approaches to meet water supply needs during a 6-month outage of imported water.

Table 13-4. Fiscal Capability

Financial Resource	Accessible or Eligible to Use?
Community Development Block Grants	No
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for Specific Purposes	No
User Fees for Water, Sewer, Gas or Electric Service	No
If yes, specify: Calleguas does not directly provide water to homes or businesses, therefore customer user fees are not directly collected. User fees are collected by the District's purveyors, which ultimately contribute to funding sources used by those purveyors to purchase water from Calleguas.	
Incur Debt through General Obligation Bonds	Yes
Incur Debt through Special Tax Bonds	No
Incur Debt through Private Activity Bonds	No
Withhold Public Expenditures in Hazard-Prone Areas	No
State-Sponsored Grant Programs	Yes
Development Impact Fees for Homebuyers or Developers	No

Table 13-5. Administrative and Technical Capability

Staff/Personnel Resource	Available?
Planners or engineers with knowledge of land development and land management practices *If Yes, Department /Position:* This resource is available through contract support.	Yes
Engineers or professionals trained in building or infrastructure construction practices *If Yes, Department /Position:* Engineering Department / Manager of Engineering, Project Managers, and Inspectors.	Yes
Planners or engineers with an understanding of natural hazards *If Yes, Department /Position:* Engineering Department / Manager of Engineering, Project Managers, and Inspectors.	Yes
Staff with training in benefit-cost analysis *If Yes, Department /Position:* This resource is available through contract support.	Yes
Surveyors *If Yes, Department /Position:* This resource is available through contract support.	Yes
Personnel skilled or trained in GIS applications *If Yes, Department /Position:* Administrative Services Department / Information Technology Specialist.	Yes
Scientist familiar with natural hazards in local area *If Yes, Department /Position:* This resource is available through contract support.	Yes
Emergency manager *If Yes, Department /Position:* Operations & Maintenance Department / Emergency Response Coordinator.	Yes
Grant writers *If Yes, Department /Position:* Engineering Department / Manager of Engineering.	Yes
Procurement Services and Management *If Yes, Department /Position:* Administrative Services Department, Operations & Maintenance Department / General Services Division.	Yes

Table 13-6. Education and Outreach Capability

Criterion	Response
Do you have a public information officer or communications office?	Yes
Do you have personnel skilled or trained in website development?	Yes
Do you have hazard mitigation information available on your website? *If yes, briefly describe:* Information is available regarding specific plans and capital projects that relate to specific hazard mitigation activities.	Yes
Do you use social media for hazard mitigation education and outreach? *If yes, briefly describe:* Public education through social media is focused on drought mitigation and water conservation.	Yes
Do you have any citizen boards or commissions that address issues related to hazard mitigation?	No
Do you have any other programs in place that could be used to communicate hazard-related information? *If yes, briefly describe:* Calleguas organizes a banner distribution program and displays signage related to drought mitigation in coordination with water purveyors throughout Ventura County.	Yes
Do you have any established warning systems for hazard events? *If yes, briefly describe:* Public warning notification procedures are established for potential safety incidents involving a dam breach or failure, as well as hazards not included in this HMP.	Yes

Table 13-7. Community Classifications

	Participating?	Classification	Date Classified
FIPS Code	No	N/A	N/A
DUNS#	Yes	010726883	N/A
Community Rating System	No	N/A	N/A
Building Code Effectiveness Grading Schedule	No	N/A	N/A
Public Protection	No	N/A	N/A
Storm Ready	No	N/A	N/A
Firewise	No	N/A	N/A
Tsunami Ready	No	N/A	N/A

Table 13-8. Adaptive Capacity for Climate Change

Criterion	Jurisdiction Rating[a]
Technical Capacity	
Jurisdiction-level understanding of potential climate change impacts	High
Comment: Calleguas' elected officials and managerial staff understand that climate change is real and requires planned actions to mitigate its impacts.	
Jurisdiction-level monitoring of climate change impacts	High
Comment: Calleguas regularly monitors climate change impacts on snowpack, water supply conditions, drought, and wildfires.	
Technical resources to assess proposed strategies for feasibility and externalities	High
Comment: Calleguas has organized and participated in plans and programs that assess mitigation strategies, in addition to utilizing contract support.	
Jurisdiction-level capacity for development of greenhouse gas emissions inventory	High
Comment: The Calleguas distribution system is primarily a gravity-fed system that generates more power than it uses on an annual basis.	
Capital planning and land use decisions informed by potential climate impacts	High
Comment: Calleguas complies with the California Environmental Quality Act (CEQA) for projects, which includes an evaluation of climate impacts.	
Participation in regional groups addressing climate risks	High
Comment: Calleguas Directors and staff actively participate in multiple groups focused on addressing climate risks and impacts, including the Watersheds Coalition of Ventura County and the Ventura County Regional Energy Alliance.	
Implementation Capacity	
Clear authority/mandate to consider climate change impacts during public decision-making processes	High
Comment: Processes in CEQA require climate change impacts to be considered.	
Identified strategies for greenhouse gas mitigation efforts	High
Comment: Strategies to mitigate greenhouse gas emissions have been identified and continue to be explored, including additional hydroelectric power generation, water use efficiency programs, and eventual transition of the District's fleet to electric vehicles.	
Identified strategies for adaptation to impacts	High
Comment: Calleguas actively participates in integrated water resource planning and local water resource development to increase local resilience and reduce reliability on imported water.	
Champions for climate action in local government departments	High
Comment: Water resources personnel at Calleguas actively organize and coordinate water conservation efforts with local cities, utilities, special districts, and the public across Ventura County.	

Criterion	Jurisdiction Rating[a]
Political support for implementing climate change adaptation strategies	High
Comment: The District's elected officials actively support strategies that direct preparedness and support measures that encourage adaptability to climate change impacts. Additionally, state and federal representatives serving regions in the District's service area traditionally support legislation intended to mitigate impacts created by climate change.	
Financial resources devoted to climate change adaptation	High
Comment: Water use efficiency programs financially incentivize efforts to conserve water. Financial resources are also dedicated to capital improvement planning projects, such as development of local water resources and resiliency of water system components, that may be impacted by climate change.	
Local authority over sectors likely to be negative impacted	High
Comment: Calleguas has jurisdiction over its water supply.	
Public Capacity	
Local residents' knowledge of and understanding of climate risk	Medium
Comment: Public capacity is measured in accordance with municipalities and unincorporated areas of Ventura County located in the District's service area.	
Local residents' support of adaptation efforts	Medium
Comment: Public capacity is measured in accordance with municipalities and unincorporated areas of Ventura County located in the District's service area.	
Local residents' capacity to adapt to climate impacts	Medium
Comment: Public capacity is measured in accordance with municipalities and unincorporated areas of Ventura County located in the District's service area.	
Local economy current capacity to adapt to climate impacts	Medium
Comment: Public capacity is measured in accordance with municipalities and unincorporated areas of Ventura County located in the District's service area.	
Local ecosystems capacity to adapt to climate impacts	Medium
Comment: Public capacity is measured in accordance with municipalities and unincorporated areas of Ventura County located in the District's service area.	

a. High = Capacity exists and is in use; Medium = Capacity may exist, but is not used or could use some improvement; Low = Capacity does not exist or could use substantial improvement; Unsure= Not enough information is known to assign a rating.

13.5 INTEGRATION REVIEW

For hazard mitigation planning, "integration" means that hazard mitigation information is used in other relevant planning mechanisms, such as capital facilities planning, and that relevant information from those sources is used in hazard mitigation. This section identifies where such integration is already in place, and where there are opportunities for further integration in the future. Resources listed at the end of this annex were used to provide information on integration. The progress reporting process described in Volume 1 of the hazard mitigation plan will document the progress of hazard mitigation actions related to integration and identify new opportunities for integration.

13.5.1 Existing Integration

Some level of integration has already been established between local hazard mitigation planning and the following other local plans and programs:

- Capital Improvement Program—The Capital Improvement Program includes projects that can help mitigate potential hazards, as well as address the potential impacts of those hazards on operations and water supply. The District will act to ensure consistency between the HMP and

the current and future capital improvement program. The HMP may identify new possible funding sources for capital improvement projects and may result in modifications to proposed projects based on results of the risk assessment.

- Emergency Response Plan—The Emergency Response Plan describes procedures and operations to be executed by Calleguas staff in the event of various types of disasters or emergency situations. Response procedures and action plans, specifically for natural hazards, incorporate mitigation planning efforts recognized in the HMP in order to minimize the impacts to District facilities, infrastructure, equipment, staff, and the public.
- Master Plan—The Master Plan includes projects that can help address the potential impacts of hazards on operations and water supply. The District will act to ensure consistency between the HMP and the Master Plan.
- Risk and Resilience Assessment—The Risk and Resilience Assessment identifies and evaluates hazards that present the highest risk to the District's infrastructure and measures the resiliency of the District's system against those hazards, including natural hazards. Countermeasures that mitigate impacts and vulnerabilities associated with high-risk hazards are evaluated, including potential mitigation actions that are also recognized and described in the HMP.
- Urban Water Management Plan—The Urban Water Management Plan outlines and assesses long-term water resource planning as local and state supplies continually experience highly variable hydrology and impacts of climate change. Water service reliability, water use efficiency efforts, and contingency planning aspects of the Urban Water Management Plan integrate the HMP by incorporating potential mitigation actions.
- Water Supply Alternatives Study—The Water Supply Alternatives Study includes projects that can help address the potential impacts of hazards on operations and water supply. The District will act to ensure consistency between the HMP and Water Supply Alternatives Study.

13.5.2 Opportunities for Future Integration

The capability assessment in this annex indicates opportunities to integrate this mitigation plan with other jurisdictional planning/regulatory capabilities. Capabilities were identified as integration opportunities if they can support or enhance the actions identified in this plan or be supported or enhanced by components of this plan. The capability assessment identified the following plans and programs that do not currently integrate hazard mitigation information but provide opportunities to do so in the future:

- Business Continuity Plan—The District may assess its existing Business Continuity Plan to expand the plan and update it in accordance with the HMP.
- Post-Disaster Recovery Plan—The District may consider preparing a Post-Disaster Recovery Plan that would emphasize the planning goals and strategies identified in the HMP during long-term recovery efforts.
- Power Outage Response Plan—The District plans to develop an action plan specifically for responding to various types of power outages, including Public Safety Power Shutoffs (PSPS) and extended blackouts. This plan will incorporate mitigation objectives and other measures identified in the HMP.

Taking action to integrate each of these programs with the hazard mitigation plan was considered as a mitigation action to include in the action plan in this annex.

13.6 RISK ASSESSMENT

13.6.1 Jurisdiction-Specific Natural Hazard Event History

Table 13-9 lists past occurrences of natural hazards for which specific damage was recorded in this jurisdiction Other hazard events that broadly affected the entire planning area, including this jurisdiction, are listed in the risk assessments in Volume 1 of this hazard mitigation plan.

Table 13-9. Past Natural Hazard Events

Type of Event	FEMA Disaster #	Date	Damage Assessment
COVID-19 Pandemic	DR-4482	01/20/2020	Ongoing.
Easy Fire	FM-5298	10/30/2019	The Easy Fire occurred just north of the District's main facility, interrupting normal operations and requiring most staff to evacuate the property. Although no District facilities were directly impacted, the District's water supply was used for firefighting efforts via distribution pipelines and aerial surface water dips in Lake Bard.
2018 Fires	DR-4407	11/08/2018	The Hill and Woolsey Fires both occurred inside separate areas of the District's service territory. Although no District facilities were directly impacted, the District's water supply was used for firefighting efforts via distribution pipelines and aerial surface water dips in Lake Bard. Power outages caused by the fire also created operational challenges and complications.
Thomas Fire	FM-5224	12/04/2017	District staff provided mutual aid and support to water agencies impacted by this fire, including staffing the water infrastructure liaison position in the County EOC.
Springs Fire	FM-5024	05/02/2013	The District's water supply was used for firefighting efforts.
Guiberson Fire	FM-2839	09/22/2009	The District's water supply was used for firefighting efforts.
Shekell Fire	FM-2681	12/03/2006	The Shekell Fire burned through the District's Wellfield facility but caused minimal damage to equipment and infrastructure. The District's water supply was used for firefighting efforts.
Topanga Fire	FM-2583	09/28/2005	The District's water supply was used for firefighting efforts.
Severe Storms	DR-1577	12/27/2004	$121,296.45
Simi Fire	DR-1498	10/21/2003	The District's water supply was used for firefighting efforts.
Northridge Earthquake	DR-1008	01/17/1994	The District incurred multiple significant pipeline failures and suffered damages on other components related to the distribution system, reaching costs totaling several hundreds of thousands of dollars to repair or replace assets.

13.6.2 Hazard Risk Ranking

Table 13-10 presents a local ranking of all hazards of concern for which this hazard mitigation plan provides complete risk assessments. As described in detail in Volume 1, the ranking process involves an assessment of the likelihood of occurrence for each hazard, along with its potential impacts on

people, property, and district operations. Mitigation actions primarily target hazards with high and medium rankings.

Table 13-10. Hazard Risk Ranking

Rank	Hazard	Risk Ranking Score	Risk Category
1	Earthquake	32	High
1	Wildfire	32	High
3	Drought	31	High
4	Severe Weather	24	Medium
4	Severe Storms	24	Medium
6	Dam Failure	21	Medium
7	Landslide	18	Medium
8	Flooding	15	Low
9	Sea Level Rise	2	Low
9	Tsunami	2	Low

13.6.3 Jurisdiction-Specific Vulnerabilities

Volume 1 of this hazard mitigation plan provides complete risk assessments for each identified hazard of concern. The following jurisdiction-specific issues have been identified based on a review of the results of the risk assessment, public involvement strategy, and other available resources:

- Strong to severe ground shaking and liquefaction produced by an earthquake on one of many nearby faults could result in significant simultaneous damages to several assets and critical facilities across the District's service area.
- Numerous District assets and critical facilities are located in a very high wildfire severity zone, including multiple pump stations, reservoirs, and water treatment facilities containing hazardous materials.
- Long-term statewide and regional drought could impact the District's imported water supply and strain local water resources and emergency reserves.
- The Santa Susana Tunnel conveys imported water from Metropolitan Water District into the Calleguas distribution system. An impact to the tunnel caused by an earthquake or other natural hazard could completely cut off imported water until the tunnel is repaired or temporary infrastructure is installed.

Mitigation actions addressing these issues were prioritized for consideration in the action plan in this annex.

13.7 STATUS OF PREVIOUS PLAN ACTIONS

Table 13-11 summarizes the actions that were recommended in the previous version of the hazard mitigation plan and their implementation status at the time this update was prepared.

Table 13-11. Status of Previous Plan Actions

Action Item from Previous Plan	Completed	Removed; No Longer Feasible	Carried Over to Plan Update: Check if Yes	Carried Over to Plan Update: Action # in Update
OA 9—Identify potentially vulnerable public and private utility systems including electric, gas, oil, water, sewer and communication. Upgrade vulnerable systems to ensure the operation and timely restoration of essential systems to reasonable levels of service.			✓	CAL-6
Comment: *Although Calleguas has completed several projects to mitigate earthquake hazards, this action item is evergreen and will always remain relevant to Calleguas.*				
OA 16—Implement landslide stabilization and/or protection measures. Stabilization measures include grading the unstable portion of the slope to a lower gradient, construction of rock buttresses and retaining walls, and drainage improvements. Protection measures include containment and/or diversion of the moving debris, such as walls, berms, ditches and catchment basins.			✓	CAL-7
Comment: *Calleguas has completed several efforts to mitigate hazards related to erosion and drainage. However, this action item will always remain relevant to Calleguas.*				
OA 21—Maintain hazards fuel treatment program for areas that have been identified with overgrown/dead brush/trees to reduce the potential for tree-to-tree ignition. Ensure that a "maintenance now" component to provide continued fire resistance is part of the program.			✓	CAL-8
Comment: *Calleguas maintains a brush clearing and defensible space program to mitigate wildfire risks. These mitigation efforts are completed regularly and will always remain relevant to Calleguas.*				

13.8 HAZARD MITIGATION ACTION PLAN

Table 13-12 lists the actions that make up the hazard mitigation action plan for this jurisdiction. Table 13-13 identifies the priority for each action. Table 13-14 summarizes the mitigation actions by hazard of concern and mitigation type.

Table 13-12. Hazard Mitigation Action Plan Matrix

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action CAL-1—Where appropriate, support retrofitting, purchase or relocation of structures located in hazard areas, prioritizing those that have experienced repetitive losses and/or are located in high- or medium-risk hazard areas.						
Hazards Mitigated: Earthquake, Wildfire, Dam Failure, Landslide, Flooding						
Existing	2, 6, 9, 18	Calleguas MWD	Various	TBD	CIP Funds, HMGP/BRIC Grant Funding	Long-term
Action CAL-2—Improve imported water supply reliability by seismically upgrading Calleguas' Santa Susana Tunnel, which was constructed in the early 1960s.						
Hazards Mitigated: Earthquake						
Existing	2, 6, 9, 18	Calleguas MWD	N/A	$4M	CIP Funds, HMGP/BRIC Grant Funding	Long-term
CAL-3—Improve water supply reliability and reduce risk of critical pipeline failure during an earthquake by rehabilitating and/or strengthening segments of Prestressed Concrete Cylinder Pipe (PCCP) in the District's distribution system that are vulnerable to "broken back" failures.						
Hazards Mitigated: Earthquake						
Existing	2, 6, 9, 18	Calleguas MWD	N/A	$10M	CIP Funds, HMGP/BRIC Grant Funding	Short and long-term (phased project)

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action CAL-4—Actively participate in the plan maintenance protocols outlined in Volume 1 of this hazard mitigation plan.						
Hazards Mitigated: All Hazards						
New/Existing	1, 4, 6, 8, 19	Calleguas MWD	N/A	Low	Staff Time, General Funds	Short-term
Action CAL-5—Purchase generators for critical facilities and infrastructure that lack adequate backup power as listed below.						
Hazards Mitigated: Earthquake, Wildfire, Severe Weather, Severe Storms, Dam Failure, Landslide, Flooding						
Existing, Lindero Pump Station	2, 6, 18	Calleguas MWD	N/A	$1.3M	CIP Funds, BRIC Grant Funding (pending)	Short-term
Existing, Lake Sherwood Pump Station	2, 6, 18	Calleguas MWD	N/A	$340,000	CIP Funds, HMGP/BRIC Grant Funding	Short-term
Action CAL-6—Identify potentially vulnerable public water utility systems. Upgrade vulnerable systems under the District's authority to ensure the operation and timely restoration of essential systems to reasonable levels of service.						
Hazards Mitigated: All Hazards						
New/Existing	2, 6, 9	Calleguas MWD	N/A	Medium	General Funds, HMGP/BRIC Grant Funding	Ongoing
Action CAL-7—Implement landslide stabilization and/or protection measures. Stabilization measures include grading the unstable portion of the slope to a lower gradient, construction of rock buttresses and retaining walls, and drainage improvements. Protection measures include containment and/or diversion of the moving debris, such as walls, berms, ditches and catchment basins.						
Hazards Mitigated: Landslide						
New/Existing	2, 6, 9	Calleguas MWD	N/A	Medium	CIP Funds, HMGP/BRIC Grant Funding	Ongoing
Action CAL-8—Maintain wildfire hazard fuel reduction program for areas that have been identified with overgrown or dead brush, trees and weeds to reduce the potential for tree-to-tree ignition. Ensure that a "maintenance now" component to provide continued fire resistance is part of the program. (Coordinates with Ventura County Fire Protection District Action VFP-6)						
Hazards Mitigated: Wildfire						
Existing	5, 13, 14	Calleguas MWD	N/A	Low	General Funds, HMGP/BRIC Grant Funding	Ongoing
Action CAL-9—Implement projects to help address water supply needs during a 6-month imported water outage.						
Hazards Mitigated: Earthquake, Drought						
New	2, 6, 18	Calleguas MWD	Various	TBD	CIP Funds, IRWM/HMGP/ BRIC Grant Funding	Long-term
Action CAL-10—The Las Virgenes-Calleguas Interconnection is a cost-effective, mutually beneficial pipeline that can deliver water between agencies if one were to experience a complete or partial water supply interruption that did not significantly affect the other agency.						
Hazards Mitigated: Earthquake						
New	2, 3, 6, 8, 18	Calleguas MWD	Las Virgenes Municipal Water District	$30M	CIP Funds, Proposition 1 IRWM Grant Funding	Short-term
Action CAL-11—The Calleguas-Ventura Interconnection is a cost-effective, mutually beneficial pipeline that will be utilized to improve water system reliability for both agencies during water supply shortages that may not significantly affect both jurisdictions at the same time.						
Hazards Mitigated: Earthquake, Drought						
New	2, 3, 6, 8, 18	Calleguas MWD	City of Ventura	$21M	CIP Funds, IRWM/HMGP/ BRIC Grant Funding	Short-term

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action CAL-12—The Crestview Well No.8 project involves construction and installation of a new groundwater well, associated components and system connections necessary to deliver water from Crestview Mutual Water Company to Calleguas during an imported water outage.						
Hazards Mitigated: Earthquake						
New	2, 6, 8, 18	Crestview Mutual Water Company	Calleguas MWD	$2.4M	CIP Funds	Short-term
Action CAL-13—Lake Bard Pump Station will enable the treatment of approximately 30% of water in Lake Bard that cannot currently be treated by the Lake Bard Water Filtration Plant due to insufficient hydraulic head by pumping that water through the treatment process. This water would likely only need to be treated during a major imported water outage, which could be caused by an earthquake.						
Hazards Mitigated: Earthquake						
New	2, 6, 18	Calleguas MWD	N/A	$6M	CIP Funds	Short-term
Action CAL-14—Fairview Well Rehabilitation will help the District meet demands during imported water outages by rehabilitating and performing upgrades on system components to enable operation of Fairview Well, an aquifer storage and recovery well that has not operated since 1998.						
Hazards Mitigated: Earthquake						
New	2, 6, 18	Calleguas MWD	N/A	$2M	CIP Funds, HMGP/BRIC Grant Funding	Short-term

a. Short-term = Completion within 5 years; Long-term = Completion within 10 years; Ongoing= Continuing new or existing program with no completion date; Acronyms used here are defined at the beginning of this volume.

Table 13-13. Mitigation Action Priority

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Cost?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Implementation Priority[a]	Grant Pursuit Priority[a]
CAL-1	4	High	Medium	Yes	Yes	No	Medium	High
CAL-2	4	High	Medium	Yes	Yes	Yes	High	High
CAL-3	4	High	Medium	Yes	Yes	Yes	High	High
CAL-4	5	Medium	Low	Yes	No	Yes	High	Low
CAL-5	3	High	Low	Yes	Yes	Yes	High	High
CAL-6	3	High	Medium	Yes	Yes	No	Medium	High
CAL-7	3	High	Medium	Yes	Yes	No	Medium	High
CAL-8	3	High	Low	Yes	Yes	Yes	High	High
CAL-9	3	High	Medium	Yes	Yes	No	Medium	High
CAL-10	5	High	Medium	Yes	Yes	Yes	High	High
CAL-11	5	High	Medium	Yes	Yes	Yes	High	High
CAL-12	4	High	Medium	Yes	Yes	Yes	High	High
CAL-13	3	High	Medium	Yes	Yes	Yes	High	High
CAL-14	3	High	Medium	Yes	Yes	Yes	High	High

a. See the introduction to this volume for explanation of priorities.

Table 13-14. Analysis of Mitigation Actions

Hazard Type	Action Addressing Hazard, by Mitigation Type[a]							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilient	Community Capacity Building
High-Risk Hazards								
Earthquake	CAL-9	CAL-1, 2, 3, 9	CAL-4		CAL-5, 6	CAL-1, 9, 10, 11, 12, 13		CAL-4, 6, 9, 10, 11, 12, 13, 14
Wildfire	CAL-8	CAL-1, 8	CAL-4	CAL-8	CAL-5, 6, 8	CAL-1		CAL-4, 6, 8
Drought	CAL-9		CAL-4			CAL-9, 11	CAL-9, 11	CAL-4, 6, 9, 11
Medium-Risk Hazards								
Severe Weather			CAL-4		CAL-5, 6			CAL-4, 6
Severe Storms			CAL-4		CAL-5, 6			CAL-4, 6
Dam Failure		CAL-1	CAL-4		CAL-5, 6	CAL-1		CAL-4, 6
Landslide		CAL-1, 7	CAL-4	CAL-7	CAL-5, 6	CAL-1, 7		CAL-4, 6, 7
Low-Risk Hazards								
Flooding		CAL-1			CAL-5, 6	CAL-1		CAL-4, 6
Sea Level Rise								CAL-4, 6
Tsunami								CAL-4, 6

a. See the introduction to this volume for explanation of mitigation types.

13.9 PUBLIC OUTREACH

Table 13-15 lists public outreach activities for this jurisdiction.

Table 13-15. Local Public Outreach

Local Outreach Activity	Date	Number of People Involved
Calleguas board resolution calling for water conservation to reduce demand by 15%	11/17/2021	15
Los Angeles Department of Water and Power (to shift-off state water project supplies), Metropolitan, Las Virgenes, and Calleguas drought press release	10/05/2021	15
Calleguas social media blast promoting public participation in the multi-hazard mitigation plan update	08/02/2021	N/A
Calleguas board adoption of stage 2 drought condition	08/18/2021	15
Calleguas board adoption of stage 4 drought condition—implementation of mandatory conservation	04/15/2015	15
Calleguas board resolution calling for increased water use efficiency	02/05/2014	25

13.10 INFORMATION SOURCES USED FOR THIS ANNEX

The following technical reports, plans, and regulatory mechanisms were reviewed to provide information for this annex.

- **Capital Improvement Program**—The Capital Improvement Program prioritizes projects that have been identified to improve District facilities, infrastructure, and equipment, including potential mitigation projects. The Capital Improvement Program was used as a source of information while preparing this annex.

- **Emergency Response Plan**—The District's Emergency Response Plan provides response procedures to various emergency incidents, including natural disasters. Several emergency response procedures and operations are intended to mitigate impacts of the incident. This information was reviewed and supported the development of this annex.
- **Master Plan**—The District's Master Plan includes projects that could mitigate the impacts of natural hazards on the water supply and distribution system. This information was referenced during the development of this annex.
- **Risk and Resilience Assessment**—The Risk and Resilience Assessment identifies the natural hazards that pose the largest risk to the District's water supply and infrastructure. Additionally, potential countermeasures to prevent or mitigate risks are included in the assessment. These aspects of the Risk and Resilience Assessment supported the development of this annex.
- **Urban Water Management Plan**—The Urban Water Management Plan provides information on water supplies, demands, and strategies to conserve water and mitigate impacts from natural hazards that could impact the distribution system. Information from the Urban Water Management Plan was utilized to support this annex.
- **Water Supply Alternatives Study**—The Water Supply Alternatives Study focuses on potential projects that could improve the District's water supply portfolio and ultimately increase local resiliency. Ideas in the Water Supply Alternatives Study were used to assist in the creation of this annex.

The following outside resources and references were reviewed:

- **California State Hazard Mitigation Plan (SHMP)**—The 2018 SHMP was referenced in order to understand the state's focus, objectives, and strategies related to hazard mitigation. The SHMP also includes an overview of disaster history, statewide risks, successful mitigation actions, and best practices.
- **Hazard Mitigation Plan Annex Development Toolkit**—The toolkit was used to support the identification of past hazard events and noted vulnerabilities, risk ranking, and the development of the mitigation action plan.
- **Integrated Water Resources Plan (IRP) developed by Metropolitan Water District of Southern California**—The 2020 IRP was prepared in concert with Metropolitan's Urban Water Management Plan and addresses the complexity of developing, maintaining, and delivering water to meet changing demands in face of uncertainties that the Southern California region faces. Climate change experts were consulted throughout the creation of the 2020 IRP, which creates multiple scenarios that could foreseeably occur due to climate change and other factors affecting water resources and demands. The IRP was referenced during development of this annex.
- **Projected Changes in Ventura County Climate**—The 2019 climate change report directed by the Watersheds Coalition of Ventura County projects local climate change impacts from 2021-2040. Climate factors that were assessed include projected changes in temperature, projected changes in precipitation, projected changes in evaporative demand, and considerations regarding atmospheric rivers, projected snowpack, drought, and wildfire. Calleguas participated in the development of the 2019 report as a wholesale water agency, and referenced the report during the development of this annex in the HMP.

- **Ventura County Emergency Operations Plan (EOP)**—The Ventura County EOP identifies countywide procedures for response to a largescale disaster or emergency incident. The County EOP was used as a resource throughout preparation of this annex.
- **Water Surplus and Drought Management Plan (WSDM Plan)**—Metropolitan Water District's WSDM Plan provides principles, goals, and potential actions to manage various water supply conditions. The WSDM Plan was used as a supporting document during development of this annex.

14. CASITAS MUNICIPAL WATER DISTRICT

14.1 LOCAL HAZARD MITIGATION PLANNING TEAM

Primary Point of Contact
Julia Aranda, PE, Engineering Manager
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Alternate Point of Contact
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This annex was developed by the local hazard mitigation planning team, whose members are listed in Table 14-1.

Table 14-1. Local Hazard Mitigation Planning Team Members

Name	Title
Julia Aranda	Engineering Manager
Greg Romey	Safety Officer
Kelley Dyer	Assistant General Manager

14.2 JURISDICTION PROFILE

14.2.1 Overview

The Casitas Municipal Water District was formed in 1952 (as the Ventura River Municipal Water District). In 1956, the Ventura River Project was authorized by Congress, which included the Robles Diversion facility on the Ventura River, the Robles Canal, and the Casitas Dam. The District is governed by a five-member Board of Directors. Funding is primarily from water rates and revenue bonds.

The Casitas Board of Directors assumes responsibility for the adoption of this plan; Casitas Municipal Water District will oversee its implementation.

14.2.2 Service Area

Casitas provides wholesale and retail water service to western Ventura County and is governed by a five-member elected Board of Directors. Communities served include the City of Ojai, Upper Ojai, the Ventura River Valley area, the City of Ventura (west of Mills Road) and the beach communities of Solimar, La Conchita, and Rincon. Originally named the Ventura River Municipal Water District in 1952,

Casitas was formed to provide supplemental water to the agricultural communities in its service area. The service area also includes residential, commercial, and industrial uses. Wholesale customers include the City of Ventura and several special districts and mutual water companies. Casitas has 60 full-time employees, not including those employed at the Lake Casitas Recreation Area.

Casitas' service area covers 136 square miles of land (177 square miles including ocean area). As of December 31, 2020, Casitas had 6,130 service connections. In 2017, Casitas acquired the Ojai Water System from Golden State Water Company (GSWC); this did not increase the service area as GSWC was a wholesale customer of Casitas.

14.2.3 Assets

Table 14-2 summarizes the assets of the District and their value. Many of the District's facilities are on land owned by the United States of America as they were acquired by the US Bureau of Reclamation; these parcels are not included in the table. Casitas operates and maintains the facilities (tanks, pump plants, etc.) on this land.

Table 14-2. Special-Purpose District Assets

Asset	Value
Property	
98.28 acres of land ($750,000/acre)	$73,710,000
Equipment	
163.52 miles of pipeline ($1.25M/mile)	$204,400,000
28.19 million gallons of storage tanks ($3/gal)	$84,570,000
16 pump plants (PP) (75,075 gpm total capacity x $1,000 per gpm)	$75,075,000
Generators	$972,000
Vehicles/Heavy Equipment	$3,000,000
Total:	***$441,727,000***
Critical Facilities	
Avenue No. 1 PP	$17,950,000
Gardens PP	$80,000
Avenue No. 2 PP	$18,800,000
Fairview PP	$4,670,000
4M PP	$5,300,000
Grand Avenue PP	$1,120,000
Upper Ojai PP	$4,850,000
3M PP	$1,425,000
Ojai Valley PP	$10,800,000
Rincon PP	$5,150,000
Fortress PP	$400,000
San Antonio PP	$3,000,000
Signal PP	$200,000
Arbolada PP	$390,000
Valley View PP	$700,000
Heidelberger PP	$240,000
Oak View Tank	$21,000,000

Asset	Value
Gardens Tank	$33,000
Villanova Tank	$19,500,000
Fairview Tank	$6,000,000
4M Tank	$6,000,000
Upper Ojai Tank	$5,400,000
3M Tank	$3,000,000
Ojai East Tank	$9,000,000
Rincon Control Tank	$750,000
Rincon Balancing Tank	$7,500,000
Fortress	$405,000
San Antonio Forebay	$1,500,000
Signal Tank	$900,000
Arbolada Tank	$3,000,000
Running Ridge Tank	$282,000
Heidelberger Tank	$300,000
Marion Walker Water Treatment Facility	$15,000,000
San Antonio Wellfield Treatment Facility	$5,000,000
District Office	$5,000,000
Robles Diversion and Fish Passage Facility	$20,000,000
San Antonio Plant Generator (500 kW)	$500,000
Marion Walker Water Treatment Plan Generator (350 kW)	$350,000
Robles Diversion Facility Generator (60 kW)	$60,000
Heidelberger PP Booster Generator (37 kW)	$37,000
Signal PP Booster Generator (25 kW)	$25,000
Vehicles and Heavy Equipment	$3,000,000
Total:	***$208,617,000***

14.3 CURRENT TRENDS

Population is not expected to significantly increase over the next ten years and the District has no plans to expand its service area.

14.4 CAPABILITY ASSESSMENT

This section describes an assessment of existing capabilities for implementing hazard mitigation strategies. The introduction at the beginning of this volume of the hazard mitigation plan describes the components included in the capability assessment and their significance for hazard mitigation planning.

Findings of the capability assessment were reviewed to identify opportunities to expand, initiate or integrate capabilities to further hazard mitigation goals and objectives. Where such opportunities were identified and determined to be feasible, they are included in the action plan. The “Analysis of Mitigation Actions” table in this annex identifies these as community capacity building mitigation actions.

The findings of the assessment are presented as follows:

- An assessment of planning and regulatory capabilities is presented in Table 14-3.
- An assessment of fiscal capabilities is presented in Table 14-4.
- An assessment of administrative and technical capabilities is presented in Table 14-5.
- An assessment of education and outreach capabilities is presented in Table 14-6.
- Classifications under various community mitigation programs are presented in Table 14-7.
- The community's adaptive capacity for the impacts of climate change is presented in Table 14-8.

Table 14-3. Planning and Regulatory Capability

Plan, Study or Program	Date of Most Recent Update	Comment
Emergency Action Plan	2021	Prepared by USBR for Casitas Dam
Standard Specifications and Details	2021	Prepared by District
Emergency Response Plan	2021	Prepared by District
Standard Operating Procedures	2007	Prepared by USBR for Casitas Dam
10 Year Capital Improvement Program	2021	Updated annually by District

Table 14-4. Fiscal Capability

Financial Resource	Accessible or Eligible to Use?
Community Development Block Grants	No
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for Specific Purposes	Yes
User Fees for Water, Sewer, Gas or Electric Service *If yes, specify:* Water	Yes
Incur Debt through General Obligation Bonds	Yes
Incur Debt through Special Tax Bonds	Yes
Incur Debt through Private Activity Bonds	No
Withhold Public Expenditures in Hazard-Prone Areas	No
State-Sponsored Grant Programs	Yes
Development Impact Fees for Homebuyers or Developers	No

Table 14-5. Administrative and Technical Capability

Staff/Personnel Resource	Available?
Planners or engineers with knowledge of land development and land management practices *If Yes, Department /Position:* Engineering/Manager	Yes
Engineers or professionals trained in building or infrastructure construction practices *If Yes, Department /Position:* Engineering/Manager	Yes
Planners or engineers with an understanding of natural hazards *If Yes, Department /Position:* Engineering/Manager	Yes
Staff with training in benefit/cost analysis	Yes

Staff/Personnel Resource	Available?
If Yes, Department /Position: Administration/Chief Financial Officer	
Surveyors	Yes
If Yes, Department /Position: Through Contract	
Personnel skilled or trained in GIS applications	Yes
If Yes, Department /Position: Engineering/GIS Technician	
Scientist familiar with natural hazards in local area	Yes
If Yes, Department /Position: Engineering/Manager	
Emergency manager	Yes
If Yes, Department /Position: Management/General Manager	
Grant writers	Yes
If Yes, Department /Position: Through Contract	
Other	Yes (Operations and Maintenance/Manager)

Table 14-6. Education and Outreach Capability

Criterion	Response
Do you have a public information officer or communications office?	Yes
Do you have personnel skilled or trained in website development?	Yes
Do you have hazard mitigation information available on your website?	No
Do you use social media for hazard mitigation education and outreach?	No
Do you have any citizen boards or commissions that address issues related to hazard mitigation?	No
Do you have any other programs in place that could be used to communicate hazard-related information?	Yes
If yes, briefly describe: Casitas uses our website to post emergency information related to interruptions in service caused by disasters.	
Do you have any established warning systems for hazard events?	No

Table 14-7. Community Classifications

	Participating?	Classification	Date Classified
FIPS Code	No	N/A	N/A
DUNS#	Yes	072927973	N/A
Community Rating System	No	N/A	N/A
Building Code Effectiveness Grading Schedule	No	N/A	N/A
Public Protection	No	N/A	N/A
Storm Ready	No	N/A	N/A
Firewise	No	N/A	N/A
Tsunami Ready	No	N/A	N/A

Table 14-8. Adaptive Capacity for Climate Change

Criterion	Jurisdiction Rating[a]
Technical Capacity	
Jurisdiction-level understanding of potential climate change impacts	High
Comment: Casitas understands climate change impacts on local, regional, and Statewide water supplies	
Jurisdiction-level monitoring of climate change impacts	High
Comment: Casitas monitors local surface water flows, evaporation rates, and water demands regularly	
Technical resources to assess proposed strategies for feasibility and externalities	Medium
Comment: Casitas engages consultants for assistance with water supply alternatives as needed	
Jurisdiction-level capacity for development of greenhouse gas emissions inventory	High
Comment: Casitas staff has this capacity	
Capital planning and land use decisions informed by potential climate impacts	Medium
Comment: Casitas manages its own capital planning; Casitas does not have jurisdiction over land use	
Participation in regional groups addressing climate risks	Medium
Comment: Casitas participates in Upper Ventura River Groundwater Agency, Ojai GMA, and Watersheds Coalition of Ventura County	
Implementation Capacity	
Clear authority/mandate to consider climate change impacts during public decision-making processes	High
Comment: The Board of Directors considers climate change impacts during environmental review of projects under their jurisdiction.	
Identified strategies for greenhouse gas mitigation efforts	Low
Comment: GGs have not been a priority for Casitas	
Identified strategies for adaptation to impacts	Medium
Comment: Casitas uses its Water Efficiency Allocation Program to implement water conservation requirements based on lake level	
Champions for climate action in local government departments	Medium
Comment: The Board participates in regional organizations advocating groundwater management, drought mitigation, and water resources.	
Political support for implementing climate change adaptation strategies	Medium
Comment: Casitas' Board considers climate change in planning efforts.	
Financial resources devoted to climate change adaptation	Low
Comment: Casitas' funds for capital projects are limited	
Local authority over sectors likely to be negative impacted	High
Comment: Casitas is a wholesale and retail agency. The Water Efficiency Allocation Program allows Casitas to impose conservation and penalties.	
Public Capacity	
Local residents' knowledge of and understanding of climate risk	Medium
Comment: Residents seem to be informed of climate change and impacts to water supply	
Local residents' support of adaptation efforts	High
Comment: Residents are very vocal about the need for additional water supplies	
Local residents' capacity to adapt to climate impacts	High
Comment: The majority of customers have surpassed conservation goals	
Local economy current capacity to adapt to climate impacts	Medium
Comment: Agricultural customers may have difficulty adapting to climate change impacts to water supply	
Local ecosystems capacity to adapt to climate impacts	Unsure
Comment:	

a. High = Capacity exists and is in use; Medium = Capacity may exist, but is not used or could use some improvement; Low = Capacity does not exist or could use substantial improvement; Unsure= Not enough information is known to assign a rating.

14.5 INTEGRATION REVIEW

For hazard mitigation planning, “integration” means that hazard mitigation information is used in other relevant planning mechanisms, such as capital facilities planning, and that relevant information from those sources is used in hazard mitigation. This section identifies where such integration is already in place, and where there are opportunities for further integration in the future. Resources listed at the end of this annex were used to provide information on integration. The progress reporting process described in Volume 1 of the hazard mitigation plan will document the progress of hazard mitigation actions related to integration and identify new opportunities for integration.

14.5.1 Existing Integration

Some level of integration has already been established between local hazard mitigation planning and the following other local plans and programs:

- **10-year Capital Improvement Plan (CIP)**—Mitigation projects are identified and included in the 10-year CIP. Funding may not be available each year to implement mitigation.
- **Emergency Response Plan (ERP)**—Casitas’ ERP identifies all vulnerable facilities and includes response actions to hazards such as earthquake, wildfire, etc.
- **Emergency Action Plan (EAP)**—The EAP prepared by the US Bureau of Reclamation is updated annually and exercises are held on a regular basis with local emergency response agencies.
- **Urban Water Management Plan (UWMP)**—The UWMP describes the District’s water supplies and demands, and identifies water supply projects to mitigate drought
- **Water Efficiency Allocation Program**—The Water Efficiency Allocation Program includes implementation of water conservation goals depending on the level of Lake Casitas to assist with drought mitigation.

14.5.2 Opportunities for Future Integration

The capability assessment in this annex indicates opportunities to integrate this mitigation plan with other jurisdictional planning/regulatory capabilities. Capabilities were identified as integration opportunities if they can support or enhance the actions identified in this plan or be supported or enhanced by components of this plan. The capability assessment identified the following plans and programs that do not currently integrate hazard mitigation information but provide opportunities to do so in the future:

- **Capital Improvement Projects**—Capital improvement project proposals may take into consideration hazard mitigation potential as a means of evaluating project prioritization.
- **Post-Disaster Recovery Plan**—The District does not have a recovery plan and intends to develop one as a mitigation planning action during the next five years. The plan will build on the mitigation goals and objectives identified in the mitigation plan.

Taking action to integrate each of these programs with the hazard mitigation plan was considered as a mitigation action to include in the action plan in this annex.

14.6 RISK ASSESSMENT

14.6.1 Jurisdiction-Specific Natural Hazard Event History

Table 14-9 lists past occurrences of natural hazards for which specific damage was recorded in this jurisdiction Other hazard events that broadly affected the entire planning area, including this jurisdiction, are listed in the risk assessments in Volume 1 of this hazard mitigation plan.

Table 14-9. Past Natural Hazard Events

Type of Event	FEMA Disaster #	Date	Damage Assessment
California COVID-19	4482	2020	Ongoing
Thomas Fire	FM-5224	2017	$692,821
Severe Storms, Flooding, Debris Flows, and Mudslides	DR-1577	2005	$454,822
Severe Winter Storms and Flooding	DR-1203	1998	$200,493
Severe Winter Storms, Flooding, Landslides, Mud Flows	DR-1044	1995	$298,414
Grass, Wildlands, Forest Fires	DR-739	1985	$43,230
Coastal Storms, Floods, Slides, Tornadoes	DR-677	1983	$211,950
Severe Storms, Mudslides, Flooding	DR-615	1980	$186,619
Coastal Storms, Mudslides, Flooding	DR-547	1978	$1,078,867
Severe Storms, High Tides, Flooding	DR-364	1973	$97,341
Severe Storms, Flooding	DR-253	1969	$245,005

14.6.2 Hazard Risk Ranking

Table 14-10 presents a local ranking of all hazards of concern for which this hazard mitigation plan provides complete risk assessments. As described in detail in Volume 1, the ranking process involves an assessment of the likelihood of occurrence for each hazard, along with its potential impacts on people, property, and district operations. Mitigation actions primarily target hazards with high and medium rankings.

Table 14-10. Hazard Risk Ranking

Rank	Hazard	Risk Ranking Score	Risk Category
1	Landslide	39	High
2	Severe Storms	35	High
3	Earthquake	32	High
4	Drought	30	High
4	Severe Weather	30	High
6	Wildfire	24	Medium
7	Flooding	18	Medium
8	Dam Failure	12	Low
9	Sea Level Rise	8	Low
10	Tsunami	7	Low

To develop the Risk Ranking Score for Casitas, first the scores for each category for City of Ojai, City of Ventura, and Unincorporated Ventura County were averaged. Next, for categories for which Casitas has specific experience and damages, the scores were adjusted to be more representative for Casitas'

service area and facilities. This specifically applies to the scores for Dam Failure, Drought, Severe Storms, and Severe Weather for the following reasons:

- Dam Failure—The average score was 16 and was adjusted to 12. Casitas Dam is owned by the US Bureau of Reclamation. The original dam was constructed in 1959 and a seismic stability berm was constructed in 1998. The dam is monitored regularly and has an extremely low chance of failure.
- Drought—The average score was 9 and was adjusted to 30. Casitas is particularly vulnerable to drought as all water sources are local and dependent on weather. As of October 25, 2021, Lake Casitas is at 33% capacity. If no inflows are received, this represents approximately five years of supply for customer demands. Casitas is currently in Stage 3 of its Water Efficiency Allocation Program and will reevaluate this stage after the 2021/22 winter season. In the event lake capacity is reduced to 30% or less, Casitas would implement Stage 4 of the Water Efficiency Allocation Program.
- Severe Storms—The average score was 24 and was adjusted to 35. Due to the topography and geographic location of District facilities, specifically pipelines in canyons and the Robles Diversion Facility adjacent to the Ventura River, damage from severe storms has been significant.
- Severe Weather—The average score was 24 and was adjusted to 30. Severe rain causes erosion and landslides where District pipelines are located. Severe hot weather increases evaporation at Lake Casitas as well as customer water demands.

14.6.3 Jurisdiction-Specific Vulnerabilities

Volume 1 of this hazard mitigation plan provides complete risk assessments for each identified hazard of concern. The following jurisdiction-specific issues have been identified based on a review of the results of the risk assessment, public involvement strategy, and other available resources:

- Over the past 60 years, the Rincon 2(M) Main, an 18-inch pipeline through mountainous terrain serving the coastal communities, has been washed out by severe storms/landslides, requiring multiple replacement and relocation projects.
- The District's Marion Walker Pressure Filtration Plant, Administration Building/Operations Center and 19 water storage tanks are in need of seismic assessment and potential retrofits.
- Lake Casitas relies on local water sources and is at 33% capacity as of October 2021. The ongoing drought has strained both surface water diversions and groundwater supplies.
- The Robles Diversion Facility has required several rehabilitation projects due to severe flooding along the Ventura River in 1969, 1973, 1978, 1980, 1995, and 1998 and was damaged in the Thomas Fire.
- The Thomas Fire impacted multiple District facilities resulting in a nearly $700,000 FEMA claim. Rented mobile generators were used to power pump plants when electrical lines burned.
- The Marion Walker Pressure Filtration Plant, located at the base of Casitas Dam, is at risk of flooding from Coyote Creek, which would impact potable water treatment to all 65,000 District customers.

Mitigation actions addressing these issues were prioritized for consideration in the action plan in this annex.

14.7 STATUS OF PREVIOUS PLAN ACTIONS

Table 14-11 summarizes the actions that were recommended in the previous version of the hazard mitigation plan and their implementation status at the time this update was prepared.

Table 14-11. Status of Previous Plan Actions

Action Item from Previous Plan	Completed	Removed; No Longer Feasible	Carried Over to Plan Update	
			Check if Yes	Action # in Update
CMWD-3—Replace and relocate pipes in vulnerable areas.			✓	CAS-1
Comment: *Rincon Main at Ayers Creek relocated in 2020. Additional vulnerable pipelines remain.*				
CMWD-4—Seismic retrofit of Ojai East and Rincon Control Reservoirs.			✓	CAS-4
Comment: *Incomplete pending completion of Casitas Master Plan.*				

14.8 HAZARD MITIGATION ACTION PLAN

Table 14-12 lists the actions that make up the hazard mitigation action plan for this jurisdiction. Table 14-13 identifies the priority for each action. Table 14-14 summarizes the mitigation actions by hazard of concern and mitigation type.

Table 14-12. Hazard Mitigation Action Plan Matrix

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action CAS-1—Replace and relocate pipes in vulnerable areas. (previously CMWD-3)						
Hazards Mitigated: Landslide, Severe Storms, Severe Weather						
Existing	9, 10, 11	Casitas Municipal Water District	NA	High	Grant Funding- FEMA HMA (BRIC, FMA, HMGP), General Funds	Short-term
Action CAS-2—Actively participate in the plan maintenance protocols outlined in Volume 1 of this hazard mitigation plan.						
Hazards Mitigated: Landslide, Severe Storms, Earthquake, Drought, Severe Weather, Wildfire, Flooding, Dam Failure, Sea Level Rise, Tsunami						
New & Existing	2, 7, 8, 11, 18, 19	County of Ventura	Casitas Municipal Water District	Low	Staff Time, General Funds	Short-term
Action CAS-3—Purchase generators for critical facilities and infrastructure that lack adequate backup power, including Administration Building/Operations Center and pump plants						
Hazards Mitigated: Earthquake, Severe Weather, Wildfire						
Existing	2, 6	Casitas Municipal Water District	NA	Medium	Grant Funding- FEMA HMA (BRIC, FMA, HMGP), General Funds	Short-term
Action CAS-4—Seismic evaluation and potential retrofit of Marion Walker Pressure Filtration Plant, Administration Building/Operations Center, District reservoirs (previously CMWD-4 Seismic Retrofit of Ojai East and Rincon Control Reservoirs)						
Hazards Mitigated: Earthquake						
Existing	2, 6, 9, 18	Casitas Municipal Water District	NA	High	Grant Funding- FEMA HMA (BRIC, FMA, HMGP), General Funds	Short-term

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action CAS-5—Ventura-Santa Barbara Counties Intertie which will allow Casitas access to 2,000 acre-feet per year of its State Water Project allocation (through facilities owned and operated by Carpinteria Valley Water District) and provides a means to supply water across County lines in the event of an emergency in the event of a supply interruption that did not significantly affect the other agency.						
Hazards Mitigated: Drought, Wildfire, Landslide						
New	2, 6, 8, 18	Casitas Municipal Water District	NA	High	Grant Funding (USBR, DWR), General Funds	Short-term
Action CAS-6—Marion Walker Pressure Filtration Plant Flood Protection						
Hazards Mitigated: Flood, Severe Storms						
Existing	2, 6, 9, 18	Casitas Municipal Water District	NA	High	Grant Funding- FEMA HMA (BRIC, FMA, HMGP), General Funds	Short-term
Action CAS-7—Lake Casitas Recreation Area Vegetation Management						
Hazards Mitigated: Wildfire						
Existing	5, 13, 14, 18	Casitas Municipal Water District	US Bureau of Reclamation	Medium	Grant Funding- FEMA HMA (BRIC, FMAP and HMGP), General Funds	Short-term
Action CAS-8—Add a mitigation page to the Casitas website that references the Ventura County Local Hazard Mitigation Plan and provide applicable updates on action status						
Hazards Mitigated: Landslide, Severe Storms, Earthquake, Drought, Severe Weather, Wildfire, Flooding, Dam Failure, Sea Level Rise, Tsunami						
Existing	17, 19	Casitas Municipal Water District	NA	Low	General Funds	Short-term

a. Short-term = Completion within 5 years; Long-term = Completion within 10 years; Ongoing= Continuing new or existing program with no completion date

Acronyms used here are defined at the beginning of this volume.

Table 14-13. Mitigation Action Priority

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Cost?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Implementation Priority[a]	Grant Pursuit Priority[a]
CAS-1	3	Medium	High	No	Yes	No	Low	Medium
CAS-2	6	Medium	Low	Yes	No	Yes	High	Low
CAS-3	2	Medium	Medium	Yes	Yes	No	Medium	Medium
CAS-4	4	Medium	High	No	Yes	No	Low	Medium
CAS-5	4	Medium	High	No	Yes	Yes	Low	Medium
CAS-6	4	Medium	High	No	Yes	No	Low	Medium
CAS-7	4	Medium	Medium	Yes	Yes	No	Medium	Medium
CAS-8	2	Medium	Low	Yes	No	Yes	Low	Low

a. See the introduction to this volume for explanation of priorities.

Table 14-14. Analysis of Mitigation Actions

Hazard Type	Action Addressing Hazard, by Mitigation Type[a]							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilient	Community Capacity Building
High-Risk Hazards								
Landslide	CAS-1	CAS-1	CAS-8				CAS-1, 5	CAS-2, 5
Severe Storms	CAS-1	CAS-1	CAS-8			CAS-6	CAS-1, 6	CAS-2, 6
Earthquake		CAS-3, CAS-4	CAS-8		CAS-3	CAS-3, CAS-4		CAS-2
Drought			CAS-8				CAS-5	CAS-2, 5
Severe Weather	CAS-1	CAS-1	CAS-8		CAS-3		CAS-1	CAS-2
Medium-Risk Hazards								
Wildfire	CAS-7	CAS-7	CAS-8	CAS-7	CAS-3		CAS-5, 7	CAS-2, 5
Flooding		CAS-6	CAS-8			CAS-6	CAS-6	CAS-2
Low-Risk Hazards								
Dam Failure			CAS-8					CAS-2
Sea Level Rise			CAS-8					CAS-2
Tsunami			CAS-8					CAS-2

a. See the introduction to this volume for explanation of mitigation types.

14.9 INFORMATION SOURCES USED FOR THIS ANNEX

The following technical reports, plans, and regulatory mechanisms were reviewed to provide information for this annex.

- **2020 Urban Water Management Plan**—This plan was used to inform the capability assessment.
- **CMWD Emergency Response Plan**—This plan was used to inform the capability assessment.
- **USBR Emergency Action Plan**—This plan was used to inform the capability assessment.
- **CMWD 10-Year Capital Improvement Plan**—This plan was used to inform the capability assessment and develop the action plan.
- **CMWD Standard Specifications and Details**—This plan was used to inform the capability assessment.
- **Casitas Dam Standard Operating Procedures**—This plan was used to inform the capability assessment.
- **Water Efficiency and Allocation Program**—This plan was used to inform the capability assessment.

The following outside resources and references were reviewed:

- **Hazard Mitigation Plan Annex Development Toolkit**—The toolkit was used to support the identification of past hazard events and noted vulnerabilities, the risk ranking, and the development of the mitigation action plan.

14.10 FUTURE NEEDS TO BETTER UNDERSTAND RISK/VULNERABILITY

- Seismic Analysis of Administration Building/Operations Center, Marion Walker Pressure Filtration Plant, and District reservoirs
- Technical and permitting assistance to scope flood protection improvements at Marion Walker Pressure Filtration Plant

15. CHANNEL ISLANDS BEACH COMMUNITY SERVICES DISTRICT

15.1 LOCAL HAZARD MITIGATION PLANNING TEAM

Primary Point of Contact
Peter Martinez, General Manager
353 Santa Monica Dr
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Alternate Point of Contact
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(805) 985-6021
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This annex was developed by the local hazard mitigation planning team, whose members are listed in Table 15-1.

Table 15-1. Local Hazard Mitigation Planning Team Members

Name	Title
Peter Martinez	General Manager
Jesus Navarro	Operations Manager
CJ Dillon	Office Manager
Erika Davis	Clerk of the Board

15.2 JURISDICTION PROFILE

15.2.1 Overview

Channel Islands Beach Community Services District (CIBCSD) was created on December 13, 1982, as a result of the demand of the citizens of the beach community for an independent governmental entity to provide solutions to their need for various services, including but not limited to water, sewer, and trash services. A five member elected board governs the District. The District currently employs a staff of 8. Funding comes primarily through water, sewer, and trash rates.

The Channel Islands Beach Community Services District Board of Directors assumes responsibility for the adoption of this plan; the General Manager for CIBCSD will oversee its implementation.

15.2.2 Service Area

The Channel Islands Beach Community Services District serves the unincorporated areas of Ventura County southwest of Port Hueneme and the beach communities south of Oxnard, including the Silverstrand, Hollywood Beach, Hollywood by the Sea, and Channel Islands Harbor. The total current service area is approximately 1 square mile and serves about 10,000 customers via approximately 2,240 service connections.

15.2.3 Assets

Table 15-2 summarizes the assets of the District and their value.

Table 15-2. Special-Purpose District Assets

Asset	Value
Property	
43 acres of land, District owns 9 lots at estimated $400,000 each	$3,600,000 (estimated)
Equipment	
Backhoe	$40,000
Wach's Valve Turning Trailer	$50,000
Ford 350 Crane Truck	$25,000
4 light work trucks 2008-2015 in age	$32,000
Large Generator	$18,000
Total:	***$165,000***
Critical Facilities	
Well House & Pumping Station 4200 W. Baracuda Way	$165,000
Sewer Lift Station 529 Ocean Drive & Corner Panama/Highland	$116,000
Sewer Lift Station 1729 Ocean Drive & 3384 Ocean Drive	$116,000
Pump Station A-Corner Highland/Roosevelt	$121,489.00
Pump Station B- 3765 Ocean Drive	$121,489.00
Pump Station H- Channel Islands Blvd. and Peninsula Rd	$79,857.00
Total:	***$719,835.00***

15.3 CURRENT TRENDS

The population within the Channel Islands Beach Community Services District boundaries is not expected to significantly increase over the next five years and the District has no plans to expand its service area.

The District is legally authorized, but not obligated to provide street maintenance and improvement, street lighting, undergrounding of overhead utilities, fire protection, and police protection. The District does not provide these additional services at this time as the District does not have sufficient revenues for any of these services. The ability of the District to provide these services in the future will depend on upon available revenues and decisions by the Board of Directors and the District electors. These additional services are currently provided by the County of Ventura in the unincorporated areas of the District and by the City of Oxnard within its boundaries.

15.4 CAPABILITY ASSESSMENT

This section describes an assessment of existing capabilities for implementing hazard mitigation strategies. The introduction at the beginning of this volume of the hazard mitigation plan describes the components included in the capability assessment and their significance for hazard mitigation planning.

Findings of the capability assessment were reviewed to identify opportunities to expand, initiate or integrate capabilities to further hazard mitigation goals and objectives. Where such opportunities were identified and determined to be feasible, they are included in the action plan. The "Analysis of Mitigation Actions" table in this annex identifies these as community capacity building mitigation actions. The findings of the assessment are presented as follows:

An assessment of planning and regulatory capabilities is presented in Table 15-3.

An assessment of fiscal capabilities is presented in Table 15-4.

An assessment of administrative and technical capabilities is presented in Table 15-5.

An assessment of education and outreach capabilities is presented in Table 15-6.

Classifications under various community mitigation programs are presented in Table 15-7.

The community's adaptive capacity for the impacts of climate change is presented in Table 15-8.

Table 15-3. Planning and Regulatory Capability

Plan, Study or Program	Date of Most Recent Update	Comment
Capital Improvement Plan	FY 2021-2022	Through FYE 2026
Emergency Response Plan	December 2021	
Urban Water Management Plan	Adopted June 2021	In coordination with Port Hueneme Water Agency
Sewer System Management Plan	2019	

Table 15-4. Fiscal Capability

Financial Resource	Accessible or Eligible to Use?
Community Development Block Grants	No
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for Specific Purposes	No
User Fees for Water, Sewer, Gas or Electric Service	Yes
If yes, specify: Water, Sewer, Refuse Collection	
Incur Debt through Wasterwater Bonds	Yes
Incur Debt through Special Tax Bonds	No
Incur Debt through Private Activity Bonds	No
Withhold Public Expenditures in Hazard-Prone Areas	No
State-Sponsored Grant Programs	Yes
Development Impact Fees for Homebuyers or Developers	Cap fees for water and sewer

Table 15-5. Administrative and Technical Capability

Staff/Personnel Resource	Available?
Planners or engineers with knowledge of land development and land management practices ***If Yes, Department /Position:*** Contracted	Yes
Engineers or professionals trained in building or infrastructure construction practices ***If Yes, Department /Position:*** Contracted	Yes
Planners or engineers with an understanding of natural hazards ***If Yes, Department /Position:*** Contracted	Yes
Staff with training in benefit/cost analysis ***If Yes, Department /Position:*** Contracted	Yes
Surveyors ***If Yes, Department /Position:*** Contracted	Yes
Personnel skilled or trained in GIS applications ***If Yes, Department /Position:*** Contracted	Yes
Scientist familiar with natural hazards in local area	No
Emergency manager ***If Yes, Department /Position:*** General Manager	Yes
Grant writers ***If Yes, Department /Position:*** Contracted	Yes

Table 15-6. Education and Outreach Capability

Criterion	Response
Do you have a public information officer or communications office?	Yes
Do you have personnel skilled or trained in website development?	Yes
Do you have hazard mitigation information available on your website? ***If yes, briefly describe:*** Drought information, Tsunami information, VC Resilient Coastal Adaptation Project	Yes
Do you use social media for hazard mitigation education and outreach? ***If yes, briefly describe:*** NextDoor	Yes
Do you have any citizen boards or commissions that address issues related to hazard mitigation? ***If yes, briefly describe:*** The Channel Islands Beach Emergency Response Team operates under the Channel Islands Beach Community Services District (CIBCSD). The team is made up of concerned residents who have completed the basic CERT training.	Yes
Do you have any other programs in place that could be used to communicate hazard-related information? ***If yes, briefly describe:*** Mobile electronic message board, bulletin boards	Yes
Do you have any established warning systems for hazard events? ***If yes, briefly describe:*** NextDoor, Website, Reverse 911	Yes

Table 15-7. Community Classifications

	Participating?	Classification	Date Classified
FIPS Code	N/A	N/A	N/A
DUNS#	Yes	085392637	N/A
Community Rating System	N/A	N/A	N/A
Building Code Effectiveness Grading Schedule	N/A	N/A	N/A
Public Protection	N/A	N/A	N/A
Storm Ready	N/A	N/A	N/A
Firewise	N/A	N/A	N/A
Tsunami Ready	N/A	N/A	N/A

Table 15-8. Adaptive Capacity for Climate Change

Criterion	Jurisdiction Rating[a]
Technical Capacity	
Jurisdiction-level understanding of potential climate change impacts ***Comment:***	Low
Jurisdiction-level monitoring of climate change impacts ***Comment:***	Low
Technical resources to assess proposed strategies for feasibility and externalities ***Comment:***	Low
Jurisdiction-level capacity for development of greenhouse gas emissions inventory ***Comment:***	Low
Capital planning and land use decisions informed by potential climate impacts ***Comment:***	Low
Participation in regional groups addressing climate risks ***Comment:***	Low
Implementation Capacity	
Clear authority/mandate to consider climate change impacts during public decision-making processes ***Comment:***	Low
Identified strategies for greenhouse gas mitigation efforts ***Comment:***	Low
Identified strategies for adaptation to impacts ***Comment:*** *CIP addresses strategies*	Medium
Champions for climate action in local government departments ***Comment:*** *Regularly discussed in board meetings*	Medium
Political support for implementing climate change adaptation strategies ***Comment:***	Unsure
Financial resources devoted to climate change adaptation ***Comment:*** *Designated rate fees for construction projects*	Medium
Local authority over sectors likely to be negative impacted ***Comment:***	Low
Public Capacity	
Local residents' knowledge of and understanding of climate risk ***Comment:*** *Often shared in board meetings*	High
Local residents' support of adaptation efforts ***Comment:*** *Support voluntary water use reduction*	High
Local residents' capacity to adapt to climate impacts ***Comment:***	Low
Local economy current capacity to adapt to climate impacts ***Comment:***	Low
Local ecosystems capacity to adapt to climate impacts ***Comment:***	Low

a. High = Capacity exists and is in use; Medium = Capacity may exist, but is not used or could use some improvement; Low = Capacity does not exist or could use substantial improvement; Unsure= Not enough information is known to assign a rating.

15.5 INTEGRATION REVIEW

For hazard mitigation planning, “integration” means that hazard mitigation information is used in other relevant planning mechanisms, such as capital facilities planning, and that relevant information from those sources is used in hazard mitigation. This section identifies where such integration is already in place, and where there are opportunities for further integration in the future. Resources listed at the end of this annex were used to provide information on integration. The progress reporting process described in Volume 1 of the hazard mitigation plan will document the progress of hazard mitigation actions related to integration and identify new opportunities for integration.

15.5.1 Existing Integration

Some level of integration has already been established between local hazard mitigation planning and the following other local plans and programs:

Capital Improvement Plan—The capital improvement plan includes projects that can help mitigate potential hazards. The District will act to ensure consistency between the hazard mitigation plan and the current and future capital improvement plans. The hazard mitigation plan may identify new possible funding sources for capital improvement projects and may result in modifications to proposed projects based on results of the risk assessment.

Urban Water Management Plan—The Urban Water Management Plan addresses risks also addressed in this hazard mitigation plan including water reliability in drought years and following regional power outages and earthquakes.

15.5.2 Opportunities for Future Integration

The capability assessment in this annex indicates opportunities to integrate this mitigation plan with other jurisdictional planning/regulatory capabilities. Capabilities were identified as integration opportunities if they can support or enhance the actions identified in this plan or be supported or enhanced by components of this plan. The capability assessment identified the following plans and programs that do not currently integrate hazard mitigation information but provide opportunities to do so in the future:

- **Capital Improvement Projects**—Capital improvement project proposals may take into consideration hazard mitigation potential as a means of evaluating project prioritization.
- **Emergency Response Plan**—The results of the risk assessment may be used in the next update of the emergency response plan.
- **Sewer System Management Plan**—The results of the risk assessment may be used in the next update of the sewer system management plan as it relates to infrastructure upgrades to protect against seismic activity and coastal hazards.

Taking action to integrate each of these programs with the hazard mitigation plan was considered as a mitigation action to include in the action plan in this annex.

15.6 RISK ASSESSMENT

15.6.1 Jurisdiction-Specific Natural Hazard Event History

Table 15-9 lists past occurrences of natural hazards for which specific damage was recorded in this jurisdiction Other hazard events that broadly affected the entire planning area, including this jurisdiction, are listed in the risk assessments in Volume 1 of this hazard mitigation plan.

Table 15-9. Past Natural Hazard Events

Type of Event	FEMA Disaster #	Date	Damage Assessment
Rain and High Wind Event		January 19, 2021	Trees down, road closures, power outages, damage to structures
COVID-19	DR-4482	January 20, 2020 Continuing	Ongoing
Atmospheric River Storm System	CA Disaster 109	January/February 2019	Local stream and street flooding, trees down, power outages
Wildfires, Flooding, Mudflows, and Debris Flows	DR-4353	December 4, 2017-January 31, 2018	Post Thomas Fire debris flows in local rivers, large deposits of debris on local beaches, road closures
Thomas Fire	DR-4224	December 4, 2017	Public Health issues due to smoke, power outages, sewage spill due to power outage
February Winter Storm	CA Disaster 77.1	February 2017	Local stream and street flooding, trees down, power outages, debris deposits in local stream and on beaches
January Winter Storm	CA Disaster 77	January 2017	Local stream and street flooding, trees down, power outages, debris deposits in local stream and on beaches
Extreme Wind Storm		February 2016	Trees down, power outages, street closures, damage to structures, debris
Erratic Weather (frost, heat, drought)		Winter 2013	Economic loss
Tsunami (7.1 earthquake in Japan)		March 11, 2011	Damage to local harbors, marinas and docks
Tsunami (8.8 earthquake in Chile)		February 27, 2010	Damage to local harbors, marinas and docks
Storm and Flood		January 18 – 22, 2010.	Local stream and street flooding, trees down, power outages
Wildfires, Flooding, Mudflows, and Debris Flows	DR-1731	October 21 – March 31, 2008	Post burn, flooding, debris and mud flows.
Severe Storm	DR-1267	January 7 – 11, 2005	Flooding and debris flows
"El Nino" Storm and Flood		February 1998	Street and stream flooding, debris flows
Storms and Floods		January and March, 1995	Unknown
Northridge Earthquake	DR-1008	January 17 – November 30, 1994	Power and communications disruptions, damage to structures
Storm and Flood		February 10-15, 1992	Street and stream flooding, debris flows
Earthquake (Whittier Narrows Earthquake)		October 1, 1987	Unknown
Storm and Flood		February 25-March 3, 1983	Street and stream flooding, debris flows
Storm and Flood		February 13-22, 1980	Street and stream flooding, debris flows
Tsunami (9.5 earthquake in Chile)		May 24, 1960	Damage to docks and ships in Port Hueneme
St Francis Dam Disaster		March 12, 1928	$7 Million (1928)—Inundation of nearly the entire area, flooding, debris flows, destruction of infrastructure, high loss of life

15.6.2 Hazard Risk Ranking

Table 15-10 presents a local ranking of all hazards of concern for which this hazard mitigation plan provides complete risk assessments. As described in detail in Volume 1, the ranking process involves an assessment of the likelihood of occurrence for each hazard, along with its potential impacts on people, property, and district operations. Mitigation actions primarily target hazards with high and medium rankings.

Table 15-10. Hazard Risk Ranking

Rank	Hazard	Risk Ranking Score	Risk Category
1	Dam Failure	36	High
2	Earthquake	32	High
3	Drought	9	High
4	Severe Storm	24	Medium
5	Severe Weather	24	Medium
6	Flooding	18	Medium
7	Landslide	18	Medium
8	Sea Level Rise	18	Medium
9	Tsunami	12	Low
10	Wildfire	0	Low

15.6.3 Jurisdiction-Specific Vulnerabilities

Volume 1 of this hazard mitigation plan provides complete risk assessments for each identified hazard of concern. The following jurisdiction-specific issues have been identified based on a review of the results of the risk assessment, public involvement strategy, and other available resources:

- Tsunami—The highest elevation in the service area is about 30 feet above sea level and the district operations facility is only about 20 feet above sea level.
- Erosion—Coastal erosion impacts the district service area especially during severe storm events. Impacts are expected to increase as the sea level rises and climate change produces stronger or more frequent coastal storms.
- Earthquake and Liquefaction Zone—Asbestos cement pipe infrastructure is known to have moderate to high vulnerability, especially in liquefaction areas. In order for the infrastructure to be more resilient to seismic activity in the liquefaction zone, it needs to be replaced with PVC C900 pipes, which have a lower vulnerability rating.
- Drought—80 percent of the water distributed by the district is pumped from wells. Only 20 percent is imported.

Mitigation actions addressing these issues were prioritized for consideration in the action plan in this annex.

15.7 STATUS OF PREVIOUS PLAN ACTIONS

Table 15-11 summarizes the actions that were recommended in the previous version of the hazard mitigation plan and their implementation status at the time this update was prepared.

Table 15-11. Status of Previous Plan Actions

Action Item from Previous Plan	Completed	Removed; No Longer Feasible	Carried Over to Plan Update: Check if Yes	Carried Over to Plan Update: Action # in Update
OA 9—Identify potentially vulnerable public and private utility systems including electric, gas, oil, water, sewer and communication. Upgrade vulnerable systems to ensure the operation and timely restoration of essential systems to reasonable levels of service.			✓	CIB-2 CIB-3
Comment: *Closed circuit TV assessments done in 2018, but need to continue every 5 years. The district does not have current authority over electric, gas, oil or communication utilities.*				
OA 18—Continue to participate in the NWS TsunamiReady Program through continued implementation of Guideline 4: Community Preparedness measures, including public outreach material and curriculum.			✓	CIB-8
Comment: *Public outreach component is part of the CERT outreach and is an ongoing action that needs to be carried forward.*				
CIBCSD 1—Replace and relocate pipes in vulnerable areas.			✓	CIB-2 CIB-3
Comment: *Sewer line replacement is an ongoing action and needs to be carried forward.*				

15.8 HAZARD MITIGATION ACTION PLAN

Table 15-12 lists the actions that make up the hazard mitigation action plan for this jurisdiction. Table 15-13 identifies the priority for each action. Table 15-14 summarizes the mitigation actions by hazard of concern and mitigation type.

Table 15-12. Hazard Mitigation Action Plan Matrix

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action CIB-1—Where appropriate, support retrofitting, purchase or relocation of structures located in hazard areas, prioritizing those that have experienced repetitive losses and/or are located in high- or medium-risk hazard areas.						
Hazards Mitigated: Dam Failure, Earthquake, Severe Storm, Severe Weather, Flooding, Landslide, Sea Level Rise, Tsunami						
Existing	2, 6, 9, 11, 19	CIBCSD		High	General Funds, Grant Funding- FEMA HMA (BRIC, FMA, HMGP)	Short-term
Action CIB-2—Assess and address the vulnerability of critical sewer infrastructure through the capital improvement plan process, including, but not limited to: • Inflow and Infiltration Reduction • Sewer Lift Station and Pump Station Rehabilitation • Sewer Improvement Projects • Pump Station B Replacement • Oxnard Wastewater Plant Improvements						
Hazards Mitigated: Dam Failure, Earthquake, Severe Storm, Severe Weather, Flooding, Landslide, Sea Level Rise, Tsunami						
Existing	2, 6, 9, 11, 19	CIBCSD		High	Staff Time, General Funds, Grant Funding- FEMA HMA (BRIC, FMA, HMGP)	Short-term and Ongoing

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action CIB-3—Assess and address the vulnerability of critical water infrastructure through the capital improvement plan process, including, but not limited to: • Easement Risk Mitigation Projects • Port Hueneme Water Agency Improvements • Water Distribution Improvements • Valve Replacement • Water Supply Upgrades • Fire Flow Improvements						
Hazards Mitigated:	Dam Failure, Earthquake, Drought, Severe Storm, Severe Weather, Flooding, Landslide, Sea Level Rise, Tsunami					
Existing	2, 6, 9, 11, 19	CIBCSD		High	Staff Time, General Funds, Grant Funding- FEMA HMA (BRIC, FMA, HMGP)	Short-term and Ongoing
Action CIB-4—Replace or renovate the Administration & Operations Facility to meet current seismic and Americans with Disabilities Act standards						
Hazards Mitigated:	Dam Failure, Earthquake, Severe Storm, Severe Weather, Flooding, Landslide, Sea Level Rise, Tsunami					
Existing	2, 6, 9, 11, 19	CIBCSD		High	General Funds, Grant Funding- FEMA HMA (BRIC, FMA, HMGP)	Short-term
Action CIB-5—Actively participate in the plan maintenance protocols outlined in Volume 1 of this hazard mitigation plan.						
Hazards Mitigated:	Dam Failure, Earthquake, Drought, Severe Storm, Severe Weather, Flooding, Landslide, Sea Level Rise, Tsunami, Wildfire					
New & Existing	2, 8, 17, 19	CIBCSD		Low	Staff Time, General Funds	Short-term
Action CIB-6—Purchase generators for critical facilities and infrastructure that lack adequate backup power.						
Hazards Mitigated:	Dam Failure, Earthquake, Severe Storm, Severe Weather, Flooding, Landslide, Tsunami, Wildfire					
Existing	2, 6	CIBCSD		High	Staff Time, General Funds, Grant Funding- FEMA HMA (BRIC, HMGP)	Short-term
Action CIB-7—Study the feasibility of using green energy, such as solar power, for emergency backup power at pump stations and other critical locations. Determine if space requirements can be met with current or new green energy technology.						
Hazards Mitigated:	Dam Failure, Earthquake, Severe Storm, Severe Weather, Flooding, Landslide, Tsunami					
Existing	1, 15, 19	CIBCSD		Low	Staff Time, General Funds, Grant Funding- FEMA HMA (BRIC, FMA, HMGP)	Short-term
Action CIB-8—Continue to participate in the NWS TsunamiReady Program through continued implementation of Guideline 4: Community Preparedness measures, including public outreach material and curriculum.						
Hazards Mitigated:	Tsunami					
New & Existing	2, 7, 8, 17	CIBCSD		Low	Staff Time, General Funds	Ongoing

a. Short-term = Completion within 5 years; Long-term = Completion within 10 years; Ongoing= Continuing new or existing program with no completion date

Acronyms used here are defined at the beginning of this volume.

Table 15-13. Mitigation Action Priority

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Cost?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Implementation Priority[a]	Grant Pursuit Priority[a]
1	5	High	High	Yes	Yes	No	Medium	High
2	5	Medium	High	No	Yes	Yes	Low	Medium
3	5	Medium	High	No	Yes	Yes	Low	Medium
4	5	High	High	Yes	Yes	Yes	High	High
5	4	Medium	Low	Yes	No	Yes	High	Low
6	2	High	High	Yes	Yes	No	Medium	High
7	3	Low	Low	Yes	Yes	Yes	High	Medium
8	4	Medium	Low	Yes	No	Yes	High	Low

a. See the introduction to this volume for explanation of priorities.

Table 15-14. Analysis of Mitigation Actions

Hazard Type	Action Addressing Hazard, by Mitigation Type[a]							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilient	Community Capacity Building
High-Risk Hazards								
Dam Failure	CIB-2, 3	CIB-1, 2, 3, 4	CIB-5	CIB-7	CIB-6	CIB-2	CIB-7	CIB-5, 7
Earthquake	CIB-2, 3	CIB-1, 2, 3, 4	CIB-5	CIB-7	CIB-6	CIB-2	CIB-7	CIB-5, 7
Drought	CIB-3	CIB-3	CIB-5					CIB-5
Medium-Risk Hazards								
Severe Storm	CIB-2, 3	CIB-1, 2, 3, 4	CIB-5	CIB-7	CIB-6	CIB-2	CIB-7	CIB-5, 7
Severe Weather	CIB-2, 3	CIB-1, 2, 3, 4	CIB-5	CIB-7	CIB-6	CIB-2	CIB-7	CIB-5, 7
Flooding	CIB-2, 3	CIB-1, 2, 3, 4	CIB-5	CIB-7	CIB-6	CIB-2	CIB-7	CIB-5, 7
Landslide	CIB-2, 3	CIB-1, 2, 3, 4	CIB-5	CIB-7	CIB-6	CIB-2	CIB-7	CIB-5, 7
Sea Level Rise	CIB-2, 3	CIB-1, 2, 3, 4	CIB-5	CIB-7				CIB-5
Low-Risk Hazards								
Tsunami	CIB-2, 3	CIB-1, 2, 3, 4	CIB-5	CIB-7	CIB-6	CIB-2	CIB-7	CIB-5, 7, 8
Wildfire					CIB-6			CIB-5

a. See the introduction to this volume for explanation of mitigation types.

15.9 PUBLIC OUTREACH

Table 15-15 lists public outreach activities for this jurisdiction.

Table 15-15. Local Public Outreach

Local Outreach Activity	Date	Number of People Involved
Channel Islands Beach Emergency Response Team Meetings	Monthly, every third Tuesday	Average attendance 8
Website—tsunami evacuation and emergency preparedness outreach	Updated as needed	About 10,000 customers

15.10 INFORMATION SOURCES USED FOR THIS ANNEX

The following technical reports, plans, and regulatory mechanisms were reviewed to provide information for this annex.

- **Capital Improvement Plan—**The CIP was reviewed for the capabilities assessment, plan integration analysis, and in the development of mitigation actions.
- **Port Hueneme Water Agency 2020 Urban Water Management Plan—**The urban water management plan was used for the capabilities assessment, plan integration analysis, and in the development of mitigation actions.
- **Emergency Response Plan—**The Emergency Response Plan was reviewed for the capabilities assessment.
- **Sewer System Management Plan—**The Sewer System Management Plan was reviewed for the capabilities assessment.

The following outside resources and references were reviewed:

- **Hazard Mitigation Plan Annex Development Toolkit**—The toolkit was used to support the identification of past hazard events and noted vulnerabilities, the risk ranking, and the development of the mitigation action plan.
- **Environmental Protection Agency (EPA) Earthquake Resilience Guide for Water and Wastewater Utilities, March 2018**—Reviewed for the development of the mitigation action plan.

15.11 FUTURE NEEDS TO BETTER UNDERSTAND RISK/VULNERABILITY

Groundwater Sustainability Plan will require groundwater pumping cutbacks by 50% over the next 20 years.

16. CONEJO RECREATION & PARK DISTRICT

16.1 LOCAL HAZARD MITIGATION PLANNING TEAM

Primary Point of Contact
Bill Palermo, Park Operations Analyst
403 West Hillcrest Drive
Thousand Oaks, CA 91360
Telephone: 805-381-1201
e-mail Address: bpalermo@crpd.org

Alternate Point of Contact
Andrew Mooney, Senior Planner
403 West Hillcrest Drive
Thousand Oaks, CA 91360
Telephone: 805-495-6471
e-mail Address: amooney@crpd.org

This annex was developed by the local hazard mitigation planning team, whose members are listed in Table 16-1.

Table 16-1. Local Hazard Mitigation Planning Team Members

Name	Title
James Friedl	General Manager
Bill Palermo	Park Operations Analyst
Andrew Mooney	Senior Park Planner

16.2 JURISDICTION PROFILE

16.2.1 Overview

The Conejo Recreation and Park District (CRPD) is a special district created in 1963 to provide park and recreational services and facilities for the residents of the Conejo Valley. A five-member elected Board of Directors governs the District. The Board will assume responsibility for the adoption of this plan; the General Manager will oversee its implementation. The District currently employs a full-time staff of 94. Funding is obtained through property taxes, State revenue bonds, developer fees, and assessment districts.

The City of Thousand Oaks and CRPD formed the Conejo Open Space Conservation Agency (COSCA) by a Joint Powers Agreement in 1977. This agreement enables the combined agency to conserve natural open space lands and assures the coordination of local land use and resource management decisions that support the goals of the City of Thousand Oaks General Plan and the CRPD Master Plan. Additional agreements between the City of Thousand Oaks, COSCA, and CRPD provide for an extensive equestrian/hiking trail system and a citywide bicycle trail system. In cooperation with the National Park Service, the Mountains Recreation and Conservation Authority,

COSCA, CRPD, and CTO, over 15,000 acres of open space are available for public enjoyment. COSCA, CRPD, and the City of Thousand Oaks maintain approximately 13,215 acres of this amount and a 140-mile multi-use trail system.

16.2.2 Service Area and Trends

The District covers 62 square miles, and serves more than 136,000 residents of Thousand Oaks, Newbury Park, and the Ventura County portion of Westlake Village. Assets

Table 16-2 summarizes the assets of the District and their value.

Table 16-2. Special-Purpose District Assets

Asset	Value
Property	
3,254.1 acres of land	$ unknown
Equipment	
Vehicles, Blanket	$1,563,000
Equipment Blanket	$2,500,000
Total:	***$4,063,000***
Critical Facilities	
Borchard Community Center—190 Reino Road, Thousand Oaks, CA 91320	$2,619,000
Conejo Community Center—1175 Hendrix Avenue, Thousand Oaks, CA 91360	$3,571,486
Dos Vientos Community Center—4801 Borchard Road, Thousand Oaks, CA 91320	$4,935,548
Thousand Oaks Community Center—2525 N. Moorpark Rd, Thousand Oaks, CA 91360	$6,483,858
Old Meadows Center—1600 Marview Drive, Thousand Oaks, CA 91362	$1,349,914
Hillcrest Center—403 West Hillcrest Drive, Thousand Oaks, CA 91360	$1,088,921 (contents only)
Conejo Creek South Park	$1,402,928
Total: (value of all facilities on Property Schedule: $60,684,717)	***$21,451,655***

16.3 CURRENT TRENDS

Recent updates to the City's General Plan project a build-out population of over 145,000 by 2045. CRPD faces two distinct funding challenges. The first is the high cost of funding new facilities, and the second, the funding of ongoing maintenance and operation of new and existing facilities. Coordination with the City and updates to the District's Master Plan will enable the District to meet the projected service needs of the community.

16.4 CAPABILITY ASSESSMENT

This section describes an assessment of existing capabilities for implementing hazard mitigation strategies. The introduction at the beginning of this volume of the hazard mitigation plan describes the components included in the capability assessment and their significance for hazard mitigation planning.

Findings of the capability assessment were reviewed to identify opportunities to expand, initiate or integrate capabilities to further hazard mitigation goals and objectives. Where such opportunities were identified and determined to be feasible, they are included in the action plan. The "Analysis of Mitigation

Actions" table in this annex identifies these as community capacity building mitigation actions. The findings of the assessment are presented as follows:

An assessment of planning and regulatory capabilities is presented in Table 16-3.

An assessment of fiscal capabilities is presented in Table 16-4.

An assessment of administrative and technical capabilities is presented in Table 16-5.

An assessment of education and outreach capabilities is presented in Table 16-6.

Classifications under various community mitigation programs are presented in Table 16-7.

The community's adaptive capacity for the impacts of climate change is presented in Table 16-8.

Table 16-3. Planning and Regulatory Capability

Plan, Study or Program	Date of Most Recent Update	Comment
CRPD Administration Public Policies and Documents	Continually updated	Public Policies and Documents: Finance & Audit; Forms and Documents
Memorandum of Understanding for Emergency Care and Shelter Services	5/12/20	
American Red Cross Agreement	5/12/20	
County of Ventura Mass Care Shelter Annex	3/12/19	
CRPD Disaster Management Plan	5/07/20	Internal document not formally approved

Table 16-4. Fiscal Capability

Financial Resource	Accessible or Eligible to Use?
Community Development Block Grants	Yes
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for Specific Purposes	Yes
User Fees for Water, Sewer, Gas or Electric Service	No
Incur Debt through General Obligation Bonds	No
Incur Debt through Special Tax Bonds	No
Incur Debt through Private Activity Bonds	No
Withhold Public Expenditures in Hazard-Prone Areas	No
State-Sponsored Grant Programs	Yes
Development Impact Fees for Homebuyers or Developers	Yes

Table 16-5. Administrative and Technical Capability

Staff/Personnel Resource	Available?
Planners or engineers with knowledge of land development and land management practices ***If Yes, Department /Position:*** Andrew Mooney, Senior Planner; Bill Palermo, Park Operations Analyst	Yes
Engineers or professionals trained in building or infrastructure construction practices ***If Yes, Department /Position:*** Andrew Mooney, Senior Planner; Joe Tornero, Facility Maintenance Supervisor	Yes
Planners or engineers with an understanding of natural hazards ***If Yes, Department /Position:*** Andrew Mooney, Senior Planner; Matt Kouba, Park Superintendent;	Yes
Staff with training in benefit/cost analysis ***If Yes, Department /Position:*** Andrew Mooney, Senior Planner; Bill Palermo, Park Operation Analyst	Yes
Surveyors	No
Personnel skilled or trained in GIS applications ***If Yes, Department /Position:*** Bill Palermo, Park Operations Analyst	Yes
Scientist familiar with natural hazards in local area	No
Emergency manager ***If Yes, Department /Position:*** Matt Kouba, Park Superintendent	Yes
Grant writers ***If Yes, Department /Position:*** Bill Palermo, Park Operations Analyst	Yes

Table 16-6. Education and Outreach Capability

Criterion	Response
Do you have a public information officer or communications office?	No
Do you have personnel skilled or trained in website development? (consultant developed; staff maintained)	Yes
Do you have hazard mitigation information available on your website? ***If yes, briefly describe:*** Information posted as needed during an event (i.e., emergency shelters; cooling centers)	Yes
Do you use social media for hazard mitigation education and outreach? ***If yes, briefly describe:*** Information posted as needed during an event (i.e., emergency shelters; cooling centers)	Yes
Do you have any citizen boards or commissions that address issues related to hazard mitigation?	No
Do you have any other programs in place that could be used to communicate hazard-related information?	No
Do you have any established warning systems for hazard events?	No

Table 16-7. Community Classifications

	Participating?	Classification	Date Classified
FIPS Code:	No	N/A	N/A
DUNS#:	Yes	798289708	N/A
Community Rating System	No	N/A	N/A
Building Code Effectiveness Grading Schedule	No	N/A	N/A
Public Protection	No	N/A	N/A
Storm Ready	No	N/A	N/A
Firewise	No	N/A	N/A
Tsunami Ready	No	N/A	N/A

Table 16-8. Adaptive Capacity for Climate Change

Criterion	Jurisdiction Rating[a]
Technical Capacity	
Jurisdiction-level understanding of potential climate change impacts ***Comment:***	Low
Jurisdiction-level monitoring of climate change impacts ***Comment:***	Low
Technical resources to assess proposed strategies for feasibility and externalities ***Comment:***	Low
Jurisdiction-level capacity for development of greenhouse gas emissions inventory ***Comment:***	Low
Capital planning and land use decisions informed by potential climate impacts ***Comment:***	Low
Participation in regional groups addressing climate risks ***Comment:***	Low
Implementation Capacity	
Clear authority/mandate to consider climate change impacts during public decision-making processes ***Comment:*** *Processes in CEQA require climate change impacts to be considered.*	Medium
Identified strategies for greenhouse gas mitigation efforts ***Comment:***	Low
Identified strategies for adaptation to impacts ***Comment:*** *Strategies include, but not limited to, capturing electrical power through solar carport, emergency backup generators, removal of non-essential turf, LED construction practices, fuel modification, fire resiliency projects, stormwater management, bioswales and planting of vegetation on slopes. An existing agreement with American Red Cross and pending shelter agreement with the County of Ventura aid in providing public assistance during a climate event.*	Medium
Champions for climate action in local government departments ***Comment:*** *Planning of development and capital improvement projects include aforementioned strategies in addressing the negative impacts of climate change. Capital improvement project proposals take into consideration hazard mitigation potential as a means of evaluating project prioritization.*	Medium
Political support for implementing climate change adaptation strategies ***Comment:*** *CRPD Board of Directors and other elected City officials support strategies for implementation of climate change adaptation.*	Medium
Financial resources devoted to climate change adaptation ***Comment:*** *Funding for climate change adaptation is available through the District's General Fund and Capital Improvement Projects budget.*	Medium
Local authority over sectors likely to be negative impacted ***Comment:*** *CRPD works closely with the Ventura County Fire Protection District to eliminate potential risks of wildfire. Fuel modification is managed through an annual weed abatement contract and brush clearance easements.*	Medium
Public Capacity	
Local residents' knowledge of and understanding of climate risk ***Comment:***	Low
Local residents' support of adaptation efforts ***Comment:***	Low
Local residents' capacity to adapt to climate impacts ***Comment:***	Low
Local economy current capacity to adapt to climate impacts ***Comment:***	Low
Local ecosystems capacity to adapt to climate impacts ***Comment:***	Low

a. High = Capacity exists and is in use; Medium = Capacity may exist, but is not used or could use some improvement; Low = Capacity does not exist or could use substantial improvement; Unsure= Not enough information is known to assign a rating.

16.5 INTEGRATION REVIEW

For hazard mitigation planning, “integration” means that hazard mitigation information is used in other relevant planning mechanisms, such as capital facilities planning, and that relevant information from those sources is used in hazard mitigation. This section identifies where such integration is already in place, and where there are opportunities for further integration in the future. Resources listed at the end of this annex were used to provide information on integration. The progress reporting process described in Volume 1 of the hazard mitigation plan will document the progress of hazard mitigation actions related to integration and identify new opportunities for integration.

16.5.1 Existing Integration

Conejo Recreation and Park District continually integrates hazard mitigation information and strategies during planning sessions related to capital improvement projects. This includes projects of new development and those related to the major repair of existing facilities (see FY 2021-2023 Adopted Budget via ‘CRPD Administration Public Policies and Documents’ link, Finance and Audit Section, in Table 16-3 above).

The development of internal documents, such as the ‘CRPD Disaster Management Plan’, which outlines a disaster response protocol, including training, and procedures for deployment of resources during an event, is another example of this integration. The District has included, in its two-year budget, portable emergency backup generators and electrical plug-in retrofits for these units. Other examples of integration include sustainable building practices, reduction of non-essential turf in response to the ongoing drought and the adoption of facility use agreements with coordinating agencies, such as the City of Thousand Oaks and American Red Cross.

16.5.2 Opportunities for Future Integration

The capability assessment in this annex indicates opportunities to integrate this mitigation plan with other jurisdictional planning/regulatory capabilities. Capabilities were identified as integration opportunities if they can support or enhance the actions identified in this plan or be supported or enhanced by components of this plan. The capability assessment identified the following plans and programs that do not currently integrate hazard mitigation information but provide opportunities to do so in the future:

- Conejo Recreation and Park District will continue to explore opportunities that will reduce hazards and bolster our resiliency against the negative effects of climate change and other natural disasters.
- Taking action to integrate each of these programs with the hazard mitigation plan was considered as a mitigation action to include in the action plan in this annex.

16.6 RISK ASSESSMENT

16.6.1 Jurisdiction-Specific Natural Hazard Event History

Table 16-9 lists past occurrences of natural hazards for which specific damage was recorded in this jurisdiction Other hazard events that broadly affected the entire planning area, including this jurisdiction, are listed in the risk assessments in Volume 1 of this hazard mitigation plan.

Table 16-9. Past Natural Hazard Events

Type of Event	FEMA Disaster #	Date	Damage Assessment
COVID-19	DR-4482-CA	3/2020	$150,000; ongoing
Woolsey / Hill Fires	DR-4407-CA	11/2018	$712,000; ; mutual aid provided in fire response
Active Shooter, Borderline Shooting	N/A	11/2018	support role; no cost damages
Sesnon Fire	CA-LAC-08246455	10/2008	$ 45,970, mutual aid provided in fire response
California Wildfires	DR-1731-CA	10/2007	$ 21,982; mutual aid provided in fire response
California Severe Storms	DR-1577-CA	1/2005	$131,602; flooding, power outages, debris from winds
Fire Mitigation	DR-1498-CA	10/2003	$115,950; mutual aid provided in fire response
Wildfire	N/A	12/2000	Gusty winds fueled wildfire, 600-acres burned; mutual aid
Severe Winter Storms, El Niño	DR-1203-CA	2/1998	$398,984; flooding, power outages; debris from winds
Winter Storms (Aggregate)	N/A	1996, 1997	Flooding, power outages; debris from heavy winds
Northridge-Simi Earthquake	DR-1008-CA	1/1994	no cost damages
California Fires	DR-1005-CA	10/1993	$27,288; mutual aid provided in fire response

16.6.2 Hazard Risk Ranking

Table 16-10 presents a local ranking of all hazards of concern for which this hazard mitigation plan provides complete risk assessments. As described in detail in Volume 1, the ranking process involves an assessment of the likelihood of occurrence for each hazard, along with its potential impacts on people, property, and district operations. Mitigation actions primarily target hazards with high and medium rankings.

Table 16-10. Hazard Risk Ranking

Rank	Hazard	Risk Ranking Score	Risk Category
1	Landslide	51	High
2	Wildfire	36	High
3	Earthquake	32	High
4	Severe Storms	24	Medium
4	Severe Weather	24	Medium
5	Flooding	18	Medium
6	Dam Failure	12	Low
7	Drought	9	Low
8	Sea Level Rise; Coastal Erosion	0	Low
8	Tsunami	0	Low

16.6.3 Jurisdiction-Specific Vulnerabilities

Volume 1 of this hazard mitigation plan provides complete risk assessments for each identified hazard of concern.

Irrespective of the risk ranking above, the principal hazards affecting Conejo Recreation and Park District are wildfire, severe storms and weather, and drought. The following hazard mitigation action plan will address vulnerabilities through flood and erosion control, soil stabilization, defensible space, ignition-resistant construction and infrastructure retrofits. Through independent solutions, public facilities and neighboring properties will have increased protection and full capacity of use.

Mitigation actions addressing these issues were prioritized for consideration in the action plan in this annex.

16.7 HAZARD MITIGATION ACTION PLAN

Table 16-11 lists the actions that make up the hazard mitigation action plan for this jurisdiction. Table 16-12 identifies the priority for each action. Table 16-13 summarizes the actions by hazard of concern and type.

Table 16-11. Hazard Mitigation Action Plan Matrix

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action CRP-1—Maintain wildfire hazard fuel reduction program for areas that have been identified with overgrown or dead brush, trees and weeds to reduce the potential for tree-to-tree ignition. Ensure that a "maintenance now" component to provide continued fire resistance is part of the program. (Coordinates with Ventura County Fire Protection District Action VFP-6 and City of Thousand Oaks Action CTO-7) *Hazards Mitigated:* Wildfire						
New & Existing	2, 4, 5, 6, 8, 10, 11, 13, 14, 15, 18, 19	Ventura County Fire Protection District	CAL FIRE, USDA, Conejo Recreation & Park District, City of Thousand Oaks	Low	General Fund, Grant Funding- FEMA HMA (BRIC, HMGP and FMAP)	Ongoing
Action CRP-2—Actively participate in the plan maintenance protocols outlined in Volume 1 of this hazard mitigation plan. *Hazards Mitigated:* Landslide, Wildfire, Earthquake, Severe Storms, Severe Weather, Flooding, Dam Failure, Drought						
New & Existing	4, 5, 6, 8, 19	County of Ventura	CRPD	Low	Staff Time, General Funds	Short-term
Action CRP-3—Purchase generators for critical facilities and infrastructure that lack adequate backup power. Install transfer switches to allow temporary power connections during emergencies. (Several CRPD community centers serve as evacuation shelters or cooling centers during a disaster or hazard event.) *Hazards Mitigated:* Dam Failure, Earthquake, Flooding, Landslide, Severe Weather, Wildfire						
Existing	2, 6, 7, 8	Conejo Recreation & Park District	N/A	Medium	Capital Improvement Project Budget, Staff Time, Grant Funding- FEMA HMA (BRIC, HMGP)	Short-term
Action CRP-4—Major removal of vegetation and sediment debris, flood control capacity improvement to existing drainage infrastructure in conjunction with soil stabilization and erosion control measures Districtwide, at key locations within 26 parks. *Hazards Mitigated:* Flooding, Wildfire, Severe Weather						
Existing	2, 5, 7, 8	Conejo Recreation & Park District	N/A	Medium	General Fund, Grant Funding- FEMA HMA (BRIC, FMA, HMGP)	Short-term

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action CRP-5—Retrofit irrigation system components with bubblers, low-angle directional spray heads, and smart controllers to reduce water consumption and runoff.						
Hazards Mitigated: Drought						
New & Existing	5, 8, 19	Conejo Recreation & Park District	N/A	Medium	General Fund	Ongoing
Action CRP-6—Remove non-essential turf and install drought-tolerant plants with mulch ground cover. Irrigation modifications as necessary. All new development will incorporate this action into the design of each park.						
Hazards Mitigated: Drought						
New & Existing	5, 8, 19	Conejo Recreation & Park District	N/A	Medium	General Fund	Ongoing
Action CRP-7—Track future hazard events and impacts to inform decisions on future development and provide public outreach opportunities for hazard awareness.						
Hazards Mitigated: Dam Failure, Earthquake, Flooding, Landslide, Severe Weather, Severe Storms, Tsunami, Wildfire						
New & Existing	1, 2, 5, 6, 8, 17	Conejo Recreation & Park District	N/A	Low	General Fund	Ongoing

a. Short-term = Completion within 5 years; Long-term = Completion within 10 years; Ongoing= Continuing new or existing program with no completion date

Table 16-12. Mitigation Action Priority

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Cost?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Implementation Priority[a]	Grant Pursuit Priority[a]
1	12	High	Low	Yes	Yes	Yes	High	High
2	5	Medium	Low	Yes	No	No	Low	Low
3	4	High	Medium	Yes	Yes	No	Medium	Medium
4	4	Medium	Medium	Yes	Yes	No	Medium	Medium
5	3	Medium	Medium	Yes	No	Yes	High	Low
6	3	Medium	Medium	Yes	No	No	Low	Low
7	6	Low	Low	Yes	No	No	Low	Low

a. See the introduction to this volume for explanation of priorities

Table 16-13. Analysis of Mitigation Actions

	Action Addressing Hazard, by Mitigation Type[a]							
Hazard Type	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilient	Community Capacity Building
High-Risk Hazards								
Landslide	CRP-7	CRP-4	CRP-2, 7		CRP-3			CRP-2, 3, 7
Wildfire	CRP-1, 7	CRP-1, 4	CRP-1, 2, 7	CRP-1, 4, 6	CRP-3		CRP-4	CRP-2, 3, 7
Earthquake	CRP-7	CRP-4	CRP-2, 7	CRP-6	CRP-3			CRP-2, 3, 7
Medium-Risk Hazards								
Severe Storms	CRP-7	CRP-4	CRP-2, 7		CRP-3			CRP-2, 3, 7
Severe Weather	CRP-7	CRP-4	CRP-2, 7	CRP-4	CRP-3		CRP-4	CRP-2, 3, 7
Flood	CRP-7		CRP-7		CRP-3		CRP-4	CRP-2, 3, 7

Hazard Type	Action Addressing Hazard, by Mitigation Type[a]							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilient	Community Capacity Building
Low-Risk Hazards								
Dam Failure	CRP-7				CRP-3			CRP-2, 3, 7
Drought			CRP-2, 7	CRP-1, 5, 6	CRP-3		CRP-5, 6	CRP-2, 3, 7

a. See the introduction to this volume for explanation of mitigation types.

16.8 PUBLIC OUTREACH

Table 16-14 lists public outreach activities for this jurisdiction.

Table 16-14. Local Public Outreach

Local Outreach Activity	Date	Number of People Involved
Information posted on District website and social media	Ongoing	130,000

16.9 INFORMATION SOURCES USED FOR THIS ANNEX

The following technical reports, plans, and regulatory mechanisms were reviewed to provide information for this annex.

- **American Red Cross Shelter Agreement**—Reviewed for capabilities and integration.
- **Center Emergency Action Plan**—Reviewed for capabilities
- **Memorandum of Understanding for Emergency Care and Shelter Services**—Reviewed for capabilities and integration
- **County of Ventura Mass Care Shelter Annex**—Reviewed for capabilities and integration
- **CRPD Capri Property Schedule**—Used to list district assets

The following outside resources and references were reviewed:

- **Hazard Mitigation Plan Annex Development Toolkit**—The toolkit was used to support the identification of past hazard events and noted vulnerabilities, the risk ranking, and the development of the mitigation action plan.

16.10 FUTURE NEEDS TO BETTER UNDERSTAND RISK/VULNERABILITY

The District will study and consider options to increasingly develop projects to reduce risk/vulnerability through climate resilient mitigation activities including, floodplain and stream restoration, green infrastructure methods, and flood diversion and storage.

17. OJAI VALLEY SANITARY DISTRICT

17.1 LOCAL HAZARD MITIGATION PLANNING TEAM

Primary Point of Contact
Jeff Palmer, General Manager
1072 Tico Road
Ojai, California 93023
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Alternate Point of Contact
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This annex was developed by the local hazard mitigation planning team, whose members are listed in Table 17-1.

Table 17-1. Local Hazard Mitigation Planning Team Members

Name	Title
Jeff Palmer	General Manager
Alison Young	Administrative Officer

17.2 JURISDICTION PROFILE

17.2.1 Overview

The Ojai Valley Sanitary District was established in 1985 as the result of a consolidation of the Ventura Avenue, Oak View, and Meiners Oaks sanitary districts and the Sanitation Department of the City of Ojai. It collects and transports wastewater for treatment at the Ojai Valley Treatment Plant and disposes of effluent and sludge.

The district is a public agency organized under the Sanitary District Act of 1923 and is governed by an elected seven-member board.

The Board of Directors assumes responsibility for the adoption of this plan; Staff will oversee its implementation.

17.2.2 Service Area

The District provides sanitary sewer service for about 20,000 residents of the City of Ojai and the unincorporated Ojai Valley. The District's collection system consists of approximately 120 miles of trunk and main sewer lines.

17.2.3 Assets

Table 17-2 summarizes the assets of the District and their value.

Table 17-2. Special-Purpose District Assets

Asset	Value
Property	
0 acres of land	N/A
Equipment	
Vehicles	$1.5 million
Total:	***$1.5 million***
Critical Facilities	
Tico Administration Office—1072 Tico Road, Ojai CA 93023	$2.5 million
Santa Ana Lift Station—Santa Ana Rd, Oak View CA 93022	$5 million
Little Santa Ana Lift Station—Santa Ana Rd, Oak View CA 93022	$1.5 million
Orchard Lift Station—Ojai Ca 93023	$5 million
Wastewater Treatment Plant—6363 N Ventura Ave, Ventura CA 93001	$27 Million
Collection System—various areas, Ojai Valley, Ventura CA	$22.8 million
Total:	**$63.8 Million**

17.3 CURRENT TRENDS

Flows have been steady for years with little new growth.

17.4 CAPABILITY ASSESSMENT

This section describes an assessment of existing capabilities for implementing hazard mitigation strategies. The introduction at the beginning of this volume of the hazard mitigation plan describes the components included in the capability assessment and their significance for hazard mitigation planning.

Findings of the capability assessment were reviewed to identify opportunities to expand, initiate or integrate capabilities to further hazard mitigation goals and objectives. Where such opportunities were identified and determined to be feasible, they are included in the action plan. The “Analysis of Mitigation Actions” table in this annex identifies these as community capacity building mitigation actions. The findings of the assessment are presented as follows:

- An assessment of planning and regulatory capabilities is presented in Table 17-3.
- An assessment of fiscal capabilities is presented in Table 17-4.
- An assessment of administrative and technical capabilities is presented in Table 17-5.
- An assessment of education and outreach capabilities is presented in Table 17-6.
- Classifications under various community mitigation programs are presented in Table 17-7.
- The community’s adaptive capacity for the impacts of climate change is presented in Table 17-8.

Table 17-3. Planning and Regulatory Capability

Plan, Study or Program	Date of Most Recent Update	Comment
Budget	7/2021	Annual Budget Adoption
CIP	7/2021	Reviewed Monthly
Disaster Operations Plan		
District Code of Regulations	6/2021	Updated through Ordinance No. OVSD-83
Infiltration & Inflow Master Plan	2014	
Sewer System Management Plan	9/2019	

Table 17-4. Fiscal Capability

Financial Resource	Accessible or Eligible to Use?
Community Development Block Grants	No
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for Specific Purposes	No
User Fees for Water, Sewer, Gas or Electric Service ***If yes, specify:*** Sewer Service Fees	Yes
Incur Debt through General Obligation Bonds	Yes
Incur Debt through Special Tax Bonds	Yes
Incur Debt through Private Activity Bonds	Yes
Withhold Public Expenditures in Hazard-Prone Areas	No
State-Sponsored Grant Programs	Yes
Development Impact Fees for Homebuyers or Developers	No

Table 17-5. Administrative and Technical Capability

Staff/Personnel Resource	Available?
Planners or engineers with knowledge of land development and land management practices ***If Yes, Department /Position:*** Operations Manager and General Manager	Yes
Engineers or professionals trained in building or infrastructure construction practices ***If Yes, Department /Position:*** Operations Manager and General Manager	Yes
Planners or engineers with an understanding of natural hazards ***If Yes, Department /Position:*** Operations Manager and General Manager	Yes
Staff with training in benefit/cost analysis ***If Yes, Department /Position:*** Operations Manager and General Manager	Yes
Surveyors	No
Personnel skilled or trained in GIS applications	No
Scientist familiar with natural hazards in local area	No
Emergency manager ***If Yes, Department /Position:*** Operations Manager and General Manager	Yes
Grant writers ***If Yes, Department /Position:*** Operations Manager and General Manager	Yes

Table 17-6. Education and Outreach Capability

Criterion	Response
Do you have a public information officer or communications office?	Yes
Do you have personnel skilled or trained in website development?	Yes
Do you have hazard mitigation information available on your website?	Yes
Do you use social media for hazard mitigation education and outreach?	No
Do you have any citizen boards or commissions that address issues related to hazard mitigation?	No
Do you have any other programs in place that could be used to communicate hazard-related information?	No
Do you have any established warning systems for hazard events?	No

Table 17-7. Community Classifications

	Participating?	Classification	Date Classified
FIPS Code	No	N/A	N/A
DUNS#	Yes	081077164	N/A
Community Rating System	No	N/A	N/A
Building Code Effectiveness Grading Schedule	No	N/A	N/A
Public Protection	No	N/A	N/A
Storm Ready	No	N/A	N/A
Firewise	No	N/A	N/A
Tsunami Ready	No	N/A	N/A

Table 17-8. Adaptive Capacity for Climate Change

Criterion	Jurisdiction Rating[a]
Technical Capacity	
Jurisdiction-level understanding of potential climate change impacts	High
Comment: OVSD has engineering staff to track and record flow & loading as it changes over time. Real time data is available to make operational decisions	
Jurisdiction-level monitoring of climate change impacts	High
Comment: OVSD has engineering staff to track and record flow & loading as it changes over time. Real time data is available to make operational decisions	
Technical resources to assess proposed strategies for feasibility and externalities	Low
Comment:	
Jurisdiction-level capacity for development of greenhouse gas emissions inventory	High
Comment: OVSD has engineering staff to track and record flow & loading as it changes over time. Real time data is available to make operational decisions	
Capital planning and land use decisions informed by potential climate impacts	Low
Comment:	
Participation in regional groups addressing climate risks	Low
Comment:	

Criterion	Jurisdiction Rating[a]
Implementation Capacity	
Clear authority/mandate to consider climate change impacts during public decision-making processes	Medium
Comment: *OVSD has capability to make operational decisions to address flow conditions*	
Identified strategies for greenhouse gas mitigation efforts	Low
Comment:	
Identified strategies for adaptation to impacts	Medium
Comment: *OVSD has capability to make operational decisions to address flow conditions*	
Champions for climate action in local government departments	Low
Comment:	
Political support for implementing climate change adaptation strategies	Low
Comment:	
Financial resources devoted to climate change adaptation	Low
Comment:	
Local authority over sectors likely to be negative impacted	Low
Comment:	
Public Capacity	
Local residents' knowledge of and understanding of climate risk	High
Comment: *Climate risks studied by County of Ventura & City of Ojai*	
Local residents' support of adaptation efforts	High
Comment: *Climate risks studied by County of Ventura & City of Ojai*	
Local residents' capacity to adapt to climate impacts	Low
Comment:	
Local economy current capacity to adapt to climate impacts	Low
Comment:	
Local ecosystems capacity to adapt to climate impacts	Low
Comment:	

a. High = Capacity exists and is in use; Medium = Capacity may exist, but is not used or could use some improvement; Low = Capacity does not exist or could use substantial improvement; Unsure= Not enough information is known to assign a rating.

17.5 INTEGRATION REVIEW

For hazard mitigation planning, "integration" means that hazard mitigation information is used in other relevant planning mechanisms, such as capital facilities planning, and that relevant information from those sources is used in hazard mitigation. This section identifies where such integration is already in place, and where there are opportunities for further integration in the future. Resources listed at the end of this annex were used to provide information on integration. The progress reporting process described in Volume 1 of the hazard mitigation plan will document the progress of hazard mitigation actions related to integration and identify new opportunities for integration.

17.5.1 Existing Integration

No level of integration has already been established between local hazard mitigation planning and other local plans and programs.

17.5.2 Opportunities for Future Integration

The capability assessment in this annex indicates opportunities to integrate this mitigation plan with other jurisdictional planning/regulatory capabilities. Capabilities were identified as integration opportunities if they can support or enhance the actions identified in this plan or be supported or enhanced by components of this plan. The capability assessment did not identify any plans or programs that do not currently integrate hazard mitigation information but provide opportunities to do so in the future.

17.6 RISK ASSESSMENT

17.6.1 Jurisdiction-Specific Natural Hazard Event History

Table 17-9 lists past occurrences of natural hazards for which specific damage was recorded in this jurisdiction Other hazard events that broadly affected the entire planning area, including this jurisdiction, are listed in the risk assessments in Volume 1 of this hazard mitigation plan.

Table 17-9. Past Natural Hazard Events

Type of Event	FEMA Disaster #	Date	Damage Assessment
COVID-19 Pandemic	DR-4482	January 20, 2020 and continuing	District administrative operations were impacted due to stay-at-home orders
Thomas Fire	FM-5224-CA	12/4/2017	$90,000
Wolf Fire	N/A	6/1/2002	This event impacted the Ojai area, but damages specific to the district are unknown.
Flash Flood	N/A	2/20/2000	Heavy rain, totaling 2 to 6 inches produced flash flooding in Ventura County, but damages specific to the district are unknown.

17.6.2 Hazard Risk Ranking

Table 17-10 presents a local ranking of all hazards of concern for which this hazard mitigation plan provides complete risk assessments. As described in detail in Volume 1, the ranking process involves an assessment of the likelihood of occurrence for each hazard, along with its potential impacts on people, property, and district operations. Mitigation actions primarily target hazards with high and medium rankings.

Table 17-10. Hazard Risk Ranking

Rank	Hazard	Risk Ranking Score	Risk Category
1	Landslide	33	High
2	Earthquake	32	Medium
3	Severe Storms	24	Medium
4	Severe Weather	24	Medium
5	Wildfire	18	Medium
6	Flooding	18	Medium
7	Dam Failure	12	Low
8	Drought	9	Low

17.6.3 Jurisdiction-Specific Vulnerabilities

Volume 1 of this hazard mitigation plan provides complete risk assessments for each identified hazard of concern. The following jurisdiction-specific issues have been identified based on a review of the results of the risk assessment, public involvement strategy, and other available resources:

- OVSD has had a direct wildfire impact in the form of damages done by the Thomas Fire. Increased drought conditions make us susceptible to a similar occurrence.

Mitigation actions addressing these issues were prioritized for consideration in the action plan in this annex.

17.7 STATUS OF PREVIOUS PLAN ACTIONS

The District began to participate in the previous plan, but did not complete participation and therefore does not have a previous action plan.

17.8 HAZARD MITIGATION ACTION PLAN

Table 17-11 lists the actions that make up the hazard mitigation action plan for this jurisdiction. Table 17-12 identifies the priority for each action. Table 17-13 summarizes the mitigation actions by hazard of concern and mitigation type.

Table 17-11. Hazard Mitigation Action Plan Matrix

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action OVS-1—Where appropriate, support retrofitting, purchase or relocation of structures located in hazard areas, prioritizing those that have experienced repetitive losses and/or are located in high- or medium-risk hazard areas.						
Hazards Mitigated:	Landslide, Earthquake, Severe Storms, Severe Weather, Wildfire, Flooding, Dam Failure					
Existing	2, 6, 9, 11	OVSD	None	High	FEMA HMA (BRIC, FMA, HMGP)	Short-term
Action OVS-2—Actively participate in the plan maintenance protocols outlined in Volume 1 of this hazard mitigation plan.						
Hazards Mitigated:	Landslide, Earthquake, Severe Storms, Severe Weather, Wildfire, Flooding, Dam Failure, Drought					
New & Existing	2, 8, 11, 19	OVSD	None	Low	Staff Time, General Funds	Short-term
Action OVS-3—Purchase generators for all critical facilities and infrastructure that lack adequate backup power.						
Hazards Mitigated:	Landslide, Earthquake, Severe Storms, Severe Weather, Wildfire, Flooding, Dam Failure					
Existing	2, 7, 8	OVSD	None	High	Grant Funding-FEMA HMA (BRIC, HMGP)	Short-term

a. Short-term = Completion within 5 years; Long-term = Completion within 10 years; Ongoing= Continuing new or existing program with no completion date

Acronyms used here are defined at the beginning of this volume.

Table 17-12. Mitigation Action Priority

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Cost?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Implementation Priority[a]	Grant Pursuit Priority[a]
1	4	High	High	Yes	Yes	No	Medium	High
2	4	Medium	Low	Yes	No	Yes	High	Low
3	3	High	High	Yes	Yes	No	Medium	High

a. See the introduction to this volume for explanation of priorities.

Table 17-13. Analysis of Mitigation Actions

Hazard Type	Action Addressing Hazard, by Mitigation Type[a]							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilient	Community Capacity Building
High-Risk Hazards								
Landslide		OVS-1, 3	OVS-2		OVS-3			OVS-2
Medium-Risk Hazards								
Earthquake		OVS-1, 3	OVS-2		OVS-3			OVS-2
Severe Storms		OVS-1, 3	OVS-2		OVS-3			OVS-2
Severe Weather		OVS-1, 3	OVS-2		OVS-3			OVS-2
Wildfire		OVS-1, 3	OVS-2		OVS-3			OVS-2
Flooding		OVS-1, 3	OVS-2		OVS-3			OVS-2
Low-Risk Hazards								
Dam Failure		OVS-1, 3	OVS-2		OVS-3			OVS-2
Drought			OVS-2					OVS-2

a. See the introduction to this volume for explanation of mitigation types.

17.9 INFORMATION SOURCES USED FOR THIS ANNEX

The following technical reports, plans, and regulatory mechanisms were reviewed to provide information for this annex.

- **Budget**—as a financial reference point and pre-planning operationally and major expenditures through reserves
- **CIP**—Summary and tracking of Construction Projects in progress
- **Disaster Operations Plan**—Guide to disaster preparedness and navigation

The following outside resources and references were reviewed:

- **Hazard Mitigation Plan Annex Development Toolkit**—The toolkit was used to support the identification of past hazard events and noted vulnerabilities, the risk ranking, and the development of the mitigation action plan.

18. PLEASANT VALLEY RECREATION & PARK DISTRICT

18.1 LOCAL HAZARD MITIGATION PLANNING TEAM

Primary Point of Contact
Mary Otten, General Manager
1605 E. Burnley Street
Camarillo, CA 93010
Telephone: 805-482-1996 Ext. 114
e-mail Address: motten@pvrpd.org

Alternate Point of Contact
Leonore Young, Administrative Services Manager
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Camarillo, CA 93010
Telephone: 805-482-1996 Ext. 111
e-mail Address: lyoung@pvrpd.org

This annex was developed by the local hazard mitigation planning team, whose members are listed in Table 18-1.

Table 18-1. Local Hazard Mitigation Planning Team Members

Name	Title
Mary Otten	General Manager
Leonore Young	Administrative Services Manager
Bob Cerasuolo	Park Services Manager
Dylan Gunning	Administrative Analyst
Jessica Puckett	Administrative Analyst
Nick Marienthal	Park Supervisor

18.2 JURISDICTION PROFILE

18.2.1 Overview

The Pleasant Valley Recreation and Park District is a Special District created in 1962 to provide recreation services and programs and to maintain park space which encompasses the city of Camarillo ("City") and surrounding areas. A five-member elected Board of Directors governs the District. The Board assumes responsibility for the adoption of this plan: the General Manager will oversee its implementation. The District currently employs a staff of 48. Funding comes primarily through property taxes and fees charged for District classes and programs.

18.2.2 Service Area

The Pleasant Valley Recreation and Park District serves the City of Camarillo and the unincorporated areas outside the City of Camarillo city limits to include California State University Channel Island. The

District service area covers 45 square miles with 256 acres of park land, serving a population over 78,936 (as of the latest census).

18.2.3 Assets

Table 18-2 summarizes the assets of the District and their value.

Table 18-2. Special-Purpose District Assets

Asset	Value
Property	
256.5 Acres of Land	$22,732,253
Adolfo Park 3601 N. Adolfo, Camarillo CA 93010 (3.0 Acres)	
Arneill Ranch Park 1301 Sweetwater, Camarillo CA 93010 (5.0 Acres)	
Birchview Park 5564 Laurel Ridge Lane, Camarillo CA 93012 (0.7 Acres)	
Calleguas Creek Park 675 Avenida Valencia, Camarillo CA 93012 (3.0 Acres)	
Camarillo Oak Grove Park 6968 Camarillo Springs Rd, Camarillo CA 93012 (24.55 Acres)	
Carmenita Park 1506 Sevilla Camarillo CA 93010 (1.0 Acre)	
Charter Oak Park 2500 Charter Oak Drive Camarillo CA 93010 (5.7 Acres)	
Community Center Park 1605 E. Burnley Street Camarillo CA 93010 (12.9 Acres)	
Dos Camino Park 2198 N. Ponderosa Lane Camarillo CA 93010 (4.4 Acres)	
Encanto Park 5300 Encanto Camarillo CA 93012 (3.0 Acres)	
Foothill Park 1501 Cranbrook Street Camarillo CA 93010 (2.3Acres)	
Freedom Park 275 E. Pleasant Valley Road Camarillo CA 93010 (33.9 Acres)	
Heritage Park 1630 Heritage Trail Camarillo CA 93012 (9.0 Acres)	
Las Posas Equestrian Park 2084 Via Veneto Camarillo CA 93010 (2.0 Acres)	
Laurelwood Park 2127 Dexter Camarillo CA 93010 (1.5 Acres)	
Lokker Park 848 Vista Coto Verde Camarillo CA 93010 (7.0 Acres)	
Mel Vincent Park 668 Calistoga Road Camarillo CA 93010 (5.0 Acres)	
Mission Oaks Park 5501 Mission Oaks Blvd Camarillo CA 930102 (20.2 Acres)	
Nancy Bush Park 1150 Bradford Camarillo CA 93010 (3.4 Acres)	
Pitts Ranch Park 1400 Flynn Road Camarillo CA 93012 (10.0 Acres)	
Bob Kildee Community Park 1030 Temple Ave Camarillo CA 93010 (13.0 Acres)	
Quito Park 7073 Quito Court Camarillo CA 93012 (5.0 Acres)	
Springville Park 801 Via Zamora Camarillo CA 93010 (5.0 Ares)	
Trailside Park 5462 Cherry Ridge Drive Camarillo CA 93012 (0.5 Acres)	
Valle Lindo Park 889 Aileen Street Camarillo CA 93010 (10.0 Acres)	
Pleasant Valley Fields 3777 Village at the Park Drive Camarillo CA 93010 (55.0 Acres)	
Woodcreek Park 1200 Woodcreek Road Camarillo CA 93012 (5.0 Acres)	
Woodside Park 247 Japonica Avenue Camarillo CA 93012 (5.0 Acres)	
Equipment	
20 Parks Vehicles	$805,000
4 Tractors	$140,000
3 Generators	$15,000
1-200 Gallon Portable Water Tank	$500
2-250 Portable Water Tanks	$1,500
11 Trailers	$11,000
Total:	***$973,000***

Asset	Value
Critical Facilities	
Community Center (Admin Office, Auditorium, Classrooms and Senior Center) 1605 E. Burnely St. Camarillo 93010	
Freedom Park 275 E. Pleasant Valley Road Camarillo CA 93010	
Pleasant Valley Aquatic Center 1030 Temple Ave Camarillo CA 93010	
Pleasant Valley Recreation and Parks Operation Building 480 Skyway Dr. Camarillo CA 93010	
Pleasant Valley Recreation and Parks Shop & Yard 380 Skyway Camarillo CA 93010	
Total:	***$8,712,616***

18.3 CURRENT TRENDS

Pleasant Valley Recreation and Park District has a population of 78,936 (2020 Census) and is located in Ventura County, and encompasses the City of Camarillo and surrounding areas. The City of Camarillo is currently growing at a rate of 1.42% annually. (https://worldpopulationreview.com). Slated for future development, multiple new housing projects within the boundaries of the District will increase the population, impacting the capacity of existing parks and facilities the District operates. The future growth of facilities within the District includes new sports fields, new parks, pickleball courts, and a new Senior and Community Center.

Emergency services use district parks and facilities as staging locations for natural disasters, including wildfires within the region. Additionally, the District facilities are used as evacuation centers where that District staff monitor emergency operations.

18.4 CAPABILITY ASSESSMENT

This section describes an assessment of existing capabilities for implementing hazard mitigation strategies. The introduction at the beginning of this volume of the hazard mitigation plan describes the components included in the capability assessment and their significance for hazard mitigation planning.

Findings of the capability assessment were reviewed to identify opportunities to expand, initiate or integrate capabilities to further hazard mitigation goals and objectives. Where such opportunities were identified and determined to be feasible, they are included in the action plan. The “Analysis of Mitigation Actions” table in this annex identifies these as community capacity building mitigation actions. The findings of the assessment are presented as follows:

- An assessment of planning and regulatory capabilities is presented in Table 18-3.
- An assessment of fiscal capabilities is presented in Table 18-4.
- An assessment of administrative and technical capabilities is presented in Table 18-5.
- An assessment of education and outreach capabilities is presented in Table 18-6.
- Classifications under various community mitigation programs are presented in Table 18-7.
- The community’s adaptive capacity for the impacts of climate change is presented in Table 18-8.

Table 18-3. Planning and Regulatory Capability

Plan, Study or Program	Date of Most Recent Update	Comment
Capital Improvement Plan	6/5/2013	Plan is for 2013-2018
Strategic Plan	5/5/2021	Plan is for 2021-2026
Americans with Disabilities Act Compliance Plan		Plan being devised starting Sept 2021
Fiscal Year Budget	7/7/2021	Updated Annually
Reserve Policy	9/1/2021	Reviewed every three to five years

Table 18-4. Fiscal Capability

Financial Resource	Accessible or Eligible to Use?
Community Development Block Grants	Yes, through the City of Camarillo
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for Specific Purposes	Yes
User Fees for Water, Sewer, Gas or Electric Service	No
Incur Debt through General Obligation Bonds	Yes
Incur Debt through Special Tax Bonds	No
Incur Debt through Private Activity Bonds	No
Withhold Public Expenditures in Hazard-Prone Areas	No
State-Sponsored Grant Programs	Yes
Development Impact Fees for Homebuyers or Developers	Yes
Other	Yes
If yes, specify: Quimby Fees	

Table 18-5. Administrative and Technical Capability

Staff/Personnel Resource	Available?
Planners or engineers with knowledge of land development and land management practices	No
Engineers or professionals trained in building or infrastructure construction practices	No
Planners or engineers with an understanding of natural hazards	No
Staff with training in benefit-cost analysis	Yes
If Yes, Department /Position: Administration Dept./Admin Services Manager, Administrative Analyst	
Surveyors	No
Personnel skilled or trained in GIS applications	No
Scientist familiar with natural hazards in local area	No
Emergency manager	No
Grant writers	Yes
If Yes, Department /Position: Various staff dependent upon specific grant	

Table 18-6. Education and Outreach Capability

Criterion	Response
Do you have a public information officer or communications office?	Yes
Do you have personnel skilled or trained in website development?	Yes
Do you have hazard mitigation information available on your website?	No
Do you use social media for hazard mitigation education and outreach?	No
Do you have any citizen boards or commissions that address issues related to hazard mitigation?	No
Do you have any other programs in place that could be used to communicate hazard-related information?	No
Do you have any established warning systems for hazard events?	No

Table 18-7. Community Classifications

	Participating?	Classification	Date Classified
FIPS Code	N/A		N/A
DUNS#	Yes	077230183	N/A
Community Rating System	N/A		N/A
Building Code Effectiveness Grading Schedule	N/A		N/A
Public Protection	N/A		N/A
Storm Ready	N/A		N/A
Firewise	N/A		N/A
Tsunami Ready	N/A		N/A

Table 18-8. Adaptive Capacity for Climate Change

Criterion	Jurisdiction Rating[a]
Technical Capacity	
Jurisdiction-level understanding of potential climate change impacts ***Comment:*** *Water, Electricity*	Medium
Jurisdiction-level monitoring of climate change impacts ***Comment:*** *Water, Electricity, Tankless Water heaters*	Medium
Technical resources to assess proposed strategies for feasibility and externalities ***Comment:***	Low
Jurisdiction-level capacity for development of greenhouse gas emissions inventory ***Comment:***	Low
Capital planning and land use decisions informed by potential climate impacts ***Comment:***	Low
Participation in regional groups addressing climate risks ***Comment:***	Low
Implementation Capacity	
Clear authority/mandate to consider climate change impacts during public decision-making processes ***Comment:*** *Water, Electricity, Vehicle*	Medium
Identified strategies for greenhouse gas mitigation efforts ***Comment:*** *Water, Vehicle, Urban Forest*	Medium

Criterion	Jurisdiction Rating[a]
Identified strategies for adaptation to impacts ***Comment:*** *Turf reduction*	Medium
Champions for climate action in local government departments ***Comment:***	Low
Political support for implementing climate change adaptation strategies ***Comment:***	Low
Financial resources devoted to climate change adaptation ***Comment:*** *Turf Mitigation, LED funding*	Medium
Local authority over sectors likely to be negative impacted ***Comment:***	Low
Public Capacity	
Local residents' knowledge of and understanding of climate risk ***Comment:***	Low
Local residents' support of adaptation efforts ***Comment:***	Low
Local residents' capacity to adapt to climate impacts ***Comment:***	Low
Local economy current capacity to adapt to climate impacts ***Comment:***	Low
Local ecosystems capacity to adapt to climate impacts ***Comment:***	Low

a. High = Capacity exists and is in use; Medium = Capacity may exist, but is not used or could use some improvement; Low = Capacity does not exist or could use substantial improvement; Unsure= Not enough information is known to assign a rating.

18.5 INTEGRATION REVIEW

For hazard mitigation planning, "integration" means that hazard mitigation information is used in other relevant planning mechanisms, such as capital facilities planning, and that relevant information from those sources is used in hazard mitigation. This section identifies where such integration is already in place, and where there are opportunities for further integration in the future. Resources listed at the end of this annex were used to provide information on integration. The progress reporting process described in Volume 1 of the hazard mitigation plan will document the progress of hazard mitigation actions related to integration and identify new opportunities for integration.

18.5.1 Existing Integration

Some level of integration has already been established between local hazard mitigation planning and the following other local plans and programs:

- The Strategic Plan contains goals that align with hazard mitigation including green initiatives and sustainability, increased use of technology for hazard awareness and public outreach, and retrofits to facilities to meet new design standards.

- Grid Pruning—Certified arborist hired by the District has put a grid pruning schedule together to ensure trees are maintained in the event of high winds, branches are secure, not weak, diseased or dead.
- Long term plan in place to mitigate Charter Oaks windrow Eucalyptus trees (approx. 220 trees).
- Annually clear brush at Las Posas Equestrian Park and trail as well as Camarillo Grove Park.
- Annually clear and prep storm drains prior to winter storms.
- Parks Mow/Water Schedule—The district has over 256 acres of parkland that is maintained with regular maintenance. Should a disaster occur, District parks have the capability to react quickly if they are needed for emergency usage.
- Aquatics Maintenance—Showers at the aquatics center are fully maintained. If an emergency event occurred, the showers in the aquatics center could be used either for emergency personnel or citizens who have been displaced during the event.
- Community Center Auditorium/Freedom Center—Community Center and Freedom Center is available to either house emergency personnel or citizens who have been displaced. Community Center and Freedom Center is maintained at all times.
- District electronic marquee sign has the capability to display emergency situations and weather conditions.

18.5.2 Opportunities for Future Integration

The capability assessment in this annex indicates opportunities to integrate this mitigation plan with other jurisdictional planning/regulatory capabilities. Capabilities were identified as integration opportunities if they can support or enhance the actions identified in this plan or be supported or enhanced by components of this plan. The capability assessment identified the following plans and programs that do not currently integrate hazard mitigation information but provide opportunities to do so in the future:

- The District does not have a generator for any of its sites. Placing a generator at the Community Center location would enable the district to provide shelter/housing for emergency personnel or citizens who have become displaced due to an emergency event
- The District does not currently have a recovery plan, but could partner with the City of Camarillo to offer resources and staffing in the event of an emergency. The District could build a Post-Disaster Recovery Plan partnering with the City of Camarillo to help lay out policies, operational strategies and roles and responsibilities that would help guide the decisions and actions of community leaders relative to long-term recovery and redevelopment following a major catastrophic disaster.
- Future Capital Improvement Projects could take hazard mitigation into consideration when evaluating project prioritization.
- Send selected staff to a Community Emergency Response Team (CERT) class.

Taking action to integrate each of these programs with the hazard mitigation plan was considered as a mitigation action to include in the action plan in this annex.

18.6 RISK ASSESSMENT

18.6.1 Jurisdiction-Specific Natural Hazard Event History

Table 18-9 lists past occurrences of natural hazards for which specific damage was recorded in this jurisdiction Other hazard events that broadly affected the entire planning area, including this jurisdiction, are listed in the risk assessments in Volume 1 of this hazard mitigation plan.

Table 18-9. Past Natural Hazard Events

Type of Event	FEMA Disaster #	Date	Damage Assessment
California COVID-19	DR-4482	March 22, 2020	Ongoing
California COVID-19	EM-3428	March 13, 2020	Ongoing
Wildfire	795861	November 8, 2018	The Woolsey Fire burned 96,949 across in Ventura and Los Angeles county. In total, the Woolsey Fire destroyed 1,643 structures, damaged an additional 364 structures. Three deaths.
Wildfire	795860	November 8, 2018	The Woolsey Fire burned 96,949 across in Ventura and Los Angeles county. In total, the Woolsey Fire destroyed 1,643 structures, damaged an additional 364 structures. Three deaths.
Wildfire	729837	December 4, 2017	In all, the Thomas Fire burned 281,893 acres, making it the largest recorded fire in the state of California. One firefighter died
Flash Flood	553273	December 12, 2014	Intense rainfall over the Springs Fire burn scar generated flash flooding as well as mud and debris flow in the community of Camarillo Springs. A wall of mud and debris severely damaged ten homes.
Debris Flow	544619	October 31, 2014	Two homes were damaged by mud. The debris flow occurred near the burn scar of the Springs Fire
Wildfire	439713	May 2, 2013	The Springs Fire burned 24,251 acres. Six commercial properties were damaged and 10 firefighter injuries were reported.
Wildfire	439712	May 2, 2013	The Springs Fire burned 24,251 acres. Six commercial properties were damaged and 10 firefighter injuries were reported.
Flood	5688228	March 25, 1999	N/A
Tornado	5640770	May 13, 1998	Weak tornado. No damage reported.

18.6.2 Hazard Risk Ranking

Table 18-10 presents a local ranking of all hazards of concern for which this hazard mitigation plan provides complete risk assessments. As described in detail in Volume 1, the ranking process involves an assessment of the likelihood of occurrence for each hazard, along with its potential impacts on people, property, and district operations. Mitigation actions primarily target hazards with high and medium rankings.

Table 18-10. Hazard Risk Ranking

Rank	Hazard	Risk Ranking Score	Risk Category
1	Landslide	33	High
2	Earthquake	32	High
3	Severe Storms	24	Medium
4	Severe Weather	24	Medium
5	Dam Failure	22	Medium
6	Flooding	18	Medium
7	Wildfire	12	Low
8	Drought	9	Low

18.6.3 Jurisdiction-Specific Vulnerabilities

Volume 1 of this hazard mitigation plan provides complete risk assessments for each identified hazard of concern. The following jurisdiction-specific issues have been identified based on a review of the results of the risk assessment, public involvement strategy, and other available resources:

- The jurisdiction has experienced increasingly intense wildfires that threaten District land and property. The District provides emergency personnel staging areas and public evacuation locations.
- The jurisdiction has seen landslides in correlation to the burn areas loss of vegetation
- Severe storms and weather
- The jurisdiction has experience landslides due to wildfires destroying vegetation.
- One significant District asset is not equipped with a generator.
- The jurisdiction has experienced severe storms resulting in flash flooding threatening District property.

Mitigation actions addressing these issues were prioritized for consideration in the action plan in this annex.

18.7 HAZARD MITIGATION ACTION PLAN

Table 18-11 lists the actions that make up the hazard mitigation action plan for this jurisdiction. Table 18-12 identifies the priority for each action. Table 18-13 summarizes the mitigation actions by hazard of concern and mitigation type.

Table 18-11. Hazard Mitigation Action Plan Matrix

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action PLV-1—Where appropriate, provide earthquake retrofitting for hardening and to build resilience to critical infrastructure. Armor/retrofit critical infrastructure from the impact of landslides.						
Hazards Mitigated: Earthquake, Landslide						
Existing	1, 2, 5, 6, 8, 9, 11, 13, 14, 15	PVRPD	None	High	HMGP, BRIC, FMA, General Fund	Long-Term

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action PLV-2—Actively participate in plan maintenance protocols outlined in Volume 1 of this hazard mitigation plan.						
Hazards Mitigated:	Landslide, Earthquake, Severe Storms, Severe Weather, Dam Failure, Flooding, Wildfire, Drought					
New & Existing	1, 4, 6, 8, 19	PVRPD	None	Low	General Funds	Short-term
Action PLV-3—Purchase generators for critical facilities and infrastructure that lack adequate backup power, included but not limited to the Camarillo Community Center.						
Hazards Mitigated:	Landslide, Earthquake, Severe Storms, Severe Weather, Dam Failure, Flooding, Wildfire, Drought					
Existing	2, 6, 18	PVRPD	None	High	HMGP, BRIC, General Funds	Short-term
Action PLV-4—Develop a recovery plan, partner with the City of Camarillo to offer resources and staffing in the event of an emergency.						
Hazards Mitigated:	Landslide, Earthquake, Severe Storms, Severe Weather, Dam Failure, Flooding, Wildfire, Drought					
New	2, 8, 19	PVRPD	City of Camarillo	Low	HMGP, General Funds	Short-term
Action PLV-5—Identify features and amenities with the existing facilities to be updated or improved (Fire Codes, Americans with Disabilities Act, etc.)						
Hazards Mitigated:	Landslide, Earthquake, Severe Storms, Severe Weather, Dam Failure, Flooding, Wildfire, Drought					
New & Existing	2, 4, 9	PVRPD	None	High	HMGP, BRIC, FMA, General Fund, Quimby	Long-Term
Action PLV-6—Enhance technology to engage the community by sharing information more effectively and efficiently across the organization and with the community.						
Hazards Mitigated:	Landslide, Earthquake, Severe Storms, Severe Weather, Dam Failure, Flooding, Wildfire, Drought					
New & Existing	1, 7, 8, 17	PVRPD	None	Low	FMA, General Fund	Short-Term
Action PLV-7—Develop a drought contingency plan incorporating utilizing drought-resistant landscapes on District-owned facilities.						
Hazards Mitigated:	Drought					
New & Existing	4, 5, 11, 13, 14, 15, 19	PVRPD	None	Low	HMGP, BRIC, FMA, General Fund	Short-Term
Action PLV-8—Train emergency responders and develop a strategy to take advantage of pre- and post-disaster opportunities. Educate employees and elected officials on the potential hazard exposures and emergency response protocol.						
Hazards Mitigated:	Landslide, Earthquake, Severe Storms, Severe Weather, Dam Failure, Flooding, Wildfire, Drought					
New & Existing	1, 4, 8	PVRPD	None	Medium	HMGP, BRIC, FMA, General Funds	Short-term
Action PLV-9—Create and maintain defensible space around District structures and infrastructure.						
Hazards Mitigated:	Wildfire, Landslide					
New & Existing	4, 5, 11, 13	PVRPD	None	Medium	HMGP, BRIC, General Funds	Short-term
Action PLV-10—Use performance metrics and data to evaluate and monitor impacts of climate change and natural hazard risk reduction strategies on public health and social equity						
Hazards Mitigated:	Landslide, Earthquake, Severe Storms, Severe Weather, Dam Failure, Flooding, Wildfire, Drought					
New	1, 2, 4, 15, 19	PVRPD	None	Low	HMGP, BRIC, FMA, General Fund	Short-Term

a. Short-term = Completion within 5 years; Long-term = Completion within 10 years; Ongoing= Continuing new or existing program with no completion date

Acronyms used here are defined at the beginning of this volume.

Table 18-12. Mitigation Action Priority

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Cost?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Implementation Priority[a]	Grant Pursuit Priority[a]
1	10	High	High	Yes	Yes	No	Medium	High
2	5	Medium	Low	Yes	No	Yes	High	Low
3	3	High	High	Yes	Yes	No	Medium	High
4	3	Medium	Low	Yes	Yes	Yes	High	Medium
5	3	Medium	High	No	Yes	No	Low	Medium
6	4	Low	Low	Yes	Yes	No	Medium	Medium
7	7	Medium	Low	Yes	Yes	Yes	High	Medium
8	3	Medium	Medium	Yes	Yes	Yes	High	Medium
9	4	High	Medium	Yes	Yes	Yes	High	High
10	5	Low	Low	Yes	Yes	Yes	High	Medium

a. See the introduction to this volume for explanation of priorities.

Table 18-13. Analysis of Mitigation Actions

Hazard Type	Action Addressing Hazard, by Mitigation Type[a]							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilient	Community Capacity Building
High-Risk Hazards								
Landslide	PLV-2, 4, 5, 10	PLV-1, 2, 4, 5, 10	PLV-6, 8, 9, 10	PLV-2, 5, 7, 9, 10	PLV-3, 4, 6, 8, 10	PLV-1, 2, 5, 9, 10	PLV-2, 7, 10	PLV-2, 4, 6, 8, 10
Earthquake	PLV-2, 4, 5, 10	PLV-1, 2, 4, 5, 10	PLV-6, 8, 10	PLV-2, 5, 10	PLV-3, 4, 6, 8, 10	PLV-1, 2, 5, 10	PLV-2, 7, 10	PLV-2, 4, 6, 8, 10
Medium-Risk Hazards								
Severe Storms	PLV-2, 4, 5, 10	PLV-2, 4, 5, 10	PLV-6, 8, 10	PLV-2, 5, 10	PLV-3, 4, 6, 8, 10	PLV-2, 5, 10	PLV-2, 7, 10	PLV-2, 4, 6, 8, 10
Severe Weather	PLV-2, 4, 5, 10	PLV-2, 4, 5, 10	PLV-6, 8, 10	PLV-2, 5, 10	PLV-3, 4, 6, 8, 10	PLV-2, 5, 10	PLV-2, 7, 10	PLV-2, 4, 6, 8, 10
Dam Failure	PLV-2, 4, 5, 10	PLV-2, 4, 5, 10	PLV-6, 8, 10	PLV-2, 5, 10	PLV-3, 4, 6, 8, 10	PLV-2, 5, 10	PLV-2, 7, 10	PLV-2, 4, 6, 8, 10
Flooding	PLV-2, 4, 5, 10	PLV-2, 4, 5, 10	PLV-6, 8, 10	PLV-2, 5, 10	PLV-3, 4, 6, 8, 10	PLV-2, 5, 10	PLV-2, 7, 10	PLV-2, 4, 6, 8, 10
Low-Risk Hazards								
Wildfire	PLV-2, 4, 5, 7, 10	PLV-2, 4, 5, 7, 10	PLV-6, 8, 9, 10	PLV-2, 5, 7, 9, 10	PLV-3, 4, 6, 8, 10	PLV-2, 5, 9, 10	PLV-2, 7, 10	PLV-2, 4, 6, 8, 10
Drought	PLV-2, 4, 5, 10	PLV-2, 4, 5, 10	PLV-6, 8, 9, 10	PLV-2, 5, 7, 10	PLV-3, 4, 6, 8, 10	PLV-2, 5, 9, 10	PLV-2, 7, 10	PLV-2, 4, 6, 7, 8, 10

a. See the introduction to this volume for explanation of mitigation types.

18.8 INFORMATION SOURCES USED FOR THIS ANNEX

The following technical reports, plans, and regulatory mechanisms were reviewed to provide information for this annex.

- **PVRPD Fee Schedule**—Fee schedule is used to determine the pricing for District indoor and outdoor facilities.
- **PVRPD Capital Improvement Plan**—Capital Improvement Plan is used to plan projects as the community grows and changes. The plan can also be adapted to include projects to mitigate hazards if needed. It was reviewed while developing the action plan for this annex.
- **PVRPD American with Disabilities Act Transition Plan**—Americans with Disabilities Act Plan is part of the FY21-22 budget. Plan will help District identify and correct barriers that limit access to programs, services, and activities by persons with disabilities. It was reviewed while developing the action plan for this annex.

The following outside resources and references were reviewed:

- **Hazard Mitigation Plan Annex Development Toolkit**—The toolkit was used to support the identification of past hazard events and noted vulnerabilities, the risk ranking, and the development of the mitigation action plan.

19. SATICOY SANITARY DISTRICT

19.1 LOCAL HAZARD MITIGATION PLANNING TEAM

Primary Point of Contact
Tim Doyle, Engineering Analyst
1001 Partridge Drive, Suite 150
Ventura, California 93003-0704
Telephone: 805-658-4606
e-mail Address: tim.doyle@theprdgroup.net

Alternate Point of Contact
Mark Norris, General Manager
1001 Partridge Drive, Suite 150
Ventura, California 93003-0704
Telephone: 805-658-4621
e-mail Address: marknorris@vrsd.com

This annex was developed by the local hazard mitigation planning team, whose members are listed in Table 19-1.

Table 19-1. Local Hazard Mitigation Planning Team Members

Name	Title
Tim Doyle	Engineering Analyst
Mark Norris	General Manager
Richard Jones	Operations Manager
Alvertina Rivera	Director of Finance

19.2 JURISDICTION PROFILE

19.2.1 Overview

The Saticoy Sanitary District is a special district created in 1941 to provide wastewater (sewer) service. A five-member elected Board of Directors governs the District. The Board assumes responsibility for the adoption of this plan; the General Manager will oversee its implementation. The District currently has no employees and contracts via Ventura Regional Sanitation District for its administrative and operational work with direct contracts for the General Manager and Engineering Analyst services. Funding comes primarily through sewer service rates.

19.2.2 Service Area

The Saticoy Sanitary District serves an unincorporated area of the County of Ventura with the City of Ventura to the west. The current total service area is 0.35 square miles. As of May 30, 2021, the District serves approximately 3,600 wastewater customers through 292 parcels located within the District.

19.2.3 Assets

Table 19-2 summarizes the assets of the District and their value.

Table 19-2. Special-Purpose District Assets

Asset	Value
Property	
4.88 acres of land	$390,500
Equipment	
Total length of WW pipe—4.4 miles ($2.11M/mile, includes varied sizes 6”-16”and manholes)	$9,292,800
Emergency Diesel Generator	$40,000
Three high-capacity wastewater pumps	$30,000
Four 3-hp blower/pump motors	$20,000
Total:	***$9,382,800***
Critical Facilities	
WW Treatment Plant—1419 Lirio St.	$5,223,400
Total:	***$5,223,400***

19.3 CURRENT TRENDS

The District only serves the unincorporated community of Saticoy. Population within the service has remained stable over the past 5 years and there have been no new developments within the District. There are 45 vacant parcels that could have dwelling units built there but the District has no information on any future plans. There is no potential expansion of the District’s boundaries.

19.4 CAPABILITY ASSESSMENT

This section describes an assessment of existing capabilities for implementing hazard mitigation strategies. The introduction at the beginning of this volume of the hazard mitigation plan describes the components included in the capability assessment and their significance for hazard mitigation planning.

Findings of the capability assessment were reviewed to identify opportunities to expand, initiate or integrate capabilities to further hazard mitigation goals and objectives. Where such opportunities were identified and determined to be feasible, they are included in the action plan. The “Analysis of Mitigation Actions” table in this annex identifies these as community capacity building mitigation actions. The findings of the assessment are presented as follows:

- An assessment of planning and regulatory capabilities is presented in Table 19-3.
- An assessment of fiscal capabilities is presented in Table 19-4.
- An assessment of administrative and technical capabilities is presented in Table 19-5.
- An assessment of education and outreach capabilities is presented in Table 19-6.
- Classifications under various community mitigation programs are presented in Table 19-7.
- The community’s adaptive capacity for the impacts of climate change is presented in Table 19-8.

Table 19-3. Planning and Regulatory Capability

Plan, Study or Program	Date of Most Recent Update	Comment
CA Cease and Desist Order (R4-2013-0098)	2013	
Waste Discharge Requirement (R4-2013-0092)	2013	
Emergency Response Plan	2019	
Rules and Regulations for the Sewage Collection System	1989	
Sewer System Management Plan	2015	
Ordinance SSD-14 Sewer Policy	2021	

Table 19-4. Fiscal Capability

Financial Resource	Accessible or Eligible to Use?
Community Development Block Grants	Yes
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for Specific Purposes	No
User Fees for Water, Sewer, Gas or Electric Service *If yes, specify:* VC Tax Rolls	Yes
Incur Debt through General Obligation Bonds	No
Incur Debt through Special Tax Bonds	Yes
Incur Debt through Private Activity Bonds	No
Withhold Public Expenditures in Hazard-Prone Areas	No
State-Sponsored Grant Programs	Yes
Development Impact Fees for Homebuyers or Developers	Yes

Table 19-5. Administrative and Technical Capability

Staff/Personnel Resource	Available?
Planners or engineers with knowledge of land development and land management practices *If Yes, Department /Position:* Contractor	Yes
Engineers or professionals trained in building or infrastructure construction practices *If Yes, Department /Position:* Contractor	Yes
Planners or engineers with an understanding of natural hazards *If Yes, Department /Position:* Contractor	Yes
Staff with training in benefit-cost analysis *If Yes, Department /Position:* Contractor	Yes
Surveyors *If Yes, Department /Position:* Contractor	Yes
Personnel skilled or trained in GIS applications *If Yes, Department /Position:* Contractor	Yes
Scientist familiar with natural hazards in local area *If Yes, Department /Position:* Contractor	Yes
Emergency manager *If Yes, Department /Position:* General Manager or Operations Manager	Yes
Grant writers *If Yes, Department /Position:* Contractor	Yes

Table 19-6. Education and Outreach Capability

Criterion	Response
Do you have a public information officer or communications office?	No
Do you have personnel skilled or trained in website development?	No
Do you have hazard mitigation information available on your website?	No
Do you use social media for hazard mitigation education and outreach?	No
Do you have any citizen boards or commissions that address issues related to hazard mitigation?	No
Do you have any other programs in place that could be used to communicate hazard-related information?	No
Do you have any established warning systems for hazard events?	No

Table 19-7. Community Classifications

	Participating?	Classification	Date Classified
FIPS Code	No	N/A	N/A
DUNS#	Yes	149532686	N/A
Community Rating System	No	N/A	N/A
Building Code Effectiveness Grading Schedule	No	N/A	N/A
Public Protection	No	N/A	N/A
Storm Ready	No	N/A	N/A
Firewise	No	N/A	N/A
Tsunami Ready	No	N/A	N/A

Table 19-8. Adaptive Capacity for Climate Change

Criterion	Jurisdiction Rating[a]
Technical Capacity	
Jurisdiction-level understanding of potential climate change impacts *Comment:*	Low
Jurisdiction-level monitoring of climate change impacts *Comment:*	Low
Technical resources to assess proposed strategies for feasibility and externalities *Comment:*	Low
Jurisdiction-level capacity for development of greenhouse gas emissions inventory *Comment:*	Low
Capital planning and land use decisions informed by potential climate impacts *Comment:*	Low
Participation in regional groups addressing climate risks *Comment:*	Low
Implementation Capacity	
Clear authority/mandate to consider climate change impacts during public decision-making processes *Comment:*	Low
Identified strategies for greenhouse gas mitigation efforts *Comment:*	Low

Criterion	Jurisdiction Rating[a]
Identified strategies for adaptation to impacts ***Comment:***	Low
Champions for climate action in local government departments ***Comment:***	Low
Political support for implementing climate change adaptation strategies ***Comment:***	Low
Financial resources devoted to climate change adaptation ***Comment:*** *None*	Low
Local authority over sectors likely to be negative impacted ***Comment:***	Low
Public Capacity	
Local residents' knowledge of and understanding of climate risk ***Comment:***	Low
Local residents' support of adaptation efforts ***Comment:***	Low
Local residents' capacity to adapt to climate impacts ***Comment:*** *Unknown given the demographics but likely minimal*	Low
Local economy current capacity to adapt to climate impacts ***Comment:*** *Minimal since Saticoy is a severely disadvantaged community*	Low
Local ecosystems capacity to adapt to climate impacts ***Comment:***	Low

a. High = Capacity exists and is in use; Medium = Capacity may exist, but is not used or could use some improvement; Low = Capacity does not exist or could use substantial improvement; Unsure= Not enough information is known to assign a rating.

19.5 INTEGRATION REVIEW

For hazard mitigation planning, "integration" means that hazard mitigation information is used in other relevant planning mechanisms, such as capital facilities planning, and that relevant information from those sources is used in hazard mitigation. This section identifies where such integration is already in place, and where there are opportunities for further integration in the future. Resources listed at the end of this annex were used to provide information on integration. The progress reporting process described in Volume 1 of the hazard mitigation plan will document the progress of hazard mitigation actions related to integration and identify new opportunities for integration.

19.5.1 Existing Integration

Some level of integration has already been established between local hazard mitigation planning and the following other local plans and programs:

- **Capital Improvement Plan**—The capital improvement plan includes projects that can help mitigate potential hazards through rehabilitating key components. The District will act to ensure consistency between the hazard mitigation plan and the current and future capital improvement plans. The hazard mitigation plan may identify new possible funding sources for capital improvement projects and may result in modifications to proposed projects based on results of the risk assessment. Currently, the District utilizes the Department of Housing and Urban

Development CDBG program and is in the design phase for the State of California Prop1-TA Bond Program.

- **Emergency Response Plan**—The results of a risk assessment were used in the development of the emergency response plan and are so noted in the plan.

19.5.2 Opportunities for Future Integration

The capability assessment in this annex indicates opportunities to integrate this mitigation plan with other jurisdictional planning/regulatory capabilities. Capabilities were identified as integration opportunities if they can support or enhance the actions identified in this plan or be supported or enhanced by components of this plan. The capability assessment identified the following plans and programs that do not currently integrate hazard mitigation information but provide opportunities to do so in the future:

- **Capital Improvement Projects**—Capital improvement project proposals may take into consideration hazard mitigation potential as a means of evaluating project prioritization. But the critical criteria remains the risk assessment and needs prioritization coupled with funding availability.
- **Post-Disaster Recovery Plan**—The District does not have a recovery plan and intends to develop one as a mitigation planning action during the next five years. The plan will build on the mitigation goals and objectives identified in the mitigation plan.

Taking action to integrate each of these programs with the hazard mitigation plan was considered as a mitigation action to include in the action plan in this annex.

19.6 RISK ASSESSMENT

19.6.1 Jurisdiction-Specific Natural Hazard Event History

Table 19-9 lists past occurrences of natural hazards for which specific damage was recorded in this jurisdiction. Other hazard events that broadly affected the entire planning area, including this jurisdiction, are listed in the risk assessments in Volume 1 of this hazard mitigation plan.

Table 19-9. Past Natural Hazard Events

Type of Event	FEMA Disaster #	Date	Damage Assessment
COVID-19	DR-4482	January 20, 2020 Continuing	Ongoing
Atmospheric River Storm System	CA Disaster 109	January/February 2019	N/A
Wildfires, Flooding, Mudflows, and Debris Flows	DR-4353	December 4, 2017- January 31, 2018	N/A
Thomas Fire	4224-DR-CA	December 4, 2017	N/A
February Winter Storm	CA Disaster 77.1	February 2017	N/A
January Winter Storm	CA Disaster 77	January 2017	N/A
Tsunami (7.1 earthquake in Japan)		March 11, 2011	N/A
Tsunami (8.8 Quake in Chile)		February 27, 2010	N/A
Storm and Flood		January 18 – 22, 2010.	Unknown
Wildfires, Flooding, Mudflows, and Debris Flows	DR-1731	October 21 – March 31, 2008	Unknown

Type of Event	FEMA Disaster #	Date	Damage Assessment
Severe Storm	DR-1267	January 7 – 11, 2005	Unknown
Severe Storms/Flooding	DR-1577	January 2005	Unknown
"El Nino" Storm and Flood		February 1998	Unknown
Storms and Floods		January and March, 1995	Unknown
Northridge Earthquake	DR-1008	January 17 – November 30, 1994	Unknown
Storm and Flood		February 10-15, 1992	Unknown
Storm and Flood		February 25-March 3, 1983	Unknown
Storm and Flood		February 13-22, 1980	Unknown
Sespe Creek Flood		March 4, 1978	Unknown
Storms and Floods (Calleguas Creek Flood)		February 28-March 5, 1978	Unknown
Severe Storms/Flooding	DR-211	January 1969	Unknown

19.6.2 Hazard Risk Ranking

Table 19-10 presents a local ranking of all hazards of concern for which this hazard mitigation plan provides complete risk assessments. As described in detail in Volume 1, the ranking process involves an assessment of the likelihood of occurrence for each hazard, along with its potential impacts on people, property, and district operations. Mitigation actions primarily target hazards with high and medium rankings.

Table 19-10. Hazard Risk Ranking

Rank	Hazard	Risk Ranking Score	Risk Category
1	Earthquake	36	High
1	Flooding	36	High
2	Landslide	24	Medium
2	Dam Failure	24	Medium
2	Severe Weather	24	Medium
2	Severe Storms	24	Medium
3	Wildfire	15	Low
3	Sea Level Rise	15	Low
3	Tsunami	15	Low
4	Drought	9	Low

19.6.3 Jurisdiction-Specific Vulnerabilities

Volume 1 of this hazard mitigation plan provides complete risk assessments for each identified hazard of concern. The following jurisdiction-specific issues have been identified based on a review of the results of the risk assessment, public involvement strategy, and other available resources:

- With 80% of the District's facilities underground (wastewater pipelines, storage tanks), the Risk Ranking Score for earthquake was elevated from the County level of 24 to 36.
- Structural stability for the above ground facilities and piping to retard flooding damage.

Mitigation actions addressing these issues were prioritized for consideration in the action plan in this annex.

19.7 HAZARD MITIGATION ACTION PLAN

Table 19-11 lists the actions that make up the hazard mitigation action plan for this jurisdiction. Table 19-12 identifies the priority for each action. Table 19-13 summarizes the mitigation actions by hazard of concern and mitigation type.

Table 19-11. Hazard Mitigation Action Plan Matrix

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action SAT-1—Where appropriate, support retrofitting, rehabilitation, or relocation of structures located in potential hazard areas, prioritizing those that have experienced repetitive losses and/or are located in high- or medium-risk hazard areas.						
Hazards Mitigated:	Dam Failure, Earthquake, Flooding, Landslide, Severe Weather, Sea Level, Tsunami					
Existing	2, 6, 9, 11	Saticoy SD	N/A	High	Grant Funding- FEMA HMA (BRIC, FMA, HMGP)	Short-term
Action SAT-2—Actively participate in the plan maintenance protocols outlined in Volume 1 of this hazard mitigation plan.						
Hazards Mitigated:	Earthquake, Flooding, Landslide, Dam Failure, Severe Weather, Severe Storms, Wildfire, Drought					
New & Existing	2, 8, 11, 19	Saticoy SD	N/A	Low	General Funds	Short-term
Action SAT-3—Purchase generator for treatment plant that lacks adequate backup power.						
Hazards Mitigated:	Dam Failure, Earthquake, Flooding, Landslide, Severe Weather, Tsunami					
New & Existing	2, 7, 8	Saticoy SD	N/A	Medium	CIP & Grant Funding- FEMA HMA (BRIC, HMGP)	Short-term
Action SAT-4—Develop a post disaster action plan that includes assistance with grant fund writing, debris removal components, and warehousing of critical infrastructure components.						
Hazards Mitigated:	Dam Failure, Earthquake, Flooding, Landslide, Severe Weather, Sea Level, Tsunami					
Existing	2, 8, 19	Saticoy SD	N/A	Medium	General Funds & Grant Funding- FEMA HMA (BRIC, FMA, HMGP)	Ongoing

a. Short-term = Completion within 5 years; Long-term = Completion within 10 years; Ongoing= Continuing new or existing program with no completion date

Acronyms used here are defined at the beginning of this volume.

Table 19-12. Mitigation Action Priority

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Cost?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Implementation Priority[a]	Grant Pursuit Priority[a]
SAT-1	4	High	High	Yes	Yes	No	Medium	High
SAT-2	4	Medium	Low	Yes	No	Yes	High	Low
SAT-3	3	High	Medium	Yes	Yes	No	Medium	High
SAT-4	3	Medium	Medium	Yes	Yes	No	Medium	Medium

a. See the introduction to this volume for explanation of priorities.

Table 19-13. Analysis of Mitigation Actions

Hazard Type	Action Addressing Hazard, by Mitigation Type[a]							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilient	Community Capacity Building
High-Risk Hazards								
Earthquake		SAT-1	SAT-2		SAT-3, 4	SAT-1		SAT-2, 4
Flooding	SAT-1	SAT-1	SAT-2		SAT-3, 4	SAT-1		SAT-2, 4
Medium-Risk Hazards								
Landslide		SAT-1	SAT-2		SAT-3, 4	SAT-1		SAT-2, 4
Dam Failure		SAT-1	SAT-2		SAT-3, 4	SAT-1		SAT-2, 4
Severe weather/storms	SAT-1	SAT-1	SAT-2		SAT-3, 4	SAT-1		SAT-2, 4
Low-Risk Hazards								
Wildfire	SAT-1	SAT-1	SAT-2		SAT-3, 4	SAT-1		SAT-2, 4
Drought								SAT-2, 4

a. See the introduction to this volume for explanation of mitigation types.

19.8 INFORMATION SOURCES USED FOR THIS ANNEX

The following technical reports, plans, and regulatory mechanisms were reviewed to provide information for this annex.

- **5-year CIP** was reviewed to determine if the risk assessment and hazard mitigation factors could be comingled and used to develop a more structured needs base.
- **The Los Angeles Regional Water Quality Control Board (RWQCB) Cease and Desist Order** was instrumental to prioritize the hazards the District faces due to certain system deficiencies caused by an aging infrastructure and vulnerabilities if not corrected.
- The District reviewed its **Waste Discharge Permit** and **Emergency Response Plan** along with the **Threat Assessment Matrix** to ensure that the incorporation of a Hazard Mitigation Plan could be achieved and implemented accordingly.

The following outside resources and references were reviewed:

- **Hazard Mitigation Plan Annex Development Toolkit**—The toolkit was used to support the identification of past hazard events and noted vulnerabilities, the risk ranking, and the development of the mitigation action plan. This will be incorporated as the District moves along in this process.

20. TRIUNFO WATER & SANITATION DISTRICT

20.1 LOCAL HAZARD MITIGATION PLANNING TEAM

Primary Point of Contact
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This annex was developed by the local hazard mitigation planning team, whose members are listed in Table 20-1.

Table 20-1. Local Hazard Mitigation Planning Team Members

Name	Title
Timothy Doyle	Engineering Program Manager
Mark Norris	General Manager
Richard Jones	Operations Manager
Vickie Dragan	Director of Finance
Chi Hermann	Administrative Program Manager

20.2 JURISDICTION PROFILE

20.2.1 Overview

The Triunfo Water & Sanitation District is a special district created in 1963 to provide wastewater (sewer) service. The District expanded its service to the community in 1993 with the purchase of the Metropolitan Water Company located within the District's boundaries in Oak Park. A five-member elected Board of Directors governs the District. The Board assumes responsibility for the adoption of this plan; the General Manager will oversee its implementation. The District currently has 9 employees and contracts via Ventura Regional Sanitation District for its operational services. Funding comes primarily through potable water and sewer service rates.

20.2.2 Service Area and Trends

Covering a service area of approximately 50 square miles, the District provides wastewater collection and treatment services to more than 30,000 people in Oak Park, Lake Sherwood, Bell Canyon, and the

Westlake Village and North Ranch portions of Thousand Oaks. Triunfo also supplies potable water to more than 14,000 people in Oak Park.

20.2.3 Assets

Table 20-2 summarizes the assets of the District and their value.

Table 20-2. Special-Purpose District Assets

Asset	Value
Property	
7.17 acres of land	$573,900
Equipment	
Total length of PW pipe—49 miles ($2.1M/mile, includes varied sizes 6”-30”and valves/PRVs)	$102,900,000
Total length of WW pipe—129 miles ($2.3M/mile, includes varied sizes 6”-18”and manholes)	$296,700,000
Emergency Diesel Generators (7 generators with varied KVA output)	$385,000
SCADA System	$200,000
Total:	***$400,758,900***
Critical Facilities	
Oak Canyon Reservoir 2.4 MG, 1115 Kanan Rd, 91377	$8,100,000
Deerhill Reservoir 2.2 MG, 990-1/2 Lambourne Ct, 91377	$2,690,000
Savoy Reservoir 1.6 MG, 322-1/2 Savoy Ct, 91377	$1,783,000
Kilburn Reservoir 0.86 MG, 4997 Kilburn Ct, 91377	$877,000
Deerhill Pump Station, 5000 Bishopwood Ln, 91377	$2,700,000
Lindero Pump Station, 753 Lindero Canyon Rd, 91377	$495,800
Savoy Pump Station, 322-1/2 Savoy Ct, 91377	$882,000
Lambourne Booster Station, 990-1/2 Lambourne Ct, 91377	$75,000
Smoketree Booster Station, 6613 Smoketree Ave, 91377	$75,000
Bell Canyon Lift Station, 62-1/2 Buckskin Rd, 91307	$532,200
Carlisle Lift Station, 2845 Calbourne Ln, 91361	$574,000
Lakeside Lift Station, 654 Lake Sherwood Dr, 91361	$195,000
North Ranch Lift Station, Country Valley Rd & Meadow Grove, 91362	$170,000
Polo Lift Station, E. Potrero Rd & Polo St, 91361	$150,000
Westlake Lift Station, Triunfo Canyon & Westshore Ln, 91361	$150,000
Total:	***$19,449,000***

20.3 CURRENT TRENDS

Population within the District’s service area has remained relatively stable over the past 5 years and there have been no new major developments within the District. Although Oak Park is basically built-out, there remain portions of Lake Sherwood, Bell Canyon, and the Westlake area that have parcels available for residential dwellings. These parcels are being slowly developed with approximately 5-7 new homes per year. In addition, there are ADU (Accessory Dwelling Unit) improvements to 2-3 parcels per year. There is no potential expansion of the District’s boundaries.

20.4 CAPABILITY ASSESSMENT

This section describes an assessment of existing capabilities for implementing hazard mitigation strategies. The introduction at the beginning of this volume of the hazard mitigation plan describes the components included in the capability assessment and their significance for hazard mitigation planning.

Findings of the capability assessment were reviewed to identify opportunities to expand, initiate or integrate capabilities to further hazard mitigation goals and objectives. Where such opportunities were identified and determined to be feasible, they are included in the action plan. The "Analysis of Mitigation Actions" table in this annex identifies these as community capacity building mitigation actions. The findings of the assessment are presented as follows:

- An assessment of planning and regulatory capabilities is presented in Table 20-3.
- An assessment of fiscal capabilities is presented in Table 20-4.
- An assessment of administrative and technical capabilities is presented in Table 20-5.
- An assessment of education and outreach capabilities is presented in Table 20-6.
- Classifications under various community mitigation programs are presented in Table 20-7.
- The community's adaptive capacity for the impacts of climate change is presented in Table 20-8.

Table 20-3. Planning and Regulatory Capability

Plan, Study or Program	Date of Most Recent Update	Comment
Urban Water Management Plan	2015	2020 version pending
Emergency Response Plan	2015	2020 version pending
Rules and Regulations for the Sewage Collection System	1989	
Ordinance TSD-202 Sewer Pretreatment Policy	2021	
Sewer System Management Plan	2015	

Table 20-4. Fiscal Capability

Financial Resource	Accessible or Eligible to Use?
Community Development Block Grants	Yes
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for Specific Purposes	No
User Fees for Water, Sewer, Gas or Electric Service *If yes, specify:* VC Tax Rolls	Yes
Incur Debt through General Obligation Bonds	No
Incur Debt through Special Tax Bonds	Yes
Incur Debt through Private Activity Bonds	No
Withhold Public Expenditures in Hazard-Prone Areas	No
State-Sponsored Grant Programs	Yes
Development Impact Fees for Homebuyers or Developers	Yes

Table 20-5. Administrative and Technical Capability

Staff/Personnel Resource	Available?
Planners or engineers with knowledge of land development and land management practices *If Yes, Department /Position:* Contractor	Yes
Engineers or professionals trained in building or infrastructure construction practices *If Yes, Department /Position:* Administrative Dept./Contractor	Yes
Planners or engineers with an understanding of natural hazards *If Yes, Department /Position:* Administrative Dept./Contractor	Yes
Staff with training in benefit-cost analysis *If Yes, Department /Position:* Finance Dept.	Yes
Surveyors *If Yes, Department /Position:* Contractor	Yes
Personnel skilled or trained in GIS applications *If Yes, Department /Position:* Administrative Dept./Contractor	Yes
Scientist familiar with natural hazards in local area *If Yes, Department /Position:* Contractor	Yes
Emergency manager *If Yes, Department /Position:* General Manager or Operations Manager	Yes
Grant writers *If Yes, Department /Position:* Contractor	Yes
Other *If Yes, Department /Position:* As needed	Yes

Table 20-6. Education and Outreach Capability

Criterion	Response
Do you have a public information officer or communications office?	Yes
Do you have personnel skilled or trained in website development?	Yes
Do you have hazard mitigation information available on your website?	No
Do you use social media for hazard mitigation education and outreach? *If yes, briefly describe:* Have social media but not currently used for hazard mitigation outreach	Pending
Do you have any citizen boards or commissions that address issues related to hazard mitigation?	No
Do you have any other programs in place that could be used to communicate hazard-related information?	No
Do you have any established warning systems for hazard events? *If yes, briefly describe:* Reverse 911/email/social media	Yes

Table 20-7. Community Classifications

	Participating?	Classification	Date Classified
FIPS Code	No	N/A	N/A
DUNS#	Yes	156-168205	N/A
Community Rating System	No	N/A	N/A
Building Code Effectiveness Grading Schedule	No	N/A	N/A
Public Protection	No	N/A	N/A
Storm Ready	No	N/A	N/A
Firewise	No	N/A	N/A
Tsunami Ready	No	N/A	N/A

Table 20-8. Adaptive Capacity for Climate Change

Criterion	Jurisdiction Rating[a]
Technical Capacity	
Jurisdiction-level understanding of potential climate change impacts	Low
Comment:	
Jurisdiction-level monitoring of climate change impacts	Low
Comment:	
Technical resources to assess proposed strategies for feasibility and externalities	Low
Comment:	
Jurisdiction-level capacity for development of greenhouse gas emissions inventory	Low
Comment:	
Capital planning and land use decisions informed by potential climate impacts	Low
Comment:	
Participation in regional groups addressing climate risks	Low
Comment:	
Implementation Capacity	
Clear authority/mandate to consider climate change impacts during public decision-making processes	Low
Comment:	
Identified strategies for greenhouse gas mitigation efforts	Low
Comment:	
Identified strategies for adaptation to impacts	Low
Comment:	
Champions for climate action in local government departments	Low
Comment:	
Political support for implementing climate change adaptation strategies	Low
Comment:	
Financial resources devoted to climate change adaptation	Low
Comment:	
Local authority over sectors likely to be negative impacted	Low
Comment:	
Public Capacity	
Local residents' knowledge of and understanding of climate risk	Medium
Comment: Triunfo customers are highly educated and involved with climate risk issues	
Local residents' support of adaptation efforts	Medium
Comment: District residents are highly supportive of measures to minimize risk and address climate issues	
Local residents' capacity to adapt to climate impacts	Medium
Comment: Being supportive of necessary changes posed by the District, residents are willing to cooperate, within reason, as requested by the Agency or other government entities.	
Local economy current capacity to adapt to climate impacts	Medium
Comment: Median income level is well above the State average giving additional resources to support needed changes to address impacts	
Local ecosystems capacity to adapt to climate impacts	Low
Comment:	

a. High = Capacity exists and is in use; Medium = Capacity may exist, but is not used or could use some improvement; Low = Capacity does not exist or could use substantial improvement; Unsure= Not enough information is known to assign a rating.

20.5 INTEGRATION REVIEW

For hazard mitigation planning, “integration” means that hazard mitigation information is used in other relevant planning mechanisms, such as capital facilities planning, and that relevant information from those sources is used in hazard mitigation. This section identifies where such integration is already in place, and where there are opportunities for further integration in the future. Resources listed at the end of this annex were used to provide information on integration. The progress reporting process described in Volume 1 of the hazard mitigation plan will document the progress of hazard mitigation actions related to integration and identify new opportunities for integration.

20.5.1 Existing Integration

Some level of integration has already been established between local hazard mitigation planning and the following other local plans and programs:

- **Capital Improvement Plan**—The capital improvement plan includes projects that can help mitigate potential hazards through rehabilitating key components. The District will act to ensure consistency between the hazard mitigation plan and the current and future capital improvement plans. The hazard mitigation plan may identify new possible funding sources for capital improvement projects and may result in modifications to proposed projects based on results of the risk assessment.
- **Emergency Response Plan**—The results of a risk assessment were used in the development of the emergency response plan and are so noted in the plan.

20.5.2 Opportunities for Future Integration

The capability assessment in this annex indicates opportunities to integrate this mitigation plan with other jurisdictional planning/regulatory capabilities. Capabilities were identified as integration opportunities if they can support or enhance the actions identified in this plan or be supported or enhanced by components of this plan. The capability assessment identified the following plans and programs that do not currently integrate hazard mitigation information but provide opportunities to do so in the future:

- **Capital Improvement Projects**—Capital improvement project proposals may take into consideration hazard mitigation potential as a means of evaluating project prioritization. But the critical criteria remains the risk assessment and needs prioritization coupled with funding availability.
- **Post-Disaster Recovery Plan**—The District does not have a completed recovery plan and intends to fully develop one as a mitigation planning action during the next five years. The plan will build on the mitigation goals and objectives identified in the mitigation plan.

Taking action to integrate each of these programs with the hazard mitigation plan was considered as a mitigation action to include in the action plan in this annex.

20.6 RISK ASSESSMENT

20.6.1 Jurisdiction-Specific Natural Hazard Event History

Table 20-9 lists past occurrences of natural hazards for which specific damage was recorded in this jurisdiction Other hazard events that broadly affected the entire planning area, including this jurisdiction, are listed in the risk assessments in Volume 1 of this hazard mitigation plan.

Table 20-9. Past Natural Hazard Events

Type of Event	FEMA Disaster #	Date	Damage Assessment
COVID-19	DR-4482	January 20, 2020 Continuing	Ongoing
Hill Fire	DR 4407	11/8/18 -11/9/18	N/A
Winter Storm Event	DR 4353	12/4/17- 1/31/18	N/A
Springs Fire	DR 5024	5/2/13 – 5/11/13	N/A
Wildwood I Fire	N/A	1995	N/A
Wildfires	DR-4407	November 12, 2018	$404,424
Northridge Earthquake	DR-1008	January 17, 1994	N/A
Green Meadow Fire	N/A	10/26/93 – 11/3/93	N/A
Sherwood Fire	N/A	1985	N/A
Dayton Canyon Fire	N/A	October 25, 1982	N/A
Winter Storm Event	N/A	February 21, 1980	N/A
Winter Storm Event	N/A	February 15, 1978	N/A
Winter Storm Event	N/A	January 26, 1969	N/A

20.6.2 Hazard Risk Ranking

Table 20-10 presents a local ranking of all hazards of concern for which this hazard mitigation plan provides complete risk assessments. As described in detail in Volume 1, the ranking process involves an assessment of the likelihood of occurrence for each hazard, along with its potential impacts on people, property, and district operations. Mitigation actions primarily target hazards with high and medium rankings.

Table 20-10. Hazard Risk Ranking

Rank	Hazard	Risk Ranking Score	Risk Category
1	Earthquake	36	High
1	Wildfire	36	High
1	Landslide	36	High
2	Dam Failure	24	Medium
2	Severe weather/storms	24	Medium
3	Flooding	18	Medium
4	Drought	9	Low

20.6.3 Jurisdiction-Specific Vulnerabilities

Volume 1 of this hazard mitigation plan provides complete risk assessments for each identified hazard of concern. The following jurisdiction-specific issues have been identified based on a review of the results of the risk assessment, public involvement strategy, and other available resources:

- With 90% of the District's facilities underground (water and wastewater pipelines), the Risk Ranking Score for earthquake was elevated from the County level of 24 to 36.
- The Lake Sherwood Dam poses a direct threat to District facilities downstream of its location.

Mitigation actions addressing these issues were prioritized for consideration in the action plan in this annex.

20.7 HAZARD MITIGATION ACTION PLAN

Table 20-11 lists the actions that make up the hazard mitigation action plan for this jurisdiction. Table 20-12 identifies the priority for each action. Table 20-13 summarizes the mitigation actions by hazard of concern and mitigation type.

Table 20-11. Hazard Mitigation Action Plan Matrix

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action TRI-1—Where appropriate, support retrofitting, purchase or relocation of structures located in hazard areas, prioritizing those that have experienced repetitive losses and/or are located in high- or medium-risk hazard areas.						
Hazards Mitigated:	Dam Failure, Earthquake, Flooding, Landslide, Severe Weather, Wildfire					
Existing	2, 6, 9, 11	Triunfo WSD	N/A	High	Grant Funding- FEMA HMA (BRIC, FMA, HMGP)	Short-term
Action TRI-2—Actively participate in the plan maintenance protocols outlined in Volume 1 of this hazard mitigation plan.						
Hazards Mitigated:	Earthquake, Wildfire, Landslide, Dam Failure, Severe Weather, Storms, Flooding, Drought					
New & Existing	2, 8, 11, 19	Triunfo WSD	N/A	Low	General Funds, Staff Time	Short-term
Action TRI-3—Purchase generators for critical facilities that lack adequate backup power, including Savoy, Lambourne, and Smoketree Booster Stations.						
Hazards Mitigated:	Dam Failure, Earthquake, Flooding, Landslide, Severe Weather, Wildfire					
New & Existing	2, 7, 8	Triunfo WSD	N/A	Medium	CIP & Grant Funding- FEMA HMA (BRIC, HMGP)	Ongoing
Action TRI-4—Develop a post disaster action plan that includes grant funding, debris removal components, and warehousing of critical infrastructure components						
Hazards Mitigated:	Dam Failure, Earthquake, Wildfire, Flooding, Landslide, Severe Weather, Severe Storms					
Existing	2, 8, 19	Triunfo WSD	N/A	Medium	General Funds & Grant Funding- FEMA HMA (BRIC, FMA, HMGP)	Ongoing
Action TRI-5—Maintain wildfire hazard fuel reduction program for areas that have been identified with overgrown or dead brush, trees and weeds to reduce the potential for tree-to-tree ignition. Ensure that a "maintenance now" component to provide continued fire resistance is part of the program. (Coordinates with Ventura County Fire Protection District Action VFP-6)						
Hazards Mitigated:	Wildfire					
New & Existing	2, 4, 5, 6, 8, 10, 11, 13, 14, 15, 18, 19	VCFPD	Triunfo WSD, CAL FIRE & USDA	Medium	FEMA HMA (BRIC, FMAP and HMGP), Staff Time & General Funds	Ongoing
Action TRI-6—Acquire properties in high risk areas						
Hazards Mitigated:	Wildfire, Landslide, Severe Weather, Severe Storms					
New	5, 8, 11, 17	Triunfo WSD	N/A	Medium	Grant Funding- FEMA HMA (BRIC, FMA, HMGP)	Long-term

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action TRI-7—Slope stabilization and drainage control features around water reservoirs						
Hazards Mitigated: Landslide, Flooding, Severe Weather						
Existing	5, 9, 11, 14	Triunfo WSD	N/A	Medium	General Funds & Grant Funding-FEMA HMA (BRIC, FMA, HMGP)	Ongoing

a. Short-term = Completion within 5 years; Long-term = Completion within 10 years; Ongoing= Continuing new or existing program with no completion date

Acronyms used here are defined at the beginning of this volume.

Table 20-12. Mitigation Action Priority

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Cost?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Implementation Priority[a]	Grant Pursuit Priority[a]
TRI-1	4	High	High	Yes	Yes	No	Medium	High
TRI-2	4	Medium	Low	Yes	No	Yes	High	Low
TRI-3	3	High	Medium	Yes	Yes	No	Medium	High
TRI-4	3	Medium	Medium	Yes	Yes	No	Medium	Medium
TRI-5	12	High	Low	Yes	Yes	Yes	High	High
TRI-6	4	High	Medium	Yes	Yes	No	Medium	High
TRI-7	4	High	Medium	Yes	Yes	No	Medium	High

a. See the introduction to this volume for explanation of priorities.

Table 20-13. Analysis of Mitigation Actions

Hazard Type	Action Addressing Hazard, by Mitigation Type[a]							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilient	Community Capacity Building
High-Risk Hazards								
Earthquake		TRI-1	TRI-2	TRI-5	TRI-3, 4			TRI-2, 4
Wildfire	TRI-5, 6	TRI-1	TRI-2, 5	TRI-5, 6	TRI-3, 4		TRI-5	TRI-2, 4, 5
Landslide	TRI-6	TRI-1	TRI-2	TRI-5, 6, 7	TRI-3, 4	TRI-7		TRI-2, 4
Medium-Risk Hazards								
Dam Failure		TRI-1	TRI-2	TRI-5	TRI-3, 4			TRI-2, 4
Severe Weather	TRI-5, 6	TRI-1	TRI-2	TRI-5, 7	TRI-3, 4			TRI-2, 4
Severe Storms	TRI-5	TRI-1	TRI-2	TRI-5	TRI-4	TRI-7		TRI-2, 4
Flooding	TRI-5, 6	TRI-1	TRI-2	TRI-5, 7	TRI-3, 4	TRI-7		TRI-2, 4
Low-Risk Hazards								
Drought			TRI-2					TRI-2

a. See the introduction to this volume for explanation of mitigation types.

20.8 INFORMATION SOURCES USED FOR THIS ANNEX

The following technical reports, plans, and regulatory mechanisms were reviewed to provide information for this annex.

- **Capital Improvement Plans**—The 5-year and 10-year CIPs were reviewed to determine if the risk assessment and hazard mitigation factors could be comingled and used to develop a more structured needs base.
- The District reviewed its **Urban Water Management Plan**, **Emergency Response Plan** along with the **Threat Assessment Matrix**, and **District Ordinances** to ensure that the incorporation of a Hazard Mitigation Plan could be achieved and implemented accordingly.

The following outside resources and references were reviewed:

- **Hazard Mitigation Plan Annex Development Toolkit**—The toolkit was used to support the identification of past hazard events and noted vulnerabilities, the risk ranking, and the development of the mitigation action plan. This will continue to be utilized as the District moves along in this process.

21. UNITED WATER CONSERVATION DISTRICT

21.1 LOCAL HAZARD MITIGATION PLANNING TEAM

Primary Point of Contact
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This annex was developed by the local hazard mitigation planning team, whose members are listed in Table 21-1.

Table 21-1. Local Hazard Mitigation Planning Team Members

Name	Title
Brian Collins	Chief Operations Officer
Maryam Bral	Chief Engineer
Craig Morgan	Engineering Manager
Josh Perez	Human Resources Manager
Tony Huynh	Safety and Security Program Coordinator
John Carman	O&M Program Supervisor
Michel Kadah	Engineer
Adrian Quiroz	Associate Engineer

21.2 JURISDICTION PROFILE

21.2.1 Overview

Local landowners formed the Santa Clara River Water Conservation District in 1927. As cities and agricultural areas grew, water usage increased rapidly. By 1950, the district was reorganized and renamed the United Water Conservation District (UWCD). The mission of UWCD is to manage, protect, conserve and enhance the water resources of the Santa Clara River, its tributaries and associated aquifers, in the most cost effective and environmentally balanced manner. UWCD constructed the Santa Felicia Dam, three spreading grounds, and distribution facilities, all of which were urgently needed to combat seawater intrusion.

UWCD is governed by seven members elected Board of Directors, one elected from each of the seven district divisions. UWCD administers a “basin management” program for the Santa Clara Valley and

Oxnard Plain, using the surface flow of the Santa Clara River and its tributaries for replenishment of groundwater and owns and operates a number of facilities within its service area. UWCD currently employs a staff of 64. Funding comes primarily through rates and revenue bonds.

The Board of Directors assumes responsibility for the adoption of this plan; Mr. Mauricio E. Guardado Jr. (UWCD General Manager) will oversee its implementation.

21.2.2 Service Area

UWCD operates within the Santa Clara River Valley and the Oxnard Plain and covers approximately 335 square miles in central Ventura County. UWCD owns and operates a number of facilities to recharge the groundwater basins and enhance the water supplies within UWCD boundaries including: Santa Felicia Dam and Lake Piru Reservoir; Santa Felicia Dam hydroelectric power plant; the Piru Groundwater Recharge Basins; Freeman Diversion Facility; Saticoy Groundwater Recharge Basins (Saticoy, Noble, Rose and Ferro Basins); El Rio Groundwater Recharge Facilities and Wellfield and Water Treatment Plant (El Rio); the Pleasant Valley (PV) and Pumping Trough Pipeline (PTP) (surface water deliveries in-lieu of pumping), PV and PTP reservoirs, and the Oxnard Hueneme (OH) Pipeline system which delivers domestic potable water to the City of Oxnard, Port Hueneme Water Agency, Naval Base Ventura County, several mutual water companies and the El Rio School District.

21.2.3 Assets

Table 21-2 summarizes the assets of UWCD and their value.

Table 21-2. Special-Purpose District Assets

Asset	Value
Property	
3421 acres of land (including Lake Piru)	Unknown
Equipment	
43 UWCD owned vehicles(trucks and SUV's)	$1,720.000
1 ten yard dump truck	$110,089
1 2000 gallon water truck (estimated low value)	$85,000
1 CAT 300 SLR Excavator	$280,190
1 CAT 416C Backhoe	$75,021
1 CAT D6R Dozer	$279,000
1 CAT 613 Scrapper	$193,000
1 CAT 120H Motor Grader	$170,177
1 John Deere Skip Loader	$110,000
1 CAT Skid Steer	$39,000
12 Diesel Powered Emergency Generators (1 being Portable)	$1,200,000
4 Natural Gas Backup Booster Pumps	$1,510,000
17 water wells	$15,000,000
8 Miles of OH Pipeline (1.2 million per mile x 8) (Estimated low value)	$9,600,000
13 Miles of PTP Pipeline (1.2 million per mile x13) (Estimated low value)	$15,600,000
5 Miles of PV Pipeline (1.2 million per mile x 5) (Estimated low value)	$6,000,000
3 Miles of Lake Piru Campground Pipeline (1 million per mile estimated) (Estimated low value)	$3,000,000
Lake Piru Water Treatment Plant	$1,219,000

Asset	Value
Total:	***$56,190,477***
Critical Facilities	
Headquarter Building—1701 N. Lombard Street, Suite 200, Oxnard, CA 93030	$10,000,000
Santa Felicia Dam Hydroelectric Power Plant—3838 Piru Canyon Road, Piru, CA 93040	$630,000
Santa Felicia Dam—3838 Piru Canyon Road, Piru, CA 93040 (estimated low value)	$200,000,000
Freeman Diversion Facility—2641 W. Los Angeles Ave. Oxnard, CA 93036 (estimated low value)	$30,000,000
Saticoy Groundwater Recharge Basins—2641 W. Los Angeles Ave. Oxnard, CA 93036	Unknown
El Rio Groundwater Recharge Basins– 3651 N. Rose Avenue, Oxnard, CA 93036	Unknown
Piru Groundwater Recharge Basin	Unknown
Lake Piru Reservoir	Unknown
Lake Piru Recreation Area—4780 Piru Canyon Road, Piru, CA 93040	Unknown
Pleasant Valley (PV) and Pumping Trough (PTP) irrigation pipelines –	$21,600,000
Oxnard-Hueneme booster plant system (OH System)	$4,527,000
Total:	***$266,757,000***

21.3 CURRENT TRENDS

Originally formed as the Santa Clara Water Conservation District in 1927, voters approved the formation of United Water Conservation District in 1950. UWCD was formed to conserve and enhance water resources of the Santa Clara River. UWCD operates in the Santa Clara River Valley and the Oxnard Plain and covers 214,000 acres in central Ventura County that typically receives from 12 to 20 inches of rainfall each year.

Over the years, UWCD has constructed numerous facilities, pipelines, and recharge basins, including the Santa Felicia Dam, Lake Piru Reservoir and Freeman Diversion, to enhance the local water system and maintain sustainable water management. Today, UWCD diverts Santa Clara River surface water to recharge groundwater basins or for use in-lieu of groundwater pumping by agricultural operations on the Oxnard Plain and in Pleasant Valley basin. Groundwater recharged at United's Saticoy and El Rio facilities (in the Oxnard Forebay) over the last thirty years has averaged approximately 46, 400 acre-feet per year (AFY). During the same period, surface water deliveries have averaged approximately 13, 200 AF/yr. Lake Piru receives approximately 65,000 visitors per year, with peak season between the months of April 1st to September 15. In 2021, UWCD took over operations from the previous concessionaire, and Lake Piru welcomed to date 34,600 visitors, with daily average of 1,533 guests per day since the lake re-opened from the COVID-19 closure.

21.4 CAPABILITY ASSESSMENT

This section describes an assessment of existing capabilities for implementing hazard mitigation strategies. The introduction at the beginning of this volume of the hazard mitigation plan describes the components included in the capability assessment and their significance for hazard mitigation planning.

Findings of the capability assessment were reviewed to identify opportunities to expand, initiate or integrate capabilities to further hazard mitigation goals and objectives. Where such opportunities were identified and determined to be feasible, they are included in the action plan. The "Analysis of Mitigation Actions" table in this annex identifies these as community capacity building mitigation actions. The findings of the assessment are presented as follows:

- An assessment of planning and regulatory capabilities is presented in Table 21-3.
- An assessment of fiscal capabilities is presented in Table 21-4.
- An assessment of administrative and technical capabilities is presented in Table 21-5.
- An assessment of education and outreach capabilities is presented in Table 21-6.
- Classifications under various community mitigation programs are presented in Table 21-7.
- The community's adaptive capacity for the impacts of climate change is presented in Table 21-8.

Table 21-3. Planning and Regulatory Capability

Plan, Study or Program	Date of Most Recent Update	Comment
Santa Felicia Dam Emergency Action Plan (EAP)	July 16, 2021	Approved by Cal OES on September 2, 2021
Santa Felicia Dam Security Plan	June 30, 2021	
Oxnard Hueneme System Emergency Response Plan (per America's Water Infrastructure Act, EPA)	March 15, 2021	Submitted to the U.S. EPA and the State Water Resources Control Board, Division of Drinking Water
Aqueous Ammonia Storage, California Accidental Release Prevention Program (CalARP)	June 2019	
Chlorine & Aqueous Ammonia Treatment Systems CalARP Seismic Assessment	May 2019	
Chlorine & Aqueous Ammonia Injection System, Process Hazard Analysis Report	May 21, 2019	

Table 21-4. Fiscal Capability

Financial Resource	Accessible or Eligible to Use?
Community Development Block Grants	No
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for Specific Purposes	Yes
User Fees for Water, Sewer, Gas or Electric Service ***If yes, specify:*** Only groundwater extraction fees	Yes
Incur Debt through General Obligation Bonds	No
Incur Debt through Special Tax Bonds	No
Incur Debt through Private Activity Bonds	Yes
Withhold Public Expenditures in Hazard-Prone Areas	No
State-Sponsored Grant Programs	Yes
Development Impact Fees for Homebuyers or Developers	No

Table 21-5. Administrative and Technical Capability

Staff/Personnel Resource	Available?
Planners or engineers with knowledge of land development and land management practices	No
Engineers or professionals trained in building or infrastructure construction practices ***If Yes, Department /Position:*** Engineering and Water Resources Department/ Engineers	Yes
Planners or engineers with an understanding of natural hazards ***If Yes, Department /Position:*** Engineering and Water Resources Department/ Engineers and Hydrogeologists	Yes
Staff with training in benefit/cost analysis ***If Yes, Department /Position:*** Finance Department and Engineering Department/ Accountants and Engineers	Yes
Surveyors ***If Yes, Department /Position:*** Engineering Department /Provided through retention of external vendors	Yes
Personnel skilled or trained in GIS applications ***If Yes, Department /Position:*** Engineering and Water Resources Department/ GIS Analysts	Yes
Scientist familiar with natural hazards in local area ***If Yes, Department /Position:*** Engineering and Water Resources Department/ Hydrogeologists	Yes
Emergency manager ***If Yes, Department /Position:*** Engineering/Chief Engineer Operations and Maintenance (O&M)/Chief Operations Officer Lake Piru Park Rangers/Chief Park Ranger	Yes
Grant writers ***If Yes, Department /Position:*** Engineering and Water Resources Department /Provided through retention of external vendors	Yes
Other: Environmental and Biologist ***If Yes, Department /Position:*** Environmental Services Department/ Environmental Scientists	Yes

Table 21-6. Education and Outreach Capability

Criterion	Response
Do you have a public information officer or communications office?	Yes
Do you have personnel skilled or trained in website development? Provided through retention of contractors	No
Do you have hazard mitigation information available on your website?	No
Do you use social media for hazard mitigation education and outreach?	No
Do you have any citizen boards or commissions that address issues related to hazard mitigation?	No
Do you have any other programs in place that could be used to communicate hazard-related information? ***If yes, briefly describe:*** Through the annual EAP seminars; and participation in the Association of Water Agencies Ventura County.	Yes
Do you have any established warning systems for hazard events? ***If yes, briefly describe:*** A warning siren in the town of Piru. This is used to warn the residents of dam failure incidents. The siren is tested on the first Friday of each month. UWCD utilizes the County's VC Alert (Everbridge) system, including email, text, and voice options for immediate emergency notifications to a list of stakeholders included in the Santa Felicia Dam EAP notification flow charts and follow up manual phone calls. Four dam failure scenarios are included in the SFD inundation maps.	Yes

Table 21-7. Community Classifications

	Participating?	Classification	Date Classified
FIPS Code	No	N/A	N/A
DUNS#	Yes	121878094	N/A
Community Rating System	No	N/A	N/A
Building Code Effectiveness Grading Schedule	No	N/A	N/A
Public Protection	No	N/A	N/A
Storm Ready	No	N/A	N/A
Firewise	No	N/A	N/A
Tsunami Ready	No	N/A	N/A

Table 21-8. Adaptive Capacity for Climate Change

Criterion	Jurisdiction Rating[a]
Technical Capacity	
Jurisdiction-level understanding of potential climate change impacts	High
Comment: Wildfires, as a climate change indicator, may impact UWCD operations. Also, climate change could lead to a major storm, and the probability of having a Probable Maximum Flood (PMF) event. FEMA document titled "Selecting and Accommodating Inflow Design Floods for Dams" states that recent studies have been performed to estimate the impact of the climate change on the probable maximum precipitation and some climate models are consistent in showing increases of 10 percent every few decades that would correspond to 10 percent increases in probable maximum precipitation. The climate change (soil moisture, snowpack, temperature sequence, etc.) can influence on runoff and increase the likelihood of a large flood or Probable Maximum Flood (PMF) event. UWCD is in advancing the design of a number of modifications to the existing Santa Felicia Dam spillway to be able to safely pass the Inflow Design Flood (IDF), or the PMF determined for Santa Felicia Dam by the Department of Water Resources, Division of Safety of Dams (DSOD).	
Jurisdiction-level monitoring of climate change impacts	High
Comment: Rainfall and hydrology are monitored on regular basis, Groundwater basin management and monitoring through groundwater levels recording, evaporation monitoring, and sediment monitoring.	
Technical resources to assess proposed strategies for feasibility and externalities	High
Comment: Plan for drought resiliency projects and long term mitigation for climate change impacts.	
Jurisdiction-level capacity for development of greenhouse gas emissions inventory	Low
Comment: Performed by contractor in a limited capacity.	
Capital planning and land use decisions informed by potential climate impacts	Medium
Comment: Some of UWCD CIP projects are directly or indirectly addressing the climate change impacts.	
Participation in regional groups addressing climate risks	Medium
Comment: Member of the Watersheds Coalition of Ventura County.	
Implementation Capacity	
Clear authority/mandate to consider climate change impacts during public decision-making processes	Low
Comment: No mandate.	
Identified strategies for greenhouse gas mitigation efforts	Low
Comment: Fossil fuel energy optimization efficiency is in place.	
Identified strategies for adaptation to impacts	Medium
Comment: Regulatory mandated mitigation, water supply resiliency, and portfolio diversification.	
Champions for climate action in local government departments	Low
Comment: N/A	

Criterion	Jurisdiction Rating[a]
Political support for implementing climate change adaptation strategies	Low
Comment: N/A	
Financial resources devoted to climate change adaptation	Medium
Comment: Construction of the drought resilience Oxnard Hueneme Iron and Manganese Treatment Plant Project in 2021/2022.	
Local authority over sectors likely to be negative impacted	Medium
Comment: UWCD boundaries.	
Public Capacity	
Local residents' knowledge of and understanding of climate risk	Low
Comment: N/A	
Local residents' support of adaptation efforts	Low
Comment: N/A	
Local residents' capacity to adapt to climate impacts	Low
Comment: N/A	
Local economy current capacity to adapt to climate impacts	Low
Comment: N/A	
Local ecosystems capacity to adapt to climate impacts	Low
Comment: N/A	

a. High = Capacity exists and is in use; Medium = Capacity may exist, but is not used or could use some improvement; Low = Capacity does not exist or could use substantial improvement; Unsure= Not enough information is known to assign a rating.

21.5 INTEGRATION REVIEW

For hazard mitigation planning, "integration" means that hazard mitigation information is used in other relevant planning mechanisms, such as capital facilities planning, and that relevant information from those sources is used in hazard mitigation. This section identifies where such integration is already in place, and where there are opportunities for further integration in the future. Resources listed at the end of this annex were used to provide information on integration. The progress reporting process described in Volume 1 of the hazard mitigation plan will document the progress of hazard mitigation actions related to integration and identify new opportunities for integration.

21.5.1 Existing Integration

Some level of integration has already been established between local hazard mitigation planning and the following other local plans and programs:

- **Santa Felicia Dam Emergency Action Plan (EAP):** The EAP defines the UWCD staff responsibilities and provides procedures designed to identify unusual and unlikely conditions that may endanger Santa Felica Dam in time to take mitigation action and to notify the appropriate emergency management authorities and stakeholders of possible, impending, or actual failure of the dam. The EAP may also be used to provide notification when flood releases can create major flooding. The results of the Time-Sensitive Emergency Action Plan Assessment associated with the Santa Felicia Dam were used to develop the EAP.
- **Santa Felicia Dam Outlet Works Improvement:** The purpose of the Santa Felicia Dam Outlet Works Improvement project is to replace the existing outlet works because of concerns regarding seismic stability of the intake tower and conduit through the dam. UWCD conducted a

Seismic Deformation Analyses of Santa Felicia Dam on May 11, 2015 that indicated that the computed seismic deformations of the embankment are expected to be large enough to damage the outlet works conduit, and possibly compromise the safety of the dam. In addition, based on the 2015 and 2020 bathymetric surveys of Lake Piru Reservoir performed by UWCD, the sediment level near the existing intake was approximately only 4.1 feet below the intake sill. Based on the computed average annual rate of sediment level rise, the sediment may reach the intake sill in the near future and will become inoperable. The new outlet works system will mitigate ongoing accumulation of sediment in the reservoir and includes provisions for continued operation of the facility despite the future sediment buildup in the reservoir.

- **Santa Felicia Dam Probable Maximum Flood (PMF) Containment, Spillway Improvement Project:** The capacity of the existing spillway at Santa Felicia Dam is inadequate to pass the inflow design flood (IDF), which for the Santa Felicia Dam is the PMF. The Spillway Improvement Project includes modifications to the existing spillway to safely pass the IDF of 220,000 cfs, which is derived from hydrologic evaluations (HMR 58/59) performed by the DSOD and approved by the Federal Energy Regulatory Commission.

21.5.2 Opportunities for Future Integration

The capability assessment in this annex indicates opportunities to integrate this mitigation plan with other jurisdictional planning/regulatory capabilities. Capabilities were identified as integration opportunities if they can support or enhance the actions identified in this plan or be supported or enhanced by components of this plan. The capability assessment identified in the following plans and programs does not currently integrate hazard mitigation information but provides opportunities to do so in the future:

- **Coastal Brackish Groundwater Extraction and Treatment Project**: The project objectives are to combat further seawater intrusion in the Oxnard Plain and provide a local supply source that can help meet the groundwater sustainability goals of the Fox canyon Groundwater Management Agency.
- **Expansion of the Ferro Basin**: The project is to be used as a groundwater recharge basin to expand UWCD's recharge capacities.
- **Freeman Diversion Expansion**: The project allows UWCD to increase the instantaneous diversion rate to capture more water at the peak of the hydrograph. This is necessary in the respect that regulatory agencies are requiring more flow in the river on the receding limb of the hydrograph. Ultimately the expansion project will provide the opportunity to maintain historical surface water deliveries to the Oxnard Plain when available. The project is also to comply with an Endangered Species Act (ESA) settlement as well as a mitigation measure for the Multi-Species Habitat Conservation Plan.
- **Pumping Trough Pipeline (PTP) Recycled Water Connection:** A pipeline connection to UWCD's PTP system for the delivery of recycled water. The recycled water delivered to the PTP system can significantly reduce groundwater pumping in the PTP service area and Oxnard Plain.

Taking action to integrate each of these programs with the hazard mitigation plan was considered as a mitigation action to include in the action plan in this annex.

21.6 RISK ASSESSMENT

21.6.1 Jurisdiction-Specific Natural Hazard Event History

Table 21-9 lists past occurrences of natural hazards for which specific damage was recorded in this jurisdiction Other hazard events that broadly affected the entire planning area, including this jurisdiction, are listed in the risk assessments in Volume 1 of this hazard mitigation plan.

Table 21-9. Past Natural Hazard Events

Type of Event	FEMA Disaster #	Date	Damage Assessment
Holser Fire	N/A	August 17, 2020	Lake Piru Recreation Area operational impact
Lime Fire	N/A	June 10, 2020	Recreation Area operational impact
Maria Fire	FM-5302	November 1, 2019	Headquarter closer and Saticoy Facility operational impact
Thomas Fire	FM-5224	December 4, 2017	Power outage at El Rio Facility and operational impact
Flood	DR-1585	February 18, 2005	Debris at the upstream of SFD and landslide at the downstream
Severe Storms, Tornadoes, High Winds and Flooding	DR-1267	December 20 – 28, 1998	Not Available
Severe Winter Storms and Flooding	DR-1203	February 2 – April 30, 1998	Not Available
Severe Winter Storms, Flooding, Landslides, Mud Flows	DR-1046	February 13 – April 19, 1995	Not Available
Severe Winter Storms, Flooding, Landslides, Mud Flows	DR-1044	January 3 – February, 1995	Not Available
Northridge Earthquake	DR-1008	January 17 – November 30,1994	Not Available**
Fires, Mud & Landslides, Soil Erosion, Flooding	DR-1005	October 26 – April 22, 1994	Not Available
Severe Storm, Winter Storm, Mud & Landslides, Flooding	DR-979	January 5 – March 20, 1993	Not Available
Snow Storm, Heavy Rain, High Winds, Flooding, Mudslide	DR-935	February 10 – 19, 1992	Not Available
Severe Storms, High Tides, Flooding	DR-812	January 17 – 22, 1988	Not Available
Coastal Storms, Floods, Slides, Tornadoes	DR-677	January 21 – March 30, 1983	Not Available
Severe Storms, Mudslides, Flooding	DR-615	January 8, 1980	Not Available
Coastal Storms, Mudslides, Flooding	DR-547	February 15, 1978	Not Available
Severe Storms, High Tides, Flooding	DR-364	February 8, 1973	Not Available
Severe Storms, Flooding	DR-253	January 26, 1969	Not Available

** Santa Felicia Dam recorded a peak ground acceleration of 0.27g during the Northridge earthquake with no visible movements or distortion of the structure. Following the Northridge Earthquake, the Santa Felicia Dam was inspected and surveyed to determine if any changes had occurred as a result of the earthquake. The conclusion of these investigations that the dam has responded well to the motions induced by the earthquake and has not experienced any changes or exhibited any behavior that indicate a reduction in the safety of the structure.

21.6.2 Hazard Risk Ranking

Table 21-10 presents a local ranking of all hazards of concern for which this hazard mitigation plan provides complete risk assessments. As described in detail in Volume 1, the ranking process involves an assessment of the likelihood of occurrence for each hazard, along with its potential impacts on people, property, and district operations. Mitigation actions primarily target hazards with high and medium rankings.

Table 21-10. Hazard Risk Ranking

Rank	Hazard	Risk Ranking Score	Risk Category
1	Earthquake	32	High
2	Drought	31	High
3	Dam Failure	30	Medium
4	Severe Storms	24	Medium
5	Severe Weather	24	Medium
6	Wildfire	18	Medium
7	Flooding	18	Medium
8	Sea Level Rise	15	Low
9	Landslide	12	Low
10	Tsunami	11	Low

21.6.3 Jurisdiction-Specific Vulnerabilities

Volume 1 of this hazard mitigation plan provides complete risk assessments for each identified hazard of concern. The following jurisdiction-specific issues have been identified based on a review of the results of the risk assessment, public involvement strategy, and other available resources:

- Santa Felicia Dam is classified as an “Extremely High Hazard” dam by the DSOD. Two of the Dam’s largest infrastructure components, Outlet Works and Spillway, will pose a significant risk to public safety if not modernized and upgraded. Failure of these components could result in the potential loss of life for approximately 377,000 people living downstream of the Santa Felicia Dam, as well as property loss and damage from the flooding of the towns of Piru, Fillmore, Santa Paula, and Oxnard, negatively impacting the area’s $2 billion dollar the agricultural industry as well as manufacturing, retail, hospitality, health care and military operations.

Mitigation actions addressing these issues were prioritized for consideration in the action plan in this annex.

21.7 STATUS OF PREVIOUS PLAN ACTIONS

Table 21-11 summarizes the actions that were recommended in the previous version of the hazard mitigation plan and their implementation status at the time this update was prepared.

Table 21-11. Status of Previous Plan Actions

Action Item from Previous Plan	Completed	Removed; No Longer Feasible	Carried Over to Plan Update: Check if Yes	Carried Over to Plan Update: Action # in Update
OA 10—SFD Outlet Works Rehab—Replace the nearly buried and seismic-deficient intake tower at Santa Felicia Dam with a robust facility with higher elevation point(s) of intake. Replace the seismically marginal penstock with appropriate new materials.			✓	UWC-4
Comment: *The planned design alternative is to build a new outlet works facility on the left (east) abutment of the dam. The SFD Outlet Works improvement and retrofit is currently in the design phase. The construction is anticipated to start in 2024. The success of this project is contingent upon securing grant funding support from both state and federal sources critical for the implementation of the dam safety improvements.*				
OA 10—SFD PMF Containment—The Probable Maximum Flood (PMF at all dams must be confined to the structure and spillway. Overtopping earthen dams will almost certainly lead to failure. UWCD will need to deepen the spillway and raise the height of the dam crest.			✓	UWC-5
Comment: *The SFD improvements of the spillway are currently in the design phase. The construction is anticipated to start in 2026. The success of this project is contingent upon securing both the state and federal grant funds.*				
UWCD 1—UWCD will install a generator at the Saticoy Recharge Facility.	✓			
Comment: *A new generator was installed at the Saticoy Recharge Facility in 2018.*				
UWCD 2—Part 12D Dam Safety Report—An independent consultant will be hired to perform the Federal Energy Regulatory Commission Part 12D safety inspection and review of Santa Felicia Dam. This process includes reviewing the Potential Failure Mode Analysis (completed in 2007) and the Supporting Technical Information Document; and updating the documents as necessary.	✓			
Comment: *Part 12D Dam Safety Inspection and Report for the Santa Felicia Dam was completed in 2017. UWCD will conduct the next Part 12D Dam Safety Inspection in 2022 as the inspection is required to be conducted every 5 years.*				
UWCD 3—Evaluate and develop a public outreach program that informs and educates the public located in the inundation zone directly downstream of Santa Felicia Dam.			✓	UWC-10
Comment: *The public outreach program includes the required annual Emergency Action Plan (EAP) seminars and annual law enforcement coordination meetings, as well as frequent participation in the Piru neighborhood council monthly meetings.*				

21.8 HAZARD MITIGATION ACTION PLAN

Table 21-12 lists the actions that make up the hazard mitigation action plan for this jurisdiction. Table 21-13 identifies the priority for each action. Table 21-14 summarizes the mitigation actions by hazard of concern and mitigation type.

Table 21-12. Hazard Mitigation Action Plan Matrix

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action UWC-1—Where appropriate, support retrofitting, purchase or relocation of structures located in hazard areas, prioritizing those that have experienced repetitive losses and/or are located in high- or medium-risk hazard areas.						
Hazards Mitigated: Earthquake, Drought, Dam Failure, Severe Storms, Severe Weather, Wildfire, Flooding						
Existing	1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14	United Water Conservation District	None	High	Local Fund, HMGP, BRIC, FMA	Short-term

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action UWC-2—Actively participate in the plan maintenance protocols outlined in Volume 1 of this hazard mitigation plan.						
Hazards Mitigated: All hazards						
New & Existing	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 16, 19	United Water Conservation District	None	Low	Staff Time, General Funds	Short-term
Action UWC-3—Purchase generators for critical facilities and infrastructure that lack adequate backup power.						
Hazards Mitigated: Earthquake, Drought, Dam Failure, Severe Storms, Severe Weather, Wildfire, Flooding						
Existing	1, 2, 3, 4, 10	United Water Conservation District	None	High	Local Fund, HMGP, BRIC, FMA	Short-term
Action UWC-4—Santa Felicia Dam Outlet Works Improvement and Retrofit. Replace the existing Santa Felicia Dam Outlet Works due to seismic deficiencies of the intake tower and conduit through the dam and to mitigate ongoing accumulation of sediment in Lake Piru reservoir that will impact operation of the outlet works in the near future with a robust facility with higher elevation point(s) of intake.						
Hazards Mitigated: Earthquake, Drought, Dam Failure, Severe Storms, Flooding						
New & Existing	1, 2, 3, 4, 9, 10, 11, 13, 18	United Water Conservation District	None	High	Local Fund, HMGP, BRIC, FMA, HHPD	Long-term
Action UWC-5—Santa Felicia Dam PMF Containment, Spillway Improvement Project– The Probable Maximum Flood (PMF) at all dams must be confined to the structure and spillway. Overtopping earthen dams will almost certainly lead to failure. The existing SFD spillway is inadequate to pass the inflow design flood (IDF), which for this dam is the PMF. The existing spillway will be deepened and the dam crest will be raised to allow for safely passing the IDF.						
Hazards Mitigated: Dam Failure, Severe Storms, Flooding						
Existing	1, 2, 3, 4, 9, 10, 11, 13, 18	United Water Conservation District	None	High	Local Fund, HMGP, BRIC, FMA, HHPD	Long-term
Action UWC-6—Coastal Brackish Groundwater Extraction and Treatment Project. The project objectives is to combat further seawater intrusion in the Oxnard Plain and provide a local supply source that can help meet the groundwater sustainability goals of the Fox canyon Groundwater Management Agency.						
Hazards Mitigated: Drought						
New	1, 2, 3, 4, 13, 14, 18	United Water Conservation District	None	High	Local Fund, HMGP, BRIC, FMA	Long-term
Action UWC-7—Pumping Trough Pipeline (PTP) Recycled Water Connection. Potential pipeline connections to UWCD's PTP system for the delivery of recycled water. The recycled water delivered to the PTP system can significantly reduce groundwater pumping in the PTP service area and Oxnard Plain.						
Hazards Mitigated: Drought						
New	1, 2, 3, 4, 14, 18	United Water Conservation District	None	Medium	Local Fund, HMGP, BRIC, FMA	Long-term
Action UWC-8—Freeman Diversion Rehab—The Freeman Diversion Dam is used to divert and efficiently manage run-off water from the Santa Clara River. The project allows UWCD to increase the instantaneous diversion rate to capture more water at the height of the hydrograph. This is necessary in the respect that regulatory agencies are requiring more flow in the river on the receding limb of the hydrograph. Ultimately the project will provide the opportunity to deliver additional surface water when available.						
Hazards Mitigated: Drought						
Existing	1, 2, 3, 4, 13, 14, 18	United Water Conservation District	None	High	Local Fund, HMGP, BRIC, FMA	Long-term
Action UWC-9—Twelfth Part 12D Dam Safety Inspection—An independent consultant will be hired to perform the Federal Energy Regulatory Commission Part 12D safety inspection and review of Santa Felicia Dam. This process includes reviewing the Potential Failure Mode Analysis (completed in 2007) and the Supporting Technical Information Document; and updating the documents as necessary.						
Hazards Mitigated: Earthquake, Dam Failure, Severe Storms, Flooding						
Existing	1, 2, 4, 6, 9, 10, 17, 18	United Water Conservation District	None	Low	Local Fund	Ongoing

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action UWC-10—UWCD will re-evaluate current public outreach efforts and develop a program to educate and inform the public within the inundation zone directly downstream of Santa Felicia Dam.						
Hazards Mitigated: Dam Failure, Severe Storms, Flooding						
Existing	1, 2, 4, 7, 8, 12, 17, 18	United Water Conservation District	None	Low	Local Fund	Short-term
Action UWC-11—Implement landslide stabilization and/or protection measures. Stabilization measures include grading the unstable portion of the slope to a lower gradient, construction of rock buttresses, and drainage improvements. Protection measures include containment and construction of walls, berms, ditches, and or diversion of moving debris.						
Hazards Mitigated: Landslide						
Existing	1, 2, 13, 14	United Water Conservation District	None	Low	Local Fund, HMGP, BRIC, FMA	Ongoing
Action UWC-12—Vegetation Management. Maintain vegetation management program within UWCD facilities to reduce the risk of wildfire and avoid creation of wind acceleration corridors within vegetated areas.						
Hazards Mitigated: Severe Weather, Wildfire						
Existing	1, 2, 5, 13, 14	United Water Conservation District	None	Low	Local Fund, HMGP, BRIC, FMAP	Ongoing
Action UWC-13—Update Santa Felicia Dam Emergency Action Plan (EAP)						
Hazards Mitigated: Dam Failure, Severe Storms, Flooding						
Existing	1, 2, 4, 6, 7, 8, 10, 19	United Water Conservation District	None	Low	Local Fund, HMGP, BRIC, FMA	Ongoing

a. Short-term = Completion within 5 years; Long-term = Completion within 10 years; Ongoing= Continuing new or existing program with no completion date

HHPD = Rehabilitation of High Hazard Potential Dams
FMA = Flood Mitigation Assistance Grant Program
HMGP = Hazard Mitigation Grant Program
BRIC = Building Resilient Infrastructure and Communities Grant Program

Table 21-13. Mitigation Action Priority

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Cost?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Implementation Priority[a]	Grant Pursuit Priority[a]
1	7	High	High	Yes	Yes	No	Medium	High
2	10	High	Low	Yes	Yes	Yes	Medium	High
3	7	High	High	Yes	Yes	No	Medium	High
4	5	High	High	Yes	Yes	No	Medium	High
5	3	High	High	Yes	Yes	No	Medium	High
6	2	High	High	Yes	Yes	No	Medium	High
7	1	High	Medium	Yes	Yes	No	Medium	High
8	1	High	High	Yes	Yes	No	Medium	High
9	4	Low	Low	Yes	No	Yes	High	Medium
10	3	Low	Low	Yes	No	Yes	High	Medium
11	1	High	Low	Yes	Yes	Yes	High	High
12	2	High	Low	Yes	Yes	Yes	High	High
13	3	Medium	Low	Yes	Yes	Yes	High	Medium

a. See the introduction to this volume for explanation of priorities.

Table 21-14. Analysis of Mitigation Actions

Hazard Type	Action Addressing Hazard, by Mitigation Type[a]							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilient	Community Capacity Building
High-Risk Hazards								
Earthquake	UWC-4	UWC-4				UWC-4		UWC-9
Drought	UWC-4	UWC-4, 8		UWC-6, 7, 8		UWC-4, 6, 7, 8	UWC-6	
Medium-Risk Hazards								
Dam Failure	UWC-4, 5	UWC-4, 5	UWC-10		UWC-13	UWC-4, 5	UWC-5	UWC-9, 10, 13
Severe Storms	UWC-4, 5	UWC-4, 5	UWC-10		UWC-13	UWC-4, 5	UWC-5	UWC-9, 13
Severe Weather	UWC-1, 5	UWC-3, 5	UWC-10		UWC-13	UWC-1, 3, 5	UWC-2	
Wildfire	UWC-12			UWC-12				
Flooding	UWC-4, 5	UWC-4, 5	UWC-10		UWC-13	UWC-4, 5	UWC-5	UWC-9, 13
Low-Risk Hazards								
Landslide	UWC-11			UWC-11		UWC-11		

a. See the introduction to this volume for explanation of mitigation types.

21.9 PUBLIC OUTREACH

Table 21-15 lists public outreach activities for this jurisdiction.

Table 21-15. Local Public Outreach

Local Outreach Activity	Date	Number of People Involved
Annual Emergency Action Plan seminar	December 16, 2020 October 28, 2021	31 Expected to be 30+
Monthly Board Of Director meetings	Monthly	Varies

21.10 INFORMATION SOURCES USED FOR THIS ANNEX

The following technical reports, plans, and regulatory mechanisms were reviewed to provide information for this annex.

- **Capital Improvement Plan**: The Capital Improvement Plan prioritizes projects that have been identified to improve District facilities, infrastructure, and equipment, including potential mitigation projects. The Capital Improvement Plan was used as a source of information while preparing this annex.
- **Santa Felicia Dam Emergency Action Plan (EAP):** Describes protocol for response activities to be conducted in the event of an emergency that threatens or damages the structural integrity of the Santa Felicia Dam. Includes procedures for training and preparedness, and notification and response actions to be conducted in the event of an emergency including procedures for coordination with outside agencies. The EAP was reviewed during the development of the hazard mitigation action plans.

- **Time-Sensitive Emergency Action Plan Assessment:** This assessment was used to develop the Santa Felicia Dam EAP during the development of the hazard mitigation action plans.
- **Santa Felicia Dam Safety Improvement Project, Technical Memorandums (TMs) and Design Reports:** UWCD conducted and completed feasibility studies and multiple design phases for the existing outlet works improvement and retrofit project and the spillway improvement project, collectively referred to as the Santa Felicia Dam Safety Improvement Project. The TMs and design reports developed during these design phases included structural, hydraulic, and geotechnical analyses. These analyses were the basis of the development of the hazard mitigation action plans (UWC-4 and UWC-5).
- **Santa Felicia Dam 2017 Potential Failure Mode Analysis Study Report:** The purpose of the PFMA is to identify and describe potential failure modes (PFMs) at the Santa Felicia Dam and its appurtenant structures that could be failed under postulated loading conditions. Knowledge of the PFMs can be used to better understand the potential safety concerns, develop a project specific surveillance and monitoring program, and identify potential risk reduction measures. The 2017 PFMA was reviewed during the development of the hazard mitigation plan.
- **Oxnard Hueneme System Emergency Response Plan:** This plan describes protocol for response activities to be conducted in the event of an emergency that threatens or damages UWCD's El Rio Facility and the Oxnard-Hueneme Pipeline. Includes procedures for decontamination, pipeline isolation, and notification and response actions to be conducted in the event of an emergency. This document was reviewed during the development of the capability assessment.
- **Risk and Resilience Assessment:** The purpose of this assessment was to assess the risks to, and resilience of, the District's Oxnard-Hueneme system, covering: the risk of malevolent acts and natural hazards; the resilience of the pipes and constructed conveyances, physical barriers, source water, water collection and intake, pretreatment, treatment, storage and distribution facilities, electronic, computer, or other automated systems (including the security of such systems) which are utilized by the system; the monitoring practices of the system; the financial infrastructure of the system; the use, storage, or handling of various chemicals by the system; and the operation and maintenance of the system. This document was reviewed during the development of the capability assessment.
- **California Accidental Release Prevention (CalARP) Program:** As part of the program's effort in preventing and/or minimizing damage to the accidental releases of chlorine and ammonia that can cause serious harm to the public, hazard and seismic assessments were completed. The hazard assessments for chlorine and ammonia examined worst-case and alternative scenarios while the seismic assessment ensured chlorine and aqueous ammonia equipment and piping, their supports and their anchoring met CalARP seismic requirements. This document was reviewed during the development of the capability assessment.

The following outside resources and references were reviewed:

- **2015 Ventura County Multi-Hazard Mitigation Plan:** The 2015 HMP document addresses the local hazard mitigation planning requirements for Unincorporated Ventura County and other local participants. The 2015 VC HMP was reviewed and used during the development of the mitigation action plan.
- **Selecting and Accommodating Inflow Design Floods for Dams, FEMA P-94, Dated August 2013:** The main objectives of this document is to recommend appropriate procedures for selecting and accommodating the Inflow Design Flood based on current and accepted practices

and to promote a reasonable degree of consistency and uniformity among state and federal agencies. Appropriate selection of the Inflow Design Flood is the first step in evaluating and designing a dam to address hydrologic potential failure modes and reduce risks to the public. This document was reviewed during the development of the capability assessment and the Adaptive Capacity for Climate Change.

- **Hydrometeorological Reports (HMR 58 and 59), California Department of Water Resources, Division of Safety of Dams (DSOD):** The Santa Felicia Dam Inflow Design Flood (IDF) of 220,000 cfs was developed using DSOD interim Hydrology Policy Modified HMR 58/59 (2012). The IDF was approved by the regulatory agencies. These reports were reviewed and used during the development of the hazard mitigation action plan (UWC-5).
- **Hazard Mitigation Plan Annex Development Toolkit**: The toolkit was used to support the identification of past hazard events and noted vulnerabilities, risk ranking, and the development of the mitigation action plan.

21.11 FUTURE NEEDS TO BETTER UNDERSTAND RISK/VULNERABILITY

UWCD will update the Santa Felicia Dam Vulnerability and Risk Assessment in 2022 in accordance with the Federal Energy Regulatory Commission's dam safety requirements. The Vulnerability and Risk Assessment includes evaluation of structures and facilities to identify weaknesses and or potential single or multiple points of failures. The outcome will include recommended mitigation measures to address these concerns.

21.12 ADDITIONAL COMMENTS

UWCD is currently coordinating with the Emergency Management Agencies (EMAs) of the Santa Felicia Dam impacted jurisdictions including the Ventura County Sheriff's Office of Emergency Services (VCSOES) to determine if they need assistance in developing local evacuation plans. UWCD will offer support, including technical support, to the EMAs as needed.

22. VENTURA COUNTY FIRE PROTECTION DISTRICT

22.1 LOCAL HAZARD MITIGATION PLANNING TEAM

Primary Point of Contact
Mark Lorenzen, Fire Chief
165 Durley Ave
Camarillo, CA 93010
Telephone: 805-389-9704
e-mail Address: mark.lorenzen@ventura.org

Alternate Point of Contact
Jeff Shea, Division Chief
165 Durley Ave
Camarillo, CA 93010
Telephone: 805-437-9400
e-mail Address: jeff.shea@ventura.org

This annex was developed by the local hazard mitigation planning team, whose members are listed in Table 22-1.

Table 22-1. Local Hazard Mitigation Planning Team Members

Name	Title
Mark Lorenzen	Fire Chief
Dustin Gardner	Deputy Fire Chief
Chad Cook	Assistant Fire Chief
Jeff Shea	Division Chief
Gene Fong	Battalion Chief
John Spykerman	Assistant Fire Chief
Massoud Araghi	Fire Marshal
Tom Kasper	Business Services Manager
Corina Cagley	Fire Prevention Officer
Celine Moomey	Pre-Fire Specialist
Ryan Matheson	Fire Captain, Vegetation Management
David Kirby	Manager- Facilities and Construction
Debbie Conner	Management Assistant

22.2 JURISDICTION PROFILE

22.2.1 Overview

In 1928, the VCFPD was formed as a special district to provide fire protection to the county, with the exception of the four established cities. Since that time, six additional cities have become incorporated. Today, the VCFPD acts as the county fire department for unincorporated Ventura County and as the

city fire department for seven cities (Camarillo, Moorpark, Ojai, Port Hueneme, Santa Paula, Thousand Oaks, and Simi Valley).

Composed of approximately 600 dedicated men and women, the Ventura County Fire Protection District is an all-hazard, full-service agency. VCFPD proudly provides fire protection, medical aid, rescue, hazardous materials response, and a variety of other services to the public. The Ventura County Board of Supervisors acts as the fire protection district's board of directors. These five elected supervisors appoint the fire chief and task him with providing fire protection services for the district.

VCFPD responds to calls from 33 strategically placed fire stations located throughout Ventura County. VCFPD firefighters are trained to provide the highest level of firefighting, rescue, and emergency medical care. In addition to fighting fires, VCFPD responds to medical emergencies, traffic accidents, land and water rescues, hazardous materials calls, environmental hazards, and a variety of public service requests.

The Ventura County Board of Supervisors assumes responsibility for the adoption of this plan; Ventura County Office of Emergency Services will oversee its implementation.

The District participates in the Public Protection Class Rating System and currently has a rating of 5.

22.2.2 Service Area

The District service area covers 848 square miles, serving a population of 850,000.

22.2.3 Assets

Table 22-2 summarizes the assets of the District and their value.

Table 22-2. Special-Purpose District Assets

Asset	Value
Property	
N/A acres of land	Included with Critical Facilities values below
Equipment	
Aerials 7 @ $1,500,000.00 ea. =	$10,500,000.00
Type 1 Pumpers 52 @ $710,000.00 ea. =	$36,920,000.00
Type 3 Pumpers 11 @ $350,000.00 ea. =	$3,850,000.00
Heavy Rescue 1 @ $1,000,000.00 ea. =	$1,000,000.00
Rescues 6 @ $450,00.00 ea. =	$2,700,000.00
Squads 4 @ $215,000.00 ea. =	$215,000.00
Utilities 10 @ $70,000.00 ea. =	$700,000.00
Total:	***$56,530,000.00***
Critical Facilities	
Old Fire Station 20—12727 Santa Paula-Ojai Road, Santa Paula, CA 93060	$1,571,908
Fire Station 20—12000 Santa Paula-Ojai Road, Ojai, CA 93023	$6,193,994
Fire Station 21—1201 E Ojai Ave, Ojai, CA 93023	$3,674,182
Fire Station 22—466 S La Luna Ave, Ojai, CA 93023	$3,061,690
Fire Station 23—15 Kunkle St, Oak View, CA 93022	$6,501,775

Asset	Value
Fire Station 25—5674 W Pacific Coast Highway, Ventura, CA 93001	$4,549,938
Old Fire Station 26—12391 W Telegraph Rd, Santa Paula, CA 93060	$2,963,446
Fire Station 26—536 W Main St, Santa Paula, CA 93060	$2,034,731
Old Fire Station 27—613 Old Telegraph Rd, Fillmore, CA 93015	$2,693,274
Fire Station 27—133 C St, Fillmore, CA 93015	$11,565,960
Fire Station 28—513 N Church St, Piru, CA 93040	$2,618,824
Fire Station 29—114 S 10th St, Santa Paula, CA 93060	$2,836,803
Fire Station 30—325 W Hillcrest Dr, Thousand Oaks, CA 91360	$7,904,826
Fire Station 31—151 Dusenberg Dr, Thousand Oaks, CA 91362	$3,030,222
Fire Station 32—830 S Reino Rd, Newbury Park, CA 91320	$3,199,846
Fire Station 33—33 Lake Sherwood Dr, Thousand Oaks, CA 91361	$2,867,504
Fire Station 34—555 E Avenida de los Arboles, Thousand Oaks, CA 91360	$2,798,426
Old Fire Station 35—2500 W Hillcrest Dr, Newbury Park, CA 91320	$2,608,846
Fire Station 35—751 Mitchell Rd, Newbury Park, CA 91320	$8,621,702
Fire Station 36—855 Deerhill Rd, Oak Park, CA 91377	$3,290,415
Fire Station 37—2010 Upper Ranch Rd, Thousand Oaks, CA 91362	$4,724,168
Fire Station 40—4185 Cedar Springs St, Moorpark, CA 93021	$6,494,099
Fire Station 41—1910 Church St, Simi Valley, CA 93065	$6,633,790
Fire Station 42—295 E High St, Moorpark, CA 93021	$7,316,128
Fire Station 43—5874 E Los Angeles Ave, Simi Valley, CA 93063	$8,554,926
Fire Station 44—1050 Country Club Dr, Simi Valley, CA 93065	$6,098,820
Fire Station 45—790 Pacific Ave, Simi Valley, CA 93065	$2,855,991
Fire Station 46—3265 N Tapo St, Simi Valley, CA 93063	$2,995,683
Fire Station 47—2901 Erringer Rd, Simi Valley, CA 93065	$5,505,516
Fire Station 50—189 S Las Posas Rd, Camarillo, CA 93010	$10,717,068
Fire Station 51—3302 Turnout Park Circle, Oxnard, CA 93036	$7,139,595
Fire Station 52—5353 Santa Rosa Rd, Camarillo, CA 93012	$3,285,043
Fire Station 53—304 N Second St, Port Hueneme, CA 93041	$4,681,186
Fire Station 54—2160 Pickwick Dr, Camarillo, CA 93010	$6,989,158
Fire Station 55—403 Valley Vista Dr, Camarillo, CA 93010	$2,789,216
Fire Station 56—11855 Pacific Coast Highway, Malibu, CA 90265	$4,202,245
Fire Station 57—3356 Somis Rd, Somis, CA 93066	$2,989,542
Fire Communications Center—160 Durley Ave, Camarillo, CA 93010	$17,731,555
Headquarters—165 Durley Ave, Camarillo, CA 93010	$21,716,588
Supply—2451 Latigo Ave, Oxnard, CA 93030	$36,362,659
Training Center—102 Durley Ave, Camarillo, CA 93010	$9,697,783
Total:	***$264,069,071***

22.3 CURRENT TRENDS

The current (2021) population of Ventura County is estimated at 841,734, with a growth of -0.25% in the past year according to the most recent United States Census Data. Ventura County is the 14th largest county in California. And over the last ten-year period, Ventura County's population has seen growth of 2.02% since its 2010 population of 825,097.

22.4 CAPABILITY ASSESSMENT

This section describes an assessment of existing capabilities for implementing hazard mitigation strategies. The introduction at the beginning of this volume of the hazard mitigation plan describes the components included in the capability assessment and their significance for hazard mitigation planning.

Findings of the capability assessment were reviewed to identify opportunities to expand, initiate or integrate capabilities to further hazard mitigation goals and objectives. Where such opportunities were identified and determined to be feasible, they are included in the action plan. The "Analysis of Mitigation Actions" table in this annex identifies these as community capacity building mitigation actions. The findings of the assessment are presented as follows:

- An assessment of planning and regulatory capabilities is presented in Table 22-3.
- An assessment of fiscal capabilities is presented in Table 22-4.
- An assessment of administrative and technical capabilities is presented in Table 22-5.
- An assessment of education and outreach capabilities is presented in Table 22-6.
- Classifications under various community mitigation programs are presented in Table 22-7.
- The community's adaptive capacity for the impacts of climate change is presented in Table 22-8.

Table 22-3. Planning and Regulatory Capability

Plan, Study or Program	Most Recent Update	Comment
The California Fire Code 2019	2019	Updated every three years at state-level
District Ordinances #29 and #31	2019	District-Specific Fire Code Amendments
Fire Hazard Reduction Program (FHRP)	continuous	Annual Program
Community Emergency Response Team (CERT) Program	continuous	Disaster Preparedness Education and Training
Ready, Set, Go! Program	continuous	Ventura County Emergency Preparedness Guide
VCFPD Regional Fire Services Standards of Cover	2017	To determine the distribution of the agency's resources
Emergency Plans—Area Command	11/23/2015	
Emergency Plans—Brush Plan	02/28/2019	
Emergency Plans—Civil Unrest	12/19/2016	
Emergency Plans—Communications Failure Plan	05/27/2010	
Emergency Plans—Department Operations Center	10/13/2015	
Emergency Plans—Earthquake	10/20/2016	
Emergency Plans—Flooding	06/14/2016	
Emergency Plans—Heat	01/14/2014	
Emergency Plans—High Surf	06/14/2016	
Emergency Plans—Pandemic Plan	03/12/2020	
Emergency Plans—Staffing	10/26/2015	
Emergency Plans—Tsunami	05/03/2017	
Emergency Plans—Unit Strategic Fire Plan	05/25/2021	Updated annually
Emergency Plans—Urban Terrorism	05/20/2016	
Operational Procedure 1002—Response Levels	11/18/2020	

Plan, Study or Program	Most Recent Update	Comment
Operational Procedure 1006—Water Tender Response Staffing	08/09/2013	
Operational Procedure 1009—Mutual Aid, Ventura Op Area	10/24/2005	
Operational Procedure 1012—Emergency Coordinators	02/01/2008	
Operational Procedure 1100—Emergency Plans 1,2,3 and 4	11/15/2006	
Operational Procedure 2001—Incident Safety	01/15/2013	
Operational Procedure 2004—Contingency Planning/Accountability	07/10/2015	
Operational Procedure 3001—Incident Command	12/28/2005	
Operational Procedure 3003—Staging	09/09/2014	
Operational Procedure 3004—Evacuation of Citizens	06/02/2008	
Operational Procedure 3003—Road Closures	09/18/2007	
Operational Procedure 3009—Cal-OSHA Notification	04/14/2017	
Operational Procedure 3010—Incident Rehabilitation	12/06/2010	
Operational Procedure 3014—Juvenile Fire Setter Advisor	01/15/2013	
Operational Procedure 3015—Critical Incident Stress Debriefing	12/05/2001	
Operational Procedure 4006—Emergency Medical Dispatch	02/11/2004	
Operational Procedure 4008—Multi-Casualty Incidents	12/19/2013	
Operational Procedure 4011—Haz-Mat Patients, Pre Hospital Care	11/13/2013	
Operational Procedure 4500—Rescue Doctrine	11/29/2005	
Operational Procedure 4510—Collapse Rescue	11/29/2005	
Operational Procedure 4520—Rope Rescue	11/29/2005	
Operational Procedure 4530—Trench Rescue	11/29/2005	
Operational Procedure 4540 –Confined Space Rescue	11/29/2005	
Operational Procedure 4550—Water Rescue	11/29/2005	
Operational Procedure 4560—Geologic Incidents	02/05/2007	
Operational Procedure 5200—Wildland Fire Doctrine	06/06/2015	
Operational Procedure 5202—Wildland Fire Operations	06/09/2015	
Operational Procedure 5203—Night Flying Fire Suppression	12/16/2016	
Operational Procedure 5204—Ventura Situational Awareness Tool	08/24/2016	
Operational Procedure 5205—ECP Support Package	08/12/2014	
Operational Procedure 5206—Unmanned Aerial Systems	09/14/2016	
Operational Procedure 6000—Hazardous Materials Response Doctrine	02/05/2007	
Operational Procedure 6007—Radiological Incidents	08/25/2011	
Operational Procedure 7003—Operational Worksheets	03/26/2019	

Plan, Study or Program	Most Recent Update	Comment
Operational Procedure 7003—Appendix 2 Wildland Fire Incident Command Work Sheet	01/12/2006	
Operational Procedure 7003—Appendix 3 Confined Space Rescue Resource Assignment Sheet Work Sheet	01/12/2006	
Operational Procedure 7003—Appendix 4 Collapse Rescue Resources Assignment Sheet Work Sheet	01/12/2006	
Operational Procedure 7003—Appendix 5 Trench Rescue Resource Assignment Sheet Work Sheet	01/12/2006	
Operational Procedure 7003—Appendix 6 Surf Rescue Resource Assignment Sheet Work Sheet	01/12/2006	
Operational Procedure 7003—Appendix 7 Swiftwater Rescue Resource Assignment Sheet/Work Sheet	01/12/2006	
Operational Procedure 7003—Appendix 8 Marine Disaster Resource Assignment Sheet Work Sheet	01/12/2006	
Operational Procedure 7003—Appendix 9 Area Hospitals	09/06/2005	
Operational Procedure 7003—Appendix 13 Hazardous Materials Incident Command Work Sheet	01/12/2006	
Operational Procedure 8010—Commercial Vessel Fires	02/05/2007	
Operational Procedure 8040—Camarillo Airport Aircraft Operations	02/05/2007	
Operational Procedure 8050—Railroad Incidents	02/05/2007	
AP 10103—Records Retention Schedule	06/13/2014	
AP 10105—Daily Journal, Fire Company	10/26/2016	
AP 10106—Significant Incident Documentation	12/23/2013	
AP 10501—Computer Technology Use	10/18/2019	
AP 10503—Technical Services, Request for	08/31/2001	
AP 10504—Internet Access and Use	10/18/2019	
AP 10610—Mapping and GIS System Modifications	10/10/2013	
AP 10611—Helispots	06/09/2014	
AP 10612—Tactical Pre-Plans and Supplemental Maps	06/09/2014	
AP 11100—Uniforms, General	11/05/2020	
AP 11118—Personal Protective Equipment, Maintenance & Inspection of	04/05/2021	
AP 11126—Body Armor, Care and Inspection of	02/17/2011	
Appendix 1—Body Armor, Care and Inspection of	02/17/2011	
AP 11201—Combined Leave	11//09/2007	
AP 11202—Shift Trades	08/10/2021	
AP 11203—Summons/Subpoena	04/25/2001	
AP 11205—Sick/Bereavement Leave, Usage of	03/09/2000	
AP 11206—Family Medical Leave	02/14/1994	
AP 11301—Staffing Levels	02/05/2002	
AP 11307—Apparatus Staffing, Personal Emergencies	02/28/2001	
AP 11401—Injury and Illness Prevention Program	03/29/2016	
AP 11502—Live-Fire Training	12/19/2016	

Plan, Study or Program	Most Recent Update	Comment
AP 11504—Captain Mentoring Program	04/09/2020	
AP 11505—California Incident Command Certification System	03/04/2021	
AP 11506—Paramedic Internship Program	03/05/2021	
AP 11508—Fire District California Incident Command Certification System Mentoring Team	03/04/2021	
AP 11509—Incident Management Team Participation	03/04/2021	
AP 11510—Community Emergency Response Team (CERT) Prog.	01/07/2016	
AP 11511—Staff Rides	12/19/2018	
AP 11804—Industrial Injury/Illness	09/05/2002	
AP 11806—Physical Fitness Program	02/11/2019	
AP 11808—National Fire Academy	05/24/2018	
AP 11810—Driver License	11/20/2017	
AP 12101—Tractor-Drawn Aerial Engineer and Operator	01/31/2017	
AP 12102—Vehicles and Apparatus, Operating	04/05/2018	
AP 12103—Water Rescue Equipment	05/30/2002	
AP 12104—Flight Request, Non-Emergency Incident	11/08/2006	
AP 12302—Inventory, Apparatus	07/11/2005	
AP 12300—Inventory, Apparatus: Appendices 1 – 6	04/29/2015	Engine 1, Engine Type 3, Quint, Ladder Truck, Rescue, PM Squad
AP 12300—Inventory, Apparatus: Appendix 7	02/16/2021	BC Vehicle
AP 12300—Inventory, Apparatus: Appendices 8 – 11	04/29/2015	Water Tender, Patrol, Utility, Light and Air
AP 12300—Inventory, Apparatus: Appendix 14	08/29/2016	HazMat 50
AP 12300—Inventory, Apparatus: Appendices 15 – 18	01/03/2017	US&R 40, US&R 54, US&R 54 (Cache Trailer, US&R 154
AP 12303—Fire Hose Inventory and Configuration	10/18/2019	
AP 12405—Tools/Equipment, Fire Station	12/18/2012	
AP 12406—Emergency Food & Water Supplies	11/17/2020	
AP 12501—Controlled Substances	07/08/2020	
AP 13003—Mandatory Worksite Postings	10/27/2016	
AP 13004 –Fire District Property, Disposal of	05/08/2012	
AP 13005—Complaints	05/08/2020	
AP 13006—Security of Department Facilities	05/23/2013	
AP 13008—Department Equipment & Facilities, Use of	12/22/2016	
AP 13009—Theft, County Property	11/05/2012	
AP 13010—Libraries, Fire Station and Appendix 1 (Inventory)	02/16/2017	
AP 13014—Public Records Act Requests	05/22/2009	
AP 13015—Grant Management	02/23/2017	
AP 13103—Maintenance and Construction	10/26/2016	
AP 13105—Fire Hydrants, Inspection and Maintenance of	06/11/2001	
AP 13107—Knox Rapid Entry System	02/17/2017	
AP 13109—Fire Hydrants, Reflective Markers for	03/15/2004	

Plan, Study or Program	Most Recent Update	Comment
AP 13109—Appendix 2: Encroachment Permit Information	04/04/2016	
AP 13114—Incident Response Reporting	06/20/2013	
AP 13115—Fire Locks	08/09/2018	
AP 13202—Security of Fire Communications Center	12/04/2001	
AP 14001– Inspection Authority	09/02/2014	
AP 14002—Fire Safety Inspector Program	09/02/2014	
AP 14004—Movie Safety Officer	07/30/2001	
AP 14102—Community Service Volunteers	02/18/2016	
AP 14202– Burning Permits	04/19/2016	
AP 14301—Administrative Citation Program	07/22/2021	
AP 14302—Criminal Citations	07/22/2021	
AP 14303—Outdoor Fires for Recreation and Other Uses	03/28/2019	
AP 15008—Fire Communications Center Minimum Staffing Levels	02/06/2019	
AP 15010—Fire Communications Center Special Assignments and Training Opportunities	12/28/2017	
Fire Prevention Standards:		
501—Fire Apparatus Access	09/30/2019	Provides the minimum requirements for fire apparatus access roads. This standard also includes requirements for access road gates, fire lanes, and turnarounds/turnouts.
502—Premises Identification	10/18/2018	Provides the minimum requirements for property identification.
506—Knox Rapid Entry System	04/01/2017	Provides the minimum requirements for installation and use of the Knox Rapid Entry System.
509—Residential Fire Sprinklers	02/07/2020	Provides the minimum requirements for the design and installation of automatic fire sprinkler systems in one and two-family dwellings and manufactured homes
509C—Plan Submittal Sheet for Residential Fire Sprinklers	09/25/2020	Plan submittal sheet to be used on all residential fire sprinkler systems.
515—Defensible Space and Fuel Modification Zones	11/20/2020	Provides the minimum requirements for installation and maintenance of defensible space and fuel modification zones.
516—Composting, Mulch, and Organic Processing	02/05/2020	Provides the minimum requirements for processing, storage and application of composting, mulch and organic materials.
517—Application of Mulch and Chips in Defensible Space	11/20/2020	Provides the minimum requirements for application of mulch and wood chips within the defensible space of a structure.
518—Alternate Materials and Methods	12/21/2020	Provides requirements for filing a request for alternate materials and methods
519—Fire Watch	12/17/2020	Identifies when a fire watch is required and the minimum requirements for the fire watch.
14.5.3—Fire Hydrants	06/11/2011	Provides the minimum requirements for fire hydrants
14.6.10—Access and Water Supplies for Public Schools	05/27/2011	Provides the minimum requirements for access roads and water supply.

Plan, Study or Program	Most Recent Update	Comment
14.7.2—Installation of Commercial Fire Sprinklers	07/07/2011	Provides the minimum requirements for the design and installation of automatic fire sprinkler systems in commercial, industrial and multi-family dwellings.
14.7.3—Installation of Fire Alarms	02/23/2011	Provides the minimum requirements for the design and installation of automatic and manual fire alarm systems and fire sprinkler monitoring systems.
14.7.4—Fire Extinguishing Systems for Commercial Cooking Operations	05/13/2011	Provides the minimum requirements for the design, installation, testing and inspection of fire extinguishing systems for commercial cooking operations.
14.7.5—High-Piled Combustible Storage	03/30/2011	Provides the minimum requirements for high-piled combustible storage.
14.9.3—Fireworks Requirements	05/21/2014	Provides the minimum requirements for the public display of fireworks.
Fire Prevention Guidelines:		
401—Special Event Guideline	02/13/2020	Provides a summary of the Fire District's standard conditions for special events.
403—FHRP Abatement Assessment and Appeal Process Guideline	01/01/2020	Provides a summary of the process to file an appeal to a FHRP abatement assessment.
404—Recreational Fire Safety Guideline	02/14/2019	Provides a summary of safety guidelines for the use of recreational fires.
414—Re-Opening of Assembly Occupancies During COVID-19 Guideline	05/22/2020	Provides a summary of fire safety requirements for the re-opening of an assembly occupancy during the COVID-19 pandemic.
Crop and Orchard Warming Directive	01/29/2020	Provides a guide for the use of small warming fires during frost prevention activities. (VCFPD and Ventura County Air Pollution Control District)

Table 22-4. Fiscal Capability

Financial Resource	Accessible or Eligible to Use?
Community Development Block Grants	Yes
Capital Improvements Project Funding	No
Authority to Levy Taxes for Specific Purposes	No
User Fees for Water, Sewer, Gas or Electric Service	No
Incur Debt through General Obligation Bonds	No
Incur Debt through Special Tax Bonds	No
Incur Debt through Private Activity Bonds	No
Withhold Public Expenditures in Hazard-Prone Areas	No
State-Sponsored Grant Programs	Yes
Development Impact Fees for Homebuyers or Developers	Yes
Other	Yes
If yes, specify: Fire Prevention Fees, Emergency Incident Reimbursement, State Contracts, Federal Grants	

Table 22-5. Administrative and Technical Capability

Staff/Personnel Resource	Available?
Planners or engineers with knowledge of land development and land management practices ***If Yes, Department /Position:*** Fire Prevention Bureau	Yes
Engineers or professionals trained in building or infrastructure construction practices ***If Yes, Department /Position:*** Fire Prevention Bureau	Yes
Planners or engineers with an understanding of natural hazards ***If Yes, Department /Position:*** Emergency Services Bureau-Wildland and Fire Prevention/Planner	Yes
Staff with training in benefit/cost analysis ***If Yes, Department /Position:*** Business Services Bureau	Yes
Surveyors ***If Yes, Department /Position:*** Damage Inspection Specialists and Managers for fire damage assessment and all hazards	Yes
Personnel skilled or trained in GIS applications ***If Yes, Department /Position:*** Emergency Services Bureau / GIS Specialists and Analysts	Yes
Scientist familiar with natural hazards in local area	No
Emergency manager ***If Yes, Department /Position:*** Fire Chief, and all VCFPD Managers	Yes
Grant writers	No
Other ***If Yes, Department /Position:*** IT, RNs, HR Professionals, Fiscal Staff	Yes

Table 22-6. Education and Outreach Capability

Criterion	Response
Do you have a public information officer or communications office?	Yes
Do you have personnel skilled or trained in website development?	Yes
Do you have hazard mitigation information available on your website? ***If yes, briefly describe:*** Fire Hazard Reduction Plan is on website	Yes
Do you use social media for hazard mitigation education and outreach? ***If yes, briefly describe:*** Ready, Set, Go! Program and FHRP	Yes
Do you have any citizen boards or commissions that address issues related to hazard mitigation? ***If yes, briefly describe:*** Ojai Valley Fire Safe Council, Ventura Regional Fire Safe Council, Bell Canyon Fire Safe Council, Ventura Park Fire Safe Council and the Ventura Resource Conservation District. Also a non-profit called the C.R.E.W has received funding from CAL FIRE California Climate Investments grants for a community chipper program. Piru Wildfire Prevention Education is another group	Yes
Do you have any other programs in place that could be used to communicate hazard-related information? ***If yes, briefly describe:*** Signage Boards for FHRP Community Alerts; VC Alert and Ready, Set, Go! brochures	Yes
Do you have any established warning systems for hazard events? ***If yes, briefly describe:*** Dam Inundation Alarm at Station 28, Alert Wildfire Cameras throughout the County, and remote automated weather stations throughout the County	Yes

Table 22-7. Community Classifications

	Participating?	Classification	Date Classified
FIPS Code	Yes	111-91041	UNK
DUNS#	Yes	175795681	UNK
Community Rating System	No	No	N/A
Building Code Effectiveness Grading Schedule	No	No	N/A
Public Protection	Yes	03/3X	12/21/2018
Storm Ready	Yes	N/A	UNK
Firewise	Yes	N/A	UNK
Tsunami Ready	Yes	N/A	UNK

Table 22-8. Adaptive Capacity for Climate Change

Criterion	Jurisdiction Rating[a]
Technical Capacity	
Jurisdiction-level understanding of potential climate change impacts	Medium
Comment: *We monitor fuel moistures throughout the region and we have remote automated weather stations to monitor temperatures and relative humidity, rainfall and wind.*	
Jurisdiction-level monitoring of climate change impacts	Low
Comment:	
Technical resources to assess proposed strategies for feasibility and externalities	Medium
Comment: *GIS, Wildfire Pre-Planner, Vegetation Management Planner*	
Jurisdiction-level capacity for development of greenhouse gas emissions inventory	Low
Comment:	
Capital planning and land use decisions informed by potential climate impacts	Low
Comment:	
Participation in regional groups addressing climate risks	Low
Comment:	
Implementation Capacity	
Clear authority/mandate to consider climate change impacts during public decision-making processes	Low
Comment:	
Identified strategies for greenhouse gas mitigation efforts	Low
Comment:	
Identified strategies for adaptation to impacts	Low
Comment:	
Champions for climate action in local government departments	Low
Comment:	
Political support for implementing climate change adaptation strategies	Low
Comment:	
Financial resources devoted to climate change adaptation	Low
Comment:	
Local authority over sectors likely to be negatively impacted	Low
Comment:	

Criterion	Jurisdiction Rating[a]
Public Capacity	
Local residents' knowledge of and understanding of climate risk	Unsure
Comment:	
Local residents' support of adaptation efforts	Unsure
Comment:	
Local residents' capacity to adapt to climate impacts	Unsure
Comment:	
Local economy current capacity to adapt to climate impacts	Low
Comment:	
Local ecosystems capacity to adapt to climate impacts	Low
Comment:	

a. High = Capacity exists and is in use; Medium = Capacity may exist, but is not used or could use some improvement; Low = Capacity does not exist or could use substantial improvement; Unsure= Not enough information is known to assign a rating.

22.5 INTEGRATION REVIEW

For hazard mitigation planning, "integration" means that hazard mitigation information is used in other relevant planning mechanisms, such as capital facilities planning, and that relevant information from those sources is used in hazard mitigation. This section identifies where such integration is already in place, and where there are opportunities for further integration in the future. Resources listed at the end of this annex were used to provide information. The progress reporting process described in Volume 1 of the hazard mitigation plan will document the progress of hazard mitigation actions related to integration and identify new opportunities for integration.

22.5.1 Existing Integration

Some level of integration has already been established between local hazard mitigation planning and the following other local plans and programs:

- **Cal Fire Danger Rating Tiers—**Fire severity regional maps
- **Dam Inundation Plan—**Emergency Plan for response to dam failure/flooding
- **GIS-based pre-application review process—**Maintain a GIS-based (Accella) pre-application review for new construction and major remodels in hazard areas, such levee break, high and/or very high wildfire areas.
- **Integration of the 2015 HMP into current/future planning documents—**Integrate the 2015 HMP, in particular the hazard analysis and mitigation strategy sections, into local planning documents, including general plans, emergency operations plans, and capital improvement plans.
- **Fuel Reduction Program, Chipper Program—**Maintain a fuel reduction program, such as the collection and disposal of dead fuel, within open spaces and around critical facilities and residential structures located within a SRA or LRA high or very high wildfire zone
- **Post-Fire Debris Flow Treatments—**Maintain post-fire debris flow hillslope and channel treatments, such as mulching, check dams, and debris racks, as needed.

- **Fuel Modification Program, Fire Hazard Reduction Plan—**Maintain a fuel modification program, which also includes residential maintenance requirements and enforcement, plan submittal and approval process, guidelines for planting, and a listing of undesirable plant species. Require builders and developers to submit their plans, complete with proposed fuel modification zones, to the local fire department for review and approval prior to beginning construction.
- **Public Education Program, Ready, Set, Go**—Continue to develop and promote public education programs in wildland fire safety and survival for all residents adjacent to wildland areas.
- **Water Reduction and Restrictions & Public Education**—Continue to implement water reduction and restrictions at district facilities; reduced or removed landscape vegetation and replaced it with drought tolerant vegetation. Also created a public viewing area at a fire station starting with a walking tour and plant identification for the public to use while planting their own yards.
- **National Terrorism Advisory System Bulletin—**Rating level, Department of Homeland Security (DHS) for threat preparation and planning as applied for preparatory action by the Fire District.
- **MARSEC USCG (Maritime Security U.S. Coast Guard)**—Threat rating system for our local Port of Hueneme, a Maritime Transportation Security Act regulated port as applied for preparatory action by the Fire District.
- Integrate the hazard analysis and mitigation strategy into the General Plan's Safety Element.
- Continue to participate in the NWS Tsunami Ready Program.
- Maintain a new vegetation management program that provides vegetation management services to elderly, disabled, or low- income property owners who lack the resources to remove flammable vegetation from around their homes.
- Maintain a fuel modification program for new construction by requiring builders and developers to submit their plans, complete with proposed fuel modification zones, to the local fire department for review and approval prior to beginning construction.
- Maintain a hazards fuel treatment program for areas that have been identified with overgrown/dead brush/trees to reduce the potential for tree-to-tree ignition. Ensure that a "maintenance now" component to provide continued fire resistance is part of the program.
- Maintain a vegetation management program in areas within and adjacent to rights-of-way and in close proximity to critical facilities to reduce the risk of tree failure and property damage and avoid creation of wind acceleration corridors within vegetated areas.
- Continue to work with local ranchers and oil fields to identify and create additional exit corridors for employees to use in the event of a wildfire.
- Continue to implement the hazard analysis and mitigation strategy into the district's emergency plans.
- Maintain post-fire debris flow hillslope and channel treatments, such mulching, check dams, and debris racks, as needed.

22.5.2 Opportunities for Future Integration

The capability assessment in this annex indicates opportunities to integrate this mitigation plan with other jurisdictional planning/regulatory capabilities. Capabilities were identified as integration opportunities if they can support or enhance the actions identified in this plan or be supported or enhanced by components of this plan. The capability assessment identified the following plans and programs that do not currently integrate hazard mitigation information but provide opportunities to do so in the future:

- **AB-38—**Applying the Wildland Fire Disclosure Act on Home Sales

Taking action to integrate each of these programs with the hazard mitigation plan was considered as a mitigation action to include in the action plan in this annex.

22.6 RISK ASSESSMENT

22.6.1 Jurisdiction-Specific Natural Hazard Event History

Table 22-9 lists past occurrences of natural hazards for which specific damage was recorded in this jurisdiction Other hazard events that broadly affected the entire planning area, including this jurisdiction, are listed in the risk assessments in Volume 1 of this hazard mitigation plan.

Table 22-9. Past Natural Hazard Events

Type of Event	FEMA Disaster #	Date	Damage Assessment
COVID-19 Pandemic	DR-4482	January 20, 2020 – present September 30,2021	$181,280.00
Holser Fire		August 17, 2020	$880,836.32 3, 000 acres burned
Lime Fire		June 10, 2020	$1,257,780.92 803 acres burned
Maria Fire	FM-5302	November 1, 2019 October 31, 2019	$1,431,058.00 9,999 acres burned
Easy Fire	FM-5298 DR-5298	October 30, 2019	$1,266,729.00 1,806 acres burned
Getty Fire	FM-5297	October 28, 2019	$93,205.78
Saddleridge Fire	FM-5293	October 10, 2019	$85,897.02
Wildfires (Hill/Woolsey)	DR-4407	November 8 – 25, 2018	$10,718,300.00 Woolsey, LA & VC 96,949 acres
Thomas Fire	FM-5224 DR-4353	December 4, 2017	$8,538,253.00
Springs Fire	FM-5024 DR-5024	May 2 – 11, 2013	$369,392.00 24,251 acres burned
Guiberson Fire	FM-2839 DR-2839	September 22 – 29, 2009	$533,819.00
Wildfires, Flooding, Mudflows, and Debris Flows (October 2007 Fires)	DR-1731	October 21 – March 31, 2008	$81,578.00
Sesno Fire	DR-2789	October 13, 2008	$142,434.00

Type of Event	FEMA Disaster #	Date	Damage Assessment
Shekell Fire	FM-2681 DR-2861	December 3 – 6, 2006	$2,193,118.00 13,600 acres burned 7 structures burned
Day Fire	FM-2677 DR-2677	September 4, 2006	$382,215.00
School Fire	FM-2586 DR-2568	November 17, 2005	$1,013,284.30
Topanga Fire	FM-2583 DR-2583	September 28 – October 10, 2005 September 28	$1,749,843.47 24, 175 acres burned 6 structures burned
Hurricane Katrina Evacuation	EM-3248	August 29 – October 1, 2005	$621,740
Severe Storms, Flooding, Landslides, and Mud and Debris Flows	DR-1585	February 16 – 23, 2005	Data not available
Severe Storms, Flooding, Debris Flows, and Mudslides **La Conchita**	DR-1577	December 27, 2004 – January 11, 2005	$1,828,411.00
Simi Fire		October 25, 2003	107,560 acres burned 48 structures lost
Wildfires, Flooding, Mudflow and Debris Flow	DR-1498	October 21, 2003 – March 31, 2003	Data not available
Westlake Fire		June 29, 2001	278 Acres burned
Severe Storms, Tornadoes, High Winds and Flooding	DR-1267	December 20 – 28, 1998	Data not available
Severe Winter Storms and Flooding	DR-1203	February 2 – April 30, 1998	Data not available
Severe Fires	EM-3120	October 21 – 31, 1996	Data not available
Grand Fire	Unknown	April 28, 1996	10,949 acres burned
Severe Winter Storms, Flooding, Landslides, Mud Flows	DR-1046	February 13 – April 19, 1995	Data not available
Severe Winter Storms, Flooding, Landslides, Mud Flows	DR-1044	January 3 – February, 1995	Data not available
Northridge Earthquake	DR-1008	January 17 – November 30,1994	Data not available
Fires, Mud & Landslides, Soil Erosion, Flooding	DR-1005	October 26 – April 22, 1994	Data not available
Green Meadows Fire		October 26, 1993	38,477 acres burned 45 structures burned
Severe Storm, Winter Storm, Mud & Landslides, Flooding	DR-979	January 5 – March 20, 1993	Data not available
Snow Storm, Heavy Rain, High Winds, Flooding, Mudslide	DR-935	February 10 – 19, 1992	Data not available
Severe Freeze	DR-894	December 19, 1990 – January 3, 1991	Data not available
Bates Fire		April 4, 1989	193 acres burned
Piru Fire		January 1, 1988	12,068 acres burned
Severe Storms, High Tides, Flooding	DR-812	January 17 – 22, 1988	Data not available
Bradley Fire		November 11, 1986	9,229 acres burned
Ferndale Fire		October 14, 1985	46,809 acres burned 20 structures burned
Black Mountain Fire		July 3, 1985	1,324 acres burned
Wheeler Fire		July 1, 1985	122,724 acres burned

Type of Event	FEMA Disaster #	Date	Damage Assessment
Grass, Wildlands, Forest Fires	DR-739	June 26 – July 19, 1985	Data not available
Grimes Fire		May 7, 1984	11,164 acres burned 3,000 avocado & citrus trees burned
Coastal Storms, Floods, Slides, Tornadoes	DR-677	January 21 – March 30, 1983	Data not available
Severe Storms, Mudslides, Flooding	DR-615	January 8, 1980	Data not available
Happy Camp Fire		August 28, 1978	463 acres burned
Coastal Storms, Mudslides, Flooding	DR-547	February 15, 1978	Data not available
Carlisle Fire		November 15, 1977	1,368 acres burned
Los Robles Fire		June 22, 1976	2,245 acres burned 1 structure burned
Potrero Fire		September 26, 1973	12,297 acres burned 3 structures burned
Severe Storms, High Tides, Flooding	DR-364	February 8, 1973	Data not available
Forest, Brush Fires	DR-295	September 29, 1970	Data not available
Camarillo Heights Fire		September 26, 1970	183 acres burned 3 structures burned
Foothill Fire		September 25, 1970	4,731 acres burned 12 structures burned
Severe Storms, Flooding	DR-253	January 26, 1969	Records not kept
Timber Canyon Fire		October 16, 1967	10,841 acres burned 8 structures burned
Ditch Road Fire		October 16, 1967	1,245 acres burned 13 structures burned
Sence Ranch Fire		October 15, 1967	18,354 acres burned 76 structures burned
Devonshire-Parker Fire		October 15, 1967	23,088 acres burned 48 structures burned VC&LA Counties
Warring Canyon Fire		August 28, 1967	4,003 acres burned 1 structure burned
Heavy Rains, Flooding	DR-211	December 7, 1965	Records not kept
Polo Fire		March 7, 1964	684 acres burned
Flood[a]	DR-145	February 25, 1963	No data on file
Creek Road Fire		August 20, 1963	4,533 acres burned
Squaw Flats Fire		August 20, 1963	439 acres burned
Red Mountain Fire		January 5, 1963	1,389 acres burned
Culbert Lease Fire		December 4, 1962	5,314 acres burned 4 structures burned
Severe Storm[a]	DR-138	October 24, 1962	No data on file
Flood[a]	DR-122	March 6, 1962	No data on file
Donlon & Fletcher Fire		January 15, 1961	2,426 acres burned
Calumet Fire		October 21, 1958	17,212 acres burned 5 structures burned
Flood[a]	DR-82	April 4, 1958	No data on file
Fire[a]	DR-65	December 29,1956	No data on file

Type of Event	FEMA Disaster #	Date	Damage Assessment
Lake Sherwood Fire		December 28, 1956	35,164 acres burned 20 structures burned
Flood[a]	DR-47	December 23,1955	No data on file
Ventu Park Fire		November 7, 1955	13,956 acres burned 8 structures burned
Houston Fire		February 10, 1955	500 acres burned
Flood[a]	DR-15	February 5, 1954	No data on file
Wheeler Springs Fire		September 12, 1948	22,503 acres burned 17 structures burned
Thatcher Fire		June 1, 1947	44,003 acres burned 60 structures burned
Matilija Fire		September 7, 1932	220,000 acres burned

a. FEMA did not begin distinguishing declarations by county until 1964. Declarations prior to then are statewide, not county-specific.

Source: FEMA 2021

22.6.2 Hazard Risk Ranking

Table 22-10 presents a local ranking of all hazards of concern for which this hazard mitigation plan provides complete risk assessments. As described in detail in Volume 1, the ranking process involves an assessment of the likelihood of occurrence for each hazard, along with its potential impacts on people, property, and district operations. Mitigation actions primarily target hazards with high and medium rankings.

Calculations are from Unincorporated County areas and all cities, except Ventura, Oxnard, and Fillmore. Rankings were adjusted by Chief Fong with THIRA process, professional knowledge, and experience.

Table 22-10. Hazard Risk Ranking

Rank	Hazard	Risk Ranking Score	Risk Category
1	Wildfire	34	High
2	Severe Weather	24	Medium
2	Severe Storms	24	Medium
4	Flooding	23	Medium
5	Drought	22	Medium
5	Earthquake	22	Medium
5	Dam Failure	22	Medium
8	Landslide	16	Low
9	Sea Level Rise	4	Low
9	Tsunami	4	Low

22.6.3 Jurisdiction-Specific Vulnerabilities

Volume 1 of this hazard mitigation plan provides complete risk assessments for each identified hazard of concern. The following jurisdiction-specific issues have been identified based on a review of the results of the risk assessment, public involvement strategy, and other available resources:

- Wildfires—Ventura County has experienced the largest, most destructive, and longest duration wildfires in State recorded history, with 3 of the top 20 in the County according to CAL FIRE.
- Severe Weather—The extremes of climate change have induced long duration wind-events, freezing temperatures with frost kill, record high temperatures, increased lightning activity, and prolonged drought resulting in increased calls for service.
- Severe Storms—The jurisdiction has seen extreme storm systems bring the majority of precipitation in very condensed periods, which have impacted communities and infrastructure causing flooding, with associated mudslides in prior burn areas, and coastal flooding aggravated by storm surge and rising tides.

Actions addressing these issues were prioritized for consideration in the action plan in this annex.

22.7 STATUS OF PREVIOUS PLAN ACTIONS

Table 22-11 summarizes the actions that were recommended in the previous version of the hazard mitigation plan and their implementation status at the time this update was prepared.

Table 22-11. Status of Previous Plan Actions

Action Item from Previous Plan	Completed	Removed; No Longer Feasible	Carried Over to Plan Update	
			Check if Yes	Action # in Update
OA 1—Integrate the hazard analysis and mitigation strategy with the General Plan's Safety Element.			✓	VFP-4
Comment: *Hazard analysis and mitigation strategy is continuous.*				
OA 17—Implement post-fire debris flow hillslope and channel treatments, such as seeding, mulching, check dams, and debris racks, as needed.			✓	VFP-5
Comment: *Current programs following recent fires (Thomas Fire 2017 and Woolsey Fire, 2018) have been completed. Program will continue, following impacted wildland fire areas.*				
OA 21—Maintain hazards fuel treatment program for areas that have been identified with overgrown/dead brush/trees to reduce the potential for tree-to-tree ignition. Ensure that a "maintenance now" component to provide continued fire resistance is part of the program.			✓	VFP-6
Comment: *Continuing program, indefinitely; as part of the VCFPD Fire Hazard Reduction Program.*				
OA 22—Develop a vegetation management program in areas within and adjacent to rights-of-way and in close proximity to critical facilities to reduce the risk of tree failure and property damage and avoid creation of wind acceleration corridors within vegetated areas.			✓	VFP-7
Comment: *Continuing program as areas are identified.*				
VCFPD 1 –Work with local ranchers and oil fields to identify and create additional exit corridors for employees to use in the event of a wildfire.			✓	VFP-8
Comment: *Continuing program.*				

22.8 HAZARD MITIGATION ACTION PLAN

Table 22-12 lists the actions that make up the hazard mitigation action plan for this jurisdiction. Table 22-13 identifies the priority for each action. Table 22-14 summarizes the mitigation actions by hazard of concern and mitigation type.

Table 22-12. Hazard Mitigation Action Plan Matrix

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action VFP -1—Where appropriate, support retrofitting, purchase or relocation of structures located in hazard areas, prioritizing those that have experienced repetitive losses and/or are located in high- or medium-risk hazard areas.						
Hazards Mitigated: Wildfire, Severe Storms, Severe Weather, Landslide, Sea Level Rise, Tsunami, Earthquake, Dam Failure, Flooding						
Existing	2, 6, 9, 11	VCFPD	GSA & Public Works	High	FEMA HMA (BRIC, FMA, HMGP), Staff Time, and General Funds	Short-term
Action VFP-2—Actively participate in the plan maintenance protocols outlined in Volume 1 of this hazard mitigation plan.						
Hazards Mitigated: Wildfire, Severe Storms, Severe Weather, Landslide, Sea Level Rise, Tsunami, Drought, Earthquake, Dam Failure, Flooding						
New & Existing	1, 4, 6, 8, 19	VCFPD	GSA & Public Works	Low	Staff Time, General Funds	Short-term
Action VFP-3—Purchase generators for critical facilities and infrastructure that lack adequate backup power, including the Vehicle Maintenance Unit, which will be installed sometime between the end of 2021 and beginning of 2022.						
Hazards Mitigated: Dam Failure, Earthquake, Flooding, Landslide, Severe Weather, Severe Storms, Wildfire						
Existing	2, 6, 7	VCFPD	GSA & Public Works	Low	Staff Time, General Funds, FEMA HMA (BRIC, HMGP)	Short-term
Action VFP-4—Integrate the hazard analysis and mitigation strategy with the Ventura County General Plan's Safety Element.						
Hazards Mitigated: Wildfire, Severe Storms, Severe Weather, Landslide, Sea Level Rise, Tsunami, Drought, Earthquake, Dam Failure, Flooding						
New & Existing	1, 4, 6, 8, 19	VCFPD	GSA, Public Works, CAL FIRE	Medium	FEMA HMA (BRIC, FMA, HMGP), Staff Time & General Funds	Ongoing
Action VFP-5—Implement post-fire debris flow hillslope and channel treatments, such as seeding, mulching, check dams, and debris racks, as needed.						
Hazards Mitigated: Earthquake, Dam Failure, Severe Storms, Severe Weather, Flooding, Wildfire, Landslide, Drought						
New & Existing	2, 4, 5, 6, 8, 10, 11, 13, 14, 15, 18	VCFPD	GSA, Public Works, CAL FIRE	Medium	FEMA HMA (BRIC, FMAP and HMGP), Staff Time & General Funds	Ongoing
Action VFP-6—Maintain wildfire hazard fuel reduction program for areas that have been identified with overgrown or dead brush, trees and weeds to reduce the potential for tree-to-tree ignition. Ensure that a "maintenance now" component to provide continued fire resistance is part of the program.						
Hazards Mitigated: Wildfire						
New & Existing	2, 4, 5, 6, 8, 10, 11, 13, 14, 15, 18, 19	VCFPD	CAL FIRE & USDA	Medium	FEMA HMA (BRIC, FMAP and HMGP), Staff Time & General Funds	Ongoing
Action VFP-7—Develop a vegetation management program in areas within and adjacent to rights-of-way and in close proximity to critical facilities to reduce the risk of tree failure and property damage and avoid creation of wind acceleration corridors within vegetated areas.						
Hazards Mitigated: Severe Storms, Severe Weather, Flooding, Wildfire, Landslide, Drought						
New & Existing	2, 4, 5, 6, 8, 10, 11, 13, 14, 15, 18, 19	VCFPD	CAL FIRE & USDA	Medium	FEMA HMA (BRIC, FMAP and HMGP), Staff Time & General Funds	Ongoing
Action VFP-8—Work with local ranchers and oil fields to identify and create additional exit corridors for employees to use in the event of a wildfire.						
Hazards Mitigated: Wildfire						
New & Existing	1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19	VCFPD	CAL FIRE & USDA	Low	FEMA HMA (BRIC, FMAP and HMGP), Staff Time & General Funds	Ongoing
Action VFP-9—At select Fire Stations in the district, continue using reclaimed water and promoting water-saving measures by maintaining drought-tolerant demonstration gardens for community education and awareness.						
Hazards Mitigated: Drought						
Existing	1, 2, 4, 13, 14, 15, 17, 18, 19	VCFPD	Local Water Utility Purveyors	Low	Staff Time & General Funds	Ongoing

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action VFP-10—Implement a fuel modification program for new construction by requiring builders and developers to submit their plans, complete with proposed fuel modification zones, to the local fire department for review and approval prior to beginning construction.						
Hazards Mitigated: Wildfire						
New & Existing	1, 2, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19	VCFPD	CAL FIRE & Local City Fire Depts.	Low	FEMA HMA (BRIC, FMAP and HMGP), Staff Time & General Funds	Ongoing
Action VFP-11	Develop and implement a Home Ignition Zone Assessment Program (Reference NFPA 1144) throughout the County's Fire Hazard Severity Zones.					
Hazards Mitigated: Wildfire						
New	1, 2, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19	VCFPD	Ventura County Resource Conservation District	Medium	FEMA HMA (BRIC, FMA, HMGP), General Funds & Staff Time	Ongoing
Action VFP-12	Maintain new vegetation management program that provides vegetation management services to elderly, disabled, or low-income property owners who lack the resources to remove flammable vegetation from around their homes.					
Hazards Mitigated: Wildfire						
New & Existing	2, 4, 5, 8, 10, 13, 14, 15, 19	VCFPD		Medium	FEMA HMA (BRIC, FMAP and HMGP), Staff Time, General Funds	Ongoing

a. Short-term = Completion within 5 years; Long-term = Completion within 10 years; Ongoing= Continuing new or existing program with no completion date

Acronyms used here are defined at the beginning of this volume.

Table 22-13. Mitigation Action Priority

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Cost?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Implementation Priority[a]	Grant Pursuit Priority[a]
1	4	High	High	Yes	Yes	No	Medium	High
2	5	Medium	Low	Yes	No	Yes	High	Low
3	3	High	Low	Yes	Yes	Yes	High	High
4	5	Medium	Medium	Yes	Yes	Yes	High	Medium
5	11	Medium	Medium	Yes	Yes	No	Medium	Medium
6	12	High	Medium	Yes	Yes	Yes	High	High
7	12	Medium	Medium	Yes	Yes	Yes	High	Medium
8	18	Medium	Low	Yes	Yes	Yes	High	Medium
9	9	Medium	Low	Yes	No	Yes	High	Low
10	17	Medium	Low	Yes	Yes	Yes	High	Medium
11	17	Medium	Low	Yes	Yes	Yes	High	Medium
12	9	High	Medium	Yes	Yes	Yes	High	High

a. See the introduction to this volume for explanation of priorities.

Table 22-14. Analysis of Mitigation Actions

Hazard Type	Action Addressing Hazard, by Mitigation Type[a]							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilient	Community Capacity Building
High-Risk Hazards								
Wildfire	1, 2, 4, 5, 6, 7, 8, 10, 11, 12	1, 3, 5, 6, 10, 11, 12	4, 6, 11, 12	5, 6, 7, 8, 11, 12	3, 5, 6, 8, 11, 12	5	5, 6, 7, 12	2, 4, 5, 6, 7, 8, 10, 11, 12
Medium-Risk Hazards								
Dam Failure	1, 2, 4, 5	1, 3, 5	4	5	3, 5	5	5	2, 4, 5
Severe Weather	1, 2, 4, 5, 7	1, 3, 5	4	5, 7	3, 5	5	5, 7	2, 4, 5, 7
Severe Storms	VFP-1, 2, 4, 5, 7	VFP-1, 3, 5	VFP-4	VFP-5, 7	VFP-3, 5	VFP-5	VFP-5, 7	VFP-2, 4, 5, 7
Flooding	VFP-1, 2, 4, 5, 7	VFP-1, 3, 5	VFP-4	VFP-5, 7	VFP-3, 5	VFP-5	VFP-5, 7	VFP-2, 4, 5, 7
Drought	VFP-2, 4, 5, 7		VFP-4, 9	VFP-5, 7, 9	VFP-5	VFP-5	VFP-5, 7, 9	VFP-2, 4, 5, 7
Earthquake	VFP-1, 2, 4, 5	VFP-1, 3, 5	VFP-4	VFP-5	VFP-3, 5	VFP-5	VFP-5	VFP-2, 4, 5
Landslide	VFP-1, 2, 4, 5, 7	VFP-1, 3, 5	VFP-4	VFP-5, 7	VFP-3, 5	VFP-5	VFP-5, 7	VFP-2, 4, 5, 7
Low-Risk Hazards								
Sea Level Rise	VFP-1, 2, 4	VFP-1	VFP-4					VFP-2, 4
Tsunami	VFP-1, 2, 4	VFP-1	VFP-4					VFP-2, 4

a. See the introduction to this volume for explanation of mitigation types.

22.9 PUBLIC OUTREACH

Table 22-15 lists public outreach activities for this jurisdiction.

Table 22-15. Local Public Outreach

Local Outreach Activity	Date	Number of People Involved
Tweet about OES updating the HMP	08/05/2021	7
Retweet of OES updating the HMP	08/04/2021	23
Facebook post about OES updating the HMP	08/05/2021	4,312
Instagram post about OES updating the HMP	08/05/2021	9,656
Retweet of OES updating the HMP (English and Spanish)	08/16/2021	14
Nextdoor	08/05/2021	7,279

22.10 INFORMATION SOURCES USED FOR THIS ANNEX

The following technical reports, plans, and regulatory mechanisms were reviewed to provide information for this annex.

- **VCFPD Administrative Policies Manual** was used to list planning and regulatory capabilities for Table 22-3.
- **VCFPD Operational Procedures Manual** was used to list planning and regulatory capabilities for Table 22-3.
- **VCFPD Emergency Plans Manual** was used to list planning and regulatory capabilities for Table 22-3.

- **Fiscal and Facilities Records Systems** were used to list assets in Table 22-2 and damages in Table 22-8.
- **District Records on Hazards and Loss** were used to support the identification of past hazard events and noted vulnerabilities, the risk ranking, and the development of the mitigation action plan.

The following outside resources and references were reviewed:

- **Hazard Mitigation Plan Annex Development Toolkit** was used to support the identification of past hazard events and noted vulnerabilities, the risk ranking, and the development of the mitigation action plan.
- **CAL FIRE Archives** were used to gather data for Table 22-8 Past Natural Hazard Events.

23. VENTURA COUNTY OFFICE OF EDUCATION

23.1 LOCAL HAZARD MITIGATION PLANNING TEAM

Primary Point of Contact
Russ Olsen, Director of Risk Management
Ventura County Schools Self-Funding Authority
5189A Verdugo Way
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Alternate Point of Contact
Michelle Kelly, Risk Manager
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This annex was developed by the local hazard mitigation planning team, whose members are listed in Table 23-1.

Table 23-1. Local Hazard Mitigation Planning Team Members

Name	Title
Eric Reynolds, Ventura Unified SD	Director of Risk Management
Julie Tedder, Moorpark Unified SD	Administrative Assistant, Business Services
Martha Corona, Fillmore Unified SD	Director of Fiscal Services
Russ Olsen, Ventura County Schools Self-Funding Authority	Director of Risk Management
Michelle Kelly, Ventura County Schools Self-Funding Authority	Risk Manager

23.2 JURISDICTION PROFILE

23.2.1 Overview

Ventura County comprises 19 public K-12 school districts, 11 public charter schools, and the Ventura County Office of Education (VCOE), collectively called local educational agencies. The VCOE provides facility planning, construction, and maintenance oversite and guidance to the other local educational agencies. VCOE also operates specialized schools in the county.

Ventura County Schools Self-Funding Authority (VCSSFA) provides insurance programs, risk management programs, and emergency management programs assistance to the public K-12 school districts, 8 charter schools, and VCOE.

The Ventura County Board of Education/Ventura County Superintendent of Schools assumes responsibility for the adoption of this plan; VCSSFA will oversee its implementation.

23.2.2 Service Area

The Ventura County public school service area covers 258 school district locations including schools, offices, maintenance facilities, warehouses and transportation facilities serving a population of 132,000 students and 12,410 staff. Local educational agencies provide educational instruction, extracurricular activities, transportation and meals to students.

23.2.3 Assets

Table 23-2 summarizes the assets of the District and their value.

Table 23-2. Special-Purpose District Assets

Asset	Value
Property	
242 school locations and school district auxiliary locations	$3,915,649,556
Equipment	
827 vehicles including buses, maintenance trucks, passenger cars, trailers, and mobile equipment	Unknown
Total:	***Unknown***
Critical Facilities	
Ventura County Office of Education, Administrative Office; 5189 Verdugo Way, Camarillo, CA 93012	$11,602,900
Briggs Elementary School District, District Office; 12465 Foothill Road, Santa Paula, CA 93060	$1,452,400
Conejo Valley Unified School District, Educational Center; 1400 E Janss Road, Thousand Oaks, CA 91362	$4,835,400
Fillmore Unified School District, District Office; 627 Sespe Avenue, Fillmore, CA 93015	$6,723,780
Hueneme Unified School District, District Office; 205 N Ventura Road, Port Hueneme, CA 93041	$2,746,957
Mesa Union School District, District Office; 3901 N Mesa School Road, Somis, CA 93066	$707,200
Moorpark Unified School District, District Office; 5297 Maureen Lane, Moorpark, CA 93021	$20,800,600
Oak Park Unified School District, , District Office; 5801 Conifer Street, Oak Park, CA 91377	$3,398,600
Ocean View School District, , District Office; 4200 Olds Road, Oxnard, CA 93033	$3,262,300
Ojai Unified School District, , District Office; 414 East Ojai Avenue, Ojai, CA 93023	$2,016,200
Oxnard School District, , District Office; 1051 South A Street, Oxnard, CA 93030	$12,389,000
Oxnard Union High School District, , District Office; 1800 Solar Drive, 1st Floor, Oxnard, CA 93036	$15,575,317
Pleasant Valley School District, , District Office; 600 Temple Street, Camarillo, CA 93010	$3,333,800
Rio Elementary School District, , District Office; 1800 Solar Drive, 3rd Floor, Oxnard, CA 93036	$7,775,983
Santa Paula Unified School District, District Office; 201 South Steckel Drive, Santa Paula, CA 93060	$2,926,478
Simi Valley Unified School District, , District Office; 101 West Cochran Street, Simi Valley, CA 93065	$46,598,400
Ventura Unified School District, , District Office; 255 West Stanley Avenue, Ventura, CA 93001	$35,842,500
Total:	***$181,987,815***

23.3 CURRENT TRENDS

The current (2021) population of Ventura County is estimated at 841,734, with a growth of -0.25% in the past year according to the most recent United States Census Data. Ventura County is the 14th largest county in California. And over the last ten-year period, Ventura County's population has seen growth of 2.02% since its 2010 population of 825,097.

23.4 CAPABILITY ASSESSMENT

This section describes an assessment of existing capabilities for implementing hazard mitigation strategies. The introduction at the beginning of this volume of the hazard mitigation plan describes the components included in the capability assessment and their significance for hazard mitigation planning.

Findings of the capability assessment were reviewed to identify opportunities to expand, initiate or integrate capabilities to further hazard mitigation goals and objectives. Where such opportunities were identified and determined to be feasible, they are included in the action plan. The "Analysis of Mitigation Actions" table in this annex identifies these as community capacity building mitigation actions. The findings of the assessment are presented as follows:

- Table 23-3 presents an assessment of planning and regulatory capabilities
- Table 23-4 presents an assessment of fiscal capabilities
- Table 23-5 presents an assessment of administrative and technical capabilities
- Table 23-6 presents an assessment of education and outreach capabilities
- Table 23-7 presents classifications under various community mitigation programs
- Table 23-8 Presents the community's adaptive capacity for the impacts of climate change

Table 23-3. Planning and Regulatory Capability

Plan, Study or Program	Date of Most Recent Update	Comment
California Education Code, sections 17280 et seq.	2018	Design and approval of school buildings
California Building Code	2019	Standards for building design
Board Policy 3511	2019	Energy and Water Management
Board Policy 7110		Facilities Master Plan
Board Policy 7214		General Obligation Bonds
Emergency Operations Plan	2020	Preparation, response, recovery
California Department of General Services, Division of State Architect		Review and approval of new and modernized school buildings

Table 23-4. Fiscal Capability

Financial Resource	Accessible or Eligible to Use?
Community Development Block Grants	No
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for Specific Purposes	No
User Fees for Water, Sewer, Gas or Electric Service	No
Incur Debt through General Obligation Bonds	Yes
Incur Debt through Special Tax Bonds	No
Incur Debt through Private Activity Bonds	No
Withhold Public Expenditures in Hazard-Prone Areas	No
State-Sponsored Grant Programs	Yes
Development Impact Fees for Homebuyers or Developers	No
Other	Yes
If yes, specify: Self-insurance program credit for safety and emergency preparation.	

Table 23-5. Administrative and Technical Capability

Staff/Personnel Resource	Available?
Planners or engineers with knowledge of land development and land management practices	No
Engineers or professionals trained in building or infrastructure construction practices ***If Yes, Department /Position:*** Varies by local educational agency/Director of Facilities, Bond Manager	Yes
Planners or engineers with an understanding of natural hazards	No
Staff with training in benefit/cost analysis ***If Yes, Department /Position:*** VCSSFA/Risk Manager	Yes
Surveyors	No
Personnel skilled or trained in GIS applications	No
Scientist familiar with natural hazards in local area	No
Emergency manager ***If Yes, Department /Position:*** Varies by local educational agency/Risk Manager, Emergency Technician	Yes
Grant writers ***If Yes, Department /Position:*** Department and title varies by local educational agency	Yes

Table 23-6. Education and Outreach Capability

Criterion	Response
Do you have a public information officer or communications office?	Yes
Do you have personnel skilled or trained in website development?	Yes
Do you have hazard mitigation information available on your website?	No
Do you use social media for hazard mitigation education and outreach?	No
Do you have any citizen boards or commissions that address issues related to hazard mitigation?	No
Do you have any other programs in place that could be used to communicate hazard-related information? ***If yes, briefly describe:*** Various mass notification systems -- telephone, text, e-mail	Yes
Do you have any established warning systems for hazard events? ***If yes, briefly describe:*** Various mass notification systems -- telephone, text, e-mail	Yes

Table 23-7. Community Classifications

	Participating?	Classification	Date Classified
FIPS Code	Yes	N/A	N/A
DUNS#	Yes	078294390	N/A
Community Rating System	No	N/A	N/A
Building Code Effectiveness Grading Schedule	No	N/A	N/A
Public Protection	No	N/A	N/A
Storm Ready	No	N/A	N/A
Firewise	No	N/A	N/A
Tsunami Ready	No	N/A	N/A

Table 23-8. Adaptive Capacity for Climate Change

Criterion	Jurisdiction Rating[a]
Technical Capacity	
Jurisdiction-level understanding of potential climate change impacts	Medium
Comment: *Climate change taught in some science classes, widespread use of solar panels, electric buses*	
Jurisdiction-level monitoring of climate change impacts	Low
Comment: *Impact of local educational agency efforts difficult to measure or monitor*	
Technical resources to assess proposed strategies for feasibility and externalities	Low
Comment: *Such in-house resources do not exist*	
Jurisdiction-level capacity for development of greenhouse gas emissions inventory	Low
Comment: *Such in-house resources do not exist*	
Capital planning and land use decisions informed by potential climate impacts	Medium
Comment: *Continued implementation of new solar panels, electrical storage batteries, electric buses*	
Participation in regional groups addressing climate risks	Low
Comment: *Such in-house resources do not exist*	
Implementation Capacity	
Clear authority/mandate to consider climate change impacts during public decision-making processes	Low
Comment: *Authority/mandate centered on education, which can include climate change taught in some science classes*	
Identified strategies for greenhouse gas mitigation efforts	Medium
Comment: *solar panels, electrical storage batteries, electric buses*	
Identified strategies for adaptation to impacts	Medium
Comment: *solar panels, electrical storage batteries, electric buses*	
Champions for climate action in local government departments	Low
Comment: *Local educational agencies have had energy conservation specialists, but grants have expired.*	
Political support for implementing climate change adaptation strategies	Low
Comment: *Local authority limited to school sites*	
Financial resources devoted to climate change adaptation	Low
Comment: *As allowed by the state or supported by grant funding.*	
Local authority over sectors likely to be negative impacted	Low
Comment: *Local authority limited to students and staff on school campuses*	
Public Capacity	
Local residents' knowledge of and understanding of climate risk	Medium
Comment: *Climate change taught in some science classes*	
Local residents' support of adaptation efforts	Low
Comment: *Local educational agencies have little influence beyond school sites*	
Local residents' capacity to adapt to climate impacts	Low
Comment: *Local educational agencies have little influence beyond school sites*	
Local economy current capacity to adapt to climate impacts	Low
Comment: *Local educational agencies have little influence beyond school sites*	
Local ecosystems capacity to adapt to climate impacts	Low
Comment: *Local educational agencies study ecosystems, but have little influence beyond school grounds*	

a. High = Capacity exists and is in use; Medium = Capacity may exist, but is not used or could use some improvement; Low = Capacity does not exist or could use substantial improvement; Unsure= Not enough information is known to assign a rating.

23.5 INTEGRATION REVIEW

For hazard mitigation planning, “integration” means that hazard mitigation information is used in other relevant planning mechanisms, such as capital facilities planning, and that relevant information from those sources is used in hazard mitigation. This section identifies where such integration is already in place, and where there are opportunities for further integration in the future. Resources listed at the end of this annex were used to provide information on integration. The progress reporting process described in Volume 1 of the hazard mitigation plan will document the progress of hazard mitigation actions related to integration and identify new opportunities for integration.

23.5.1 Existing Integration

Some level of integration has already been established between local hazard mitigation planning and the following other local plans and programs:

- **Emergency Operations Plan**—A plan for preparing, responding, recovery from emergencies which includes mitigation.
- **Recommendations and Requirements for Wildfire: Preparation and Response**—Includes strategies for preventing property damage due to wildfire and strategies for preventing smoke intrusion into school buildings.

23.5.2 Opportunities for Future Integration

The capability assessment in this annex indicates opportunities to integrate this mitigation plan with other jurisdictional planning/regulatory capabilities. Capabilities were identified as integration opportunities if they can support or enhance the actions identified in this plan or be supported or enhanced by components of this plan. The capability assessment identified the following plans and programs that do not currently integrate hazard mitigation information but provide opportunities to do so in the future:

- **Comprehensive School Safety Plan**—Includes strategies for the education, prevention and response to crime, violence and emergencies on school campuses and at school-related events.

Taking action to integrate each of these programs with the hazard mitigation plan was considered as a mitigation action to include in the action plan in this annex.

23.6 RISK ASSESSMENT

23.6.1 Jurisdiction-Specific Natural Hazard Event History

Table 23-9 lists past occurrences of natural hazards for which specific damage was recorded in this jurisdiction Other hazard events that broadly affected the entire planning area, including this jurisdiction, are listed in the risk assessments in Volume 1 of this hazard mitigation plan.

Table 23-9. Past Natural Hazard Events

Type of Event	FEMA Disaster #	Date	Damage Assessment
Severe Weather	N/A	February 28, 2021	Strong and gusty Santa Ana winds impacted the coastal valleys of Ventura county. Minor roof damage at some school sites
COVID-19 Pandemic	DR-4482	01/20/20 – continuing	N/A
Easy/Maria Fires	FM-5298/FM-5302	October 30, 2019	$325,000
Heat Event		7/4/2018 to 7/6/2018	Extreme 2-day heat event broke records across the county.
Woolsey Fire / Hill Fire	DR-4407	November 8, 2018	$7,932,865
Thomas Fire	DR-4353	December 4, 2017	$12,451,877
Winter Storms	N/A	2/17/2017 to 2/18/2017	Rainfall amounts from 2 to 6 inches across coastal areas with up to around 10 inches in the local mountains produced numerous reports of flash flooding as well as mud and debris flows. Strong southerly winds with gusts up to 70 mph reported in some areas.
Springs Fire	FM-5024	May 2, 2013	Smoke damage to district buildings. 24,251 acres burned countywide.
Guiberson Fire	FM-2839	9/22/2009 to 9/29/2009	Smoke damage to district buildings. 17,500 acres burned countywide.
2007 Ranch Fire	FM-1731	October 21, 2007	Smoke damage to district buildings. 58,401 acres burned in both L.A. and eastern Ventura county near Piru
Severe Freeze Event	DR-1689	1/11/2007 to 1/17/2007	4 nights of below freezing temperatures
Shekell Complex Fire	FM-2681	12/3/2006 to 12/6/2006	Smoke damage to district buildings. 13,600 acres burned countywide.
Day Fire	FM-2677	9/4/2006 to 10/9/2006	Smoke damage to district buildings. 162,702 acres burned countywide.
Winter Storms	DR-1577	1/7/2005 to 1/11/2005	Flooding and erosion throughout the county.
Simi Fire	DR-1498/FM-2504	October 24, 2003	Smoke damage to district buildings. 108,204 acres burned countywide.
Ranch Fire	N/A	December 27, 1999	Smoke damage to district buildings. 4,372 acres burned countywide
Freeze Event	DR-1267	December 20, 1998	Unknown
Northridge Earthquake	DR-1008	January 17, 1994	Non-structural damage to a limited number of school sites in the eastern areas of the county
Sylmar Earthquake	N/A	February 9, 1971	Unknown
St. Francis Dam Failure	N/A	March 12, 1928	>530 people died; infrastructure and buildings throughout the county all eradicated in flood's path down the Santa Clara river valley to the Pacific Ocean.

23.6.2 Hazard Risk Ranking

Table 23-10 presents a local ranking of all hazards of concern for which this hazard mitigation plan provides complete risk assessments. As described in detail in Volume 1, the ranking process involves an assessment of the likelihood of occurrence for each hazard, along with its potential impacts on people, property, and district operations. Mitigation actions primarily target hazards with high and medium rankings.

Calculations are from Unincorporated County areas and all cities, then adjusted based on the location of district properties within those jurisdictions, and local experience.

Table 23-10. Hazard Risk Ranking

Rank	Hazard	Risk Ranking Score	Risk Category
1	Earthquake	33	High
2	Wildfire	24	Medium
2	Severe Storm	24	Medium
2	Severe Weather	24	Medium
5	Dam Failure	18	Medium
5	Flooding	18	Medium
7	Drought	9	Low
8	Landslide	7	Low
9	Sea Level Rise	2	Low
9	Tsunami	2	Low

23.6.3 Jurisdiction-Specific Vulnerabilities

Volume 1 of this hazard mitigation plan provides complete risk assessments for each identified hazard of concern. The following jurisdiction-specific issues have been identified based on a review of the results of the risk assessment, public involvement strategy, and other available resources:

- School buildings are built to withstand strong earthquakes. Non-structural hazards can still cause serious injury.
- Smoke intrusion has been the biggest cleanup expense due to wildfire. A small number of schools are located near open space, making them vulnerable to burning.
- Many child nutrition storage areas are without generators to preserve food during power outages.

Mitigation actions addressing these issues were prioritized for consideration in the action plan in this annex.

23.7 STATUS OF PREVIOUS PLAN ACTIONS

Table 23-11 summarizes the actions that were recommended in the previous version of the hazard mitigation plan and their implementation status at the time this update was prepared.

23.8 HAZARD MITIGATION ACTION PLAN

Table 23-12 lists the actions that make up the hazard mitigation action plan for this jurisdiction. Table 23-13 identifies the priority for each action. Table 23-14 summarizes the mitigation actions by hazard of concern and mitigation type.

Table 23-11. Status of Previous Plan Actions

Action Item from Previous Plan	Completed	Removed; No Longer Feasible	Carried Over to Plan Update: Check if Yes	Carried Over to Plan Update: Action # in Update
OA 1—Integrate the hazard analysis and mitigation strategy with the General Plan's Safety Element.			✓	VOE-5
Comment: *Still needs to be implemented*				
OA 8—Adopt emergency water conservation measures and/or water conservation ordinance to limit irrigation.		✓		
Comment: *Not adopted*				
OA 11—Develop and implement plans to increase the building owner's general knowledge of and appreciation for the value of seismic upgrading of the building's structural and nonstructural elements.			✓	VOE-6
Comment: *School buildings are designed to withstand strong earthquakes. Efforts continue to implement and maintain non-structural earthquake safety.*				
OA 21—Maintain hazards fuel treatment program for areas that have been identified with overgrown/dead brush/trees to reduce the potential for tree-to-tree ignition. Ensure that a "maintenance now" component to provide continued fire resistance is part of the program.			✓	VOE-7
Comment: *Schools adjacent to open space continue to maintain brush clearance as required by the Ventura County Fire Protection District*				
VCOE 1—Convert high water volume landscape to native and other drought tolerant plants, hardscape, and synthetic turf in non-play areas.			✓	VOE-8
Comment: *Efforts continue to implement and maintain drought tolerant plants and hardscape.*				

Table 23-12. Hazard Mitigation Action Plan Matrix

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action VOE-1—Where appropriate, support retrofitting of structures located in hazard areas, prioritizing those that have experienced repetitive losses and/or are located in high- or medium-risk hazard areas.						
Hazards Mitigated: Earthquake, Wildfire, Severe Storm, Severe Weather, Dam Failure, Flooding, Landslide, Sea Level Rise, Tsunami						
Existing	2, 6, 9, 11	Facilities		High	General Funds, FEMA HMA (BRIC, HMGP)	Short-term
Action VOE-2—Actively participate in the plan maintenance protocols outlined in Volume 1 of this hazard mitigation plan.						
Hazards Mitigated: Earthquake, Wildfire, Severe Storm, Severe Weather, Dam Failure, Flooding, Drought, Landslide, Sea Level Rise, Tsunami						
New & Existing	1, 4, 6, 8, 19	Administration		Low	Staff Time, General Funds	Short-term
Action VOE-3—Purchase generators for critical facilities and infrastructure that lack adequate backup power, including computer networks and child nutrition storage facilities						
Hazards Mitigated: Dam Failure, Earthquake, Flooding, Severe Weather, Wildfire						
Existing	2, 6, 11	Facilities		Medium	Staff Time, General Funds, FEMA HMA (BRIC, FMA, HMGP)	Short-term

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action VOE-4—Harden structures with secure door seals and windows to prevent smoke and ash intrusion during wildfire events.						
Hazards Mitigated: Wildfire						
Existing	2, 6, 9, 11	Facilities		High	Staff Time, General Funds, FEMA HMA (BRIC, FMA, HMGP), Obligation Bonds	Ongoing
Action VOE-5—Integrate the hazard analysis and mitigation strategy with the General Plan's Safety Element.						
Hazards Mitigated: Earthquake, Wildfire, Severe Storm, Severe Weather, Dam Failure, Flooding, Drought, Landslide, Sea Level Rise, Tsunami						
New & Existing	1, 4, 6, 8, 19	Administration		Low	Staff Time, General Funds	Short-term
Action VOE-6—Continue to develop and implement plans to comply with existing seismic mandates for structural elements and increase the general knowledge, appreciation for, and implementation of seismic upgrading of the building's nonstructural elements.						
Hazards Mitigated: Earthquake						
New & Existing	1, 4, 6, 19	Facilities		High	Staff Time, General Funds, FEMA HMA (BRIC HMGP)	Ongoing
Action VOE-7—Maintain wildfire hazard fuel reduction program for areas that have been identified with overgrown or dead brush, trees and weeds to reduce the potential for tree-to-tree ignition. Ensure that a "maintenance now" component to provide continued fire resistance is part of the program. (Coordinates with Ventura County Fire Protection District Action VFP-6)						
Hazards Mitigated: Wildfire						
New & Existing	2, 4, 5, 6, 8, 10, 11, 13, 14, 15, 18, 19	VCFPD	Facilities, CAL FIRE & USDA	Medium	FEMA HMA (BRIC, FMAP and HMGP), Staff Time & General Funds	Ongoing
Action VOE-8—Convert high water volume landscape to native and other drought tolerant plants, hardscape, and synthetic turf in non-play areas.						
Hazards Mitigated: Drought						
Existing	4, 13, 15	Facilities		Medium	Staff Time, General Funds, FEMA HMA (BRIC, HMGP)	Ongoing

a. Short-term = Completion within 5 years; Long-term = Completion within 10 years; Ongoing= Continuing new or existing program with no completion date

Acronyms used here are defined at the beginning of this volume.

Table 23-13. Mitigation Action Priority

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Cost?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Implementation Priority[a]	Grant Pursuit Priority[a]
VOE-1	4	High	High	Yes	Yes	No	Medium	High
VOE-2	5	Medium	Low	Yes	No	Yes	High	Low
VOE-3	3	High	Medium	Yes	Yes	No	Medium	High
VOE-4	4	Medium	High	No	Yes	No	Low	Medium
VOE-5	5	Medium	Low	Yes	No	Yes	High	Low
VOE-6	4	High	High	Yes	Yes	No	Medium	High
VOE-7	12	High	Medium	Yes	Yes	No	Medium	High
VOE-8	3	Low	Medium	No	Yes	Yes	Low	Medium

a. See the introduction to this volume for explanation of priorities.

Table 23-14. Analysis of Mitigation Actions

Hazard Type	Action Addressing Hazard, by Mitigation Type[a]							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilient	Community Capacity Building
High-Risk Hazards								
Earthquake		VOE-1, 6	VOE-2, 5, 6		VOE-3			VOE-2, 5
Wildfire	VOE-7	VOE-1, 4, 7	VOE-2, 5, 7	VOE-7	VOE-3, 7		VOE-7	VOE-2, 3, 5, 7
Severe Storm		VOE-1	VOE-2, 5					
Severe Weather		VOE-1	VOE-2, 5		VOE-3			VOE-2, 3, 5
Dam Failure		VOE-1	VOE-2, 5		VOE-3			VOE-2, 5
Flooding		VOE-1	VOE-2, 5		VOE-3			VOE-2, 5
Drought			VOE-2, 5	VOE-8				VOE-2, 5, 8
Landslide		VOE-1	VOE-2, 5					VOE-2, 5
Sea Level Rise		VOE-1	VOE-2, 5					VOE-2, 5
Tsunami		VOE-1	VOE-2, 5					VOE-2, 5

a. See the introduction to this volume for explanation of mitigation types.

23.9 PUBLIC OUTREACH

Table 23-15 lists public outreach activities for this jurisdiction.

Table 23-15. Local Public Outreach

Local Outreach Activity	Date	Number of People Involved
Post VCSSFA Risk Management Committee meeting announcements at VCSSFA Office, VCOE Outdoor posting and VCSSFA website	First Monday of each month	15 to 18 representative from various school districts
Allow public to comment during meetings	First Monday of each month	No members of the public have attended meetings where hazard mitigation has been discussed

23.10 INFORMATION SOURCES USED FOR THIS ANNEX

The following technical reports, plans, and regulatory mechanisms were reviewed to provide information for this annex.

- **VCSSFA Statement of Values --** a list of properties and structures including values of structures and modeled values of contents

The following outside resources and references were reviewed:

- **Hazard Mitigation Plan Annex Development Toolkit**—The toolkit was used to support the identification of past hazard events and noted vulnerabilities, the risk ranking, and the development of the mitigation action plan.
- **Grants Portal**—contains documents about costs in response to cleanup after recent wildfires.

24. VENTURA COUNTY PUBLIC WORKS AGENCY—WATERSHED PROTECTION

24.1 LOCAL HAZARD MITIGATION PLANNING TEAM

Primary Point of Contact
Glenn Shephard, Director,
VCPWA-Watershed Protection
800 So. Victoria Avenue
Ventura, CA 93009-1610
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e-mail Address: glenn.shephard@ventura.org

Alternate Point of Contact
Gerard Kapuscik, Mgr. SRG,
VCPWA-Watershed Protection
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Telephone: (805) 648-9284
e-mail Address: gerard.kapuscik@ventura.org

This annex was developed by the local hazard mitigation planning team for Ventura County Public Works Agency—Watershed Protection (VCPWA-WP), whose members are listed in Table 24-1.

Table 24-1. Local Hazard Mitigation Planning Team Members

Name	Title
Eric Alger	Staff Services Specialist II, O&M, VCPWA-WP
Angela Bonfiglio Allen	Planner IV, ESS, WP&PD, VCPWA-WP
Shweta Chervu	Manager, APS, WP&PD, VCPWA-WP
Deby Cisneros	Adm. Asst. II, SRG, VCPWA-WP
Masood Jilani	Eng. Mgr. II, D&CD, VCPWA-WP
Gerard Kapuscik	Mgr. SRG, VCPWA-WP
Pam Lindsey	Mgr. ESS, WP&PD, VCPWA-WP
Ewelina Mutkowska	Mgr. County Stormwater Program-VCPWA-WP
Kirk Norman	Eng. Mgr. II. D&CD, VCPWA-WP
Gabriel Ramirez	Eng. Tech IV, SRG, VCPWA-WP
Bruce Rindahl	Eng. Mgr. II, WR&TS, WP&PD, VCPWA-WP
Lara Shellenbarger	WRS III, WR, VCPWA-WP
Glenn Shephard	Director, VCPWA-WP
Yunsheng Su	Eng. IV, APS, WP&PD, VCPWA-WP
Nathan Summerville	Eng. IV, APS, WP&PD, VCPWA-WP
Martha Symes	Grants Specialist, SRG, VCPWA-WP
Mark Yaftali	Eng. III, O&MD, VCPWA-WP

24.2 JURISDICTION PROFILE

24.2.1 Overview

The VCPWA-WP, formerly known as the Ventura County Flood Control District, was initially formed on September 12, 1944, by an act of the California State Legislature. VCPWA-WP is a Dependent County Special District, governed by the Board of Supervisors, and administratively housed in the Ventura County Public Works Agency.

The mission of VCPWA-WP is to protect life, property, and community infrastructure from flood events, improve water resources management, and enhance the health and natural function of watersheds in Ventura County.

VCPWA-WP is the responsible local agency sponsor for federal flood control projects throughout Ventura County. VCPWA-WP also serves as the principal co-permittee and manages the implementation of the Ventura Countywide Stormwater Quality Management Program under the municipal National Pollutant Discharge Elimination System permit for urban stormwater runoff discharges in Ventura County. Finally, VCPWA-WP also manages FEMA's NFIP and CRS for unincorporated Ventura County.

The Ventura County Watershed Protection Board of Supervisors assumes responsibility for the adoption of this plan, and the Ventura County Public Works Director, through his designee, Glenn Shephard, acting in his capacity as Director of VCPWA-WP, will oversee its implementation.

24.2.2 Service Area

VCPWA-WP's watershed protection service area is coterminous with boundaries of Ventura County, except for the offshore islands of Anacapa and San Nicholas. VCPWA-WP's service area is approximately 1,800 square miles and encompasses all 10 cities and the unincorporated areas of Ventura County.

24.2.3 Assets

Table 24-2 summarizes the assets of VCPWA-WP and their estimated current replacement value.

Table 24-2. VCPWA-WP Assets

Asset	Value
Property	
N/A	N/A
Equipment	
Flood Warning System (FWS) Equipment	***$3,454,500***
Total:	***$3,454,500***
Critical Flood Protection Infrastructure Facilities	
Dams, Debris and Detention Basins	$244,316,058
Flood/Stormwater Conveyance Channels	$2,057,616,000
Levees	$371,086,917
Pump Stations	$22,799,085
Total:	***$2,699,272,560***

24.3 CURRENT TRENDS

The current (2021) population of Ventura County is estimated at 841,734, with a growth of -0.25% in the past year according to the most recent United States Census Data. Ventura County is the 14th largest county in California. And over the last ten-year period, Ventura County's population has seen growth of 2.02% since its 2010 population of 825,097.

24.4 CAPABILITY ASSESSMENT

This section describes an assessment of existing capabilities for implementing hazard mitigation strategies. The introduction at the beginning of this volume of the hazard mitigation plan describes the components included in the capability assessment and their significance for hazard mitigation planning.

Findings of the capability assessment were reviewed to identify opportunities to expand, initiate or integrate capabilities to further hazard mitigation goals and objectives. Where such opportunities were identified and determined to be feasible, they are included in the action plan. The "Analysis of Mitigation Actions" table in this annex identifies these as community capacity building mitigation actions. The findings of the assessment are presented as follows:

- Table 24-3 presents an assessment of planning and regulatory capabilities
- Table 24-4 presents an assessment of fiscal capabilities
- Table 24-5 presents an assessment of administrative and technical capabilities
- Table 24-6 presents an assessment of education and outreach capabilities
- Table 24-7 presents classifications under various community mitigation programs
- Table 24-8 Presents the community's adaptive capacity for the impacts of climate change

Table 24-3. Planning and Regulatory Capability

Plan, Study or Program	Date of Most Recent Update	Comment
Annual Capital Improvement Plan Project Sheet Submittals	4/31/2021	5-Year Planning Horizon (FY 22-26)
District Detention Dams and Debris Basins Update	In Progress	Evaluation of 53 Debris and Detention Basins
District Facility Design Manual	In Progress	Guidance Standards Governing Flood Protection Projects Designed and Constructed by the VCPWA-Watershed Protection
District Design Hydrology Manual	July 2017	Design Hydrology Computational Guidelines and Input Data Parameters
Emergency Operations Roles & Responsibilities Matrix	March 2017	Categorization of Employees' Emergency Operations Roles and Responsibilities
Flood Mitigation Plan for Ventura County	3/1/2005	OES Planning Grant to VCPWA-WP to Prepare County's Plan Document
Flood Safety Plan for Ventura County	March 2017	Flood Safety Plan Outlines Ventura County's planned response to flood emergencies affecting Ventura County
Dam Inundation Mapping Studies for 8 State Sized Dams	1-2-20 thru 11-11-20	State Mandated Emergency Action Plans with Inundation Maps for Emergency Preparedness
VC Watershed Protection Ordinance No. WP-2	9/10/2013	Ordinance Codifying VCPWA-WP's Statutory Authorities, Powers, and Operational Practices

Table 24-4. Fiscal Capability

Financial Resource	Accessible or Eligible to Use?
Community Development Block Grants	*Yes*
Capital Improvements Project Funding	*Yes*
Authority to Levy Taxes for Specific Purposes	*Yes*
User Fees for Water, Sewer, Gas or Electric Service	*Yes*
If yes, specify: *VCPWA-WP, in accordance with applicable provisions found in the Ventura County Watershed Protection Act, (California Water Code Appendix, Chapter 46) is authorized to levy and collect taxes, assessments, and fees for its statutory powers to provide for the control of the flood and storm waters of the district, and to conserve such waters for beneficial and useful purposes as stipulated in Section 7 of its enabling act.*	
Incur Debt through General Obligation Bonds	*Yes*
Incur Debt through Special Tax Bonds	*Yes*
Incur Debt through Private Activity Bonds	*No*
Withhold Public Expenditures in Hazard-Prone Areas	*No*
State-Sponsored Grant Programs	*Yes*
Development Impact Fees for Homebuyers or Developers	*Yes*

Table 24-5. Administrative and Technical Capability

Staff/Personnel Resource	Available?
Planners or engineers with knowledge of land development and land management practices	*Yes*
If Yes, Department /Position: *VCPWA-WP* *Engineers I-II-II-IV* *Engineering Managers I-II-III* *Environmental Planners* *VCPWA-WP Director and Deputy Directors*	
Engineers or professionals trained in building or infrastructure construction practices	*Yes*
If Yes, Department /Position: *VCPWA-WP* *Engineers I-II-III-IV* *Engineer Managers I-II-III* *Environmental Planners* *VCPWA-WP Director and Deputy Directors*	
Planners or engineers with an understanding of natural hazards	*Yes*
If Yes, Department /Position: *VCPWA-WP* *Engineers I-II-III-IV* *Engineering Managers I-II-III* *Environmental Planners* *VCPWA-WP Director and Deputy Directors*	
Staff with training in benefit/cost analysis	*Yes*
If Yes, Department /Position: *VCPWA-WP* *Engineers I-II-III-IV* *Engineering Managers I-II-III* *Staff Services Manager III* *VCPWA-WP Director and Deputy Directors*	

Staff/Personnel Resource	Available?
Surveyors	*Yes*
If Yes, Department /Position:	*VCPWA-WP relies on the VCPWA-Engineering Services Department-County Surveyors Office to perform survey work required in the development of flood protection project engineering design and development efforts.* Depending on County Surveyors Office workload considerations, and certain specialized survey work required by VCPWA-WP, the County Surveyors Office may perform the requested survey work utilizing in-house staff, or contract with outside survey service vendors.
Personnel skilled or trained in GIS applications	*Yes*
If Yes, Department /Position:	*VCPWA-WP* *Engineering Techs III & IV* *Engineers I-II-III-IV* *Engineering Managers I-II-III* *Environmental Planners* *VCPWA-WP Director and Deputy Directors*
Scientist familiar with natural hazards in local area	*Yes*
If Yes, Department /Position:	VCPWA-WP Environmental Planners
Emergency manager	*Yes*
If Yes, Department /Position:	*VCPWA-WP* *Pursuant to the 2010 VCPWA-WP National Incident Management System Implementation Plan, the Director of Watershed Protection is tasked to coordinate all VCPWA-WP operations during emergencies, including serving as VCPWA-WP Primary Point of Contact with the VCPWA-Duty Officer and the VCSOES Emergency Operations Center Commander and/or VCSOES Duty Officer.*
Grant writers	*Yes*
If Yes, Department /Position:	*VCPWA-WP* *Engineers I-II-III* *Engineer Managers I-II-III* *Environmental Planners* *Staff Services Specialist I* *Staff Services Manager III*

Table 24-6. Education and Outreach Capability

Criterion	Response
Do you have a public information officer or communications office?	*Yes*
If yes, briefly describe:	*VCPWA contracts with Consortium Communications, to help craft and disseminate public information and outreach campaigns. VCPWA-WP, as one of the 5-departments in VCPWA, regularly avails itself of Consortium's public information and outreach technical support services, including an active, vigorous, and robust VCPWA social media presence on Facebook, Twitter, and Instagram.* VCPWA Online | Facebook | Twitter
Do you have personnel skilled or trained in website development?	*Yes*
Do you have hazard mitigation information available on your website?	*Yes*
If yes, briefly describe:	*VCPWA-WP was responsible for the creation and is responsible for the maintenance of the County of Ventura's Flood Information Website (vcfloodinfo.com) through the National Flood Insurance Program's Community Rating System (CRS). That website features FEMA's flood insurance rate maps which allows the public to determine if their property is affected by flood hazards, information about flood safe requirements for building in a floodplain, become better informed on how to hire a contractor, obtain information on flood insurance, and much more. Additionally, there is a link on this webpage to the 2015 Ventura County Multi-Hazard Mitigation Plan which will be updated to reflect the current Ventura County Multi-Jurisdiction Hazard Mitigation Plan, 2021 Plan Update process currently underway. (http://www.vcfloodinfo.com/resources/ventura-county-hazards-mitigation-plan)*

Criterion	Response
Do you use social media for hazard mitigation education and outreach?	*Yes*
If yes, briefly describe:	*VCPWA-WP, as one of 20+ planning partners in the HMP 2021 Plan Update process, has partnered with VCSOES in ongoing, evolving, and interactive proactive social media outreach regarding hazard mitigation plan development public information and outreach initiatives. Recently, VCPWA-WP provided VCSOES with photos of the completed Fresno Canyon Diversion Project which was funded by $5M in FEMA HMGP Grant Funding. Project photos and information in both English and Spanish, were featured in a VCSOES Twitter post this week showcasing the County's Fresno Canyon Diversion Project under the messaging theme: "Hazard Mitigation in Action!"* https://twitter.com/Venturaoes/status/1427391467534704640?s=20 (English) https://twitter.com/Venturaoes/status/1427391498052505646?s=20 (Spanish) VCPWA-WP is partnering with VCSOES to develop a 4-5 minute long video, in both English and Spanish, which will provide viewers with a pithy explanation of hazard mitigation as a thought construct, provide an overview of the current hazard mitigation plan 2021 update planning process underway, including milestone timelines and progress, and highlighting key mitigation projects that have been accomplished in Ventura County with FEMA HMGP grant funding (such as the Fresno Canyon Diversion Project) to bring these planning concepts more tangible and closer to home. The video will be posted on the readyventuracounty.org website and will be made available to planning partners for distribution via their existing social media, online, and texting messaging ecosystems.	
Do you have any citizen boards or commissions that address issues related to hazard mitigation?	*Yes*
If yes, briefly describe:	*VCPWA-WP actively participated in the 2015 VC HMP Plan Development process and currently is actively participating in the HMP-2021 Plan Update Process managed by the Ventura County Sheriff's Office of Emergency Services (VCSOES). VCPWA-WP's Director, Glenn Shephard, and SRG Manager Gerard Kapuscik are both members and active participants in the Core Planning Team and the Steering Committee tasked with advisory support to the team.*	
Do you have any other programs in place that could be used to communicate hazard-related information?	*Yes*
If yes, briefly describe:	*Ventura County's VC Alert Emergency Notification System allows members of the public to send a text message to VCNOTIFY to 888777 which will allow them to receive real-time alerts and advisories directly from the County. Residents can register multiple contact methods and request to be alerted to a home phone, cell phone, business phone, e-mail and/or hearing-impaired receiving device. Residents can also register up to five different addresses such as a home address, work address, school address, or business address. Additionally, VCPWA has a similar text notification system for all Public Works Employees which can be used for similar real-time text alerts and advisories.*	
Do you have any established warning systems for hazard events?	Yes
If yes, briefly describe:	*VCPWA-WP operates a Flood Warning System (FWS) composed of 90 self-reporting rain gages and 30 self-reporting stream gages countywide. The FWS also receives telemetered data for 65 additional rain gages and 23 stream gages operated by other agencies including the United States Geological Survey, Los Angeles Department of Public Works, and the California Department of Water Resources. The critical rain and stream gage information collected and reported in real time are used in the hydrologic models for determining the amount of runoff from storm events information is provided to VCSOES in real time and is an important data source utilized for potential emergency event evacuation notifications triggered by high-flow rate storm flood events.*	

Table 24-7. Community Classifications

	Participating?	Classification	Date Classified
FIPS Code	Yes	111-91042	Pre-2005
DUNS#	Yes	066691122	Unknown
Community Rating System	Yes	Class 5 Rating	5/1/2016
Building Code Effectiveness Grading Schedule	No	N/A	N/A
Public Protection	No	N/A	N/A
Storm Ready	Yes	N/A	2011
Firewise	No	N/A	N/A
Tsunami Ready	Yes	N/A	2012

Table 24-8. Adaptive Capacity for Climate Change

Criterion	Jurisdiction Rating[a]
Technical Capacity	
Jurisdiction-level understanding of potential climate change impacts	High
Comment: *Given the nature of the diverse interdisciplinary teams (engineers, environmental scientists, hydrologists, etc.), there is a keen situational awareness of climate change impacts on flood protection facilities and the need to mitigate those hazards. VCPWA-WP Staff contributed to the Projected Changes in Ventura County Climate Study completed in 2019 by the Western Regional Climate Center, Desert Research Institute (wrcc.dri.edu/climate/reports). VCPWA-WP also contributes to the Watersheds Coalition of Ventura County's Integrated Regional Water Management Plan updates, including the Climate Change Vulnerability Assessment and project selection process. Furthermore, VCPWA-WP has incorporated into its levee improvement process the planning for one percent annual chance (formerly 100-year) flood protection plus an additional 10 percent to address the uncertainty of climate change impacts.*	
Jurisdiction-level monitoring of climate change impacts	High
Comment: *VCPWA-WP operates and maintains a system of 100 self-reporting rain gages,47 self-reporting stream gages, and 16-self-reporting weather gages. VCPWA-WP also receives telemetered data from 65 additional rain gages and 23 stream gages operated by other agencies including the U.S.G.S., Los Angeles Department of Public Works, and California Department of Water Resources (DWR). All the data from this system is maintained by VCPWA-WP and includes records of over 150 years. The continuing long term data sets will be used to analyze and quantify the long-term impacts of climate change on hydrologic processes.*	
Technical resources to assess proposed strategies for feasibility and externalities	Medium
Comment: *VCPWA-WP utilizes its Flood Warning System (FWS) system data to populate and continuously update its hydrologic and hydraulic modeling in support of flood control facility improvement designs.*	
Jurisdiction-level capacity for development of greenhouse gas emissions inventory	Low
Comment: *VCPWA-WP obtains assistance from environmental consultants to evaluate the potential GHG emissions that would be associated with specific projects, both temporary and long-term impacts. These analyses are presented in the Environmental Impact Reports prepared for flood protection projects. These results inform mitigation measures needed to reduce potential GHG impacts.*	
Capital planning and land use decisions informed by potential climate impacts	High
Comment: *With respect to capital planning decisions, see answers above. With respect to land use decisions, VCPWA-WP does not have land use decision-making power. However, VCPWA-WP staff reviews applications submitted under the CEQA process for unincorporated Ventura County and all cities in the County, as well as adjoining counties. The applicants are required to evaluate their projects' flood risk impacts using the Ventura County Hydrology Manual. Based on the results, they are also required to retain storm runoff exceeding pre-project levels.*	
Participation in regional groups addressing climate risks	High
Comment: *VCPWA-WP staff participates in decision-making by the Watersheds Coalition of Ventura County (local body that implements state-level Integrated Regional Water Management planning), Ventura County General Plan climate adaptation updates and implementation of strategies for action, Beach Erosion Authority for Control and Nourishment (BEACON) relating to sea level rise and increasing coastal erosion impacts along the Ventura County coast. VCPWA-WP leads the countywide effort among all City and County floodplain managers addressing coastal and riverine flood modeling and mapping technical review and comments to FEMA, partners with local non-governmental organizations (The Nature Conservancy and others) to advance preservation of floodplain properties to prevent development on lands at risk of flooding countywide.*	

Criterion	Jurisdiction Rating[a]
Implementation Capacity	
Clear authority/mandate to consider climate change impacts during public decision-making processes	High
Comment: *VCPWA-WP, as a state-created, county-dependent special district is required to comply with several state laws addressing climate change impacts, including but not limited to the California Global Warming Solutions Act of 2006 and Senate Bill 97 enacted in 2007 to amend the CEQA statute to address GHG emissions and impacts. Additionally, VCPWA-WP is required to comply with the 2040 General Plan for Ventura County, which notes: "…the County developed an integrated approach to addressing climate change in the General Plan by incorporating related policies and programs throughout the General Plan elements, such that the General Plan will also serve as the County's Climate Action Plan. VCPWA-WP staff also functions as staff for several groundwater sustainability agencies, including the Fox Canyon Groundwater Management Agency, tasked with developing Groundwater Sustainability Plans for medium and high priority over drafted groundwater basins, in compliance with the Sustainable Groundwater Management Act (SGMA).*	
Identified strategies for greenhouse gas mitigation efforts	Low
Comment: *Interim VCPWA Teleworking policy in place. Hybrid and electric models are replacing aging fleet vehicles to the extent feasible, as administered by the Ventura County General Services Agency. Agricultural irrigation efficiency assistance by Fox Canyon Groundwater Management Agency.* *A GHG inventory with 2015 as the baseline year was prepared to support the Ventura County General Plan update and will be updated every five years. The greatest contribution was transportation (36%).* *VC General Plan 2040 Policies created for the purpose of mitigating GHGs are listed below. Please refer to the General Plan for the numerous related Implementation Programs (FB=Financing and Budgeting; IGC=Inter-Governmental Coordination; JP=Joint Partnerships with the Private Sector; RDR=Regulation and Development Review; SO=Services and Operations):* ***Conservation and Open Space Element (COS)*** *COS-1.13: The County shall continue to work in partnership with agencies, organizations, and entities responsible for the protection, management, and enhancement of the county's biological resources. (IGC)* *COS-1.15: The County shall establish and support a countywide target for the County, cities in Ventura County, agencies, organizations, businesses, and citizens to plant two million trees throughout the county by 2040. (SO, JP, IGC)* *COS-3.2: The County shall encourage the planting of trees and the protection of existing urban forests and native woodlands, savannahs, and tree canopy throughout the county, including along State or County designated scenic roadways and in residential and commercial zones throughout the county, especially those located within designated disadvantaged communities. (MPSP, RDR)* *COS-3.3: The County shall give overhead utility undergrounding within high fire hazard areas and Scenic Resource Areas priority when allocating County Utility Undergrounding Funds. (MPSP, FB)* *COS-7.4: The County shall require discretionary development for oil and gas exploration and production to use electrically powered equipment from 100 percent renewable sources and cogeneration, where feasible, to reduce air pollution and greenhouse gas emissions from internal combustion engines and equipment. (RDR)* *COS-7.7: The County shall require new discretionary oil wells to use pipelines to convey oil and produced water; oil and produced water shall not be trucked. (RDR)* *COS-8.1: The County shall promote the development and use of renewable energy resources (e.g., solar, thermal, wind, tidal, bioenergy, hydroelectricity) to reduce dependency on petroleum-based energy sources. (IGC, RDR)* *COS-8.2: The County shall encourage the State, community choice aggregation programs, and energy utility companies to provide programs, rebates, and incentives for energy efficiency installation and retrofit projects. (IGC)* *COS-8.3: The County shall facilitate the coordination of its Climate Action Plan implementation and maintenance with the cities in the county, the Air Pollution Control District (APCD), and other organizations to promote countywide collaboration on addressing climate change. (SO, IGC)* *COS-8.4: The County, as a signatory to a legal entity created under a Joint Powers Authority with neighboring communities, shall continue to serve as an active member of the Clean Power Alliance or similar organization providing local customer access to electricity generated from low carbon renewable energy sources in excess of State requirements. (SO, IGC)* *COS-8.5: The County shall work with utility providers to offer residents options to purchase and use renewable energy resources. (SO, IGC, JP)* *COS-8.6: The County shall support the transition to zero net energy and zero net carbon buildings, including electrification of new buildings. (RDR)* *COS-8.7: The County shall promote sustainable building practices that incorporate a "whole systems" approach for design and construction that consumes less energy, water, and other non-renewable resources, such as by facilitation passive ventilation and effective use of daylight. (RDR)*	

Criterion	Jurisdiction Rating[a]
COS-8.8: The County shall encourage the integration of features that support the generation, transmission, efficient use, and storage of renewable energy sources in discretionary development. (RDR) *COS-8.9: The County shall encourage discretionary development to include the planting of shade trees on each property and within parking areas to reduce radiation heat production. (RDR)* *COS-8.10: The County shall encourage battery energy storage systems as an option for optimizing the management of electricity generated by renewable resources. (RDR)* *COS-9.1: The County shall preserve natural open space resources through: the concentration of development in Urban Areas and Existing Communities; use of cluster or compact development techniques in discretionary development adjacent to natural open space resources; maintaining large lot sizes in agricultural, rural, and open space areas; discouraging conversion of lands currently used for agricultural production or grazing; limiting development in areas constrained by natural hazards; and encouraging agricultural and ranching interests to maintain natural habitat in open space areas where the terrain or soil is not conducive to agricultural production or grazing. (RDR)* *COS-9.3: The County shall place a high priority on preserving open space lands for recreation, habitat protection, and overall community benefit. (MPSP)* *COS-10.1: The County shall maintain and refer to the General Plan and its integrated greenhouse gas (GHG) Reduction Strategy as the County's comprehensive plan for reducing community-wide GHG emissions in the unincorporated County. (RDR)* *COS-10.2: The County shall work toward achieving a community-wide GHG emissions reduction target of 41 percent below 2015 levels by 2030. (RDR)* *COS-10.3: The County shall work toward achieving longer-term, post-2030 community-wide GHG emissions reduction goals, as follows: 61 percent below 2015 levels by 2040 and 80 percent below 2015 levels by 2050. (RDR)* *COS-10.4: The County shall reduce GHG emissions in both existing and new development through a combination of measures included in the GHG Strategy, which includes new and modified regulations, financing and incentive-based programs, community outreach and education programs, partnerships with local or regional agencies, and other related actions. (RDR)*	
Identified strategies for adaptation to impacts	High
Comment: *The **2015 Ventura County Local Hazard Mitigation Plan** identified the following overarching mitigation actions (OA) that could be implemented:* *OA 4: Relocate or reinforce bike trails, parking lots, and other beach access amenities away from the shoreline to restore the beach/shoreline in sea-level rise/coastal erosion areas.* *OA 5: Restore habitat and improve flood protection for low-lying areas by employing innovative techniques such as constructing levees coupled with gently sloping tidal marshes to help protect from storm wave action and tidal surge.* *OA 7: Develop a water conservation public outreach program to increase awareness about the drought, fines, and penalties for overuse and solutions for conserving water.* *OA 8: Adopt emergency water conservation measures and/or water conservation ordinance to limit irrigation.* *OA 13: Reinforce roads/bridges from flooding through protection activities, including elevating the roads/bridges and installing/widening culverts beneath the roads/bridges or upgrading storm drains.* *OA 14: Acquire, relocate, or elevate residential structures, particularly those that have been identified as repetitive loss properties, within the 100-year floodplain.* *OA 16: Implement landslide stabilization and/or protection measures. Stabilization measures include grading the unstable portion of the slope to a lower gradient, construction of rock buttresses and retaining walls, and drainage improvements. Protection measures include containment and/or diversion of the moving debris, such as walls, berms, ditches, and catchment basins.* *OA 19: Create a new vegetation management program that provides vegetation management services to elderly, disabled, or low-income property owners who lack the resources to remove flammable vegetation from around their homes.* *OA 20: Implement a fuel modification program for new construction by requiring builders and developers to submit their plans, complete with proposed fuel modification zones, to the local fire department for review and approval prior to beginning construction.* *OA 21: Develop a hazards fuel treatment program for areas that have been identified as overgrown or contain dead brush and trees to reduce the potential for tree-to-tree ignition. Ensure that the program includes a "maintenance now" component to provide continued fire resistance.* ***VC General Plan 2040** Policies are listed below (FB=Financing and Budgeting; IGC=Inter-Governmental Coordination; JP=Joint Partnerships with the Private Sector; MPSP=Master Plans, Strategies, and Programs; PI=Public Information; PSR=Planning Studies and Reports; RDR=Regulation and Development Review; SO=Services and Operations):*	

Criterion	Jurisdiction Rating[a]

Conservation and Open Space Element (COS)

COS-2.2: The County shall support activities that trap or add sand through beach nourishment, dune restoration, and other adaptation strategies to enhance or create beaches in areas susceptible to sea-level rise and coastal flooding. (MPSP)

COS-2.10: The County shall work with Federal, State, and local jurisdictions, agencies, and organizations to monitor saltwater intrusion and take proactive steps to reduce intrusion, including: working to maintain and restore coastal wetlands buffers; enhancing groundwater management to prevent excessive pumping in order to restore groundwater levels needed to reduce saltwater intrusion; and implementing mitigation measures to prevent saltwater intrusion into estuaries and groundwater basins including, but not limited to, implementation of reactive barriers and use of pumps to divert saltwater. (PSR, IGC, JP)

COS-3.2: The County shall encourage the planting of trees and the protection of existing urban forests and native woodlands, savannahs, and tree canopy throughout the county, including along State or County designated scenic roadways and in residential and commercial zones throughout the county, especially those located within designated disadvantaged communities. (MPSP, RDR)

COS-3.3: The County shall give overhead utility undergrounding within high fire hazard areas and Scenic Resource Areas priority when allocating County Utility Undergrounding Funds. (MPSP, FB)

COS-5.3: The County shall encourage landowners to participate in voluntary programs that reduce soil erosion and increase soil productivity. To this end, the County shall promote coordination between the Natural Resources Conservation Service, Ventura County Resource Conservation District, University of California Cooperative Extension, and other similar agencies and organizations. (RDR)

Land Use and Community Character Element (LU)

LU-1.1: The County shall continue to promote orderly and compact development by: working with cities in Ventura County and the Ventura Local Agency Formation Commission to promote and maintain reasonable city boundaries and Spheres of Influence to prevent growth-inducing urban development in unincorporated areas; and require unincorporated urban development to be located in areas designated as Existing Communities and unincorporated urban centers consistent with the Guidelines for Orderly Development and as defined in Policy LU-1.2. (RDR, IGC)

LU-11.3: The County shall require new commercial and industrial developments to be designed to be generally compact, grouped and consolidated into functional units providing for sufficient off-street parking and loading facilities, maximize pedestrian and vehicle safety, reduce vehicle miles traveled (VMT), encourage electric vehicle charging, and minimize land use conflicts and traffic congestion. The County shall require that commercial and industrial discretionary development is designed to provide adequate buffering (e.g., walls, landscaping, setbacks) and operational conditions (e.g., hours of operation, and scheduling of deliveries) to minimize adverse impacts (e.g., noise, glare, and odors) on adjoining and adjacent residential areas. (RDR

LU-11.4: The County shall encourage discretionary development on commercial- and industrial-designated land to incorporate sustainable technologies, including energy- and water-efficient practices and low- and zero-carbon practices. (RDR)

LU-16.5: The County shall encourage discretionary commercial development to promote ease of pedestrian/bicycle access to encourage walk-in business, while providing sufficient off-street parking. (RDR)

LU-16.9: The County shall encourage discretionary development to be oriented and landscaped to enhance natural lighting, solar access, and passive heating or cooling opportunities to maximize energy efficiency. (RDR)

LU-18.5: The County shall encourage stakeholders in designated disadvantaged communities who are vulnerable to sea level rise or other climate change impacts to have the opportunity to learn about and participate in the decision-making process for adaptation planning within Ventura County. (PI)

LU-22.2: The County shall maintain and annually review the General Plan Implementation Programs before the preparation of the County's Annual Budget. As part of this process, the County shall update the prioritization of programs based on applicability, relevance, timing of initiation, and availability of funding. (PSR, SO)

Circulation, Transportation, and Mobility Element (CTM)

CTM-2.1: The County shall prepare and adopt Complete Streets Design Guidelines to be used when constructing new roadways or improving existing roadways where Complete Streets would be appropriate/feasible. The Complete Streets Design Guidelines shall employ a context-sensitive approach to planning and designing the road and street network to reflect the distinct agricultural, rural, or urban character of a particular location. (MPSP)

CTM-2.2: The County shall plan a roadway system that has adequate capacity and is designed to provide reasonable and safe use by vehicles, public transportation, bicycles, and pedestrians with minimum delay pursuant to LOS standards described in Policy CMT-1.2. The road system should follow Federal Highway Administration classification as identified on Figure 4-4. (MPSP)

Criterion	Jurisdiction Rating[a]
CTM-2.3: The County shall require discretionary development with access onto a County road to have the access point(s) designed and built to County standards. (RDR) *CTM-2.4: The County shall strive to provide safe operating conditions for all appropriate modes and uses of County roadways. (RDR, MPSP, SO)* *CTM-2.5: The County shall coordinate the development and maintenance of all transportation facilities with emergency service providers to ensure continued emergency service operation and service levels. (ICG)* *CTM-2.6: The County shall work with Caltrans, Southern California Association of Governments (SCAG), Ventura County Transportation Commission (VCTC), and cities in the county to plan, develop, and maintain regional transportation facilities and services, and to identify existing and future transportation corridors that should be linked across jurisdictional boundaries so that sufficient right-of-way may be preserved. (IGC)* *CTM-2.7: The County shall coordinate with VCTC to implement and update the Congestion Management Plan (CMP). The County shall also encourage consideration of multimodal performance measures as part of future updates to the CMP. (MPSP, IGC)* *CTM-2.8: For those portions of the County's Regional Road Network currently not designated as part of the CMP, the County shall coordinate with VCTC to formally designate applicable County maintained roadways as part of the CMP. (MPSP, IGC)* *CTM-2.9: The County shall work with the VCTC and Caltrans to reprioritize the re-striping of SR 118 from Vineyard Avenue to Darling Road on the CMP and the Caltrans list of projects to provide for an additional lane in each direction of travel. (IGC)* *CTM-2.10: The County shall work with public and private schools to identify and expand safe routes to school, where feasible. (IGC)* *CTM-2.11: The County shall establish land use patterns that promote shorter travel distances between residences, employment centers, and retail and service-oriented uses to support the use of public transportation, walking, bicycling, and other forms of transportation that reduce reliance on single-passenger automobile trips. (RDR, MPSP)* *CTM-2.12: The County shall coordinate with the cities in the county and VCTC to plan and implement a system of bicycle lanes and multi-use trails that link the cities, unincorporated communities, schools including colleges and universities, commercial/retail, employment centers, health care service facilities, public transportation, and other points of interest. (MPSP, IGC)* *CTM-2.13: The County shall strive to eliminate "gaps" in roadways, bikeways, and pedestrian networks by planning for and seeking funding to construct necessary improvements to remove barriers and improve transportation system connectivity as well as connections that support first and last mile accessibility to and from public transportation. (MPSP, PSR, FB)* *CTM-2.14: When designing new bicycle facilities, or modifying existing roadways with bicycle facilities, the County shall prioritize and install features to improve the safety and visibility of bicyclists. (MPSP)* *CTM-2.15: The County shall rely on the guidelines and design standards for bicycle and pedestrian facilities established by the California Manual on Uniform Traffic Control Devices (CAMUTCD) and supporting guidelines provided by the Federal Highway Administration, Caltrans, and American Association of State Highway and Transportation Officials (AASHTO). (MPSP, PSR, SO)* *CTM-2.16: The County shall consider the safety and accessibility of pedestrians when preparing transportation plans, studies, and reports. (MPSP)* *CTM-2.17: The County shall support regional bicycle efforts to improve infrastructure that will make biking more attractive to residents and tourists. (IGC, SO, JP)* *CTM-2.18: The County shall require discretionary development in designated Existing Communities to construct roadways to urban standards and Complete Streets principles, including curb, gutter, sidewalks, and bike lanes when there is a nexus for improvement. The County shall rely on the guidelines and design standards for the CAMUTCD, Caltrans in the Highway Design Manual, and Complete Streets Guidelines (pursuant to Deputy Directive-64-R2), Federal Highway Administration, AASHTO. (RDR)* *CTM-2.19: The County shall continue to examine and update safety metrics for CEQA impact analysis as appropriate. Options include but are not limited to queue spill-back at intersections; mid-block unprotected crossings; and increased crossing distances. (RDR)* *CTM-2.20: The County shall improve pedestrian safety at intersections and mid-block locations in Existing Communities through approved features consistent with the CAMUTCD, Highway Design Manual, Federal Highway Administration, AASHTO, and the National Cooperative Highway Research Program Report 498 (Application of Pedestrian Crossing Treatments for Streets and Highways. (RDR, SO)*	

Criterion	Jurisdiction Rating[a]
CTM-2.21: Within Existing Communities, the County shall provide/retrofit separated or buffered pedestrian and bicycle paths from the outside travel lane along County Road Network roads that are designated Overweight Vehicle Corridors and Surface Transportation Assistance Act designated Terminal Access Routes. Where the application or retrofitting of separated or buffered facilities is not feasible, the County shall prioritize alternative pedestrian and bicycle connections that encourage and attract pedestrian and bicycle traffic off designated Overweight Vehicle Corridors or Surface Transportation Assistance Act designated truck routes. (MPSP) *CTM-2.22: The County shall seek funding sources first for construction of new sidewalks in designated disadvantaged communities and then for sidewalk maintenance, particularly in low-income areas. (FB)* *CTM-2.23: The County shall continue to work with VCTC, Naval Base Ventura County, and local public transportation regional bus service providers to promote the expansion of a safe, efficient, convenient, integrated, and cost-effective intercommunity and countywide public transportation and bus service that provides county residents with access to employment, commercial services, health and medical facilities, social services, educational facilities and institutions, and personal business destinations. (IGC)* *CTM-2.24: The County shall work with VCTC and local public transportation providers to address the needs of non-drivers living in rural areas to provide public transportation and paratransit service. (IGC)* *CTM-2.25: The County shall support the recommendations of the California State Rail Plan for Amtrak trains, including track and signalization upgrades, increasing service frequencies by additional round-trip service to regional destinations north and south of Ventura County, improving passenger information and comfort, and reducing travel time. (IGC)* *CTM-2.26: When railroad rights-of-way are abandoned, the County shall evaluate the feasibility of acquiring the land for public use as public transportation, bicycle, pedestrian, or equestrian paths. (MPSP)* *CTM-2.27: The County shall require that discretionary development be subject to the following permit conditions of approval, where feasible, to minimize traffic impacts by incorporating pedestrian and bicycle pathways, bicycle racks and lockers, ridesharing programs, transit improvements (bus turnouts, shelters, benches), and/or transit subsidies for employees or residents of the proposed development. (RDR)* *CTM-3.1: The County shall identify and prioritize components of a bicycle network to increase public access and ridership on bicycle routes. (MPSP, SO)* *CTM-3.2: The County shall develop a bicycle network for all user types and routes across the county. (MPSP, SO, PI)* *CTM-3.3: The County shall encourage the development of a bicycle network that connects to regional destinations such as parks, trails, educational institutions, employment centers, transit, park, and ride lots, and tourist destinations. (IGC)* *CTM-3.4: The County shall promote bicycle network connectivity between Ventura County communities as well as Santa Barbara and Los Angeles Counties. (IGC)* *CTM-3.5: The County shall plan for bicycle network connectivity in rural, agricultural, and open space areas in a way that supports and complements business and agricultural activities in those areas. (JP)* *CTM-3.6: The County shall support the Complete Streets effort by, when feasible, constructing bicycle lanes on County maintained roads listed in the VCTC Bicycle Wayfinding Plan. (SO, JP, IGC)* *CTM-3.7: The County shall encourage the construction of a bicycle trail along the Santa Paula Branch Line Railroad in the unincorporated area between the cities of Ventura and Santa Paula. (SO, JP, IGC)* *CTM-3.8: The County shall use clear and consistent message and placement for on- and off-street regional bikeways and to regional destinations. (PI, SO)* *CTM-3.9: The County shall actively pursue outside funding opportunities for bicycle network improvements. (FB, JP)* *CTM-3.10: The County shall require adequate bicycle storage facilities (e.g., bicycle racks, lockers) for discretionary development as determined by allowable land uses at a given site. (RDR)* *CTM-4.1: The County shall work with Caltrans and VCTC to reduce VMT by facilitating the efficient use of existing transportation facilities; striving to provide viable modal choices that make driving alone an option rather than a necessity; supporting variable work schedules to reduce peak period VMT; and providing more direct routes for pedestrians and bicyclists. (MPSP, SO)* *CTM-4.2: The County shall encourage bicycling, walking, public transportation, and other forms of alternative transportation to reduce VMT, traffic congestion, and GHG emissions. (PI)* *CTM-4.3: The County shall work with a broad range of agencies (e.g., Caltrans, VCTC, Amtrak, Ventura County APCD, public transportation providers, and shared mobility vendors) to encourage and support programs that increase vehicle occupancy including the provision of traveler information, shuttles, and preferential parking for carpools/vanpools. (IGC, PI)* *CTM-4.4: The County shall coordinate with Caltrans and VCTC to identify future park-and-ride lots within the unincorporated areas of Ventura County to facilitate more carpooling, vanpooling, and public transportation use. (IGC)*	

Criterion	Jurisdiction Rating[a]
CTM-6.1: The County shall support the integration of emerging technologies that increase the routine use of alternative transportation options to decrease single-passenger automobile travel. (MPSP) *CTM-6.3: As part of new roadway planning and design as part of discretionary development, the County shall promote the use of permeable paving and other passive drainage features such as bio-swales to prevent flooding, particularly in urban areas. (RDR, SO)* *CTM-6.4: The County shall support the development of alternative fueling stations (e.g., electric and hydrogen) and vehicle-to-infrastructure (V2I) technology for emerging technologies. (SO)* *CTM-6.5: The County shall support the installation of electric vehicle charging stations, where feasible, at County facilities, parking lots, park-and-ride lots, truck stops, and new development. (RDR, SO)* *CTM-6.6: The County shall encourage developments and street systems that support the use of properly licensed Neighborhood Electric Vehicles where appropriate. (MPSP)* *CTM-6.7: The County shall encourage and support car share operators at multimodal facilities including transportation hubs, passenger rail stations, and park-and-ride lots. (RDR)* *CTM-6.8: The County shall evaluate the feasibility and work to establish requirements for shared micro-mobility (e.g., bike sharing) vendors within unincorporated areas. (RDR)* *CTM-6.9: The County shall encourage Mobility-as-a-Service (MaaS) providers to park between service calls versus driving within unincorporated communities. (RDR, SO)* *CTM-6.10: The County shall encourage Mobility-as-a-Service (MaaS) providers to coordinate with public transportation providers that serve unincorporated areas to increase the attractiveness of public transportation through the provision of free or subsidized public transportation patron first and last mile connections within unincorporated communities. (IGC, JP)* ***Public Facilities, Services, and Infrastructure Element (PFS)*** *PFS-1.2: The County shall monitor the projected impacts of climate change and natural disasters to make adaptive improvements and upgrades to public facilities and services. (SO)* *PFS-1.3: The County shall review plans for constructing new essential public facility, such as a hospital, health care facility, emergency shelter, emergency command center, or emergency communications facility, so that these facilities are located outside of at-risk areas whenever feasible. If such a location is infeasible, then the County shall require the use of construction methods and site design features to minimize potential damage to these facilities. (RDR, SO)* *PFS-1.10: The County shall operate and maintain County facilities in an efficient manner that meets community needs while conserving financial and natural resources. (SO)* *PFS-2.1: The County shall encourage energy efficiency, GHG reduction features, and resiliency planning into County facility and service plans and operations. (PSR, SO)* *PFS-2.2: The County shall encourage the incorporation of sustainable design features in community facilities to reduce energy demand and environmental impacts, such as solar reflective roofing, permeable pavement, and incorporation of shade trees. (SO, IGC)* *PFS-2.3: The County shall prioritize energy efficiency and water conservation as key design features when constructing, purchasing, leasing, retrofitting, or expanding County facilities. (SO)* *PFS-2.4: The County shall provide recycling and composting receptacles and use of biodegradable or recycled-material products at County facilities and events, where feasible. (SO)* *PFS-2.5: The County shall encourage its employees to reduce the number and distance of single-occupancy vehicle work trips. (SO)* *PFS-2.6: The County shall review market-available technologies for alternative fuel vehicles and prioritize purchase of vehicles to reduce GHG emissions where economically feasible. (SO)* *PFS-2.8: The County shall include electrical vehicle charging station infrastructure in a new County-initiated facility construction to the extent feasible. The County shall also look for opportunities to install EV charging stations as part of any major renovation, retrofit or expansion of County facilities. (SO)* *PFS-4.4: The County shall encourage wastewater treatment facilities to provide the maximum feasible protection and enhancement of groundwater resources. (SO, IGC)* *PFS-4.6: The County shall encourage public wastewater system operators to upgrade existing wastewater treatment systems to reclaim water suitable for reuse for landscaping, irrigation, and groundwater recharge. (SO, IGC)* *PFS-5.4: The County shall continue to provide educational and informational materials to restaurants, grocery stores, and other food providers, as part of food facility inspections, to support donation of safe, unused food to non-profit service agencies.* *PFS-5.5: The County shall support the beneficial reuse of agricultural wastes for activities such as composting and energy generation. (RDR, SO)*	

Criterion	Jurisdiction Rating[a]
PFS-5.6: The County shall promote value-added alternatives to solid waste management, such as compost, energy, biochar, and wood products to avoid open burning of agricultural biomass wastes. (SO, PI) *PFS-6.3: The County shall monitor projected climate change impacts, and coordinate with local, regional, state, and federal agencies to identify existing and potential projected impacts and develop strategies to maintain and improve flood control facilities accordingly. (SO, IGC)* *PFS-6.4: The County shall coordinate with local, regional, state, and federal agencies to identify existing and potential infrastructure improvements to increase water retention to respond to drought conditions. (SO, IGC)* *PFS-7.2: The County shall work with utility companies to modernize and upgrade transmission lines and associated equipment to reduce the risk of fire in areas with a high wildfire hazard risk. (JP)* *PFS-7.6: The County shall work with utility providers to implement smart grid technologies as part of new developments and infrastructure projects. (JP)* *PFS-12.4: The County, in coordination with local water agencies and the Fire Protection District, shall require new discretionary development to comply with applicable standards for fire flows and fire protection. (RDR, IGC)* ***Hazards and Safety Element (HAZ)*** *HAZ-1.1: The County shall continue to require development to incorporate design measures that enhance fire protection in areas of high fire risk. This shall include but is not limited to incorporation of fire-resistant structural design, use of fire-resistant landscaping, and fuel modification around the perimeter of structures. (RDR, PI)* *HAZ-1.2: The County shall require adherence to defensible space standards, or vegetation "clear zones," for all existing and new structures in areas that are designated as Hazardous Fire Areas by the Ventura County Fire Protection District and High Fire Hazard Severity Zones by the California Department of Forestry and Fire Protection. (CAL FIRE) (IGC, PI, RDR)* *HAZ-1.3: The County shall continue to recognize the role of fire in local ecosystems by supporting controlled burns and other fire prevention measures. (IGC)* *HAZ-1.4: The County shall require the recordation of a Notice of Fire Hazard with the County Recorded for all new discretionary entitlements (including subdivisions and land use permits) within areas designated as Hazardous Fire Areas by the Ventura County Fire Department or High Fire Hazard Severity Zones by CAL FIRE. (RDR)* *HAZ-1.6: The County shall continue to develop and distribute educational materials and conduct educational outreach activities informing the public about wildfire risk and protection strategies. (PSR, IGC, PI)* *HAZ-3.1: The County shall continue to actively plan for sea level rise by using the best available science to analyze critical vulnerabilities, identify measures to conserve coastal resources, minimize impacts on residents and businesses, maintain public services, and strengthen resiliency. (MPSP)* *HAZ-3.2: County-initiated infrastructure projects sited along or seaward of Highway 101, such as bridges and levees, that will provide 100 years or more of service, shall be planned with the potential to be easily modified to accommodate 100-years of projected sea level rise in accordance with the H++ extreme risk aversion sea level rise scenario. (PSR, IGC)* *HAZ-3.3: To the extent feasible, the County shall incorporate education elements into coastal adaptation projects to inform the public about the risks of sea level rise and option for adaptation. (RDR, SO, JP)* *HAZ-10.1: The County shall strive to reduce air pollutants from stationary and mobile sources to protect human health and welfare, focusing efforts on shifting patterns and practices that contribute to the areas with the highest pollution exposures and health impacts. (MPSP, RDR, SO, IGC, PI, JP)* *HAZ-10.5: The County shall work with applicants for discretionary development projects to incorporate bike facilities, solar water heating, solar space heating, incorporation of electric appliances and equipment, the use of zero and/or near zero emission vehicles and other measures to reduce air pollution impacts and reduce GHG emissions. (RDR)* *HAZ-10.6: The County shall continue to work with the APCD and VCTC to develop and implement Transportation Control Measures (TCM) programs consistent with the APCD's Air Quality Management Program (AQMP) to facilitate public transit and alternative transportation modes within the county. (IGC, FB)* *HAZ-10.7: When purchasing new County vehicles, the County shall give strong preference to fuel efficient vehicles, including the use of zero emission vehicles when feasible. (SO, FB)* *HAZ-10.8: The County shall promote alternative modes of transportation that reduce single-occupancy vehicle (SOV) travel and enhance "last mile" transportation options to improve air quality. (IGC, JP, PI)* *HAZ-11.1: The County shall identify and protect critical infrastructure locations that are vulnerable to damage from extreme heat. (SO, FB, PSR, IGC)* *HAZ-11.2: The County shall partner with SCAG, utilities, nonprofit organizations, and other entities to implement future and ongoing heat-related climate change initiatives. The County's partnership in ongoing programs and future initiatives could include helping other organizations increase participation in existing programs through education and promotion, and by using and integrating them in County programs and activities, where feasible. (JP)*	

Criterion	Jurisdiction Rating[a]
HAZ-11.3: The County shall work with public, private, and nonprofit partners to limit impacts of climate change on Designated Disadvantaged Communities by focusing planning efforts and interventions on communities with the highest need and ensuring representatives of these communities have a role in the decision-making process for directing climate change response. (MPSP, SO) *HAZ-11.4: The County shall support efforts of agencies and organizations that provide effective education and outreach to Designated Disadvantaged Communities on the effects of climate change, including increasing temperatures, wildfires, flooding, sea level rise, poor air quality, extreme weather events, disease prevention, and other public health effects. (PI)* *HAZ-11.5: The County shall work with State and County health agencies and local organizations to provide educational programs and resources targeted at reducing the impacts of exposure to sun and heat. (ICG, JP, PI)* *HAZ-11.6: The County shall expand partnerships with local governments, non-government organizations, churches, and businesses to provide additional cooling centers, particularly in designated disadvantaged communities. (SO, IGC, JP, PI)* *HAZ-11.7: The County shall encourage development to include new building designs or retrofits to improve building performance through strategic building design features, including insulation to reduce energy usage, solar-reflective white roofs, solar panels, green roofs (vegetation on roofs), and battery storage for energy. (RDR)* *HAZ-11.8: The County shall work with utility providers to underground overhead power lines (both existing and as part of discretionary development) to increase the resilience of the energy grid and reduce wildfire potential, especially in Existing Communities. (JP)* *HAZ-11.9: The County shall promote the use of urban greening techniques, such as cool pavement technology, parking lot shading, landscaping, and other methods to offset climate change impacts and reduce GHG emissions for discretionary development and County-initiated projects. (RDR, FB, SO)* *HAZ-11.10: The County shall promote the use of solar photovoltaic carports for discretionary development and County initiated projects. (RDR)* ***Agriculture Element (AG)*** *AG-1.1: The County shall continue to protect and preserve agricultural land by directing growth away from productive agricultural lands into cities, unincorporated urban areas, or existing communities and by supporting the acquisition or voluntary dedication of agriculture conservation easements. (RDR, MPSP)* *AG-3.2: The County shall encourage and support the use of Integrated Pest Management practices to reduce pesticide use and human health risks. (JP, PI)* *AG-3.3: The County shall collaborate with the agricultural community to provide information on Integrated Pest Management and agricultural products and practices in Ventura County. (JP, PI)* *AG-4.1: The County shall strive to enhance access to and consumption of fresh, local produce by encouraging direct connections between local farmers/ranchers and markets, restaurants, institutions, schools, hospitals, food banks, and other businesses. (JP)* *AG-4.3: The County shall encourage the use of technology that supports agricultural production, while enhancing environmental sustainability and natural resource conservation. (JP)* *AG-5.1: The County shall encourage farmers to reduce fertilizer application and transition to products that reduce or avoid nitrous oxide (N_20) emissions, such as organic composting and enhanced efficiency fertilizers. (MPSP)* *AG-5.2: The County shall encourage and support the transition to electric- or renewable-powered or lower emission agricultural equipment in place of fossil fuel-powered equipment, when feasible. (PI, JP)* *AG-5.3: The County shall encourage farmers to convert fossil fuel-powered irrigation pumps to systems powered by electric or renewable energy sources, such as solar-power, and encourage electric utilities to eliminate or reduce stand-by charges. (SO)* *AG-5.4: The County shall encourage farmers to continue and enhance the water-saving irrigation techniques designed to reduce water consumption. (RDR, JP)* *AG-5.5: The County shall encourage and support the efforts of resource conservation districts, farmers, and other stakeholders to expand carbon farming practices, such as reduced tilling, cover-cropping, composting, biochar, and other activities that both reduce GHG emissions and increase carbon sequestration and storage, when feasible. (JP)* *AG-6.1: The County shall support and monitor research on the effects of a changing climate on the agricultural industry within Ventura County. (PSR)* *AG-6.2: The County shall engage the agricultural sector to understand the tolerance of current crop mixes to withstand the impacts of climate change, including increased temperatures, disease, and pests, and explore options to diversify crops. (JP)* ***Water Resources Element (WR)***	

Criterion	Jurisdiction Rating[a]
WR-3.1: The County shall encourage the use of non-potable water, such as tertiary treated wastewater and household graywater, for industrial, agricultural, environmental, and landscaping needs consistent with appropriate regulations. (RDR) *WR-3.2: The County shall require the use of water conservation techniques for discretionary development, as appropriate. Such techniques include low flow plumbing fixtures in new construction that meet or exceed the California Plumbing Code, use of graywater or reclaimed water for landscaping, retention of stormwater runoff for direct use and/or groundwater recharge, and landscape water efficiency standards that meet or exceed the standards in the California Model Water Efficiency Landscape Ordinance.* *WR-3.3: The County shall require discretionary development to incorporate low impact development design features and best management practices, including integration of stormwater capture facilities, consistent with County's Stormwater Permit. (RDR)* *WR-3.4: The County shall strive for efficient use of potable water in County buildings and facilities through conservation measures and technological advancements. (SO)* *WR-4.1: The County shall work with water suppliers, water users, groundwater management agencies, and groundwater sustainability agencies to implement the Sustainable Groundwater Management Act (SGMA) and manage groundwater resources within the sustainable yield of each basin to ensure that county residents, businesses, agriculture, government, and the environment have reliable, high-quality groundwater to serve existing and planned land uses during prolonged drought years. (IGC, RDR, SO)* *WR-4.3: The County shall support groundwater recharge and multi-benefit projects consistent with SGMA and the Integrated Regional Water Management Plan to ensure the long-term sustainability of groundwater. (IGC, RDR, SO)* *WR-4.4: The County shall encourage the use of in-stream water flow and recycled water for groundwater recharge while balancing the needs or urban and agricultural uses, and healthy ecosystems, including in-stream waterflows needed for endangered species protection. (RDR)* *WR-6.1: The County should support the appropriate agencies in their efforts to effectively manage and enhance water quantity and quality to ensure long-term, adequate availability of high quality and economically viable water for agricultural uses, consistent with water use efficiency programs. (IGC)* *WR-6.2: The County should support programs designed to increase agricultural water use efficiency and secure long-term water supplies for agriculture. (PI)* *WR-6.3: The County should encourage the use of reclaimed irrigation water and treated urban wastewater for agricultural irrigation in accordance with federal and state requirements to conserve untreated groundwater and potable water supplies. (IGC, RDR, SO)* ***Economic Vitality Element (EV)*** *EV-4.4: The County shall identify appropriate locations to allow for development of renewable energy generation and storage facilities and encourage the development of innovative approaches to renewable energy deployment, including solar power, wind power, wave energy, distributed power systems and micro-grids, and other appropriate renewable sources and storage and distribution systems. (MPSP, JP)*	
Champions for climate action in local government departments	High
Comment: *The Ventura County Board of Supervisors adopted the 2040 General Plan on September 15, 2020, which includes the above referenced reduction measures and adaptation strategies. As a result, effective October 15, 2020, VCPWA-WP, and other County departments are directed to incorporate climate action in their policies, procedures, and operational practices.*	
Political support for implementing climate change adaptation strategies	High
Comment: *See above.*	
Financial resources devoted to climate change adaptation	Medium
Comment: *Pursuant to the Board of Supervisors policy direction to all County departments, including VCPWA-WP, to incorporate climate action in their policies, procedures, and operational practices, it is anticipated that additional financial resources will be required to accomplish this policy directive. And those additional financial resources, be they repurposing a portion of existing VCPWA-WP revenue streams or new, climate action dedicated grant revenue funding streams, will be identified in future fiscal year budgets for consideration and adoption by the Ventura County Watershed Protection Board of Supervisors.*	
Local authority over sectors likely to be negative impacted	Medium
Comment: *VCPWA-WP has proprietary authority over flood protection facilities that it designs, constructs, operates, and maintains in its flood protection asset portfolio. It also has permitting authority over watercourses designated as red line channels by its ordinance (WP-2). VCPWA-WP provides staffing and technical assistance to the VCPWA-Engineering Services Department in their role of implementation of the Ventura County Floodplain Management Ordinance No. 4521 and Well Ordinance No. 4468.*	

Criterion	Jurisdiction Rating[a]
Public Capacity	
Local Residents' knowledge of and understanding of climate risk	Unsure
Comment: Not enough objectively credible information is known to VCPWA-WP staff to assign a rating.	
Local Residents' support of adaptation efforts	Unsure
Comment: Not enough objectively credible information is known to VCPWA-WP staff to assign a rating.	
Local Residents' capacity to adapt to climate impacts	Unsure
Comment: Not enough objectively credible information is known to VCPWA-WP staff to assign a rating.	
Local economy current capacity to adapt to climate impacts	Unsure
Comment: Not enough objectively credible information is known to VCPWA-WP staff to assign a rating.	
Local ecosystems capacity to adapt to climate impacts	Low
Comment: Local ecosystems are stressed by the current multi-year drought that has created favorable conditions for repeated fires (just since 2017, Thomas, Woolsey, Easy, Maria, etc.). Once fire devastates local ecosystems, they are unable to quickly recover in the absence of sufficient rainfall. Non-native, invasive vegetation then can quickly gain a foothold, potentially fueling future fires.	

a. High = Capacity exists and is in use; Medium = Capacity may exist but is not used or could use some improvement; Low = Capacity does not exist or could use substantial improvement; Unsure= Not enough information is known to assign a rating.

24.5 INTEGRATION REVIEW

For hazard mitigation planning, "integration" means that hazard mitigation information is used in other relevant planning mechanisms, such as capital facilities planning, and that relevant information from those sources is used in hazard mitigation. This section identifies where such integration is already in place, and where there are opportunities for further integration in the future. Resources listed at the end of this annex were used to provide information on integration. The progress reporting process described in Volume 1 of the hazard mitigation plan will document the progress of hazard mitigation actions related to integration and identify new opportunities for integration.

24.5.1 Existing Integration

Some level of integration has already been established between local hazard mitigation planning and the following other local plans and programs:

- VCPWA-WP's Integrated Watershed Protection Plan Project Prioritization Process
- VCPWA-WP 5 Year Capital Improvement Projects Plan—Annual Update and Prioritized Project Ranking Process
- VCPWA-WP's Preparation of Annual Recertifications and Cycle Verification of Class V Rating for Unincorporated Ventura County under FEMA's Community Rating System Program
- Ventura County Flood Safety Plan
- Ventura County 2040 General Plan Implementation Actions Under the Following Plan Elements:
  - Public Facilities, Services, and Infrastructure
  - Conservation and Open Space
  - Hazards and Safety
  - Water Resources
  - Economic Vitality

  - Unincorporated Communities' Area Plans
  - Appendix B, Climate Change
- Ventura County Integrated Regional Water Management Plan Updates (IRWM) and Eligible Project List Development for IRWM Grant Funding Opportunities Provided by the State
- Ventura River Watershed Management Plan
- Ventura County Transportation Commission Transportation Emergency Preparedness Plan
- Ventura County Local Coastal Plan Update, VC Resilient Coastal Adaptation Project

24.5.2 Opportunities for Future Integration

The capability assessment in this annex indicates opportunities to integrate this mitigation plan with other jurisdictional planning/regulatory capabilities. Capabilities were identified as integration opportunities if they can support or enhance the actions identified in this plan or be supported or enhanced by components of this plan. The capability assessment identified the following plans and programs that do not currently integrate hazard mitigation information but provide opportunities to do so in the future:

- Ventura County Integrated Regional Water Management Plan Updates (IRWM) Climate Change Vulnerability Assessment (new section in IRWMP 2019)
- Ventura County Active Transportation Plan (ongoing)
- Climate resiliency, Fire Safe Council, programs led by Ventura County Resource Conservation District
- Groundwater Sustainability Plans (FCGMA, Mound Basin, Fillmore and Piru groundwater sustainability agency, Cuyama groundwater sustainability agency, Upper Ventura groundwater sustainability agency)
- Naval Base of Ventura County
- Urban Water Management Plans (County of Ventura, its 10 cities, and water districts required to develop them)
- Prop 1 IRWM Disadvantaged Community Involvement Program Needs Assessment Report (completed by fall 2021). Includes surveys and meetings with community members to identify water management needs of disadvantaged communities and tribal communities.

Taking action to integrate each of these programs with the hazard mitigation plan was considered as a mitigation action to include in the action plan in this annex.

24.6 RISK ASSESSMENT

24.6.1 Jurisdiction-Specific Natural Hazard Event History

Table 24-9 lists past occurrences of natural hazards for which specific damage was recorded in this jurisdiction Other hazard events that broadly affected the entire planning area, including this jurisdiction, are listed in the risk assessments in Volume 1 of this hazard mitigation plan.

Table 24-9. Past Natural Hazard Events

Type of Event	FEMA Disaster #	Date	Damage Assessment
COVID-19 Pandemic	DR-4482	January 20, 2020 and continuing	$Unknown
Maria Fire	FM-5302	November 1, 2019	$Unknown
Easy Fire	FM-5298	October 1, 2019	$Unknown
Saddleridge Fire	FM-5293	October 10, 2019	$Unknown
Severe Storms & Flooding	State	February 3, 2019	$Unknown
Wildfires	DR-4407	November 8-25, 2018	$Unknown
Wildfires, Flooding, Mudflows, and Debris Flows	DR-4353	Dec 4, 2017-January 31, 2018	$165,110-PA & HMGP-Gauges
Thomas Fire	FM-5224	December 4, 2017	$Unknown
Wildfire	FM-5189	July 9, 2017	S5,000,000-HMGP-Fresno Cyn.
Winter Storms	State	February 1, 2017	$Unknown
Springs Fire	FM-5024	May 2-11, 2013	$Unknown
Winter Storms	State	February 20, 2013	$Unknown
Winter Storms	State	February 19 – 26, 2011	$Unknown
Ormond Beach Breach	None	January 18, 2010	$162,933 VCPWA-WP Internal Data
Guiberson Fire	FM-2839	September 22-29, 2009	$Unknown
Wildfires, Flooding, Mudflows, and Debris Flows	DR-1731	October 21, 2007-March 31, 2008	$16,650-CDAA-Gauges
Severe Freeze	DR-1689	January 11-17, 2007	$Unknown
Shekell Fire	FM-2681	December 3 – 6, 2006	$Unknown
Day Fire	FM-2677	September 25-30, 2006	$55,867-CDAA-Gauges & Stop Log
School Fire	FM-2586	November 18-23, 2005	$Unknown
Topanga Fire	FM-2583	September 28-October 10, 2005	$Unknown
Severe Storms, Flooding, Landslides, Mud and Debris Flows	DR-1585	February 16, 23, 2005	$735,657 HMGP North Simi, FEMA, $3,656,067, CDAA $973,722, PDM Fresno Canyon Diversion $55,499
Severe Storms, Flooding, Debris Flows and Mudslides	DR-1577	December 27, 2004 – January 11, 2005	FEMA $13,293,182 CDAA $110,636
Wildfires, Flooding, Mudflow and Debris Flow	DR-1498	October 31, 2003 – March 31, 2004	$46,875-HMGP Gauges FEMA $265,310, CDDA $1,740,850
Severe Storms, Tornadoes, High Winds, and Flooding	DR-1267	December 20 – 28, 1988	$Unknown
Severe Winter Storms and Flooding	DR-1203	February 2 – April 30, 1998	$ 5,464,863 FEMA $1,742,593 CDAA
Severe Fires	EM-3120	October 21 – 31, 1996	$Unknown
Severe Winter Storms, Flooding, Landslides, and Mud Flows	DR-1046	February 13 – April 19, 1996	$Unknown
Severe Winter Storms, Flooding, Landslides, and Mud Flows	DR-1044	January 3 – February, 1995	$Unknown
Northridge Earthquake	DR-1008	January 17 – November 30, 1994	$Unknown

Type of Event	FEMA Disaster #	Date	Damage Assessment
Fires, Mud & Landslides, Soil Erosion, and Flooding	DR-1005	October 26, 1993 – April 22, 1994	$881,390
Severe Storm, Winter Storm, Mud & Landslides and Flooding	DR-979	January 5 – March 20, 1993	$Unknown
Snow Storm, Heavy Rain, High Winds, Flooding and Mudslide	DR-935	February 10-19, 1992	$5,335,410
Severe Freeze	DR-894	December 19, 1990 – January 3, 1991	$Unknown
Severe Storms, High Tides & Flooding	DR-812	January 17 – 22, 1988	$Unknown
Grass, Wildlands, & Forrest Fires	DR-739	June 26 – July 19, 1985	$Unknown
Coastal Winter Storms, Floods, Slides and Tornadoes	DR-677	January 21 – March 30, 1983 February 26 – March 1, 1983	$4,098,650 $14,181,650
Severe Storms, Mudslides & Flooding	DR-615	January 8, 1980	$5,464,869
Coastal Storms, Mudslides & Flooding	DR-547	February 15, 1978	$Unknown
Severe Storms, High Tides & Flooding	DR-364	February 8, 1973	$1,800,000
Forest & Brush Fires	DR-295	September 29, 1970	$Unknown
Severe Storms & Flooding	DR-253	January 26, 1969	$15,770,000
Heavy Rains & Flooding	DR-211	February 25, 1965	$Unknown

24.6.2 Hazard Risk Ranking

Table 24-10 presents a local ranking of all hazards of concern for which this hazard mitigation plan provides complete risk assessments. As described in detail in Volume 1, the ranking process involves an assessment of the likelihood of occurrence for each hazard, along with its potential impacts on people, property, and district operations. Mitigation actions primarily target hazards with high and medium rankings.

Table 24-10. Hazard Risk Ranking

Rank	Hazard	Risk Ranking Score	Risk Category
1	Dam Failure	34	High
2	Severe Storms[a]	24	High
2	Severe Weather[a]	24	High
4	Flooding[a]	18	High
5	Earthquake	32	Medium
6	Wildfire	24	Medium
7	Landslide[b]	18	Medium
8	Sea Level Rise	12	Low
8	Tsunami	12	Low
10	Drought	9	Low

a. Risk Category adjusted based on local knowledge and past natural hazard events
b. Score based only on Very High susceptibility category

24.6.3 Jurisdiction-Specific Vulnerabilities

Volume 1 of this hazard mitigation plan provides complete risk assessments for each identified hazard of concern. The following jurisdiction-specific issues have been identified based on a review of the results of the risk assessment, public involvement strategy, and other available resources:

- Based on the fact that virtually all of VCPWA-WP's critical facility assets were constructed to provide flood protection and/or are geospatially located proximate to and/or in flood plains, and as documented in Table 1.8 Past Natural Hazard Events above, during the aforementioned 56-year period, VCPWA-WP's critical facility flood protection assets experienced $81 Million in damage from flooding, severe storms and severe weather events, VCPWA-WP has ranked Flood risks as "High" in Table 1.9 above.
- Matilija Dam in the Ventura River watershed is vulnerable to seismic failure. Many communities are at risk of inundation. Implementation of the Matilija Dam Ecosystem Restoration Project (MDERP) would address this risk while also opening 17 miles of habitat for endangered steelhead trout. MDERP comprises several downstream flood protection and water supply reliability components that must precede removal of the dam, some of which have been completed or are at various stages of completion (alternatives analysis, design, or construction).
- VCPWA-WP is currently engaged in preliminary design engineering and CEQA work in support of levee retrofit and/or flood-protection enhancement projects required to certify all its levees in full-compliance with Federal Levee Certification requirements. Major levee rehabilitation and ultimate certification projects in Ventura County mentioned in the Action Plan Items below include: Calleguas Creek Levee-Somis Flood Wall (CC-2) located in the City of Camarillo, the Santa Clara River Levee upstream of Hwy 101 (SCR-1) located in the City of Oxnard, the Ventura River Levee (VR-1) located in the City of San Buenaventura, the Ventura River Levee (VR-2) located in the unincorporated community of Casitas Spring, and the Ventura River Levee (VR-3) located in the near the unincorporated community of Oak View. VCPWA-WP is working closely with FEMA, the United States Army Corps of Engineers (USACE), as well as affected cities, residents, and property owners throughout Ventura County to marshal scarce Federal, State, and local funding resources necessary to complete five very important levee retrofit public safety and flood protection projects. Once all VCPWA-WP's levee retrofit projects are completed, VCPWA-WP's levees will fully comply with applicable Federal Levee Certification requirements found in 44 CFR 65.10. At best, full completion of VCPWA-WP's five levee rehab projects will require a minimum of five to ten years, and could take longer, depending on final engineering design plan results, environmental considerations, and availability of project funding required to construct the rehab projects.
- San Nicholas, Santa Monica, and Santa Paula Pump Stations lift stormwater from low elevation coastal neighborhoods and discharge directly to the Pacific Ocean. The Santa Monica and Santa Paula Pump Station outlets are frequently clogged during high tide and heavy surf events, causing the pumps to shut off and requiring manual removal of sand to ensure the coastal communities do not flood. With sea level rise, the risk increases. While not currently afflicted with the propensity for sand to clog its outlet, San Nicholas Pump Station is vulnerable to failure as sea level rises. The pumps in each facility are over 40 years old and do not have on site backup generators, making them vulnerable to power failures, which cause alarms to sound signaling the need for immediate emergency response. All three facilities need constant repair due to corrosive salt air and water. Upgrades are needed, but more land is required for truly effective solutions, and adjacent land is occupied by high value coastal residences.

- Ormond Lagoon is a coastal estuary open to the ocean only during rain events and for a variable period thereafter depending on time between rain events, tides, etc. Sea level rise may reduce the ability of storm runoff from Ormond Lagoon Waterway and *tšumaš* Creek to breach the lagoon and flow into the Pacific Ocean. Without a Beach Elevation Management Plan, the adjacent Oxnard Wastewater Treatment Plant, Advanced Water Purification Facility, New Indy paper recycling plant, Halaco Superfund Site, local residences, and roads are all vulnerable to flooding from storm water backed up in the lagoon. Restoration of a large Ormond Wetlands complex may help reduce flood potential.

Mitigation actions addressing these issues were prioritized for consideration in the action plan in this annex.

24.7 STATUS OF PREVIOUS PLAN ACTIONS

Table 24-11 summarizes the actions that were recommended in the previous version of the hazard mitigation plan and their implementation status at the time this update was prepared.

Table 24-11. Status of Previous Plan Actions

Action Item from Previous Plan	Completed	Removed; No Longer Feasible	Carried Over to Plan Update	
			Check if Yes	Action # in Update
VCWPD 1—Complete the General Plan Update. In 2015, the Resource Management Agency, Planning Division initiated a General Plan Update project that is expected to take 5 years to complete. As part of the General Plan Update, the County will be considering the adoption of a number of new elements that will include land use policies that will apply to new land use development projects within the Unincorporated area of the County. In addition, the Resource Management Agency, Planning Division is currently working on Phase II of an update to its Local Coastal Program ("LCP Update"). The relevant issues that the General Plan Update and LCP Update will address include the following: • Climate change, including (but not limited to) sea level rise and coastal resiliency policies for new development along the coast. • Wildlife movement overlay zone that will limit new development within flood-prone areas (e.g., riparian corridors). • Limitations on new development within Environmentally Sensitive Habitat Areas (e.g., the Santa Monica Mountains that are characterized by steep slopes, relatively intact native habitat, and coastal areas subject to flooding hazards); and • Changes to the permitting requirements for brush removal in open space areas (e.g., areas with steep slopes that are prone to erosion, mudslide, and flood hazards).	✓			
Comment: *The Ventura County General Plan Update was completed and approved by the Board of Supervisors in October 2020. The update addressed climate change and sea level rise. A Habitat Connectivity and Wildlife Corridors ordinance was passed by the Board of Supervisors in 2019, which established development standards intended to preserve wildlife corridors in certain overlay zones. Development requirements in the unincorporated areas of the County are enforced by the County's Resource Management Agency as part of the normal planning and building permit process. The Coastal Area Plan which is part of the Local Coastal Program was updated in April 2017 and approved by the California Coastal Commission in July 2017. The updated Coastal Area Plan includes policies to protect Environmentally Sensitive Habitat Areas such as coastal dunes.*				

Action Item from Previous Plan	Completed	Removed; No Longer Feasible	Carried Over to Plan Update: Check if Yes	Carried Over to Plan Update: Action # in Update
VCWPD 2—Revise existing landslide/debris flow maps to include potential runout areas and include the runout area with a classification scheme for probability. Present landslide/debris flow maps only include the main slide mass or body and not the potential areas of effect from potential future movement.	✓			
Comment: *After the Thomas, Woolsey, and Maria fires Debris Flow maps were prepared in early 2018 for emergency repair planning purposes for major Watershed Protection jurisdictional channels significantly impacted by the wildfires. Major streams impacted by the Thomas, Woolsey, Maria, and Easy Fires were all mapped. The mapping focuses on identifying at-risk areas resulting from 1% annual chance flood flows with after fire debris bulking applied.*				
VCWPD 4—Integrate alluvial fan management measures for oil, agriculture, and development to include stormwater runoff, sediment transport, and alluvial fan geomorphology from geologic perspective. Alluvial fans are presently considered only from hydrologic/hydraulic models.	✓			
Comment: *Alluvial fan management is regulated by the Ventura County Public Works Agency Engineering Services (VCPWA-ES) Department, Land Development Division with support from VCPWA-WP as part of the site review for grading permits associated with agricultural, oil and development projects. Geology and Engineering disciplines are utilized during these reviews to consider potential alluvial fan hazards typically not associated with the riverine environment. The reviews are performed on a project-by-project basis as many projects are not within the alluvial fan environment.*				
VCWPD 5—Upgrade the County of Ventura's Flood warning system. The existing ALERT ***(Automated Local Evaluation in Real Time)*** system is utilizing radio technology from the 1980s.	✓			
Comment: *VCPWA-WP successfully secured a total of $3,174,181 in three rounds of Flood Emergency Response Grants in 2014, 2016, and 2018. These three grants which funded the update of older ALERT legacy flood warning systems throughout Southern California to a new radio protocol called ALERT2. All three Flood Emergency Response Grants for Southern California were managed by Ventura County. Participating agencies included: Ventura County, County of Orange, Los Angeles County, San Bernardino County, Riverside County, San Diego County, National Weather Service Oxnard, National Weather Service San Diego, Santa Barbara County, San Luis Obispo County and Coachella Valley Water District* *ALERT2 incorporates the use of GPS timing with timed transmissions among other enhancements like faster transmission rates. The faster rates facilitate sending more data in a shorter time slot. This makes the radio transmissions shorter. Some of the timed data check ins being received are now at a higher frequency rate in some cases going from 12-hour check-ins to receiving 5-minute data every hour. ALERT2 also makes the warning system much more reliable. The timed transmissions reduce the radio signal collusions where data can be lost to almost nothing making the ALERT2 a much more reliable system when it comes to data loss. The timed transmissions during an event are still considered real time as no transmissions are more than two minutes old.*				
VCWPD 6—Continue modernizing and streamlining the Ventura County Watershed Protection's Integrated Watershed Protection Plan and establish collaborative, cost-sharing, multi-benefit project partnerships with public and private sector agencies and organizations, aimed at improving community resiliency to flood risk hazards, floodplain management, groundwater, and environmental protection, and securing a sustainable water supply for urban and agricultural customers.			✓	VCPWA-WP-2
Comment: *An Integrated Watershed Protection Plan is used by VCPWA-WP to rank projects for prioritizing funding and inclusion in VCPWA-WP's 5-Year Capital Improvement Plan. The plan encourages collaboration and cost-sharing among public and private sector agencies and organizations on multi-purpose projects which integrate project objectives for flood control, floodplain management, groundwater recharge, recreation, and environmental enhancement. A cost sharing collaboration for Runkle Canyon resulted in completed improvements to rehabilitate infrastructure and increase flood safety by creating a sustainable funding source through a special assessment to properties that benefit from the improvements. A similar model has also been used for an area impacted by flood risks from Santa Paula Creek. Through collaboration and cost-sharing with the City of Oxnard, a linear park is planned together with the improvement to the flood channel conveyance capacity of tšumaš Creek.*				

Action Item from Previous Plan	Completed	Removed; No Longer Feasible	Carried Over to Plan Update: Check if Yes	Carried Over to Plan Update: Action # in Update
VCWPD 7—Undertake public outreach initiatives aimed at increasing property owner awareness of the risks of flooding, including coastal flooding from sea-level rise and actions that residents can take to reduce the risk of loss of life and property damage.	✓			
Comment: *VCPWA-WP actively participates in CA Flood Preparedness Week activities during the month of October annually, which provides helpful information to residents, businesses, and schools on proactive steps that everyone should take to reduce their risk to loss of life and property damage from flood events, including coastal flooding from sea level rise. The County also mails flood safety information to all properties within a FEMA defined floodplain which often includes coastal residents vulnerable to coastal erosion and sea level rise. Another outreach activity is to provide flood risk information to realtors and lenders who serve residents looking for new housing.*				
VCWPD 8—Stabilize landslide-prone areas through stability improvement measures, including interceptor drains, in situ soil piles, drained earth buttresses, subdrains, removal of slide areas, and dewatering ground.	✓			
Comment: *Landslide prone areas are stabilized as development is proposed within these areas. Should development or access to development be proposed in these areas and are not able to be relocated away from the hazard then geologic and engineering studies are required to provide recommendations for mitigation strategies to stabilize the ground that include factors of safety against future movement.*				
VCWPD 9—Acquire, relocate and/or floodproof critical facilities located within the 100-year floodplain, as financially feasible. Projects will be undertaken by the Ventura County Public Works Agency and other applicable County agencies. Where feasible, acquired lands will be considered for passive open space.			✓	VCPWA-WP-5
Comment: *VCPWA-WP and other County Agencies routinely consider the feasibility, practicality, and affordability of relocating and or floodproofing critical facilities located within the 100-year flood plain during routine project engineering design efforts, and in the preparation of project alternatives analyses in applicable CEQA documentation. Further, the Ventura County 2040 General Plan provides the following two policies providing direction to flood-proof critical facilities located within flood plains or in areas subject to sea-level rise* ***Public Facilities, Services, and Infrastructure Element (PFS):*** *PFS-1.3: The County shall review plans for constructing new essential public facility, such as a hospital, health care facility, emergency shelter, emergency command center, or emergency communications facility, so that these facilities are located outside of at-risk areas whenever feasible. If such a location is infeasible, then the County shall require the use of construction methods and site design features to minimize potential damage to these facilities.* ***Hazards and Safety Element (HAZ):*** HAZ-3.2: County-initiated infrastructure projects sited along or seaward of Highway 101, such as bridges and levees, that will provide 100 years or more of service, shall be planned with the potential to be easily modified to accommodate 100-years of projected sea level rise in accordance with the H++ extreme risk aversion sea level rise scenario				

Action Item from Previous Plan	Completed	Removed; No Longer Feasible	Carried Over to Plan Update: Check if Yes	Carried Over to Plan Update: Action # in Update
VCWPD 10—Reinforce and maintain County roads, bridges, ditches, and culverts from flooding through various flood proofing measures.			✓	VCPWA-WP-5
Comment: *Ventura County Public Works Agency Roads and Transportation Department (VCPWA-RT) is responsible for the operation and maintenance of County roads, bridges, ditches, and culverts in the unincorporated areas of Ventura County. VCPWA-RT conducts annual ditch cleaning and culvert cleaning before winter storm season to maintain the capacity of ditches and proper drainage flow to mitigate roadway flooding in rural areas of the county. In addition to the annual cleaning of ditches and culverts, the VCPWA-RT is actively working to rehabilitate Bridge Road Bridge (#442) which is currently in design and environmental permitting phase and is expected to be completed in 2023. Replacement of Catalina Drive Bridge (#384) was completed in May 2020 and replacement of Casitas Vista Road Bridge (#327) was completed in September 2020. Mupu Road Bridge and the Wheeler Canyon Road Bridge improvements projects were completed in 2016-2017. The VCPWA-RT is developing a Bridge Management Program to maintain County bridges. The program will identify and prioritize VCPWA-RT's 158 bridge structures which include 81 bridges on the National Bridge Inventory and 77 other structures. This program will identify budget needs, and schedules for preventive maintenance as well as budget for required rehabilitation or replacement of VCPWA-RT maintained bridges for short and long-term planning needs. The Bridge Management Program is expected to be completed in calendar year 2021. In 2020-2021, VCPWA-WP continued to clean flood control channels and catch basins to prepare for winter storm seasons. VCPWA-WP also secured Proposition 1 grant funding for the Santa Ana Bridge and Camino Cielo Bridge replacement projects which are managed by VCPWA-RT (both are components of the MDERP). The design of Camino Cielo Bridge is progressing towards 30% millstone. For the Santa Ana Bridge project, a construction contract was awarded in March 2021 with an estimated completion date of December 2022.*				
VCWPD 11—Work with FEMA Region IX to address any floodplain management issues that may have arisen/arise from the countywide DFIRM, Community Assessment Visits, and/or DWR.			✓	VCPWA-WP-10
Comment: *VCPWA-WPD staff have worked closely with FEMA Region IX and CA Department of Water Resources (DWR) staff on a regular basis to address floodplain management issues. In coordination with FEMA Region IX, floodplain managers from the county and cities meet quarterly to discuss and address issues facing the floodplain management communities. The County continues to work with FEMA in moving forward with the Physical Map Revisions (PMR) for Santa Clara River watershed. The mapping projects for the Ventura River watershed and the Californian Coastal Analysis and Mapping Project were completed with maps effective 1/29/2021. County staff worked closely with FEMA on the public outreach for the completed mapping projects ahead of the effective dates to inform residents and encourage flood insurance purchase. County staff worked closely with FEMA and DWR on the dam break analysis and mapping and successfully achieved approval. All eight (8) state sized dams Ventura County maintains have approved inundation maps.*				
VCWPD 12—Increase the Unincorporated Ventura County's participation in the NFIP by maintaining a CRS Class 6 CRS rating, if not improving to a Class 5 or better rating, which through enhanced floodplain management activities allows property owners to receive increasing discounts on their NFIP flood insurance premiums.			✓	VCPWA-WP-7
Comment: *Since May 1, 2016, unincorporated Ventura County has achieved a Class 5 rating in the NFIP's CRS administered by FEMA. A CRS rating reflects the extent to which a community has exceeded the NFIP's minimum standards for flood hazard mitigation and credits those efforts through flood insurance premium discounts. This Class 5 rating allows owners of floodplain properties in the unincorporated Ventura County to receive annual discounts of up to 25% on flood insurance premiums. FEMA listed the county's class 5 rating in the CRS program on April 1, 2021. In May of 2018, FEMA performed a Cycle Verification confirming Class 5 status. The next Cycle Verification is due in 2023. Additionally, in compliance with CRS program protocols, yearly recertification documentation continues to be submitted by VCPWA-WP to FEMA between Cycle Verifications. The most recent recertification was submitted July 28, 2021 and the next recertification will be due by August 1st of 2022.*				

Action Item from Previous Plan	Completed	Removed; No Longer Feasible	Carried Over to Plan Update: Check if Yes	Carried Over to Plan Update: Action # in Update
VCWPD 14—Engage in preliminary design engineering, project feasibility analysis, and CEQA work for the Calleguas Creek Levee (CC-2) in Camarillo, the Santa Clara River Levee (SCR-1) in Oxnard, the Ventura River Levee (VR-1) in Ventura, and the Ventura River Levee (VR-2) in the Unincorporated area of Casitas Springs.			✓	VCPWA-WP-6
Comment: The County of Ventura, working in close coordination with federal and state agencies, continues to progress the design engineering and environmental permitting, and in some cases, the construction of projects required to rehabilitate levees owned by the County. A DWR Local Levee Assistance Program (LLAP) grant provided funding for the hydrologic and hydraulic analysis, geologic investigation, and alternative analysis for the preliminary design of the rehabilitation of the *Calleguas Creek and Somis Drain Levee System (CC-2) in the City of Camarillo, and for the Ventura River Levee (VR-2) in the unincorporated community of Casitas Springs, which will ultimately lead to certification of these levees by the County, and accreditation of that certification by FEMA. The predesign study for CC-2 was completed in March 2021. That LLAP grant also provided funding to advance design engineering work, CEQA report preparation, and required environmental permitting approvals for both the Santa Clara River Levee (SCR-1) in Oxnard, and the Ventura River Levee (VR-1) in Ventura. Finally, the Sespe Creek Levee (SC-2) rehabilitation from HWY 126 to Old Telegraph Road was completed in the fall of 2017. Phase I levee rehabilitation construction work required to support the eventual certification of the Santa Clara River Levee (SCR-3) in Oxnard was completed by the County in June of 2018. Phase II of SCR-3 is planned for construction beginning in the 2022-23 fiscal year. Ongoing coordination between the County and the USACE, under the Section 408 Permit envelope, is underway for both the SCR-1 and VR-1 levees. For VR-1, the County submitted 60% design plans to USACE for review in early 2021.*				

Action Item from Previous Plan	Completed	Removed; No Longer Feasible	Carried Over to Plan Update: Check if Yes	Carried Over to Plan Update: Action # in Update
VCWPD 15—As part of the Memorandum of Agreement / Memorandum of Understanding with The Nature Conservancy (TNC): partner with TNC on acquisition, restoration, and mitigation planning processes; partner on grant proposals; participate in negotiations with land use owners; carry-out restoration projects; hold titles to floodplain properties as appropriate; and hold or co-hold with TNC multipurpose easements.			✓	VCPWA-WP-8

Comment: *In November 2020, VCPWA-WP collaborated with TNC as well as the Santa Clara River Conservancy and the University of California at Santa Barbara to identify privately-owned parcels within the Santa Clara River one-percent annual chance flood zone that could be acquired, preserved with a conservation easement, and whose habitat quality could be enhanced. VCPWA-WP included acquisition and enhancement of the parcels in its SCR-3 Levee Rehab and Habitat Enhancement Project grant application to the California Department of Water Resources' Coastal Watershed Flood Risk Reduction grant program. TNC and SCRC submitted letters of support. On June 1, 2021, DWR issued a recommendation to fund five grants, including $3.125 million for the SCR-3 Project, of which $625,000 is budgeted for the habitat acquisition and enhancement. The public has an opportunity to comment on this recommendation until June 15, 2021.*

VCPWA-WP also coordinated with TNC and other NGOs such as Ojai Valley Land Conservancy and Friends of the Santa Clara River during preparation of its original (2010) and follow up (2015 & 2018) Community Rating System applications, Activity 420-Open Space, to document and quantify all lands preserved as open space within the one-percent annual chance flood zone throughout Ventura County. Through its participation in the Santa Clara River Watershed Committee and other organizations, VCPWA-WP also encourages all entities considering acquisition and preservation of open space to prioritize those parcels within the one-percent annual chance floodplain.

In 2019, TNC reached out to VCPWA-WP to assist in developing multi-benefit project ideas to enhance stream water quality, in compliance with National Pollutant Discharge Elimination System /MS4 permit requirements.
TNC, in collaboration with the City of Oxnard and State Coastal Conservancy, is developing the Ormond Beach Restoration and Access Plan (OBRAP). VCPWA-WP has provided input on the plan, including recommendations on approaches to incorporate its existing flood control facilities such as the Ormond Lagoon Waterway into the project while still protecting adjacent developed areas from flooding. In January 2021, VCPWA-WP began enlarging a portion of tšumaš Creek, another tributary to Ormond Lagoon. Project completion is anticipated by February 2022 and VCPWA-WP continues to seek grant funding to continue the channel enlargement upstream. The tšumaš Creek project is also covering the channel from Hueneme Road northward to provide a surface on which the City of Oxnard could install a linear park connecting an underserved community to Ormond Beach and coastal recreation areas (VCPWA-WP has assisted the City in preparation of three grant applications for this purpose, though to date no grant has been awarded). This linear park feature is reflected in the OBRAP.

VCPWA-WP has carried out several habitat restoration projects, including removal of giant reed (Arundo donax) and other invasive species and either native plant installation or passive recruitment in the Ventura River, Santa Clara River, and Calleguas Creek watersheds. This work is ongoing.

Action Item from Previous Plan	Completed	Removed; No Longer Feasible	Carried Over to Plan Update: Check if Yes	Carried Over to Plan Update: Action # in Update
VCWPD 16—Develop a Post Disaster Assessment and Planning Data Base. WPD will collect Ventura County's OES Post Disaster Damage Reports. This information will be geo-referenced and stored in a special database as a shape file. VCPWA-WP will compare the disaster information with existing DFIRM maps, and existing repetitive loss inventory data for monitoring and identification of flood prone areas (Hot Spots). Following the identification of damaged structures, VCPWA-WP will research and document if damaged structures were affected by local drainage problems, such as a plugged culvert, or unintended drain blockage. If not, consider the type of drainage system. If drainage system is local, refer the problem to PWA-Transportation for future mitigation, or if it is within VCPWA-WP's facilities, VCPWA-WP to assess problem and potential solution.			✓	VCPWA-WP-3
Comment: *In January of 2018, VCPWPD piloted the creation of a geospatially referenced post disaster damage assessment storyboard after the Thomas Fire which captured many of the features mentioned in this action plan item. Efforts to refine, improve, and standardize that storyboard to cover critical facility-assets found in the asset management portfolios of VCPWA-Roads and Transportation, Water and Sanitation Department, and Watershed Protection will be explored and further developed in an action item entry for the next five-year plan development period.*				

24.8 HAZARD MITIGATION ACTION PLAN

Table 24-12 lists the actions that make up the hazard mitigation action plan for this jurisdiction. Table 24-13 identifies the priority for each action. Table 24-14 summarizes the mitigation actions by hazard of concern and mitigation type.

Table 24-12. Hazard Mitigation Action Plan Matrix

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action VCPWA-WP-1—Support and actively participate in countywide initiatives and plan maintenance protocols identified in Volume 1 of the hazard mitigation plan, prioritizing VCPWA-WP's involvement in geographical areas of the county which have experienced severe repetitive losses and/or are in high- or medium-risk hazard areas identified in Watershed Protection's jurisdictional annex.						
Hazards Mitigated: Drought, Dam Failure, Earthquake, Flood, Landslide, Sea Level Rise, Severe Storm, Severe Weather, Tsunami, and Wildfire						
Existing & New	1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15, 16, 17, 18, 19	VCSOES and Ventura County Departments	VCPWA-WP	Low	VCPWA-WP Structural Revenues augmented by FEMA Grants (BRIC and HMGP) and County General Funds, as required	Ongoing

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action VCPWA-WP-2—Refine the Integrated Watershed Protection Plan to update the identification and prioritization of multi-hazard mitigation projects, which incorporate dam failure, drought, earthquake, landslide, sea-level rise, server storm and weather, and tsunami hazard mitigation features to advance the inclusion of multi-hazard mitigation projects in Capital Improvement Project (CIP) project planning, design, and implementation actions. Ensure that the unique vulnerabilities of disadvantaged, socially vulnerable, and historically underrepresented communities are identified, considered, and reflected appropriately in the project prioritization ranking process through coordination and engagement with representatives of these communities, multi-stakeholder watershed groups, and nonprofit partners.						
Hazards Mitigated: Dam Failure, Drought, Earthquake, Flooding, Landslide, Sea Level Rise, Severe Storm, Severe Weather, and Tsunami						
New & Existing	1, 2, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19	VCPWA-WP	Ventura County Departments, Cities, Special-Purpose Districts, and NGOs.	Medium	VCPWA-WP Structural Revenues augmented by FEMA Grants (BRIC, FMA, and HMGP) and County General Funds, as required	Ongoing
Action VCPWA-WP-3—Implement a Post Disaster Critical Facilities Risk Impact Assessment Program designed to capture and geo-reference perishable data after significant events (e.g., preliminary damage estimates, damage photos, event mapping, etc.) in support of future hazard mitigation efforts including the implementation and maintenance of the HMP. Leverage applications (Maintstar v15, ArcGIS Online) to capture information related to VCPWA-RT, W&S, and WP critical facility asset impacts, and establish a centralized location to document and archive critical facilities geospatial data related to disaster events which will facilitate the development and optimize the pursuit of grant funding for future hazard mitigation projects.						
Hazards Mitigated: Dam Failure, Drought, Earthquake, Flood, Landslide, Sea Level Rise, Severe Storm, Severe Weather, Tsunami, and Wildfire						
New & Existing	1, 2, 4, 6, 8, 9, 10, 11, 12, 13, 16, 17, 18, 19	VCPWA-WP	Ventura County Departments, Cities, Special-Purpose Districts, and NGOs.	Low	VCPWA-WP Structural Revenues augmented by FEMA Grants (BRIC) and County General Funds, as required	Short Term
Action VCPWA-WP-4—Improve public awareness and community response to flood event emergencies by upgrading and modernizing the Flood Warning System (FWS) optimized to leverage multi-social media venues. Expand the public outreach of the FWS through targeted marketing based on web-site analytics and develop multiple language interfaces to better reflect the linguistic and cultural diversity found in Ventura County communities.						
Hazards Mitigated: Flood, Landslide, Sea Level Rise, Severe Storms, Severe Weather, Tsunami						
New & Existing	1, 2, 6, 7, 12, 17, 18, 19	VCPWA-WP	DWR, NOAA, VCSOES, Ventura County Departments, Cities, Special-Purpose Districts, community and tribal leaders, community councils, and NGOs	Medium	VCPWA-WP Structural Revenues augmented by DWR and FEMA Grants (BRIC and HMGP) and County General Funds, as required	Short Term
Action VCPWA-WP-5—Prioritize efforts to upgrade County bridges, culverts, dams, debris and detention basins, flood conveyance channel and pipeline infrastructure, pump stations, roads, water and wastewater community infrastructure, and other critical facilities required to provide adequate flood-proofing protection and enhance the resiliency of vital community lifelines in Ventura County.						
Hazards Mitigated: Dam Failure, Earthquake, Flood, Landslide, Sea Level Rise, Severe Storm, Severe Weather, Tsunami and Wildfire						
New & Existing	1, 2, 5, 6, 8, 9, 10, 11, 13, 16, 18, 19	VCPWA Departments	Ventura County Departments, Cities, Special-Purpose Districts	High	VCPWA-WP Structural Revenues augmented by FEMA Grants (BRIC, HMGP) DWR, VCTC, Caltrans and County General Funds, as required	Long Term

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action VCPWA-WP-6—Complete project feasibility analyses, design engineering and CEQA work for the Calleguas Creek Levee (CC-2) in Camarillo, the Santa Clara River Levee (SCR-1) in Oxnard, the Santa Paula Creek Flood Protection Project in Santa Paula, the Ventura River Levee (VR-1) in Ventura, the Ventura River Levee (VR-2) in the unincorporated community of Casitas Springs, and the Live Oak Acres Levee (VR-3) near the unincorporated community of Oak View required to evidence local compliance with Federal Levee Certification Regulations (44 CFR 65.10)						
Hazards Mitigated: Dam Failure, Earthquake, Flood, Landslide, Sea Level Rise, Severe Storm, Severe Weather, and Tsunami						
New & Existing	1, 2, 5, 6, 8, 9, 10, 11, 13, 16, 18, 19	VCPWA-WP	Ventura County Departments and Cities of Camarillo, Oxnard, and San Buenaventura	High	VCPWA-WP Structural Revenues augmented by FEMA Grants (BRIC and HMGP) DWR-LLAP Grants USACE, and County General Funds, as required	Long Term
Action VCPWA-WP-7—Strengthen the unincorporated area's participation in the NFIP by maintaining a CRS Class 5 Rating; and pursue a renewed emphasis on the planning and implementation of flood mitigation projects for repetitive loss properties eligible for grant funding under FEMA's Building Resilient Infrastructure and Communities (BRIC) program with the goal of reducing the number of repetitive loss properties in Ventura County.						
Hazards Mitigated: Flood, Landslide, Sea Level Rise, Severe Storm, Severe Weather, Tsunami						
New & Existing	1, 2, 4, 6, 9, 10, 11, 12, 13, 16, 18, 19	VCPWA-WP	Ventura County Departments, DWR, FEMA	High	VCPWA-WP Structural Revenues augmented by Grants (FMA, BRIC, HMGP) and County General Funds, as required	Ongoing
Action VCPWA-WP-8—Partner with the Nature Conservancy, Santa Clara River Conservancy, Ojai Valley Land Conservancy, and other NGOs in cooperative efforts to acquire floodplain properties, carry out restoration projects, and enhance resiliency to natural disasters with green design elements included in hazard mitigation projects where feasible.						
Hazards Mitigated: Dam Failure, Drought, Flood, Landslide, Sea Level Rise, Severe Storms, Severe Weather, Tsunami, and Wildfire						
New & Existing	1, 2, 5, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18	VCPWA-WP	Ventura County Departments, TNC, SCRC, OVLC, DWR, CDFW, State Coastal Conservancy	High	VCPWA-WP Structural Revenues augmented by Grants (FMA, BRIC, HMGP, DWR, SCC, etc.) and County General Funds, as required	Ongoing
Action VCPWA-WP-9—Advance planning, feasibility analyses, preliminary design, and ultimate construction of multi-benefit stormwater capture projects through a regionally collaborative approach; as well as pursue strategies to maximize stormwater as a resource (enhance recycled water, stormwater capture and sanitary system diversion, and groundwater recharge) where possible in infrastructure planning and implementation of VCPWA-WP stormwater capital projects.						
Hazards Mitigated: Drought, Flood, Sea Level Rise, Severe Storm, and Severe Weather						
New	1, 2, 9, 10, 11, 12, 14, 15, 16, 17, 18, 19	VCPWA-WP	Ventura County Departments, SWRCB, LARWQCB, DWR, SGMAs, NGOs and Private Landowners	High	VCPWA-WP Structural Revenues augmented by FEMA Grants (BRIC & HMGP) DWR, IRWM, LARWQB, SWRCB) and County General Funds, as required	Ongoing

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action VCPWA-10—Coordinate with FEMA Region IX to proactively address flood plain management and flood risk mapping issues that could adversely impact local hazard mitigation project planning and implementation efforts which may arise from updates to the Countywide DFIRMs, Community Assistance Visits, and/or other risk mapping initiatives.						
Hazards Mitigated: Flood, Sea Level Rise, Severe Storm, and Weather						
New & Existing	1, 2, 4, 6, 8, 9, 10, 11, 12, 16, 17, 18 19	VCPWA-WP	Ventura County Departments, DWR, FEMA, Cities, NGOs, and Private Landowners	Medium	VCPWA-WP Structural Revenues augmented by FEMA Grants (BRIC & HMGP) DWR, and County General Funds, as required	Ongoing
Action VCPWA-11—Work closely with CA Division of Safety of Dams (DSOD), County Sheriff Office of Emergency Services (OES), and other Federal, State, and local agencies to update and refine the Emergency Action Plans (EAPs) for the state size dams owned by the County.						
Hazards Mitigated: Dam Failure, Flood, Earthquake, Severe Storms and Weather						
New & Existing	1, 2,4, 7,8, 12, 17, 18	VCPWA-WP	Ventura County Departments, FEMA, DWR, Cities, NGOs, and Private Landowners	Medium	VCPWA-WP Structural Revenues augmented by FEMA Grants (BRIC), DWR, and County General Funds, as required	Short-Term
Action VCPWA-12—Complete project feasibility analyses, design engineering, CEQA, and implementation of the removal of Matilija Dam, reconstruction of the Camino Cielo Bridge crossing, and work with the Casitas Municipal Water District to reconstruct the Robles Diversion, as well as complete the construction of flood protection projects in the unincorporated community of Meiners Oaks in compliance with DSOD requirements.						
Hazards Mitigated: Dam Failure, Drought, Earthquake, Flood, Severe Storm and Weather						
New & Existing	1, 2, 4, 6, 8, 9, 10, 11, 12, 13, 14, 15, 17, 18 19	VCPWA-WP	Ventura County Departments, Casitas Municipal Water District, Bureau of Reclamation, Caltrans, CDFW, DSOD, DWR, FEMA, USACE, NGOs	High	VCPWA-WP Structural Revenues augmented by FEMA Grants (BRIC & HMGP) CDFW, DWR, NFWF, NRCS, SCC, WCB, and NGO's and County and Casitas General Funds, as required	Long-Term
Action VCPWA-13—Collaborate with the City of Oxnard, Nature Conservancy, and State Coastal Conservancy to advance planning, design, and implementation of the Ormond Beach Restoration and Access Plan (OBRAP), particularly those components alleviating flooding along the Ormond Lagoon Waterway and creating public access along *tšumaš* Creek. This supports the City of Oxnard's Action OXN-12						
Hazards Mitigated: Drought, Flood, Severe Weather, Severe Storms, Sea Level Rise, Tsunami						
New & Existing	1, 2, 3, 9, 12, 13, 14, 15, 17, 18, 19	City of Oxnard	VCPWA-WP	High	City Structural Revenues augmented by FEMA Grants (BRIC), CDFG	Ongoing

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action VCPWA-14—Coordinate efforts to plan, develop, and ultimately construct multi-benefit, flood resiliency and other risk hazard mitigation projects with the Watershed Coalition of Ventura County (WCVC) 3-Watershed Councils, its Disadvantaged Community Committee, and nonprofit partners by increasing outreach and engagement with disadvantaged and socially vulnerable communities and tribal groups to better understand their unique community-lifeline vulnerabilities, facilitate the development of flood hazard mitigation multi-benefit projects, and align and leverage advocacy efforts to optimize grant funding opportunities.						
Hazards Mitigated: Flood, Severe Weather, Severe Storms and Weather, Sea Level Rise, Tsunami						
New & Existing	1, 2, 4, 8, 9, 10, 11, 12, 14, 15, 16, 17, 18, 19	VCPWA-WP	County of Ventura Departments, Cities, Special-Purpose Districts, community and tribal leaders, community councils, WCVC, and NGOs	Medium	VCPWA-WP Structural Revenues augmented by FEMA Grants (BRIC & HMGP) DWR, IRWM, and City and County General Funds as required	Ongoing
Action VCPWA-WP-15—Complete construction of the SCR-3 Levee Rehab Project consisting of 2400 linear feet of flood protection beginning from the east end of Reach 3 and ending north of the Union Pacific Railroad embankment. The flood protection consists of earthen levee embankment, sheet pile, reinforced concrete floodwalls, floodgate, rock riprap bank protection, and drainage improvements. When completed, this project will provide flood protection from a 1%-annual chance flood event to over 3,800 structures and nearly 6,400 residents of North Oxnard along the South Bank of the Santa Clara River.						
Hazards Mitigated: Dam Failure, Earthquake, Flood, Landslide, Sea Level Rise, Severe Storm, Severe Weather, and Tsunami						
New & Existing	1, 2, 5, 6, 8, 9, 10, 11, 13, 16, 18, 19	VCPWA-WP	Ventura County Departments and City of Oxnard	High	VCPWA-WP Structural Revenues augmented by FEMA Grants (HMGP) DWR (Coastal Watershed Flood Risk Reduction and LLAP), and City and County General Funds as required	Short-Term
Action VCPWA-WP-16—Continue to participate in the National Weather Service's (NWS) StormReady and TsunamiReady Programs.						
Hazards Mitigated: Severe Storms, Severe Weather, Tsunami, Flood, Dam Failure, Landslide, Sea Level Rise						
New & Existing	1, 2, 7, 8, 17	Ventura County Public Works	Ventura County Sheriff's OES	Low	Staff Time, General Funds	Ongoing

a. Short-term = Completion within 5 years; Long-term = Completion within 10 years; Ongoing= Continuing new or existing program with no completion date

Acronyms used here are defined at the beginning of this volume.

Table 24-13. Mitigation Action Priority

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Cost?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Implementation Priority[a]	Grant Pursuit Priority[a]
1	17	Medium	Low	Yes	Yes	Yes-only at a level that is "Minimally Necessary to Comply"	Medium	Medium
2	16	Medium	Medium	Yes	Yes	No	Medium	Medium
3	14	Medium	Low	Yes	Yes	Yes-only at a level that is "Minimally Necessary to Comply"	Medium	Medium
4	8	Medium	Medium	Yes	Yes	Yes-only at a level that is "Minimally Necessary to Comply"	Medium	Medium
5	12	High	High	Yes	Yes	No	Medium	High
6	12	Medium	High	No	Yes	No	Low	Medium

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Cost?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Implementation Priority[a]	Grant Pursuit Priority[a]
7	12	Medium	High	Yes	Yes	Maintaining Class 5-CRS Rating: Yes. Reducing Severe Repetitive Loss Property Exposure: No.	Low	Medium
8	13	High	High	Yes	Yes	Establishing Partnerships with NGOs: Yes Acquiring flood plain properties, carrying out restoration projects, and including green design elements: No	Low	Medium
9	12	High	High	Yes	Yes	Advance planning and feasibility analysis: Yes. Perform Final Design and Construction: No	Medium	High
10	13	Medium	Medium	Yes	Yes	Coordination with FEMA: Yes. New Hazard Mitigation Project Planning and Execution: No	Medium	Medium
11	8	High	Medium	Yes	Yes	Coordination with FEMA, DWR, and DSOD: Yes Emergency Action Plan Refinements: No	Medium	High
12	15	High	High	Yes	Yes	No	Medium	High
13	11	High	High	Yes	Yes	Collaboration with City of Oxnard: Yes. OBRAP Flood Mitigation Project Design and Implementation Actions: No	Medium	High
14	14	High	Medium	Yes	Yes	Coordination efforts with WCVC, its DAC, and NGOs: Yes. Flood Mitigation Project Design and Implementation Actions: No	Medium	High
15	12	High	Medium	Yes	Yes	Yes. Project has received $5 Million in grant awards from FEMA and DWR, which will augment VCPWA-WP's Zone 2 project funding	High	Low
16	5	Medium	Low	Yes	No	Yes	Medium	Low

a. See the introduction to this volume for explanation of priorities.

Table 24-14. Analysis of Mitigation Actions

Hazard Type	Action Addressing Hazard, by Mitigation Type[a]							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilient	Community Capacity Building
High-Risk Hazards								
Dam Failure	VCPWA-WP-11	VCPWA-WP-7	VCPWA-WP-1, 2, 16	VCPWA-WP 8, 13	VCPWA-WP-4, 11	VCPWA-WP-5, 6, 12, 15	VCPWA-WP-5, 6, 8	VCPWA-WP-1, 2, 3, 14, 16
Severe Storms	VCPWA-WP-10, 11	VCPWA-WP-7	VCPWA-WP-1, 2, 4, 16	VCPWA-WP 8, 9, 13	VCPWA-WP-4, 11	VCPWA-WP-5, 6, 12, 13, 15	VCPWA-WP-5, 6, 8	VCPWA-WP-1, 2, 3, 10, 14, 16

Hazard Type	Action Addressing Hazard, by Mitigation Type[a]							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilient	Community Capacity Building
Severe Weather	VCPWA-WP-10, 11	VCPWA-WP-7	VCPWA-WP-1, 2, 4, 16	VCPWA-WP 8, 9, 13	VCPWA-WP-4, 11	VCPWA-WP-5, 6, 12, 13, 15	VCPWA-WP-5, 6, 8	VCPWA-WP-1, 2, 3, 10, 14, 16
Flooding	VCPWA-WP-10, 11	VCPWA-WP-7	VCPWA-WP-1, 2, 4, 16	VCPWA-WP 8, 9, 13	VCPWA-WP-4, 11	VCPWA-WP-5, 6, 12, 13, 15	VCPWA-WP-5, 6, 8, 12	VCPWA-WP-1, 2, 3, 10, 14, 16
Medium-Risk Hazards								
Earthquake	VCPWA-WP-11		VCPWA-WP-1, 2		VCPWA-WP-11	VCPWA-WP-5, 6	VCPWA-WP 12	VCPWA-WP-1, 2, 3
Wildfire			VCPWA-WP-1	VCPWA-WP 8				VCPWA-WP-1, 2, 3
Landslides			VCPWA-WP-1, 2, 4, 16	VCPWA-WP 8	VCPWA-WP-4	VCPWA-WP-5, 6		VCPWA-WP-1, 2, 3, 16
Low-Risk Hazards								
Sea Level Rise	VCPWA-WP-10	VCPWA-WP-7	VCPWA-WP-1, 2, 4, 16	VCPWA-WP 8, 9, 13	VCPWA-WP-4	VCPWA-WP-5, 6, 13, 15	VCPWA-WP-5, 6, 8	VCPWA-WP-1, 2, 3, 10, 14, 16
Tsunami		VCPWA-WP-7	VCPWA-WP-1, 2, 4, 16	VCPWA-WP 8, 13	VCPWA-WP-4	VCPWA-WP-5, 6, 13, 15		VCPWA-WP-1, 2, 3, 14, 16
Drought			VCPWA-WP-1, 2	VCPWA-WP 8, 9, 13		VCPWA-WP-12, 13	VCPWA-WP-5, 6, 8	VCPWA-WP-1, 2, 3, 14

a. See the introduction to this volume for explanation of mitigation types.

24.9 PUBLIC OUTREACH

Table 24-15 lists public outreach activities for this jurisdiction.

Table 24-15. Local Public Outreach

Local Outreach Activity	Date	Number of People Involved
Multi-Hazard Mitigation Plan 2020 Progress Report to Ventura County Board of Supervisors	7-28-20	Annual Report Approved without express Board or Public Comments during Board's Adoption of Consent Agenda Items for this Remote Zoom Meeting
Multi-Hazard Mitigation Plan 2021 Progress Report to Ventura County Board of Supervisors	7-21-21	Annual Report Approved without express Board or Public Comments during Board's Adoption of Consent Agenda Items for this Remote Zoom Meeting
Ventura County Sheriff's Office of Emergency Services' Multi-Jurisdictional Hazard Mitigation Plan Development Public Outreach/Emergency Preparedness Workshops Planned During Month of September 2021	9-15-21 9-16-21 9-22-21 9-23-21	Unknown

24.10 INFORMATION SOURCES USED FOR THIS ANNEX

The following technical reports, plans, and regulatory mechanisms were reviewed to provide information for this annex.

- **Ventura County 2040 General Plan:** Evaluated Plan Implementation Actions under the following Plan Elements: (a) Public Facilities, Services, and Infrastructure, (b) Conservation and Open Space, (c) Hazards and Safety, (d) Water Resources, (e) Economic Vitality, (f) Unincorporated Communities' Area Plans, and (g) Appendix B: Climate Change which helped Watershed Protection perform its capability assessment and frame the development of its Hazard Mitigation Plan Action Items with more granular-precision and purposeful-effect.
- **VCPWA-WP's Integrated Watershed Protection Plan Project Prioritization Process:** Explored possible opportunities to better integrate the development of multi-benefit flood protection project partnerships with public and private sector agencies and organizations aimed at improving community resiliency to flood hazard risk, flood plain management, groundwater conservation, stormwater capture, environmental protection, and helping to secure a sustainable water supply for agricultural and urban users.
- **VCPWA-WP 5-Year Capital Improvement Projects Plan, Annual Update:** Confirmed inclusion of flood protection projects in VCPWA-WP's current 5-year portfolio which address a mix of high, medium, and low hazard risks found in VCPWA-WP's current Jurisdiction Annex, keying-up those projects as entries in VCPWA-WP's new 5-year Action Plan portfolio, including seven levee rehabilitation projects which when completed will ultimately result in local compliance with Federal Levee Certification regulations found in 44CFR 65.10.
- **Ventura County Flood Mitigation and Safety Plans:** Consulted current plan documents to identify opportunities of alignment and optimization of VCPWA-WP's new 5-Year Action Plan submittal with the baseline framework found in these historical County flood mitigation and safety plan documents.
- **VCPWA-WP's Preparation of Annual Recertifications and Cycle Verification of Class V Rating for Unincorporated Ventura County under FEMA's Community Rating System Program**: Consulted the current Class 5 Rating program performance and reporting requirements to ensure continuation of this rating, as well as identified opportunities for renewed emphasis on the planning and implementation of flood mitigation projects for repetitive loss properties eligible for grant funding under FEMA's Building Resilient Infrastructure and Communities (BRIC) program with the goal of reducing the number of repetitive loss properties in Ventura County.
- **Ventura County Emergency Services Planning Documents:** Reviewed emergency services planning documents prepared by the Ventura County Sheriff's Office of Emergency Services to gain a better understanding of how best to facilitate appropriate development of VCPWA-WP's new 5-year Action Plan submittal by complementing and supplementing countywide risk hazard emergency planning rubric defined by County's Emergency Action Plan, as well as refine Emergency Action Plans for the state-sized dams owned by the County.
- **Ventura County Integrated Regional Water Management Plan (IRWMP) Updates and DAC Public Outreach Engagement Initiative:**: Explored framing potential opportunities to better coordinate joint efforts to plan, develop, and ultimately construct multi-benefit, flood resiliency and other risk hazard mitigation projects contained in VCPWA-WP's new 5-Year Action Plan submittal by increasing outreach and engagement with disadvantaged and socially vulnerable communities and tribal groups to better understand their unique community-lifeline

vulnerabilities, facilitate the development of flood hazard mitigation multi-benefit projects, and align and leverage advocacy efforts to optimize grant funding opportunities.

The following outside resources and references were reviewed:

- **Hazard Mitigation Plan Annex Development Toolkit**—The toolkit was used to support the identification of past hazard events and noted vulnerabilities, the risk ranking, and the development of the mitigation action plan.

25. VENTURA REGIONAL SANITATION DISTRICT

25.1 LOCAL HAZARD MITIGATION PLANNING TEAM

Primary Point of Contact
Tina Rivera, Director of Finance
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This annex was developed by the local hazard mitigation planning team, whose members are listed in Table 25-1.

Table 25-1. Local Hazard Mitigation Planning Team Members

Name	Title
Sandy Warren (through 6-30-21)	Management Analyst
Tina Rivera	Director of Finance
Eddie Pettit	Senior Engineer
Jo Cavanaugh	Safety Officer
Richard Jones	Director of Operations

25.2 JURISDICTION PROFILE

25.2.1 Overview

The Ventura Regional Sanitation District (VRSD) is a special district created in 1970 to provide sanitation services to cities and unincorporated areas of Ventura County. The District provides solid waste disposal services via the Toland Road Landfill and also offers a variety of water and wastewater-related services under contract to selected special districts and private entities. A nine-member appointed Board of Directors oversees the District. VRSD has approximately 60 employees. The District's operations are funded solely by fees for the services it provides.

The VRSD Board of Directors assumes responsibility for the adoption of this plan; the Executive General Manager will oversee its implementation.

25.2.2 Service Area

The District service area covers approximately 200 square miles, serving a population of approximately 600,000 in the cities of Camarillo, Fillmore, Ojai, Oxnard, Port Hueneme, Santa Paula, Thousand Oaks, and Ventura, as well as unincorporated County areas.

25.2.3 Assets

Table 25-2 summarizes the assets of the District and their value.

Table 25-2. Special-Purpose District Assets

Asset	Value
Property	
449 acres of land	(unknown)
Equipment	
Landfill & water/wastewater operations equipment	$9,121,492
Landfill gas above-ground pipework	$825,000
Landfill liner	$1,500,000
Total:	***$11,446,492***
Critical Facilities	
Toland Road Landfill (active) 3500 Toland Road, Santa Paula, CA 93060	$2,627,200
Bailard Landfill (inactive) 4105 W. Gonzales Road, Oxnard, CA 93030	$943,800
Malibu Bay Club (Wastewater Treatment Plant) 4100 Pacific Coast Highway, Malibu CA 90265	$3,587,976
Total:	***$7,158,976***

25.3 CURRENT TRENDS

From 1970 to 2019, Ventura County's population grew from approximately 370,000 to 846,000, an overall increase of approximately 128 percent. VRSD expanded its solid waste disposal capacity over the years to keep pace with projected needs. In March 2021, VRSD received approval from the Ventura County Board of Supervisors to proceed with the Toland Optimization Plan, which removes the prior mandated 2027 landfill closure date, eliminates the lifetime limit of 15 million tons, and allows for the landfill to be filled to the 1,435-foot elevation approved in 1996. The landfill will be able to keep pace with any population growth.

25.4 CAPABILITY ASSESSMENT

This section describes an assessment of existing capabilities for implementing hazard mitigation strategies. The introduction at the beginning of this volume of the hazard mitigation plan describes the components included in the capability assessment and their significance for hazard mitigation planning.

Findings of the capability assessment were reviewed to identify opportunities to expand, initiate or integrate capabilities to further hazard mitigation goals and objectives. Where such opportunities were identified and determined to be feasible, they are included in the action plan. The "Analysis of Mitigation Actions" table in this annex identifies these as community capacity building mitigation actions. The findings of the assessment are presented as follows:

- Table 25-3 presents an assessment of planning and regulatory capabilities
- Table 25-4 presents an assessment of fiscal capabilities
- Table 25-5 presents an assessment of administrative and technical capabilities
- Table 25-6 presents an assessment of education and outreach capabilities
- Table 25-7 presents classifications under various community mitigation programs
- Table 25-8 Presents the community's adaptive capacity for the impacts of climate change

Table 25-3. Planning and Regulatory Capability

Plan, Study or Program	Date of Most Recent Update
Joint Technical Document	5/21
Stormwater Pollution Prevention Plan	9/20
Spill Prevention Control and Countermeasure Plan	9/20
Hazardous Materials Business Plan	3/21

Table 25-4. Fiscal Capability

Financial Resource	Accessible or Eligible to Use?
Community Development Block Grants	No
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for Specific Purposes	No
User Fees for Water, Sewer, Gas or Electric Service *If yes, specify:* Landfill Disposal Services	Yes
Incur Debt through General Obligation Bonds	No
Incur Debt through Special Tax Bonds	No
Incur Debt through Private Activity Bonds	No
Withhold Public Expenditures in Hazard-Prone Areas	No
State-Sponsored Grant Programs	Yes
Development Impact Fees for Homebuyers or Developers	No

Table 25-5. Administrative and Technical Capability

Staff/Personnel Resource	Available?
Planners or engineers with knowledge of land development and land management practices *If Yes, Department /Position:* Director Of Operations, Senior Engineer	Yes
Engineers or professionals trained in building or infrastructure construction practices	No
Planners or engineers with an understanding of natural hazards *If Yes, Department /Position:* Director of Operations, Senior Engineer	Yes
Staff with training in benefit/cost analysis *If Yes, Department /Position:* Director of Finance	Yes
Surveyors	No
Personnel skilled or trained in GIS applications	No
Scientist familiar with natural hazards in local area	No
Emergency manager *If Yes, Department /Position:* Safety Officer	Yes
Grant writers	No

Table 25-6. Education and Outreach Capability

Criterion	Response
Do you have a public information officer or communications office?	No
Do you have personnel skilled or trained in website development?	No
Do you have hazard mitigation information available on your website?	No
Do you use social media for hazard mitigation education and outreach?	No
Do you have any citizen boards or commissions that address issues related to hazard mitigation?	No
Do you have any other programs in place that could be used to communicate hazard-related information? *If yes, briefly describe: Hazardous Materials Business Plan / Spill Prevention Control and Countermeasure Plan*	Yes
Do you have any established warning systems for hazard events? *If yes, briefly describe: Listed in the Hazardous Materials Business Plan and included in training*	Yes

Table 25-7. Community Classifications

	Participating?	Classification	Date Classified
FIPS Code	No	N/A	N/A
DUNS#	Yes	030382014	N/A
Community Rating System	No	N/A	N/A
Building Code Effectiveness Grading Schedule	No	N/A	N/A
Public Protection	No	N/A	N/A
Storm Ready	No	N/A	N/A
Firewise	No	N/A	N/A
Tsunami Ready	No	N/A	N/A

Table 25-8. Adaptive Capacity for Climate Change

Criterion	Jurisdiction Rating[a]
Technical Capacity	
Jurisdiction-level understanding of potential climate change impacts	High
Comment: Participate in GHG study sponsored by NASA and the California Air Resources Board	
Jurisdiction-level monitoring of climate change impacts	High
Comment: Required to monitor GHG at active and closed landfills	
Technical resources to assess proposed strategies for feasibility and externalities	High
Comment: Work with several landfill gas consultants and state and federal agencies to reduce GHG emissions at our sites	
Jurisdiction-level capacity for development of greenhouse gas emissions inventory	High
Comment: Required to monitor and report GHG generation at active and closed landfills	
Capital planning and land use decisions informed by potential climate impacts	High
Comment: Increase in annual budget in order to upgrade systems to reduce climate impacts	
Participation in regional groups addressing climate risks	High
Comment: Participate in statewide study of GHG sponsored by NASA and the California Air Resources Board	
Implementation Capacity	
Clear authority/mandate to consider climate change impacts during public decision-making processes	High
Comment: We are required by District rule and regulation to reduce impacts to the environment	
Identified strategies for greenhouse gas mitigation efforts	High
Comment: Required to monitor and report GHG generation at active and closed landfills	

Criterion	Jurisdiction Rating[a]
Identified strategies for adaptation to impacts	Medium
Comment: Provide health & safety cooling stations for employees	
Champions for climate action in local government departments	Low
Comment: Our scope of authority is specific as defined by state legislation.	
Political support for implementing climate change adaptation strategies	Low
Comment: Our scope of authority is specific as defined by state legislation.	
Financial resources devoted to climate change adaptation	Low
Comment: Our scope of authority is specific as defined by state legislation.	
Local authority over sectors likely to be negative impacted	Low
Comment: Our scope of authority is specific as defined by state legislation.	
Public Capacity	
Local residents' knowledge of and understanding of climate risk	Low
Comment: Our scope of authority is specific as defined by state legislation.	
Local residents' support of adaptation efforts	Low
Comment: Our scope of authority is specific as defined by state legislation.	
Local residents' capacity to adapt to climate impacts	Low
Comment: Our scope of authority is specific as defined by state legislation.	
Local economy current capacity to adapt to climate impacts	Low
Comment: Our scope of authority is specific as defined by state legislation.	
Local ecosystems capacity to adapt to climate impacts	Low
Comment: Our scope of authority is specific as defined by state legislation.	

a. High = Capacity exists and is in use; Medium = Capacity may exist, but is not used or could use some improvement; Low = Capacity does not exist or could use substantial improvement; Unsure= Not enough information is known to assign a rating.

25.5 INTEGRATION REVIEW

For hazard mitigation planning, "integration" means that hazard mitigation information is used in other relevant planning mechanisms, such as capital facilities planning, and that relevant information from those sources is used in hazard mitigation. This section identifies where such integration is already in place, and where there are opportunities for further integration in the future. Resources listed at the end of this annex were used to provide information on integration. The progress reporting process described in Volume 1 of the hazard mitigation plan will document the progress of hazard mitigation actions related to integration and identify new opportunities for integration.

25.5.1 Existing Integration

Some level of integration has already been established between local hazard mitigation planning and the following other local plans and programs:

- Joint Technical Document—Planning and control document for landfill operations and maintenance
- Stormwater Pollution Prevention plan—This program is how stormwater and run off are handled at the landfill
- Spill Prevention Control and Countermeasure Plan

- Hazzard Materials Business Plan—this plan defines and establishes location of all hazard materials at VRSD facilities

25.5.2 Opportunities for Future Integration

The capability assessment in this annex indicates opportunities to integrate this mitigation plan with other jurisdictional planning/regulatory capabilities. Capabilities were identified as integration opportunities if they can support or enhance the actions identified in this plan or be supported or enhanced by components of this plan. The capability assessment identified the following plans and programs that do not currently integrate hazard mitigation information but provide opportunities to do so in the future:

- **Capital Improvement Projects**—Capital improvement project proposals may take into consideration hazard mitigation potential as a means of evaluating project prioritization.
- **Post-Disaster Recovery Plan**—The District does not have a recovery plan and intends to develop one as a mitigation planning action during the next five years. The plan will build on the mitigation goals and objectives identified in the mitigation plan.

Taking action to integrate each of these programs with the hazard mitigation plan was considered as a mitigation action to include in the action plan in this annex.

25.6 RISK ASSESSMENT

25.6.1 Jurisdiction-Specific Natural Hazard Event History

Table 25-9 lists past occurrences of natural hazards for which specific damage was recorded in this jurisdiction Other hazard events that broadly affected the entire planning area, including this jurisdiction, are listed in the risk assessments in Volume 1 of this hazard mitigation plan.

Table 25-9. Past Natural Hazard Events

Type of Event	FEMA Disaster #	Date	Damage Assessment
Covid- 19	DR-4482	1/20/21	$116,525
Easy Fire	FM-5298	10/30/2019	$2,196,235
Thomas Fire	FM-5224	December 4, 2017	$1,732,810

25.6.2 Hazard Risk Ranking

Table 25-10 presents a local ranking of all hazards of concern for which this hazard mitigation plan provides complete risk assessments. As described in detail in Volume 1, the ranking process involves an assessment of the likelihood of occurrence for each hazard, along with its potential impacts on people, property, and district operations. Mitigation actions primarily target hazards with high and medium rankings.

Table 25-10. Hazard Risk Ranking

Rank	Hazard	Risk Ranking Score	Risk Category
1	Wildfire	36	High
2	Landslide	33	High
3	Earthquake	32	Medium
4	Severe Storm	24	Medium
4	Severe Weather	24	Medium
6	Dam Failure	24	Medium
7	Flooding	18	Medium
8	Sea Level Rise	12	Medium
9	Tsunami	10	Low
10	Drought	9	Low

25.6.3 Jurisdiction-Specific Vulnerabilities

Volume 1 of this hazard mitigation plan provides complete risk assessments for each identified hazard of concern. The following jurisdiction-specific issues have been identified based on a review of the results of the risk assessment, public involvement strategy, and other available resources:

- Underground Fires.
- Wind Storms—often halts operations and spreads debris which requires additional labor to clean-up

Mitigation actions addressing these issues were prioritized for consideration in the action plan in this annex.

25.7 HAZARD MITIGATION ACTION PLAN

Table 25-11 lists the actions that make up the hazard mitigation action plan for this jurisdiction. Table 25-12 identifies the priority for each action. Table 25-13 summarizes the mitigation actions by hazard of concern and mitigation type.

Table 25-11. Hazard Mitigation Action Plan Matrix

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action VRS-1—Where appropriate, support retrofitting, purchase or relocation of structures located in hazard areas, prioritizing those that have experienced repetitive losses and/or are located in high- or medium-risk hazard areas.						
Hazards Mitigated:	Earthquake, Flooding, Landslide, Severe Weather, Wildfire, Severe Storms, Dam Failure					
Existing	2, 6, 9, 11	VRSD		High	Grant Funding- FEMA HMA (BRIC, FMA, HMGP)	Short-term
Action VRS-2—Actively participate in the plan maintenance protocols outlined in Volume 1 of this hazard mitigation plan.						
Hazards Mitigated:	Earthquake, Flooding, Landslide, Severe Weather, Tsunami, Wildfire, Severe Storms, Dam Failure, Drought, Sea Level Rise					
New & Existing	1, 4, 6, 8, 19	VRSD		Low	Staff Time, General Funds	Short-term

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action VRS-3—Purchase generators for critical facilities and infrastructure that lack adequate backup power, including Landfill gas extraction and Flares						
Hazards Mitigated: Earthquake, Flooding, Landslide, Severe Weather, Tsunami, Wildfire, Severe Storms, Dam Failure						
Existing	2, 6, 7	VRSD		Medium	Staff Time, Grant Funding- FEMA HMA (BRIC, HMGP)	Long-term
Action VRS-4—Develop a post disaster action plan that includes grant funding, debris removal components, and warehousing of critical infrastructure components						
Hazards Mitigated: Earthquake, Flooding, Landslide, Severe Weather, Tsunami, Wildfire, Severe Storms, Dam Failure						
Existing/Future	2, 8, 19	VRSD		Medium	Staff Time, General Funds, Grant Funding- FEMA HMA (BRIC, FMA, HMGP)	Long-Term
Action VRS-5—Create/implement wildfire preparedness plan with emphasis on defensible space and access issues						
Hazards Mitigated: Wildfire						
Existing	5, 11, 14, 17, 19	VRSD		Medium	Staff Time, General Funds, Grant Funding- FEMA HMA (BRIC, FMAP and HMGP)	Short-term
Action VRS-6—Slope stabilization and drainage control features around water reservoirs						
Hazards Mitigated: Earthquake, Flooding, Landslide, Severe Weather, Wildfire, Severe Storms, Dam Failure						
Existing	5, 9, 11, 14	VRSD		High	Staff Time, General Funds, Grant Funding- FEMA HMA (BRIC, FMA, HMGP)	Ongoing

a. Short-term = Completion within 5 years; Long-term = Completion within 10 years; Ongoing= Continuing new or existing program with no completion date

Acronyms used here are defined at the beginning of this volume.

Table 25-12. Mitigation Action Priority

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Cost?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Implementation Priority[a]	Grant Pursuit Priority[a]
1	4	High	High	Yes	Yes	No	Medium	High
2	5	Medium	Low	Yes	No	No	High	Low
3	3	High	Medium	Yes	Yes	No	Medium	High
4	3	Medium	Medium	Yes	Yes	No	Medium	Medium
5	5	Medium	Medium	Yes	Yes	Yes	Medium	Medium
6	4	High	High	Yes	Yes	Yes	Medium	High

a. See the introduction to this volume for explanation of priorities.

Table 25-13. Analysis of Mitigation Actions

Hazard Type	Action Addressing Hazard, by Mitigation Type[a]							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilient	Community Capacity Building
High-Risk Hazards								
Wildfire		VRS-1, 5		VRS-5, 6	VRS-2, 5, 6	VRS-6	VRS-5	VRS-2, 4
Landslide		VRS-1		VRS-6	VRS-2, 6	VRS-6		VRS-2, 4
Medium-Risk Hazards								
Earthquake		VRS-1		VRS-6	VRS-2	VRS-6		VRS-2, 4
Severe Storm		VRS-1		VRS-6	VRS-2	VRS-6		VRS-2, 4
Severe Weather		VRS-1		VRS-	VRS-2	VRS-6		VRS-2, 4
Dam Failure		VRS-1		VRS-6	VRS-2	VRS-6		VRS-2, 4
Flooding		VRS-1		VRS-6	VRS-2	VRS-6		VRS-2, 4
Sea Level Rise		VRS-1						VRS-2
Low-Risk Hazards								
Tsunami		VRS-1			VRS-2			VRS-2, 4
Drought		VRS-1						VRS-2

a. See the introduction to this volume for explanation of mitigation types.

25.8 INFORMATION SOURCES USED FOR THIS ANNEX

The following technical reports, plans, and regulatory mechanisms were reviewed to provide information for this annex.

- **Joint Technical Document**—Used to inform the capability assessment.
- **Title V Reports**—Used to inform the capability assessment.
- **Stormwater Pollution Prevention Plan**—Used to inform the capability assessment.

The following outside resources and references were reviewed:

- **Hazard Mitigation Plan Annex Development Toolkit**—The toolkit was used to support the identification of past hazard events and noted vulnerabilities, the risk ranking, and the development of the mitigation action plan.

Appendix A. Planning Partner Expectations

A. PLANNING PARTNER EXPECTATIONS

The federal Disaster Mitigation Act (DMA) of 2000 (Public Law 106-390), commonly known as the 2000 Stafford Act amendments, was approved by Congress on October 10, 2000. This act required state and local governments to develop hazard mitigation plans as a condition for federal grant assistance. Among other things, this legislation reinforces the importance of pre-disaster infrastructure mitigation planning to reduce disaster losses nationwide. DMA 2000 is aimed primarily at the control and streamlining of the administration of federal disaster relief and programs to promote mitigation activities. Prior to 2000, federal legislation provided funding for disaster relief, recovery, and some hazard mitigation planning. The DMA improves upon the planning process by emphasizing the importance of communities planning for disasters before they occur.

The Disaster Mitigation Act defines a "local government" as:

> Any county, municipality, city, town, public authority, school district, special district, intrastate district, council of governments (regardless of whether the council of governments is incorporated as a nonprofit corporation under State law), regional or interstate government entity, or agency or instrumentality of a local government; any Indian tribe or authorized tribal organization, or Alaska Native village or organization; and any rural community, unincorporated town or village, or other public entity

Any local government wishing to pursue funding afforded under FEMA Hazard Mitigation Grant Programs must have an approved hazard mitigation plan in order to be eligible to apply for these funds.

One of the goals of the multi-jurisdictional approach to hazard mitigation planning is to achieve compliance with the Disaster Mitigation Act (DMA) for all participating members in the planning effort. DMA compliance must be certified for each member in order to maintain eligibility for the benefits under the DMA. Whether the planning process generates ten individual plans or one large plan that has a chapter for each partner jurisdiction, the following items must be addressed by each planning partner to achieve DMA compliance:

- **Participate in the Process.** It must be documented in the plan that each planning partner "participated" in the process that generated the plan. Participation can vary based on the type of planning partner (i.e.: City vs. a Special-Purpose District). However, the level of participation must be defined and the extent for which this level of participation has been met for each partner must be contained in the plan context.
- **Consistency Review.** Review of existing documents pertinent to each jurisdiction to identify policies or recommendations that are not consistent with those documents reviewed in producing the "parent" plan or have policies and recommendations that complement the hazard mitigation initiatives selected (i.e.: comp plans, basin plans or hazard-specific plans).

- **Action Review.** For plan updates, a review of the strategies from your prior action plan to determine those that have been accomplished and how they were accomplished; and why those that have not been accomplished were not completed.
- **Update Localized Risk Assessment.** Personalize the Risk Assessment for each jurisdiction by removing any hazards not associated with the defined jurisdictional area (e.g. tsunami and coastal erosion hazards for inland jurisdictions) or redefining vulnerability based on a hazard's impact to a jurisdiction. This phase will include:
  - A ranking of the risk
  - A description of the number and type of structures at risk
  - An estimate of the potential dollar losses to vulnerable structures
  - A general description of land uses and development trends within the community, so that mitigation options can be considered in future land use decisions.
- **Capability Assessment.** Each planning partner must identify and review their individual regulatory, technical, and financial capabilities with regards to the implementation of hazard mitigation actions.
- **Prioritize Mitigation Recommendations.** Identify and prioritize mitigation recommendations specific to each jurisdiction's defined area.
- **Create an Action Plan.**
- **Incorporate Public Participation.** Each jurisdiction must present the Plan to the public for comment at least once, within two weeks prior to adoption.
- **Plan Adoption.** The updated plan must be adopted by each jurisdiction following FEMA approval.

One of the benefits to multi-jurisdictional planning is the ability to pool resources. This means more than monetary resources. Resources such as staff time, meeting locations, media resources, technical expertise will all need to be utilized to generate a successful plan. In addition, these resources can be pooled such that decisions can be made by a peer group applying to the whole and thus reducing the individual level of effort of each planning partner. This will be accomplished by the formation of a steering committee made up of planning partners and other "stakeholders" within the planning area. The size and makeup of this steering committee will be determined by the planning partnership. This body will assume the decision-making responsibilities on behalf of the entire partnership. This will streamline the planning process by reducing the number of meetings that will need to be attended by each planning partner. The assembled Steering Committee for this effort will meet monthly on an as needed basis as determined by the planning team, and will provide guidance and decision making during all phases of the plan's development.

With the above participation requirements in mind, each partner is expected to aid this process by being prepared to develop its section of the plan. To be an eligible planning partner in this effort, each planning partner shall provide the following:

A. *If you haven't already submitted* a "Letter of Intent (LOI) to participate" or Resolution to participate (see Exhibit A); you must submit an LOI.

B. Designate a lead and alternate points of contact for this effort. The lead will be listed as the hazard mitigation point of contact for your jurisdiction in the plan.

C. If requested, provide support in the form of a mailing list and public information materials, such as newsletters, newspapers, or direct mailed brochures, required to implement the public engagement strategy developed by the Steering Committee.

D. Participate in the entire process (from first partner meeting to plan completion). There will be many ways as this plan evolves to participate. Opportunities such as:
   a. Attending online Steering Committee meetings
   b. Attending online public meetings
   c. Completing the phased Jurisdiction Annex Process
   d. Participating in public review and comment periods prior to adoption

   At each of these meetings, attendance will be recorded. Attendance records will be used to document participation for each planning partner. No thresholds will be established as minimum levels of participation. However, each planning partner should attempt to attend all possible meetings and events.

E. Designate a Local Planning Team. Each planning partner will be asked to identify a lead point of contact and an alternate point of contact for their jurisdiction as well as other resources within that jurisdiction that can support or enhance the mitigation actions from this plan. For municipal planning partners, participants should include, at a minimum, representation from Planning, Public Works and Emergency Management. For Special Purpose Districts, participants should include anyone responsible for facilities management and/or emergency management. All phases of the Jurisdictional Annex process should be conducted through these local planning teams.

F. Complete all 3 phases of the Jurisdictional Annex process. Volume 2 of the plan consists of jurisdictional specific components of the plan required under section 2016, 44CFR for multi-jurisdictional local hazard mitigation plans. It is mission-critical to the ultimate approval of this plan update that these annexes are created or updated in accordance with the requirements. To achieve this compliance, the Core Planning Team (CPT) will deploy the Jurisdictional Annex process in the following 3 phases over the course of this plan update process:

   - Phase 1 - Jurisdiction Profiles and Prior Action Review
   - Phase 2 - Core Capability Assessment
   - Phase 3 - Risk Ranking and Action Plan Development

   Complete and thorough technical assistance will be available to all planning partners during this phased process. Phase 1 will be deployed in May 2021 with specified deadlines, and the response to each phase by the Planning Partnership will be aggregated by the CPT.

   Failure to meet deadlines specified for Phases 1 and 2 will not jeopardize and planning partner's eligibility for coverage under the plan. However, it is important to note that, if a planning partner does not meet the deadline for Phase 1, it is expected that the information submitted during Phase 2 will include all of the information requested under Phases 1 and 2. The ultimate deadline for this phased process will be the deadline for Phase 3.

   Failure to submit a complete Jurisdictional Annex by the specified deadline for Phase 3 will result in a planning partner's removal from the Partnership for failure to meet the specified planning partner expectations.

   Phase 3 will include a mandatory workshop that will focus on action plan development and prioritization. Attendance at the Phase 3 workshop will be tracked, and each planning partner must send at least one representative to the workshop to fully meet the participation requirements defined for this plan update process.

At a minimum, two workshops will be conducted - one for municipal planning partners and one for special district planning partners to provide guidance on action plan development specific to the differing capabilities between these two planning partner types.

G. Each partner will be asked to perform a “consistency review” of all technical studies, plans, ordinances specific to hazards to determine the existence of any not consistent with the same such documents reviewed in the preparation of the County (parent) Plan. For example, if your community has a floodplain management plan that makes recommendations that are not consistent with any of the County’s Basin Plans, that plan will need to be reviewed for probable incorporation into the plan for your area.

H. Each partner will be asked to review the Risk Assessment and identify hazards and vulnerabilities specific to its jurisdiction. Contract resources will provide the jurisdiction-specific mapping and technical consultation to aid in this task, but the determination of risk and vulnerability will be up to each partner.

I. Each partner will be asked to review and determine if the mitigation recommendations chosen in the parent plan will meet the needs of its jurisdiction. Projects within each jurisdiction consistent with the parent plan recommendations will need to be identified, prioritized, and reviewed to determine their benefits vs. costs.

J. Each partner will be required to create its own action plan that identifies each project, who will oversee the task, how it will be financed, and when it is estimated to occur.

K. Each partner will be required to formally adopt the plan.

Templates and instructions to aid in the compilation of this information will be provided to all committed planning partners. Each partner will be asked to complete their templates in a timely manner and according to the timeline specified.

NOTE: Once this plan is completed, and DMA compliance has been determined for each partner, maintaining that eligibility will be dependent upon each partner implementing the plan implementation-maintenance protocol identified in the plan.

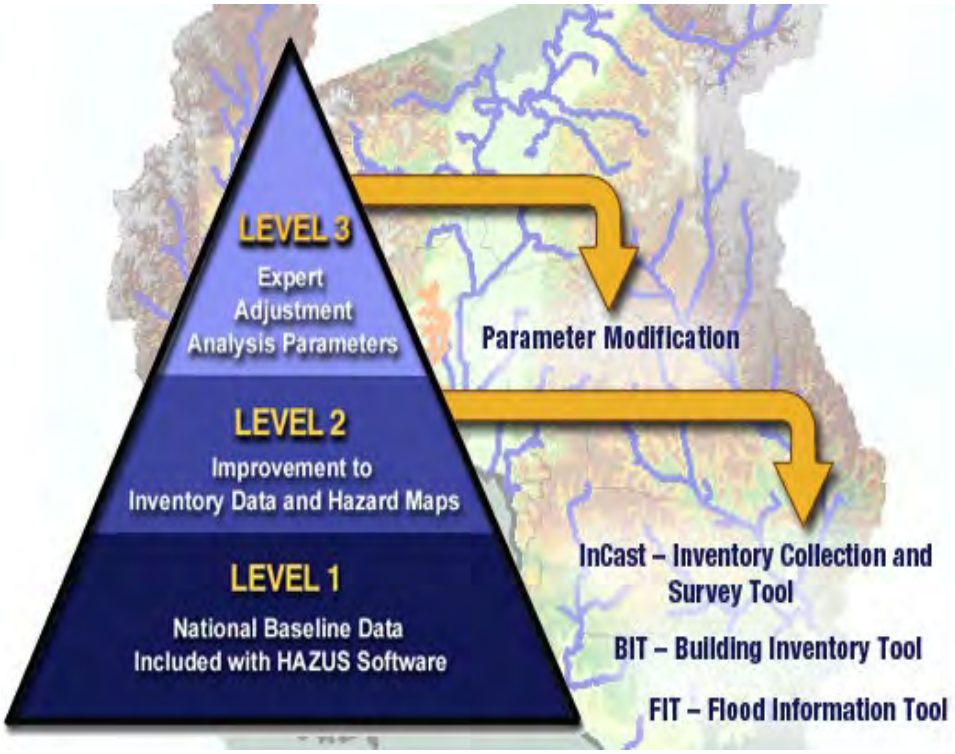
Exhibit A
Planning Team Contact information

Name	Representing	Address	e-mail
Bonnie Luke	Ventura County Sheriff's Office of Emergency Services	800 South Victoria Avenue Ventura, CA 93009	BonnieK.Luke@ventura.org
Kathy Gibson	Ventura County Sheriff's Office of Emergency Services	800 South Victoria Avenue Ventura, CA 93009	kathy.gibson@ventura.org
Patrick Maynard	Ventura County Sheriff's Office of Emergency Services	800 South Victoria Avenue Ventura, CA 93009	patrick.maynard@ventura.org
Glenn Shephard	Ventura County Public Works Agency Watershed Protection	800 South Victoria Avenue Ventura, CA 93009	glenn.shephard@ventura.org
Gerard Kapuscik	Ventura County Public Works Agency Watershed Protection	800 South Victoria Avenue Ventura, CA 93009	gerard.kapuscik@ventura.org
Ruth Venus	Ventura County Information Technology Services	1957 Eastman Avenue Ventura, CA 93003	Ruth.Venus@ventura.org
Cole McLaughlin	Ventura County Information Technology Services	1957 Eastman Avenue Ventura, CA 93003	cole.mclaughlin@ventura.org
Richard Paschal	Ventura County Information Technology Services	1957 Eastman Avenue Ventura, CA 93003	Richard.Paschal@ventura.org
Ashley Bautista	Ventura County CEO	800 South Victoria Avenue Ventura, CA 93009	ashley.bautista@ventura.org
Jackie Nuñez	Ventura County CEO	800 South Victoria Avenue Ventura, CA 93009	jackie.nunez@ventura.org
Rob Flaner	Tetra Tech, Inc.	90 S. Blackwood Ave Eagle, ID 83616	rob.flaner@tetratech.com
Megan Brotherton	Tetra Tech, Inc.	737 Bishop Street, Suite 2340 Honolulu, HI 96813	megan.brotherton@tetratech.com
Carol Bauman	Tetra Tech, Inc.		carol.bauman@tetratech.com

Exhibit C.
Overview of Hazus

Overview of Hazus (Multi-Hazard)

Hazus, is a nationally applicable standardized methodology and software program that contains models for estimating potential losses from earthquakes, floods, tsunamis, and hurricane winds. Hazus was developed by the Federal Emergency Management Agency (FEMA) under contract with the National Institute of Building Sciences (NIBS). NIBS maintains committees of wind, flood, earthquake and software experts to provide technical oversight and guidance to Hazus development. Loss estimates produced by Hazus are based on current scientific and engineering knowledge of the effects of hurricane winds, floods, and earthquakes. Estimating losses is essential to decision-making at all levels of government, providing a basis for developing mitigation plans and policies, emergency preparedness, and response and recovery planning.



Hazus uses state-of-the-art geographic information system (GIS) software to map and display hazard data and the results of damage and economic loss estimates for buildings and infrastructure. It also allows users to estimate the impacts of hurricane winds, floods, tsunamis, and earthquakes on populations. The latest release, Hazus 4.0, is an updated version of Hazus that incorporates many new features which improve both the speed and functionality of the models. For information on software and hardware requirements to run Hazus 4.0, see Hazus Hardware and Software Requirements.

Hazus Analysis Levels

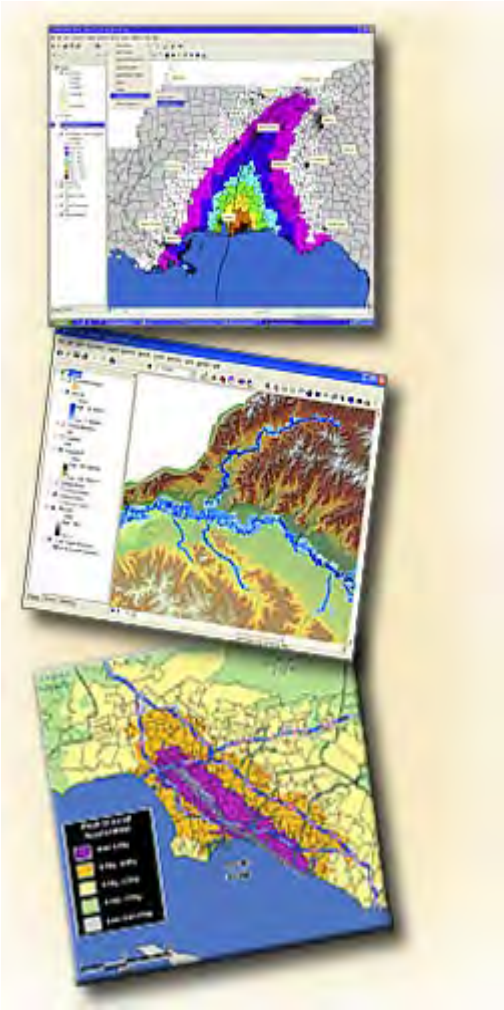
Hazus provides for three levels of analysis:

- A Level 1 analysis yields a rough estimate based on the nationwide database and is a great way to begin the risk assessment process and prioritize high-risk communities.

- A Level 2 analysis requires the input of additional or refined data and hazard maps that will produce more accurate risk and loss estimates. Assistance from local emergency management personnel, city planners, GIS professionals, and others may be necessary for this level of analysis.
- A Level 3 analysis yields the most accurate estimate of loss and typically requires the involvement of technical experts such as structural and geotechnical engineers who can modify loss parameters based on to the specific conditions of a community. This level analysis will allow users to supply their own techniques to study special conditions such as dam breaks and tsunamis. Engineering and other expertise is needed at this level.

Three data input tools have been developed to support data collection. The Comprehensive Data Management System helps users collect and manage local building data for more refined analyses than are possible with the national level data sets that come with Hazus. The system has expanded capabilities for multi-hazard data collection. Hazus includes an enhanced Building Inventory Tool allows users to import building data and is most useful when handling large datasets, such as tax assessor records. The Flood Information Tool helps users manipulate flood data into the format required by the Hazus flood model. All Three tools are included in the Hazus MR1 Application DVD.

Hazus Models



The Hazus Hurricane Wind Model gives users in the Atlantic and Gulf Coast regions and Hawaii the ability to estimate potential damage and loss to residential, commercial, and industrial buildings. It also allows users to estimate direct economic loss, post-storm shelter needs and building debris. In the future, the model will include the capability to estimate wind effects in island territories, storm surge, indirect economic losses, casualties, and impacts to utility and transportation lifelines and agriculture. Loss models for other severe wind hazards will be included in the future. Details about the Hurricane Wind Model.

The Hazus Flood Model is capable of assessing riverine and coastal flooding. It estimates potential damage to all classes of buildings, essential facilities, transportation and utility lifelines, vehicles, and agricultural crops. The model addresses building debris generation and shelter requirements. Direct losses are estimated based on physical damage to structures, contents, and building interiors. The effects of flood warning are taken into account, as are flow velocity effects. Details about the Flood Model.

The Hazus Earthquake Model, The Hazus earthquake model provides loss estimates of damage and loss to buildings, essential facilities, transportation and utility lifelines, and population based on scenario or probabilistic earthquakes. The model addresses debris generation, fire-following, casualties, and shelter requirements. Direct losses are estimated based on physical damage to structures, contents, inventory, and building interiors. The earthquake model also includes the Advanced

Engineering Building Module for single- and group-building mitigation analysis. Details about the Earthquake Model.

The Hazus Tsunami Model represents the first new disaster module for the Hazus software in almost 15 years and is the culmination of work completed on the Hazus Tsunami Methodology Development (FEMA, 2013) by a team of tsunami experts, engineers, modelers, emergency planners, economists, social scientists, geographic information system (GIS) analysts, and software developers. A Tsunami Oversight Committee provided technical direction and review of the methodology development. New features with the model include:

- Territory Analysis: This release represents the first time that analysis will be available for U.S. territories (Guam, American Samoa, Commonwealth of Northern Mariana Islands and U.S. Virgin Islands).
- New Point Format: The Hazus General Building Stock for the Tsunami release will use a new National Structure Inventory point format (details in User Release Notes available with download).
- Case Studies: The Tsunami Module will require user-provided data, so the Hazus Team has provided five case study datasets for users, which will be available on the MSC download site.
- Two Types of Damage Analysis: Users will be able to run both near-source (Earthquake + Tsunami) and distant-source (Tsunami only) damage analysis.

Additionally, Hazus can perform multi-hazard analysis by providing access to the average annualized loss and probabilistic results from the hurricane wind, flood, and earthquake models and combining them to provide integrated multi-hazard reports and graphs. Hazus also contains a third-party model integration capability that provides access and operational capability to a wide range of natural, man-made, and technological hazard models (nuclear and conventional blast, radiological, chemical, and biological) that will supplement the natural hazard loss estimation capability (hurricane wind, flood, tsunami and earthquake) in Hazus.

Appendix B. Annex Instructions and Templates

Appendix B.1
Instructions and Templates for
Municipality Annexes

INSTRUCTIONS FOR COMPLETING CITY/COUNTY ANNEX TEMPLATE

Jurisdictional annex templates for the *2022 Ventura County Multi-Jurisdictional Hazard Mitigation Plan* update will be completed in three phases. **This document provides instructions for completing all phases of the template for cities and counties.**

The target timeline for completion is as follows:

- **Phase 1**—Team, Profile, Trends, and Previous Plan Status
  - **Deploy:** May 10, 2021
  - **Due:** June 21, 2021 by close of business
- **Phase 2**—Capability Assessment, Integration Review, and Information Sources
  - **Deploy:** July 6, 2021
  - **Due:** August 20, 2021 by close of business
- **Phase 3**—Risk Assessment, Action Plan, Information Sources, Future Needs, and Additional Comments
  - **Deploy:** September 9, 2021
  - **Mandatory Phase 3 Workshop**: September 22, 2021
  - **Due**: October 25, 2021 by close of business, Pacific Time. **No due date extensions!**

Please direct any questions and return your completed Phase 3 template in electronic format to:

Megan Brotherton
Tetra Tech
Phone: (808) 339-9119
E-mail: *megan.brotherton@tetratech.com*

A Note About Formatting

The template for the annex is a Microsoft Word document in a format that will be used in the final plan. Partners are asked to use this template so that a uniform product will be completed for each partner.

Content should be entered directly into the template rather than creating text in another document and pasting it into the template. Text from another source may alter the formatting of the document.

The section and table numbering in the document will be updated when completed annexes are combined into the final document. Please do not adjust any of the numbering.

For planning partners who participated in the 2015 planning effort, relevant information has been brought over to the 2022 template. Fields that require attention have been highlighted using the following color coding:

- **Yellow:** Text has been brought over from 2015 Plan and should be reviewed and updated as needed.
- **Pink:** This is a new field that will require information that was not included in 2015.

Un-highlight each field that you update so that reviewers will know an edit has been made.

New planning partners will need to complete the template in its entirety.

PHASE 1 INSTRUCTIONS

CHAPTER TITLE

In the chapter title at the top of Page 1, type in the complete official name of your municipality (e.g., City of Pleasantville, West County). Do not change the chapter number. Revise only the jurisdiction name. If your jurisdiction's name has already been entered, verify that wording and spelling are correct; revise as needed.

LOCAL HAZARD MITIGATION PLANNING TEAM

Points of Contact

Provide the name, title, mailing address, telephone number, and e-mail address for the primary point of contact for your jurisdiction. This should be the person responsible for monitoring, evaluating and updating the annex for your jurisdiction. This person should also be the principle liaison between your jurisdiction and the Steering Committee overseeing development of this plan.

In addition, designate an alternate point of contact. This would be a person to contact should the primary point of contact be unavailable or no longer employed by the jurisdiction.

Note: Both of these contacts should match the contacts that were designated in your jurisdiction's letter of intent to participate in this planning process. If you have changed the primary or secondary contact, let the planning team know by inserting a comment into the document.

Participating Planning Team

Populate Table 1-1 with the names of staff from your jurisdiction who participated in preparing this annex or otherwise contributed to the planning process for this hazard mitigation plan.

Who Should Be on the Local Mitigation Planning Team

The Local Hazard Mitigation Planning Team is responsible for developing your jurisdiction's annex to the hazard mitigation plan. Team membership should represent agencies with authority to regulate development and enforce local ordinances or regulatory standards, such as building/fire code enforcement, emergency management, emergency services, floodplain management, parks and recreation, planning/ community development, public information, public works/ engineering, stormwater management, transportation, or infrastructure.

JURISDICTION PROFILE

Provide information specific to your jurisdiction as indicated, in a style similar to the examples provided below. This should be information that will not be provided in the overall mitigation plan document.

Location and Features

Describe the community's location, size and prominent features, in a statement similar to the example below:

> **EXAMPLE:** The City of Jones is in the northwest portion of Smith County, along the Pacific Coast in northern California. It is almost 150 miles northeast of San Francisco. The city's total area is 4.2 square miles, with boundaries generally extending north-south from State Highway 111 to the

Johnson River and east-west from Coast Road to East Frank Avenue. The City of Allen is to the north, unincorporated county is to the west, the City of Bethany is to the south, and the Pacific Ocean is to the west.

Jones is home to the University of Arbor, Bickerson Manufacturing, and the western portion of Soosoo National Park. Significant geographic features include the Watery River, which flows southwest across the city, Lake Splash in the city's northwest corner, and the foothills of the Craggy Mountains on the east side.

History

Describe the community's history, focusing on economy and development, and note its year of incorporation, in a statement similar to the example below:

EXAMPLE: The City of Jones was incorporated in 1858. The area was settled during the gold rush in the 1850s as a supply center for miners. As the gold rush died down, timber and fishing became the area's major economic resources. By 1913, the Jones Teachers College, a predecessor to today's University of Arbor, was founded. Recently, the presence of the college has come to shape Jones' population into a young and educated demographic. In 1981 the City developed the Jones Marsh and Wildlife Sanctuary, an environmentally friendly sewage treatment enhancement system.

With numerous annexations since its original incorporation, the city's area has almost doubled. Today it features a commercial core in the center of the city, with mostly residential areas to the north and south, the university to the west and the national park on the east.

Governing Body Format

Describe the community's key governance elements and staffing, in a statement similar to the example below:

EXAMPLE: The City of Jones is governed by a five-member city council. The City consists of six departments: Finance, Environmental Services, Community Development, Public Works, Police, and the City Manager's Office. The City has 13 commissions and task forces, which report to the City Council. The City currently employs a total of 155 employees (full-time equivalent).

The City Council assumes responsibility for the adoption of this plan; the City Manager will oversee its implementation.

CURRENT TRENDS

Population

Provide the most current population estimate for your jurisdiction based on an official means of tracking (e.g., the U.S. Census or state agency that develops population estimates). Describe the current estimate and recent population trends in a statement similar to the example below.

EXAMPLE: According to California Department of Finance, the population of Jones as of July 2020 was 17,280. Since 2010, the population has grown at an average annual rate of 1.2 percent, though that rate is declining, with an annual average of only 0.8 percent since 2015.

Development

In the highlighted text that says "Describe trends in general," provide a brief description of your jurisdiction's recent development trends in a statement similar to the example below:

> **EXAMPLE:** Anticipated future development for Jones is low to moderate, consisting primarily of residential growth. Recent development has been mostly infill. There has been a focus on affordable housing and a push for more secondary mother-in-law units. Future growth in the City will be managed as identified in the City's 2018 general plan. City actions, such as those relating to land use, annexations, zoning, subdivision and design review, redevelopment, and capital improvements, must be consistent with the plan.

Complete the table titled "Recent and Expected Future Development Trends." Note:

- The portion of the table requesting the number of permits by year is specifically looking for development permits for **new** construction. If your jurisdiction does not have the ability to differentiate between permit types, list the total number of permits and indicate "N/A" (not applicable) for the permit sub-types.
- If your jurisdiction does not have the ability to track permits by hazard area, delete the bullet list of hazard areas and insert a qualitative description of where development has occurred.

STATUS OF PREVIOUS PLAN ACTIONS

Note that this section only applies to jurisdictions that are conducting updates to previously approved hazard mitigation plans. If your jurisdiction has not previously participated in an approved plan, enter an "X" in the box at the beginning of this section and do not complete the section. We will remove this section from your final annex.

Also note that this section is further back in the annex than the rest of the Phase 1 content. Some Phase 2 sections are included before it.

All action items identified in prior mitigation plans must be reconciled in this update. Action items must all be marked as **ONE** of the following; check the appropriate box (place an X) and provide information as follows:

- **Completed**—If an action has been completed since the prior plan was prepared, check the "Completed" box and **provide a date of completion in the comment section**. If an action has been initiated and is an ongoing program (e.g. annual outreach event), you may mark it as completed and **note that it is ongoing in the comments**. If an action addresses an ongoing program you would like to continue to include in your action plan, see the "Carried Over to Plan Update" bullet below.
- **Removed**—If action items are to be removed because they are no longer feasible, a reason must be given. Lack of funding does not mean that it is no longer feasible, unless the sole source of funding for an action is no longer available. **Place a comment in the comment section explaining why the action is no longer feasible or barriers that prevented the action from being implemented (e.g., "Action no longer considered feasible due to lack of political support.").** If the wording and/or intent of a previously identified action is unclear, this can be a reason for removal. A change in community priorities may also be a reason for removal and should be discussed in the comments.
- **Carried Over to Plan Update**—If an action is in progress, is ongoing, or has not been initiated and you would like to carry it over to the plan update, check the "Check if Yes" column under "Carried Over to Plan Update." Selecting this option indicates that the action will be included in the mitigation action

plan for this update. If you are carrying over an action to the update, **include a comment describing any action that has been taken or why the action was not taken** (specifically, any barriers or obstacles that prevented the action from moving forward or slowed progress). Leave the last column, "Action # in Update," blank at this point. This will be filled in after completing the updated action plan in Phase 3.

Ensure that you have provided **a status and a comment for each action.**

HAZARD MITIGATION ACTION PLAN INPUT

When preparing the hazard mitigation action plan in Phase 3, all action items from your jurisdiction's previous hazard mitigation plan that are marked as "Carried Over to Plan Update" will need to be included in the action plan.

THIS COMPLETES PHASE 1

PHASE 2 INSTRUCTIONS

CAPABILITY ASSESSMENT

Note that it is unlikely that one person will be able to complete all sections of the capability assessment alone. The primary preparer will likely need to reach out to other departments within the local government for information. It may be beneficial to provide these individuals with background information about this planning process, as input from them will be needed again during Phase 3 of the annex development.

Planning and Regulatory Capability

In the table titled "Planning and Regulatory Capability," indicate "Yes" or "No" for each listed code, ordinance, requirement or planning document in each of the following columns:

- Local Authority—Enter "Yes" if your jurisdiction has prepared or adopted the identified item; otherwise, enter "No." If yes, then enter the code, ordinance number, or plan name and its date of adoption in the comments column. ***Note: If you enter yes, be sure to provide a comment with the appropriate code, ordinance or plan and date of adoption.***
- Other Jurisdiction Authority—Enter "Yes" if another agency (e.g., a state agency or special purpose district) enforces or administers the identified item in a way that may impact your jurisdiction or if any state or federal regulations or laws would prohibit local implementation of the identified item; otherwise, enter "No." ***Note: If you enter yes, be sure to provide a comment indicating the other agency and its relevant authority.***
- State Mandated—Enter "Yes" if state laws or other requirements enable or require the listed item to be implemented at the local level; otherwise, enter "No." ***Note: If you enter yes, be sure to provide a comment describing the relevant state mandate.***
- Integration Opportunity—Enter "Yes" if there are obvious ways that the code, ordinance or plan can be coordinated with the hazard mitigation plan. Consider the following:
  - If you answered "Yes" in the Local Authority column for this item, then enter "Yes" for integration opportunity if any of the following are true:
    - The item already addresses hazards and their impacts and should be updated to reflect new information about risk from this hazard mitigation plan
    - The item does not address hazards and their impacts but is due for an update in the next 5 years and could be updated in a way that does address hazards and impacts
    - The item identifies projects for implementation and these could be reviewed to determine if they can be modified to help address hazard mitigation goals
    - The item identifies projects for implementation and some of these should be considered for inclusion in the hazard mitigation action plan for your jurisdiction
  - If you answered "No" in the Local Authority column for this item, then enter "Yes" for integration opportunity if your jurisdiction will develop the item over the next 5 years

    Note: Each capability with a "Yes" answer to Integration Opportunity will be discussed in more detail later in the annex. You may wish to keep notes when assessing the Integration Opportunity or review the "Integration with Other Planning Initiatives" section below.
- Comments—Enter the code number and adoption date for any local code indicated as being in place; provide other comments as appropriate to describe capabilities for each entry. DO NOT OVERLOOK THIS STEP

For the categories "General Plan" and "Capital Improvement Plan," answer the specific questions shown, in addition to completing the four columns indicating level of capability.

Development and Permit Capability

Complete the table titled "Development and Permitting Capabilities."

Fiscal Capability

Complete the table titled "Fiscal Capability" by indicating whether each of the listed financial resources is accessible to your jurisdiction. Enter "Yes" if the resource is fully accessible to your jurisdiction. Enter "No" if there are limitations or prerequisites that may hinder your use of this resource.

Administrative and Technical Capability

Complete the table titled "Administrative and Technical Capability" by indicating whether your jurisdiction has access to each of the listed personnel resources. Enter "Yes" or "No" in the column labeled "Available?". If yes, then enter the department and position title. If you have contract support with these capabilities, you can still answer "Yes." Indicate in the department row that this resource is provided through contract.

Education and Outreach Capability

Complete the table titled "Education and Outreach."

HAZARD MITIGATION ACTION PLAN INPUT

When preparing the hazard mitigation action plan in Phase 3, review all the above capability assessment tables and consider including actions to provide a capability that your jurisdiction does not currently have, update a capability that your jurisdiction does have, or implement an action that is recommended in an existing plan or program.

National Flood Insurance Program Compliance

Complete the table titled "National Flood Insurance Program Compliance."

Community Classifications

Complete the table titled "Community Classifications" to indicate your jurisdiction's participation in various national programs related to natural hazard mitigation. For each program enter "Yes" or "No" in the second column to indicate whether your jurisdiction participates. If yes, then enter the classification that your jurisdiction has earned under the program in the third column and the date on which that classification was issued in the fourth column; enter "N/A" in the third and fourth columns if your jurisdiction is not participating. If you do not know your current classification, information is available at the following websites:

- FIPS Code— https://www.census.gov/geographies/reference-files/2018/demo/popest/2018-fips.html

- **DUNS #**— https://www.dnb.com/duns-number.html
- **Community Rating System**— https://www.fema.gov/floodplain-management/community-rating-system
- **Building Code Effectiveness Grading Schedule**— https://www.isomitigation.com/bcegs/iso-s-building-code-effectiveness-grading-schedule-bcegs.html
- **Public Protection Classification**— https://www.isomitigation.com/ppc/
- **Storm Ready**— https://www.weather.gov/stormready/communities
- **Firewise**— http://www.firewise.org/usa-recognition-program/map-of-active-participants.aspx
- **Tsunami Ready**— https://www.weather.gov/tsunamiready/communities

Adaptive Capacity for Climate Change

Consider climate change impact concerns such as the following:

- Reduced snowpack
- Increased wildfires
- Sea level rise
- Inland flooding
- Threats to sensitive species
- Loss in agricultural productivity
- Public health and safety.

With those impacts in mind, complete the table titled "Adaptive Capacity for Climate Change" by indicating your jurisdiction's capacity for each listed criterion as follows:

- **High**—The capacity exists and is in use.
- **Medium**—The capacity may exist, but is not used or could use some improvement.
- **Low**—The capacity does not exist or could use substantial improvement.
- **Unsure**—Not enough information is known to assign a rating.

This is a subjective assessment, but providing a few words of explanation is useful. It is highly recommended that you complete this table with an internal planning team after reviewing the results of the other capability assessment tables.

HAZARD MITIGATION ACTION PLAN INPUT

When preparing the hazard mitigation action plan in Phase 3, review all the adaptive capacity criteria and consider including actions to improve the rating for those rated medium or low, to make use of the capacity for those rated high, or to acquire additional information for those rated unsure.

INTEGRATION REVIEW

For hazard mitigation planning, "integration" means that hazard mitigation information is used in other relevant planning mechanisms, such as general planning and capital facilities planning, and that relevant information from those sources is used in hazard mitigation. FEMA recommends integration as follows:

- Integrate hazard mitigation plan goals with community objectives (e.g. incorporate the goals for risk reduction and safety into the policies of other plans).
- Use the risk assessment to inform plans and policies (e.g. incorporate risk assessment findings into land use plans, site plan review, emergency operations plans).
- Implement mitigation actions through existing mechanisms (e.g. include mitigation projects in the capital improvement plan).
- Think about mitigation before and after a disaster (e.g. build recovery planning on existing mitigation plans and goals).

After reviewing the plans, programs and ordinances identified in the capability assessment tables, identify all plans and programs that have already been integrated with the hazard mitigation plan, and those that offer opportunities for future integration. The simplest way to do this is to review the Planning and Regulatory Capabilities table to see which items were marked as "Yes" under the Integration Opportunity column.

Existing Integration

In the highlighted bullet list, list items for which you entered "Yes" under the Integration Opportunity column of the "Planning and Regulatory Capability" table because the plan or ordinance already addresses potential impacts or includes specific projects that should be included as action items in the mitigation action plan. Consider listing items marked as Completed in the "Status of Previous Plan Actions" table if they were indicated as being ongoing actions. Provide a brief description of how the plan or ordinance is integrated. Examples are as follows:

- Capital Improvement Plan—The capital improvement plan includes projects that can help mitigate potential hazards. The City will act to ensure consistency between the hazard mitigation plan and the current and future capital improvement plans. The hazard mitigation plan may identify new possible funding sources for capital improvement projects and may result in modifications to proposed projects based on results of the risk assessment.
- Building Code and Fire Code—The City's adoption of the 2016 California building and fire codes incorporated local modifications to account for the climatic, topographic and geographic conditions that exist in the City.
- General Plan—The general plan includes a Safety Element to protect the community from unreasonable risk by establishing policies and actions to avoid or minimize the following hazards:
  - Geologic and seismic hazards
  - Fire hazards
  - Hazardous materials
  - Flood control
  - Impacts from climate change.

- **Climate Action Plan**—The City's Climate Action Plan includes projects for reducing greenhouse gas emissions and adapting to likely impacts of climate change. These projects were reviewed to identify cross-planning initiates that serve both adaptation and mitigation objectives.

HAZARD MITIGATION ACTION PLAN INPUT

When preparing the hazard mitigation action plan in Phase 3, any plans that fall into the "Existing Integration" category should be reviewed and elements from them should be included in the action plan as appropriate.

Opportunities for Future Integration

List any remaining items that say "Yes" in the Integration Opportunity column in the Planning and Regulatory Capabilities table and explain the process by which integration could occur. Examples follow:

- **Zoning Code**—The City is conducting a comprehensive update to its zoning code. Additional mitigation and abatement measures will be considered for incorporation into the code.
- **Capital Improvement Projects**—Capital improvement project proposals may take into consideration hazard mitigation potential as a means of evaluating project prioritization.
- **Post-Disaster Recovery Plan**—The City does not have a recovery plan and intends to develop one as a mitigation planning action during the next five years. The plan will build on the goals and objectives identified in the hazard mitigation plan.

After you have accounted for all items marked as "Yes" under the Integration Opportunity column, consider other programs you may have in place in your jurisdiction that include routine consideration and management of hazard risk. Examples of such programs may include: tree pruning programs, right-of-way mowing programs, erosion control or stream maintenance programs, etc. Add any such programs to the integration discussion and provide a brief description of how these programs manage (or could be adapted to manage) risk from hazards.

HAZARD MITIGATION ACTION PLAN INPUT

When preparing the hazard mitigation action plan in Phase 3, an action to integrate any identified "Opportunities for Future Integration" should be considered for inclusion in the action plan.

INFORMATION SOURCES USED FOR THIS ANNEX

Note that this section will ultimately describe all information sources used to develop this annex, but that only the sources used for Phases 1 and 2 will be listed at this point. Additional sources will be added with the preparation of the Phase 3 annex.

This section should describe what resources you used to complete the annex and how you used them. Several items are started for you, but be sure to update and enhance any descriptions. Providing this information is a requirement to pass the state and FEMA review process.

THIS COMPLETES PHASE 2

PHASE 3 INSTRUCTIONS

RISK ASSESSMENT

Jurisdiction-Specific Natural Hazard Event History

In the table titled "Past Natural Hazard Events," list in chronological order (most recent first) any natural hazard event that has caused damage to your jurisdiction. If it was a federally declared disaster, include the FEMA Disaster #, otherwise enter N/A in that column. Include the date of the event and the estimated dollar amount of damage it caused. You are welcome to include any events, but special attention should be made to include major storms and federally declared disasters. Refer to the table below that lists hazard events in the planning area.

Table 1. Presidential Disaster Declarations for the Planning Area

Type of Event	FEMA Disaster #	Date	Damage Assessment
			$

We recommend including most large-scale disasters, unless you know that there were no impacts on your jurisdiction. Specifically, we recommend that you include these events if you have damage estimate information or can provide a brief description of impacts that occurred within your community. In addition to these events, refer to the NOAA NCDC storm events database included in the toolkit. We recommend conducting a search for the name of your jurisdiction in order to identify events with known impacts. Other potential sources of damage information include the following

- Preliminary damage estimates your jurisdiction filed with the county or state
- Insurance claims data
- Newspaper archives
- Emergency management documents (general plan safety element, emergency response plan, etc.)
- Resident input.

If you do not have estimates for costs of damage caused, list "Not Available" in the "Damage Assessment" column or list a brief description of the damage rather than a dollar value (e.g., Main Street closed as a result of flooding, downed trees and residential damage). Note that tracking such damage is a valid and useful mitigation action if your jurisdiction does not currently track such information.

Hazard Risk Ranking

Risk ranking identifies which hazards pose the greatest risk to the community, based on how likely it is for each hazard to occur (this is called the community's exposure) and how great an impact each hazard will have if it does occur (this is called the community's vulnerability). Every jurisdiction has differing degrees of risk exposure and vulnerability and therefore needs to rank risk for its own area. The risk ranking for each jurisdiction has been calculated in the "Loss Matrix" spreadsheet included in the annex preparation toolkit. The ranking is on the basis of risk ranking scores for each hazard that were calculated based on the hazard's probability of occurrence and its potential impact on people, property and the economy.

The results for your jurisdiction have already been entered into the "Hazard Risk Ranking" table in your Phase 3 annex template. The hazard with the highest risk rating is listed at the top of table and was given a rank of 1; the hazard with the second highest rating is listed second with a rank of 2; and so on. Two hazards with equal risk ranking scores were given the same rank. Hazards were assigned to "High," Medium," or "Low" risk categories based on the risk ranking score. If you wish to review the calculations in detail, the appendix at the end of these instructions describes the calculation methodology that the spreadsheet uses.

Review the hazard risk ranking information that is included in your annex. If these results differ from what you know based on substantiated data and documentation, you may alter the ranking and risk categories based on this knowledge. If you do so, indicate the reason for the change in your template. For example:

> "Drought was ranked as low; however, the jurisdiction's economy is heavily reliant on water-using industries, such as agriculture or manufacturing, so this hazard should be ranked as medium."

HAZARD MITIGATION ACTION PLAN INPUT

When preparing the hazard mitigation action plan in Phase 3, you will need to have at least one mitigation action for each hazard ranked as "high" or "medium."

Jurisdiction-Specific Vulnerabilities

Repetitive Loss Properties

A repetitive loss property is any property for which FEMA has paid two or more flood insurance claims in excess of $1,000 in any rolling 10-year period since 1978. In the space provided, the following information has been included in your annex based on data provided by FEMA:

- The number of any FEMA-identified repetitive-loss properties in your jurisdiction.
- The number of any FEMA-identified severe-repetitive-loss properties in your jurisdiction.
- The number (if any) of repetitive-loss or severe-repetitive-loss properties in your jurisdiction that have been mitigated. Mitigated for this exercise means that flood protection has been provided to the structure.

HAZARD MITIGATION ACTION PLAN INPUT

When preparing the hazard mitigation action plan in Phase 3, if your jurisdiction has any repetitive loss properties, you should strongly consider including a mitigation action that addresses mitigating these properties.

Other Noted Vulnerabilities

Review the results of the risk assessment included in the toolkit, your jurisdiction's natural events history, and any relevant public comments/input, then develop a few sentences that discuss specific hazard vulnerabilities. You do not need to develop a sentence for every hazard, but identify a few issues you would like to highlight. Also list any known hazard vulnerabilities in your jurisdiction that may not be apparent from the risk assessment and other information provided.

Spending some time thinking about the results of the risk assessment and other noted vulnerabilities will be a big help in the development of your hazard mitigation action plan. The following are examples of vulnerabilities you could identify through this exercise:

- About 45 percent of the population lives in the 0.2 percent annual chance flood hazard area, where flood insurance is generally not required.
- A magnitude 7.5 earthquake on the Smithburg Fault is estimated to produce nearly 1 million tons of structure debris.
- Over the past 10 years, the jurisdiction has experienced more than $6 million in damage from severe storm events.
- More than 50 buildings are located in areas that would be permanently inundated with 12 inches of sea level rise.
- The results of the public survey indicated that 40 percent of Smithburg residents would not be able to be self-sufficient for 5 days following a major event.
- An urban drainage issue at a specific location results in localized flooding every time it rains.
- One area of the community frequently loses power due to a lack of tree maintenance.

- A critical facility, such as a police station, is not equipped with a generator.
- A neighborhood has the potential to have ingress and egress cut off as the result of a flood or earthquake (e.g. a bridge is the only access).
- Substantial number of buildings in one area of the community are unreinforced masonry or soft-story construction.
- An area along the river is eroding and threatening public and/or private property.
- A large visitor population that may not be aware of tsunami risk.

HAZARD MITIGATION ACTION PLAN INPUT

When preparing the hazard mitigation action plan in Phase 3, consider including actions to address the jurisdiction-specific vulnerabilities listed in this section.

HAZARD MITIGATION ACTION PLAN

Hazard Mitigation Action Plan Matrix

The hazard mitigation action plan is the heart of your jurisdictional annex. This is where you will identify the actions your jurisdiction would like to pursue with this plan.

Select Recommended Actions

All of the work that you have done thus far should provide you with ideas for actions. Throughout these instructions, green boxes labeled “Hazard Mitigation Action Plan Input” have indicated information that needs to be considered in the selection of mitigation actions. The following sections describe how to consider these and other information sources to develop a list of potential actions.

Be sure to consider the following factors in your selection of actions:

- Select actions that are consistent with the overall purpose, goals, and objectives of the hazard mitigation plan.
- Identify actions where benefits exceed costs.
- Include any action that your jurisdiction has committed to pursuing, regardless of grant eligibility.
- Know what is and is not grant-eligible under various federal grant programs (see the fact sheet on FEMA hazard mitigation grant programs in the annex preparation toolkit and the table below).

Table 2. Federal Hazard Mitigation Grant Program Eligibility by Action Type

Eligible Activities	Hazard Mitigation Grant Program	BRIC	Flood Mitigation Assistance
Mitigation Projects			
Property Acquisition and Structure Demolition	√	√	√
Property Acquisition and Structure Relocation	√	√	√
Structure Elevation	√	√	√
Mitigation Reconstruction	√	√	√
Dry Floodproofing of Historic Residential Structures	√	√	√
Dry Floodproofing of Non-residential Structures	√	√	√
Generators	√	√	
Localized Flood Risk Reduction Projects	√	√	√
Non-Localized Flood Risk Reduction Projects	√	√	
Structural Retrofitting of Existing Buildings	√	√	√
Non-structural Retrofitting of Existing Buildings and Facilities	√	√	√
Safe Room Construction	√	√	
Wind Retrofit for One- and Two-Family Residences	√	√	
Infrastructure Retrofit	√	√	√
Soil Stabilization	√	√	√
Wildland fire Mitigation	√	√	
Post-Disaster Code Enforcement	√		
Advance Assistance	√		
5 Percent Initiative Projects*	√		
Aquifer and Storage Recovery**	√	√	√
Flood Diversion and Storage**	√	√	√
Floodplain and Stream Restoration**	√	√	√
Green Infrastructure**	√	√	√
Miscellaneous/Other**	√	√	√
Hazard Mitigation Planning	√	√	√
Technical Assistance			√
Management Costs	√	√	√

* FEMA allows increasing the 5% initiative amount under the Hazard Mitigation Grant Program up to 10% for a presidential major disaster declaration. The additional 5% initiative funding can be used for activities that promote disaster-resistant codes for all hazards. As a condition of the award, either a disaster-resistant building code must be adopted or an improved Building Code Effectiveness Grading Schedule is required.

** Indicates that any proposed action will be evaluated on its own merit against program requirements. Eligible projects will be approved provided funding is available.

Material Previously Developed for This Annex

Capability Assessment Section—Planning and Regulatory Capability Table, Fiscal Capability Table, Administrative and Technical Capability Table, Education and Outreach Table, and Community Classification Table

Review these tables and consider the following:

- For any capability that you do not currently have, consider whether your jurisdiction should have this capability. If so, consider including an action to develop/acquire the capability.
- For any capability that you do currently have, consider whether this capability can be leveraged to increase or improve hazard mitigation in the jurisdiction.
- If any capabilities listed in the Planning and Regulatory Capabilities table have not been updated in more than 10 years, consider an action to review and update the capability and, as appropriate, incorporate hazard mitigation principles or information obtained in the risk assessment.
- Consider including actions that are identified in other plans and programs (capital improvement plans, strategic plans, etc.) as actions in this plan.

Capability Assessment Section—National Flood Insurance Program Compliance table

Review the table and consider the following:

- If you have no certified floodplain managers and you have flood risk, consider adding an action to provide key staff members with training to obtain certification.
- If your flood damage prevention was last updated in or before 2004, you should identify an action to update your ordinance to ensure it is compliant with current NFIP requirements.
- If you have any outstanding NFIP compliance issues, be sure to add an action to address them.
- If flood hazard maps do not adequately address the flood risk within your jurisdiction, consider actions to request new mapping or conduct studies.
- If you wish to begin to participate in CRS or you already to participate and would like to improve your classification, consider this as an action.
- If the number of flood insurance polices in your jurisdiction is low relative to the number of structures in the floodplain, consider an action that will promote flood insurance in your jurisdiction.

Capability Assessment Section— Adaptive Capacity for Climate Change Table

Consider your responses to this section:

- For criteria that you listed as medium or low, think of ways you could improve this rating (see adaptive capacity portion of the mitigation best practices catalog).
- For criteria you listed as high, think about how you can leverage this capacity to improve or enhance mitigation or continue to improve this capacity.
- For criteria that you were unable to provide responses for, consider ways you could improve your understanding of this capacity (see mitigation best practices and adaptive capacity catalog).

Integration Review Section

Review the items you identified in this section and consider an action that specifically says what the plan, code, ordinance etc. is and how it will be integrated. For items that address land use, include them in the prepopulated action in your template that reads as follows:

> "Integrate the hazard mitigation plan into other plans, ordinances and programs that dictate land use decisions in the community, including _____."

Risk Ranking Section

You must identify at least one mitigation action that is clearly defined and actionable (i.e. not a preparedness or response action) for every hazard that is categorized in the risk ranking as "high" or "medium" risk.

Jurisdiction-Specific Vulnerabilities Section

Review the vulnerability issues that you identified in this section and consider actions to address them (see mitigation best practices catalog). Two examples are shown in the table below.

Table 3. Example Actions to Address Jurisdiction-Specific Vulnerabilities

Noted Vulnerability	Example Mitigation Action
About 45 percent of the population lives in the 0.2 percent annual chance flood hazard area where flood insurance is generally not required.	Implement an annual public information initiative that targets residents in the 0.2 percent annual chance flood hazard area. Provide information on the availability of relatively low cost flood insurance policies.
An urban drainage issue results in localized flooding every time it rains.	Replace undersized culverts that are contributing to localized flooding. Priority areas include: • The corner of Main Street and 1st Street • Old Oak subdivision.

Status of Previous Plan Actions Section

If your jurisdiction participated in a previous hazard mitigation plan, be sure to include any actions that were identified as "carry over" actions.

Other Sources

Mitigation Best Practices Catalog

A catalog that includes best practices identified by FEMA and other agencies, as well as recommendations from the steering committee and other stakeholders, is included in your toolkit. Review the catalog and identify actions your jurisdiction should consider for its action plan.

Public Input

Review input received during the process, specifically the public survey results included in your toolkit.

Common Actions for All Partners

The following six actions have been prepopulated in your annex template; **these six actions should be included in every annex and should not be removed**:

- Where appropriate, support retro-fitting, purchase or relocation of structures located in high hazard areas, prioritizing those structures that have experienced repetitive losses and/or are located in high or medium ranked hazard.
- Integrate the hazard mitigation plan into other plans, ordinances and programs that dictate land use decisions within the community.
- Actively participate in the plan maintenance protocols outlined in Volume 1 of this hazard mitigation plan.
- Continue to maintain good standing and compliance under the NFIP through implementation of floodplain management programs that, at a minimum, meet the NFIP requirements:
  - Enforce the flood damage prevention ordinance.
  - Participate in floodplain identification and mapping updates.
  - Provide public assistance/information on floodplain requirements and impacts.
- Identify and pursue strategies to increase adaptive capacity to climate change.
- Purchase generators for critical facilities and infrastructure that lack adequate back-up power.

In addition, the core planning team recommends that every planning partner strongly consider the following actions:

- Develop and implement a program to capture perishable data after significant events (e.g. high water marks, preliminary damage estimates, damage photos) to support future mitigation efforts including the implementation and maintenance of the hazard mitigation plan.
- Support the County-wide initiatives identified in Volume I of the hazard mitigation plan.
- Develop a post-disaster recovery plan and a debris management plan.
- Develop and/or update plans that support or enhance continuity of operations following disasters.

The specifics of all these common actions should be adjusted as needed for the particulars of each community.

Complete the Table

Complete the table titled “Hazard Mitigation Action Plan Matrix” for all the actions you have identified and would like to include in the plan:

- Enter the action number (see box on next page) and description. **If the action is carried over from your previous hazard mitigation plan, return to the “Status of Previous Plan Actions” table you completed in Phase 1 and enter the new action number in the column labeled “Action # in Update.”**
- Indicate whether the action mitigates hazards for new and/or existing assets.
- Identify the specific hazards the action will mitigate (note: you must list each hazard by name; simply indicating “all hazards” is not deemed acceptable).
- Identify by number the mitigation plan objectives that the action addresses (see toolkit).
- Indicate who will be the lead in administering the action. This will most likely be a department within your jurisdiction (e.g. planning or public works). If you wish to indicate more than one department as responsible for the action, clearly identify one as the lead agency and list the others in the “supporting agency” column.

- Enter an estimated cost in dollars if known; otherwise, enter "High," "Medium," or "Low," as determined for the prioritization process described in the following section.
- Identify funding sources for the action. If it is a grant, include the grant-providing agency as well as funding sources for any required cost share. Refer to your fiscal capability assessment to identify possible sources of funding and refer to the table on page 15 of these instructions for project eligibility for FEMA's hazard mitigation assistance grant programs.
- Indicate the time line as "short-term" (1 to 5 years) or "long-term" (5 years or greater) or "ongoing" (a continual program)

Action Numbering

Actions are to be numbered using the three-letter code for your jurisdiction shown below, followed by a hyphen and the action's sequential number:

- Ventura, County of—VCO-1, VCO-2…
- Camarillo, City of—CAM-1, CAM-2…
- Fillmore, City of—FIL-1, FIL-2…
- Moorpark, City of —MPK-1, MPK-2…
- Ojai, City of —OJC-1, OJC-2…
- Oxnard, City of —OXN-1, OXN-2…
- Port Hueneme, City of —PTH-1, PTH-2…
- Santa Paula, City of —STP-1, STP-2…
- Simi Valley, City of —SIM-1, SIM-2…
- Thousand Oaks, City of —THO-1, THO-2…
- Ventura, City of —VEN-1, VEN-2…

Mitigation Action Priority

Complete the information in the table titled "Mitigation Action Priority" as follows:

- **Action #**—Indicate the action number from the Hazard Mitigation Action Plan Matrix table.
- **# of Objectives Met**—Enter the number of objectives the action will meet.
- **Benefits**—Enter "High," "Medium" or "Low" as follows:
  - High—Action will provide an immediate reduction of risk exposure for life and property.
  - Medium—Action will have a long-term impact on the reduction of risk exposure for life and property, or action will provide an immediate reduction in the risk exposure for property.
  - Low—Long-term benefits of the action are difficult to quantify in the short term.
- **Cost**—Enter "High," "Medium" or "Low" as follows:
  - High—Existing funding will not cover the cost of the action; implementation would require new revenue through an alternative source (for example, bonds, grants, and fee increases).
  - Medium—The action could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the action would have to be spread over multiple years.
  - Low—The action could be funded under the existing budget. The action is part of or can be part of an ongoing existing program.
- **Do Benefits Exceed the Cost?**—Enter "Yes" or "No." This is a qualitative assessment. Enter "Yes" if the benefit rating (high, medium or low) is the same as or higher than the cost rating (high benefit/high cost; high benefit/medium cost; medium benefit/low cost; etc.). Enter "No" if the benefit rating is lower than the cost rating (medium benefit/high cost, low benefit/medium cost; etc.)
- **Is the Action Grant-Eligible?**—Enter "Yes" or "No." Refer to the fact sheet on FEMA hazard mitigation grant programs in the annex preparation toolkit and the table on page 15 of these instructions.

- **Can Action Be Funded Under Existing Program Budgets?**—Enter "Yes" or "No." In other words, is this action currently budgeted for, or would it require a new budget authorization or funding from another source such as grants?
- **Implementation Priority**— Enter "High," "Medium" or "Low" as follows:
  - High Priority—An action that meets multiple objectives, has benefits that exceed costs, and has a secured source of funding. Action can be completed in the short term (1 to 5 years).
  - Medium Priority—An action that meets multiple objectives, has benefits that exceed costs, and is eligible for funding though no funding has yet been secured for it. Action can be completed in the short term (1 to 5 years), once funding is secured. Medium-priority actions become high-priority actions once funding is secured.
  - Low Priority—An action that will mitigate the risk of a hazard, has benefits that do not exceed the costs or are difficult to quantify, has no secured source of funding, and is not eligible for any known grant funding. Action can be completed in the long term (1 to 10 years). Low-priority actions may be eligible for grant funding from programs that have not yet been identified.
- **Grant Pursuit Priority**— Enter "High," "Medium" or "Low" as follows:
  - High Priority—An action that meets identified grant eligibility requirements, has high benefits, and is listed as high or medium implementation priority; local funding options are unavailable or available local funds could be used instead for actions that are not eligible for grant funding.
  - Medium Priority—An action that meets identified grant eligibility requirements, has medium or low benefits, and is listed as medium or low implementation priority; local funding options are unavailable.
  - Low Priority—An action that has not been identified as meeting any grant eligibility requirements.

Actions identified as high-grant-pursuit priority actions should be closely reviewed for consideration when grant funding opportunities arise.

Note: If a jurisdiction wishes to identify an action as high priority that is outside of the prioritization scheme for high priorities, a note indicating so should be inserted and a rationale should be provided.

Analysis of Mitigation Actions

In the table titled "Analysis of Mitigation Actions," for each combination of hazard type and mitigation type, enter the numbers of all recommended actions that address that hazard type and can be categorized as that mitigation type. The mitigation types are as follows:

- **Prevention**—Government, administrative or regulatory actions that influence the way land and buildings are developed to reduce hazard losses. Includes planning and zoning, floodplain laws, capital improvement programs, open space preservation, and stormwater management regulations.
- **Property Protection**—Modification of buildings or structures to protect them from a hazard or removal of structures from a hazard area. Includes acquisition, elevation, relocation, structural retrofit, storm shutters, and shatter-resistant glass.
- **Public Education & Awareness**—Actions to inform residents and elected officials about hazards and ways to mitigate them. Includes outreach projects, real estate disclosure, hazard information centers, and school-age and adult education.

- **Natural Resource Protection**—Actions that minimize hazard loss and preserve or restore the functions of natural systems. Includes sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, wetland restoration and preservation, and green infrastructure.
- **Emergency Services**—Actions that protect people and property during and immediately after a hazard event. Includes warning systems, emergency response services, and the protection of essential facilities.
- **Structural Projects**—Actions that involve the construction of structures to reduce the impact of a hazard. Includes dams, setback levees, floodwalls, retaining walls, and safe rooms.
- **Climate Resilience**—Actions that incorporate methods to mitigate and/or adapt to the impacts of climate change. Includes aquifer storage and recovery activities, incorporating future conditions projections in project design or planning, or actions that specifically address jurisdiction-specific climate change risks, such as sea-level rise or urban heat island effect.
- **Community Capacity Building**—Actions that increase or enhance local capabilities to adjust to potential damage, to take advantage of opportunities, or to respond to consequences. Includes staff training, memorandums of understanding, development of plans and studies, and monitoring programs.

This exercise demonstrates that the jurisdiction has selected a comprehensive range of actions. This table must show at least one action to address each "high" and "medium" ranked hazard. Planning partners should aim to identify at least one action for each mitigation type, but this is not required.

An example of a completed "Analysis of Mitigation Actions" table is provided below. Note that an action can be more than one mitigation type.

Sample Completed Table – Analysis of Mitigation Actions

Hazard Type	Action Addressing Hazard, by Mitigation Type							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilience	Community Capacity Building
High-Risk Hazards								
Dam Failure	EX-2, 3, 4, 5, 6	EX-1, 6	EX-4, 6		EX-8, 11			EX-3, 4, 8, 9, 10
Drought	EX-2	EX-1	EX-4					EX-3, 4, 8, 9, 10
Medium-Risk Hazards								
Earthquake	EX-2, 3, 4, 5, 7	EX-1, 7	EX-4		EX-8, 11			EX-3, 4, 8, 9
Flooding	EX-2, 3, 4, 5, 6, 7	EX-1, 6, 7	EX-4, 6	EX-9	EX-8, 11	EX-6		EX-3, 4, 8, 9, 10
Landslide	EX-2, 3, 4, 5, 7	EX-1, 7	EX-4		EX-8, 11			EX-3, 4, 8, 9, 10
Low-Risk Hazards								
Severe Weather	EX-2, 3, 4, 5, 7	EX-1, 7, 9	EX-4		EX-8, 9, 11		EX-8, 7	EX-3, 4, 8, 9, 10
Wildfire	EX-2, 3, 4, 5, 7	EX-1, 7, 9	EX-4, 9	EX-9	EX-8, 11			EX-3, 4, 8, 9, 10

PUBLIC OUTREACH

FEMA requirements for public outreach will be met by the County's engagement efforts and are included in the main part of the plan. These may include public meetings, a StoryMap, surveys, etc. If individual jurisdictions want to have a more robust outreach for their local community, the public outreach table in each annex may be used to memorialize those local efforts.

This table should record local public outreach efforts made by your jurisdiction to inform the community of the plan update process. Examples may include local surveys on hazard awareness/preparedness, social media blasts, press releases, and outreach to local groups (CERT, senior citizen organizations, etc.) **This section is optional.**

INFORMATION SOURCES USED FOR THIS ANNEX

This section should describe what resources you used to complete the annex and how you used them. The sources used for Phases 1 and 2 should have been entered previously. List any additional sources used for the preparation of the Phase 3 annex. Review to ensure that all materials used in all three phases are identified. Providing this information is a requirement to pass the state and FEMA review process.

FUTURE NEEDS TO BETTER UNDERSTAND RISK/VULNERABILITY

In this section, identify any future studies, analyses, reports, or surveys your jurisdiction needs to better understand its vulnerability to identified or currently unidentified risks. These could be needs based on federal or state agency mandates. **This section is optional.**

ADDITIONAL COMMENTS

Use this section to add any additional information pertinent to hazard mitigation and your jurisdiction not covered in this template. **This section is optional.**

THIS COMPLETES PHASE 3

APPENDIX— Risk Ranking Calculation Methodology

The instructions below describe the methodology for how risk rankings were derived in the "Loss Matrix" spreadsheet provided with the annex preparation toolkit. The risk-ranking for each hazard assessed its probability of occurrence and its potential impact on people, property, and the economy. Refer to the Loss Matrix spreadsheet in order to follow along.

Probability of Occurrence

A probability factor is assigned based on how often a hazard is likely to occur. The probability of occurrence of a hazard event is generally based on past hazard events in an area, although weight can be given to expected future probability of occurrence based on established return intervals and changing climate conditions. For example, if your jurisdiction has experienced two damaging floods in the last 25 years, the probability of occurrence is high for flooding and scores a 3 under this category. If your jurisdiction has experienced no damage from landslides in the last 100 years, your probability of occurrence for landslide is low, and scores a 1 under this category. Each hazard was assigned a probability factor as follows:

- High—Hazard event is likely to occur within 25 years (Probability Factor = 3)
- Medium—Hazard event is likely to occur within 100 years (Probability Factor = 2)
- Low—Hazard event is not likely to occur within 100 years (Probability Factor = 1)
- None—There is no exposure to the hazard and no probability of occurrence (Probability Factor = 0)

Potential Impacts of Each Hazard

The impact of each hazard is divided into three categories: impacts on people, impacts on property, and impacts on the economy. These categories are also assigned weighted values. Impact on people was assigned a weighting factor of 3, impact on property was assigned a weighting factor of 2 and impact on the economy was assigned a weighting factor of 1.

Impact factors for each category (people, property, economy) are described below:

- People—Values are assigned based on the percentage of the total ***population exposed*** to the hazard event. The degree of impact on individuals will vary and is not measurable, so the calculation assumes for simplicity and consistency that all people exposed to a hazard because they live in a hazard zone will be equally impacted when a hazard event occurs. Impact factors were assigned as follows:
  - High—25 percent or more of the population is exposed to a hazard (Impact Factor = 3)
  - Medium—10 percent to 24 percent of the population is exposed to a hazard (Impact Factor = 2)
  - Low—9 percent or less of the population is exposed to the hazard (Impact Factor = 1)
  - No impact—None of the population is exposed to a hazard (Impact Factor = 0)
- Property—Values are assigned based on the percentage of the total ***property value exposed*** to the hazard event:
  - High—25 percent or more of the total replacement value is exposed to a hazard (Impact Factor = 3)
  - Medium—10 percent to 24 percent of the total replacement value is exposed to a hazard (Impact Factor = 2)
  - Low—9 percent or less of the total replacement value is exposed to the hazard (Impact Factor = 1)

  - No impact—None of the total replacement value is exposed to a hazard (Impact Factor = 0)

- **Economy**—Values were assigned based on the percentage of the total ***property value vulnerable*** to the hazard event. Values represent estimates of the loss from a major event of each hazard in comparison to the total replacement value of the property exposed to the hazard. For some hazards, such as wildland fire and landslide, vulnerability may be considered to be the same or a portion of exposure due to the lack of loss estimation tools specific to those hazards.
  - High—Estimated loss from the hazard is 10 percent or more of the total replacement value (Impact Factor = 3)
  - Medium—Estimated loss from the hazard is 5 percent to 9 percent of the total replacement value (Impact Factor = 2)
  - Low—Estimated loss from the hazard is 4 percent or less of the total replacement value (Impact Factor = 1)
  - No impact—No loss is estimated from the hazard (Impact Factor = 0).

Impacts on People

The percent of the total population exposed to each hazard of concern with a defined extent and location (e.g. floodplain) can be found in the loss estimate matrix in the **green highlighted column.** For those hazards that do not have a defined extent and location the entire population or a portion of the population is considered to be exposed, depending on the hazard. For the drought hazard, it is common for jurisdictions to list "low" or "none," because all people in the planning area would be exposed to drought, but impacts to the health and safety of individuals are expected to be minimal.

Impacts on Property

The percent of the total value exposed to each hazard of concern with a defined extent and location (e.g. floodplain) can be found in the loss estimate matrix in the **blue highlighted column.** For those hazards that do not have a defined extent and location (e.g. severe weather) the entire building stock is generally considered to be exposed. For the drought hazard, it is common for jurisdictions to list "low" or "none," because all structures in the planning area would be exposed to drought, but impacts to structures are expected to be minimal.

Impacts on the Economy

The loss estimates for each hazard of concern that was modeled (i.e. dam failure, flood, earthquake) can be found in the loss estimate matrix in the **purple highlighted column.** For those hazards that have a defined extent and location, but do not have modelled loss results, loss estimates can be the same as exposure or a portion thereof. For example, a large percentage of the building stock may be exposed to landslide or wildland fire risk, but it would not be expected that one event that resulted in loss to all exposed structures would occur. For those hazards that do not have a defined extent and location, exposure is based on the hazard type.

Risk Rating for Each Hazard

A risk rating for each hazard was determined by multiplying the assigned probability factor by the sum of the weighted impact factors for people, property and the economy:

Risk Rating = Probability Factor x Weighted Impact Factor {people + property + economy}

This is the number that is shown in the risk ranking table in your template. Generally, score of 30 or greater receive a “high” rating, score between 15 and 30 receive a “medium” rating, and score of less than 15 receives a “low” rating.

1. JURISDICTION NAME

1.1 LOCAL HAZARD MITIGATION PLANNING TEAM

Primary Point of Contact
Name, Title
Street Address
City, State ZIP
Telephone: xxx-xxx-xxxx
e-mail Address: xxx@xxx.xxx

Alternate Point of Contact
Name, Title
Street Address
City, State ZIP
Telephone: xxx-xxx-xxxx
e-mail Address: xxx@xxx.xxx

This annex was developed by the local hazard mitigation planning team, whose members are listed in Table 1-1.

Table 1-1. Local Hazard Mitigation Planning Team Members

Name	Title
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

1.2 JURISDICTION PROFILE

1.2.1 Location and Features

___[jurisdiction name]___ is in ___[general location description]___

The current boundaries generally extend from ___[describe]___, encompassing an area of ___[area in square miles]___.

___[general description of key features]___

1.2.2 History

___[jurisdiction name]___ was incorporated in ___[date]___. ___[brief historical summary]___

1.2.3 Governing Body Format

___[general description]___.

The __[name of adopting body]___ assumes responsibility for the adoption of this plan; __[name of oversight agency]__ will oversee its implementation.

1.3 CURRENT TRENDS

1.3.1 Population

According to ___[identify data source]___, the population of ___[jurisdiction name]___ as of ___[month year]___ was ___[population]___ Since ___[year]___, the population has grown at an average annual rate of ___[number]___ percent.

1.3.2 Development

_DESCRIBE TRENDS IN GENERAL__.

Identifying previous and future development trends is achieved through a comprehensive review of permitting since completion of the previous plan and in anticipation of future development. Tracking previous and future growth in potential hazard areas provides an overview of increased exposure to a hazard within a community. Table 1-2 summarizes development trends in the performance period since the preparation of the previous hazard mitigation plan, as well as expected future development trends.

Table 1-2. Recent and Expected Future Development Trends

Criterion	Response					
Has your jurisdiction annexed any land since the preparation of the previous hazard mitigation plan? ***If yes, give the estimated area annexed and estimated number of parcels or structures.***	Yes/No _____					
Is your jurisdiction expected to annex any areas during the performance period of this plan? ***If yes, describe land areas and dominant uses.*** ***If yes, who currently has permitting authority over these areas?***	Yes/No _____ _____					
Are any areas targeted for development or major redevelopment in the next five years? ***If yes, briefly describe, including whether any of the areas are in known hazard risk areas***	Yes/No _____					
How many permits for new construction were issued in your jurisdiction since the preparation of the previous hazard mitigation plan?		**2016**	**2017**	**2018**	**2019**	**2020**
	Single Family	__	__	__	__	__
	Multi-Family	__	__	__	__	__
	Other	__	__	__	__	__
	Total	__	__	__	__	__
Provide the number of new-construction permits for each hazard area or provide a qualitative description of where development has occurred.	• Special Flood Hazard Areas: # • Landslide: # • High Liquefaction Areas: # • Tsunami Inundation Area: # • Wildfire Risk Areas: #					

Criterion	Response
Describe the level of buildout in the jurisdiction, based on your jurisdiction's buildable lands inventory. If no such inventory exists, provide a qualitative description.	

1.4 CAPABILITY ASSESSMENT

This section describes an assessment of existing capabilities for implementing hazard mitigation strategies. The introduction at the beginning of this volume of the hazard mitigation plan describes the components included in the capability assessment and their significance for hazard mitigation planning.

Findings of the capability assessment were reviewed to identify opportunities to expand, initiate or integrate capabilities to further hazard mitigation goals and objectives. Where such opportunities were identified and determined to be feasible, they are included in the action plan. The "Analysis of Mitigation Actions" table in this annex identifies these as community capacity building mitigation actions. The findings of the assessment are presented as follows:

- An assessment of planning and regulatory capabilities is presented in Table 1-3.
- Development and permitting capabilities are presented in Table 1-4.
- An assessment of fiscal capabilities is presented in Table 1-5.
- An assessment of administrative and technical capabilities is presented in Table 1-6.
- An assessment of education and outreach capabilities is presented in Table 1-7.
- Information on National Flood Insurance Program (NFIP) compliance is presented in Table 1-8.
- Classifications under various community mitigation programs are presented in Table 1-9.
- The community's adaptive capacity for the impacts of climate change is presented in Table 1-10.

Table 1-3. Planning and Regulatory Capability

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity?
Codes, Ordinances, & Requirements				
Building Code *Comment:* *Enter Comment*	Yes/No	Yes/No	Yes/No	Yes/No
Zoning Code *Comment:* *Enter Comment*	Yes/No	Yes/No	Yes/No	Yes/No
Subdivisions *Comment:* *Enter Comment*	Yes/No	Yes/No	Yes/No	Yes/No
Stormwater Management *Comment:* *Enter Comment*	Yes/No	Yes/No	Yes/No	Yes/No
Post-Disaster Recovery *Comment:* *Enter Comment*	Yes/No	Yes/No	Yes/No	Yes/No
Real Estate Disclosure *Comment:* *Enter Comment*	Yes/No	Yes/No	Yes/No	Yes/No
Growth Management *Comment:* *Enter Comment*	Yes/No	Yes/No	Yes/No	Yes/No
Site Plan Review *Comment:* *Enter Comment*	Yes/No	Yes/No	Yes/No	Yes/No
Environmental Protection *Comment:* *Enter Comment*	Yes/No	Yes/No	Yes/No	Yes/No
Flood Damage Prevention *Comment:* *Enter Comment*	Yes/No	Yes/No	Yes/No	Yes/No
Emergency Management *Comment:* *Enter Comment*	Yes/No	Yes/No	Yes/No	Yes/No
Climate Change *Comment:* *Enter Comment*	Yes/No	Yes/No	Yes/No	Yes/No
Other *Comment:* *Enter Comment*	Yes/No	Yes/No	Yes/No	Yes/No
Planning Documents				
General Plan *Is the plan compliant with Assembly Bill 2140?* *Yes/No* *Comment:* *Enter Comment*	Yes/No	Yes/No	Yes/No	Yes/No
Capital Improvement Plan *How often is the plan updated?* _____ *Comment:* *Enter Comment*	Yes/No	Yes/No	Yes/No	Yes/No
Disaster Debris Management Plan *Comment:* *Enter Comment*	Yes/No	Yes/No	Yes/No	Yes/No
Floodplain or Watershed Plan *Comment:* *Enter Comment*	Yes/No	Yes/No	Yes/No	Yes/No
Stormwater Plan *Comment:* *Enter Comment*	Yes/No	Yes/No	Yes/No	Yes/No
Urban Water Management Plan *Comment:* *Enter Comment*	Yes/No	Yes/No	Yes/No	Yes/No

	Local Authority	Other Jurisdiction Authority	State Mandated	Integration Opportunity?
Habitat Conservation Plan ***Comment:*** *Enter Comment*	Yes/No	Yes/No	Yes/No	Yes/No
Economic Development Plan ***Comment:*** *Enter Comment*	Yes/No	Yes/No	Yes/No	Yes/No
Shoreline Management Plan ***Comment:*** *Enter Comment*	Yes/No	Yes/No	Yes/No	Yes/No
Community Wildfire Protection Plan ***Comment:*** *Enter Comment*	Yes/No	Yes/No	Yes/No	Yes/No
Forest Management Plan ***Comment:*** *Enter Comment*	Yes/No	Yes/No	Yes/No	Yes/No
Climate Action Plan ***Comment:*** *Enter Comment*	Yes/No	Yes/No	Yes/No	Yes/No
Emergency Operations Plan ***Comment:*** *Enter Comment*	Yes/No	Yes/No	Yes/No	Yes/No
Threat & Hazard Identification & Risk Assessment (THIRA) ***Comment:*** *Enter Comment*	Yes/No	Yes/No	Yes/No	Yes/No
Post-Disaster Recovery Plan ***Comment:*** *Enter Comment*	Yes/No	Yes/No	Yes/No	Yes/No
Continuity of Operations Plan ***Comment:*** *Enter Comment*	Yes/No	Yes/No	Yes/No	Yes/No
Public Health Plan ***Comment:*** *Enter Comment*	Yes/No	Yes/No	Yes/No	Yes/No
Other ***Comment:*** *Enter Comment*	Yes/No	Yes/No	Yes/No	Yes/No

Table 1-4. Development and Permitting Capability

Criterion	Response
Does your jurisdiction issue development permits? ***If no, who does? If yes, which department?*** Enter Response	Yes/No
Does your jurisdiction have the ability to track permits by hazard area?	Yes/No
Does your jurisdiction have a buildable lands inventory?	Yes/No

Table 1-5. Fiscal Capability

Financial Resource	Accessible or Eligible to Use?
Community Development Block Grants	Yes/No
Capital Improvements Project Funding	Yes/No
Authority to Levy Taxes for Specific Purposes	Yes/No
User Fees for Water, Sewer, Gas or Electric Service *If yes, specify:* Enter Response	Yes/No
Incur Debt through General Obligation Bonds	Yes/No
Incur Debt through Special Tax Bonds	Yes/No
Incur Debt through Private Activity Bonds	Yes/No
Withhold Public Expenditures in Hazard-Prone Areas	Yes/No
State-Sponsored Grant Programs	Yes/No
Development Impact Fees for Homebuyers or Developers	Yes/No
Other *If yes, specify:* Enter Response	Yes/No

Table 1-6. Administrative and Technical Capability

Staff/Personnel Resource	Available?
Planners or engineers with knowledge of land development and land management practices *If Yes, Department /Position:* Enter Response	Yes/No
Engineers or professionals trained in building or infrastructure construction practices *If Yes, Department /Position:* Enter Response	Yes/No
Planners or engineers with an understanding of natural hazards *If Yes, Department /Position:* Enter Response	Yes/No
Staff with training in benefit/cost analysis *If Yes, Department /Position:* Enter Response	Yes/No
Surveyors *If Yes, Department /Position:* Enter Response	Yes/No
Personnel skilled or trained in GIS applications *If Yes, Department /Position:* Enter Response	Yes/No
Scientist familiar with natural hazards in local area *If Yes, Department /Position:* Enter Response	Yes/No
Emergency manager *If Yes, Department /Position:* Enter Response	Yes/No
Grant writers *If Yes, Department /Position:* Enter Response	Yes/No
Other *If Yes, Department /Position:* Enter Response	Yes/No

Table 1-7. Education and Outreach Capability

Criterion	Response
Do you have a public information officer or communications office?	Yes/No
Do you have personnel skilled or trained in website development?	Yes/No
Do you have hazard mitigation information available on your website? *If yes, briefly describe:* Enter Response	Yes/No
Do you use social media for hazard mitigation education and outreach? *If yes, briefly describe:* Enter Response	Yes/No
Do you have any citizen boards or commissions that address issues related to hazard mitigation? *If yes, briefly describe:* Enter Response	Yes/No
Do you have any other programs in place that could be used to communicate hazard-related information? *If yes, briefly describe:* Enter Response	Yes/No
Do you have any established warning systems for hazard events? *If yes, briefly describe:* Enter Response	Yes/No

Table 1-8. National Flood Insurance Program Compliance

Criterion	Response
What local department is responsible for floodplain management?	Enter Response
Who is your floodplain administrator? (department/position)	Enter Response
Are any certified floodplain managers on staff in your jurisdiction?	Yes/No
What is the date that your flood damage prevention ordinance was last amended?	Enter Response
Does your floodplain management program meet or exceed minimum requirements? *If exceeds, in what ways?* Enter Response	Meets/Exceeds
When was the most recent Community Assistance Visit or Community Assistance Contact?	Enter Response
Does your jurisdiction have any outstanding NFIP compliance violations that need to be addressed? *If so, state what they are.* Enter Response	Yes/No
Are any RiskMAP projects currently underway in your jurisdiction? *If so, state what they are.* Enter Response	Yes/No
Do your flood hazard maps adequately address the flood risk within your jurisdiction? *If no, state why.* Enter Response	Yes/No
Does your floodplain management staff need any assistance or training to support its floodplain management program? *If so, what type of assistance/training is needed?* Enter Response	Yes/No
Does your jurisdiction participate in the Community Rating System (CRS)? *If yes, is your jurisdiction interested in improving its CRS Classification?* Yes/No *If no, is your jurisdiction interested in joining the CRS program?* Yes/No	Yes/No
How many flood insurance policies are in force in your jurisdiction?[a] *What is the insurance in force?* $_____ *What is the premium in force?* $_____	Enter Response

Criterion	Response
How many total loss claims have been filed in your jurisdiction?[a] ***How many claims are still open or were closed without payment?*** Enter Response ***What were the total payments for losses?*** $_____	Enter Response

a. According to FEMA statistics as of MONTH XX, 20XX

Table 1-9. Community Classifications

	Participating?	Classification	Date Classified
FIPS Code	Yes/No	_____	Date
DUNS #	Yes/No	_____	Date
Community Rating System	Yes/No	_____	Date
Building Code Effectiveness Grading Schedule	Yes/No	_____	Date
Public Protection	Yes/No	_____	Date
Storm Ready	Yes/No	_____	Date
Firewise	Yes/No	_____	Date
Tsunami Ready	Yes/No	_____	Date

Table 1-10. Adaptive Capacity for Climate Change

Criterion	Jurisdiction Rating[a]
Technical Capacity	
Jurisdiction-level understanding of potential climate change impacts ***Comment:*** *Enter Comment*	High/Medium/Low
Jurisdiction-level monitoring of climate change impacts ***Comment:*** *Enter Comment*	High/Medium/Low
Technical resources to assess proposed strategies for feasibility and externalities ***Comment:*** *Enter Comment*	High/Medium/Low
Jurisdiction-level capacity for development of greenhouse gas emissions inventory ***Comment:*** *Enter Comment*	High/Medium/Low
Capital planning and land use decisions informed by potential climate impacts ***Comment:*** *Enter Comment*	High/Medium/Low
Participation in regional groups addressing climate risks ***Comment:*** *Enter Comment*	High/Medium/Low
Implementation Capacity	
Clear authority/mandate to consider climate change impacts during public decision-making processes ***Comment:*** *Enter Comment*	High/Medium/Low
Identified strategies for greenhouse gas mitigation efforts ***Comment:*** *Enter Comment*	High/Medium/Low
Identified strategies for adaptation to impacts ***Comment:*** *Enter Comment*	High/Medium/Low
Champions for climate action in local government departments ***Comment:*** *Enter Comment*	High/Medium/Low

Criterion	Jurisdiction Rating[a]
Political support for implementing climate change adaptation strategies ***Comment:*** *Enter Comment*	High/Medium/Low
Financial resources devoted to climate change adaptation ***Comment:*** *Enter Comment*	High/Medium/Low
Local authority over sectors likely to be negative impacted ***Comment:*** *Enter Comment*	High/Medium/Low
Public Capacity	
Local residents knowledge of and understanding of climate risk ***Comment:*** *Enter Comment*	High/Medium/Low
Local residents support of adaptation efforts ***Comment:*** *Enter Comment*	High/Medium/Low
Local residents' capacity to adapt to climate impacts ***Comment:*** *Enter Comment*	High/Medium/Low
Local economy current capacity to adapt to climate impacts ***Comment:*** *Enter Comment*	High/Medium/Low
Local ecosystems capacity to adapt to climate impacts ***Comment:*** *Enter Comment*	High/Medium/Low

a. High = Capacity exists and is in use; Medium = Capacity may exist, but is not used or could use some improvement; Low = Capacity does not exist or could use substantial improvement; Unsure= Not enough information is known to assign a rating.

1.5 INTEGRATION REVIEW

For hazard mitigation planning, "integration" means that hazard mitigation information is used in other relevant planning mechanisms, such as general planning and capital facilities planning, and that relevant information from those sources is used in hazard mitigation. This section identifies where such integration is already in place, and where there are opportunities for further integration in the future. Resources listed at the end of this annex were used to provide information on integration. The progress reporting process described in Volume 1 of the hazard mitigation plan will document the progress of hazard mitigation actions related to integration and identify new opportunities for integration.

1.5.1 Existing Integration

Some level of integration has already been established between local hazard mitigation planning and the following other local plans and programs:

- **Plan or Program Name**—Description
- **Plan or Program Name**—Description
- **Plan or Program Name**—Description
- **Plan or Program Name**—Description
- **Plan or Program Name**—Description

1.5.2 Opportunities for Future Integration

The capability assessment presented in this annex indicates opportunities to integrate this mitigation plan with other jurisdictional planning/regulatory capabilities. Capabilities were identified as integration opportunities if they can support or enhance the actions identified in this plan or be supported or enhanced by components of this plan. The capability assessment identified the following plans and programs that do not currently integrate hazard mitigation information but provide opportunities to do so in the future:

- **Plan or Program Name**—Description
- **Plan or Program Name**—Description
- **Plan or Program Name**—Description
- **Plan or Program Name**—Description
- **Plan or Program Name**—Description

Taking action to integrate each of these programs with the hazard mitigation plan was considered as a mitigation action to include in the action plan presented in this annex.

1.6 RISK ASSESSMENT

1.6.1 Jurisdiction-Specific Natural Hazard Event History

Table 1-11 lists past occurrences of natural hazards for which specific damage was recorded in this jurisdiction Other hazard events that broadly affected the entire planning area, including this jurisdiction, are listed in the risk assessments in Volume 1 of this hazard mitigation plan.

Table 1-11. Past Natural Hazard Events

Type of Event	FEMA Disaster #	Date	Damage Assessment
Insert event type	_____	Date	$_____
Insert event type	_____	Date	$_____
Insert event type	_____	Date	$_____
Insert event type	_____	Date	$_____
Insert event type	_____	Date	$_____
Insert event type	_____	Date	$_____
Insert event type	_____	Date	$_____
Insert event type	_____	Date	$_____
Insert event type	_____	Date	$_____
Insert event type	_____	Date	$_____
Insert event type	_____	Date	$_____
Insert event type	_____	Date	$_____
Insert event type	_____	Date	$_____
Insert event type	_____	Date	$_____
Insert event type	_____	Date	$_____

1.6.2 Hazard Risk Ranking

Table 1-12 presents a local ranking of all hazards of concern for which this hazard mitigation plan provides complete risk assessments. As described in detail in Volume 1, the ranking process involves an assessment of the likelihood of occurrence for each hazard, along with its potential impacts on people, property and the economy. Mitigation actions target hazards with high and medium rankings.

Table 1-12. Hazard Risk Ranking

Rank	Hazard	Risk Ranking Score	Risk Category
1			High/Medium/Low
2			High/Medium/Low
3			High/Medium/Low
4			High/Medium/Low
5			High/Medium/Low
6			High/Medium/Low
7			High/Medium/Low
8			High/Medium/Low
9			High/Medium/Low

1.6.3 Jurisdiction-Specific Vulnerabilities

Volume 1 of this hazard mitigation plan provides complete risk assessments for each identified hazard of concern. This section provides information on a few key vulnerabilities for this jurisdiction. Available jurisdiction-specific risk maps of the hazards are provided at the end of this annex.

Repetitive Loss Properties

Repetitive loss records are as follows:

- Number of FEMA-identified Repetitive-Loss Properties: XX
- Number of FEMA-identified Severe-Repetitive-Loss Properties: XX
- Number of Repetitive-Loss Properties or Severe-Repetitive-Loss Properties that have been mitigated: XX

Other Noted Vulnerabilities

The following jurisdiction-specific issues have been identified based on a review of the results of the risk assessment, public involvement strategy, and other available resources:

- Insert as appropriate.
- Insert as appropriate.
- Insert as appropriate.

Mitigation actions addressing these issues were prioritized for consideration in the action plan presented in this annex.

1.7 STATUS OF PREVIOUS PLAN ACTIONS

If your jurisdiction has no previous hazard mitigation plan, please enter an "X" in the box at right and do not complete this section.

Table 1-13 summarizes the actions that were recommended in the previous version of the hazard mitigation plan and their implementation status at the time this update was prepared.

Table 1-13. Status of Previous Plan Actions

Action Item from Previous Plan	Completed	Removed; No Longer Feasible	Carried Over to Plan Update: Check if Yes	Carried Over to Plan Update: Action # in Update
Insert Action Number & Text ***Comment:*** *Enter Comment*				
Insert Action Number & Text ***Comment:*** *Enter Comment*				
Insert Action Number & Text ***Comment:*** *Enter Comment*				
Insert Action Number & Text ***Comment:*** *Enter Comment*				
Insert Action Number & Text ***Comment:*** *Enter Comment*				
Insert Action Number & Text ***Comment:*** *Enter Comment*				
Insert Action Number & Text ***Comment:*** *Enter Comment*				
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Insert Action Number & Text ***Comment:*** *Enter Comment*				
Insert Action Number & Text ***Comment:*** *Enter Comment*				
Insert Action Number & Text ***Comment:*** *Enter Comment*				
Insert Action Number & Text ***Comment:*** *Enter Comment*				
Insert Action Number & Text ***Comment:*** *Enter Comment*				

1.8 HAZARD MITIGATION ACTION PLAN

Table 1-14 lists the identified actions, which make up the hazard mitigation action plan for this jurisdiction. Table 1-15 identifies the priority for each action. Table 1-16 summarizes the mitigation actions by hazard of concern and mitigation type.

Table 1-14. Hazard Mitigation Action Plan Matrix

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action xxx-1—Where appropriate, support retrofitting, purchase or relocation of structures located in hazard areas, prioritizing those that have experienced repetitive losses and/or are located in high- or medium-risk hazard areas.						
Hazards Mitigated: Enter Response						
Existing	Enter Response	Enter Response	Enter Response	High	HMGP, PDM, FMA	Short-term
Action xxx-2— Integrate the hazard mitigation plan into other plans, ordinances and programs that dictate land use decisions in the community, including _____						
Hazards Mitigated: Enter Response						
New & Existing	Enter Response	Enter Response	Enter Response	Low	Staff Time, General Funds	Ongoing
Action xxx-3—Actively participate in the plan maintenance protocols outlined in Volume 1 of this hazard mitigation plan.						
Hazards Mitigated: Enter Response						
New & Existing	Enter Response	Enter Response	Enter Response	Low	Staff Time, General Funds	Short-term
Action xxx-4—Continue to maintain good standing and compliance under the NFIP through implementation of floodplain management programs that, at a minimum, meet the NFIP requirements: • Enforce the flood damage prevention ordinance. • Participate in floodplain identification and mapping updates. • Provide public assistance/information on floodplain requirements and impacts.						
Hazards Mitigated: Enter Response						
New & Existing	Enter Response	Enter Response	Enter Response	Low	Staff Time, General Funds	Ongoing
Action xxx-5—Identify and pursue strategies to increase adaptive capacity to climate change including but not limited to the following: • _____.						
Hazards Mitigated: Enter Response						
New & Existing	Enter Response	Enter Response	Enter Response	Low	Staff Time, General Funds	Short-term
Action xxx-6— Purchase generators for critical facilities and infrastructure that lack adequate backup power, including _____.						
Hazards Mitigated: Dam failure, earthquake, flooding, landslide, severe weather, tsunami, wildfire						
Existing	Enter Response	Enter Response	Enter Response			
Action xxx-7—Description						
Hazards Mitigated: Enter Response						
Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response
Action xxx-8—Description						
Hazards Mitigated: Enter Response						
Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action xxx-9—Description *Hazards Mitigated:* Enter Response						
Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response
Action xxx-10—Description *Hazards Mitigated:* Enter Response						
Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response
Action xxx-11—Description *Hazards Mitigated:* Enter Response						
Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response
Action xxx-12—Description *Hazards Mitigated:* Enter Response						
Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response
Action xxx-13—Description *Hazards Mitigated:* Enter Response						
Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response
Action xxx-14—Description *Hazards Mitigated:* Enter Response						
Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response
Action xxx-15—Description *Hazards Mitigated:* Enter Response						
Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response
Action xxx-16—Description *Hazards Mitigated:* Enter Response						
Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response
Action xxx-17—Description *Hazards Mitigated:* Enter Response						
Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response
Action xxx-18—Description *Hazards Mitigated:* Enter Response						
Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response
Action xxx-19—Description *Hazards Mitigated:* Enter Response						
Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response
Action xxx-20—Description *Hazards Mitigated:* Enter Response						
Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response

a. Short-term = Completion within 5 years; Long-term = Completion within 10 years; Ongoing= Continuing new or existing program with no completion date

Acronyms used here are defined at the beginning of this volume.

Table 1-15. Mitigation Action Priority

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Cost?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Implementation Priority[a]	Grant Pursuit Priority[a]
1	3	High	High	Yes	Yes	No	Medium	High
2	7	Medium	Low	Yes	No	Yes	High	Low
3	3	Low	Low	Yes	No	Yes	High	Low
4	6	Medium	Low	Yes	No	Yes	High	Low
5	7	Medium	Low	Yes	No	Yes	High	Medium
6	3	High	Medium	Yes	Yes	No	Medium	High
7								
8								
9								
10								
11								

a. See the introduction to this volume for explanation of priorities.

Table 1-16. Analysis of Mitigation Actions

Hazard Type	Action Addressing Hazard, by Mitigation Type[a]							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilience	Community Capacity Building
High-Risk Hazards								
Medium-Risk Hazards								
Low-Risk Hazards								

a. See the introduction to this volume for explanation of mitigation types.

1.9 PUBLIC OUTREACH

Table 1-17 lists public outreach activities in connection with this hazard mitigation plan update for this jurisdiction.

Table 1-17. Local Public Outreach

Local Outreach Activity	Date	Number of People Involved

1.10 INFORMATION SOURCES USED FOR THIS ANNEX

The following technical reports, plans, and regulatory mechanisms were reviewed to provide information for this annex.

- **___[jurisdiction name]___ Municipal Code**—The municipal code was reviewed for the full capability assessment and for identifying opportunities for action plan integration.
- **___[jurisdiction name]___ Flood Damage Prevention Ordinance**—The flood damage prevention ordinance was reviewed for compliance with the National Flood Insurance Program.
- <INSERT DOCUMENT NAME AND DESCRIPTION OF HOW IT WAS USED>
- <INSERT DOCUMENT NAME AND DESCRIPTION OF HOW IT WAS USED>
- <INSERT DOCUMENT NAME AND DESCRIPTION OF HOW IT WAS USED>
- <INSERT DOCUMENT NAME AND DESCRIPTION OF HOW IT WAS USED>
- <INSERT DOCUMENT NAME AND DESCRIPTION OF HOW IT WAS USED>

The following outside resources and references were reviewed:

- **Hazard Mitigation Plan Annex Development Toolkit**—The toolkit was used to support the identification of past hazard events and noted vulnerabilities, the risk ranking, and the development of the mitigation action plan.
- <INSERT DOCUMENT NAME AND DESCRIPTION OF HOW IT WAS USED>

1.11 FUTURE NEEDS TO BETTER UNDERSTAND RISK/VULNERABILITY

Insert text, if any; otherwise, delete section

1.12 ADDITIONAL COMMENTS

Insert text, if any; otherwise, delete section

INSTRUCTIONS FOR COMPLETING SPECIAL-PURPOSE DISTRICT ANNEX TEMPLATE

Jurisdictional annex templates for the *2022 Ventura County Multi-Jurisdictional Hazard Mitigation Plan* update will be completed in three phases. **This document provides instructions for completing all phases of the template for special-purpose districts.**

The target timeline for completion is as follows:

- **Phase 1**—Team, Profile, Trends, and Previous Plan Status
  - **Deploy:** May 10, 2021
  - **Due:** June 21, 2021 by close of business
- **Phase 2**—Capability Assessment, Integration Review, and Information Sources
  - **Deploy:** July 6, 2021
  - **Due:** August 20, 2021 by close of business
- **Phase 3**—Risk Assessment, Action Plan, Information Sources, Future Needs, and Additional Comments
  - **Deploy:** September 9, 2021
  - **Mandatory Phase 3 Workshop**: September 23, 2021
  - **Due:** October 25, 2021 by close of business, Pacific Time. **No due date extensions!**

Please direct any questions and return your completed Phase 3 template in electronic format to:

Megan Brotherton
Tetra Tech
Phone: (808) 339-9119
E-mail: *megan.brotherton@tetratech.com*

A Note About Formatting

The template for the annex is a Microsoft Word document in a format that will be used in the final plan. Partners are asked to use this template so that a uniform product will be completed for each partner.

Content should be entered directly into the template rather than creating text in another document and pasting it into the template. Text from another source may alter the formatting of the document.

The section and table numbering in the document will be updated when completed annexes are combined into the final document. Please do not adjust any of the numbering.

For planning partners who participated in the 2015 planning effort, relevant information has been brought over to the 2022 template. Fields that require attention have been highlighted using the following color coding:

- **Yellow:** Text has been brought over from 2015 Plan and should be reviewed and updated as needed.
- **Pink:** This is a new field that will require information that was not included in 2015.

Please un-highlight each field that you update so that reviewers will know an edit has been made.

New planning partners will need to complete the template in its entirety.

Appendix B.2
Instructions and Templates for Special Purpose District Annexes

PHASE 1 INSTRUCTIONS

CHAPTER TITLE

In the chapter title at the top of Page 1, type in the complete official name of your district (e.g. West County Fire Protection District #1, Johnsonville Flood Protection District). Do not change the chapter number. Revise only the jurisdiction name. If your jurisdiction's name has already been entered, verify that wording and spelling are correct; revise as needed.

LOCAL HAZARD MITIGATION PLANNING TEAM

Points of Contact

Provide the name, title, mailing address, telephone number, and e-mail address for the primary point of contact for your jurisdiction. This should be the person responsible for monitoring, evaluating, and updating the annex for your jurisdiction. This person should also be the principle liaison between your jurisdiction and the Steering Committee overseeing development of this plan.

In addition, designate an alternate point of contact. This would be a person to contact should the primary point of contact be unavailable or no longer employed by the jurisdiction.

Note: Both of these contacts should match the contacts that were designated in your jurisdiction's letter of intent to participate in this planning process. If you have changed the primary or secondary contact, let the planning team know by inserting a comment into the document.

Participating Planning Team

Populate Table 1-1 with the names of staff from your jurisdiction who participated in preparing this annex or otherwise contributed to the planning process for this hazard mitigation plan.

JURISDICTION PROFILE

Overview

Provide a brief summary description of the following:

- The purpose of the jurisdiction
- The date of inception
- The type of organization
- The number of employees
- Funding sources
- The type of governing body, and who has adoptive authority.

This should be information that is specific to your jurisdiction and will not be provided in the overall, planning area-wide mitigation plan document. Provide a statement similar to the example below:

> **EXAMPLE:** *The Johnsonville Community Services District is a special district created in 1952 to provide water and sewer service. A five-member elected Board of Directors governs the District. The Board assumes responsibility for the adoption of this plan; the General Manager will oversee its implementation. The District currently employs a staff of 21. Funding comes primarily through rates and revenue bonds.*

Service Area

Provide a brief description of the following:

- Who the District's customers are and an approximation of how many are currently served
- The area served, in square miles
- The geographic extent of the service area

This should be information that is specific to your jurisdiction and will not be provided in the overall, planning area-wide mitigation plan document. Provide a statement similar to the example below:

> **EXAMPLE:** *The Johnsonville Community Services District serves unincorporated areas of Jones County east of the City of Smithburg, including the communities of Johnsonville, Creeks Corner, Jones Hill, Fields Landing, King Salmon, and Freshwater. The current total service area is 3.3 square miles. As of April 30, 2020, the District serves 7,305 water connections and 6,108 sewer connections.*

Assets

List District-owned assets in the categories shown on the table (and described in the sections below). Include an approximate value for each asset and a subtotal value for identified assets in each category.

Property

Provide an approximate value for any land owned by the District.

Equipment

List equipment owned by the District that is used in times of emergency or that, if incapacitated, could severely impact the service area (vehicles, generators, pumps, etc.). Provide an approximate replacement value for each item. Equipment of similar type may be listed as a single category (e.g., "3 diesel-powered generators"). For water and sewer districts, include mileage of pipeline under this category.

Critical Facilities

List District-owned facilities that are vital to maintain services to the service area. Include the address of each facility. Provide an approximate replacement value for each line. Critical facilities are generally defined as facilities owned by the District that are critical to District operations and to public health or safety and that are especially important following hazard events, including but not limited to the following:

- Structures or facilities that produce, use, or store hazardous materials (highly volatile, flammable, explosive, toxic and/or water-reactive materials)

- Hospitals, nursing homes, and housing facilities likely to contain occupants who may not be sufficiently mobile to avoid death or injury during a natural hazard event
- Mass gathering facilities that may be used as evacuation shelters (such as schools or community centers)
- Transportation infrastructure such as roads, bridges and airports that provide sources for evacuation before, during and after natural hazard events
- Police stations, fire stations, government facilities, vehicle equipment and storage facilities, and emergency operation centers that are needed for response activities before, during and after a natural hazard event
- Public utility facilities such as drinking water, stormwater, and wastewater systems that are vital to providing normal services to damaged areas before, during and after natural hazard events.

The table below shows an example of assets to be listed in this section.

Sample Completed Table – Special District Assets

Asset	Value
Property	
11.5 Acres	$5,750,000
Equipment	
Total length of pipe 40 miles ($1.32 million per mile X 40 miles)	$52,800,000
4 Emergency Generators	$250,000
Total:	***$53,050,000***
Critical Facilities	
Administrative Buildings – 357 S. Jones Street	$2,750,000
Philips Pump Station – 111 Fifth Avenue N.	$377,000
Total:	***$3,127,000***

NOTE: Placeholders in the table of assets request **ADDRESSES** for critical facilities. These addresses will not be included in the final published annex, but are needed in order to perform risk mapping and risk analysis for the hazard mitigation plan. Include the addresses in the table if convenient. If not, then provide a separate document listing all critical facilities and addresses for use in development of the hazard mitigation plan.

CURRENT TRENDS

Provide a brief description of previous growth trends in the service area and anticipated future increase or decrease in services (if applicable). This should be information that is specific to your jurisdiction and will not be provided in the overall, planning area-wide mitigation plan document. Provide a statement similar to the example below:

> **EXAMPLE:** *The Johnsonville Community Services District originally was formed to serve only the Johnsonville area. The District's service area expanded throughout the years to include the full area served today. Total customers have increased by 3 percent since 2010. Population in the service area is not projected to change significantly over the next 10 years, and the District has no plans to expand its service area.*

STATUS OF PREVIOUS PLAN ACTIONS

Note that this section applies only to jurisdictions that are conducting updates to previously approved hazard mitigation plans. If your jurisdiction has not previously participated in an approved plan, enter an "X" in the box at the beginning of this section and do not complete the section. We will remove this section from your final annex.

Also note that this section is further back in the annex than the rest of the Phase 1 content. Some Phase 2 sections are included before it.

The hazard mitigation plan update must describe the status of all action items from each jurisdiction's previous hazard mitigation plan. Each action item must be marked as ONE of the options below by checking the appropriate box (place an X) and providing the following information:

- **Completed**—If an action has been completed since the prior plan was prepared, check the "Completed" box and provide a date of completion in the comment section. If an action has been initiated and is an ongoing program (e.g. annual outreach event), you may mark it as completed and note that it is ongoing in the comments. If an action addresses an ongoing program you would like to continue to include in your action plan, see the "Carried Over to Plan Update" bullet below.
- **Removed**—If action items are to be removed because they are no longer feasible, a reason must be given. Lack of funding does not mean that it is no longer feasible, unless the sole source of funding for an action is no longer available. Place a comment in the comment section explaining why the action is no longer feasible or barriers that prevented the action from being implemented (e.g., "Action no longer considered feasible due to lack of political support."). If the wording and/or intent of a previously identified action is unclear, this can be a reason for removal. A change in community priorities may also be a reason for removal and should be discussed in the comments.
- **Carried Over to Plan Update**—If an action is in progress, is ongoing, or has not been initiated and you would like to carry it over to the plan update, check the "Check if Yes" column under "Carried Over to Plan Update." Selecting this option indicates that the action will be included in the mitigation action plan for this update. If you are carrying over an action to the update, include a comment describing any action that has been taken or why the action was not taken (specifically, any barriers or obstacles that prevented the action from moving forward or slowed progress). Leave the last column, "Action # in Update," blank at this point. This will be filled in after completing the updated action plan in Phase 3.

Ensure that you have provided a status and a comment for each action.

HAZARD MITIGATION ACTION PLAN INPUT

When preparing the hazard mitigation action plan in Phase 3, all action items from your jurisdiction's previous hazard mitigation plan that are marked as "Carried Over to Plan Update" will need to be included in the action plan.

THIS COMPLETES PHASE 1

PHASE 2 INSTRUCTIONS

CAPABILITY ASSESSMENT

Note that it is unlikely that one person will be able to complete all sections of the capability assessment alone. The primary preparer will likely need to reach out to other departments within the local government for information. It may be beneficial to provide these individuals with background information about this planning process, as input from them will be needed again during Phase 3 of the annex development.

Planning and Regulatory Capability

List any federal, state, local or district ordinances, plans, or policies that apply to your jurisdiction and relate to hazard mitigation. Provide the date of last update and any comments as appropriate. The table below shows an example of items to be listed in this section.

Sample Completed Table – Planning and Regulatory Capability

Plan, Study or Program	Date of Most Recent Update	Comment
District Design Standards	2010	
Capital Improvement Program	Updated annually	covers 5 year timeframe
Emergency Operations Plan	2000	
Facility Maintenance Manual	1990	
State Building Code	2016	
Division of State Architects		Review of all building and site design features is required prior to construction

Fiscal Capability

Complete the table titled "Fiscal Capability" by indicating whether each of the listed financial resources is accessible to your jurisdiction. Enter "Yes" if the resource is fully accessible to your jurisdiction. Enter "No" if there are limitations or prerequisites that may hinder your use of this resource.

Administrative and Technical Capability

Complete the table titled "Administrative and Technical Capability" by indicating whether your jurisdiction has access to each of the listed personnel resources. Enter "Yes" or "No" in the column labeled "Available?". If yes, then enter the department and position title. If you have contract support with these capabilities, you can still answer "Yes." Indicate in the department row that this resource is provided through contract.

Education and Outreach Capability

Complete the table titled "Education and Outreach."

HAZARD MITIGATION ACTION PLAN INPUT

When preparing the hazard mitigation action plan in Phase 3, review all the above capability assessment tables and consider including actions to provide a capability that your jurisdiction does not currently have, update a capability that your jurisdiction does have, or implement an action that is recommended in an existing plan or program.

Community Classifications

Complete the table titled "Community Classifications" to indicate your jurisdiction's participation in various national programs related to natural hazard mitigation. For each program enter "Yes" or "No" in the second column to indicate whether your jurisdiction participates. If yes, then enter the classification that your jurisdiction has earned under the program in the third column and the date on which that classification was issued in the fourth column; enter "N/A" in the third and fourth columns if your jurisdiction is not participating. If you do not know your current classification, information is available at the following websites:

- **FIPS Code**— https://www.census.gov/geographies/reference-files/2018/demo/popest/2018-fips.html
- **DUNS #**— https://www.dnb.com/duns-number.html
- **Community Rating System**— https://www.fema.gov/floodplain-management/community-rating-system
- **Building Code Effectiveness Grading Schedule**— https://www.isomitigation.com/bcegs/iso-s-building-code-effectiveness-grading-schedule-bcegs.html
- **Public Protection Classification**— https://www.isomitigation.com/ppc/
- **Storm Ready**— https://www.weather.gov/stormready/communities
- **Firewise**— http://www.firewise.org/usa-recognition-program/map-of-active-participants.aspx
- **Tsunami Ready**— https://www.weather.gov/tsunamiready/communities

Adaptive Capacity for Climate Change

Consider climate change impact concerns such as the following:

- Reduced snowpack
- Increased wildfires
- Sea level rise
- Inland flooding
- Threats to sensitive species
- Loss in agricultural productivity
- Public health and safety.

With those impacts in mind, complete the table titled "Adaptive Capacity for Climate Change" by indicating your jurisdiction's capacity for each listed criterion as follows:

- **High**—The capacity exists and is in use.
- **Medium**—The capacity may exist, but is not used or could use some improvement.
- **Low**—The capacity does not exist or could use substantial improvement.
- **Unsure**—Not enough information is known to assign a rating.

This is a subjective assessment, but providing a few words of explanation is useful. It is highly recommended that you complete this table with an internal planning team after reviewing the results of the other capability assessment tables.

HAZARD MITIGATION ACTION PLAN INPUT

When preparing the hazard mitigation action plan in Phase 3, review all the adaptive capacity criteria and consider including actions to improve the rating for those rated medium or low, to make use of the capacity for those rated high, or to acquire additional information for those rated unsure.

INTEGRATION REVIEW

For hazard mitigation planning, "integration" means that hazard mitigation information is used in other relevant planning mechanisms, such as capital facilities planning, and that relevant information from those sources is used in hazard mitigation. FEMA recommends integration as follows:

- Integrate hazard mitigation plan goals with community objectives (e.g. incorporate the goals for risk reduction and safety into the policies of other plans).
- Use the risk assessment to inform plans and policies (e.g. incorporate risk assessment findings into emergency operations plans).
- Implement mitigation actions through existing mechanisms (e.g. include mitigation projects in the capital improvement plan).
- Think about mitigation before and after a disaster (e.g. build recovery planning on existing mitigation plans and goals).

After reviewing the plans, programs and ordinances identified in the capability assessment tables, identify all plans and programs that have already been integrated with the hazard mitigation plan, and those that offer opportunities for future integration.

Existing Integration

In the highlighted bullet list, provide a brief description of integrated plans or ordinances and how each is integrated. Consider listing items marked as Completed in the "Status of Previous Plan Actions" table if they were indicated as being ongoing actions. Examples are as follows:

- Capital Improvement Plan—The capital improvement plan includes projects that can help mitigate potential hazards. The District will act to ensure consistency between the hazard mitigation plan and the current and future capital improvement plans. The hazard mitigation plan may identify new possible funding sources for capital improvement projects and may result in modifications to proposed projects based on results of the risk assessment.
- Emergency Operations Plan—The results of the risk assessment were used in the development of the emergency operations plan.

- **Facilities Plan**—The results of the risk assessment and mapped hazard areas are used in facility planning for the District. Potential sites are reviewed for hazard risks, and appropriate mitigation measures are considered in building and site design.

HAZARD MITIGATION ACTION PLAN INPUT

When preparing the hazard mitigation action plan in Phase 3, any plans that fall into the "Existing Integration" category should be reviewed and elements from them should be included in the action plan as appropriate.

Opportunities for Future Integration

List any plans or programs that offer the potential for future integration and describe the process by which integration will occur. Examples follow:

- **Capital Improvement Projects**—Capital improvement project proposals may take into consideration hazard mitigation potential as a means of evaluating project prioritization.
- **Post-Disaster Recovery Plan**—The District does not have a recovery plan and intends to develop one as a mitigation planning action during the next five years. The plan will build on the mitigation goals and objectives identified in the mitigation plan.

Consider other programs you may have in place in your jurisdiction that include routine consideration and management of hazard risk. Examples of such programs may include: tree pruning programs, right-of-way mowing programs, erosion control or stream maintenance programs, etc. Add any such programs to the integration discussion and provide a brief description of how these program manage (or could be adapted to manage) risk from hazards.

HAZARD MITIGATION ACTION PLAN INPUT

When preparing the hazard mitigation action plan in Phase 3, an action to integrate any identified "Opportunities for Future Integration" should be considered for inclusion in the action plan.

INFORMATION SOURCES USED FOR THIS ANNEX

Note that this section will ultimately describe all information sources used to develop this annex, but that only the sources used for Phases 1 and 2 will be listed at this point. Additional sources will be added with the preparation of the Phase 3 annex.

This section should describe what resources you used to complete the annex and how you used them. Several items are started for you, but be sure to update and enhance any descriptions. Providing this information is a requirement to pass the state and FEMA review process.

THIS COMPLETES PHASE 2

PHASE 3 INSTRUCTIONS

RISK ASSESSMENT

Jurisdiction-Specific Natural Hazard Event History

In the table titled "Past Natural Hazard Events," list in chronological order (most recent first) any natural hazard event that has caused damage to your jurisdiction. If it was a federally declared disaster, include the FEMA Disaster #, otherwise enter N/A in that column. Include the date of the event and the estimated dollar amount of damage it caused. You are welcome to include any events, but special attention should be made to include major storms and federally declared disasters. Refer to the table below that lists hazard events in the planning area.

Table 1. Past Natural Hazard Events

Type of Event	FEMA Disaster #	Date	Damage Assessment
			$

We recommend including most large-scale disasters, unless you know that there were no impacts on your jurisdiction. Specifically, we recommend that you include these events if you have damage estimate information or can provide a brief description of impacts that occurred within your community. In addition to these events, refer to the NOAA NCDC storm events database included in the toolkit. We recommend conducting a search for the name of your jurisdiction in order to identify events with known impacts. Other potential sources of damage information include the following

- Preliminary damage estimates your jurisdiction filed with the county or state
- Insurance claims data
- Newspaper archives
- Emergency management documents (general plan safety element, emergency response plan, etc.)
- Resident input.

If you do not have estimates for costs of damage caused, list "Not Available" in the "Damage Assessment" column or list a brief description of the damage rather than a dollar value (e.g., Main Street closed as a result of flooding, downed trees and residential damage). Note that tracking such damage is a valid and useful mitigation action if your jurisdiction does not currently track such information.

Hazard Risk Ranking

Risk ranking identifies which hazards pose the greatest risk to the community, based on how likely it is for each hazard to occur (this is called the community's exposure) and how great an impact each hazard will have if it does occur (this is called the community's vulnerability). Every jurisdiction has differing degrees of risk exposure and vulnerability and therefore needs to rank risk for its own area. Risk rankings for cities and the county have been calculated in the "Loss Matrix" spreadsheet included in the annex preparation toolkit. These rankings are on the basis of risk ranking scores for each hazard that were calculated based on the hazard's probability of occurrence and its potential impact on people, property and the economy.

The risk ranking methodology used for cities and counties is not usable for special-purpose districts because the risk-related mapping generally does not align with the boundaries of districts. To rank risk for your District, use the following procedure:

- Find the risk ranking scores in the Loss Matrix spreadsheet (on the "Risk Ranking Summary" tab) for the county overall and for any cities whose area overlaps that of your District.
- For each hazard, generate a risk ranking score for your District by calculating the average of the scores for those other jurisdictions.
- Rank the hazards based on those average scores:
  - Assign the rank of 1 to the hazard with the highest risk ranking score, the rank of 2 to the hazard with the second highest ranking score; and so on.
  - Assign the same rank to any two hazards with equal risk ranking scores
- If the resulting ranking differs from what you know based on substantiated data and documentation, alter the scores and ranking as needed based on this knowledge.

- Assign each hazard to the risk category of "High," Medium," or "Low" based on the risk rating score:
  - Low for scores of 0 to 15
  - Medium for scores of 16 to 30
  - High for scores greater than 30

Enter the results of this analysis in the "Hazard Risk Ranking" table in the template; enter the hazards in order of ranking, with 1 at the top of the table.

HAZARD MITIGATION ACTION PLAN INPUT

When preparing the hazard mitigation action plan in Phase 3, you will need to have at least one mitigation action for each hazard ranked as "high" or "medium."

Jurisdiction-Specific Vulnerabilities

Review the results of the risk assessment included in the toolkit, your jurisdiction's natural events history, and any relevant public comments/input, then develop a few sentences that discuss specific hazard vulnerabilities. You do not need to develop a sentence for every hazard, but identify a few issues you would like to highlight. Also list any known hazard vulnerabilities in your jurisdiction that may not be apparent from the risk assessment and other information provided.

Spending some time thinking about the results of the risk assessment and other noted vulnerabilities will be a big help in the development of your hazard mitigation action plan. The following are examples of vulnerabilities you could identify through this exercise:

- Over the past 10 years, the jurisdiction has experienced more than $1 million in damage to critical assets from severe storm events.
- 17 critical assets are in areas that would be permanently inundated with 12 inches of sea level rise.
- One significant District asset is not equipped with a generator and four District buildings are unreinforced masonry or soft-story construction.
- An area along the river is eroding and threatening a District-owned treatment facility.

HAZARD MITIGATION ACTION PLAN INPUT

When preparing the hazard mitigation action plan in Phase 3, consider including actions to address the jurisdiction-specific vulnerabilities listed in this section.

HAZARD MITIGATION ACTION PLAN

Hazard Mitigation Action Plan Matrix

The hazard mitigation action plan is the heart of your jurisdictional annex. This is where you will identify the actions your jurisdiction would like to pursue with this plan.

Select Recommended Actions

All of the work that you have done thus far should provide you with ideas for actions. Throughout these instructions, green boxes labeled "Hazard Mitigation Action Plan Input" have indicated information that needs to be considered in the selection of mitigation actions. The following sections describe how to consider these and other information sources to develop a list of potential actions.

Be sure to consider the following factors in your selection of actions:

- Select actions that are consistent with the overall purpose, goals, and objectives of the hazard mitigation plan.
- Identify actions where benefits exceed costs.
- Include any action that your jurisdiction has committed to pursuing, regardless of grant eligibility.
- Know what is and is not grant-eligible under various federal grant programs (see the fact sheet on FEMA hazard mitigation grant programs in the toolkit and the table on the next page).

Material Previously Developed for This Annex

Capability Assessment Section—Planning and Regulatory Capability Table, Fiscal Capability Table, Administrative and Technical Capability Table, and Education and Outreach Table

Review these tables and consider the following:

- For any capability that you do not currently have, consider whether your jurisdiction should have this capability. If so, consider including an action to develop/acquire the capability.
- For any capability that you do currently have, consider whether this capability can be leveraged to increase or improve hazard mitigation in the jurisdiction.
- If any items listed in the Planning and Regulatory Capabilities table have not been updated in more than 10 years, consider an action to review and update the capability and, as appropriate, incorporate hazard mitigation principles or information obtained in the risk assessment.
- Consider including actions that are identified in other plans and programs (capital improvement plans, strategic plans, etc.) as actions in this plan.

Capability Assessment Section— Adaptive Capacity for Climate Change Table

Consider your responses to this section:

- For criteria that you listed as medium or low, think of ways you could improve this rating (see adaptive capacity portion of the mitigation best practices catalog).
- For criteria you listed as high, think about how you can leverage this capacity to improve or enhance mitigation or continue to improve this capacity.
- For criteria that you were unable to provide responses for, consider ways you could improve your understanding of this capacity (see mitigation best practices and adaptive capacity catalog).

Table 2. Federal Hazard Mitigation Grant Program Eligibility by Action Type

Eligible Activities	Hazard Mitigation Grant Program	BRIC	Flood Mitigation Assistance
Mitigation Projects			
Property Acquisition and Structure Demolition	√	√	√
Property Acquisition and Structure Relocation	√	√	√
Structure Elevation	√	√	√
Mitigation Reconstruction	√	√	√
Dry Floodproofing of Non-residential Structures	√	√	√
Generators	√	√	
Localized Flood Risk Reduction Projects	√	√	√
Non-Localized Flood Risk Reduction Projects	√	√	
Structural Retrofitting of Existing Buildings	√	√	√
Non-structural Retrofitting of Existing Buildings and Facilities	√	√	√
Safe Room Construction	√	√	
Infrastructure Retrofit	√	√	√
Soil Stabilization	√	√	√
Wildfire Mitigation	√	√	
Post-Disaster Code Enforcement	√		
Advance Assistance	√		
5 Percent Initiative Projects*	√		
Aquifer and Storage Recovery**	√	√	√
Flood Diversion and Storage**	√	√	√
Floodplain and Stream Restoration**	√	√	√
Green Infrastructure**	√	√	√
Miscellaneous/Other**	√	√	√
Hazard Mitigation Planning	√	√	√
Technical Assistance			√
Management Costs	√	√	√

* FEMA allows increasing the 5% initiative amount under the Hazard Mitigation Grant Program up to 10% for a presidential major disaster declaration. The additional 5% initiative funding can be used for activities that promote disaster-resistant codes for all hazards. As a condition of the award, either a disaster-resistant building code must be adopted or an improved Building Code Effectiveness Grading Schedule is required.

** Indicates that any proposed action will be evaluated on its own merit against program requirements. Eligible projects will be approved provided funding is available.

Integration Review Section

Review the items you identified in this section and consider an action that specifically says what the plan, code, ordinance etc. is and how it will be integrated.

Risk Ranking Section

You must identify at least one mitigation action that is clearly defined and actionable (i.e. not a preparedness or response action) for every hazard that is categorized in the risk ranking as “high” or “medium” risk.

Jurisdiction-Specific Vulnerabilities Section

Review the vulnerability issues that you identified in this section and consider actions to address them (see mitigation best practices catalog).

Status of Previous Plan Actions Section

If your jurisdiction participated in a previous hazard mitigation plan, be sure to include any actions that were identified as "carry over" actions.

Other Sources

Mitigation Best Practices Catalog

A catalog that includes best practices identified by FEMA and other agencies, as well as recommendations from the steering committee and other stakeholders, is included in your toolkit. Review the catalog and identify actions your jurisdiction should consider for its action plan.

Public Input

Review input received during the process, specifically the public survey results included in your toolkit.

Common Actions for All Partners

The following three actions have been prepopulated in your annex template; **these three actions should be included in every annex and should not be removed**:

- Where appropriate, support retro-fitting, purchase or relocation of structures located in high hazard areas, prioritizing those structures that have experienced repetitive losses and/or are located in high or medium ranked hazard.
- Actively participate in the plan maintenance protocols outlined in Volume 1 of this hazard mitigation plan.
- Purchase generators for critical facilities and infrastructure that lack adequate back-up power.

In addition, the core planning team recommends that every planning partner strongly consider the following actions:

- Identify and pursue strategies to increase adaptive capacity to climate change.
- Develop and implement a program to capture perishable data after significant events (e.g. high water marks, preliminary damage estimates, damage photos) to support future mitigation efforts including the implementation and maintenance of the hazard mitigation plan.
- Support the County-wide initiatives identified in Volume I of the hazard mitigation plan.
- Develop a post-disaster recovery plan and a debris management plan.
- Develop and/or update plans that support or enhance continuity of operations following disasters.

The specifics of all these common actions should be adjusted as needed for the particulars of each community.

Complete the Table

Complete the table titled "Hazard Mitigation Action Plan Matrix" for all the actions you have identified and would like to include in the plan:

- Enter the action number (see box at right) and description. **If the action is carried over from your previous hazard mitigation plan, return to the "Status of Previous Plan Actions" table you completed in Phase 1 and enter the new action number in the column labeled "Action # in Update."**
- Indicate whether the action mitigates hazards for new and/or existing assets.
- Identify the specific hazards the action will mitigate (note: you must list each hazard by name; simply indicating "all hazards" is not deemed acceptable).
- Identify by number the mitigation plan objectives that the action addresses (see toolkit).

Action Numbering

Actions are to be numbered using the three-letter code for your jurisdiction shown below, followed by a hyphen and the action's sequential number:

- Cal State/Channel Islands—CSU-1, CSU-2…
- Calleguas Municipal Water—CAL-1, CAL-2…
- Casitas Municipal Water—CAS-1, CAS-2…
- Channel Is. Beach CSD—CIB-1, CIB-2…
- Conejo Recreation & Park—CRP-1, CRP-2…
- Ojai Valley Sanitary—OVS-1, OVS-2…
- Pleasant Valley Recreation & Park—PLV-1, PLV-2…
- Saticoy Sanitary—SAT-1, SAT-2…
- Triunfo Water & Sanitation—TRI-1, TRI-2…
- United Water Conservation—UWC-1, UWC-2…
- Ventura County Fire Protection—VFP-1, VFP-2…
- Ventura County Office of Education—VOE-1, VOE-2…
- Ventura County Watershed Protection—VWP-1, VWP-2…
- Ventura County Emergency Services—VES-1, VES-2…
- Ventura Regional Sanitation—VRS-1, VRS-2

- Indicate who will be the lead in administering the action. This will most likely be a department within your jurisdiction (e.g. planning or public works). If you wish to indicate more than one department as responsible for the action, clearly identify one as the lead agency and list the others in the "supporting agency" column.
- Enter an estimated cost in dollars if known; otherwise, enter "High," "Medium," or "Low," as determined for the prioritization process described in the following section.
- Identify funding sources for the action. If it is a grant, include the grant-providing agency as well as funding sources for any required cost share. Refer to your fiscal capability assessment to identify possible sources of funding and refer to the table on page 14 of these instructions for project eligibility for FEMA's hazard mitigation assistance grant programs.
- Indicate the time line as "short-term" (1 to 5 years) or "long-term" (5 years or greater) or "ongoing" (a continual program)

Mitigation Action Priority

Complete the information in the table titled "Mitigation Action Priority" as follows:

- **Action #**—Indicate the action number from the Hazard Mitigation Action Plan Matrix table.
- **# of Objectives Met**—Enter the number of objectives the action will meet.
- **Benefits**—Enter "High," "Medium" or "Low" as follows:
  - High—Action will provide an immediate reduction of risk exposure for life and property.
  - Medium—Action will have a long-term impact on the reduction of risk exposure for life and property, or action will provide an immediate reduction in the risk exposure for property.
  - Low—Long-term benefits of the action are difficult to quantify in the short term.

- **Cost**—Enter "High," "Medium" or "Low" as follows:
  - High—Existing funding will not cover the cost of the action; implementation would require new revenue through an alternative source (for example, bonds, grants, and fee increases).
  - Medium—The action could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the action would have to be spread over multiple years.
  - Low—The action could be funded under the existing budget. The action is part of or can be part of an ongoing existing program.

- **Do Benefits Exceed the Cost?**—Enter "Yes" or "No." This is a qualitative assessment. Enter "Yes" if the benefit rating (high, medium or low) is the same as or higher than the cost rating (high benefit/high cost; high benefit/medium cost; medium benefit/low cost; etc.). Enter "No" if the benefit rating is lower than the cost rating (medium benefit/high cost, low benefit/medium cost; etc.)
- **Is the Action Grant-Eligible?**—Enter "Yes" or "No." Refer to the fact sheet on FEMA hazard mitigation grant programs in the annex preparation toolkit and the table on page 14 of these instructions.
- **Can Action Be Funded Under Existing Program Budgets?**—Enter "Yes" or "No." In other words, is this action currently budgeted for, or would it require a new budget authorization or funding from another source such as grants?
- **Implementation Priority**— Enter "High," "Medium" or "Low" as follows:
  - High Priority—An action that meets multiple objectives, has benefits that exceed costs, and has a secured source of funding. Action can be completed in the short term (1 to 5 years).
  - Medium Priority—An action that meets multiple objectives, has benefits that exceed costs, and is eligible for funding though no funding has yet been secured for it. Action can be completed in the short term (1 to 5 years), once funding is secured. Medium-priority actions become high-priority actions once funding is secured.
  - Low Priority—An action that will mitigate the risk of a hazard, has benefits that do not exceed the costs or are difficult to quantify, has no secured source of funding, and is not eligible for any known grant funding. Action can be completed in the long term (1 to 10 years). Low-priority actions may be eligible for grant funding from programs that have not yet been identified.

- **Grant Pursuit Priority**— Enter "High," "Medium" or "Low" as follows:
  - High Priority—An action that meets identified grant eligibility requirements, has high benefits, and is listed as high or medium implementation priority; local funding options are unavailable or available local funds could be used instead for actions that are not eligible for grant funding.
  - Medium Priority—An action that meets identified grant eligibility requirements, has medium or low benefits, and is listed as medium or low implementation priority; local funding options are unavailable.
  - Low Priority—An action that has not been identified as meeting any grant eligibility requirements.

Actions identified as high-grant-pursuit priority actions should be closely reviewed for consideration when grant funding opportunities arise.

Note: If a jurisdiction wishes to identify an action as high priority that is outside of the prioritization scheme for high priorities, a note indicating so should be inserted and a rationale should be provided.

Analysis of Mitigation Actions

In the table titled "Analysis of Mitigation Actions," for each combination of hazard type and mitigation type, enter the numbers of all recommended actions that address that hazard type and can be categorized as that mitigation type. The mitigation types are as follows:

- **Prevention**—Government, administrative or regulatory actions that influence the way land and buildings are developed to reduce hazard losses. Includes planning and zoning, floodplain laws, capital improvement programs, open space preservation, and stormwater management regulations.
- **Property Protection**—Modification of buildings or structures to protect them from a hazard or removal of structures from a hazard area. Includes acquisition, elevation, relocation, structural retrofit, storm shutters, and shatter-resistant glass.
- **Public Education & Awareness**—Actions to inform residents and elected officials about hazards and ways to mitigate them. Includes outreach projects, real estate disclosure, hazard information centers, and school-age and adult education.
- **Natural Resource Protection**—Actions that minimize hazard loss and preserve or restore the functions of natural systems. Includes sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, wetland restoration and preservation, and green infrastructure.
- **Emergency Services**—Actions that protect people and property during and immediately after a hazard event. Includes warning systems, emergency response services, and the protection of essential facilities.
- **Structural Projects**—Actions that involve the construction of structures to reduce the impact of a hazard. Includes dams, setback levees, floodwalls, retaining walls, and safe rooms.
- **Climate Resilience**—Actions that incorporate methods to mitigate and/or adapt to the impacts of climate change. Includes aquifer storage and recovery activities, incorporating future conditions projections in project design or planning, or actions that specifically address jurisdiction-specific climate change risks, such as sea-level rise or urban heat island effect.
- **Community Capacity Building**—Actions that increase or enhance local capabilities to adjust to potential damage, to take advantage of opportunities, or to respond to consequences. Includes staff training, memorandums of understanding, development of plans and studies, and monitoring programs.

This exercise demonstrates that the jurisdiction has selected a comprehensive range of actions. This table must show at least one action to address each "high" and "medium" ranked hazard. Planning partners should aim to identify at least one action for each mitigation type, but this is not required.

An example of a completed "Analysis of Mitigation Actions" table is provided below. Note that an action can be more than one mitigation type.

Sample Completed Table – Analysis of Mitigation Actions

Hazard Type	Action Addressing Hazard, by Mitigation Type							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilience	Community Capacity Building
High-Risk Hazards								
Dam Failure	EX-2, 3, 4, 5, 6	EX-1, 6	EX-4, 6		EX-8, 11			EX-3, 4, 8, 9, 10
Drought	EX-2	EX-1	EX-4					EX-3, 4, 8, 9, 10
Medium-Risk Hazards								
Earthquake	EX-2, 3, 4, 5, 7	EX-1, 7	EX-4		EX-8, 11			EX-3, 4, 8, 9
Flooding	EX-2, 3, 4, 5, 6, 7	EX-1, 6, 7	EX-4, 6	EX-9	EX-8, 11	EX-6		EX-3, 4, 8, 9, 10
Landslide	EX-2, 3, 4, 5, 7	EX-1, 7	EX-4		EX-8, 11			EX-3, 4, 8, 9, 10
Low-Risk Hazards								
Severe Weather	EX-2, 3, 4, 5, 7	EX-1, 7, 9	EX-4		EX-8, 9, 11		EX-8, 7	EX-3, 4, 8, 9, 10
Wildfire	EX-2, 3, 4, 5, 7	EX-1, 7, 9	EX-4, 9	EX-9	EX-8, 11			EX-3, 4, 8, 9, 10

PUBLIC OUTREACH

FEMA requirements for public outreach will be met by the County's engagement efforts and are included in the main part of the plan. These may include public meetings, a StoryMap, surveys, etc. If individual jurisdictions want to have a more robust outreach for their local community, the public outreach table in each annex may be used to memorialize those local efforts.

This table should record local public outreach efforts made by your jurisdiction to inform the community of this hazard mitigation plan update process. Examples may include local surveys on hazard awareness/preparedness, social media blasts, press releases, and outreach to local groups (CERT, senior citizen organizations, etc.) **This section is optional.**

INFORMATION SOURCES USED FOR THIS ANNEX

This section should describe what resources you used to complete the annex and how you used them. The sources used for Phases 1 and 2 should have been entered previously. List any additional sources used for the preparation of the Phase 3 annex. Review to ensure that all materials used in all three phases are identified. Providing this information is a requirement to pass the state and FEMA review process.

FUTURE NEEDS TO BETTER UNDERSTAND RISK/VULNERABILITY

In this section, identify any future studies, analyses, reports, or surveys your jurisdiction needs to better understand its vulnerability to identified or currently unidentified risks. These could be needs based on federal or state agency mandates. **This section is optional.**

ADDITIONAL COMMENTS

Use this section to add any additional information pertinent to hazard mitigation and your jurisdiction not covered in this template. **This section is optional.**

THIS COMPLETES PHASE 3

1. DISTRICT NAME

1.1 LOCAL HAZARD MITIGATION PLANNING TEAM

Primary Point of Contact
Name, Title
Street Address
City, State ZIP
Telephone: xxx-xxx-xxxx
e-mail Address: xxx@xxx.xxx

Alternate Point of Contact
Name, Title
Street Address
City, State ZIP
Telephone: xxx-xxx-xxxx
e-mail Address: xxx@xxx.xxx

This annex was developed by the local hazard mitigation planning team, whose members are listed in Table 1-1.

Table 1-1. Local Hazard Mitigation Planning Team Members

Name	Title

1.2 JURISDICTION PROFILE

1.2.1 Overview

Insert Narrative Profile Information, per Instructions.

The __[name of adopting body]___ assumes responsibility for the adoption of this plan; __[name of oversight agency]__ will oversee its implementation.

All fire districts should include the following sentence (non-fire special purpose districts should delete the sentence):

The District participates/does not participate in the Public Protection Class Rating System and currently has a rating of #.

1.2.2 Service Area

The District service area covers ___[area in square miles]___, serving a population of _ population _.

1.2.3 Assets

Table 1-2 summarizes the assets of the District and their value.

Table 1-2. Special Purpose District Assets

Asset	Value
Property	
**number** **acres of land**	$_value_
Equipment	
**description**	$_value_
**description**	$_value_
**description**	$_value_
**description**	$_value_
**description**	$_value_
Total:	***$_value_***
Critical Facilities	
**description – Include Address**	$_value_
**description – Include Address**	$_value_
**description – Include Address**	$_value_
**description – Include Address**	$_value_
Total:	***$_value_***

1.3 CURRENT TRENDS

Insert summary description of service trends.

1.4 CAPABILITY ASSESSMENT

This section describes an assessment of existing capabilities for implementing hazard mitigation strategies. The introduction at the beginning of this volume of the hazard mitigation plan describes the components included in the capability assessment and their significance for hazard mitigation planning.

Findings of the capability assessment were reviewed to identify opportunities to expand, initiate or integrate capabilities to further hazard mitigation goals and objectives. Where such opportunities were identified and determined to be feasible, they are included in the action plan. The "Analysis of Mitigation Actions" table in this annex identifies these as community capacity building mitigation actions. The findings of the assessment are presented as follows:

- An assessment of planning and regulatory capabilities is presented in Table 1-3.
- An assessment of fiscal capabilities is presented in Table 1-4.
- An assessment of administrative and technical capabilities is presented in Table 1-5.

- An assessment of education and outreach capabilities is presented in Table 1-6.
- Classifications under various community mitigation programs are presented in Table 1-7.
- The community's adaptive capacity for the impacts of climate change is presented in Table 1-8.

Table 1-3. Planning and Regulatory Capability

Plan, Study or Program	Date of Most Recent Update	Comment
Name of code, ordinance, policy, program or plan		
Name of code, ordinance, policy, program or plan		
Name of code, ordinance, policy, program or plan		
Name of code, ordinance, policy, program or plan		
Name of code, ordinance, policy, program or plan		

Table 1-4. Fiscal Capability

Financial Resource	Accessible or Eligible to Use?
Community Development Block Grants	Yes/No
Capital Improvements Project Funding	Yes/No
Authority to Levy Taxes for Specific Purposes	Yes/No
User Fees for Water, Sewer, Gas or Electric Service	Yes/No
If yes, specify: Enter Response	
Incur Debt through General Obligation Bonds	Yes/No
Incur Debt through Special Tax Bonds	Yes/No
Incur Debt through Private Activity Bonds	Yes/No
Withhold Public Expenditures in Hazard-Prone Areas	Yes/No
State-Sponsored Grant Programs	Yes/No
Development Impact Fees for Homebuyers or Developers	Yes/No
Other	Yes/No
If yes, specify: Enter Response	

Table 1-5. Administrative and Technical Capability

Staff/Personnel Resource	Available?
Planners or engineers with knowledge of land development and land management practices *If Yes, Department /Position:* Enter Response	Yes/No
Engineers or professionals trained in building or infrastructure construction practices *If Yes, Department /Position:* Enter Response	Yes/No
Planners or engineers with an understanding of natural hazards *If Yes, Department /Position:* Enter Response	Yes/No
Staff with training in benefit/cost analysis *If Yes, Department /Position:* Enter Response	Yes/No
Surveyors *If Yes, Department /Position:* Enter Response	Yes/No
Personnel skilled or trained in GIS applications *If Yes, Department /Position:* Enter Response	Yes/No
Scientist familiar with natural hazards in local area *If Yes, Department /Position:* Enter Response	Yes/No
Emergency manager *If Yes, Department /Position:* Enter Response	Yes/No
Grant writers *If Yes, Department /Position:* Enter Response	Yes/No
Other *If Yes, Department /Position:* Enter Response	Yes/No

Table 1-6. Education and Outreach Capability

Criterion	Response
Do you have a public information officer or communications office?	Yes/No
Do you have personnel skilled or trained in website development?	Yes/No
Do you have hazard mitigation information available on your website? *If yes, briefly describe:* Enter Response	Yes/No
Do you use social media for hazard mitigation education and outreach? *If yes, briefly describe:* Enter Response	Yes/No
Do you have any citizen boards or commissions that address issues related to hazard mitigation? *If yes, briefly describe:* Enter Response	Yes/No
Do you have any other programs in place that could be used to communicate hazard-related information? *If yes, briefly describe:* Enter Response	Yes/No
Do you have any established warning systems for hazard events? *If yes, briefly describe:* Enter Response	Yes/No

Table 1-7. Community Classifications

	Participating?	Classification	Date Classified
FIPS Code	Yes/No	_____	Date
DUNS#	Yes/No	_____	Date
Community Rating System	Yes/No	_____	Date
Building Code Effectiveness Grading Schedule	Yes/No	_____	Date
Public Protection	Yes/No	_____	Date
Storm Ready	Yes/No	_____	Date
Firewise	Yes/No	_____	Date
Tsunami Ready	Yes/No	_____	Date

Table 1-8. Adaptive Capacity for Climate Change

Criterion	Jurisdiction Rating[a]
Technical Capacity	
Jurisdiction-level understanding of potential climate change impacts	High/Medium/Low
Comment: *Enter Comment*	
Jurisdiction-level monitoring of climate change impacts	High/Medium/Low
Comment: *Enter Comment*	
Technical resources to assess proposed strategies for feasibility and externalities	High/Medium/Low
Comment: *Enter Comment*	
Jurisdiction-level capacity for development of greenhouse gas emissions inventory	High/Medium/Low
Comment: *Enter Comment*	
Capital planning and land use decisions informed by potential climate impacts	High/Medium/Low
Comment: *Enter Comment*	
Participation in regional groups addressing climate risks	High/Medium/Low
Comment: *Enter Comment*	
Implementation Capacity	
Clear authority/mandate to consider climate change impacts during public decision-making processes	High/Medium/Low
Comment: *Enter Comment*	
Identified strategies for greenhouse gas mitigation efforts	High/Medium/Low
Comment: *Enter Comment*	
Identified strategies for adaptation to impacts	High/Medium/Low
Comment: *Enter Comment*	
Champions for climate action in local government departments	High/Medium/Low
Comment: *Enter Comment*	
Political support for implementing climate change adaptation strategies	High/Medium/Low
Comment: *Enter Comment*	
Financial resources devoted to climate change adaptation	High/Medium/Low
Comment: *Enter Comment*	
Local authority over sectors likely to be negative impacted	High/Medium/Low
Comment: *Enter Comment*	

Criterion	Jurisdiction Rating[a]
Public Capacity	
Local residents knowledge of and understanding of climate risk ***Comment:*** *Enter Comment*	High/Medium/Low
Local residents support of adaptation efforts ***Comment:*** *Enter Comment*	High/Medium/Low
Local residents' capacity to adapt to climate impacts ***Comment:*** *Enter Comment*	High/Medium/Low
Local economy current capacity to adapt to climate impacts ***Comment:*** *Enter Comment*	High/Medium/Low
Local ecosystems capacity to adapt to climate impacts ***Comment:*** *Enter Comment*	High/Medium/Low

a. High = Capacity exists and is in use; Medium = Capacity may exist, but is not used or could use some improvement; Low = Capacity does not exist or could use substantial improvement; Unsure= Not enough information is known to assign a rating.

1.5 INTEGRATION REVIEW

For hazard mitigation planning, "integration" means that hazard mitigation information is used in other relevant planning mechanisms, such as capital facilities planning, and that relevant information from those sources is used in hazard mitigation. This section identifies where such integration is already in place, and where there are opportunities for further integration in the future. Resources listed at the end of this annex were used to provide information on integration. The progress reporting process described in Volume 1 of the hazard mitigation plan will document the progress of hazard mitigation actions related to integration and identify new opportunities for integration.

1.5.1 Existing Integration

Some level of integration has already been established between local hazard mitigation planning and the following other local plans and programs:

- **Plan or Program Name**—Description
- **Plan or Program Name**—Description
- **Plan or Program Name**—Description
- **Plan or Program Name**—Description
- **Plan or Program Name**—Description

1.5.2 Opportunities for Future Integration

The capability assessment presented in this annex indicates opportunities to integrate this mitigation plan with other jurisdictional planning/regulatory capabilities. Capabilities were identified as integration opportunities if they can support or enhance the actions identified in this plan or be supported or enhanced by components of this plan. The capability assessment identified the following plans and programs that do not currently integrate hazard mitigation information but provide opportunities to do so in the future:

- **Plan or Program Name**—Description
- **Plan or Program Name**—Description
- **Plan or Program Name**—Description
- **Plan or Program Name**—Description
- **Plan or Program Name**—Description

Taking action to integrate each of these programs with the hazard mitigation plan was considered as a mitigation action to include in the action plan presented in this annex.

1.6 RISK ASSESSMENT

1.6.1 Jurisdiction-Specific Natural Hazard Event History

Table 1-9 lists past occurrences of natural hazards for which specific damage was recorded in this jurisdiction Other hazard events that broadly affected the entire planning area, including this jurisdiction, are listed in the risk assessments in Volume 1 of this hazard mitigation plan.

Table 1-9. Past Natural Hazard Events

Type of Event	FEMA Disaster #	Date	Damage Assessment
Insert event type	_____	Date	$_____
Insert event type	_____	Date	$_____
Insert event type	_____	Date	$_____
Insert event type	_____	Date	$_____
Insert event type	_____	Date	$_____
Insert event type	_____	Date	$_____
Insert event type	_____	Date	$_____
Insert event type	_____	Date	$_____
Insert event type	_____	Date	$_____
Insert event type	_____	Date	$_____
Insert event type	_____	Date	$_____
Insert event type	_____	Date	$_____
Insert event type	_____	Date	$_____
Insert event type	_____	Date	$_____
Insert event type	_____	Date	$_____

1.6.2 Hazard Risk Ranking

Table 1-10 presents a local ranking of all hazards of concern for which this hazard mitigation plan provides complete risk assessments. As described in detail in Volume 1, the ranking process involves an assessment of the likelihood of occurrence for each hazard, along with its potential impacts on people, property and district operations. Mitigation actions target hazards with high and medium rankings.

Table 1-10. Hazard Risk Ranking

Rank	Hazard	Risk Ranking Score	Risk Category
1			High/Medium/Low
2			High/Medium/Low
3			High/Medium/Low
4			High/Medium/Low
5			High/Medium/Low
6			High/Medium/Low
7			High/Medium/Low
8			High/Medium/Low
9			High/Medium/Low

1.6.3 Jurisdiction-Specific Vulnerabilities

Volume 1 of this hazard mitigation plan provides complete risk assessments for each identified hazard of concern. The following jurisdiction-specific issues have been identified based on a review of the results of the risk assessment, public involvement strategy, and other available resources:

- Insert as appropriate.
- Insert as appropriate.
- Insert as appropriate.

Mitigation actions addressing these issues were prioritized for consideration in the action plan presented in this annex.

1.7 STATUS OF PREVIOUS PLAN ACTIONS

If your jurisdiction has no previous hazard mitigation plan, please enter an "X" in the box at right and do not complete this section.

Table 1-11 summarizes the actions that were recommended in the previous version of the hazard mitigation plan and their implementation status at the time this update was prepared.

Table 1-11. Status of Previous Plan Actions

Action Item from Previous Plan	Completed	Removed; No Longer Feasible	Carried Over to Plan Update: Check if Yes	Carried Over to Plan Update: Action # in Update
Insert Action Number & Text ***Comment:*** *Enter Comment*				
Insert Action Number & Text ***Comment:*** *Enter Comment*				
Insert Action Number & Text ***Comment:*** *Enter Comment*				
Insert Action Number & Text ***Comment:*** *Enter Comment*				

Action Item from Previous Plan	Completed	Removed; No Longer Feasible	Carried Over to Plan Update: Check if Yes	Carried Over to Plan Update: Action # in Update
Insert Action Number & Text ***Comment:*** *Enter Comment*				
Insert Action Number & Text ***Comment:*** *Enter Comment*				
Insert Action Number & Text ***Comment:*** *Enter Comment*				
Insert Action Number & Text ***Comment:*** *Enter Comment*				
Insert Action Number & Text ***Comment:*** *Enter Comment*				
Insert Action Number & Text ***Comment:*** *Enter Comment*				
Insert Action Number & Text ***Comment:*** *Enter Comment*				
Insert Action Number & Text ***Comment:*** *Enter Comment*				
Insert Action Number & Text ***Comment:*** *Enter Comment*				
Insert Action Number & Text ***Comment:*** *Enter Comment*				

1.8 HAZARD MITIGATION ACTION PLAN

Table 1-12 lists the actions that make up the hazard mitigation action plan for this jurisdiction. Table 1-13 identifies the priority for each action. Table 1-14 summarizes the mitigation actions by hazard of concern and mitigation type.

Table 1-12. Hazard Mitigation Action Plan Matrix

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action xxx-1—Where appropriate, support retrofitting, purchase or relocation of structures located in hazard areas, prioritizing those that have experienced repetitive losses and/or are located in high- or medium-risk hazard areas.						
Hazards Mitigated: Enter Response						
Existing	Enter Response	Enter Response	Enter Response	High	Grant Funding	Short-term
Action xxx-2—Actively participate in the plan maintenance protocols outlined in Volume 1 of this hazard mitigation plan.						
Hazards Mitigated: All hazards						
New & Existing	Enter Response	Enter Response	Enter Response	Low	Staff Time, General Funds	Short-term
Action xxx-3— Purchase generators for critical facilities and infrastructure that lack adequate backup power, including _____.						
Hazards Mitigated: Dam failure, earthquake, flooding, landslide, severe weather, tsunami, wildfire						
Existing	Enter Response	Enter Response	Enter Response			

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline[a]
Action xxx-4—Description *Hazards Mitigated:* Enter Response						
Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response
Action xxx-5—Description *Hazards Mitigated:* Enter Response						
Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response
Action xxx-6—Description *Hazards Mitigated:* Enter Response						
Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response
Action xxx-7—Description *Hazards Mitigated:* Enter Response						
Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response
Action xxx-8—Description *Hazards Mitigated:* Enter Response						
Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response	Enter Response

a. Short-term = Completion within 5 years; Long-term = Completion within 10 years; Ongoing= Continuing new or existing program with no completion date

Acronyms used here are defined at the beginning of this volume.

Table 1-13. Mitigation Action Priority

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Cost?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Implementation Priority[a]	Grant Pursuit Priority[a]
1								
2								
3								
4								
5								
6								
7								
8								
9								

a. See the introduction to this volume for explanation of priorities.

Table 1-14. Analysis of Mitigation Actions

Hazard Type	Action Addressing Hazard, by Mitigation Type[a]							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resilient	Community Capacity Building
High-Risk Hazards								
Medium-Risk Hazards								
Low-Risk Hazards								

a. See the introduction to this volume for explanation of mitigation types.

1.9 PUBLIC OUTREACH

Table 1-15 lists public outreach activities for this jurisdiction.

Table 1-15. Local Public Outreach

Local Outreach Activity	Date	Number of People Involved

1.10 INFORMATION SOURCES USED FOR THIS ANNEX

The following technical reports, plans, and regulatory mechanisms were reviewed to provide information for this annex.

- <INSERT DOCUMENT NAME AND DESCRIPTION OF HOW IT WAS USED>
- <INSERT DOCUMENT NAME AND DESCRIPTION OF HOW IT WAS USED>
- <INSERT DOCUMENT NAME AND DESCRIPTION OF HOW IT WAS USED>

The following outside resources and references were reviewed:

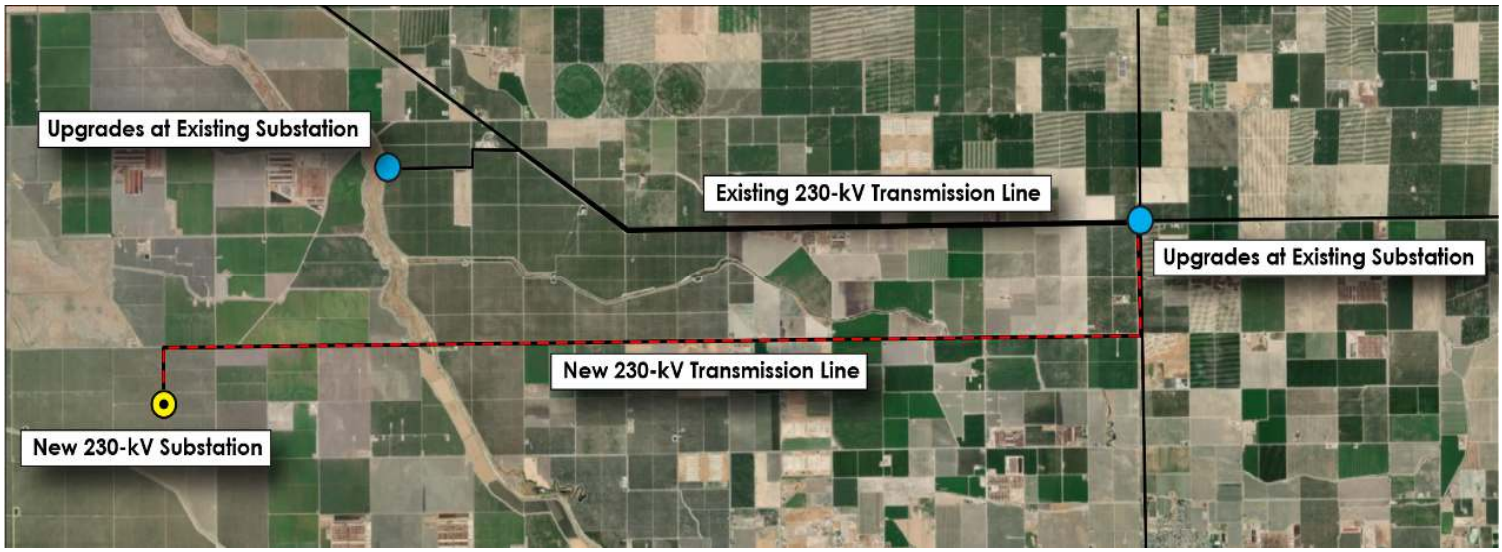
- **Hazard Mitigation Plan Annex Development Toolkit**—The toolkit was used to support the identification of past hazard events and noted vulnerabilities, the risk ranking, and the development of the mitigation action plan.
- <INSERT DOCUMENT NAME AND DESCRIPTION OF HOW IT WAS USED>

1.11 FUTURE NEEDS TO BETTER UNDERSTAND RISK/VULNERABILITY

Insert text, if any; otherwise, delete section

1.12 ADDITIONAL COMMENTS

Insert text, if any; otherwise, delete section



Guidelines for Energy Project Applications Requiring CEQA Compliance:

Pre-filing and Proponent's Environmental Assessments

November 2019

Version 1.0

Energy Division

Infrastructure Permitting and CEQA Unit

California Public Utilities Commission

Guidelines for Energy Project Applications Requiring CEQA Compliance:

Pre-filing and Proponent's Environmental Assessments

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Foreword

November 12, 2019

To: Applicants Filing Proponent's Environmental Assessments for Energy Infrastructure Projects at the California Public Utilities Commission (CPUC or Commission)

From: Merideth Sterkel (Program Manager, Infrastructure Planning and Permitting) and Mary Jo Borak and Lonn Maier, Supervisors, Infrastructure Permitting and California Environmental Quality Act, Energy Division, CPUC

Subject: Introducing revisions to the Pre-filing Guidelines for Energy Infrastructure Projects and a Unified and Updated Electric and Gas PEA Checklist

We are pleased to release a 2019 revision to the California Environmental Quality Act (CEQA) Proponent's Environmental Assessments (PEA) Checklist. This substantially revised document is now entitled "Guidelines for Energy Project Applications Requiring CEQA Compliance: Pre-filing and Proponent's Environmental Assessments" (Guidelines). Future updates to this document will be made as determined necessary. The CPUC's Rules of Practice and Procedure Sections 2.4 provide that all applications to the CPUC for authority to undertake projects that are not statutorily or categorically exempt from CEQA requirements shall include an Applicant-prepared PEA.

Updates Overview

Prior versions of the Working Draft PEA Checklist were published in 2008 and 2012. For this 2019 update, extensive revisions were made to all sections based on our experience with the prior checklist versions. All electric and natural gas projects are now addressed in a single PEA Checklist, and the following updates were made:

- **CEQA Statute and Guidelines 2019 Updates:** The PEA Checklist is updated pursuant to the 2019 CEQA Statues and Guidelines, including new energy and wildfire resource areas.
- **Pre-filing Consultation Guidelines:** Pre-filing guidelines are now provided since the pre-filing and PEA development processes are intertwined.
- **Unified PEA Checklist for Energy Projects:** All electric and natural gas projects are now addressed in a single PEA Checklist.
- **Additional CEQA Impact Questions:** Questions are included for the following PEA Checklist sections: 5.4, Biological Resources; 5.6, Energy; 5.9, Hazards, Hazardous Materials, and Public Safety; 5.16, Recreation; 5.17, Transportation; and 5.19, Utilities and Service Systems.
- **CPUC Draft Environmental Measures:** Draft measures are provided in PEA Checklist Attachment 4 for Aesthetics, Air Quality, Cultural Resources, Greenhouse Gas Emissions, Utilities and Service Systems and Wildfire.

Purpose of the Guidelines Document

The purpose and objective of the PEA Checklist included within this Guidelines document has not changed, which is to provide project Proponents (Applicants) with detailed guidance about information our CEQA Unit Staff expect in sufficient PEAs. The document details the information Applicants must provide the CPUC to complete environmental reviews that satisfy CEQA requirements. Specifically, the Pre-filing Consultation Guidelines and PEA Checklist, together, are intended to achieve the following objectives:

1. Provide useful guidance to Applicants, CPUC staff, and outside consultants regarding the type and detail of information needed to quickly and efficiently deem an application complete;

2. Ensure PEAs provide reviewers with a detailed project description and associated information sufficient to deem an application complete, avoid lengthy review periods and numerous data requests for the purpose of augmenting a PEA, and avoid unnecessary PEA production costs;
3. Increase the level of consistency between PEAs submitted and provide for more consistent review by CPUC CEQA Unit Staff and outside consultants; and
4. Promote transparency and reduce the potential for conflicts between utility and CPUC Staff about the types, scope, and thoroughness of data expected for data adequacy purposes.

The Guidelines document provides detailed instructions to Applicants for use during the Pre-filing process and PEA development. The document is intended to fully inform Applicants and focus the role of outside consultants, thus, enabling Applicants to submit more complete, useful, and immediately data-adequate PEAs.

Benefits of High Quality and Complete PEAs

CPUC CEQA Unit Staff seek to complete the environmental review process required under CEQA as quickly and efficiently as possible. Table 1 shows the average duration in months of CPUC applications that require CEQA documents. While there are tensions between speed and quality in all project management, the achievement of expeditious environmental reviews can result in lower project costs to ratepayers. Our staff have reviewed the timelines for 108 past CPUC applications that required review pursuant to CEQA and determined that the average length of time from application filing to PEA deemed complete is four months, regardless of the type of CEQA document. The goal for our agency is to deem PEAs complete within 30 days. The faster PEAs are deemed complete, the sooner staff can prepare the CEQA document. With each delay to PEA completeness, the fundamental project purpose and need and baseline circumstances may shift, requiring refreshing of the data. The Guidelines document will improve the initial accuracy of PEAs and reduce the time required to deem PEAs complete. Once an application is formally filed, the Applicant will receive a notification letter from CPUC CEQA Unit Staff when the PEA is deemed complete.

Table 1. Average Duration in Months of CPUC Applications that Require CEQA Documents (1996–2019)

	I: Application Filed to PEA Deemed Complete	II: PEA Deemed Complete to Draft Environmental Document Circulated	III: Draft Environmental Document to Final Released	IV: Final Released to Proposed Decision	V: Proposed Decision to Final Decision (with Certification of CEQA Document)	I-V: Overall Duration (1)
Environmental Impact Report (EIR; n=49)	5	13	7	5	2	**29**
Initial Study/ Mitigated Negative Declaration (IS/MND; n=56)	4	8	3	4	1	**19**
All Document Types (n=108)	4	8	4	5	2	**23**
Range: All Document Types	*1-9*	*5-18*	*2-10*	*1-7*	*1-2*	***12-38***

Note:
(1) The overall duration is not a sum of the average durations for each step. The overall duration was calculated using "n," the number of applications with data available for the date of application filing and final decision date. Not all projects had data available for each step. The data include several instances where the CEQA document was developed in conjunction with a NEPA document, e.g., an EIR/Environmental Impact Statement or IS/MND/Environmental Assessment/Finding of No Significant Impact was prepared instead of an EIR or MND, respectively. The above data is not inclusive of projects that had averages and ranges that are statistically abnormal.

Lessons Learned about the PEA Process

In the past, Applicants have filed PEAs using the checklist to ensure the correct information was provided but have not followed the format and organization of the PEA checklist and sometimes chose not to engage in Pre-filing activities with our staff. To achieve the objectives and benefits listed above, Applicants will file all future PEAs in the same organizational format as the updated checklist and adhere to the Pre-filing Consultation Guidelines in coordination with CPUC CEQA Unit Staff.

The Guidelines document describes the level effort required for the assessments necessary to not only finalize a CEQA document but ensure its legal defensibility. While final design and survey information is preferred, the PEA may incorporate preliminary design and survey data as appropriate and in consultation with CEQA Unit Staff during Pre-filing. We recognize that projects are fact specific, and deviations from the Pre-filing Consultation Guidelines and PEA Checklist are inevitable but providing concise and accurate information as soon as possible is paramount. Any deviations from these Guidelines must include clear justification and should be discussed and submitted during the Pre-filing Consultation process to avoid subsequent delays.

The PEA Checklist is written with the assumption that an Environmental Impact Report will be prepared, however, a Mitigated Negative Declaration or other form of CEQA document (e.g., exemption) may be appropriate. This determination, however, must be made in consultation with CPUC CEQA Unit Staff during Pre-filing and prior to submittal of the Draft PEA.

Future Modifications and Improvements

Like the predecessor PEA checklists, this is a working document that will be modified over time based on experience and changes to the CEQA Statute and Guidelines. To meet the above stated objectives and maintain consistency with CEQA. We expect Applicants, their consultants, CPUC consultants, and the CPUC to engage in a regular and ongoing dialogue about specific improvements to the CEQA process overall, and these Guidelines in particular.

We look forward to working with Applicants during the Pre-filing Consultation process to ensure that the level of effort that goes into preparing PEAs can be effectively and efficiently transferred into the CEQA document prepared by CPUC Staff and consultants. Applicants are invited to debrief with our staff about the efficacy of these Guidelines.

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/s/
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California Public Utilities Commission

Mary Jo Borak
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Supervisor, Infrastructure Permitting and CEQA Unit
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California Public Utilities Commission

Pre-Filing Consultation Guidelines

The following Pre-filing Consultation Guidelines apply to all PEAs filed with applications to the CPUC and outline a process for Applicants to engage with CPUC CEQA Unit Staff about upcoming projects that will require environmental review pursuant to CEQA. The CPUC is typically the Lead Agency for large projects by investor-owned gas and electric utilities. The CPUC's CEQA Unit Staff are experienced with developing robust CEQA documents for long, linear energy projects. The PEA Checklist, starting in the next section, is based upon that experience.

Pre-filing Consultation Process

During Pre-filing Consultation, Applicants and CPUC Staff meet to discuss the upcoming application. Successful projects will commence Pre-filing Consultation no less than six months prior to application filing at the CPUC. When the application is formally filed at the CPUC, the Application and the PEA are submitted to the CPUC Docket Office.

1. Meetings with CPUC Staff

To initiate Pre-filing Consultation, Applicants will request and attend a meeting with CPUC CEQA Unit Staff at least six months prior to application filing.

a. Applicants can request a Pre-Filing Consultation meeting via email or letter. Initial contact via telephone may occur, but staff request written documentation of Pre-filing Consultation commencement.

b. For the initial meeting, Applicants will provide staff with a summary of the proposed project including maps and basic GIS data at least one week prior to the meeting.

c. Applicants will receive initial feedback on the scope of the proposed project and PEA. Staff will work with Applicants to establish a schedule for subsequent Pre-filing meetings and milestones.

2. Consultant Resources

CPUC CEQA Unit Staff will initiate the consultant contract immediately following the initial Pre-filing Consultation meeting. CPUC's consultant contract resources will be executed prior to Applicant filing of the Draft PEA. The consultant contract is critical to the Pre-filing Consultation process. Applicants are encouraged to request updates about the status of the contract. The CPUC may use its on-call consulting resources contract for these purposes. If CEQA Unit Staff determine that their on-call consulting resources are not appropriate due to the anticipated project scope, staff may initiate a request for proposals process to engage consulting resources, and the resulting contracting process will be completed and consultant contract in place prior to Draft PEA filing.

3. Draft PEA Provided Prior to PEA Filing

A complete Draft PEA will be filed at least three months prior to application filing. CPUC CEQA Unit Staff and the CPUC consultant team will review and provide comments on the Draft PEA to the Applicant early in the three-month period to allow time for Applicant revisions to the PEA.

4. Project Site Visits

One or more site visits will be scheduled with CPUC CEQA Unit Staff and their consultant at the time of Draft PEA filing (or prior). Appropriate federal, state, and local agencies will also be engaged at this time.

5. Consultation with Public Agencies

The Applicant and CPUC CEQA Unit Staff will jointly reach out and conduct consultation meetings with public agencies and other interested parties in the project area. CPUC CEQA Unit Staff may also choose to conduct separate consultation meetings if needed.

If a federal agency will be a co-lead pursuant to the National Environmental Policy Act and coordinating with the CPUC during the environmental review process, the Applicant and CPUC CEQA Unit Staff will ensure that the agency has the opportunity to comment on the Draft PEA and participate jointly with the CPUC throughout the application review process. Applicant and Commission CEQA Unit Staff coordination with the federal agency (if applicable) will likely need to occur more than six months in advance of application filing.

6. Alternatives Development

PEAs will be drafted with the assumption that an Environmental Impact Report (EIR) will be prepared. Applicants will include a reasonable range of alternatives in the PEA (even though a Mitigated Negative Declaration [MND] may ultimately be prepared), including sufficient information about each alternative. In some situations, CPUC CEQA Unit Staff and project Applicants may agree during Pre-filing Consultation that an MND is likely and a reasonable range of alternatives is not required for the PEA. This determination, however, must be made in consultation with CEQA Unit Staff during Pre-filing and is not final. The type of document to be prepared may change based on public scoping results and other findings during the environmental review process.

CEQA Unit Staff will provide feedback on the range of alternatives prior to Draft PEA filing (if possible) based on their review of the Draft PEA. It is critical that Applicants receive feedback from CEQA Unit Staff about the range of alternatives prior to filing the PEA. Applicants will ensure that each alternative is described and evaluated in the PEA with an equal level of detail as the proposed project unless otherwise instructed in writing by CEQA Unit Staff.

7. Format of PEA Submittal

Each PEA submittal will include the completed PEA Checklist tables. Each PEA submittal will be formatted and organized as shown in the Example PEA Table of Contents provided in the PEA Checklist unless otherwise directed by CPUC CEQA Unit Staff in writing prior to application filing. The example PEA Table of Contents is modeled after typical CPUC EIRs.

8. Transmission and Distribution System Information

A key component of CEQA projects analyzed during CPUC environmental reviews is the context of the project within the larger transmission and distribution system. Detailed descriptions of the regional transmission system, including GIS data, to which the proposed project would interconnect are required. The required level of detail about interconnecting systems is project specific and will be specified by CEQA Unit Staff in writing during Pre-filing Consultation. Detailed distribution system information may also be required.

9. Data and Technical Adequacy

Applicants will focus PEA development efforts on providing thorough, up-to-date data and technical reports required for CPUC CEQA Unit Staff to complete the environmental document and alternatives analysis.

The Applicant-drafted PEA Executive Summary, Introduction, Project Description, Description of Alternatives, and other chapters typically found in past CPUC EIRs and Initial Study/MNDs will be *thorough*—emulate the level of detail provided in typical CPUC EIRs. The setting sections provided for

PEA Chapter 5, Environmental Analysis, will also be thorough. Applicants will ensure that the PEA text, graphics, and file formats can be efficiently converted into CPUC's CEQA document with minimal revision, reformatting, and redevelopment by CPUC Staff and consultants.

The impact analyses and determinations provided for Chapter 5, Environmental Analysis, and Chapter 6, Comparison of Alternatives, need not be as thorough as those to be prepared by the CPUC for its CEQA document. These two sections are expected to be revised and redeveloped by CPUC Staff and consultants. Other sections of the CEQA document will only be revised and redeveloped by CPUC Staff and consultants if determined to be necessary after PEA filing.

10. Applicant Proposed Measures

The Pre-filing Consultation process can support the development Applicant Proposed Measures (APMs); measures that Applicants incorporate into the PEA project description to avoid or reduce what otherwise may be considered significant impacts. APMs that use phrases, such as, "as practicable," "as needed," or other conditional language will be superseded by Mitigation Measures if required to avoid or reduce a potentially significant impact. CPUC CEQA Unit Staff and their consultant team may review and provide comments on the Draft PEA APMs during Pre-filing Consultation.

Applicants will carefully consider each CPUC Draft Environmental Measure identified in Chapter 5 of this PEA Checklist. The measures may be applied to the proposed project if appropriate and may be subject to modification by the CPUC during its environmental review.[1]

11. PEA Checklist Deviations

CPUC CEQA Unit Staff understand that the PEA Checklist requires Applicants to develop a significant quantity of information. There are times when it is appropriate to deviate from the PEA Checklist. Deviations to the Pre-Filing Consultation Guidelines or the PEA Checklist contents may be approved by the CPUC's CEQA Unit Staff. Staff approval will be in writing and will occur prior to Applicant filing of the Draft PEA. Note that any deviations approved in writing by staff during the Pre-filing period may be reversed or modified after application and PEA filing and at any time throughout the environmental review period at the discretion of CPUC CEQA Unit Staff.

12. Submittal of Confidential Information

CPUC Staff are available during Pre-filing Consultation to discuss concerns that Applicants may have about confidentiality. However, the CEQA process requires public disclosure about projects, and such disclosure can often appear to conflict with Applicant requests for confidentiality. CPUC CEQA Unit Staff will rely on CPUC adopted confidentiality procedures to resolve confidentiality concerns. Applicants that expect aspects of a PEA filing to be confidential must follow CPUC confidentiality procedures. Applicants may mark information as confidential if allowed pursuant to General Order 66 or latest applicable Commission rule (e.g., see Public Records Act Proceeding Rulemaking (R.14-11-001).

13. Additional CEQA Impact Questions

Additional CEQA Impact Questions that are specific to the types of projects evaluated by the Commission's CEQA Unit are identified in the PEA Checklist to be considered in addition to the checklist items in CEQA Guidelines Appendix G.

The next section of this Guidelines document provides the PEA Checklist for all energy project applications that require CEQA compliance.

[1] At this time, the CPUC environmental measures are in draft format, see PEA Checklist Attachment 4. They may be formally incorporated into Chapter 5 of future versions of the PEA Checklist.

Proponent's Environmental Assessment (PEA) Checklist

The PEA Checklist provides project Applicants (e.g., projects involving electric transmission lines, electric substations or switching stations, natural gas transmission pipelines, and underground natural gas storage facilities) with detailed guidance regarding the level of detail CPUC CEQA Unit Staff expect to deem PEAs complete. Applicants will prepare their PEAs using the same section headers and numbering as provided in the PEA Checklist. Applicants will also provide supporting data that is specific to each item within the PEA Checklist. As noted in the Pre-Filing Consultation Guidelines, the PEA Checklist is written with the assumption that an EIR will be prepared. PEA contents may not need to support the development of an EIR, but this determination can only be made in consultation with CPUC CEQA Unit Staff as described in the Pre-Filing Consultation Guidelines.

Formatting and Basic PEA Data Needs, Including GIS Data

1. Provide **editable and fully functional source files** in electronic format for all PDF files, hardcopies, maps, images, and diagrams. Files will be provided in their original file format as well as the output file format. All Excel and other spreadsheet files or modeling files will include all underlying formulas/modeling details. All modeling files must be fully functional.
2. Details about the types of **GIS data and maps** to be submitted are provided in Attachment 1. GIS data not specified in this checklist may also be requested depending on the Proposed Project and alternatives.
3. The Applicant is responsible for ensuring that all project features, including project components and temporary and permanent work areas, are included within all **survey boundaries** (e.g., biological and cultural resources).
4. Excel spreadsheets with **emissions calculations** will be provided that are complete with all project assumptions, values, and formulas used to prepare emissions calculations in the PEA. Accompanying PDF files with the same information will be provided as Appendix B to the PEA (see List of Appendices below).
5. Applicants will provide in an Excel spreadsheet a comprehensive **mailing list** that includes the names and addresses of all affected landowners and residents, including unit numbers for multi-unit properties for both the proposed project and alternatives.
    a. An affected resident or landowner is defined as one whose place of residence or property is:
        i. Crossed by or abuts any component of the proposed project or an alternative including any permanent or temporary disturbance area (either above or below ground) and any extra work area (e.g., staging or parking area); or
        ii. Located within approximately 1,000 feet[2] of the edge of any construction work area.
    b. Include in the following information for each resident in a spreadsheet, at minimum: parcel APN number, owner name and mailing address, and parcel physical address. If individual occupant names, facility names, or business names are available, also provide these names and addresses in the spreadsheet. A sample mailing list format is provided in Table 2.

[2] Notice to all property owners within 300 feet of a Proposed Project is required at the time of application filing under GO 131-D. Commission notices of CEQA document preparation may be mailed to residents and property owners greater than 300 feet from a Proposed Project to ensure adequate notification (e.g., 1,000 feet) and the extent of notification will be determined on a project specific basis. Appropriate notice expectations will be discussed during Pre-filing (e.g., with respect to visual impact areas and other types of impacts specific to the Proposed Project and its study area).

Table 2. Sample Project Mailing List

Category	Company/ Agency	Name	Mailing Address	Phone Number	Email	APN	Source
State Agency	California Resources Agency	John Doe	1234 California Street City, CA 98765	(333) 456-7899	johndoe@email.com	123-456-789	County Assessor
Individual	n/a	Jane Doe	222 Main Street City, CA 97531	(909) 876-5432	janedoe@email.com	101-202-303	Public meeting on Month, Day 2019

6. **PEA Organization:** This PEA Checklist is organized to include each of the chapters and sections found in typical CPUC EIRs. The following sections will serve as the outline for all Draft PEAs submitted during Pre-filing and all PEAs filed with the CPUC Docket Office. PEAs will include each chapter and section identified (in matching numerical order) unless otherwise directed by CPUC CEQA Unit Staff in writing prior to filing.

Cover

A single sheet with the following information:	Applicant Notes, Comments
Title "Proponent's Environmental Assessment" and filing date	
Proponent Name (the Applicant)	
Name of the proposed project[3]	
Technical subheading summarizing the type of project and its major components, in one sentence or about 40 words, for example: A new 1,120 MVA, 500/115kV substation, 10 miles of new singled-circuit 500kV transmission lines, 25 miles of new and replaced double-circuit 115kV power lines, and upgrades at three existing substations are proposed.	
Location of the proposed project (all counties and municipalities or map figure for the cover that shows the areas crossed)	
Proceeding for which the PEA was prepared and CPUC Docket number (if known) or simply leave a blank where the Docket number would go	
Primary Contact's name, address, telephone number, and email address for both the project Applicant(s) and entities that prepared the PEA	
See example PEA cover in Figure 1.	

[3] If approved by the California Independent System Operator (CAISO), the project name listed will match the name specified in the CAISO approval. If multiple names apply, list all versions.

Figure 1. Example PEA Cover

Proponent's Environmental Assessment for California Utility Company's Evergreen Electric Substation and Transmission Line Project

May 1, 2019 (PEA filing date)

A new 230 kV substation, 10 miles of new single-circuit 230kV transmission lines, and upgrades at two existing substations are proposed.

The Proposed Project would be located primarily in __ County but would also cross __ and __ counties and areas within the City of __.

Application A.19-05-01 to the California Public Utilities Commission

Prepared by California Environmental Consulting
1234 Avenue
City, CA Zip Code
Primary Contact's Name
Position
Phone Number
Email

Prepared for California Utility Company
1234 Avenue
City, CA Zip Code
Primary Contact's Name
Position
Phone Number
Email

Table of Contents

Sections

Order	The format of the PEA will be organized as follows:	Applicant Notes, Comments
--	Cover	
--	Table of Contents, List of Tables, List of Figures, List of Appendices	
1	Executive Summary	
2	Introduction	
3	Proposed Project Description	
4	Description of Alternatives	
5	Environmental Analysis	
5.1	Aesthetics	
5.2	Agriculture and Forestry	
5.3	Air Quality	
5.4	Biological Resources	
5.5	Cultural Resources	
5.6	Energy	
5.7	Geology, Soils, and Paleontological Resources	
5.8	Greenhouse Gas Emissions	
5.9	Hazards, Hazardous Materials, and Public Safety	
5.10	Hydrology and Water Quality	
5.11	Land Use and Planning	
5.12	Mineral Resources	
5.13	Noise	
5.14	Population and Housing	
5.15	Public Services	
5.16	Recreation	
5.17	Transportation	
5.18	Tribal Cultural Resources	
5.19	Utilities and Service Systems	
5.20	Wildfire	
5.21	Mandatory Findings of Significance	
6	Comparison of Alternatives	

7	Cumulative Impacts and Other CEQA Considerations	
8	List of Preparers	
9	References[4]	
--	Appendices	

Required PEA Appendices and Supporting Materials

Order	Title	Applicant Notes, Comments
Appendix A	Detailed Maps and Design Drawings	
Appendix B	Emissions Calculations	
Appendix C	Biological Resources Technical Reports (see Attachment 2)	
Appendix D	Cultural Resources Studies (see Attachment 3)	
Appendix E	Detailed Tribal Consultation Report[5]	
Appendix F	Environmental Data Resources Report, Phase I Environmental Site Assessment, or similar hazardous materials report	
Appendix G	Agency Consultation and Public Outreach Report and Records of Correspondence	
Appendix H	Construction Fire Prevention Plan[6]	

Potentially Required[7] Appendices and Supporting Materials

Order	Title	Applicant Notes, Comments
Appendix I	Noise Technical Studies	
Appendix J	Traffic Studies	
Appendix K	Geotechnical Investigations (may preliminary at time of PEA filing)	
Appendix L	Hazardous Substance Control and Emergency Response Plan / Hazardous Waste and Spill Prevention Plan	

4 References will be organized by section but contained in a single chapter called, "References."

5 Include summary and timing of all correspondence to and from any Tribes and the State Historic Preservation Office/Native American Heritage Commission, including Sacred Lands File search results, and full description of any issues identified by Tribes in their interactions with the Applicant.

6 The Construction Fire Prevention Plan will be provided to federal, state, and local fire agencies for review and comment as applicable to where components of the proposed project would be located. CPUC will approve the final Construction Fire Prevention Plan. Record of the request for review and comment and any comments received from these agencies will be provided to CPUC CEQA Unit Staff.

7 Anticipated Appendix and study requirements should be discussed with CPUC CEQA Unit Staff during Pre-filing.

Appendix M	Erosion and Sedimentation Control Best Management Practice Plan / Draft Storm Water Pollution Prevention Plan (may be preliminary at time of PEA filing)	
Appendix N	FAA Notice and Criteria Tool Results	
Appendix O	Revegetation or Site Restoration Plan	
Appendix P	Health and Safety Plan	
Appendix Q	Existing Easements[8]	
Appendix R	Blasting Plan (may be preliminary at time of PEA filing)	
Appendix S	Traffic Control/Management Plan (may be preliminary at time of PEA filing)	
Appendix T	Worker Environmental Awareness Program (may preliminary at time of PEA filing)	
Appendix U	Helicopter Use and Safety Plan (may be preliminary at time of PEA filing)	
Appendix V	Electric and Magnetic Fields Management Plan (may be part of the Application rather than the PEA)	

8 Easements should be provided military lands, conservation easements, or other lands where the real estate agreement specifies the range of activities that can be conducted

1 Executive Summary

This section will include, but is not limited to, the following:	PEA Section and Page Number[9]	Applicant Notes, Comments
1.1: Proposed Project Summary. Provide a summary of the proposed project and its underlying purpose and basic objectives.		
1.2: Land Ownership and Right-of-Way Requirements. Provide a summary of the existing and proposed land ownership and rights-of-way for the proposed project.		
1.3: Areas of Controversy. Identify areas of anticipated controversy and public concern regarding the project.		
1.4: Summary of Impacts a) Identify all impacts expected by the Applicant to be potentially significant. Identify and discuss Applicant Proposed Measures here and provide a reference to the full listing of Applicant Proposed Measures provided in the table described in Section 3.11 of this PEA Checklist. b) Identify any significant and unavoidable impacts that may occur.		
1.5: Summary of Alternatives. Summarize alternatives that were considered by the Applicant and the process and criteria that were used to select the proposed project.		
1.6: Pre-filing Consultation and Public Outreach Summary. Briefly summarize Pre-filing consultation and public outreach efforts that occurred and identify any significant outcomes that were incorporated into the proposed project.		
1.7: Conclusions. Provide a summary of the major PEA conclusions.		
1.8: Remaining Issues. Describe any major issues that must still be resolved.		

[9] The *PEA Section and Page Number* column and *Applicant Notes, Comments* column are intended to be filled out and provided with PEA submittals. The PEA Checklist is provided in Word to all Applicants to allow column resizing as appropriate to reduce PEA checklist length when completed for submittal. Landscape formatting may also be appropriate for completed PEA Checklist tables.

2 Introduction

2.1 Project Background

This section will include, but is not limited to, the following:	PEA Section and Page Number	Applicant Notes, Comments
2.1.1: Purpose and Need a) Explain why the proposed project is needed. b) Describe localities the proposed project would serve and how the project would fit into the local and regional utility system. c) If the proposed project was identified by the California Independent System Operator (CAISO), thoroughly describe the CAISO's consideration of the proposed project and provide the following information: i. Include references to all CAISO Transmission Planning Processes that considered the proposed project. ii. Explain if the proposed project is considered an economic, reliability, or policy-driven project or a combination thereof. iii. Identify whether and how the Participating Transmission Owner recommended the project in response to a CAISO identified need, if applicable. iv. Identify if the CAISO approved the original scope of the project or an alternative and the rationale for their approval either for the original scope or an alternative. v. Identify how and whether the proposed project would exceed, combine, or modify in any way the CAISO identified project need. vi. If the Applicant was selected as part of a competitive bid process, identify the factors that contributed to the selection and CAISO's requirements for in-service date. d) If the project was not considered by the CAISO, explain why.		
(Natural Gas Storage Only) e) Provide storage capacity or storage capacity increase in billion cubic feet. If the project does not increase capacity, make this statement. f) Describe how existing storage facilities will work in conjunction with the proposed project. Describe the purchasing process (injection, etc.) and transportation arrangements this facility will have with its customers.		
2.1.2: Project Objectives a) Identify and describe the basic project objectives.[10] The objectives will include reasons for constructing the project based on its		

[10] Tangential project goals should not be included as basic project objectives, such as, minimizing environmental impacts, using existing ROWs and disturbed land to the maximum extent feasible, ensuring safety during construction and operation, building on property already controlled by the Applicant/existing site control. Goals of this type do not describe the underlying purpose or basic objectives but, rather, are good general practices for all projects.

purpose and need (i.e., address a specific reliability issue). The description of the project objectives will be sufficiently detailed to permit CPUC to independently evaluate the project need and benefits to accurately consider them in light of the potential environmental impacts. The basic project objectives will be used to guide the alternatives screening process, when applicable. b) Explain how implementing the project will achieve the basic project objectives and underlying purpose and need. c) Discuss the reasons why attainment of each basic objective is necessary or desirable.		
2.1.3: Project Applicant(s). Identify the project Applicant(s) and ownership of each component of the proposed project. Describe each Applicant's utility services and their local and regional service territories.		

2.2 Pre-filing Consultation and Public Outreach[11]

This section will include, but is not limited to, the following:	**PEA Section and Page Number**	**Applicant Notes, Comments**
2.2.1: Pre-filing Consultation and Public Outreach a) Describe all Pre-filing consultation and public outreach that occurred, such as, but not limited to: i. CAISO ii. Public agencies with jurisdiction over project areas or resources that may occur in the project area iii. Native American tribes affiliated with the project area iv. Private landowners and homeowner associations v. Developers for large housing or commercial projects near the project area vi. Other utility owners and operators vii. Federal, state, and local fire management agencies b) Provide meeting dates, attendees, and discussion summaries, including any preliminary concerns and how they were addressed and any project alternatives that were suggested. c) Clearly identify any significant outcomes of consultation that were incorporated into the proposed project. d) Clearly identify any developments that could coincide or conflict with project activities (i.e., developments within or adjacent to a proposed ROW).		
2.2.2: Records of Consultation and Public Outreach. Provide contact information, notification materials, meeting dates and materials, meeting notes, and records of communication organized by entity as an Appendix to the PEA (Appendix G).		

[11] CPUC CEQA Unit Staff request that consultation and public outreach that occurs during the Pre-filing period and throughout environmental review include the assigned CPUC Staff person and CPUC consultant.

2.3 Environmental Review Process

This section will include, but is not limited to, the following:	PEA Section and Page Number	Applicant Notes, Comments
2.3.1: Environmental Review Process. Provide a summary of the anticipated environmental review process and schedule.		
2.3.2: CEQA Review a) Explain why CPUC is the appropriate CEQA Lead agency. b) Identify other state agencies and any federal agencies that may have discretionary permitting authority over any aspect of the proposed project. c) Identify all potential involvement by federal, state, and local agencies not expected to have discretionary permitting authority (i.e., ministerial actions). d) Summarize the results of any preliminary outreach with these agencies as well as future plans for outreach.		
2.3.3: NEPA Review (if applicable). If review according to the National Environmental Policy Act (NEPA) is expected, explain the portions of the project that will require the NEPA review process. Discuss which agency is anticipated to be the NEPA Lead agency if discretionary approval by more than one federal agency is required.		
2.3.4: Pre-filing CEQA and NEPA Coordination. Describe the results of Pre-filing coordination with CEQA and NEPA review agencies (refer to CPUC's Pre-Filing Consultation Guidelines). Identify major outcomes of the Pre-filing coordination process and how the information was incorporated into the PEA, including suggestions on the type of environmental documents and joint or separate processes based on discussions with agency staff.		

2.4 Document Organization

This section will include, but is not limited to, the following:	PEA Section and Page Number	Applicant Notes, Comments
2.4: PEA Organization. Summarize the contents of the PEA and provide an annotated list of its sections.		

3 Proposed Project Description[12]

3.1 Project Overview

This section will include, but is not limited to, the following:	PEA Section and Page Number	Applicant Notes, Comments
3.1: Project Overview a) Provide a concise summary of the proposed project and components in a few paragraphs. b) Described the geographical location of the proposed project (i.e., county, city, etc.). c) Provide an overview map of the proposed project location.		

3.2 Existing and Proposed System

This section will include, but is not limited to, the following:	PEA Section and Page Number	Applicant Notes, Comments
3.2.1: Existing System a) Identify and describe the existing utility system that would be modified by the proposed project, including connected facilities to provide context. Include detailed information about substations, transmission lines, distribution lines, compressor stations, metering stations, valve stations, nearby renewable generation and energy storage facilities, telecommunications facilities, control systems, SCADA systems, etc. b) Provide information on users and the area served by the existing system features. c) Explain how the proposed project would fit into the existing local and regional systems. d) Provide a schematic diagram of the existing system features. e) Provide detailed maps and associated GIS data for existing facilities that would be modified by the proposed project.		
3.2.2: Proposed Project System a) Describe the whole of the proposed project by component, including all new facilities and any modifications, upgrades, or expansions to existing facilities and any interrelated activities that are part of the whole of the action. b) Clearly identify system features that would be added, modified, removed, disconnected and left in place, etc. c) Identify the expected capacities of the proposed facilities, highlighting any changes from the existing system. If the project would not change existing capacities, make this statement. For electrical projects, provide the anticipated capacity increase in amps or megawatts or in the typical units for the types of facilities proposed. For gas projects, provide the total volume of gas to be		

[12] Applicant review of the Administrative Draft Project Description or sections of the Administrative Draft Project Description prepared for the CEQA document may be requested by CPUC CEQA Unit Staff to ensure technical accuracy.

delivered by the proposed facilities, anticipated system capacity increase (typically in million cubic feet per day), expected customers, delivery points and corresponding volumes, and the anticipated maximum allowable operating pressure(s). d) Describe the initial buildout and eventual full buildout of the proposed project facilities. For example, if an electrical substation or gas compressor station would be installed to accommodate additional demand in the future, then include the designs for both the initial construction based on current demand and the design for all infrastructure that could ultimately be installed within the planned footprint of an electric substation or compressor station. e) Explain whether the electric line or gas pipeline will create a second system tie or loop for reliability. f) Provide information on users and the area served by the proposed system features, highlighting any differences from the existing system. g) Provide a schematic diagram of the proposed system features. h) Provide detailed maps and associated GIS data for proposed facilities that would be installed, modified, or relocated by the proposed project.		
3.2.3: System Reliability. Explain whether the electric line or gas pipeline will create a second system tie or loop for reliability. Clearly explain and show how the proposed project relates to and supports the existing utility systems.		
3.2.4: Planning Area. Describe the system planning area served or to be served by the project. Clearly define the Applicant's term for the planning area (e.g., Electrical Needs Area or Distribution Planning Area).		

3.3 Project Components

This section will include, but is not limited to, the following:	PEA Section and Page Number	Applicant Notes, Comments
Required for all Project Types		
3.3.1: Preliminary Design and Engineering a) Provide preliminary design and engineering information for all above-ground and below-ground facilities for the proposed project. The approximately locations, maximum dimensions of facilities, and limits of areas that would be needed to construction and operate the facilities should be clearly defined.[13] b) Provide preliminary design drawings for project features and explain the level of completeness (i.e., percentage). c) Provide detailed project maps (approximately 1:3,000 scale) and associated GIS data of all facility locations and boundaries with attributes and spatial geometry that corresponds to information in the Project Description.		

[13] Refer to Attachment 1 for mapping and GIS data requirements for the project layout and design.

3.3.2: Segments, Components, and Phases a) Define all project segments, components, and phases for the proposed project. b) Provide the length/area of each segment or component, and the timing of each development phase. c) Provide an overview map showing each segment and provide associated GIS data (may be combined with other mapping efforts).		
3.3.3: Existing Facilities a) Identify the types of existing facilities that would be removed or modified by the proposed project (i.e., conductor/cable, poles/towers, substations, switching stations, gas storage facilities, gas pipelines, service buildings, communication systems, etc.). b) Describe the existing facilities by project segment and/or component, and provide information regarding existing dimensions, areas/footprints, quantities, locations, spans, etc. c) Distinguish between above-ground and below-ground facilities and provide both depth and height ranges for each type of facility. For poles/towers, provide the installation method (i.e., foundation type or direct bury), and maximum above-ground heights and below-ground depths. d) Explain what would happen to the existing facilities. Would they be replaced, completely removed, modified, or abandoned? Explain why. e) Identify the names, types, materials, and capacity/volumes ranges (i.e., minimum and maximum) of existing facilities that would be installed or modified by the proposed project. f) Provide diagrams with dimensions representing existing facilities to provide context on how the proposed facilities would be different. g) Briefly describe the surface colors, textures, light reflectivity, and any lighting of existing facilities.		
3.3.4: Proposed Facilities a) Identify the types of proposed facilities to be installed or modified by the proposed project (e.g., conductor/cable, poles/towers, substations, switching stations, gas storage facilities, gas pipelines, service buildings, communication systems). b) Describe the proposed facilities by project segment and/or component, and provide information regarding maximum dimensions, areas/footprints, quantities, locations, spans, etc. c) Distinguish between above-ground and below-ground facilities and provide both depth and height ranges for each type of facility. For poles/towers, provide the installation method (i.e., foundation type or direct bury), and maximum above-ground heights and below-ground depths.		

d) Identify where facilities would be different (e.g., where unique or larger poles would be located, large guy supports or snub poles). e) Provide details about civil engineering requirements (i.e., permanent roads, foundations, pads, drainage systems, detention basins, spill containment, etc.). f) Distinguish between permanent facilities and any temporary facilities (i.e., poles, shoo-fly lines, mobile substations, mobile compressors, transformers, capacitors, switch racks, compressors, valves, driveways, and lighting). g) Identify the names, types, materials, and capacity/volumes ranges (i.e., minimum and maximum) of proposed facilities that would be installed or modified by the proposed project. h) Provide diagrams with dimensions representing existing facilities. i) Briefly describe the surface colors, textures, light reflectivity, and any lighting of proposed facilities.		
3.3.5: Other Potentially Required Facilities a) Identify and describe in detail any other actions or facilities that may be required to complete the project. For example, consider the following questions: i. Could the project require the relocation (temporary or permanent), modification, or replacement of unconnected utilities or other types of infrastructure by the Applicant or any other entity? ii. Could the project require aviation lighting and/or marking? iii. Could the project require additional civil engineering requirements to address site conditions or slope stabilization issues, such as pads and retaining walls, etc.? b) Provide the location of each facility and a description of the facility.		
3.3.6: Future Expansions and Equipment Lifespans a) Provide detailed information about the current and reasonably foreseeable plans for expansion and future phases of development. b) Provide the expected usable life of all facilities. c) Describe all reasonably foreseeable consequences of the proposed project (e.g., future ability to upgrade gas compressor station to match added pipeline capacity).		
Required for Certain Project Types		
3.3.7: Below-ground Conductor/Cable Installations (as Applicable) a) Describe the type of line to be installed (e.g., single circuit cross-linked polyethylene-insulated solid-dielectric, copper-conductor cables). b) Describe the type of casing the cable would be installed in (e.g., concrete-encased duct bank system) and provide the dimensions of the casing.		

c) Describe the types of infrastructure would likely be installed within the duct bank (e.g., transmission, fiber optics, etc.).		
3.3.8: Electric Substations and Switching Stations (as Applicable) a) Provide the number of transformer banks that will be added at initial and full buildout of the substation. Identify the transformer voltage and number of each transformer type. b) Identify any gas insulated switchgear that will be installed within the substation. c) Describe any operation and maintenance facilities, telecommunications equipment, and SCADA equipment that would be installed within the substation.		
3.3.9: Gas Pipelines (as Applicable). For each segment: a) Identify pipe diameter, number and length of exposed sections, classes and types of pipe to be installed, pressure of pipe, and cathodic protection for each linear segment. b) Describe new and existing inspection facilities (e.g., pig launcher sites). c) Describe system cross ties and laterals/taps. d) Identify the spacing between each valve station. e) Describe the compressor station, if needed, for any new or existing pipeline. f) Describe all pipelines and interconnections with existing and proposed facilities: i. Number of interconnections and locations and sizes; ii. All below-ground and above-ground installations; and iii. All remote facility locations for metering, telemetry, control.		
3.3.10: Gas Storage Facilities – Background and Resource Information (as Applicable) a) Provide detailed background information on the natural gas formation contributing to the existing or proposed natural gas facility, including the following: i. Description of overlying stratigraphy, especially caps ii. Description of production, injection, and intervening strata iii. Types of rock iv. Description of types of rocks in formation, including permeability or fractures v. Thickness of strata b) Provide a graphic and/or table showing formation thicknesses. c) Identify and describe any potential gas migration pathways, such as faults, permeable contacts, abandoned wells, underground water or other pipelines. d) Provide a summary and detailed cross-section diagrams of the geologic formations and structures of the oil/gas field or area. e) Provide the first well drilling and production history, abandonment procedures, inspections, etc. f) Describe production zones, including depth, types of formations, and characteristics of field/area.		

g) Describe the existing and proposed storage capacity and limiting factors, such as injection or withdrawal capacities. h) Describe existing simulation studies that were used to predict the reservoir pressure response under gas injection and withdrawal operations, and simulation studies for how the system would change as proposed. Provide the studies as a PEA Appendix. i) Provide the history of the oil/gas field or area.		
3.3.11: Gas Storage Facilities – Well-Head Sites (as Applicable). Describe the location, depth, size and completion information for all existing, abandoned, proposed production and injection, monitoring, and test wells.		
3.3.12: Gas Storage Facilities – Production and Injection (as Applicable) a) Provide the proposed storage capacity of production and injection wells. b) Provide production and injection pressures, depths, and rates. c) Provide production and injection cycles by day, week, and year. d) Describe existing and proposed withdrawal/production wells (i.e., size, depth, formations, etc.). e) Describe existing and proposed cushion gas requirements. f) Describe any cushion gas injection—formation the well is completed in (cushion gas formation), and injection information.		
3.3.13: Gas Storage Facilities – Electrical Energy (as Applicable). Describe all existing and proposed electric lines, telecommunications facilities, and other utilities/facilities (e.g., administrative offices, service buildings, and non-hazardous storage), and chemical storage associated with the proposed project.		
3.3.14: Telecommunication Lines (as Applicable) a) Identify the type of cable that is proposed and length in linear miles by segment. b) Identify any antenna and node facilities that are part of the project. c) For below-ground telecommunication lines, provide the depth of cable and type of conduit. d) For above-ground telecommunication lines, provide: i. Types of poles that will be installed (if new poles are required) ii. Where existing poles will be used iii. Any additional infrastructure (e.g., guy wires) or pole changes required to support the additional cable on existing poles		

3.4 Land Ownership, Rights-of-Way, and Easements

This section will include, but is not limited to, the following:	PEA Section and Page Number	Applicant Notes, Comments
3.4.1: Land Ownership. Describe existing land ownership where each project component would be located. State whether the proposed		

project would be located on property(ies) owned by the Applicant or if additional property would be required.		
3.4.2: Existing Rights-of-Way or Easements a) Identify and describe existing rights-of-way (ROWs) or easements where project components would be located. Provide the approximately lengths and widths in each project area. b) Clearly state if project facilities would be replaced, modified, or relocated within existing ROWs or easements.		
3.4.3: New or Modified Rights-of-Way or Easements a) Describe new permanent or modified ROWs or easements that would be required. Provide the approximately lengths and widths in each project area. b) Describe how any new permanent or modified ROWs or easements would be acquired. c) Provide site plans identifying all properties/parcels and partial properties/parcels that may require acquisition and the anticipated ROWs or easements. Provide associated GIS data. d) Describe any development restrictions within new ROWs or easements, e.g., building clearances and height restrictions, etc. e) Describe any relocation or demolition of commercial or residential property/structures that may be necessary.		
3.4.4: Temporary Rights-of-Way or Easements f) Describe temporary ROWs or easements that would be required to access project areas, including ROWs or easements for temporary construction areas (i.e., staging areas or landing zones). g) Explain where temporary construction areas would be located with existing ROWs or easements for the project or otherwise available to the Applicant without a temporary ROW or easement. h) Describe how any temporary ROWs or easements would be acquired.		

3.5 Construction

This section will include, but is not limited to, the following:	**PEA Section and Page Number**	**Applicant Notes, Comments**
3.5.1 Construction Access (All Projects)		
3.5.1.1: Existing Access Roads a) Provide the lengths, widths, ownership details (both public and private roads), and surface characteristics (i.e., paved, graveled, bare soil) of existing access roads that would be used during construction. Provide the area of existing roads that would be used (see example in Table 3 below). b) Describe any road modifications or stabilization that would be required prior to construction, including on the adjacent road		

shoulders or slopes. Identify any roads that would be expanded and provide the proposed width increases. c) Describe any procedures to address incidental road damage cause by project activities following construction. d) Provide detailed maps and associated GIS data for all existing access roads.		

Table 3. Access Roads

Type of Road	Description	Area Proposed Project
Existing Dirt Road	Typically double track. May have been graded previously. No other preparation required, although a few sections may need to be re-graded and crushed rock applied in very limited areas for traction.	_____ acres
New Permanent	Would be xx feet wide, bladed. No other preparation required although crushed rock may need to be applied in very limited areas for traction.	_____ acres
Overland Access	No preparation required. Typically grassy areas that are relatively flat. No restoration would be necessary.	_____ acres

3.5.1.2: New Access Roads a) Identify any new access roads that would be developed for project construction purposes, such as where any blading, grading, or gravel placement could occur to provide equipment access outside of a designated workspace.[14] b) Provide lengths, widths, and development methods for new access roads. c) Identify any temporary or permanent gates that would be installed. d) Clearly identify any roads that would be temporary and fully restored following construction. Otherwise it will be assumed the new access road is a permanent feature. e) Provide detailed maps and associated GIS data for all new access roads.		
3.5.1.3: Overland Access Routes a) Identify any overland access routes that would be used during construction, such as where vehicles and equipment would travel over existing vegetation and where blading, grading, or gravel placement would occur. b) Provide lengths and widths for new access roads. c) Provide detailed maps and associated GIS data for all overland access routes.		
3.5.1.4: Watercourse Crossings a) Identify all temporary watercourse crossings that would be required during construction. Provide specific methods and procedures for temporary watercourse crossings.		

[14] Temporary roads that would not require these activities should be considered an overland route.

b) Describe any bridges or culverts that replacement or installation of would be required for construction access. c) Provide details about the location, design and construction methods.		
3.5.1.5: Helicopter Access. If helicopters would be used during construction: a) Describe the types and quantities of helicopters that would be used during construction (e.g., light, medium, heavy, or sky crane), and a description of the activities that each helicopter would be used for. b) Identify areas for helicopter takeoff and landing. c) Describe helicopter refueling procedures and locations. d) Describe flight paths, payloads, and expected hours and durations of helicopter operation. e) Describe any safety procedures or requirements unique to helicopter operations, such as but not limited to obtaining a Congested Area Plan from the Federal Aviation Administration (FAA).		
3.5.2 Staging Areas (All Projects)		
3.5.2.1: Staging Area Locations a) Identify the locations of all staging area(s). Provide a map and GIS data for each.[15] b) Provide the size (in acres) for each staging area and the total staging area requirements for the project.		
3.5.2.2: Staging Area Preparation a) Describe any site preparation required, if known, or generally describe what might be required (i.e., vegetation removal, new access road, installation of rock base, etc.). b) Describe what the staging area would be used for (i.e., material and equipment storage, field office, reporting location for workers, parking area for vehicles and equipment, etc.). c) Describe how the staging area would be secured. Would a fence be installed? If so, describe the type and extent of the fencing. d) Describe how power to the site would be provided if required (i.e., tap into existing distribution, use of diesel generators, etc.). e) Describe any temporary lightning facilities for the site. f) Describe any grading activities and/or slope stabilization issues.		

[15] While not all potential local site staging areas will be known prior to selection of a contractor, it is expected that approximate area and likely locations of staging areas be disclosed. The identification of extra or optional staging areas should be considered to reduce the risk of changes after project approval that could necessitate further CEQA review.

3.5.3 Construction Work Areas (All Projects)		
3.5.3.1: Construction Work Areas a) Describe known work areas that may be required for specific construction activities (e.g., pole assembly, hillside construction)[16] b) Describe the types of activities that would be performed at each work area. Work areas may include but are not necessarily limited to: i. Helicopter landing zones and touchdown areas ii. Vehicle and equipment parking, passing, or turnaround areas iii. Railroad, bridge, or watercourse crossings iv. Temporary work pads for facility installation, modification, or removal v. Excavations and associated equipment work areas vi. Temporary guard structures vii. Pull-and-tension/stringing sites viii. Jack and bore pits, drilling areas and pull-back areas for horizontal directional drills ix. Retaining walls		
3.5.3.2 Work Area Disturbance a) Provide the dimensions of each work area including the maximum area that would be disturbed during construction (e.g., 100 feet by 200 feet) (see example in Table 4 below). b) Provide a table with temporary and permanent disturbance at each work area (in square feet or acres), and the total area of temporary and permanent disturbance for the entire project (in acres).		
3.5.3.3: Temporary Power. Identify how power would be provided at work area (i.e., tap into existing distribution, use of diesel generators, etc.). Provide the disturbance area for any temporary power lines.		
3.5.4 Site Preparation (All Projects)		
3.5.4.1: Surveying and Staking. Describe initial surveying and staking procedures for site preparation and access.		
3.5.4.2: Utilities a) Describe the process for identifying any underground utilities prior to construction (i.e., underground service alerts, etc.). b) Describe the process for relocating any existing overhead or underground utilities that aren't directly connected to the project system. c) Describe the process for installing any temporary power or other utility lines for construction.		

[16] Understanding that each specific work area may not be determined until the final work plan is submitted by the construction contractor, estimate total area likely to be disturbed.

Table 4. Work Areas

	Proposed Project (approximate metrics)
Pole Diameter:	
• Wood	_____ inches
• Self-Supporting Steel	_____inches
Lattice Tower Base Dimension:	
• Self-Supporting Lattice Structure	_____feet
Auger Hole Depth:	
• Wood	_____ to _____ feet
• Self-Supporting Steel	_____ to _____ feet
Permanent Footprint per Pole/Tower:	
• Wood	_____ sq. feet
• Self-Supporting Steel	_____ sq. feet
• Self-Supporting Steel Tower	_____ sq. feet
Number of Poles/Towers:	
• Wood	_____
• Self-Supporting Steel	_____
• Self-Supporting Steel Tower	_____
Average Work Area around Pole/Towers (e.g., for old pole removal and new pole installation):	
• Tangent structure work areas	_____ sq. feet
• Dead End / Angle structure work areas	_____ sq. feet
Total Permanent Footprint for Poles/Towers	Approximately _____ acres

3.5.4.3: Vegetation Clearing a) Describe what types of vegetation clearing may be required (e.g., tree removal, brush removal, flammable fuels removal) and why (e.g., to provide access, etc.). b) Provide calculations of temporary and permanent disturbance of each vegetation community and include all areas of vegetation removal in the GIS database. Distinguish between disturbance that would occur in previously developed areas (i.e., paved, graveled, or otherwise urbanized), and naturally vegetated areas. c) Describe how each type of vegetation removal would be accomplished. d) Describe the types of equipment that would be used for vegetation removal.		
3.5.4.4: Tree Trimming Removal a) For electrical projects, distinguish between tree trimming as required under CPUC General Order 95-D and tree removal. b) Identify the types, locations, approximate numbers, and sizes of trees that may need to be removed or trimmed substantially. c) Identify potentially protected trees that may be removed or substantially trimmed, such as but not limited to riparian trees, oaks trees, Joshua trees, or palm trees.		

d) Describe the types of equipment that would typically be used for tree removal.		
3.5.4.5: Work Area Stabilization. Describe the processes to stabilize temporary work areas and access roads including the materials that would be used (e.g., gravel).		
3.5.4.6: Grading a) Describe any earth moving or substantial grading activities (i.e., grading below a 6-inch depth) that would be required and identify locations where it would occur. b) Provide estimated volumes of grading (in cubic yards) including total cut, total fill, cut that would be reused, cut that would be hauled away, and clean fill that would be hauled to the site.		
3.5.5 Transmission Line Construction (Above Ground)		
3.5.5.1: Poles/Towers a) Describe the process and equipment for removing poles, towers, and associated foundations for the proposed project (where applicable). Describe how they would be disconnected, demolished, and removed from the site. Describe backfilling procedures and where the material would be obtained. b) Describe the process and equipment for installing or otherwise modifying poles and towers for the proposed project. Describe how they would be put into place and connected to the system. Identify any special construction methods (e.g., helicopter installation) at specific locations or specific types of poles/towers. c) Describe how foundations, if any, would be installed. Provide a description of the construction method(s), approximate average depth and diameter of excavation, approximate volume of soil to be excavated, approximate volume of concrete or other backfill required, etc. for foundations. Describe what would be done with soil removed from a hole/foundation site. d) Describe how the poles/towers and associated hardware would be delivered to the site and assembled. e) Describe any pole topping procedures that would occur, identify specific locations and reasons, and describe how each facility would be modified. Describe any special methods that would be required to top poles that may be difficult to access.		
3.5.5.2: Aboveground and Underground Conductor/Cable a) Provide a process-based description of how new conductor/cable would be installed and how old conductor/cable would be removed, if applicable. b) Identify where conductor/cable stringing/installation activities would occur. c) Provide a diagram of the general sequencing and equipment that would be used. d) Describe the conductor/cable splicing process.		

e) Provide the general or average distance between pull-and-tension sites. Describe the approximate dimensions and where pull-and-tension sites would generally be required (as indicated by the designated work areas), such as the approximate distance to pole/tower height ratio, at set distances, or at significant direction changes. Describe the equipment that would be required at these sites. f) For underground conductor/cable installations, describe all specialized construction methods that would be used for installing underground conductor or cable. If vaults are required, provide their dimensions and location/spacing along the alignment. Provide a detailed description for how the vaults would be delivered to the site and installed. g) Describe any safety precautions or areas where special methodology would be required (e.g., crossing roadways, stream crossing).		
3.5.5.3: Telecommunications. Identify the procedures for installation of proposed telecommunication cables and associated infrastructure.		
3.5.5.4: Guard Structures. Identify the types of guard structures that would be used at crossings of utility lines, roads, railroads, highways, etc. Describe the different types of guard structures or methods that may be used (i.e., buried poles and netting, poles secured to a weighted object, bucket trucks, etc.). Describe any pole installation and removal procedures associated with guard structures. Describe guard structure installation and removal process and duration that guard structures would remain in place.		
3.5.5.5: Blasting a) Describe any blasting that may be required to construct the project. b) If blasting may be required, provide a Blasting Plan that identifies the blasting locations; types and amounts of blasting agent to be used at each location; estimated impact radii; and, noise estimates. The Blasting Plan should be provided as an Appendix to the PEA. c) Provide a map identifying the locations where blasting may be required with estimated impact radii. Provide associated GIS data.		
3.5.6 Transmission Line Construction (Below Ground)		
3.5.6.1: Trenching a) Describe the approximate dimensions of the trench (e.g., depth, width). b) Provide the total approximate volume of material to be removed from the trench, the amount to be used as backfill, and any amount to subsequently be removed/disposed of offsite in cubic yards. c) Describe the methods used for making the trench (e.g., saw cutter to cut the pavement, backhoe to remove, etc.). d) Provide off-site disposal location, if known, or describe possible option(s). e) Describe if dewatering would be anticipated and if so, how the trench would be dewatered, the anticipated flows of the water,		

whether there would be treatment, and how the water would be disposed of. f) Describe the process for testing excavated soil or groundwater for the presence of pre-existing environmental contaminants that could be exposed from trenching operations. g) If a pre-existing hazardous waste were encountered, describe the process of removal and disposal. h) Describe the state of the ground surface after backfilling the trench. i) Describe standard Best Management Practices to be implemented.		
3.5.6.2: Trenchless Techniques (Microtunnel, Jack and Bore, Horizontal Directional Drilling) a) Identify any locations/features for which the Applicant expects to use a trenchless (i.e., microtunneling, jack and bore, horizontal directional drilling) crossing method and which method is planned for each crossing. b) Describe the methodology of the trenchless technique. c) Provide the approximate location and dimensions of the sending and receiving pits. d) Describe the methodology of excavating and shoring the pits. e) Provide the total volume of material to be removed from the pits, the amount to be used as backfill, and the amount subsequently to be removed/disposed of offsite in cubic yards. f) Describe process for safe handling of drilling mud and bore lubricants. g) Describe the process for detecting and avoiding "fracturing-out" during horizontal directional drilling operations. h) Describe the process for avoiding contact between drilling mud/lubricants and stream beds. i) If engineered fill would be used as backfill, indicate the type of engineered backfill and the amount that would be typically used (e.g., the top 2 feet would be filled with thermal-select backfill). j) Describe if dewatering is anticipated and, if so, how the pits would be dewatered, the anticipated flows of the water, whether there would there be treatment, and how the water would be disposed of. k) Describe the process for testing excavated soil or groundwater for the presence of pre-existing environmental contaminants. Describe the process of disposing of any pre-existing hazardous waste that is encountered during excavation. l) Describe any standard BMPs that would be implemented for trenchless construction.		
3.5.7 Substation, Switching Stations, Gas Compressor Stations		
3.5.7.1: Installation or Facility Modification. Describe the process and equipment for removing, installing, or modifying any substations, switching stations, or compressor stations including: a) Transformers/ electric components b) Gas components c) Control and operation buildings d) Driveways		

e) Fences f) Gates g) Communication systems (SCADA) h) Grounding systems		
3.5.7.2: Civil Works. Describe the process and equipment required to construct any slope stabilization, drainage, retention basins, and spill containment required for the facility.		
3.5.8 Gas Pipelines		
3.5.8.1: Gas Pipeline Construction. Describe the process for proposed pipeline construction including site development, trenching and trenchless techniques, pipe installation, and backfilling.		
3.5.8.2: Water Crossings. Describe water feature crossings that will occur during trenching, the method of trenching through stream crossings, and the process for avoiding impacts to the water features required for pipeline construction. Identify all locations where the pipeline will cross water features. Cite to any associated geotechnical or hydrological investigations completed and provide a full copy of each report as an Appendix to the PEA.[17]		
3.5.8.3: Gas Pipeline Other Requirements a) Describe hydrostatic testing process including pressures, timing, source of flushing water, discharge of water. b) Describe energy dissipation basin, and the size and length of segments to be tested. c) Describe pig launching locations and any inline inspection techniques used during or immediately post construction.		
3.5.9 Gas Storage Facilities		
3.5.9.1: Gas Storage Construction a) Describe the process for constructing the gas storage facility including constructing well pads and drilling wells. b) Describe the specific construction equipment that would be used, such as the type of drill rig (i.e., size, diesel, electric, etc.), depth of drilling, well-drilling schedule and equipment.		
3.5.9.2: Drilling Muds and Fluids. Describe the use of any drilling muds, fluids, and other drilling materials. Provided estimated types and quantities.		
3.5.10 Public Safety and Traffic Control (All Projects)		
3.5.10.1: Public Safety a) Describe specific public safety considerations during construction and best management practices to appropriately manage public safety. Clearly state when and where they each safety measure would be applied.		

[17] If a geotechnical study is not available at the time of PEA filing, provide the best information available.

b) Identify procedures for managing work sites in urban areas, covering open excavations securely, installing barriers, installing guard structures, etc. c) Identify specific project areas where public access may be restricted for safety purposes and provide the approximate durations and timing of restricted access at each location.		
3.5.10.2: Traffic Control a) Describe traffic control procedures that would be implemented during construction. b) Identify the locations, process, and timing for closing any sidewalks, lanes, roads, trails, paths, or driveways to manage public access. c) Identify temporary detour routes and locations. d) Provide a preliminary Traffic Control Plan(s) for the project.		
3.5.10.3: Security. Describe any security measures, such as fencing, lighting, alarms, etc. that may be required. State if security personnel will be stationed at project areas and anticipated duration of security.		
3.5.10.4: Livestock. Describe any livestock fencing or guards that may be necessary to prevent livestock from entering project areas. State if the fencing would be electrified and if so, how it would be powered.		
3.5.11 Dust, Erosion, and Runoff Controls (All Projects)		
3.5.11.1: Dust. Describe specific best management practices that would be implemented to manage fugitive dust.		
3.5.11.2: Erosion. Describe specific best management practices that would be implemented to manage erosion.		
3.5.11.3: Runoff. Describe specific best management practices that would be implemented to manage stormwater runoff and sediment.		
3.5.12 Water Use and Dewatering (All Projects)		
3.5.12.1: Water Use. Describe the estimated volumes of water that would be used by construction activity (e.g., dust control, compaction, etc.). State if recycled or reclaimed water would be used and provide estimated volumes. Identify the anticipated sources where the water would be acquired or purchased. Identify if the source of water is groundwater and the quantity of groundwater that could be used.		
3.5.12.2: Dewatering a) Describe dewatering procedures during construction, including pumping, storing, testing, permitted discharging, and disposal requirements that would be followed. b) Describe the types of equipment and workspace considerations to be used to dewater, store, transport, or discharge extracted water.		
3.5.13 Hazardous Materials and Management (All Projects)		
3.5.13.1: Hazardous Materials a) Describe the types, uses, and volumes of all hazardous materials that would be used during construction. b) State if herbicides or pesticides may be used during construction.		

c) If a pre-existing hazardous waste were encountered, describe the process of removal and disposal.		
3.5.13.2: Hazardous Materials Management a) Identify specific best management practices that would be followed for transporting, storing, and handling hazardous materials. b) Identify specific best management practices that would be followed in the event of an incidental leak or spill of hazardous materials. c) Provide a Hazardous Substance Control and Emergency Response Plan / Hazardous Waste and Spill Prevention Plan as an Appendix to the PEA, if appropriate.		
3.5.14 Waste Generation and Management (All Projects)		
3.5.14.1: Solid Waste a) Describe solid waste streams from existing and proposed facilities during construction. b) Identify procedures to be implemented to manage solid waste, including collection, containment, storage, treatment, and disposal. c) Provide estimated total volumes of solid waste by construction activity or project component. d) Describe the recycling potential of solid waste materials and provide estimated volumes of recyclable materials by construction activity or project component. e) Identify the locations of appropriate disposal and recycling facilities where solid wastes would be transported.		
3.5.14.2: Liquid Waste a) Describe liquid waste streams during construction (i.e., sanitary waste, drilling fluids, contaminated water, etc.) b) Describe procedures to be implemented to manage liquid waste, including collection, containment, storage, treatment, and disposal. c) Provide estimated volumes of liquid waste generated by construction activity or project component. d) Identify the locations of appropriate disposal facilities where liquid wastes would be transported.		
3.5.14.3: Hazardous Waste a) Describe potentially hazardous waste streams during construction and procedures to be implemented to manage hazardous wastes, including collection, containment, storage, treatment, and disposal. b) If large volumes of hazardous waste are anticipated, such as from a pre-existing contaminant in the soil that must be collected and disposed of, provide estimated volumes of hazardous waste that would be generated by construction activity or project component. c) Identify the locations of appropriate disposal facilities where hazardous wastes would be transported.		
3.5.15 Fire Prevention and Response (All Projects)		
3.5.15.1: Fire Prevention and Response Procedures. Describe fire prevention and response procedures that would be implemented during		

construction. Provide a Construction Fire Prevention Plan or specific procedures as an Appendix to the PEA.		
3.5.15.2: Fire Breaks. Identify any fire breaks (i.e., vegetation clearance) requirements around specific project activities (i.e., hot work). Ensure that such clearance buffers are included in the limits of the defined work areas, and the vegetation removal in that area is attributed to Fire Prevention and Response (refer to 3.5.4.3: Vegetation Clearing).		

3.6 Construction Workforce, Equipment, Traffic, and Schedule

This section will include, but is not limited to, the following:	**PEA Section and Page Number**	**Applicant Notes, Comments**
3.6.1: Construction Workforce a) Provide the estimated number of construction crew members. In the absence of project-specific data, provide estimates based on past projects of a similar size and type. b) Describe the crew deployment. Would crews work concurrently (i.e., multiple crews at different sites); would they be phased? How many crews could be working at the same time and where? c) Describe the different types of activities to be undertaken during construction, the number of crew members for each activity (i.e. trenching, grading, etc.), and number and types of equipment expected to be used for the activity. Include a written description of the activity. See example in Table 5.		
3.6.2: Construction Equipment. Provide a tabular list of the types of equipment expected to be used during construction of the proposed project including the horsepower. Define the equipment that would be used by each phase as shown in the example table below (Table 5).		

Table 5. Construction Equipment and Workforce

Work Activity				Activity Production				
Equipment Description	Estimated Horse-power	Probable Fuel Type	Equipment Quantity	Estimated Workforce	Estimated Start Date	Estimated End Date	Duration of Use (Hrs./Day)	Estimated Production
Survey				**4**	**January 2020**	**December 2020**		**358 Miles**
1-Ton Truck, 4x4	300	Diesel	2		January 2020	December 2020	10	1 Mile/Day
Staging Yards				**5**	**DOP**			
1-Ton Truck, 4x4	300	Diesel	1				4	
R/T Forklift	350	Diesel	1				5	
Boom/Crane Truck	350	Diesel	1				5	
Water Truck	300	Diesel	2		Duration of Project		10	
Jet A Fuel Truck	300	Diesel	1				4	
Truck, Semi-Tractor	500	Diesel	1				6	
Road Work				**6**	**January 2020**	**March 2020**		**426 Miles**
1-Ton Truck, 4x4	300	Diesel	2		January 2020	March 2020	5	
Backhoe/Front Loader	350	Diesel	1		January 2020	March 2020	7	
Track Type Dozer	350	Diesel	1		January 2020	March 2020	7	
Motor Grader	350	Diesel	1		January 2020	March 2020	5	
Water Truck	300	Diesel	2		January 2020	March 2020	10	
Drum Type Compactor	250	Diesel	1		January 2020	March 2020	5	
Excavator	300	Diesel	1		January 2020	February 2020	7	
Lowboy Truck/Trailer	500	Diesel	1		January 2020	February 2020	4	

3.6.3: Construction Traffic a) Describe how the construction crews and their equipment would be transported to and from the proposed project site. b) Provide vehicle type, number of vehicles, and estimated hours of operation per day, week, and month for each construction activity and phase. c) Provide estimated vehicle trips and vehicles miles traveled (VMT) for each construction activity and phase. Provide separate values for construction crews commuting, haul trips, and other types of construction traffic.		
3.6.4: Construction Schedule a) Provide the proposed construction schedule (e.g., month and year) for each segment or project component, and for each construction activity and phase. b) Provide and explain the sequencing of construction activities, and if they would or would not occur concurrently. c) Provide the total duration of each construction activity and phase in days or weeks. d) Identify seasonal considerations that may affect the construction schedule, such as weather or anticipated wildlife restrictions, etc. The proposed construction should account for such factors.		
3.6.5: Work Schedule a) Describe the anticipated work schedule, including the days of the week and hours of the day when work would occur. Clearly state if work would occur at night or on weekends and identify when and where this could occur. b) Provide the estimated number of days or weeks that construction activities would occur at each type of work area. For example, construction at a stationary facility or staging area may occur for the entire duration of construction, but construction at individual work areas along a linear project would be limited to a few hours, days or weeks, and only a fraction of the total construction period.		

3.7 Post-Construction

This section will include, but is not limited to, the following:	PEA Section and Page Number	Applicant Notes, Comments
3.7.1: Configuring and Testing. Describe the process and duration for post-construction configuring and testing of facilities. Describe the number of personnel and types of equipment that would be involved.		
3.7.2: Landscaping. Describe any landscaping that would be installed. Provide a conceptual landscape plan that identifies the locations and types of plantings that will be used. Identify whether plantings will include container plants or seeds. Include any water required for landscaping in the description of water use above.		

3.7.3 Demobilization and Site Restoration		
3.7.3.1: Demobilization. Describe the process for demobilization after construction activities, but prior to leaving the work site. For example, describe final processes for removing stationary equipment and materials, etc.		
3.7.3.2: Site Restoration. Describe how cleanup and post-construction restoration would be performed (i.e., personnel, equipment, and methods) on all project ROWs, sites, and extra work areas. Things to consider include, but are not limited to, restoration of the following: a) Restoring natural drainage patterns b) Recontouring disturbed soil c) Removing construction debris d) Vegetation e) Permanent and semi-permanent erosion control measures f) Restoration of all disturbed areas and access roads, including restoration of any public trails that are used as access, as well as any damaged sidewalks, agricultural infrastructure, or landscaping, etc. g) Road repaving and striping, including proposed timing of road restoration for underground construction within public roadways		

3.8 Operation and Maintenance

This section will include, but is not limited to, the following:	PEA Section and Page Number	Applicant Notes, Comments
3.8.1: Regulations and Standards a) Identify and describe all regulations and standards applicable to operation and maintenance of project facilities. b) Provide a copy of any applicable Wildfire Management Plan and describe any special procedures for wildfire management.		
3.8.2: System Controls and Operation Staff a) Describe the systems and methods that the Applicant would use for monitoring and control of project facilities (e.g., on-site control rooms, remote facilities, standard monitoring and protection equipment, pressure sensors, automatic shut-off valves, and site and equipment specific for monitoring and control such as at natural gas well pads). b) If new full-time staff would be required for operation and/or maintenance, provide the number of positions and purpose.		
3.8.3: Inspection Programs a) Describe the existing and proposed inspection programs for each project component, including the type, frequency, and timing of scheduled inspections (i.e., aerial inspection, ground inspection, pipeline inline inspections). b) Describe any enhanced inspections, such as within any High Fire Threat Districts consistent with applicable Wildfire Management Plan requirements.		

c) Describe the inspection processes, such as the methods, number of crew members, and how access would occur (i.e., walk, vehicle, all-terrain vehicle, helicopter, drone, etc.). If new access would be required, describe any restoration that would be provided for the access roads.		
3.8.4: Maintenance Programs a) Describe the existing and proposed maintenance programs for each project component. b) Describe scheduled maintenance or facility replacement after the designated lifespan of the equipment. c) Identify typical parts and materials that require regular maintenance and describe the repair procedures. d) Describe any access road maintenance that would occur. e) Describe maintenance for surface or color treatment. f) Describe cathodic protection maintenance that would occur. g) Describe ongoing landscaping maintenance that would occur.		
3.8.5: Vegetation Management Programs a) Describe vegetation management programs within and surrounding project facilities. Distinguish between any different types of vegetation management. b) Describe any enhanced vegetation management, such as within any High Fire Threat Districts consistent with any applicable Wildfire Management Plan requirements. Identify the areas where enhanced vegetation management would be conducted.		

3.9 Decommissioning

This section will include, but is not limited to, the following:	PEA Section and Page Number	Applicant Notes, Comments
3.9.1: Decommissioning. Provide detailed information about the current and reasonably foreseeable plans for the disposal, recycling, or future abandonment of all project facilities.		

3.10 Anticipated Permits and Approvals

This section will include, but is not limited to, the following:	PEA Section and Page Number	Applicant Notes, Comments
3.10.1: Anticipated Permits and Approvals. Identify all necessary federal, state, regional, and local permits that may be required for the project. For each permit, list the responsible agency and district/office representative with contact information, type of permit or approval, and status of each permit with date filed or planned to file. For example: a) Federal Permits and Approvals i. U.S. Fish and Wildlife Service ii. U.S. Army Corps of Engineers iii. Federal Aviation Administration iv. U.S. Forest Service		

v. U.S. Department of Transportation – Office of Pipeline Safety vi. U.S. Environmental Protection Agency (Resource Conservation and Recovery Act; Comprehensive Environmental Response, Compensation, and Liability Act) b) State and Regional Permits i. California Department of Fish and Wildlife ii. California Department of Transportation iii. California State Lands Commission iv. California Coastal Commission v. State Historic Preservation Office, Native American Heritage Commission vi. State Water Resources Control Board vii. California Division of Oil, Gas and Geothermal Resources viii. Regional Air Quality Management District ix. Regional Water Quality Control Board (National Pollutant Discharge Elimination System General Industrial Storm Water Discharge Permit) x. Habitat Conservation Plan Authority (if applicable) See also Table 6 of example permitting requirements and processes.		
3.10.2: Rights-of-Way or Easement Applications. Demonstrate that applications for ROWs or other proposed land use have been or soon will be filed with federal, state, or other land-managing agencies that have jurisdiction over land that would be affected by the project (if any). Discuss permitting plans and timeframes and provide the contact information at the federal agency(ies) approached.		

3.11 Applicant Proposed Measures

This section will include, but is not limited to, the following:	PEA Section and Page Number	Applicant Notes, Comments
3.11 Applicant Proposed Measures a) Provide a table with the full text of any Applicant Proposed Measure. Where applicable, provide a copy of Applicant procedures, plans, and standards referenced in the Applicant Proposed Measures. b) Within Chapter 5, describe the basis for selecting a particular Applicant Proposed Measure and how the Applicant Proposed Measure would reduce the impacts of the project.[18] c) Carefully consider each CPUC Draft Environmental Measure identified in Chapter 5 of this PEA Checklist. The CPUC Draft Environmental Measures will be applied to the proposed project where applicable.		

[18] Applicant Proposed Measures that use phrases, such as, "as practicable" or other conditional language are not acceptable and will be superseded by Mitigation Measures if required to avoid or reduce a potentially significant impact.

Table 6. Example Permitting Requirements and Processes

Note: In addition to the CPCN or PTC, the applicant may also be required to secure resource agency permits for the project.

Disclaimer: Below is a general list of permits required for transmission projects. Permit requirements for individual projects may vary slightly depending on project conditions.

Agency	Permit	Regulation	Protected Resource	Trigger	Application Process	Timing
				Federal		
Army Corps of Engineers	404 Permit	Clean Water Act	Waters of the United States (including wetlands)	Placement of dredge or fill material into waters of the U.S., including wetlands. If project impacts less than 0.5 acres a **nationwide permit (NWP)** is typically issued	**NWP:** prepare a preconstruction notification (PCN) along with the draft Corps's application (Engineer Form 4345). Information in the PCN includes, but is not limited to: results of wetland delineation including areas of waters of the U.S.; temporary and permanent impacts to waters of the U.S. and discussion of avoidance; construction techniques, timeline, and equipment that would be used; special status species that potentially occur in the project area, and discussion of mitigation (if applicable) to replace wetlands	**NWP:** takes approximately nine months from the date of application submittal (depending on level of impacts and level of consultation required by other agencies). Initial review is 30 days after which application is deemed complete or additional information is requested.
				If project would impact more than 0.5 acres a **regional or individual permit** may be required.	**Regional or Individual Permit:** Same requirements as NWP as well as preparation and submittal of 404(b)(1) Alternatives analysis which identifies the Least Environmentally Damaging Practicable Alternative (LEDPA). Public notice also required	**Regional or Individual Permit:** An additional three to six months may be required on top of the nine months expected for an NWP. A 30 day public notice is also required to inform the public about the project before the Corps issues the permit.
USFWS	Section 7 Consultation	Federal Endangered Species Act	Federally Listed Species	Potential impact to a federally listed threatened or endangered species	Biological Assessment (BA) prepared and submitted to Corps. BA contains information on each species and describes potential for "take" of species and/or habitat.	The timeline for processing and receiving a formal **Biological Opinion (BO)** from USFWS can be six months to a year from when the Corps has initiated consultation and depending on the level of impact to listed species. The typical timeline for issuance of a BO is no less than 135 days after acceptance of the BA as complete.
US Department of Agriculture, Forest Service	Special Use Authorization	National Forest Management Act/NEPA	National Forest lands	Use of federal lands managed by the USDA Forest Service for a transmission line. Typically constitutes a Major Federal Action which in turn triggers NEPA analysis.	**Special Use Authorization Application:** prepare a special use application for consideration by the Forest Service. Prior to submitting a proposal, applicant is required to arrange a preapplicaiton meeting at the local Forest Service office. Application typically includes project plan, operating plans, liability insurance, licenses/registrations and other documents. If it is determined that NEPA is required either an EA or EIS would be prepared. The NEPA document may be prepared jointly with the CEQA document.	Revies of Special Use Authorization applications is often dependent upon what level of NEPA analysis is required. An EA is typically 9-12 months, and EIS is generally 18 months. NEPA process may occur concurrently with CEQA process.
US Department of the Interior, Bureau of Land Management	Right-of-Way Grant	Federal Land Policy and Management Act/NEPA	Federal Lands	Use of federal lands managed by the BLM for a transmission line. Typically constitutes a Major Federal Action which in turn triggers NEPA analysis.	**Right-of-Way Application**: Contact the BLM office with management responsibility. Obtain an application form "Application for Transportation and Utility Systems and Facilities on Federal Lands". Arrange a pre-application meeting with a BLM Realty Specialist or appropriate staff member. Submit completed application to the appropriate BLM office. If it is determined that NEPA is required either an EA or EIS would be prepared. The NEPA document may be prepared jointly with the CEQA document.	BLM attempts to review completed applications within 60 days of submittal. Full timing is often dependent upon what level of NEPA analysis is required. An EA is typically 9-12 months, and EIS is generally 18 months. NEPA process may occur concurrently with CEQA process.

Agency	Permit	Regulation	Protected Resource	Trigger	Application Process	Timing
			State (continued)			
State Historic Preservation Officer (SHPO)	Section 106 National Historic Preservation Act (NHPA)	National Historic Preservation Act	Cultural and/or historical resources	Required if there are potential impacts to cultural and/or historical resources that are listed or eligible for listing on the National Register of Historic Places.	Information on cultural and historical resources gathered during the draft CEQA document preparation is included in a 106 Technical Report and submitted to the Corps along with the Area of Potential Effect (APE) map. The information is then evaluated by the Corps' cultural resources evaluator for potential adverse effects within the APE. Depending upon the level of potential adverse effect, the Corps then forwards its finding to SHPO for concurrence or begins the process for a Memorandum of Agreement (MOA). Native American consultation is also mandatory for the 106 process but can begin during preparation of the environmental document. All letters and correspondence for the Native American consultation must be provided to the Corps.Consultation with federally-recongized tribes may require a more extensive consultation.	Once SHPO has received the Corps' determination, it has approximately 60 days to agree or request additional information. However, SHPO has recently become more involved in projects and this timeframe is only an estimate and if a potential adverse effect to cultural or historical resources could occur, the SHPO process can take up to a year or more. Depending on the level of impacts to cultural resources, the Corps may determine no effect and issue the permit before receiving concurrence from SHPO.
California State Lands Commission (CSLC)	Right of Way Lease Agreement	Division 6 of the California Public Resources Code	California Sovereign Lands	May be triggered if the transmission line crosses state lands under the jurisdiction of the CSLC, which includes the beds of 1) more than 120 rivers, streams and sloughs; 2) nearly 40 non-tidal navigable lakes, such as Lake Tahoe and Clear Lake; 3) the tidal navigable bays and lagoons; and 4) the tide and submerged lands adjacent to the entire coast and offshore islands of the State from the mean high tide line to three nautical miles offshore.	Leases or permits may be issued to qualified applicants and the Commission shall have broad discretion in all aspects of leasing including category of lease or permit and which use, method or amount of rental is most appropriate, whether competitive bidding should be used in awarding a lease, what term should apply, how rental should be adjusted during the term, whether bonding and insurance should be required and in what amounts, whether an applicant is qualified based on what it deems to be in the best interest of the State.	Most coordination should be done concurrently with the CEQA process to ensure that any CSLC-required issues are addressed under CEQA. Once a final route/alternative is selected, the lease process may take two to three months for final Commission approval.
			Local / Other			
Air Quality Management District or Air Pollution Control District	Permit to Construct	Federal Clean Air Act	Air Quality	Depends on the air disctrict involved; may not be required for most transmission projects. Some air districts have a trigger level based on disturbed acreage.	Application forms need to be prepared and submiited to the local AQMD or APCD	Typically 30 to 90 days after submittal of a complete application.

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[19] Permitting is project specific. This table is provided for discussion purposes.

3.12 Project Description Graphics, Mapbook, and GIS Requirements

This section will include, but is not limited to, the following:	PEA Section and Page Number	Applicant Notes, Comments
3.12.1: Graphics. Provide diagrams of the following as applicable: a) All pole, tower, pipe, vault, conduit, and retaining wall types b) For poles, provide typical drawings with approximate diameter at the base and tip; for towers, estimate the width at base and top. c) A typical detail for any proposed underground duct banks and vaults d) All substation, switchyard, building, and facility layouts e) Trenching, drilling, pole installation, pipe installation, vault installation, roadway construction, facility removal, helicopter uses, conductor installation, traffic control, and other construction activities where a diagram would assist the reader in visualizing the work area and construction approach f) Typical profile views of proposed aboveground facilities and existing facilities to be modified within the existing and proposed ROW (e.g., typical cross-section of existing and proposed facilities by project segment). g) Photos of representative existing and proposed structures		
3.12.2: Mapbook. Provide a detailed mapbook on an aerial imagery basemap at a scale between 1:3000 and 1:6000 (or as appropriate and legible) that show mileposts, roadways, and all project components and work areas including: a) All proposed above-ground and underground structure/facility locations (e.g., poles, conductor, substations, compressor stations, telecommunication lines, vaults, duct bank, lighting, markers, etc.) b) All existing structures/facilities that would be modified or removed c) Identify by milepost where existing ROW will be used and where new ROW or land acquisition will be required. d) All permanent work areas including permanent facility access e) All access roads including, existing, temporary, and new permanent access f) All temporary work areas including staging, material storage, field offices, material laydown, temporary work areas for above ground (e.g., pole installation) and underground facility construction (e.g., trenching and duct banks), helicopter landing zones, pull and tension sites, guard structures, shoo flys etc. g) Areas where special construction methods (e.g., jack and bore, HDD, blasting, retaining walls etc.) may need to be employed		

h) Areas where vegetation removal may occur i) Areas to be heavily graded and where slope stabilization measures would be employed including any retaining walls		
3.12.3: GIS Data. Provide GIS data for all features and ROW shown on the detailed mapbook.		
3.12.4: GIS Requirements. Provide the following information for each pole/tower that would be installed and for each pole/tower that would be removed: a) Unique ID number and type of pole (e.g., wood, steel, etc.) or tower (e.g., self-supporting lattice) both in a table and in the attributes of the GIS data provided b) Identify pole/tower heights and conductor sizes in the attributes of the GIS data provided.		
3.12.5: Natural Gas Facilities GIS Data. For natural gas facilities, provide GIS data for system cross ties and all laterals/taps, valve stations, and new and existing inspection facilities (e.g., pig launcher sites).		

4 Description of Alternatives

All Applicants will assume that alternatives will be required for the environmental analysis and that an EIR will be prepared unless otherwise instructed by CPUC CEQA Unit Staff in writing prior to application filing. See PEA Requirements at the beginning of this checklist document. The consideration and discussion of alternatives will adhere to CEQA Guidelines Section 15126.6. The description of alternatives will be provided in this chapter of the PEA, and the comparison of each alternative to the proposed project is provided in PEA Chapter 6. The amount of detail required for the description of various alternatives to the proposed project and what may be considered a reasonable range of alternatives will be discussed with CPUC during Pre-filing.

This section will include, but is not limited to, the following:	PEA Section and Page Number	Applicant Notes, Comments
4.1 Alternatives Considered. Identify alternatives to the proposed project.[20] Include the following: a) All alternatives to the proposed project that were suggested, considered, or studied by the CAISO or by CAISO stakeholders b) Alternatives suggested by the public or agencies during public outreach efforts conducted by the Applicant c) Reduced footprint alternatives, including, e.g., smaller diameter pipelines and space for fewer electric transformers d) Project phasing options (e.g., evaluate the full build out for environmental clearance but consider an initial, smaller buildout that would only be expanded [in phases] if needed) e) Alternative facility and construction activity sites (e.g., substation, compressor station, drilling sites, well-head sites, staging areas) f) Renewable, energy conservation, energy efficiency, demand response, distributed energy resources, and energy storage alternatives g) Alternatives that would avoid or limit the construction of new transmission-voltage facilities or new gas transmission pipelines h) Other technological alternatives (e.g., conductor type) i) Route alternatives and route variations j) Alternative engineering or technological approaches (e.g., alternative types of facilities, or materials, or configurations) k) Assign an identification label and brief, descriptive title to each alternative described in this PEA chapter (e.g., Alternative A: No Project; Alterative B: Reduced Footprint 500/115-kV Substation; Alternative C: Ringo Hills 16-inch Pipeline Alignment; Alternative D1: Lincoln Street Route Variation; etc.). Each alternative will be easily identifiable by reading the brief title. Provide a description of each alternative. The description of each alternative will discuss to what extent it would be potentially feasible,		

[20] Reduced footprint alternatives; siting alternatives; renewable, energy conservation, energy efficiency, demand response, distributed energy resources, and energy storage alternatives; and non-wires alternatives (electric projects only) are typically required. For linear projects, route alternatives and route variations are typically required as well.

meet the project's underlying purpose, meet most of the basic project objectives, and avoid or reduce one or more potentially significant impacts. If the Applicant believes that an alternative is infeasible or the implementation is remote and speculative (CEQA Guidelines Section 15126.6(f)(3), clearly explain why. If significant environmental effects are possible without mitigation, alternatives will be provided in the PEA that are capable of avoiding or reducing any potentially significant environmental effects, even if the alternative(s) substantially impede the attainment of some project objectives or are costlier.[21]		
4.2 No Project Alternative. Include a thorough description of the No Project Alternative. The No Project Alternative needs to describe the range of actions that are reasonably foreseeable if the proposed project is not approved. The No Project Alternative will be described to meet the requirements of CEQA Guidelines Section15126.6(e).		
4.3 Rejected Alternatives. Provide a detailed discussion of all alternatives considered by the Applicant that were not selected by the Applicant for a full description in the PEA and analysis in PEA Chapter 5. The detailed discussion will include the following: a) Description of the alternative and its components b) Map of any alternative sites or routes c) Discussion about the extent to which the alternative would meet the underlying purpose of the project and its basic objectives d) Discussion about the feasibility of implementing the alternative e) Discussion of whether the alternative would reduce or avoid any significant environmental impacts of the proposed project f) Discussion of any new significant impacts that could occur from implementation of the alternative g) Description of why the alternative was rejected h) Any comments from the public or agencies about the alternative during PEA preparation		
For Natural Gas Storage Projects:		
4.4 Natural Gas Storage Alternatives. In addition to the requirements included above, alternatives to be considered for proposed natural gas storage projects include the following, where applicable: a) Alternative reservoir locations considered for gas storage including other field locations and other potential storage areas b) Alternative pipelines, road, and utility siting c) Alternative suction gas requirements, and injection/withdrawal options		

[21] CPUC CEQA Unit Staff will determine whether an alternative could *substantially* reduce one or more potentially significant impacts of the proposed project (CEQA Guidelines Section 15125.5). Applicants are strongly advised to provide more rather than less alternatives for CPUC's consideration or as determined during Pre-filing.

5 Environmental Analysis

Include a description of the environmental setting, regulatory setting, and impact analysis for each resource area. The resource areas addressed will include each environmental factor (resource area) identified in the most recent adopted version of the CEQA Guidelines Appendix G checklist and any additional relevant resource areas and impact questions that are defined in this PEA checklist.

1. Environmental Setting
    a. For each resource area, the PEA will include a detailed description of the natural and built environment in the vicinity of the proposed project area (e.g., topography, land use patterns, biological environment, etc.) as applicable to the resource area. Both regional and local environmental setting information will be provided.
    b. All setting information provided will relate in some way to the impacts of the proposed project discussed in the PEA's impacts analysis, however CPUC's impacts analysis may be more thorough, which may necessitate additional setting information than the Applicant might otherwise provide.
2. Regulatory Setting
    a. Organized by federal, State, regional, and local sections
    b. Describe the policy or regulation and briefly explain why it is applicable to the proposed project.
        i. Identify in the setting all laws, regulations, and policies that would be applicable for CPUC's exclusive jurisdiction over the siting and design of electric and gas facilities. Public utilities under CPUC's jurisdiction are expected to consult with local agencies regarding land use matters. Local laws, regulations, and policies will be considered for the consideration of potential impacts during CPUC's CEQA review (e.g., encroachment, grading, erosion control, scenic corridors, overhead line undergrounding, tree removal, fire protection, permanent and temporary noise limits, zoning requirements, general plan polices, and all local and regional laws, regulations, and policies).
3. Impact Questions
    a. Includes all impact questions in the current version of CEQA Guidelines, Appendix G.
    b. Additional impact questions that are frequently relevant to utility projects are provided in Attachment 4, CPUC Draft Environmental Measures.
4. Impact Analyses
    a. Discussion organized by CEQA Guidelines, Appendix G impact items and any Additional CEQA Impact Questions in the PEA Checklist. Assess all potential environmental impacts and make determinations, such as, No Impact, Less than Significant, Less than Significant with Mitigation, Significant and Unavoidable, or Beneficial Impact with respect to construction, operations, and maintenance activities.
    b. The impact analyses provided in PEA Chapter 5, Environmental Analysis, need not be as thorough as those to be prepared by CPUC for the CEQA environmental document. A preliminary determination will be provided but with only brief justification unless otherwise directed by CPUC Staff in writing during Pre-filing.
5. CPUC Draft Environmental Measures
    a. CPUC Draft Environmental Measures are provided for some of the resource areas in Attachment 4, CPUC Draft Environmental Measures. The measures may be applied to the proposed project as written or modified by the CPUC during its environmental review if the measure would avoid or reduce a potentially significant impact.

b. The CPUC Draft Environmental Measures should be discussed with the CPUC's CEQA Unit Staff during Pre-filing, especially with respect to the development of Applicant Proposed Measures.
c. In general, impact avoidance is preferred to the reduction of potentially significant impacts.

Additional requirements specific to each resource area are identified in the following sections.

5.1 Aesthetics

This section will include, but is not limited to, the following:	PEA Section and Page Number	Applicant Notes, Comments
5.1.1 Environmental Setting		
5.1.1.1: Landscape Setting. Briefly described the regional and local landscape setting.		
5.1.1.2: Scenic Resources. Identify and describe any vistas, scenic highways, national scenic areas, or other scenic resources within and surrounding the project area (approximately 5-mile buffer but may be greater if necessary). Scenic resources may also include but are not limited to historic structures, trees, or other resources that contribute to the scenic values where the project would be located.		
5.1.1.3: Viewshed Analysis a) Conduct a viewshed analysis for the project area (approximately 5-mile buffer but may be greater if necessary). b) Describe the project viewshed, including important visibility characteristics for the project site, such as viewing distance, viewing angle, and intervening topography, vegetation, or structures. c) Provide a supporting map (or maps) showing project area, landscape units, topography (i.e., hillshade), and the results of the viewshed analysis. Provide associated GIS data.		
5.1.1.4: Landscape Units. Identify and describe landscape units (geographic zones) within and surrounding the project area (approximately 5-mile buffer but may be greater if necessary) that categorizes different landscape types and visual characteristics, with consideration to topography, vegetation, and existing land uses. Landscape units should be developed based on the existing landscape characteristics rather than the project's features or segments.		
5.1.1.5: Viewers and Viewer Sensitivity. Identify and described the types of viewers expected within the viewshed and landscape units. Describe visual sensitivity to general visual change based on viewing conditions, use of the area, feedback from the public about the project, and landscape characteristics.		

5.1.1.6: Representative Viewpoints a) Identify representative viewpoints from publicly accessible locations (up to approximately 5-mile buffer but may be greater if appropriate). The number and location of the viewpoints must represent a range of views of the project site from major roads, highways, trails, parks, vistas, landmarks, and other scenic resources near the project site. Multiple viewpoints should be included where the project site would be visible from sensitive scenic resources to provide context on different viewing distances, perspectives, and directions. b) Provide the following information for each viewpoint: i. Number, title, and brief description of the location ii. Types of viewers iii. Viewing direction(s) and distance(s) to the nearest proposed project features iv. Description of the existing visual conditions and visibility of the project site as seen from the viewpoint and shown in the representative photographs c) Provide a supporting map (or maps) showing project features and representative viewpoints with arrows indicating the viewing direction(s). Provide associated GIS data (may be combined with GIS data request below for representative photographs).		
5.1.1.7: Representative Photographs a) Provide high resolution photographs taken from the representative viewpoints in the directions of all proposed project features.[22] Multiple photographs should be provided where project features may be visible in different viewing directions from the same location. b) Provide the following information for each photograph: i. Capture time and date ii. Camera body and lens model iii. Lens focal length and camera height when taken c) Provide GIS data associated with each photograph location that includes coordinates (<1 meter resolution), elevations, and viewing directions, as well as the associated viewpoint.		
5.1.1.8: Visual Resource Management Areas a) Identify any visual resource management areas within and surrounding the project area (approximately 5-mile buffer). b) Describe any project areas within visual resource management areas.		

[22] All representative photographs should be taken using a digital single-lens reflex camera with standard 50-millimeter lens equivalent, which represents an approximately 40-degree horizontal view angle. The precise photograph coordinates and elevations should be collected using a high accuracy GPS unit.

c) Provide a supporting map (or maps) showing project features and visual resource management areas. Provide associated GIS data.		
5.1.2 Regulatory Setting		
5.1.2.1: Regulatory Setting. Identify applicable federal, state, and local laws, policies, and standards regarding aesthetics and visual resource management.		
5.1.3 Impact Questions		
5.1.3.1: Impact Questions. The impact questions include all aesthetic impact questions in the current version of CEQA Guidelines, Appendix G. **5.1.3.2:** Additional CEQA Impact Questions: None.		
5.1.4 Impact Analysis		
5.1.4.1: Visual Impact Analysis. Provide an impact analysis for each checklist item identified in CEQA Guidelines Appendix G for this resource area and any additional impact questions listed above.		
The following information will be included in the PEA or a technical Appendix to support the aesthetic impact analysis:		
5.1.4.2: Analysis of Selected Viewpoints. Identify the methodology and assumptions that were applied in selecting key observation points for visual simulation. It is recommended that viewpoints are selected where viewers may be sensitive to visual change (public views) and in areas that are visually sensitive, or heavily trafficked or visited.[23]		
5.1.4.3: Visual Simulation a) Identify methodology and assumptions for completing the visual simulations. The simulations should include photorealistic 3-D models of project features and any land changes within the KOP view. The visual simulations should depict conditions: i. Immediately following construction, and ii. After vegetation establishment in all areas of temporary impact to illustrate the visual impact from vegetation removal. b) Provide high resolution images for the visual simulations.		
5.1.4.4: Analysis of Visual Change a) Identify the methodology and assumptions for completing the visual change analysis.[24] The methodology should be consistent with applicable visual resource management criteria. b) Provide a description of the visual change for each selected viewpoint. Describe any conditions that would change over time, such as vegetation growth.		

[23] The KOP selection process should be discussed with CPUC during Pre-filing
[24] The visual impact assessment methodology should be discussed with CPUC during Pre-filing

c) Describe the effects of visual change that would result in the entire project area, as indicated by the selected viewpoints that were simulated and analyzed.		
5.1.4.5: Lighting and Marking. Identify all new sources of permanent lighting. Identify any proposed structures or lines that could require FAA notification. Identify any structures or line segments that could require lighting and marking based on flight patterns and FAA or military requirements. Provide supporting documentation in an Appendix (e.g., FAA notice and criteria tool results).		
5.1.5 CPUC Draft Environmental Measures		
Refer to Attachment 4, CPUC Draft Environmental Measures.		

5.2 Agriculture and Forestry Resources

This section will include, but is not limited to, the following:	PEA Section and Page Number	Applicant Notes, Comments
5.2.1 Environmental Setting		
5.2.1.1: Agricultural Resources and GIS a) Identify all agricultural resources that occur within the project area including: i. Areas designated as Prime Farmland, Unique Farmland, or Farmland of Statewide Importance ii. Areas under Williamson Act contracts and provide information on the status of the Williamson Act contract iii. Any areas zoned for agricultural use in local plans iv. Areas subject to active agricultural use b) Provide GIS data for agricultural resources within the proposed project area.		
5.2.1.2: Forestry Resources and GIS a) Identify all forestry resources within the project area including: i. Forest land as defined in Public Resources Code 12220(g)25 ii. Timberland as defined in Public Resource Code section 4526 iii. Timberland zoned Timberland Production as defined in Government Code section 51104(g) b) Provide GIS data for all forestry resources within the proposed project area.		
5.2.2 Regulatory Setting		
5.2.2: Agriculture and Forestry Regulations. Identify all federal, state, and local policies for protection of agricultural and forestry resources that apply to the proposed project.		

[25] Forest land is defined in Public Resources Code as, "land that can support 10 percent native tree cover of any species, including hardwoods, under natural conditions, and that allows for management of one or more forest resources, including timber, aesthetics, fish and wildlife, biodiversity, water quality, recreation, and other public benefits."

5.2.3 Impact Questions		
5.2.3.1: Agriculture and Forestry Impact Questions. The impact questions include all agriculture and forestry impact questions in the current version of CEQA Guidelines, Appendix G. **5.2.3.2:** Additional CEQA Impact Questions: None.		
5.2.4 Impact Analyses		
5.2.4.1: Agriculture and Forestry Impacts. Provide an impact analysis for each checklist item identified in CEQA Guidelines Appendix G for this resource area and any additional impact questions listed above.		
Incorporate the following discussions into the analysis of impacts:		
5.2.4.2: Prime Farmland Soil Impacts. Calculate the acreage of Prime Farmland soils that would be affected by construction and operation and maintenance.		
5.2.4.3. Williamson Act Impacts. Describe the approach to resolve potential conflicts with Williamson Act contract (if applicable)		
5.2.5 CPUC Draft Environmental Measures		
Refer to Attachment 4, CPUC Draft Environmental Measures.		

5.3 Air Quality

This section will include, but is not limited to, the following:	PEA Section and Page Number	Applicant Notes, Comments
5.3.1 Environmental Setting		
5.3.1.1: Air Quality Plans Identify and describe all applicable air quality plans and attainment areas. Identify the air basin(s) for the project area. If the project is located in more than one attainment area and/or air basin, provide the extent in each attainment area and air basin.		
5.3.1.2: Air Quality. Describe existing air quality in the project area. a) Identify existing air quality exceedance of National Ambient Air Quality Standards and California Ambient Air Quality Standards in the air basin. b) Provide the number of days that air quality in the area exceeds state and federal air standards for each criteria pollutant that where air quality standards are exceeded. c) Provide air quality data from the nearest representative air monitoring station(s).		
5.3.1.3: Sensitive Receptor Locations. Identify the location and types of each sensitive receptor locations[26] within 1,000 feet of the project area. Provide GIS data for sensitive receptor locations.		

[26] Sensitive Receptor locations may include hospitals, schools, and day care centers, and such other locations as the air district board or California Air Resources Board may determine (California Health and Safety Code § 42705.5(a)(5)).

5.3.2 Regulatory Setting		
5.3.2.1: Regulatory Setting. Identify applicable federal, state, and local laws, policies, and standards regarding aesthetics and visual resource management.		
5.3.2.2: Air Permits. Identify and list all necessary air permits.		
5.3.3 Impact Questions		
5.3.3.1: Impact Questions. The impact questions include all air quality impact questions in the current version of CEQA Guidelines, Appendix G. **5.3.3.2:** Additional CEQA Impact Questions: None.		
5.3.4 Impact Analysis		
5.3.4.1: Impact Analysis. Provide an impact analysis for each checklist item identified in CEQA Guidelines Appendix G for this resource area and any additional impact questions listed above.		
The following information will be presented in the PEA or a technical Appendix to support the air quality impact analysis:		
5.3.4.2: Air Quality Emissions Modeling. Model project emissions using the most recent version of CalEEMod and/or a current version of other applicable modeling program. Provide all model input and output data sheets in Microsoft Excel format to allow CPUC to evaluate whether project data was entered into the modeling program accurately. The assumptions used in the air quality modeling must be consistent with all PEA information about the project's schedule, workforce, and equipment. The following information will be addressed in the emissions modeling, Air Quality Appendix, and PEA: a) Quantify the expected emissions of criteria pollutants from all project-related sources. Quantify emissions for both construction and operation (e.g., compressor equipment). b) Identify manufacturer's specifications for all proposed new emission sources. For proposed new, additional, or modified compressor units, include the horsepower, type, and energy source. c) Describe any emission control systems that are included in the air quality analysis (e.g., installation of filters, use of EPA Tier II, III, or IV equipment, use of electric engines, etc.). d) When multiple air basins may be affected by the project, model air emissions within each air basin and provide a narrative (supported by calculations) that clearly describes the assumptions around the project activities considered for each air basin. Provide modeled emissions by attainment area or air basin (supported by calculations).		

5.3.4.3: Air Quality Emissions Summary. Provide a table summarizing the air quality emissions for the project and applicable thresholds for each applicable attainment area. Include a summary of uncontrolled emissions (prior to application of any APMs) and controlled emissions (after application of APMs). Clearly identify the assumptions that were applied in the controlled emissions estimates.		
5.3.4.4: Health Risk Assessment. Complete a Health Risk Assessment when air quality emissions have the potential to lead to human health impacts[27]. If health impacts are not anticipated from project emissions, the analysis should clearly describe why emissions would not lead to health impacts.		
5.3.5 CPUC Draft Environmental Measures		
Refer to Attachment 4, CPUC Draft Environmental Measures.		

5.4 Biological Resources

This section will include, but is not limited to, the following:	**PEA Section and Page Number**	**Applicant Notes, Comments**
5.4.1 Environmental Setting		
5.4.1.1: Biological Resources Technical Report. Provide a Biological Resources Technical Report as an Appendix to the PEA that includes all information specified in Attachment 2.		
The following biological resources information will be presented in the PEA:		
5.4.1.2: Survey Area (Local Setting). Identify and describe the biological resources survey area as documented in the Biological Resources Technical Report. All temporary and permanent project areas must be within the survey area.		
5.4.1.3: Vegetation Communities and Land Cover a) Identify, describe, and quantify vegetation communities and land cover types within the biological resources survey area. b) Clearly identify any sensitive natural vegetation communities that meet the definition of a biological resource under CEQA (i.e., rare, designated, or otherwise protected), such as, but not limited to, riparian habitat. c) Provide a supporting map (or maps) showing project features and vegetation communities and land cover type.		

[27] Refer to Office of Environmental Health Hazard Assessment (OEHHA) most recent guidance for preparation of Health Risk Assessments to determine whether a Health Risk Assessment is required for the project. The need for an HRA should also be discussed with CPUC during Pre-filing.

5.4.1.4: Aquatic Features a) Identify, describe, and quantify aquatic features within the biological resources survey area that may provide potentially suitable aquatic habitat for rare and special-status species. b) Identify and quantify potentially jurisdictional aquatic features and delineated wetlands, according to the Wetland Delineation Report and Biological Resources Technical Report. c) Provide a supporting map (or maps) showing project features and aquatic resources.		
5.4.1.5: Habitat Assessment. Identify rare and special-status species with potential to occur in the project region (approximately a 5-mile buffer but may be larger if necessary). For each species, provide the following information: a) Common and scientific name b) Status and/or rank c) Habitat characteristics (i.e., vegetation communities, elevations, seasonal changes, etc.) d) Blooming characteristics for plants e) Breeding and other dispersal (range) behavior for wildlife f) Potential to occur within the survey area (i.e., Present, High Potential, Moderate Potential, Low Potential, or Not Expected), with justification based on the results of the records search, survey findings, and presence of potentially suitable habitat g) Specific types and locations of potentially suitable habitat that correspond to the vegetation communities and land cover and aquatic features		
5.4.1.6: Critical Habitat a) Identify and describe any critical habitat for rare or special-status species within and surrounding the project area (approximately a 5-mile buffer). b) Provide a supporting map (or maps) showing project features and critical habitat.		
5.4.1.7: Native Wildlife Corridors and Nursery Sites a) Identify and describe regional and local wildlife corridors within and surrounding the project area (approximately a 5-mile buffer), including but not limited to, landscape and aquatic features that connect suitable habitat in regions otherwise fragmented by terrain, changes in vegetation, or human development. b) Identify and describe regional and local native wildlife nursery sites within and surrounding the project area (approximately a 5-mile buffer), as identified through the records search, surveys, and habitat assessment.		

c) Provide a supporting map (or maps) showing project features, native wildlife corridors, and native nursery sites.		
5.4.1.8: Biological Resource Management Areas a) Identify any biological resource management areas (i.e., conservation or mitigation areas, HCP or NCCP boundaries, etc.) within and surrounding the project area (approximately 5-mile buffer). b) Identify and quantify any project areas within biological resource management areas. c) Provide a supporting map (or maps) showing project features and biological resource management areas.		
5.4.2 Regulatory Setting		
5.4.2.1: Regulatory Setting. Identify applicable federal, state, and local laws, policies, and standards regarding biological resources.		
5.4.2.2: Habitat Conservation Plan. Provide a copy of any relevant Habitat Conservation Plan.		
5.4.3 Impact Questions		
5.4.3.1: Impact Questions. The impact questions include all biological resource impact questions in the current version of CEQA Guidelines, Appendix G. **5.4.3.2:** Additional CEQA Impact Question: Would the project create a substantial collision or electrocution risk for birds or bats?		
5.4.4 Impact Analysis		
5.4.4.1: Impact Analysis Provide an impact analysis for each checklist item identified in CEQA Guidelines, Appendix G for Biological Resources and any additional impact questions listed above.		
The following information will be included in the impact analysis:		
5.4.4.2: Quantify Habitat Impacts. Provide the area of impact in acres by each habitat type. Quantify temporary and permanent impacts. For all temporary impacts provide the following: a) Description of the restoration and revegetation approach b) Vegetation species that would be planted within the area of temporary disturbance c) Procedures to reduce invasive weed encroachment within areas of temporary disturbance d) Expected timeframe for restoration of the site		
5.4.4.3: Special-Status Species Impacts. Identify anticipated impacts on special-status species. Identify any take permits that are anticipated for the project. If an existing habitat conservation plan (HCP) or natural communities conservation plan (NCCP) would be used for the project, provide current accounting of take coverage included in the HCP/NCCP		

to demonstrate that there is sufficient habitat coverage remaining under the existing permit.		
5.4.4.4: Wetland Impacts. Quantify the area (in acres) of temporary and permanent impacts on wetlands. Include the following details: a) Provide a table identifying all wetlands, by milepost and length, crossed by the project and the total acreage of each wetland type that would be affected by construction. b) Discuss construction and restoration methods proposed for crossing wetlands. c) If wetlands would be filled or permanently lost, describe proposed measures to compensate for permanent wetland losses. d) If forested wetlands would be affected, describe proposed measures to restore forested wetlands following construction.		
5.4.4.5: Avian Impacts. Describe avian obstructions and risk of electrocution from the project. Describe any standards that will be implemented as part of the project to reduce the risk of collision and electrocution.		
5.4.5 CPUC Draft Environmental Measures		
Refer to Attachment 4, CPUC Draft Environmental Measures.		

5.5 Cultural Resources[28]

This section will include, but is not limited to, the following:	PEA Section and Page Number	Applicant Notes, Comments
5.5.1 Environmental Setting		
5.5.1.1: Cultural Resource Reports. Provide a cultural resource inventory and evaluation report that addresses the technical requirement provided in Attachment 3.		
5.5.1.2: Cultural Resources Summary. Summarize cultural resource survey and inventory results and survey methods. Do not provide any confidential cultural resource information within the PEA chapter.		
5.5.1.3: Cultural Resource Survey Boundaries. Provide a map with mileposts showing the boundaries of all survey areas in the report. Provide the GIS data for the survey area. Provide confidential GIS data for the resource locations and boundaries separately under confidential cover.		
5.5.2 Regulatory Setting		
5.5.2.1: Regulatory Setting. Identify applicable federal and state regulations for protection of cultural resources.		

[28] For a description and evaluation of cultural resources specific to Tribes, see Section 5.18, Tribal Cultural Resources.

5.5.3 Impact Questions		
5.5.3.1: Impact Questions. The impact questions include all cultural resource impact questions in the current version of CEQA Guidelines, Appendix G. **5.5.3.2:** Additional CEQA Impact Questions: None.		
5.5.4 Impact Analysis		
5.5.4.1: Impact Analysis. Provide an impact analysis for each checklist item identified in CEQA Guidelines, Appendix G for this resource area and any additional impact questions listed above.		
Include the following information in the impact analysis		
5.5.4.2: Human Remains. Describe the potential for encountering human remains or grave goods during the trenching or any other phase of construction. Describe the procedures that would be used if human remains are encountered.		
5.5.4.3: Resource Avoidance. Describe avoidance procedures that would be implemented to avoid known resources.		
5.5.5 CPUC Draft Environmental Measures		
Refer to Attachment 4, CPUC Draft Environmental Measures.		

5.6 Energy

This section will include, but is not limited to, the following:	PEA Section and Page Number	Applicant Notes, Comments
5.6.1 Environmental Setting		
5.6.1.1: Existing Energy Use. Identify energy use of existing infrastructure if the proposed project would replace or upgrade an existing facility.		
5.6.2 Regulatory Setting		
5.6.2.1: Regulatory Setting. Identify applicable federal, state, or local regulations or policies applicable to energy use for the proposed project.		
5.6.3 Impact Questions		
5.6.3.1: Impact Questions: The impact questions include all energy impact questions in the current version of CEQA Guidelines, Appendix G. **5.6.3.2:** Additional CEQA Impact Question: Would the project add capacity for the purpose of serving a non-renewable energy resource?		

5.6.4 Impact Analysis		
5.6.4.1: Impact Analysis. Provide an impact analysis for each checklist item identified in CEQA Guidelines Appendix G for this resource area and any additional impact questions listed above.		
Include the following information in the impact analysis:		
5.6.4.2: Nonrenewable Energy. Identify renewable and non-renewable energy projects that may interconnected to or be supplied by the proposed project.		
5.6.4.3: Fuels and Energy Use a) Provide an estimation of the amount of fuels (gasoline, diesel, helicopter fuel, etc.) that would be used during construction and operation and maintenance of the project. Fuel estimates should be consistent with Air Quality calculations supporting the PEA. b) Provide the following information on energy use: i. Total energy requirements of the project by fuel type and end use ii. Energy conservation equipment and design features iii. Identification of energy supplies that would serve the project		
5.6.5 CPUC Draft Environmental Measures		
Refer to Attachment 4, CPUC Draft Environmental Measures.		

5.7 Geology, Soils, and Paleontological Resources

This section will include, but is not limited to, the following:	PEA Section and Page Number	Applicant Notes, Comments
5.7.1 Environmental Setting		
5.7.1.1: Regional and Local Geologic Setting. Briefly describe the regional and local physiography, topography, and geologic setting in the project area.		
5.7.1.2: Seismic Hazards a) Provide the following information on potential seismic hazards in the project area: i. Identify and describe regional and local seismic risk including any active faults within and surrounding the project area (will be a 10-mile buffer unless otherwise instructed in writing by CEQA Unit Staff during Pre-filing) ii. Identify any areas that are prone to seismic-induced landslides iii. Provide the liquefaction potential for the project area b) Provide a supporting map (or maps) showing project features and major faults, areas of landslide risk, and areas at high risk of liquefaction. Provide GIS data for all faults, landslides, and areas of high liquefaction potential.		

5.7.1.3: Geologic Units. Identify and describe the types of geologic units in the project area. Include the following information for each geologic unit: a) Summarize the geologic units within the project area. b) Identify any previous landslides in the area and any areas that are at risk of landslide. c) Identify any unstable geologic units. d) Provide a supporting map (or maps) showing project features and geologic units. Clearly identify any areas with potentially hazardous geologic conditions. Provide associated GIS data.		
5.7.1.4: Soils. Identify and describe the types of soils in the project area. a) Summarize the soils within the project area. b) Clearly identify any soils types that could be unstable (e.g., at risk of lateral spreading, subsidence, liquefaction, or collapse). c) Provide information on erosion susceptibility for each soil type that occurs in the project area. d) Provide a supporting map (or maps) showing project features and soils. Provide associated GIS data.		
5.7.1.5: Paleontological Report. Provide a paleontological report that includes the following: a) Information on any documented fossil collection localities within the project area and a 500-foot buffer. b) A paleontological resource sensitivity analysis based on published geological mapping and the resource sensitivity of each rock type. c) Supporting maps and GIS data.		
5.7.2 Regulatory Setting		
5.7.2.1: Regulatory Setting. Identify applicable federal, state, and local laws, policies, and standards regarding geology, soils, and paleontological resources.		
5.7.3 Impact Questions		
5.7.3.1: Impact Questions. The impact questions include all geology, soils, and paleontological resource impact questions in the current version of CEQA Guidelines, Appendix G. **5.7.3.2:** Additional CEQA Impact Questions: None.		
5.7.4 Impact Analysis		
5.7.4.1: Impact Analysis. Provide an impact analysis for each checklist item identified in CEQA Guidelines, Appendix G for this resource area and any additional impact questions listed above.		
Include the following information in the impact analysis:		

5.7.4.2: Geotechnical Requirements. Identify any geotechnical requirements that would be implemented to address effects from unstable geologic units or soils. Describe how the recommendation would be applied (i.e., when and where).		
5.7.4.3: Paleontological Resources. Identify the potential to disturb paleontological resources based on the depth of proposed excavation and paleontological sensitivity of geologic units within the project area.		
5.7.5 CPUC Draft Environmental Measures		
Refer to Attachment 4, CPUC Draft Environmental Measures.		

5.8 Greenhouse Gas Emissions

This section will include, but is not limited to, the following:	**PEA Section and Page Number**	**Applicant Notes, Comments**
5.8.1 Environmental Setting		
5.8.1.1: GHG Setting. Provide a description of the setting for greenhouse gases (GHGs). The setting should consider any GHG emissions from existing infrastructure that would be upgraded or replaced by the proposed project.		
5.8.2 Regulatory Setting		
5.8.2.1: Regulatory Setting. Identify applicable federal, state, and local laws, policies, and standards for greenhouse gases.		
5.8.3 Impact Questions		
5.8.3.1 Impact Questions. The impact questions include all greenhouse gas impact questions in the current version of CEQA Guidelines, Appendix G. **5.8.3.2:** Additional CEQA Impact Questions: None.		
5.8.4 Impact Analysis		
5.8.4.1: Impact Analysis. Provide an impact analysis for each checklist item identified in CEQA Guidelines, Appendix G for this resource area and any additional impact questions listed above.		
Include the following information in the impact analysis:		
5.8.4.2: GHG Emissions. Provide a quantitative assessment of GHG emissions for construction and operation and maintenance of the proposed project. Provide model results and all model files. Modeling will be conducted using the latest version of the emissions model at the time of application filing (e.g., most recent version of CalEEMod). GHG emissions will be provided for the following conditions: a) Uncontrolled emissions (before APMs are applied) b) Controlled emissions considering application of APMs i. Based on the modeled GHG emissions, quantify the project's contribution to and analyze the project's effect on		

climate change. Identify and provide justification for the timeframe considered in the analysis. ii. Discuss any programs already in place to reduce GHG emissions on a system-wide level. This includes the Applicant's voluntary compliance with the EPA SF6 reduction program, reductions from energy efficiency, demand response, LTPP, etc. iii. For any significant impacts, identify potential strategies that could be employed by the project to reduce GHGs during construction or operation and maintenance consistent with OPR Advisory on CEQA and Climate Change.		
Natural Gas Storage		
5.8.4.3: Natural Gas Storage Accident Conditions. In addition to the requirements above, identify the potential GHG emissions that could result in the event of a gas leak.		
5.8.4.4: Monitoring and Contingency Plan. Provide a comprehensive monitoring plan that would be implemented during project operation to monitor for gas leaks. The plan should identify a monitoring schedule, description of monitoring activities, and actions to be implemented if gas leaks are observed.		
5.8.5 CPUC Draft Environmental Measures		
Refer to Attachment 4, CPUC Draft Environmental Measures.		

5.9 Hazards, Hazardous Materials, and Public Safety[29]

This section will include, but is not limited to, the following:	PEA Section and Page Number	Applicant Notes, Comments
5.9.1 Environmental Setting		
5.9.1.1: Hazardous Materials Report. Provide a Phase I Environmental Site Assessment or similar hazards report for the proposed project area. Describe any known hazardous materials locations within the project area and the status of the site.		
5.9.1.2: Airport Land Use Plan. Identify any airport land use plan(s) within the project area.		
5.9.1.3: Fire Hazard. Identify if the project occurs within federal, state, or local fire responsibility areas and identify the fire hazard severity rating for all project areas, including temporary work areas and access roads.		
5.9.1.4: Metallic Objects. For electrical projects, identify any metallic pipelines or cables within 25 feet of the project.		

[29] For fire risk specific to state responsibility areas or lands classified as very high fire hazard severity zones, see Section 5.20, Wildfire.

5.9.1.5: Pipeline History (for Natural Gas Projects). Provide a narrative describing the history of the pipeline system(s) to which the project would connect, list of previous owner and operators, and detailed summary of the pipeline systems' safety and inspection history.		
5.9.2 Regulatory Setting		
5.9.2.1: Regulatory Setting. Identify applicable federal, state, and local laws, policies, and standards for hazards, hazardous materials, and public safety.		
5.9.2.2: Touch Thresholds. Identify applicable standards for protection of workers and the public from shock hazards.		
5.9.3 Impact Questions		
5.9.3.1: Impact Questions. The impact questions include all hazards and hazardous materials impact questions in the current version of CEQA Guidelines, Appendix G. **5.9.3.2:** Additional CEQA Impact Questions: a) Would the project create a significant hazard to air traffic from the installation of new power lines and structures? b) Would the project create a significant hazard to the public or environment through the transport of heavy materials using helicopters? c) Would the project expose people to a significant risk of injury or death involving unexploded ordnance? d) Would the project expose workers or the public to excessive shock hazards?		
5.9.4 Impact Analysis		
5.9.4.1: Impact Analysis. Provide an impact analysis for each checklist item identified in CEQA Guidelines Appendix G for this resource area and any additional impact questions listed above.		
Include the following information in the impact analysis:		
5.9.4.2: Hazardous Materials. Identify the hazardous materials (i.e., chemicals, solvents, lubricants, and fuels) that would be used during construction and operation of the project. Estimate the quantity of each hazardous material that would be stored on site during construction and operation.		
5.9.4.3: Air Traffic Hazards. If the project involves construction of above-ground structures (including structure replacement) within the airport land use plan area, provide a discussion of how the project would or would not conflict with height restrictions identified in the airport land use plan and how the project would comply with any FAA or military requirements for the above ground facilities.		
5.9.4.4: Accident or Upset Conditions. Describe how the project facilities would be designed, constructed, operated, and maintained to		

minimize potential hazard to the public from the failure of project components as a result of accidents or natural catastrophes.		
5.9.4.5: Shock Hazard. For electricity projects, identify infrastructure that may be susceptible to induced current from the proposed project. Describe strategies (e.g., cathodic protection) that the project would employ to reduce shock hazards and avoid electrocution of workers or the public.		
For Natural Gas and Gas Storage:		
5.9.4.6: Health and Safety Plan. Include in the Health and Safety Plan, plans for addressing gas leaks, fires, etc. Identify sensitive receptors, methods of evacuation, and protection measures. The Plan will be provided as an Appendix to the PEA.		
5.9.4.7: Health Risk Assessment. Provide a Health Risk Assessment including risk from potential gas leaks, fires, etc. Identify sensitive receptors that would be affected and potential impacts on them if there is a gas release.[30]		
5.9.4.8: Gas Migration. Describe potential for and effects of gas migration through natural and manmade pathways. a) Provide Applicant Proposed Measures for avoiding gas emissions at the surface from gas migration pathways. b) Provide Applicant Proposed Measures for avoiding emissions of mercaptan and/or other odorizing agents.		
5.9.5 CPUC Draft Environmental Measures		
Refer to Attachment 4, CPUC Draft Environmental Measures.		

5.10 Hydrology and Water Quality

This section will include, but is not limited to, the following:	**PEA Section and Page Number**	**Applicant Notes, Comments**
5.10.1 Environmental Setting		
5.10.1.1: Waterbodies. Identify by milepost all ephemeral, intermittent, and perennial surface waterbodies crossed by the project. For each, list its water quality classification, if applicable.		
5.10.1.2: Water Quality. Identify any downstream waters that are on the state 303(d) list and identify whether a total maximum daily load (TMDL) has been adopted or the date for adoption of a TMDL. Identify existing sources of impairment for downstream waters. Describe any management plans that are in place for downstream waters.		
5.10.1.3: Groundwater Basin. Identify all known EPA and state groundwater basins and aquifers crossed by the project.		

[30] Refer to the requirements for Health Risk Assessments in Section 5.3.4.4.

5.10.1.4: Groundwater Wells and Springs. Identify the locations of all known public and private groundwater supply wells and springs within 150 feet of the project area.		
5.10.1.5: Groundwater Management. Identify the groundwater management status of any groundwater resources in the project area and any groundwater resources that may be used by the project. Describe if groundwater resources in the basin have been adjudicated. Identify any sustainable groundwater management plan that has been adopted for groundwater resources in the project area or describe the status of groundwater management planning in the area.		
5.10.2 Regulatory Setting		
5.10.2.1: Regulatory Setting. Identify applicable federal, state, and local laws, policies, and standards regarding hydrologic and water quality.		
5.10.3 Impact Questions		
5.10.3.1: Impact Questions. The impact questions include all hydrology and water quality impact questions in the current version of CEQA Guidelines, Appendix G. **5.10.3.2:** Additional CEQA Impact Questions: None.		
5.10.4 Impact Analysis		
5.10.4.1: Impact Analysis. Provide an impact analysis for each checklist item identified in the current version of CEQA Guidelines, Appendix G for this resource area and any additional impact questions listed above.		
Include the following information in the impact analysis:		
5.10.4.2: Hydrostatic Testing. Identify all potential sources of hydrostatic test water, quantity of water required, withdrawal methods, treatment of discharge, and any waste products generated.		
5.10.4.3: Water Quality Impacts. Describe impacts to surface water quality, including the potential for accelerated soil erosion, downstream sedimentation, and reduced surface water quality.		
5.10.4.4: Impermeable Surfaces. Describe increased run-off and impacts on groundwater recharge due to construction of impermeable surfaces. Provide the acreage of new impermeable surfaces that will be created as a result of the project.		
5.10.4.5: Waterbody Crossings. Identify by milepost all waterbody crossings. Provide the following information for crossing: a) Identify whether the waterbody has contaminated waters or sediments. b) Describe the waterbody crossing method and any approaches to avoid the waterbody. c) Describe typical additional work area and staging area requirements at waterbody and wetland crossings.		

d) Describe any dewatering or water diversion that will be required during construction near the waterbody. Identify treatment methods for any dewatering. e) Describe any proposed restoration methods for work near or within the waterbody.		
5.10.4.6: Groundwater Impacts. If water would be obtained from groundwater supplies, evaluate the project's consistency with any applicable sustainable groundwater management plan.		
5.10.5 CPUC Draft Environmental Measures		
Refer to Attachment 4, CPUC Draft Environmental Measures.		

5.11 Land Use and Planning

This section will include, but is not limited to, the following:	**PEA Section and Page Number**	**Applicant Notes, Comments**
5.11.1 Environmental Setting		
5.11.1.1: Land Use. Provide a description of land uses within the area traversed by the project route as designated in the local General Plan (e.g., residential, commercial, agricultural, open space, etc.).		
5.11.1.2: Special Land Uses. Identify by milepost and segment all special land uses within the project area including: a) All land administered by federal, state, or local agencies, or private conservation organizations b) Any designated coastal zone management areas c) Any designated or proposed candidate National or State Wild and Scenic Rivers crossed by the project d) Any national landmarks		
5.11.1.3: Habitat Conservation Plan. Provide a copy of any Habitat Conservation Plan applicable to the project area or proposed project. Also required for Section 5.4, Biological Resources.		
5.11.2 Regulatory Setting		
5.11.2.1: Regulatory Setting. Identify applicable federal, state, and local laws, policies, and standards for land use and planning.		
5.11.3 Impact Questions		
5.11.3.1: Impact Questions. The impact questions include all land use questions in the current version of CEQA Guidelines, Appendix G. **5.11.3.2:** Additional CEQA Impact Questions: None.		
5.11.4 Impact Analysis		
5.11.4.1: Impact Analysis. Provide an impact analysis for each checklist item identified in CEQA Guidelines, Appendix G for this resource area and any additional impact questions listed above.		

5.11.5 CPUC Draft Environmental Measures		
Refer to Attachment 4, CPUC Draft Environmental Measures.		

5.12 Mineral Resources

This section will include, but is not limited to, the following:	**PEA Section and Page Number**	**Applicant Notes, Comments**
5.12.1 Environmental Setting		
5.12.1.1: Mineral Resources. Provide information on the following mineral resources within 0.5 mile of the proposed project area: a) Known mineral resources b) Active mining claims c) Active mines d) Resource recovery sites		
5.12.2 Regulatory Setting		
5.12.2.1: Regulatory Setting. Identify applicable federal, state, and local laws, policies, and standards for minerals.		
5.12.3 Impact Questions		
5.12.3.1: Impact Questions. The impact questions include all mineral resource impact questions in the current version of CEQA Guidelines, Appendix G. **5.12.3.2:** Additional CEQA Impact Questions: None.		
5.12.4 Impact Analysis		
5.12.4.1: Impact Analysis. Provide an impact analysis for each checklist item identified in CEQA Guidelines, Appendix G for this resource area and any additional impact questions listed above.		
5.12.5 CPUC Draft Environmental Measures		
Refer to Attachment 4, CPUC Draft Environmental Measures.		

5.13 Noise

This section will include, but is not limited to, the following:	**PEA Section and Page Number**	**Applicant Notes, Comments**
5.13.1 Environmental Setting		
5.13.1.1: Noise Sensitive Land Uses. Identify all noise sensitive land uses within 1,000 feet of the proposed project. Provide GIS data for sensitive receptors within 1,000 feet of the project.		
5.13.1.2: Noise Setting. Provide the existing noise levels (Lmax, Lmin, Leq, and Ldn sound level and other applicable noise parameters) at noise sensitive areas near the proposed project. All noise measurement data and the methodology for collecting the data will be provided in a noise study as an Appendix to the PEA.		

5.13.2 Regulatory Setting		
5.13.2.1: Regulatory Setting. Identify applicable state, and local laws, policies, and standards for noise.		
5.13.3 Impact Questions		
5.13.3.1 Impact Questions. The impact questions include all noise questions in the current version of CEQA Guidelines, Appendix G. **5.13.3.2:** Additional CEQA Impact Questions: None.		
5.13.4 Impact Analysis		
5.13.4.1: Impact Analysis. Provide an impact analysis for each checklist item identified in CEQA Guidelines, Appendix G for this resource area and any additional impact questions listed above.		
Include the following information in the impact analysis:		
5.13.4.2: Noise Levels a) Identify noise levels for each piece of equipment that could be used during construction. b) Provide a table that identifies each phase of construction, the equipment used in each construction phase, and the length of each phase at any single location (see example in Table 7 below). c) Estimate cumulative equipment noise levels for each phase of construction. d) Include phases of operation if noise levels during operation have the potential to frequently exceed pre-project existing conditions. e) Identify manufacturer's specifications for equipment and describe approaches to reduce impacts from noise.		

Table 7. Construction Noise Levels

Equipment Required	Equipment Noise Levels (Leq; 50 feet)	Phase Noise Level (Leq; 50 feet)	Phase Duration at Each Location	Receptor Nearest to Construction Phase	Noise Level at Nearest Receptor (Leq)	Exceeds Noise Standard at Nearest Receptor?	Distance to Not Exceed Standard
Site Preparation/Grading							
Dozer	78 dBA	82 dBA	5 days	Residence on Main Street; 100 feet from Substation Site	76 dBA	Yes	112 feet
Gradall	79 dBA						
Dump Truck	73 dBA						
Construct Tower Foundation							
Auger Rig	77 dBA	82 dBA	11 days	School on Education Avenue; 130 feet from Tower A12	73 dBA	No	N/A
Dump Truck	73 dBA						
Excavator	77 dBA						
Concrete Truck	75 dBA						

For Natural Gas:		
5.13.4.3: Compressor Station Noise. Provide site plans of compressor stations or other noisy, permanent equipment, showing the location of the nearest noise sensitive areas within 1 mile of the proposed ROW. If new compressor station sites are proposed, measure or estimate the existing ambient sound environment based on current land uses and		

activities. For existing compressor stations (operated at full load), include the results of a sound level survey at the site property line and nearby noise-sensitive areas. Include a plot plan that identifies the locations and duration of noise measurements.		
5.13.5 CPUC Draft Environmental Measures		
Refer to Attachment 4, CPUC Draft Environmental Measures.		

5.14 Population and Housing

This section will include, but is not limited to, the following:	**PEA Section and Page Number**	**Applicant Notes, Comments**
5.14.1 Environmental Setting		
5.14.1.1: Population Estimates. Identify population trends for the areas (county, city, town, census designated place) where the project would take place.		
5.14.1.2: Housing Estimates. Identify housing estimates and projections in areas where the project would take place.		
5.14.1.3: Approved Housing Developments a) Provide the following information for all housing development projects within 1 mile of the proposed project that have been recently approved or may be approved around the PEA and application filing date: i. Project name ii. Location iii. Number of units and estimated population increase iv. Approval date and construction status v. Contact information for developer (provided in the public outreach Appendix) b) Ensure that the project information provided above is consistent with the PEA analysis of cumulative project impacts.		
5.14.2 Regulatory Setting		
5.14.2.1: Regulatory Setting. Identify any applicable federal, state or local laws or regulations that apply to the project.		
5.14.3 Impact Questions		
5.14.3.1: Impact Questions. The impact questions include all population and housing impact questions in the current version of CEQA Guidelines, Appendix G. **5.14.3.2:** Additional CEQA Impact Questions: None.		
5.14.4 Impact Analysis		
5.14.4.1: Impact Analysis. Provide an impact analysis for each checklist item identified in CEQA Guidelines, Appendix G for this resource area and any additional impact questions listed above.		

Include the following information in the impact analysis:		
5.14.4.2: Impacts to Housing. Identify if any existing or proposed homes occur within the footprint of any proposed project elements or right-of-way. Describe housing impacts (e.g., demolition and relocation of residents) that may occur as a result of the proposed project.		
5.14.4.3: Workforce Impacts. Describe on-site manpower requirements, including the number of construction personnel who currently reside within the impact area, who would commute daily to the site from outside the impact area or would relocate temporarily within the impact area. Chapter 4 of this document can be referenced as applicable. Identify any permanent employment opportunities that would be create by the project and the workforce conditions in the area that the jobs would be created.		
5.14.4.4: Population Growth Inducing. Provide information on the project's growth inducing impacts, if any. The information will include, but is not necessarily limited to, the following: a) Any economic or population growth in the surrounding environment that will directly or indirectly result from the project b) Any obstacles to population growth that the project would remove c) Any other activities directly or indirectly encouraged or facilitated by the project that would cause population growth leading to a significant effect on the environment, either individually or cumulatively		
5.14.5 CPUC Draft Environmental Measures		
Refer to Attachment 4, CPUC Draft Environmental Measures.		

5.15 Public Services

This section will include, but is not limited to, the following:	**PEA Section and Page Number**	**Applicant Notes, Comments**
5.15.1 Environmental Setting		
5.15.1.1 Service Providers a) Identify the following service providers that serve the project area and provide a map showing the service facilities that could serve the project: i. Police ii. Fire (identify service providers within local and state responsibility areas) iii. Schools iv. Parks v. Hospitals		

b) Provide the documented performance objectives and data on existing emergency response times for service providers in the area (e.g., police or fire department response times).		
5.15.2 Regulatory Setting		
5.15.2.1 Regulatory Setting. Identify any applicable federal, state or local laws or regulations for public services that apply to the project.		
5.15.3 Impact Questions		
5.15.3.1: Impact Questions. The impact questions include all public services impact questions in the current version of CEQA Guidelines, Appendix G. **5.15.3.2:** Additional CEQA Impact Questions: None.		
5.15.4 Impact Analysis		
5.15.4.1 Impact Analysis. Provide an impact analysis for each checklist item identified in CEQA Guidelines, Appendix G for this resource area and any additional impact questions listed above.		
Include the following information in the impact analysis:		
5.15.4.2: Emergency Response Times a) Describe whether the project would impede ingress and egress of emergency vehicles during construction and operation. b) Include an analysis of impacts on emergency response times during project construction and operation, including impacts during any temporary road closures. Describe approaches to address impacts on emergency response times.		
5.15.4.3: Displaced Population. If the project would create permanent employment or displace people, evaluate the impact of the new employment or relocated people on governmental facilities and services and describe plans to reduce the impact on public services.		
5.15.5 CPUC Draft Environmental Measures		
Refer to Attachment 4, CPUC Draft Environmental Measures.		

5.16 Recreation

This section will include, but is not limited to, the following:	**PEA Section and Page Number**	**Applicant Notes, Comments**
5.16.1 Environmental Setting		
5.16.1.1: Recreational Setting a) Describe the regional and local recreation setting in the project area including: i. Any recreational facilities or areas within and surrounding the project area (approximately 0.5-mile buffer) including the recreational uses of each facility or area		

ii. Any available data on use of the recreational facilities including volume of use b) Provide a map (or maps) showing project features and recreational facilities and provide associated GIS data.		
5.16.2 Regulatory Setting		
5.16.2.1: Regulatory Setting. Identify applicable federal, state, and local laws, policies, and standards regarding recreation.		
5.16.3 Impact Questions		
5.16.3.1: Impact Questions. The impact questions include all recreation impact questions in the current version of CEQA Guidelines, Appendix G. **5.16.3.2:** Additional CEQA Impact Questions: a) Would the project reduce or prevent access to a designated recreation facility or area? b) Would the project substantially change the character of a recreational area by reducing the scenic, biological, cultural, geologic, or other important characteristics that contribute to the value of recreational facilities or areas? c) Would the project damage recreational trails or facilities?		
5.16.4 Impact Analysis		
5.16.4.1: Impact Analysis: Provide an impact analysis for each checklist item identified in CEQA Guidelines, Appendix G for this resource area and any additional impact questions listed above.		
5.16.4.2: Impact Details. Clearly identify the maximum extent of each impact, and when and where the impacts would or would not occur. Organize the impact assessment by project phase, project component, and/or geographic area, as necessary.		
5.16.5 CPUC Draft Environmental Measures		
Refer to Attachment 4, CPUC Draft Environmental Measures.		

5.17 Transportation

This section will include, but is not limited to, the following:	PEA Section and Page Number	Applicant Notes, Comments
5.17.1 Environmental Setting		
5.17.1.1: Circulation System. Briefly describe the regional and local circulation system in the project area, including modes of transportation, types of roadways, and other facilities that contribute to the circulation system.		
5.17.1.2: Existing Roadways and Circulation a) Identify and describe existing roadways that may be used to access the project site and transport materials during		

construction or are otherwise adjacent to or crossed by linear project features. Provide the following information for each road: i. Name of the road ii. Jurisdiction or ownership (i.e., State, County, City, private, etc.) iii. Number of lanes in both directions of travel iv. Existing traffic volume (if publicly available data is unavailable or significantly outdated, then it may be necessary to collect existing traffic counts for road segments where large volumes of construction traffic would be routed or where lane or road closures would occur) v. Closest project feature name and distance b) Provide a supporting map (or maps) showing project features and the existing roadway network identifying each road described above. Provide associated GIS data. The GIS data should include all connected road segments within at least 5 miles of the project.		
5.17.1.3: Transit and Rail Services a) Identify and describe transit and rail service providers in the region. b) Identify any rail or transit lines within 1,000 feet of the project area. c) Identify specific transit stops, and stations within 0.5 mile of the project. Provide the frequency of transit service. d) Provide a supporting map (or maps) showing project features and transit and rail services within 0.5 mile of the project area. Provide associated GIS data.		
5.17.1.4: Bicycle Facilities a) Identify and describe any bicycle plans for the region. b) Identify specific bicycle facilities within 1,000 feet of the project area. c) Provide a supporting map (or maps) showing project features and bicycle facilities. Provide associated GIS data.		
5.17.1.5: Pedestrian Facilities a) Identify and describe important pedestrian facilities near the project area that contribute to the circulation system, such as important walkways. b) Identify specific pedestrian facilities that would be near the project, including on the road segments identified per 5.17.1.2. c) Provide a supporting map (or maps) showing project features and important pedestrian facilities. Provide associated GIS data.		

5.17.1.6: Vehicle Miles Traveled (VMT). Provide the average VMT for the county(s) where the project is located.		
5.17.2 Regulatory Setting		
5.17.2.1: Regulatory Setting. Identify applicable federal, state, and local laws, policies, and standards regarding transportation.		
5.17.3 Impact Questions		
5.17.3.1: Impact Questions. All impact questions for this resource area in the current version of CEQA Guidelines, Appendix G. **5.17.3.2:** Additional CEQA Impact Questions: a) Would the project create potentially hazardous conditions for people walking, bicycling, or driving or for public transit operations? b) Would the project interfere with walking or bicycling accessibility? c) Would the project substantially delay public transit?		
5.17.4 Impact Analysis		
5.17.4.1: Impact Analysis. Provide an impact analysis for each significance criteria identified in Appendix G of the CEQA Guidelines for transportation and any additional impact questions listed above[31].		
Include the following information in the impact analysis:		
5.17.4.2: Vehicle Miles Traveled (VMT) a) Identify whether the project is within 0.5 mile of a major transit stop or a high-quality transit corridor. b) Identify the number of vehicle daily trips that would be generated by the project during construction and operation by light duty (e.g., worker vehicles) and heavy-duty vehicles (e.g., trucks). Provide the frequency of trip generation during operation. c) Quantify VMT generation for both project construction and operation. d) Provide an excel file with the VMT assumptions and model calculations, including all formulas and values. e) Evaluate the project VMT relative to the average VMT for the area in which the project is located.		
5.17.4.3: Traffic Impact Analysis. Provide a traffic impact study. The traffic impact study should be prepared in accordance with guidance from the relevant local jurisdiction or Caltrans, where appropriate.		
5.17.4.4: Hazards. Identify any traffic hazards that could result from construction and operation of the project. Identify any lane closures and traffic management that would be required to construct the project.		

[31] Discuss with CPUC during Pre-filing whether a traffic study is needed.

5.17.4.5: Accessibility. Identify any closures of bicycle lanes, pedestrian walkways, or transit stops during construction or operation of the project.		
5.17.4.6: Transit Delay. Identify any transit lines that could be delayed by construction and operation of the project. Provide the maximum extent of the delay in minutes and the duration of the delay.		
5.17.5 CPUC Draft Environmental Measures		
Refer to Attachment 4, CPUC Draft Environmental Measures.		

5.18 Tribal Cultural Resources[32]

This section will include, but is not limited to, the following:	**PEA Section and Page Number**	**Applicant Notes, Comments**
5.18.1 Environmental Setting		
5.18.1.1: Outreach to Tribes. Provide a list of all tribes that are on the Native American Heritage Commission (NAHC) list of tribes that are affiliated with the project area. Provide a discussion of outreach to Native American tribes, including tribes notified, responses received from tribes, and information of potential tribal cultural resources provided by tribes. Any information of potential locations of tribal cultural resources should be submitted in an Appendix under clearly marked confidential cover. Provide copies of all correspondence with tribes in an Appendix.		
5.18.1.2: Tribal Cultural Resources. Describe tribal cultural resources (TCRs) that are within the project area. a) Summarize the results of attempts to identify possible TCRs using publicly available documentary resources. The identification of TCRs using documentary sources should include review of archaeological site records and should begin during the preparation of the records search report (see Attachment 3). During the inventory phase, a formal site record would be prepared for any resource identified unless tribes object. b) Summarize attempts to identify TCRs by speaking directly with tribal representatives.		
5.18.1.3: Ethnographic Study. The ethnographic study should document the history of Native American use of the area and oral history of the area.		
5.18.2 Regulatory Setting		
5.18.2.1: Regulatory Setting. Identify any applicable federal, state or local laws or regulations for tribal cultural resources that apply to the project.		

[32] For a description of historical resources and requirements for cultural resources that are not tribal cultural resources, refer to Section 5.5 Cultural Resources.

5.18.3 Impact Questions		
5.18.3.1: Impact Questions. The impact questions include all tribal cultural resources impact questions in the current version of CEQA Guidelines, Appendix G. **5.18.3.2:** Additional CEQA Impact Questions: None.		
5.18.4 Impact Analysis		
5.18.4.1: Impact Analysis. Provide an impact analysis for each checklist item identified in CEQA Guidelines, Appendix G for this resource area and any additional impact questions listed above.		
Include the following information in the impact analysis:		
5.18.4.2: Information Provided by Tribes. Include an analysis of any impacts that were identified by the tribes during the Applicant's outreach.		
5.18.5 CPUC Draft Environmental Measures		
Refer to Attachment 4, CPUC Draft Environmental Measures.		

5.19 Utilities and Service Systems

This section will include, but is not limited to, the following:	PEA Section and Page Number	Applicant Notes, Comments
5.19.1 Environmental Setting		
5.19.1.1: Utility Providers. Identify existing utility providers and the associated infrastructure that serves the project area.		
5.19.1.2: Utility Lines. Describe existing utility infrastructure (e.g., water, gas, sewer, electrical, stormwater, telecommunications, etc.) that occurs in the project ROW. Provide GIS data and/or as-built engineering drawings to support the description of existing utilities and their locations.		
5.19.1.3: Approved Utility Projects. Identify utility projects that have been approved for construction within the project ROW but that have not yet been constructed.[33]		
5.19.1.4: Water Supplies. Identify water suppliers and the water source (e.g., aqueduct, well, recycled water, etc.). For each potential water supplier, provide data on the existing water capacity, supply, and demand.		
5.19.1.5: Landfills and Recycling. Identify local landfills that can accept construction waste and may service the project. Provide documentation of landfill capacity and estimated closure date. Identify any recycling centers in the area and opportunities for construction and demolition waste recycling.		

[33] Note that this project information should be consistent with the cumulative project description included in Chapter 7.

5.19.2 Regulatory Setting		
5.19.2.1: Regulatory Setting. Identify any applicable federal, state or local laws or regulations for utilities that apply to the project.		
5.19.3 Impact Questions		
5.19.3.1: Impact Questions. All impact questions for this resource area in the current version of CEQA Guidelines, Appendix G. **5.19.3.2:** Additional CEQA Impact Question: Would the project increase the rate of corrosion of adjacent utility lines as a result of alternating current impacts?		
5.19.4 Impact Analysis		
5.19.4.1: Impact Analysis. Provide an impact analysis for each checklist item identified in CEQA Guidelines, Appendix G for this resource area and any additional impact questions listed above.		
Include the following information in the impact analysis:		
5.19.4.2: Utility Relocation. Identify any project conflicts with existing utility lines. If the project may require relocation of existing utilities, identify potential relocation areas and analyze the impacts of relocating the utilities. Provide a map showing the relocated utility lines and GIS data for all relocations.		
5.19.4.3: Waste a) Identify the waste generated by construction, operation, and demolition of the project. b) Describe how treated wood poles would be disposed of after removal, if applicable. c) Provide estimates for the total amount of waste materials to be generated by waste type and how much of it would be disposed of, reused, or recycled.		
5.19.4.4: Water Supply a) Estimate the amount of water required for project construction and operation. Provide the potential water supply source(s). b) Evaluate the ability of the water supplier to meet the project demand under a multiple dry year scenario. c) Provide a discussion as to whether the proposed project meets the criteria for consideration as a project subject to Water Supply Assessment Requirements under Water Code Section 10912. d) If determined to be necessary under Water Code Section 10912, submit a Water Supply Assessment to support conclusions that the proposed water source can meet the project's anticipated water demand, even in multiple dry year scenarios. Water Supply Assessments should be approved by		

the water supplier and consider normal, single-dry, and multiple-dry year conditions.		
5.19.4.5: Cathodic Protection. Analyze the potential for existing utilities to experience corrosion due to proximity to the proposed project. Identify cathodic protection measures that could be implemented to reduce corrosion issues and where the measures may be applied.		
5.19.5 CPUC Draft Environmental Measures		
Refer to Attachment 4, CPUC Draft Environmental Measures.		

5.20 Wildfire

This section will include, but is not limited to, the following:	**PEA Section and Page Number**	**Applicant Notes, Comments**
5.20.1 Environmental Setting		
5.20.1.1: High Fire Risk Areas and State Responsibility Areas a) Identify areas of high fire risk or State Responsibility Areas (SRAs) within the project area. Provide GIS data for the Wildland Urban Interface (WUI) and Fire Hazard Severity Zones (FHSZ) mapping along the project alignment. Include areas mapped by CPUC as moderate and high fire threat districts as well as areas mapped by CalFire. b) Identify any areas the utility has independently identified as High FHSZ known to occur within the proposed project vicinity.		
5.20.1.2: Fire Occurrence. Identify all recent (within the last 10 years) large fires that have occurred within the project vicinity. For each fire, identify the following: a) Name of the fire b) Location of fire c) Ignition source and location of ignition d) Amount of land burned e) Boundary of fire area in GIS		
5.20.1.3: Fire Risk. Provide the following information for assessment of baseline fire risk in the area: a) Provide fuel modeling using Scott Burgan fuel models, or other model of similar quality. b) Provide values of wind direction and speed, relative humidity, and temperature for representative weather stations along the alignment for the previous 10 years, gathered hourly. c) Digital elevation models for the topography in the project region showing the relationship between terrain and wind patterns, as well as localized topography to show the effects of terrain on wind flow, and on a more local area to show effect of slope on fire spread.		

d) Describe vegetation fuels within the project vicinity and provide data in map format for the project vicinity. USDA Fire Effects Information System or similar data source should be consulted to determine high-risk vegetation types. Provide the mapped vegetation fuels data in GIS format.		
5.20.1.4: Values at Risk. Identify values at risk along the proposed alignment. Values at risk may include: Structures, improvements, rare habitat, other values at risk, (including utility-owned infrastructure) within 1000 feet of the project. Provide some indication as to its vulnerability (wood structures vs. all steel features). Communities and/or populations near the project should be identified with their proximity to the project defined.		
5.20.1.5: Evacuation Routes. Identify all evacuation routes that are adjacent to or within the project area. Identify any roads that lack a secondary point of access or exit (e.g., cul-de-sacs).		
5.20.2 Regulatory Setting		
5.20.2.1: Regulatory Setting. Identify applicable federal, state, and local laws, policies, and standards for wildfire.		
5.20.2.2: CPUC Standards. Identify any CPUC standards that apply to wildfire management of the new facilities.		
5.20.3 Impact Questions		
5.20.3.1: Impact Questions. All impact questions for this resource area in the current version of CEQA Guidelines, Appendix G. **5.20.3.2:** Additional CEQA Impact Questions: None.		
5.20.4 Impact Analysis		
5.20.4.1: Impact Analysis. Provide an impact analysis for each checklist item identified in CEQA Guidelines, Appendix G for this resource area and any additional impact questions listed above.		
Include the following information in the impact analysis:		
5.20.4.2: Fire Behavior Modeling. For any new electrical lines, provide modeling to support the analysis of wildfire risk.		
5.20.4.3: Wildfire Management. Describe approaches that would be implemented during operation and maintenance to manage wildfire risk in the area. Provide a copy of any Wildfire Management Plan.		
5.20.5 CPUC Draft Environmental Measures		
Refer to Attachment 4, CPUC Draft Environmental Measures.		

5.21 Mandatory Findings of Significance[34]

This section will include, but is not limited to, the following:	PEA Section and Page Number	Applicant Notes, Comments
5.21.1: Impact Assessment for Mandatory Findings of Significance. Provide an impact analysis for each of the mandatory findings of significance provided in Appendix G of the CEQA Guidelines. The impact analysis can reference relevant information and conclusion from the biological resources, cultural resources, air quality, hazards, and cumulative sections of the PEA, where applicable.		

6 Comparison of Alternatives

This section will include, but is not limited to, the following:	PEA Section and Page Number	Applicant Notes, Comments
6.1: Alternatives Comparison a) Compare the ability of each alternative described in Chapter 4 against the proposed project in terms of its ability to avoid or reduce a potentially significant impact. The alternatives addressed in this section will each be: i. Potentially feasible ii. Meet the underlying purpose of the proposed project iii. Meet most of the basic project objectives, and iv. Avoid or reduce one or more potentially significant impacts. b) The relative effect of the various potentially significant impacts may be compared using the following or similar descriptors and an accompanying analysis: i. Short-term versus long-term impacts ii. Localized versus widespread impacts iii. Ability to fully mitigate impacts c) Impacts that the Applicant believes would be less than significant with mitigation may also be included in the analysis, but only if the steps listed above fail to distinguish among the remaining few alternatives.		
6.2: Alternatives Ranking. Provide a detailed table that summarizes the Applicant's comparison results and ranks the alternatives in order of environmental superiority.[35]		

[34] PEAs need only include a Mandatory Findings of Significance section if CPUC CEQA Unit Staff determine that a Mitigated Negative Declaration may be the appropriate type of document to prepare for the project, as determined through Pre-filing consultation. If no such determination has been made, then a Mandatory Findings of Significance section and the requirements below are not required.

[35] If the proposed project does not rank #1 on the list, the Applicant should provide the rationale for selecting the proposed project.

7 Cumulative and Other CEQA Considerations

This section will include, but is not limited to, the following:	PEA Section and Page Number	Applicant Notes, Comments
7.1 Cumulative Impacts		
7.1.1: List of Cumulative Projects a) Provide a detailed table listing past, present, and reasonably foreseeable future projects within and surrounding the project area (approximately 2-mile buffer)[36]. The following information should be provided for each project in the table: i. Project name and type ii. Brief description of the project location(s) and associated actions iii. Distance to and name of the nearest project component iv. Project status and anticipated construction schedule v. Source of the project information and date last checked (for each individual project), including links to any public websites where the information was obtained so it can be reviewed and updated (the project information should be current when the PEA is filed) b) Provide a supporting map (or maps) showing project features and cumulative project locations and/or linear features. Provide associated GIS data.		
7.1.2: Geographic Scope. Define the geographic scope of analysis for each resource topic. The geographic scope of analysis for each resource topic should consider the extent to which impacts can be cumulative. For example, the geographic scope for cumulative noise impacts would be more limited in scale than the geographic scope for biological resource impacts because noise attenuates rapidly with distance. Explain why the geographic scope is appropriate for each resource.		
7.1.3: Cumulative Impact Analysis. Provide an analysis of cumulative impacts for each resource topic included in Chapter 5. Evaluate whether the proposed project impacts are cumulatively considerable[37] for any significant cumulative impacts.		
7.2 Growth-Inducing Impacts		
7.2.1: Growth-Inducing Impacts. Provide an evaluation of the following potential growth-inducing impacts:		

[36] Information on cumulative projects may be obtained from federal, state, and local agencies with jurisdiction over planning, transportation, and/or resource management in the area. Other projects the Applicant is involved in or aware of in the area should be included.

[37] "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.

a) Would the proposed project foster any economic or population growth, either directly or indirectly, in the surrounding environment? b) Would the proposed project cause any increase in population that could further tax existing community service facilities (i.e., schools, hospitals, fire, police, etc.)? c) Would the proposed project remove any obstacles to population growth? d) Would the proposed project encourage and facilitate other activities that would cause population growth that could significantly affect the environment, either individually or cumulatively?		

8 List of Preparers

This section will include, but is not limited to, the following:	PEA Section and Page Number	Applicant Notes, Comments
8.1: List of Preparers. Provide a list of persons, their organizations, and their qualifications for all authors and reviewers of each section of the PEA.		

9 References

This section will include, but is not limited to, the following:	PEA Section and Page Number	Applicant Notes, Comments
9.1: Reference List a) Organize all references cited in the PEA by section within a single chapter called "References." b) Within the References chapter, organize all of the Chapter 5 references under subheadings for each resource area section.		
9.2: Electronic References a) Provide complete electronic copies of all references cited in the PEA that cannot be readily obtained for free on the Internet. This includes any company-specific documentation (e.g., standards, policies, and other documents). b) If the reference can be obtained on the Internet, the Internet address will be provided.		

PEA Checklist Attachments

Attachment 1: GIS Data Requirements

This Attachment includes specific requirements and format of GIS data that is intended to be applicable to all PEAs. The specific GIS data requirements may be updated on a project-specific basis during Pre-filing coordination with CPUC's CEQA Unit Staff.

1. GIS data will be provided in an appropriate format (i.e., point, line, polygon, raster) and scale to adequately verify assumptions in the PEA and supporting materials and determine the level of environmental impacts. At a minimum, all GIS data layers will include the following metadata properties:
    a. The source (e.g., report reference), date, title, and preparer (name or company)
    b. Description of the contents and any limitations of the data
    c. Reference scale and accuracy of the data
    d. Complete attributes that correspond to the detailed mapbook, project description, and figures presented in the PEA and/or supporting application materials, including unique IDs, labels, geometry, and other appropriate project details
2. Where precise boundaries of project features may change (e.g., staging areas and temporary construction work areas), the Applicant will provide GIS data layers with representative boundaries to evaluate potential environmental impacts as a worst-case scenario.
3. Provide GIS data for:
    a. All proposed and alternative project facilities including but not limited to existing and proposed/alternative ROWs; substations and switching stations; pole/tower locations; conduit; vaults, pipelines; valves; compressor stations; metering stations; valve stations, gas wellheads; other project buildings, facilities, and components (both temporary and permanent); telecommunication and distribution lines modifications or upgrades related to the project; marker ball and lighting locations; and mileposts, facility perimeters, and other demarcations or segments as applicable
    b. All proposed areas required for construction and construction planning, including all proposed and alternative disturbance areas (both permanent and temporary); access roads; geotechnical work areas; extra work areas (e.g., staging areas, parking areas, lay-down areas, work areas at and around specific pole/tower sites, pull and tension sites, helicopter landing areas); airport landing areas; underground installation areas (e.g. trenches, vaults, underground work areas); horizontal directional drilling, jack and bore, or tunnel areas; blasting areas; and any areas where special construction methods may need to be employed
    c. Within the PEA checklist there are also specific requirements for environmental resources within Chapter 5. All environmental resource GIS data must meet the minimum mapping standards specified in this Attachment.

Attachment 2: Biological Resource Technical Report Standards

Definitions

The following biological resources will be considered within the scope of the PEA and the Biological Resources Technical Report:

Sensitive Vegetation Communities and Habitats

a) Sensitive vegetation communities/habitats identified in local or regional plans, policies, or regulations, or designated by CDFW38 or USFWS
b) Areas that provide habitat for locally unique biotic species/communities (e.g., oak woodlands, grasslands, and forests)
c) Habitat that contains or supports rare, endangered, or threatened wildlife or plant species as defined by CDFW and USFWS
d) Habitat that supports CDFW Species of Special Concern
e) Areas that provide habitat for rare or endangered species and that meet the definition in CEQA Guidelines Section 15380
f) Existing game and wildlife refuges and reserves
g) Lakes, wetlands, estuaries, lagoons, streams, and rivers
h) Riparian corridors

Special-Status Species

a) Species listed or proposed for listing as threatened or endangered under the federal Endangered Species Act (ESA) (50 CFR § 17.12 [listed plants], 17.11 [listed animals] and various notices in the Federal Register [proposed species])
b) Species that are candidates for possible future listing as threatened or endangered under the federal ESA (61 FR § 40, February 28, 1996)
c) Species listed or proposed for listing by the State of California as threatened or endangered under the California ESA (14 CCR § 670.5)
d) Plants listed as rare or endangered under the California Native Plant Protection Act (California Fish and Game Code, Section 1900 et seq.)
e) Species that meet the definitions of rare and endangered under CEQA. CEQA Guidelines Section 15380 provides that a plant or animal species may be treated as "rare or endangered" even if not on one of the official lists.
f) Plants considered by the California Native Plant Society (CNPS) to be "rare, threatened or endangered in California" (California Rare Plant Rank 1A, 1B, 2A, and 2B) as well as California Rare Plant Rank 3 and 4 plant species
g) Species designated by CDFW as Fully Protected or as a Species of Special Concern
h) Species protected under the Federal Bald and Golden Eagle Protection Act
i) Birds of Conservation Concern or Watch List species
j) Bats considered by the Western Bat Working Group to be "high" or "medium" priority (Western Bat Working Group 2015)

[38] CDFW's Rarity Ranking follows NatureServe's Heritage Methodology (Faber-Langendoen, et al. 2016) in which communities are given a G (global) and S (state) rank based on their degree of imperilment (as measured by rarity, trends, and threats). Communities with a Rarity Ranking of S1 (critically imperiled), S2 (imperiled), or S3 (vulnerable) are considered sensitive by CDFW.

Biological Resource Technical Report Minimum Requirements

Report Contents

The Biological Resource Technical Report will include the following information at a minimum.

a) **Preliminary Agency Consultation.** Describe any pre-survey contact with agencies. Describe any agency approvals that were required for biologists or agency protocols that were applied to the survey effort. Provide copies of correspondence and meeting notes with the names and contact information for agency staff and the dates of consultation as an appendix to the Biological Resources Technical Report.
b) **Records Search.** Provide the results of all database and literature searches for biological resources within and surrounding the project area. Identify all sources reviewed (e.g., CNDDB, CNPS, USFWS, etc.).
c) **Biological Resource Survey Method.** Identify agency survey requirements and protocols applicable to each biological survey that was conducted. Identify the areas where each survey occurred. Identify any limitations for the surveys (e.g., survey timing or climatic conditions) that could affect the survey results.
d) **Vegetation Communities and Land Cover.** Identify all vegetation communities or land cover types (e.g., disturbed or developed) within the biological survey area. The biological survey area should include a 1,000-foot buffer from project facilities to support CPUC's evaluation of indirect effects.
e) **Aquatic Resources.** Identify any wetlands, streams, lakes, reservoirs, estuarine, or other aquatic resources within the biological survey area. Provide a wetland delineation and all data sheets including National Wetlands Inventory maps (or the appropriate state wetland maps, if National Wetlands Inventory maps are not available) that show all proposed facilities and include milepost locations for proposed pipeline routes. Provide a copy of agency verification of the wetland delineation if the delineation has been verified by the U.S. Army Corps of Engineers or CDFW. If the delineation has not been verified, describe the process and timing for obtaining agency verification.
f) **Habitat Assessments.** Evaluate the potential for suitable habitat in the biological survey area for each species identified in the database and literature search.
g) **Native Wildlife Corridors and Nursery Sites.** Identify any wildlife corridors or nursery sites that occur within the biological survey area.
h) **Survey Results.** Describe all survey results and include a copy of any focused (e.g., rare plant, protocol special-status wildlife) biological resources survey reports.

Mapping and GIS Data

Provide detailed maps (at approximately 1:3,000 scale or similar), and all associated GIS data for the Biological Resources Technical Report and any supporting biological survey reports, including:

a) Biological survey area for each survey that was conducted
b) Vegetation communities and land cover types
c) Aquatic resource delineation
d) Special-status plant locations
e) Special-status wildlife locations
f) Avian point count locations
g) Critical habitat
h) California Coastal Commission or Bay Conservation and Development Commission jurisdictional areas

Attachment 3: Cultural Resource Technical Report Standards

Cultural Resource Inventory Report

Provide a cultural resource inventory report that includes archaeological, unique archaeological, and built-environment resources within all areas that could be affected by the proposed project including areas of indirect effect. The inventory report will include the results of both a literature search and pedestrian survey. The contents will address the requirements in *Archaeological Resource Management Reports: Recommended Contents and Guidelines*. The methodology and results of the inventory should be sufficient to provide the reader with an understanding of the nature, character, and composition of newly discovered and previously identified cultural resources so that the required recommendations about the resource(s) CRHR eligibility are clearly understood. No information regarding the location of the cultural resources will be included in these descriptions. The required Department of Parks and Recreation (DPR) 523 forms, including location information and photographs of the resources, are to be included in a removable confidential appendix to the report.[39]

The inventory report will meet the following requirements:

a) The report should clearly discuss the methods used to identify unique archaeological resources (e.g., how the determination was made about the resources' eligibility).
b) The report should identify large resources such as districts and landscapes where resources indicate their presence, even if federal agencies disagree. It is understood that often only a few contributing elements may be in the project area, and that the boundaries of the large resource may need to be revisited as part of future projects. It is acknowledged that boundaries of districts and landscapes can be difficult to define and there is not always good recorded data on these resources.
c) In the case of archaeological resources, the report should discuss whether each one is also a unique archaeological resource and explain why or why not.
d) Descriptions of resources should include spatial relationships to other nearby resources, raw materials sources, and natural features such as water sources and mountains.
e) The evidence that indicates a particular function or age for a resource should be explicitly described with a clear explanation, not simply asserted.

Cultural Resource Evaluation Report

Provide a cultural resource evaluation report. The report contents required by the state of California are outlined in the *Archaeological Resource Management Reports: Recommended Contents and Guidelines*. The evaluation report should also include:

a) Resource descriptions and evaluations together, and not in separate volumes or report sections. This will facilitate understanding of each resource.
b) An evaluation of each potential or eligible California Register of Historical Resources (CRHR) resource within the public archaeology laboratory (PAL) for all seven aspects of integrity[40] using specific examples for each resource. This evaluation needs to be included in the evaluation

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39 Any aspect of the PEA and associated data that Applicants believe to be confidential will be provided in full but may be marked confidential if allowed pursuant to General Order 66 or latest applicable Commission rule (e.g., see Public Records Act Proceeding R.14-11-001).

40 The seven aspects of integrity are location, design, setting, materials, workmanship, feeling, and association, as defined in "***Types of Historical Resources and Criteria for Listing in the California Register of Historical Resources***" [14 CCR 4852(c)]).

report for all resources that could be affected by the project even if the resources were not previously evaluated. Previous evaluations should be reviewed to address change over time.

c) An evaluation of each potential or eligible CRHR resource within the PAL under all four criteria using specific examples for each resource. This evaluation needs to be included in the evaluation report for all resources that could be affected by the project even if the resources were not previously evaluated. The cultural resources professional should make their own recommendation regarding eligibility, which does not need to agree with previous recommendations for CRHR or NRHP, as long as it is clearly explained.
d) For **prehistoric archaeological resources**, Criteria 1, 2 and 3[41] should be explicitly considered. Research efforts to search for important events and persons related to the resource must be described. This evaluation needs to be included in the evaluation report for all resources that could be affected by the project even if the resources were not previously evaluated. The cultural resources professional should make their own recommendation, which does not need to agree with previous recommendations for CRHR or NRHP eligibility, as long as it is clearly explained.
e) While **potential unique archaeological resources** could be identified in the records search report or inventory report, the justification for each individual resource to be considered a resource under CEQA should be presented in this report.
f) If surface information collected during survey is sufficient to make an eligibility recommendation, this reasoning should be outlined explicitly for each resource. This is particularly the case for resources that are believed to have buried subsurface components.
g) If archaeological testing or additional historical research was required in order to evaluate a resource, the evaluation report will be explicit about why the work was required, the results for each resource, and the subsequent eligibility recommendation.
h) For large projects with multiple similar resources where the eligibility justifications for similar resources are essentially identical, it is acceptable to discuss these resources as a group. However, eligibility justifications for each individual resource is preferred, so if the grouping strategy is used, the criteria used to group resources must be clearly justified.
i) Large resources such as districts and landscapes may be challenging to fully evaluate in the context of a single project. CPUC encourages the identification and evaluation of these resources with the understanding that often only a few contributing elements may be located within the project area, and that the boundaries of the large resource may need to be revisited as part of future projects. It is understood that a full evaluation of the resource may be beyond the scope of one project. Regardless, the potential for the project to affect any resources within a district or landscape must be defined.

[41] Criteria for Designation on the California Register are as follows (defined in http://ohp.parks.ca.gov/?page_id=21238):
- Criterion 1: Associated with events that have made a significant contribution to the broad patterns of local or regional history or the cultural heritage of California or the United States.
- Criterion 2: Associated with the lives of persons important to local, California or national history.
- Criterion 3: Embodies the distinctive characteristics of a type, period, region or method of construction or represents the work of a master or possesses high artistic values.
- Criterion 4: Has yielded, or has the potential to yield, information important to the prehistory or history of the local area, California or the nation.

Attachment 4: CPUC Draft Environmental Measures

About this Attachment: The following CPUC Draft Environmental Measures are provided for consideration during PEA development. They should be discussed with the CPUC's CEQA Unit Staff during Pre-filing, especially with respect to the development of Applicant Proposed Measures. The CPUC Draft Environmental Measures may form the basis for mitigation measures in the CEQA document if appropriate to the analysis of potentially significant impacts. These and other CPUC Draft Environmental Measures may be formally incorporated into Chapter 5 of future versions of the PEA Checklist.

5.1 Aesthetics

Aesthetics Impact Reduction During Construction

All project sites will be maintained in a clean and orderly state. Construction staging areas will be sited away from public view where possible. Nighttime lighting will be directed away from residential areas and have shields to prevent light spillover effects. Upon completion of project construction, project staging and temporary work areas will be returned to pre-project conditions, including re-grading of the site and re-vegetation or re-paving of disturbed areas to match pre-existing contours and conditions.

5.3 Air Quality

Dust Control During Construction

The Applicant shall implement measures to control fugitive dust in compliance with all local air district(s) standards. Dust control measures shall include the following at a minimum:

- All exposed surfaces with the potential of dust-generating shall be watered or covered with coarse rock to reduce the potential for airborne dust from leaving the site.
- The simultaneous occurrence of more than two ground disturbing construction phases on the same area at any one time shall be limited. Activities shall be phased to reduce the amount of disturbed surfaces at any one time.
- Cover all haul trucks entering/leaving the site and trim their loads as necessary.
- Use wet power vacuum street sweepers to sweep all paved access road, parking areas, staging areas, and public roads adjacent to project sites on a daily basis (at minimum) during construction. The use of dry power sweeping is prohibited.
- All trucks and equipment, including their tires, shall be washed off prior to leaving project sites.
- Apply gravel or non-toxic soil stabilizers on all unpaved access roads, parking areas, and staging areas at project sites.
- Water and/or cover soil stockpiles daily.
- Vegetative ground cover shall be planted in disturbed areas as soon as possible and watered appropriately until vegetation is established.
- All vehicle speeds shall be limited to fifteen (15) miles per hour or less on unpaved areas.
- Implement dust monitoring in compliance with the standards of the local air district.
- Halt construction during any periods when wind speeds are in excess of 50 mph.

5.5 Cultural Resources

Human Remains (Construction and Maintenance)

Avoidance and protection of inadvertent discoveries that contain human remains shall be the preferred protection strategy with complete avoidance of such resources ensured by redesigning the project. If human remains are discovered during construction or maintenance activities, all work shall be diverted from the area of the discovery, and the CPUC shall be informed immediately. The Applicant shall contact the County Coroner to determine whether or not the remains are Native American. If the remains are determined to be Native American, the Coroner will contact the Native American Heritage Commission (NAHC). The NAHC will then identify the person or persons it believes to be the most likely descendant of the deceased Native American, who in turn would make recommendations for the appropriate means of treating the human remains and any associated funerary objects.

If the remains are on federal land, the remains shall be treated in accordance with the Native American Graves Protection and Repatriation Act (NAGPRA). If the remains are not on federal land, the remains shall be treated in accordance with Health and Safety Code Section 7050.5, CEQA Section 15064.5(e), and Public Resources Code Section 5097.98.

5.8 Greenhouse Gas Emissions

Greenhouse Gas Emissions Reduction During Construction

The following measures shall be implemented to minimize greenhouse gas emissions from all construction sites:

- If suitable park-and-ride facilities are available in the project vicinity, construction workers shall be encouraged to carpool to the job site.
- The Applicant shall develop a carpool program to the job site.
- On road and off-road vehicle tire pressures shall be maintained to manufacturer specifications. Tires shall be checked and re-inflated at regular intervals.
- Demolition debris shall be recycled for reuse to the extent feasible.
- The contractor shall use line power instead of diesel generators at all construction sites where line power is available.
- The contractor shall maintain construction equipment per manufacturing specifications.

5.19 Utilities and Service Systems

Notify Utilities with Facilities Above and Below Ground

The Applicant shall notify all utility companies with utilities located within or crossing the project ROW to locate and mark existing underground utilities along the entire length of the project at least 14 days prior to construction. No subsurface work shall be conducted that would conflict with (i.e., directly impact or compromise the integrity of) a buried utility. In the event of a conflict, areas of subsurface excavation or pole installation shall be realigned vertically and/or horizontally, as appropriate, to avoid other utilities and provide adequate operational and safety buffering. In instances where separation between third-party utilities and underground excavations is less than 5 feet, the Applicant shall submit the intended construction methodology to the owner of the third-party utility for review and approval at least 30 days prior to construction. Construction methods shall be adjusted as necessary to assure that the integrity of existing utility lines is not compromised.

5.20 Wildfire

Construction Fire Prevention Plan

A project-specific Construction Fire Prevention Plan for both construction and operation of the project shall be submitted for review prior to initiation of construction. A draft copy of the Plan shall be provided to the CPUC and state and local fire agencies at least 90 days before the start of any construction activities in areas designated as Very High or High Fire Hazard Severity Zones. Plan reviewers shall also include

federal, state, or local agencies with jurisdiction over areas where the project is located. The final Plan shall be approved by the CPUC at least 30 days prior to the initiation of construction activities. The Plan shall be fully implemented throughout the construction period and include the following at a minimum:

- The purpose and applicability of the Plan
- Responsibilities and duties
- Preparedness training and drills
- Procedures for fire reporting, response, and prevention that include:
    - Identification of daily site-specific risk conditions
    - The tools and equipment needed on vehicles and to be on hand at sites
    - Reiteration of fire prevention and safety considerations during tailboard meetings
    - Daily monitoring of the red-flag warning system with appropriate restrictions on types and levels of permissible activity
- Coordination procedures with federal and local fire officials
- Crew training, including fire safety practices and restrictions
- Method(s) for verifying that all Plan protocols and requirements are being followed

A project Fire Marshal or similar qualified position shall be established to enforce all provisions of the Construction Fire Prevention Plan as well as perform other duties related to fire detection, prevention, and suppression for the project. Construction activities shall be monitored to ensure implementation and effectiveness of the Plan.

Fire Prevention Practices (Construction and Maintenance)

The Applicant shall implement ongoing fire patrols during the fire season as defined each year by local, state, and federal fire agencies. These dates vary from year to year, generally occurring from late spring through dry winter periods. During Red Flag Warning events, as issued daily by the National Weather Service, all construction/maintenance activities shall cease, with an exception for transmission line testing, repairs, unfinished work, or other specific activities which may be allowed if the facility/equipment poses a greater fire risk if left in its current state.

All construction/maintenance crews and inspectors shall be provided with radio and cellular telephone access that is operational in all work areas and access routes to allow for immediate reporting of fires. Communication pathways and equipment shall be tested and confirmed operational each day prior to initiating construction/maintenance activities at each work site. All fires shall be reported to the fire agencies with jurisdiction in the area immediately upon discovery of the ignition.

All construction/maintenance personnel shall be trained in fire-safe actions, initial attack firefighting, and fire reporting. All construction/maintenance personnel shall be trained and equipped to extinguish small fires in order to prevent them from growing into more serious threats. All construction/maintenance personnel shall carry at all times a laminated card and be provided a hard hat sticker that list pertinent telephone numbers for reporting fires and defining immediate steps to take if a fire starts. Information on laminated contact cards and hard hat stickers shall be updated and redistributed to all construction/maintenance personnel and outdated cards and hard hat stickers shall be destroyed prior to the initiation of construction/maintenance activities on the day the information change goes into effect.

Construction/maintenance personnel shall have fire suppression equipment on all construction vehicles. Construction/maintenance personnel shall be required to park vehicles away from dry vegetation. Water tanks and/or water trucks shall be sited or available at active project sites for fire protection during construction. The Applicant shall coordinate with applicable local fire departments prior to construction/maintenance activities to determine the appropriate amounts of fire equipment to be carried on vehicles and, should a fire occur, to coordinate fire suppression activities.

Groundwater Sustainability Plan for the Oxnard Subbasin

Fox Canyon Groundwater Management Agency
800 South Victoria Avenue
Ventura, California 93009-1610
December 2019

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December 13, 2019 9837

Board of Directors
Fox Canyon Groundwater Management Agency
800 South Victoria Avenue
Ventura, CA 93009

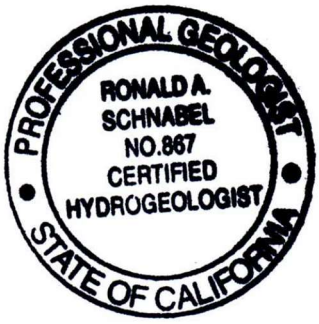
Subject: Groundwater Sustainability Plan for the Oxnard Subbasin

Dear Board of Directors:

Dudek is pleased to submit this Groundwater Sustainability Plan (GSP) for the Oxnard Subbasin to the Fox Canyon Groundwater Management Agency. This GSP was prepared this in accordance with California Code of Regulations, Title 23. Water, Division 2. Department of Water Resources, Chapter 1.5. Groundwater Management, Subchapter 2. Groundwater Sustainability Plans.

Respectfully Submitted,

Ronald Schnabel, PG #7836, CHG #867
Senior Hydrogeologist



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ACRONYMS AND ABBREVIATIONS

Acronym/Abbreviation	Definition
AEA	Annual Efficiency Allocation
AFY	acre-feet per year
AMI	advanced metering infrastructure
ASR	Aquifer Storage and Recovery
AWMP	Agricultural Water Management Plan
AWPF	Advanced Water Purification Facility
bgs	below ground surface
BM	benchmark
BMO	Basin Management Objective
BMP	best management practice
BTEX	benzene, toluene, ethyl benzene, and xylenes
cfs	cubic feet per second
CIMIS	California Irrigation Management Information System
CMWD	Calleguas Municipal Water District
COCs	constituents of concern
DAC	Disadvantaged Community
DBS&A	Daniel B. Stephens & Associates Inc.
DPWM	Distributed Parameter Watershed Model
DWR	California Department of Water Resources
EOPMA	East Oxnard Plain Management Area
Evap	evaporation
FCA	Fox Canyon Aquifer
FCGMA	Fox Canyon Groundwater Management Agency
GDE	groundwater-dependent ecosystem
gpm	gallons per minute
GREAT	Groundwater Recovery Enhancement and Treatment
GRRP	Recycled Water/Groundwater Replenishment Reuse Project
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
IE	irrigation efficiency
IRWM	Integrated Regional Water Management
LAS	Lower Aquifer System
M&I	municipal and industrial
MCL	maximum contaminant level
mgd	million gallons per day
mg/L	milligrams per liter
msl	above mean sea level
MTBE	methyl tertiary butyl ether
MWD	Metropolitan Water District of Southern California
OHWS	Oxnard–Hueneme Water System
OPV	Oxnard Subbasin–Pleasant Valley Basin

Acronym/Abbreviation	Definition
PCB	polychlorinated biphenyl
PHWA	Port Hueneme Water Agency
RMSE	root-mean-squared error
SCAG	Southern California Association of Governments
SGMA	Sustainable Groundwater Management Act
SMP	Salinity Management Pipeline
SNMP	Salt and Nutrient Management Plan
SWP	State Water Project
SWRCB	State Water Resources Control Board
TAG	Technical Advisory Group
TBA	tert-butyl alcohol
TDS	total dissolved solids
UAS	Upper Aquifer System
USGS	U.S. Geological Survey
UWCD	United Water Conservation District
UWMP	urban water management plan
UWMPA	Urban Water Management Planning Act
VCGP	Ventura County General Plan
VCWPD	Ventura County Watershed Protection District
VOC	volatile organic compound
VWD	City of Ventura Water Department
VWRF	Ventura Water Reclamation Facility
WOPMA	West Oxnard Plain Management Area
WQO	Water Quality Objective

EXECUTIVE SUMMARY

The Fox Canyon Groundwater Management Agency (FCGMA, or the Agency) has developed this Groundwater Sustainability Plan (GSP) for the Oxnard Subbasin (Subbasin; DWR Basin 4-004.02) of the Santa Clara River Valley Groundwater Basin (DWR Basin 4-004), in compliance with the 2014 Sustainable Groundwater Management Act (SGMA; California Water Code, Section 10720 et seq.). The purpose of this GSP is to define the conditions under which the groundwater resources of the entire Oxnard Subbasin, which support agricultural, municipal and industrial, and environmental uses, will be managed sustainably in the future.

Historical groundwater production has resulted in seawater intrusion in the five primary aquifers of the Subbasin. These aquifers have been divided into an Upper Aquifer System, which comprises the Oxnard and Mugu Aquifers, and a Lower Aquifer System, which comprises the Hueneme, Fox Canyon, and Grimes Canyon Aquifers. The average rate of groundwater production from the Upper Aquifer System between 2015 and 2017 was approximately 40,000 acre-feet per year (AFY). The average production from the Lower Aquifer System between 2015 and 2017 was approximately 29,000 AFY. Numerical groundwater simulations indicate that if these production rates were carried into the future, seawater intrusion would continue in the Subbasin and the area currently impacted by concentrations of chloride greater than 500 milligrams per liter would grow. The landward extent of this area is referred to as the *saline water impact front*.[1]

Combinations of projects and management actions were explored to estimate the rate of groundwater production that would prevent future expansion of the area of the Subbasin currently impacted by concentrations of chloride greater than 500 milligrams per liter. This rate of groundwater production is referred to as the sustainable yield. With the currently available projects and management actions, the sustainable yield of the Upper Aquifer System, was calculated to be approximately 32,000 AFY, with an uncertainty of ± 4,100 to 6,000 AFY. The sustainable yield of the Lower Aquifer System was calculated to be approximately 7,000 AFY, with an uncertainty of ± 2,300 to 3,600 AFY.

Adoption of this GSP represents the first step in achieving groundwater sustainability within the Oxnard Subbasin by 2040, as required by SGMA. Evaluation of this GSP is required at a minimum of every 5 years following submittal to the California Department of Water Resources (DWR). As part of the 5-year evaluation process, the sustainable yield for each aquifer system will be refined and adjusted. These refinements will be based on new data, additional studies undertaken to fill data gaps, and groundwater modeling. Refinements and adjustments will also be made to the minimum threshold water levels developed to avoid

[1] Sources of water high in chloride in the Oxnard Subbasin include modern-day seawater as well as non-marine brines and connate water in fine-grained sediments. Therefore, the area of the Subbasin impacted by concentrations of chloride greater than 500 milligrams per liter is referred to as the *saline water impact area*, rather than the *seawater intrusion impact area*, to reflect all the potential sources of chloride to the aquifers in this area.

undesirable results, the measurable objective water levels that account for the need to continue groundwater production during drought cycles and the associated interim milestones to help gauge progress toward sustainability over the next 20 years.

In order to minimize the pumping reductions required to achieve sustainable management of the Subbasin, investment in large-scale projects to increase water supply, provide the infrastructure to redistribute pumping, and/or directly control seawater intrusion should be investigated. Basin optimization studies, groundwater modeling, and project feasibility studies will be conducted over the next 5 years to explore practicable processes and approaches to increasing the sustainable yield of the Oxnard Subbasin.

ES.1 INTRODUCTION

The Oxnard Subbasin is a coastal alluvial groundwater subbasin, located in Ventura County, California, that is in hydrologic communication, to varying degrees, with adjoining groundwater basins to the north and east, and with the Pacific Ocean to the west and southwest. The climate is typical of coastal Southern California, with average daily temperatures ranging generally from 50°F to 78°F in summer and from 40°F to 75°F in winter. Land use on the Oxnard Plain is roughly equally divided between agricultural and urban uses. DWR has designated the 90-square-mile Subbasin as high priority and subject to critical conditions of overdraft.

Historical groundwater production in the Subbasin was first found to have induced seawater intrusion into the aquifers of the Oxnard Subbasin in the 1930s. In 1982, the California Legislature formed the FCGMA, an independent special district, to manage and protect the aquifers within its jurisdiction for the common benefit of the public and all groundwater users. Extractors within FCGMA jurisdiction are subject to the Agency's GSPs, ordinances, and policies created for the sustainable management of groundwater management actions.

Three groundwater sustainability agencies (GSAs) have jurisdiction over portions of the Subbasin. FCGMA is the GSA for the area of the Subbasin that falls within its jurisdiction. The Camrosa Water District–Oxnard Subbasin GSA has jurisdictional control over the portion of the Camrosa Water District service area in the Subbasin that is south and east of the Bailey Fault, and the Oxnard Outlying Areas GSA has jurisdictional control over portions of the Subbasin not within FCGMA or Camrosa Water District–Oxnard Subbasin GSA jurisdiction. This FCGMA GSP is the sole GSP prepared for the Subbasin, and covers the entire Subbasin, including all areas of the Subbasin outside of FCGMA's jurisdiction.

Public participation and stakeholder feedback have played a critical role in the development of this GSP. The FCGMA maintains a list of stakeholders interested in the GSP process, known as the *List of Interested Parties*. A monthly newsletter, meeting notices, and notices of GSP documents available for review were sent electronically to the List of Interested Parties. Public workshops

were held to inform stakeholders and the general public on the contents of the GSPs and to solicit feedback on that content. To further facilitate stakeholder understanding, the FCGMA Board of Directors (Board) approved release of a preliminary draft GSP for public comment in November 2017. Additionally, the FCGMA Board formed a Technical Advisory Group, which held monthly public meetings throughout the GSP development process beginning in July 2015. Updates on the development of the GSP were given at meetings of the FCGMA Board beginning in April 2015. All FCGMA Board meetings, Technical Advisory Group meetings, Board-appointed committee meetings, and Board special workshops were noticed in accordance with the Brown Act, and opportunities for public comment were provided at all FCGMA Board meetings, Technical Advisory Group meetings, Board-appointed committee meetings, and workshops.

ES.2 SUMMARY OF BASIN SETTING AND CONDITIONS

There are five commonly recognized aquifers in the Subbasin: the Oxnard, Mugu, Hueneme, Fox Canyon, and Grimes Canyon Aquifers. These aquifers are grouped into the Upper Aquifer System and the Lower Aquifer System, with the Oxnard and Mugu Aquifers composing the Upper Aquifer System and the Hueneme, Fox Canyon, and Grimes Canyon Aquifers composing the Lower Aquifer System. The majority of recharge that replenishes the Subbasin comes from surface water diversions of the Santa Clara River, which are directed to spreading basins in the Oxnard Forebay operated by the United Water Conservation District (UWCD). In the Forebay, the Upper Aquifer System rests directly on the folded and eroded upper surface of the Hueneme Aquifer and the Fox Canyon Aquifer. Elsewhere in the Subbasin, the aquifers of the Lower Aquifer System are separated from those of the Upper Aquifer System by low-permeability clay beds. A low-permeability clay cap also overlies the aquifers of the Upper Aquifer System throughout the Subbasin, except in the Forebay. Water that recharges in the Forebay is able to migrate throughout the Subbasin.

Groundwater elevations and flow directions have varied historically in the Subbasin. During periods of above average precipitation, when UWCD has been able to operate its recharge basins from the diversion of Santa Clara River water, groundwater elevations have been higher than sea level, generating a seaward-directed gradient that prevents seawater intrusion. At other times in the past, and since the onset of the drought period beginning in 2011, groundwater elevations have been below sea level, creating a landward gradient that allows for inland migration of seawater. Absolute changes in groundwater levels over cycles of drought and recovery vary both geographically and vertically within the aquifers of the Subbasin, although the general patterns of decline and recovery are similar throughout the Subbasin.

Seawater intrusion tends to occur preferentially in the vicinity of Port Hueneme and Point Mugu, where submarine canyons are close to the coast, and the onshore freshwater aquifer units are exposed in the canyon walls. The current extent of seawater intrusion varies by aquifer, but in

general the impacted area of the Subbasin lies to the south of Hueneme Road and west of Highway 1. Groundwater quality not related to seawater intrusion is also a concern in the Forebay of the Subbasin, where nitrate concentrations exceeding the water quality objectives for the Subbasin are present in the groundwater. These concentrations are likely a legacy of historical septic discharges and historical agricultural fertilizer application practices, and may also be influenced by current agricultural return flows.

The water budget for the Subbasin provides an accounting and assessment of the average annual volume of groundwater and surface water entering (i.e., inflow) and leaving (i.e., outflow) the Subbasin and enables an accounting of the cumulative change in groundwater in storage over time. UWCD developed the Ventura Regional Groundwater Flow Model, a MODFLOW numerical groundwater flow model, for the Oxnard Subbasin, the Mound Basin, the western part of the Las Posas Valley Basin, and the Pleasant Valley Basin. A peer review study of the UWCD model was conducted for this GSP. The historical groundwater budget for the Subbasin is based on the UWCD model, which had a historical base period from 1985 to 2015. During average conditions (1988, 1991, 1992, 1994, 1996, 1997, 2000, 2001, 2003, 2006, 2008, 2010, and 2011), which are defined as water years in which the precipitation in the Oxnard Subbasin was between 75% and 150% of the average annual precipitation, the net change in groundwater storage for the Upper Aquifer System without seawater intrusion was an increase in 1,856 AFY and the net change in storage without seawater intrusion in the Lower Aquifer System was a decrease of 4,196 AFY. The net seawater intrusion during these years was 4,189 AFY in the Upper Aquifer System, and 5,225 AFY in the Lower Aquifer System. Groundwater pumping during these average condition years averaged 47,080 AFY in the Upper Aquifer System and 28,893 AFY in the Lower Aquifer System.

Several model scenarios were developed to assess the future sustainable yield of the Subbasin. Each future scenario covered a 50-year timeframe, from 2020 to 2069. In two scenarios, the 2015–2017 average groundwater extraction rate was continued throughout the 50-year modeled period. The results of each of these scenarios indicated that continuing the 2015–2017 extraction rate would contribute to net seawater intrusion in both the Upper Aquifer System and Lower Aquifer System. In three additional scenarios, the groundwater production rate was decreased gradually over the first 20 years. These model scenarios indicated that reduced groundwater production from the Subbasin can eliminate net seawater intrusion in the Subbasin over periods of drought and recovery. Based on the suite of model scenarios, the sustainable yield of the Upper Aquifer System was calculated to be approximately 32,000 AFY, with an uncertainty of ± 4,100 to 6,000 AFY. The sustainable yield of the Lower Aquifer System was calculated to be approximately 7,000 AFY, with an uncertainty of ± 2,300 to 3,600 AFY.

It is anticipated that the analysis for the 5-year update to the GSP will focus on developing new water supply projects, as well as examining the potential impacts of differential extractions on the coast and inland, particularly in the Lower Aquifer System. Additional modeling is recommended for the

5-year update process to understand how changes in pumping patterns and the addition of new water supply projects can increase the overall sustainable yield of the Subbasin. As this understanding improves, projects to support increases in the overall sustainable yield can be developed.

To reflect the current understanding of the hydrogeologic characteristics of the Subbasin, and in anticipation of future management strategies the Subbasin has been divided into five management areas. These areas are the Forebay Management Area, the West Oxnard Plain Management Area, the Oxnard Pumping Depression Management Area, the Saline Intrusion Management Area, and the East Oxnard Plain Management Area. These areas are separated by hydrogeologic and water quality characteristics.

ES.3 OVERVIEW OF SUSTAINABILITY CRITERIA

The sustainability goal in the Subbasin is to increase groundwater elevations inland of the Pacific coast in the aquifers that compose the Upper Aquifer System and the Lower Aquifer System to elevations that will prevent the long-term, or climatic cycle net (net), landward migration of the area currently impacted by seawater intrusion; prevent net seawater intrusion in the Upper Aquifer System; and prevent net seawater intrusion in the Lower Aquifer System.

Under SGMA, undesirable results occur when the effects caused by groundwater conditions occurring throughout the Subbasin cause significant and unreasonable impacts to any of the six sustainability indicators:

- Chronic lowering of groundwater levels
- Reduction of groundwater storage
- Seawater intrusion
- Degraded water quality
- Land subsidence
- Depletions of interconnected surface water

All six sustainability indicators are applicable to the Subbasin. Minimum thresholds and measurable objectives, which are quantitative metrics of groundwater conditions in the Subbasin, were established for the sustainability indicators determined to be a current and/or potential future undesirable result. Groundwater elevations that achieve the sustainability goal for seawater intrusion were used as a proxy for other sustainability indicators in establishing the minimum thresholds and measurable objectives. This is because if the minimum thresholds and measurable objectives for seawater intrusion are achieved, then undesirable results for the other sustainability indicators are avoided.

The measurable objective water levels for the Subbasin are the groundwater levels throughout the Subbasin, at which there is neither seawater flow into nor freshwater flow out of the Upper Aquifer System or Lower Aquifer System. If groundwater levels in the Subbasin remained at the measurable objective in perpetuity, no groundwater would flow from the aquifer systems into the Pacific Ocean, and no ocean water would flow into the aquifer systems. To allow for operational flexibility during drought periods, water levels in the Subbasin are allowed to fall below the measurable objective. In order to prevent net seawater intrusion over periods of drought and recovery, the periods during which groundwater elevations are below the measurable objective must be offset by periods when the groundwater elevations are higher than the measurable objective.

The minimum thresholds for all six sustainability indicators are groundwater levels that were selected to limit seawater intrusion and allow declines in groundwater elevations during periods of future drought to be offset by recoveries during future periods of above-average rainfall. These thresholds were tested with future groundwater model simulations. The model simulations suggest that if groundwater levels fall below the minimum threshold elevations, the Subbasin is likely to experience net landward migration of the 2015 saline water impact front after 2040. These minimum thresholds are anticipated to improve the beneficial uses of the Subbasin by limiting seawater intrusion. This allows for long-term use of groundwater supplies in the Subbasin.

Although exceedance of a minimum threshold at any given well in the Subbasin may indicate an undesirable result is occurring in the Subbasin, a single exceedance is not necessarily sufficient to indicate that Subbasin-wide conditions are causing undesirable results. Additionally, conditions in the Upper Aquifer System may differ from those in the Lower Aquifer System. Therefore, to define the conditions under which undesirable results will occur in the Subbasin, criteria were developed for each aquifer system. The Upper Aquifer System would be determined to be experiencing an undesirable result if:

- In any single monitoring event, groundwater levels in 6 of 15 identified key wells are below their respective minimum thresholds.
- The groundwater elevation at any individual key well is below the historical low water level for that well.
- The groundwater level in any individual key well is below the minimum threshold for either three consecutive monitoring events or three of five consecutive monitoring events, which occur in the spring and fall of each year.

The Lower Aquifer System would be determined to be experiencing an undesirable result if:

- In any single monitoring event, groundwater levels in 8 of 19 identified key wells are below their respective minimum thresholds.

- The groundwater elevation at any individual key well is below the historical low water level for that well.
- The groundwater level in any individual key well is below the minimum threshold for either three consecutive monitoring events or three of five consecutive monitoring events, which occur in the spring and fall of each year.

ES.4 OVERVIEW OF THE SUBBASIN MONITORING NETWORK

The overall objective of the monitoring network in the Subbasin is to track and monitor parameters that demonstrate progress toward meeting the sustainability goals. In order to accomplish this objective, the monitoring network in the Subbasin must be capable of the following:

- Monitoring changes in groundwater conditions (in six sustainability indicator categories)
- Monitoring progress toward minimum thresholds and measurable objectives
- Quantifying annual changes in water budget components

The existing network of groundwater wells includes both monitoring wells and production wells. This network is capable of delineating the groundwater conditions in the Subbasin and has been used for this purpose in the past. The current groundwater well network will be used to monitor groundwater conditions moving forward, in order to continue to assess long-term trends in groundwater elevation and groundwater quality in the Subbasin.

Although the current monitoring network is adequate to monitor groundwater conditions in the Subbasin, it can be improved as funding becomes available An additional well, or wells, in the Oxnard Pumping Depression Management Area would provide aquifer-specific groundwater elevations in an area that does not have local wells screened solely in the Mugu Aquifer or the Hueneme Aquifer, and does not have a dedicated monitoring well screened in any of the primary aquifers.

Additionally, the monitoring network in the West Oxnard Plain Management Area could be improved by adding a monitoring well to the area north of Highway 101 and south of the Oxnard Forebay, and adding a monitoring well to the area north of 6th Street and west of Ventura Road. A monitoring well north of Highway 101 and south of the Oxnard Forebay would provide for aquifer-specific water levels adjacent to the West Las Posas Management Area boundary. These groundwater levels could be used to constrain the gradient between the West Las Posas Management Area and the Subbasin. A monitoring well north of 6th Street and west of Ventura Road would help constrain groundwater gradients in the northwestern Subbasin.

There are currently no monitoring wells in the East Oxnard Plain Management Area, which has minimal known groundwater production. Addition of a monitoring well in the vicinity of Calleguas

Creek in this management area would help constrain the relationship between groundwater elevations in the East Oxnard Plain Management Area and groundwater conditions in the adjacent Oxnard Pumping Depression and Saline Intrusion Management Areas.

In addition to supplementing the existing monitoring network with new wells, monitoring can also be improved in the future by coordination of monitoring schedules to ensure that groundwater monitoring activities occur over a 2-week window during the key reporting periods and mid-March and mid-October. As funding becomes available, pressure transducers should be added to wells in the groundwater monitoring network. Pressure transducer records provide the high-temporal-resolution data that allows for a better understanding of water level dynamics in the wells related to groundwater production, groundwater management activities, and climatic influence.

In the future, to the extent possible, additional dedicated monitoring wells will be incorporated into the existing monitoring network. These wells will provide information on groundwater conditions in geographic locations where data gaps have been identified, or where a dedicated monitoring well would better represent conditions in the aquifers than a production well currently used for monitoring.

ES.5 PROJECTS AND MANAGEMENT ACTIONS

Projects and management actions have been identified to address potential impacts to beneficial uses and users of groundwater in the Subbasin resulting from groundwater production in excess of the current sustainable yield. The five projects included in this GSP were suggested by stakeholders and were reviewed by the Operations Committee of the FCGMA Board. The inclusion of these projects does not constitute a commitment by the FCGMA Board to construct or fund the projects, but rather signals that these projects were sufficiently detailed to be included in groundwater modeling efforts that examined the quantitative impacts of the projects on groundwater elevations and the sustainable yield of the Subbasin. Projects included in the GSP or any amendment thereof that increase the available supply of groundwater are necessary to meet the sustainability goal for the Subbasin in a manner that avoids adverse impacts to beneficial uses and users of groundwater within the Subbasin.

Project No. 1 – GREAT Program Advanced Water Purification Facility

Under this project, the City of Oxnard's Groundwater Recovery Enhancement and Treatment (GREAT) Program's Advanced Water Purification Facility (AWPF) could provide the Subbasin with a source of reclaimed water that can be used for landscape irrigation, agricultural, industrial process water, and groundwater recharge. The AWPF product water that will be put to use in the Subbasin is secondary wastewater effluent that is currently discharged to the Pacific Ocean. Therefore, this project provides a new source of water for use in the Subbasin.

Project No. 2 – GREAT Program Advanced Water Purification Facility Expansion Project

The purpose of the GREAT Program AWPF Expansion Project is to increase the production of high-quality recycled water within the City of Oxnard, the Subbasin, and the Pleasant Valley Basin. This project will provide additional reclaimed water for Subbasin recharge, in-lieu groundwater production, or indirect potable reuse. The AWPF Expansion Project product water that will be put to use in the Subbasin is secondary wastewater effluent that is currently discharged to the Pacific Ocean. Therefore, this project provides a new source of water for use in the Subbasin.

Project No. 3 – RiverPark–Saticoy GRRP Recycled Water Project

The RiverPark–Saticoy Groundwater Replenishment and Reuse Project (GRRP) Recycled Water Project will convey water produced by the GREAT Program AWPF Expansion Project to the Saticoy Groundwater Recharge Facility and El Rio Groundwater Recharge Facility operated by UWCD. The RiverPark–Saticoy Pipeline and the GRRP will help ensure that excess flows from the AWPF will be used for groundwater recharge and implementation of this project is expected to improve groundwater quality in the Forebay.

Project No. 4 – Freeman Expansion Project

The Freeman Expansion Project will expand the recharge facilities operated by UWCD adjacent to the Santa Clara River, to be able to accommodate diversions from the river at higher flow rates. The benefits of this project are multifold. It will provide additional recharge, improve water quality in the Forebay, and reduce pump lift, and therefore energy consumption, for municipal and agricultural pumpers.

Project No. 5 – Temporary Agricultural Land Fallowing

The Temporary Agricultural Land Fallowing Project will decrease groundwater production in the portions of the Subbasin that are susceptible to seawater intrusion. This project will benefit the Subbasin by mitigating seawater intrusion in the Subbasin and would complement a water market that is currently being developed for the Subbasin by providing an alternative method for landowners to monetize pumping allocations.

Management Action No. 1 – Reduction in Groundwater Production

The primary management action proposed under this GSP is a reduction in groundwater production from the Subbasin. FCGMA has had the authority to monitor and regulate groundwater production in the Subbasin since 1983. The primary benefit related to reduction in groundwater production is recovery of groundwater elevations that have historically allowed for seawater intrusion in the Subbasin. Reduction in groundwater production can be used to close any differential between

groundwater elevations that can be obtained through implementation of projects and the groundwater elevations necessary to prevent future net seawater intrusion in the Upper Aquifer System and the Lower Aquifer System.

FCGMA approved an ordinance to establish an allocation system for the Oxnard Subbasin and the Pleasant Valley Basin on October 23, 2019. The purpose of this ordinance is to facilitate adoption and implementation of the GSP and to ensure that the Oxnard Subbasin and the Pleasant Valley Basin are operated within their sustainable yields. It is not the purpose of the ordinance to determine or alter water right entitlements, including those that may be asserted pursuant to California Water Code Sections 1005.1, 1005.2, or 1005.4.

Management Action No. 2 – Water Market Pilot Program

A water market pilot program is currently being conducted by FCGMA as a means of increasing operational management of groundwater in the Subbasin. Analysis of the water market pilot program will be conducted and its suitability for incorporation as a management action for the Subbasin will be determined after the pilot program is completed in July 2019.

CHAPTER 1
ADMINISTRATIVE INFORMATION

1.1 PURPOSE OF THE GROUNDWATER SUSTAINABILITY PLAN

The Fox Canyon Groundwater Management Agency (FCGMA), acting as the Groundwater Sustainability Agency (GSA) for the Oxnard Subbasin of the Santa Clara River Valley Groundwater Basin (4-004; Oxnard Subbasin [Subbasin]), has developed this Groundwater Sustainability Plan (GSP) in compliance with the 2014 Sustainable Groundwater Management Act (SGMA) (California Water Code, Section 10720 et seq.). This GSP has been developed to apply to the entirety of the Oxnard Subbasin, including those portions of the Subbasin that lie outside FCGMA's jurisdictional boundary, primarily consisting of fringe areas of the Subbasin. The County of Ventura (County) and the Camrosa Water District (CWD) have each elected to act as the GSA for portions of the Subbasin not within FCGMA's jurisdiction. The County and CWD will rely on this GSP and coordinate with FCGMA as necessary to ensure that the Subbasin is sustainably managed in its entirety, in accordance with SGMA.

SGMA defines sustainable groundwater management as the management and use of groundwater in a manner that can be maintained over a 50-year planning and implementation horizon without causing undesirable results. Undesirable results are defined in SGMA and are summarized here as any of the following effects caused by groundwater conditions occurring throughout the Subbasin:[1]

- Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply
- Significant and unreasonable reduction of groundwater storage
- Significant and unreasonable seawater intrusion
- Significant and unreasonable degraded water quality
- Significant and unreasonable land subsidence
- Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water

As described in Chapter 2, Basin Setting, of this GSP, undesirable results within the Oxnard Subbasin are occurring with respect to significant and unreasonable reduction of groundwater storage and seawater intrusion. Portions of the Subbasin are experiencing, or under threat of experiencing, degraded water quality. Chronic lowering of groundwater levels has not occurred because declines in groundwater elevation are offset by seawater intrusion. Land subsidence has occurred historically in the Subbasin and has the potential to occur in the future if groundwater

[1] As defined in SGMA, "basin" means a groundwater basin or subbasin identified and defined in Bulletin 118 or as modified pursuant to California Water Code, Section 10720 et seq. (Basin Boundaries).

conditions are not managed sustainably. Depletions of interconnected surface water have not occurred historically in the Subbasin, because the Groundwater-Dependent Ecosystems (GDEs) in the Subbasin are supported by shallow groundwater flows that are generally separated and disconnected from the primary groundwater aquifers (see Section 1.3.2, Geography; Section 2.2.1, Geology; and Section 2.3.7, Groundwater-Dependent Ecosystems).

The purpose of this GSP is to define the conditions under which the groundwater resources of the entire Oxnard Subbasin, which support agricultural, municipal and industrial (M&I), and environmental uses, will be managed sustainably in the future. The adoption of this GSP represents the first step in achieving groundwater sustainability within the Oxnard Subbasin by 2040, as required by SGMA. Over the next 20 years, data will continue to be gathered and used to refine the estimated sustainable yield and potential paths for achieving sustainability set forth in the following chapters. As the understanding of the Subbasin improves, this GSP will be updated to reflect the new understanding of the Subbasin. This GSP outlines a plan for annual reporting and periodic (5-year) evaluations (Chapter 1); characterizes groundwater conditions, trends, and the cumulative impacts of groundwater pumping for each of the SGMA-defined sustainability indicators (Chapter 2); establishes minimum thresholds, measurable objectives and interim milestones by which sustainability can be measured and tracked (Chapter 3, Sustainable Management Criteria); outlines the monitoring network used to support and document progress toward sustainability (Chapter 4, Monitoring Networks); and identifies projects and management actions to be implemented by the GSA and/or stakeholders to minimize undesirable results (Chapter 5, Projects and Management Actions).[2] This GSP documents a viable path, determined by the GSA in collaboration with stakeholders and informed by the best available information, to achieving the sustainability goal within the Oxnard Subbasin.

1.2 AGENCY INFORMATION

1.2.1 Agency Name

Fox Canyon Groundwater Management Agency (FCGMA or Agency)

1.2.2 Agency Address

Mailing Address:

Fox Canyon Groundwater Management Agency
800 South Victoria Avenue
Ventura, California 93009-1610

[2] All references in this GSP to *minimizing*, *limiting*, or *mitigating* undesirable results means doing so in a manner that culminates in the absence of (i.e., avoidance of) undesirable results by 2040 and thereafter during the planning and implementation horizon.

Office Location:

Ventura County Government Center
Hall of Administration
800 South Victoria Avenue
Ventura, California 93009

1.2.3 Organization and Management Structure

FCGMA is governed by five Board of Directors (Board) members who represent (1) the County, (2) the United Water Conservation District (UWCD), (3) the seven mutual water companies and small water districts within the Agency (Alta Mutual Water Company, Pleasant Valley County Water District (PVCWD), Berylwood Mutual Water Company, Calleguas Municipal Water District (CMWD), CWD, Zone Mutual Water Company, and Del Norte Mutual Water Company), (4) the five incorporated cities within FCGMA (Ventura, Oxnard, Camarillo, Port Hueneme, and Moorpark), and (5) the farmers (FCGMA 2019a). Four of these Board members, representing the County, UWCD, the mutual water companies and small water districts, and the incorporated cities, are appointed by their respective organizations or groups. The representative for the farmers is appointed by the other four seated Board members from a list of candidates jointly supplied by the Ventura County Farm Bureau and the Ventura County Agricultural Association. An alternate Board member is selected by each appointing agency or group in the same manner as the regular member and acts in place of the regular member in case of absence or inability to act.

All members and alternates serve for a 2-year term of office, or until the member or alternate is no longer an eligible official of the member agency. All Board members and alternates serve on a volunteer basis and no compensation is provided for attendance at FCGMA meetings or events. Information regarding current FCGMA Board representatives can be found on the Agency's website (FCGMA 2019b).

Extractors within Oxnard Subbasin will be subject to FCGMA's GSP and any management actions created for this GSP. These actions are administered by the Agency Executive Officer, who is appointed by the FCGMA Board. The Agency Executive Officer and other FCGMA staff are provided by the County of Ventura Public Works Agency pursuant to a contract with the County of Ventura. FCGMA does not construct, operate, or maintain capital facilities but does have the authority to adopt ordinances requiring registration of groundwater wells, requiring reporting of groundwater use, regulating groundwater extractions, and requiring fees. FCGMA contracts with the County to provide staff to support FCGMA (FCGMA 2019a).

1.2.4 Plan Manager

Executive Officer of FCGMA, Jeff Pratt, PE

Mailing Address:

Fox Canyon Groundwater Management Agency
800 South Victoria Avenue
Ventura, California 93009-1610

Phone: 805.654.2073

Email: Jeff.Pratt@ventura.org

1.2.5 Legal Authority

FCGMA is an independent special district formed by the California Legislature in 1982 to manage and protect the aquifers within its jurisdiction for the common benefit of the public and all agricultural, domestic, and M&I users (FCGMA et al. 2007). FCGMA's jurisdiction was established as the area overlying the FCA and includes portions of the Oxnard Subbasin and the Las Posas Valley Basin (LPVB), the Pleasant Valley Basin (PVB), and the Arroyo Santa Rosa Valley Basin. FCGMA may adopt ordinances for the purpose of regulating, conserving, managing, and controlling the use and extraction of groundwater within its territory (FCGMA Act, Section 403).

The FCGMA Act prohibits the Agency from engaging in water supply activities normally and historically undertaken by its member agencies. Nonetheless, FCGMA may exercise the water supply powers and authorities authorized under SGMA provided the Board makes a finding that FCGMA is otherwise unable to sustainably manage the basin.

The full text of the FCGMA Act, Assembly Bill 2995, as well as amendments and additional legislation, can be accessed on the Agency's website (FCGMA 2019c). FCGMA is identified in SGMA as an agency created by statute to manage groundwater that is the exclusive GSA within its territory with powers to comply with SGMA (SGMA, Section 10723[c][1][D]). FCGMA notified the California Department of Water Resources (DWR) of its intent to undertake sustainable groundwater management under SGMA on January 26, 2015, and was granted exclusive GSA status under SGMA, Section 10723(c) (Appendix A, GSA Formation Documentation, to this GSP).

1.2.6 Groundwater Sustainability Plan Implementation and Cost Estimate

This GSP will be implemented by FCGMA, with cooperation from the Camrosa Water District–Oxnard Subbasin GSA and County for the small portion of the Subbasin outside FCGMA jurisdiction (see Section 1-3, Description of Plan Area). The following sections provide a discussion of the standards for and costs associated with GSP implementation, including annual reporting, periodic updates, monitoring protocols, and projects and management actions. Potential funding sources and mechanisms are presented along with a tentative schedule for implementing the GSP's primary components. In addition, annual reporting and 5-year evaluation procedures for the Oxnard Subbasin are described.

1.2.6.1 Standards for Plan Implementation

Annual Reporting

The GSA shall submit an annual report to DWR by April 1 of each year following the adoption of the GSP. The annual report shall include the following components for the preceding water year (23 CCR, Section 356.2):

- General information, including an executive summary and a location map depicting the basin covered by the report
- A detailed description and graphical representation of
  - Groundwater elevation data from wells identified in the monitoring network
  - Groundwater extraction for the preceding water year
  - Change in groundwater in storage
  - Surface water supply used or available for use
  - Total water use
- A description of progress toward implementing the Plan, including achieving interim milestones, and implementation of projects or management actions since the previous annual report

The description and graphical representation of groundwater elevations will include groundwater elevation contour maps for each principal aquifer in the Subbasin illustrating, at a minimum, the seasonal high and seasonal low groundwater conditions. Additionally, hydrographs of groundwater elevations and water year type using historical data to the greatest extent available, including from January 1, 2015, to current reporting year, will be included in the annual report. As described in Section 1.2.6.2, Data Collection, Validation, and Analysis, relevant data collected by

entities within the PVB are regularly provided to FCGMA and will be used to prepare the annual reports submitted to DWR.

The description and graphical representation of change in groundwater storage will include a graph depicting water year type, groundwater use, the annual change in groundwater in storage, and the cumulative change in groundwater in storage for the basin based on historical data to the greatest extent available, including from January 1, 2015, to the current reporting year.

Five-Year Evaluation

FCGMA will evaluate the GSP at least every 5 years. This 5-year evaluation will be provided as a written assessment to DWR. The assessment shall describe whether the Plan implementation, including implementation of projects and management actions, are meeting the sustainability goal in the basin. The evaluation will include the following:

- A description of current groundwater conditions for each applicable sustainability indicator relative to measurable objectives, interim milestones, and minimum thresholds
- A description of the implementation of any projects or management actions, and the effect on groundwater conditions resulting from those projects or management actions
- Revisions, if any, to the basin setting, management areas, or the identification of undesirable results and the setting of minimum thresholds and measurable objectives
- An evaluation of the basin setting in light of significant new information or changes in water use, and an explanation of any significant changes
- A description of the monitoring network within the basin, including whether data gaps exist, or any areas within the basin are represented by data that does not satisfy the requirements of the GSP Regulations (23 CCR, Sections 352.4 and 354.34[c])
- A description of significant new information that has been made available since GSP adoption, amendment, or the last 5-year assessment
- A description of relevant actions taken by the Agency, including a summary of regulations or ordinances related to the GSP
- Information describing any enforcement or legal actions taken by the Agency in furtherance of the sustainability goal for the basin
- A description of completed or proposed GSP amendments
- A summary of coordination that occurred between FCGMA and other agencies, if appropriate, in the Subbasin, as well as between FCGMA and other agencies in hydrologically connected basins

1.2.6.2 GSP Implementation Budget

The primary costs associated with implementing the GSP are anticipated to be connected with the following:

- Data collection, validation, and analysis
- Ongoing data gap analysis and assessments of priorities for filling data gaps
  - Filling of data gaps
  - Operations and maintenance
- Annual report preparation and preparation of the 5-year GSP evaluation
- Regional studies for basin optimization, groundwater modeling
- Management, administration, and other costs

Data Collection, Validation, and Analysis

FCGMA has historically obtained data from the Ventura County Watershed Protection District (VCWPD) to monitor streamflow, precipitation, groundwater elevation, and groundwater quality throughout the Oxnard Subbasin. Besides VCWPD, entities that monitor groundwater level and groundwater quality in the Oxnard Subbasin include the United Water Conservation District (UWCD), the Cities of Oxnard and Camarillo, PVCWD, and small mutual water companies. Relevant data collected by these entities is regularly provided to VCWPD, and the data are shared with FCGMA for use in the FCGMA annual groundwater reports. This process will continue, but analysis will now include comparison of collected data against sustainable management criteria established by this GSP.

The majority of water level and water quality data in the Oxnard Subbasin are generated by VCWPD and UWCD. To date, this data sharing has not required expenditures from FCGMA because FCGMA did not control the location or timing of data and sample collection. The existing monitoring schedules and locations are discussed in Chapter 4, Monitoring Networks. It is anticipated that as long as the existing schedules are maintained, VCWPD will continue to host the data for the Oxnard Subbasin and FCGMA will be able to use the data for annual monitoring reports and the 5-year GSP evaluations. However, to the degree that monitoring schedules and locations will change, a cost-sharing agreement will be developed between VCWPD and FCGMA.

Data Gap Analysis and Priorities

During the initial 5-year period after the GSP is adopted, FCGMA will explore options for filling data gaps identified in this GSP. The primary data gaps identified in the historical data are spatial and temporal gaps in groundwater elevation and groundwater quality measurements.

In order to assess the priorities for filling these gaps, FCGMA plans to review options and potential costs associated with those options to direct funding toward the solutions that are needed most. One option that will be investigated would include adding pressure transducers to existing agricultural wells in the monitoring network. These transducers would record water levels at regular intervals (e.g., hourly) to determine static, or recovered, water levels. The cost for purchasing and installing transducers in agricultural wells must be assessed and incorporated into the cost of GSP implementation. As instrumentation is added to the monitoring network, the annual cost of operations and maintenance will also be factored in to the budget for GSP implementation.

In addition to assessing the need for new instrumentation, the analysis of data gaps and priorities will review the potential cost and need to substitute existing agricultural wells in the monitoring network with dedicated monitoring wells, or install monitoring wells in key areas where there are no appropriate wells to monitor. While monitoring wells are often preferred to agricultural wells, for the time being, the agricultural well data provide a link to historical data. This link is critical in assessing progress toward sustainability. Therefore, the data gap analysis and priorities assessment will review which agricultural wells may need to be substituted and which wells should be retained for ongoing historical comparison.

Annual Report Preparation and Preparation of the 5-Year Evaluation

Details of the information that will be included in the annual reports are presented in Section 1.2.6.1, Standards for Plan Implementation. It is currently anticipated that the annual reports will be produced by FCGMA staff and the costs associated with these reports will be incorporated in the annual operating budget of FCGMA.

Every fifth year of GSP implementation and whenever the GSP is amended, the GSA is required to prepare and submit an Agency Evaluation and Assessment Report to the DWR together with the annual report for that year. The tasks associated with preparing this report include updating the water budget, updating the groundwater model, and reassessing the sustainable yield, minimum thresholds, and measurable objectives (see Section 1.2.6.1). Additionally, the evaluation will provide an assessment of the pumping and groundwater conditions. It is currently anticipated that the 5-year evaluation reports will be produced by FCGMA staff with the assistance of consultants and that the costs associated with these reports will be incorporated in the annual operating budget of FCGMA.

Basin Optimization Studies, Groundwater Modeling, and Project Feasibility

During the initial 5-year period after the GSP is adopted, FCGMA will explore opportunities to optimize basin management. The work required to assess these opportunities includes implementing and supporting regional studies and groundwater modeling efforts that assess how

to maximize the sustainable yield of the Oxnard Subbasin and adjoining basins. These studies are anticipated to include more detailed feasibility studies of projects that were proposed and modeled for this GSP, as well as an investigation of how the projects will be implemented, the costs associated with project implementation, and potential cost-sharing agreements for these projects.

It should be noted that Chapter 5 of this GSP includes projects that were far enough along in development and/or implementation that meaningful information could be included about their potential to improve sustainable management of the Subbasin. Additional projects may be implemented within the next 20 years to, for example, minimize the need for pumping reductions. This GSP does not preclude future projects or existing projects that are too early in the stage of development to be included in Chapter 5 from being investigated or undergoing feasibility analysis in the coming years. Relevant information about new projects and/or updates to existing projects described in Chapter 5 will be provided in annual reports and 5-year evaluations.

Current anticipated costs for implementing projects in the Oxnard Subbasin that were analyzed as part of this GSP are presented in Table 1-1.

In addition, it is anticipated that basin optimization studies will be undertaken in the initial 5-year period after the GSP is implemented adopted to assess projects that were not included in this GSP. This assessment is expected to include an investigation of how adjustments to the location of groundwater production will minimize seawater intrusion in the Oxnard Subbasin, while maximizing the sustainable yield of the combined aquifer systems of the Oxnard Subbasin, the PVB, and the West Las Posas Management Area. Basin optimization investigations are inherently tied to groundwater modeling, which would be conducted to provide the estimated sustainable yield for all scenarios analyzed.

Lastly, as part of the project feasibility analyses, FCGMA anticipates evaluating potential revenue streams for implementing the projects required to optimize basin management. This analysis will include a review of the potential for implementing basin replenishment fees and the costs associated with proposing and passing such fees.

Cost Estimate

The estimated total GSP implementation costs are presented in Table 1-2. The starting cost for monitoring systems, coordination of data collection, obtaining data form other GSAs in the basin is estimated to be $1 million for 2020. Costs were increased annually, using a 2.8% inflation rate, from 2020 to 2040 (Table 1-2). The annual reviews to DWR are anticipated to be included as part of the operations and monitoring costs for FCGMA. The management, administration, and other costs for 2020 are based on the 2019–2020 fiscal year budget, in which these costs are estimated to be $1,455,000.

The 5-year evaluation costs are anticipated to cover the professional specialty services to evaluate and assess the GSP and perform the additional work necessary to fill data gaps and analyze projects and management actions for the Oxnard Subbasin, as well as for the PVB and LPVB. FCGMA has prepared the GSPs for the entire area of the Oxnard Subbasin, Las Posas Valley Basin, and Pleasant Valley Basin. FCGMA will be responsible for evaluating these GSPs, for each basin, every 5 years. Cost sharing for these evaluations may be investigated with the other GSAs in each basin in the future. Initial costs for the 5-year evaluation were estimated to be $100,000 per basin, with 2.8% inflation between 2020 and 2024. Costs for 2025 through 2029 were estimated to be $100,000 if the work were performed in 2020, but the costs in the budget account for 2.8% annual inflation between 2020 and 2025. Costs between 2030 and 2033 were calculated from the 2.8% annual inflation on $50,000. Subsequent years were calculated either based on 2.8% inflation on $100,000, or 2.8% inflation on $50,000, depending on whether the year included preparation of a physical report for DWR.

Finally, the estimated implementation costs include a 10% contingency on the total operating and monitoring costs, management administration and other costs, and the 5-year evaluation.

1.2.6.3 Funding Sources

In general, FCGMA plans to fund its basic operations costs using groundwater extraction charges. Surcharges for extractions in excess of an allocation may also be used in carrying out FCGMA's groundwater management functions. FCGMA collects a groundwater extraction base rate fee of $6 per acre-foot and imposes a surcharge of up to $1,961 for excess extractions. Together, these pump fees have generated more than $1 million in operating revenues each fiscal year (ending in June) between 2013 and 2016. FCGMA anticipates using this existing revenue structure, along with eventual implementation of a replenishment fee, to fund the GSP implementation and direct costs.

Under SGMA, FCGMA gained additional authority to impose regulatory fees and currently collects a sustainability of fee of $11 per acre-foot in addition to its groundwater extraction fee. The sustainability fee is projected to generate additional annual revenue of $1,375,000. The sustainability fee will increase to $14 per acre-foot in 2020 and generate an additional $375,000 in annual revenue. Upon adoption of this GSP, FCGMA will have authority to impose replenishment fees and to fund projects and management actions that can influence groundwater supply. Projects to achieve sustainability are anticipated to require funding beyond that generated by the existing extraction and sustainability fees. FCGMA anticipates working with other agencies and stakeholders to understand how individual projects will impact stakeholders and identify the most appropriate funding sources for these projects.

1.3 DESCRIPTION OF PLAN AREA

1.3.1 Description

The Oxnard Subbasin (the Subbasin; DWR Groundwater Basin 4-004.02) is a coastal alluvial subbasin of the Santa Clara River Valley Groundwater Basin (4-004). It is bounded to the east by the LPVB (4-008), the Camarillo Hills, and the PVB (4-006); to the southeast by the Santa Monica Mountains; to the west and southwest by the Pacific Ocean; and to the north by the Mound (4-004.03) and Santa Paula (4-004.04) Subbasins of the Santa Clara River Valley Groundwater Basin (Figure 1-1, Vicinity Map for the Oxnard Subbasin).

The Oxnard Subbasin is in hydrologic communication, to varying degrees, with the LPVB and PVB to the east, the Mound and Santa Paula Subbasins to the north, and the Pacific Ocean to the west and southwest.

The Oak Ridge and McGrath Faults form the boundary between the Oxnard Subbasin and the Mound and Santa Paula Subbasins to the north (DWR 2016a). The boundary between the Oxnard Subbasin and the LPVB is a jurisdictional boundary that corresponds to property lines and associated water sources. It is parallel and proximal to the surface expression of the Wright Road Fault. The boundary between the Oxnard Subbasin and the PVB is defined by a facies change between the predominantly coarse-grained sand and gravel deposits that compose the Upper Aquifer System (UAS) in the Oxnard Subbasin and finer-grained clay- and silt-rich deposits in the PVB. The southeastern boundary of the Oxnard Subbasin is the contact between permeable alluvium and semi-permeable rocks of the Santa Monica Mountains (SWRCB 1956; DWR 2016a).

The Oxnard Subbasin has historically been divided into two subareas by local practitioners (UWCD 2014). Across most of the Oxnard Plain, the main water-producing aquifers are confined beneath a low-permeability, clay-rich layer that separates the UAS from the topmost unconfined semi-perched aquifer groundwater unit. This clay layer and the semi-perched aquifer are absent in the northeastern area known as the Oxnard Forebay, and as a result, unconfined aquifer conditions exist in the UAS in this area (Figure 1-1).

In this report, to distinguish between features on the land surface and in the subsurface, the term "Oxnard Plain" will be used to refer to the geographic area overlying the Oxnard Subbasin.

Administrative Boundaries

Multiple boundaries have been used to define or manage the Subbasin (Figure 1-2, Administrative Boundaries for the Oxnard Subbasin), including the following:

1. The boundary of the Subbasin defined by DWR in its 2016 Basin Boundary Modification
2. The jurisdictional boundary of FCGMA
3. The boundaries of the Oxnard Forebay historically used by FCGMA
4. The boundary of the Oxnard Subbasin historically used by FCGMA

The boundary of the Oxnard Subbasin defined by DWR in its 2016 Basin Boundary Modification extends beyond FCGMA jurisdiction to the southeast, northwest, and northeast (Figure 1-2). The jurisdictional boundary of FCGMA was established based on a vertical projection of the interpreted extent of the FCA, as provided by the Fox Canyon Groundwater Management Agency Act (FCGMA Act) in 1982. The FCA is absent in the areas of the DWR Bulletin 118 boundaries for the Oxnard Subbasin that lie outside of FCGMA jurisdiction (Figure 1-2). The majority of the area that is outside FCGMA jurisdiction but inside the 2016 Subbasin boundary lies within the jurisdiction of the County of Ventura. The County has filed to be the GSA for the Oxnard Basin Outlying Areas (see Appendix A; Figure 1-2). The remaining area outside of FCGMA jurisdiction but within the boundary of the Subbasin currently used by DWR will be managed by CWD, which has filed to be the GSA for the Camrosa Water District–Oxnard Subbasin, which covers the portion of CWD's service area that lies within the Oxnard Subbasin (Appendix A; Figure 1-2). Table 1-3 presents a breakdown of all GSAs that intersect the boundary of the Oxnard Subbasin defined by DWR in its 2016 Basin Boundary Modification. The 2016 Basin Boundary Modification was used instead of the 2018 Basin Boundary Modification to be consistent with the groundwater model used in this GSP. The County (by Resolution 17-088) and CWD (by Resolution 17-11) have each elected to act as the GSA for portions of the Subbasin not within FCGMA's jurisdiction (Appendix A). The County and CWD will rely on this GSP and coordinate with the FCGMA, as necessary, to ensure that the Subbasin is sustainably managed in its entirety, in accordance with SGMA.

The external boundary of the Oxnard (4-004.02), Mound (4-004.03), and Santa Paula (4-004.04) Subbasins were adjusted in DWR's 2018 Basin Boundary Modification process (DWR 2019). The adjustment was made by request of the Mound Basin GSA, who notified FCGMA of the proposed change, which was ultimately approved by DWR in 2019. The purpose of the boundary change was to better align the boundaries of the Mound Subbasin, FCGMA, and the Santa Paula basin adjudication. Compared with the 2016 boundary for the Oxnard Subbasin, the 2018 Basin Boundary Modification aligned the north-northwestern border of the Subbasin with FCGMA's jurisdictional boundary, resulting in subtraction of 75.2 acres from the Subbasin near the Pacific Coastline south of the Santa Clara River, and the addition of 614.7 acres to the Subbasin in a narrow zone north of the Santa Clara River (DWR 2016a, 2019).

From a technical and sustainable management perspective, the effect of the change in area for the Oxnard Subbasin between 2016 and 2018 is negligible, because the area does not newly include or exclude representative monitoring sites or production wells and does not affect the model domain, boundary conditions, and/or other parameters used in the Ventura Regional Groundwater Flow Model. Therefore, the effect on water budget for the Subbasin would be limited to the inclusion and/or exclusion of model grid cells for inflow and outflow calculations along the northern boundary of the Subbasin. The dimension of the model grid cells (2,000 feet) is greater than the maximum change in distance between the 2016 and 2018 boundaries for the Oxnard Subbasin (1,300 feet or less), which suggests that any difference could be within the margin of error associated with the model grid resolution. Because this change represents just 0.9% of the Subbasin's total area and is an administrative rather than a scientific/technical boundary modification, and because this GSP was largely completed prior to adoption of the change in 2019, Subbasin condition information presented in this GSP reflects DWR's 2016 Basin Boundary Modification.

Land Ownership and Jurisdiction

Land within the Oxnard Subbasin is under a variety of municipal, County, state, and federal jurisdictions. The City of Oxnard and Port Hueneme are entirely encompassed by the Oxnard Subbasin. The Cities of Ventura and Camarillo lie primarily outside the Subbasin; however, the cities' outer edges are crossed by the Subbasin boundary. Land under County jurisdiction outside the incorporated cities composes the majority (55.5%) of the Subbasin's land area. State agencies that own and/or manage land within the Oxnard Subbasin include the California Department of Parks and Recreation, California State University, and California Department of Corrections and Rehabilitation. Federal land within the Subbasin consists of the Naval Base Ventura County (Naval Construction Battalion Center Port Hueneme and Point Mugu Naval Air Station), which occupies about 10% of the Subbasin's land area. Finally, The Nature Conservancy owns and manages land along the lower reach of the Santa Clara River and Ormond Beach for conservation purposes. A summary of land ownership and jurisdiction is provided in Table 1-4.

1.3.2 Geography

1.3.2.1 Surface Water and Drainage Features

The dominant surface water bodies in the Oxnard Plain are the Santa Clara River, Revolon Slough, and Calleguas Creek, all three of which drain watersheds that extend beyond the boundaries of the Subbasin. In addition, the relatively flat areas within the Cities of Oxnard and Port Hueneme are drained by several lined drains that discharge directly into the Pacific Ocean (Figure 1-3, Weather Station and Stream Gauge Locations).

The Santa Clara River is close to and generally parallels the northern boundary of the Oxnard Subbasin and discharges to the Pacific Ocean through the Santa Clara River Estuary north of the

Oxnard Subbasin. Flow in the channel infiltrates into sediments overlying the Oxnard Forebay and is a source of recharge to the aquifers in the Subbasin. In addition, UWCD, under permit, diverts surface water from the Santa Clara River at the Freeman Diversion. The diversion, which was constructed in 1991, replaced an earthen diversion that had been in place since 1928. The diversion is located upstream of the Subbasin boundary and discharges Santa Clara River water to infiltration basins overlying the Oxnard Forebay (Figure 1-3). West of the Oxnard Forebay, the Santa Clara River channel overlies a confining clay layer and does not communicate directly with the confined aquifers of the UAS and the Lower Aquifer System (LAS). In this portion of the channel (including the estuary) the semi-perched aquifer, which is located above the uppermost confining clay layer, supplies water to the Lower Santa Clara River (Section 2.1, Introduction to Basin Setting).

Revolon Slough drains the eastern portion of the Oxnard Plain and the western portions of the LPVB and PVB (which are east of the Oxnard Plain) (Figure 1-3). The drainage area of Revolon Slough includes western Camarillo. Flow in the slough is generally southward, parallel to the eastern Oxnard Subbasin boundary, until it joins with Calleguas Creek. Calleguas Creek drains the approximately 250-square-mile Calleguas Creek Watershed to the northeast of the Oxnard Subbasin and crosses the Oxnard Subbasin boundary with the PVB at the base of the Santa Monica Mountains (Figure 1-3). Within the Oxnard Subbasin, Calleguas Creek flows generally southward along the southeastern boundary of the Subbasin and discharges into the Pacific Ocean through Mugu Lagoon near Point Mugu (Figure 1-3). Recharge from surface waters into the Oxnard Subbasin is discussed in Section 2.3.6, Groundwater–Surface Water Connections.

Characterization of Flow

Streamflow records for four active and five inactive streamflow gauging stations (Figure 1-3; Table 1-5) were used to characterize flow in the Santa Clara River (Stations 708, 708A, 723, and 724), in the Revolon Slough Watershed (Stations 776, 776A, 780, and 782), and in Calleguas Creek (Station 805).

Some reaches of the Santa Clara River are typically dry in dry weather (for example, at Stations 708 and 708A; Figure 1-3). Sources of dry-weather flow to Revolon Slough include discharge from private tile drains in the Oxnard Plain. Although dry-weather flow is observed in some portions of Calleguas Creek (i.e., at Station 805), in other reaches, Calleguas Creek is dry in dry weather (VCWPD 2009). The primary sources of dry-weather flow to Calleguas Creek are two wastewater treatment plants: the Hill Canyon Wastewater Treatment Plant, operated by the City of Thousand Oaks, which discharges to Arroyo Conejo, a tributary to Arroyo Santa Rosa; and the Camarillo Sanitary District Wastewater Treatment Plant, operated by the City of Camarillo, which discharges to Conejo Creek. Both Arroyo Santa Rosa and Conejo Creek are tributaries of Calleguas Creek. Irrigation water from agriculture and/or landscaping may also serve as a source of flow in all three channels during some parts of the year.

In the Santa Clara River, the available stream flow record within the Subbasin extends from 1927 to 2014, with a gap from 1932 to 1950 (Figure 1-4, Average Daily Flows [ADF] and Monthly Minimum ADF in Oxnard Surface Waters [A]). Peak flow typically occurs between November and April of any given water year and baseflow generally falls to 0 cubic feet per second (cfs) between July and September, except in reaches above and below the Oxnard Forebay. There are some exceptions, particularly in 1980, 1983, 1993, 1998, and 2005, when flow continued through the summer months. The highest gauged flow was 92,300 cfs in March 1969 (Figure 1-4[A]).

In the Revolon Slough, the available streamflow record within the Subbasin extends from 1979 to 2014. Peak flow typically occurs between December and March of any given water year, and baseflow tends to drop to between 2 and 25 cfs between July and September. The highest gauged flow was 2,870 cfs in January 2005 (Figure 1-4[B]).

In Calleguas Creek, the available streamflow record within the Subbasin extends from 1968 to 2014. Peak flow typically occurs between December and March of any given water year, and baseflow tends to drop to between 5 and 13 cfs between July and September. The highest gauged flow was 9,686 cfs in March 1983 (Figure 1-4[C]).

To quantitatively assess changes in baseflow, all streamflow gauges were assigned a minimum average daily flow for each month of the record, and this monthly minimum was plotted in Figures 1-4(D) through 1-4(F). In Calleguas Creek, flows from 2005 to 2015 were lower than those in the 1980s and 1990s. The low flows correspond with a period of below-average rainfall associated with the recent drought. Because surface water in Calleguas Creek and its tributaries is diverted by property owners and by CWD and delivered as a water supply in lieu of groundwater pumping, decreased flow in Calleguas Creek will affect groundwater management in the Subbasin. On the Santa Clara River, decreased flows in the past 5 years have impacted artificial recharge operations and other management decisions made by UWCD.

1.3.2.2 Current, Historical, and Projected Climate

Current Climate

The climate of the Oxnard Plain is typical of coastal Southern California, with average daily temperatures ranging generally from 50°F to 78°F in summer and from 40°F to 75°F in winter, as measured at the California Irrigation Management Information System (CIMIS) weather station in Oxnard, which was active from October 2001 through April 2017 (CIMIS 2018). Typically, approximately 85% of precipitation in the Ventura County region falls between November and April (Hanson et al. 2003).

Records of rainfall were collected from VCWPD weather stations located within the boundary of the Oxnard Plain (12 active and 11 inactive; Figure 1-3, Figure 1-5 (Oxnard Plain Annual Precipitation), and Table 1-6). Annual precipitation varies from gauge to gauge (Figure 1-5 and Table 1-6).

Evaporation as pan evaporation rate is measured at one VCWPD weather station within the Oxnard Plain (Station 239, El Rio–UWCD Spreading Grounds). The Station 239 evaporation record begins in 1972 and ends in 2016. Monthly average evaporation ranges from 3.7 inches in January to 7.2 inches in July, with an average total annual evaporation of 63.0 inches.

Evapotranspiration is measured at CIMIS Station 156, located on the River Ridge Golf Course, approximately 800 feet south of the Santa Clara River and 725 feet west of North Ventura Road. The monthly average evapotranspiration calculated for data collected between 2001 and 2017 using the Penman–Monteith equation at Station 156 ranges from 2.01 inches in December to 5.12 inches in July. The average total annual evapotranspiration is 44.93 inches.

Historical Climate Trends

In order to characterize rainfall variability in the Oxnard Plain over the past century, two stations whose combined records cover the entire period were selected: Stations 032 and 168 (Figure 1-3). Station 032 (Oxnard–Water Department) is located approximately 1.5 miles east of Station 168 (Oxnard Airport). Precipitation records can vary based on several factors, including geographic location, the type of gauge used to measure precipitation, and the physical characteristics of the area surrounding a measurement site. Therefore, in order to examine how rainfall recorded at these two stations compared to the other stations, correlation coefficients (R) were calculated for the period of time in which the station records overlap. The correlation coefficients between all pairs of station records, excepting pairs that included Stations 223, 273, 412, and 503, exceeded 0.9. Stations 273, 412, and 503 have less than 8 years of overlapping data, which may explain the poorer correlation between these sites and Stations 032 and 168. The low correlation between Station 223, which is located near the southwest corner of the Oxnard Plain near Point Mugu, and Stations 032 and 168 is due in part to anomalously low values recorded at Station 223 in some years in the 1950s, 1960s, and 1970s. Because the record from Station 223 does not correlate with the records from any other station in the area, this station cannot be used to typify trends in the Oxnard Plain.

The variability in the records of precipitation measured at Stations 032 and 168 is similar to that measured at the other precipitation stations, and can be used to characterize the precipitation trends in Oxnard Plain over the 113-year period from 1903 to 2015 (Figure 1-5).

The long-term trend record was based on the record from Station 032 for the period from 1902 to 2003. After 2003, no data are available for Station 032. Therefore, from 2003 to 2016, the annual precipitation value recorded at Station 168 was used to predict a value for the location of Station

032, based on a linear regression of the annual precipitation values in the 46 years of overlap (1957–2002) in the records for Stations 032 and 168 (see formula below).

$$Station\ 032\ (inches) = 1.0127 * Station\ 168\ (inches) + 0.0011 \qquad (R^2 = 0.9766)$$

The root-mean-squared error (RMSE) between the observed annual precipitation at Station 032 and the predicted precipitation using Station 168 was 1.3 inches per year. The bias was −0.00058 inches. Thus, some uncertainty is introduced by extending the Station 032 record using Station 168. However, this slight uncertainty does not outweigh the benefit of being able to use the resulting 113-year record to characterize long-term climate trends.

Based on this long-term record, the calculated mean annual precipitation in the central Oxnard Plain is 14.4 inches (Figure 1-6, Long-Term Precipitation Trends in the Oxnard Plain). For each water year in the record, the total annual precipitation was compared to the long-term mean annual precipitation in order to calculate the cumulative departure from mean precipitation (Figure 1-6). Historical drought periods were defined as a falling limb on the cumulative departure from the mean curve (Figure 1-6). Based on the historical record, a drought in the Oxnard Plain can be defined as a period of years in which the area experiences no more than one consecutive year of above-average precipitation and at least 24 inches of cumulative precipitation deficit (see Table 1-7 and Figure 1-6).

The century-long precipitation record demonstrates that drought cycles have frequently impacted the Oxnard Plain. The average drought duration in the past century was 8.2 years, and the average cumulative rainfall deficit during the droughts was −30.25 inches. The duration of periods of average or above-average rainfall was rarely more than 10 years. In this historical context, the approximately 20-year period in the 1990s and 2000s constitutes an unusually long wet period (Figure 1-6). Consequently, planning for drought cycles in the coming decades will be an integral component of water resources management.

The FCGMA contracted and received evapotranspiration data collected at private weather stations located in the Oxnard Subbasin during the period 1992 to 2013. The number of weather stations in the Subbasin fluctuated over the years. The data collected from the private weather stations were used for determining the annual irrigation efficiency allocation during the period 1992 to 2013. These data are available from FCGMA Board Meeting Agenda packets and were reported to FCGMA on a monthly basis.

Projected Climate

The literature review conducted in support of the U.S. Bureau of Reclamation's Los Angeles Basin Stormwater Conservation Study Task 3.1 Report found that the following changes are anticipated in Southern California due to global climate change (Bureau of Reclamation 2013):

- Increased temperature (1°C to 3°C)
- Increased evaporation rate
- Decrease in annual precipitation (2% to 5%)
- Increase in extreme precipitation events

Future climate conditions were modeled for the Oxnard Subbasin using climate change factors provided by DWR. The impacts to the future water budget are discussed in more detail in Chapter 2, Basin Setting.

1.3.2.3 Historical, Current, and Projected Land Use

Historical land uses on the Oxnard Plain were determined based on review of data from the Southern California Association of Governments (SCAG), which has mapped more than 105 land use categories to a minimum 2-acre resolution for the years 1990, 1993, 2001, and 2005 (SCAG 2005). Current land uses within the Oxnard Plain were determined based on review of the General Plan land use map for Ventura County (VCPD 2015), and are shown on Figure 1-7, Land and Water Use. Existing land use patterns and trends are expected to continue, and are described based on information contained in General Plan documents.

The majority of the Oxnard Plain consists of unincorporated areas of Ventura County, though it also encompasses nearly all of the Cities of Oxnard and Port Hueneme. Land use on the Oxnard Plain consists of 47% agriculture, 47% urban uses, and 6% vacant/open space (Table 1-8). About 83% of the agricultural uses consist of orchards, cropland, and improved pasture land with the remaining 17% consisting of nurseries, horse ranches, and other uses (Table 1-8). The primary crops grown in the Oxnard Plain are strawberries, raspberries, celery, peppers, kale, cut flowers, and nursery stock (VCFB 2016). Urban and residential land uses are concentrated in Oxnard and Port Hueneme. Federal lands consist of two Naval Base Ventura County operations within the Oxnard Subbasin, Point Mugu and Port Hueneme, and the Channel Islands Air National Guard Station. The Naval Base Ventura County was formed in 2000 through the merger of Naval Air Station Point Mugu (located in the southern portion of the Oxnard Subbasin in unincorporated Ventura County) and Naval Construction Battalion Center Port Hueneme (located in the west-central part of the Oxnard Subbasin within the City of Port Hueneme along the coast). Currently, there are about 19,000 military, civilian, and contract personnel working or stationed at Naval Base Ventura County (City of Oxnard 2011).

Recreational land uses on the Oxnard Plain consist of state and local beaches, golf courses, and community parks in Oxnard and Port Hueneme. Open space (i.e., not consisting of agricultural, military, or urban uses) is limited to the Santa Clara River corridor, beaches, and lagoons. Table 1-8 shows the County General Plan land uses within the Oxnard Plain, tabulated by area in acres and by percentage of total area.

With the exception of several high-rise buildings in north Oxnard, the City of Oxnard is characterized by one- or two-story residential and commercial buildings and several industrial areas (City of Oxnard 2011). Most of Oxnard's higher-intensity development lies adjacent to primary thoroughfares, such as Highway 101, Gonzales Road, Rose Avenue, Rice Avenue, Oxnard Boulevard, Hueneme Road, Ventura Road, Victoria Avenue, and Saviers Road, and in the central business district (City of Oxnard 2011). Growth is directed into one of Oxnard's 14 Specific Plans, which are in various stages of planning or buildout. City of Oxnard projects currently in the planning, permitting, or construction stages consist of 19 residential projects (greater than 50 units), 18 commercial projects, and 6 industrial projects (City of Oxnard 2016a). The largest planned development consists of the Teal Club Specific Plan (located west of Ventura Road between Doris Avenue and Teal Club Road), where up to 990 residential units are envisioned (City of Oxnard 2016a).

In the future, agricultural preservation and open space land use policies are expected to limit the rate and reach of "greenfield" development and direct growth through infill development and zoning policies that allow higher-density and mixed-use development (VCPD 2015). Furthermore, large-scale development is highly restricted in the California Coastal Zone, so development is likely to be concentrated on the urban fringes of Oxnard and Port Hueneme that are outside the coastal zone. For unincorporated areas within the Oxnard Plain, the Ventura County General Plan Environmental Impact Report identifies the widening of roads as a potential growth-inducing effect of the General Plan land uses and policies, as well as policies that allow for the creation of substandard-sized parcels for farmworker housing complexes and an increase in allowable building coverage for farmworker housing complexes in Agricultural and Open Space designations (VCPD 2005). Demographics and population growth within the Oxnard Plain are addressed in Section 1.3.2.4.

1.3.2.4 Historical, Current, and Projected Demographics

There are several sources of population data for the Oxnard Plain, most of which are derived from decennial census counts, which last occurred in 2010. Sources of population information are as follows:

- **U.S. Census Bureau**: The U.S. Census Bureau conducts a census count every 10 years. Census data are gathered by tracts, blocks, and census-designated places. Census tracts were intersected with the Oxnard Plain boundary to determine the population overlying the

Oxnard Subbasin for 2010. Census tracts that intersected the boundaries of the Oxnard Plain were area-weighted to determine the population that falls within the Oxnard Plain.

- **City and County General Plans**: The Cities of Oxnard and Port Hueneme and the County of Ventura gather data on development, growth, and land use patterns, and make population estimates in conjunction with census data. The cities' and county's general plans and websites were reviewed for historical and current population data.
- **Southern California Association of Governments**: SCAG is the nation's largest metropolitan planning organization, representing 6 counties, 191 cities, and more than 18 million residents. SCAG produces demographics data and growth forecasts for the entire Southern California region.

At a countywide level, population growth is skewed toward incorporated cities. The population distribution within Ventura County is the result of a 1969 County–City agreement, called the Guidelines for Orderly Development, which directs urban-level development to incorporated cities in Ventura County (VCPD 2015). That agreement limits urban-level development and services within unincorporated areas. The total increase in population within unincorporated areas in Ventura County was only 1.9% from 2000 to 2010, whereas population in the cities increased by 10.4% over the same period.

Table 1-9 shows the past, current, and projected population for Ventura County, the Cities of Oxnard and Port Hueneme, and the Oxnard Plain. The population of the Oxnard Plain is estimated to have been 237,871 in 2010, based on census data. The population of the City of Oxnard is over 200,000 residents, as of 2015, with an average household size of 3.99 (City of Oxnard 2011; SCAG 2016). The City of Port Hueneme has about 22,000 residents and an average household size of 2.99 (City of Port Hueneme 2016a). The population of unincorporated areas within the Oxnard Plain is less than 10% of the total population of the Oxnard Plain.

The aforementioned population information is limited to the population that resides within the Oxnard Subbasin boundary. It should be noted that the City of Ventura overlies a portion of the Oxnard Subbasin, but this portion consists of commercial, recreational, and industrial land uses, with a negligible permanent population. The City of Ventura relies on groundwater from the Oxnard Plain for part of its groundwater supply. The population for the City of Ventura's water service area, as reported in its 2015 UWMP, is 112,412 (City of Ventura 2016).

1.4 EXISTING MONITORING AND MANAGEMENT PLANS

Over the past few decades, multiple agencies have implemented programs to monitor and manage water within the Oxnard Subbasin. Local and state agencies have worked together and with stakeholders to develop management strategies and monitoring programs. Table 1-10 and Table

1-11 summarize the monitoring and management programs, projects, and strategies that are currently in effect.

1.4.1 Monitoring Programs

Table 1-10 provides a summary of existing monitoring programs. It is subdivided into monitoring programs that are primarily for surface water and those primarily for groundwater. These monitoring programs are anticipated to continue, independent of the development of this GSP; however, the data from these programs will continue to be used to help assess groundwater conditions in the Oxnard Subbasin. Specifically, groundwater elevation data collected by VCWPD at key wells throughout the Subbasin will be compared to the minimum thresholds and measurable objective established in Chapter 3, Sustainable Management Criteria, of this GSP. VCWPD will continue to host the data for the Oxnard Subbasin and FCGMA will use the data for annual monitoring reports and the 5-year GSP evaluations (Section 1.2.6, Groundwater Sustainability Plan Implementation and Cost Estimate).

1.4.2 Management Programs

Table 1-11 provides a summary of management programs, projects, and strategies. Similar to Table 1-10, it is subdivided into projects that address primarily surface water and those that address primarily groundwater. It also contains a third category, "other," for projects that address both surface water and groundwater or an additional parameter.

Table 1-11 indicates whether each project or program is associated with conjunctive use. As used herein, "conjunctive use" applies to programs, projects, and strategies that meet the 2003 Bulletin 118 definition of the term: "Conjunctive management in its broadest definition is the coordinated and combined use of surface water and groundwater to increase the overall water supply of a region and improve the reliability of that supply" (DWR 2016a). For example, CWD provides reclaimed wastewater from the Hill Canyon WWTP diverted from Conejo Creek to its non-potable customers in the Arroyo Santa Rosa Valley Basin and the PVB and to PVCWD for delivery to agricultural users in the Oxnard Subbasin and PVB, thereby reducing the amount of groundwater pumped from these basins (FCGMA 2014a). For a description of some of the most important projects and programs, see Section 1.5, Existing Conjunctive-Use Programs.

Due to the overlapping jurisdictions of the agencies that manage groundwater resources, there are many programs that occur within the Subbasin or benefit multiple basins. Therefore, Tables 1-10 and 1-11 include a column ("Multi-Basin Program") that lists the basins in which the programs are conducted or those that benefit from each program.

1.4.3 Operational Flexibility Limitations

Operational flexibility is a key consideration in integrated water resource management because it helps water purveyors adapt to known legal, operational, and environmental constraints, and plan for an uncertain future, especially as it relates to drought resiliency and the effects of climate change. Operational flexibility can be measured over a given time horizon and/or geographic scale (e.g., water district service area) as the difference between available water supply and service area demand. Operational flexibility is maximized when a water purveyor has a large variety of sources in a water supply portfolio, when it has local control over such sources, and when such sources are connected to each other (i.e., conjunctively managed). On a general statewide scale, water purveyors are increasingly looking to minimize reliance on imported water supplies by promoting stormwater recharge, maximizing wastewater recycling, and sustainably developing local sources of water.

For the Oxnard Subbasin, water purveyors collectively draw from a combination of sources—including local surface water, groundwater, imports from the State Water Project (SWP), and increasingly, recycled water—which differ in terms of the volume available, area served, timing of peak availability, and reliability. Climate and regulatory constraints (e.g., water quality standards, water rights, and minimum environmental flows) have historically had a greater impact on the availability of surface water supplies. Groundwater sources with adequate water quality were historically limited only by the capacity of production wells accessing the aquifer until 1991, when FCGMA initiated a groundwater allocation reduction system. With the passage of SGMA and the sustainable management criteria established in this GSP (Chapter 3), once adopted, groundwater extraction will be further limited by minimum thresholds established for each sustainability indicator. FCGMA has exercised its authority to limit groundwater production since 1983, and thus has managed the basin in an effort to avoid critical overdraft. Because in 2015 the State Department of Water Resources listed the Oxnard Subbasin as being in a state of Critical Overdraft, the sustainable management criteria adopted in this GSP may limit operational flexibility by further reducing allowable groundwater production.

The GSP complements and enhances existing projects and programs currently in place to maximize beneficial use of water resources and increase operational flexibility within the Oxnard Plain and within FCGMA jurisdiction as a whole. Existing water monitoring and management activities are described in Tables 1-10 and 1-11. Because the basins are all interconnected either physically or through water sources, the opportunity for operational flexibility exists and has been used by FCGMA and local water agencies. Examples of projects that have increased operational flexibility within the Oxnard Plain include the City of Oxnard's Groundwater Recovery Enhancement and Treatment (GREAT) Program and the Oxnard–Hueneme (OH) Pipeline and the Freeman Diversion Project, both operated by UWCD (Table 1-11).

Despite the coordination of projects and programs within the Oxnard Subbasin, limits to operational flexibility remain. These limits include constraints imposed by interaction with other regulatory programs, including the federal Endangered Species Act and the Recycled Water Policy (2009, amended 2013) that was adopted by the State Water Resources Control Board. The Recycled Water Policy intends to encourage the safe use of recycled water by recognizing its benefits, establishing statewide recycled water goals and targets, clarifying regulatory agency roles and permitting approaches for various types of recycled water projects, and establishing an approach to avoid or minimize potential adverse consequences (e.g., excessive salts, nutrients, and/or constituents of emerging concern). For example, the policy requires that local water and wastewater entities prepare Salt and Nutrient Management Plans (SNMPs) for the groundwater basin in which they operate. The SNMP for the Lower Santa Clara River, which includes the Oxnard Forebay, has been accepted by the Los Angeles Regional Water Quality Control Board (LARWQCB), and the SNMP for the Oxnard Plain and Pleasant Valley Basins has been submitted to the LARWQCB (VCWPD 2015; City of Oxnard 2016b).

UWCD has prepared a Multiple Species Habitat Conservation Plan as part of its application for incidental take permits under Section 10(a)(1)(B) of the federal Endangered Species Act (UWCD 2018). The Multiple Species Habitat Conservation Plan specifies conditions under which flow diversions from the Santa Clara River would be allowed. The diverted flow at the Freeman Diversion, one of the oldest and most important sources of supply to the Oxnard Subbasin, is used to recharge groundwater and provided for in-lieu use in both the Oxnard Subbasin and the PVB. The operational flexibility provided by this project is constrained by habitat requirements for the federally endangered Southern California steelhead (*Oncorhynchus mykiss*) in the Santa Clara River. Climate fluctuations and future climate may also impact the quantity of water diverted from the Santa Clara River. Currently, the project permit limits access to flows. Water diversion is primarily during the recession of a large storm event and during conditions allowed per National Marine Fisheries Service diversion constraints.

In addition to local projects, parts of the Oxnard Plain depend on imported water from the SWP. Such supplies have been, and may continue to be, limited by climate, infrastructure, and increased commitment for environmental and supply purposes (see Section 1.6.2, Urban Water Management Plans, under Calleguas Municipal Water District UWMP).

1.5 EXISTING CONJUNCTIVE-USE PROGRAMS

In the California Water Plan, DWR (2013) describes conjunctive use as follows: “Conjunctive management or conjunctive use refers to the coordinated and planned use and management of both surface water and groundwater resources to maximize the availability and reliability of water supplies in a region to meet various management objectives. Surface water and groundwater resources typically differ significantly in their availability, quality, management needs, and

development and use costs. Managing both resources together, rather than in isolation, allows water managers to use the advantages of both resources for maximum benefit. Conjunctive management thus involves the efficient use of both resources through the planned and managed operation of a groundwater basin and a surface water storage system combined through a coordinated conveyance infrastructure."

Due to the history of interagency collaboration on groundwater management within FCGMA jurisdiction on the Oxnard Plain, multiple conjunctive-use programs are currently operational. These are identified and described in Table 1-11, as introduced in Section 1.4, Existing Monitoring and Management Plans. Some of the most important of these projects and programs are described in this section. The GSP will occur in conjunction with and build upon existing and planned conjunctive use programs in the Subbasin.

UWCD Freeman Diversion Project. The UWCD Freeman Diversion Project is a critical component of water supply within the Oxnard Subbasin. Its predecessor was constructed in 1927 as a series of earthen levies that diverted water from the Santa Clara River, which were washed out and replaced after large flows. The current project, constructed in 1991, diverts on average more than 62,000 acre-feet per year (AFY). About 75% of the water diverted has been sent to spreading basins within the Oxnard Forebay for groundwater recharge. Water from the project is also delivered to the Oxnard Subbasin and PVB through the Pumping Trough Pipeline and Pleasant Valley Pipeline, which supply water for non-potable applications (see Table 2-10, Summary of Water Deliveries). The water provided by the Freeman Diversion Project offsets groundwater production in coastal areas of the Subbasin, thereby helping to alleviate seawater intrusion. One of the projects and management actions identified in this GSP (Chapter 5) would build upon the existing facilities by increasing the Freeman Diversion Project's capability to divert surface flows (by capturing higher flow rates with higher sediment loads) and by developing additional recharge capabilities (using two former gravel mines).

City of Oxnard Advanced Water Purification Facility. The City of Oxnard's Advanced Water Purification Facility (AWPF) is part of the City of Oxnard's GREAT Program, which focuses on using existing water resources more efficiently. As the key project of the GREAT Program, the AWPF provides the City with Title 22 recycled water source that can be used for landscape irrigation, agriculture, industrial process water, and groundwater recharge. The AWPF is designed to initially treat approximately 8 to 9 million gallons per day (mgd) of secondary effluent and produce 6.25 mgd (7,000 AFY) of product water for reclaimed water uses with infrastructure in place to ultimately produce 25 mgd (28,000 AFY) of product water for reuse. The main treatment processes consist of microfiltration, reverse osmosis, and ultraviolet disinfection using advanced oxidation. Several of the projects and management actions identified in this GSP (Chapter 5) could build upon the GREAT Program by expanding the AWPF's capacity, increasing utilization of the recycled water in lieu of groundwater for irrigation.

CMWD SWP Deliveries. SWP deliveries are an important source of water within the Oxnard Subbasin. Supplied by CMWD, the vast majority of SWP water is delivered to and used by the City of Oxnard, with minor amounts used by the Port Hueneme Water Agency (PHWA). CMWD treats SWP water to potable standards and delivers it to M&I customers within its service area (see Section 2.4, Water Budget, for a discussion of this in the context of the water budget, including Table 2-10). In addition, up to 5,000 AFY of the Ventura County SWP allocation may be delivered to Lake Piru and later released for percolation or diversion at the Freeman Project. Note that CMWD is a member agency of the Metropolitan Water District of Southern California (MWD), which supplies water from a number of sources, including the Colorado River. One of the management actions to be implemented by FCGMA will be to reduce groundwater extraction allocations over time to a rate that will prevent net seawater intrusion after 2040. Reduced groundwater allocations may put increased pressure on water purveyors to use the maximum SWP allocations available, which are already highly limited by climate and competing demands. However, other projects and management actions in the GSP—including temporary agricultural land fallowing, expansion of recycled water sources and reach, and better utilization of existing and new stormwater recharge facilities—are expected to minimize this potential effect.

Fox Canyon Groundwater Management Agency Programs. FCGMA has been charged with groundwater management for decades and implements several programs that encourage efficient use of groundwater, new water sources, and brackish groundwater. Most programs apply to the entire FCGMA jurisdiction, but some management programs apply to specific areas. In addition to programs and ordinances that require reporting and fees for groundwater use, FCGMA implements a groundwater storage credit program that provides groundwater credits for surface water or imported water delivered equal to the amount of water that was used in lieu of pumping groundwater and that could have been used for groundwater recharge (spreading or injection).

By Resolution 2014-01, FCGMA approved the Conejo Creek Water Pumping Program involving CWD and PVCWD using the Conejo Creek Diversion (Conejo Creek Project). The Conejo Creek Project provides for the use of recycled water produced by the Hill Canyon Wastewater Treatment Plant in Thousand Oaks within the PVCWD service area through CWD. CWD diverts recycled water discharged to Conejo Creek and delivers it to the PVCWD service area for use in lieu of pumping. The FCGMA resolution allows the PVCWD to transfer credits generated by using recycled water in lieu of groundwater pumping within its service area to CWD. If monitoring data indicate that the Subbasin will support it, the resolution provides for extraction of up to 4,500 acre-feet (AF) from CWD-owned wells in an amount equal to the volume of recycled water delivered by PVCWD in lieu of pumping. However, flows from the Hill Canyon WWTP have decreased in response to conservation programs and are expected to decrease further in the future, thus reducing the potential yield of the project. Diversions of surface water on Conejo Creek prior to 2002 were estimated to average 2,450 AFY from 1985 to 2002 (see Chapter 2 of this GSP).

FCGMA approved an ordinance to establish an allocation system for the Oxnard Subbasin and PVB on October 23, 2019. The purpose of this ordinance is to facilitate adoption and implementation of the GSP and to ensure that the Oxnard Subbasin and PVB are operated within their sustainable yields. It is not the purpose of the ordinance to determine or alter water right entitlements, including those that may be asserted pursuant to California Water Code Sections 1005.1, 1005.2, or 1005.4. A copy of this ordinance is included in Appendix A.

1.6 LAND USE ELEMENTS OR TOPIC CATEGORIES OF APPLICABLE GENERAL PLANS

SGMA requires that the GSP include a description of the consideration given to the applicable county and city general plans and the various adopted water-resources-related plans and programs and an assessment of how the GSP may affect those plans (California Water Code, Section 10727.2[g]). In addition to these elements, the GSP may include processes to review land use plans and efforts to coordinate with land use planning agencies to assess activities that potentially create risks to groundwater quality or quantity (California Water Code, Section 10727.2[g]). Several kinds of land use plans contain provisions that affect water use and sustainability within the Oxnard Subbasin. Sustainable management of the FCGMA basins and the SGMA legislation require that the provisions of these plans be considered and coordinated in the development of DWR requires that the GSP include a summary of these plans and a description of how these plans may change water demands or affect FCGMA's ability to achieve sustainability and how the GSP addresses these potential effects, and how the GSP may affect the water supply assumptions made in these plans (DWR 2016b, Sections 354.8[f] and 354.8[g]). The California Water Code requires that the GSP include processes to review land use plans and coordinate with planning agencies related to groundwater issues (California Water Code, Section 10727.2). Plan types relevant to FCGMA jurisdiction and individual basins within it include county and city General Plans and associated area-specific and community plans and urban water management plans (UWMPs). There are no agricultural water management plans applicable to the Oxnard Subbasin because none of the water purveyors serve more than 25,000 irrigated acres within the Subbasin (excluding recycled water deliveries). The CWD has a 2015 Agricultural Water Management Plan, and although the southern end of CWD's service area extends into the Oxnard Subbasin near California State University Channel Islands, its agricultural service area occurs outside the Subbasin (CWD 2017).

California state law requires that cities and counties prepare and adopt a "comprehensive long-term general plan for the physical development of the county or city" and that "elements and parts [of the plan] comprise an integrated, internally consistent and compatible statement of policies for the adopting agency" (California Government Code, Sections 65300 and 65300.5). Among the required elements of the plan is the conservation, development, and utilization of water developed in coordination with groundwater agencies such as FCGMA (California Government Code, Section 65302[d][1]).

The Urban Water Management Planning Act of 1983 requires urban water suppliers to report on water sources, deliveries, demand, and efficiency, as well as performing water shortage contingency planning. Such plans are to be updated every 5 years (in years ending in 0 and 5) and submitted to DWR. The Urban Water Management Planning Act applies both to urban retail suppliers that provide potable municipal water to more than 3,000 end users or 3,000 AFY and to urban wholesale water suppliers that provide more than 3,000 AFY at wholesale (DWR 2016c). The applicable codes have been modified multiple times to include various provisions for water-related reporting.

For more than three decades, FCGMA has participated in the management of water within its jurisdiction. Such management includes oversight of many aspects of groundwater production and use, as well as coordination with all other entities responsible for water supply and land use issues. Because of these long-term relationships, many of the plans described in this section are consistent with the goal of sustainable groundwater management over the planning and implementation horizon. Due to the high level of coordination among agencies within the Oxnard Plain and FCGMA jurisdiction, it is anticipated that water demand among land uses managed by City and County jurisdiction, as well as water customers served by water purveyors, will be monitored and managed in a manner consistent with the provisions of SGMA and this GSP.

The following sections contain a description of the land use and water management plans that are applicable to water planning within the Oxnard Plain, a discussion of the consideration given to the land use plans, and an assessment of how the GSP may affect those plans. The plans included were selected as the plans with the most salient information relating to sustainable management. However, this is not intended to be a comprehensive list; other plans that include information pertinent to water management in the Oxnard Subbasin include the City of Port Hueneme UWMP, PHWA UWMP, MWD UWMP, the City of Oxnard General Plan, and the Naval Base Ventura County Joint Land Use Study (City of Port Hueneme 2016b; PHWA 2016; MWD 2016; City of Oxnard 2011; NBVC 2015). These plans are discussed in brief in Section 1.6.3, Additional Plan Summaries.

1.6.1 General Plans

General plans are considered applicable to the GSP to the extent that they may change water demands within the Oxnard Subbasin or affect the ability of the GSA to achieve sustainable groundwater management over the planning and implementation horizon. General Plans applicable to the Oxnard Subbasin are (1) the Ventura County General Plan, (2) the City of Oxnard 2030 General Plan, and (3) the 2015 General Plan and Local Coastal Program for the City of Port Hueneme. Small parts of the City of Ventura and City of Camarillo partially overlap the Subbasin, but implementation of their general plans are expected to have a negligible effect on

implementation of the GSP within the Oxnard Subbasin. The areas of Ventura and Camarillo that extend into the Subbasin are already built out or zoned as agriculture and open space.

FCGMA staff has participated on the Ventura County General Plan Update Water Element Focus Group and continues to work with Ventura County planning staff to ensure that the GSP and the General Plan Update are mutually consistent. Furthermore, the FCGMA Board includes a representative for both the County and all the incorporated cities within FCGMA's jurisdiction, ensuring representation and coordination between the GSA, the County, and the incorporated cities.

Based on the timing of the adoption of the General Plan Update and the GSP, the GSA will be subject to the following California Government Code sections pertaining specifically to the coordination of planning and SGMA-related documents:

- California Government Code, Section 65350.5 – requires that the planning agency review and consider GSPs prior to General Plan adoption.
- California Government Code, Section 65352 – requires that prior to adoption of a General Plan Update, the legislative body must refer the plan to the GSA for review.
- California Government Code, Section 65352.5 – requires that the GSA provide the current version of the GSP to planning agencies preparing to update or adopt the General Plan.

All existing general plans and future updates undergo an analysis of environmental impacts under the California Environmental Quality Act (CEQA). In addition, all discretionary projects proposed within the Oxnard Subbasin under municipal, County, and/or state jurisdiction are required to comply with CEQA. In 2019, the Governor's Office of Planning and Research released an update to the CEQA Guidelines that included a new requirement to analyze projects for their compliance with adopted GSPs. Specifically, the applicable significance criteria include the following:

- Would the program or project substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?
- Would the program or project conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?

Therefore, to the extent general plans allow growth that could have an impact on groundwater supply, such projects would be evaluated for their consistency with adopted GSPs and for whether they adversely impact the sustainable management of the Subbasin. Under CEQA, potentially significant impacts identified must be avoided or substantially minimized unless significant impacts are unavoidable, in which case the lead agency must adopt a statement of overriding considerations.

Ventura County General Plan

Plan Description

The Ventura County General Plan (VCPD 2015) applies to the County as a whole and includes area-specific plans for distinct unincorporated areas. For example, the El Rio/Del Norte Area Plan includes policies to (1) protect the Oxnard Forebay Basin and its recharge area within the El Rio/Del Norte area in order to protect groundwater resources and (2) ensure that sewage treatment facilities provide maximum feasible protection and/or enhancement of groundwater resources. The County General Plan was last amended in October 2015. However, the County Planning Department is now undertaking a comprehensive update of the plan, thereby providing an immediate opportunity for coordination between FCGMA (as the GSA) and the County Planning Department, as required by SGMA.

The comprehensive update of the County General Plan is due to be completed by mid-2020 and will have a planning horizon of 20 years.

How the Plan May Affect Sustainable Water Management

Because General Plans and the associated elements define long-term policy related to community growth, development, and land use, General Plans are integral to the implementation of sustainable water management. The County General Plan is in the process of undergoing a comprehensive update, which provides the opportunity for consistency in regard to the relevant areas of the County General Plan and the GSP. Areas where FCGMA will coordinate with the County include the following:

- The compatibility of County land use with the goals and requirements of SGMA and groundwater sustainability. This includes County programs and policies for the protection or redesignation of urban, agriculture, and open space for the purpose of reducing or adjusting groundwater use, recharge, or groundwater quality.
- The consistency of discretionary development as it pertains to the FCGMA basins' water resources.
- The development of thresholds by the County for development within available water supply limits as determined by the GSPs for the FCGMA basins.
- Coordinated water-related monitoring programs within the FCGMA basins.
- The inclusion of land subsidence, drought, and point-source pollution as "hazards," as identified in the County General Plan.
- The coordination of goals, policies, and programs of the Water Resources section of the General Plan.

- The coordination of goals, policies, and programs of the Water Resources section of the General Plan, which pertain to groundwater overdraft, environmental uses of surface water, groundwater and surface water quality, and demand management and reuse. The programs of the Water Resources section specifically address the coordination of water agencies and County support of FCGMA plans.
- The coordination of capital projects or programs proposed as part of the GSP to achieve sustainability within the FCGMA basins.
- The regulatory authority of the GSA as it relates to that of the County.

How the GSP May Impact the Water Supply Assumptions of the General Plan

Sections 1.3.1 through 1.3.3 of the General Plan (VCPD 2015) describe the goals, policies, and programs that apply to water resources. The goals outlined in Section 1.3.1 of the General Plan include monitoring water supply and quality, maintaining or restoring water quality and supply, balancing supply and demand, protection of aquifer recharge areas and protecting and restoring wetlands. The GSP includes specific provisions for each of these: the monitoring of water resources (Chapter 4), the definition and maintenance of groundwater-dependent ecosystems (wetlands), definition of sustainability as it pertains to water resources (Chapter 3), and projects and management actions by which these goals will be obtained (Chapter 5, Projects and Management Actions). The General Plan also has a resource appendix that describes in general terms the groundwater resources within Ventura County. The next time the general plan is updated, the information in the GSP will be used to provide information relevant to the groundwater resources appendix.

The General Plan policies listed in Section 1.3.2 (VCPD 2015) include provisions and requirements for discretionary development. Some of the projects of the GSP will likely constitute discretionary development and therefore require consistency with General Plan or demonstration of "overriding considerations." The GSAs within the Subbasin will encourage municipalities to consider the GSP in the implementation of each of their general plans, and incorporate groundwater management criteria, where applicable and relevant, from the GSP into future general plan updates. General Plan Section 1.3.3 lists specific programs that County divisions will support in the application of the General Plan. Programs (management actions) implemented by FCGMA as part of the GSP may be added to those supported by the General Plan.

The 1998 Save Open Space and Agricultural Resources ordinance generally requires an approval by the electorate for any General Plan Amendment that changes land use designations for agricultural, rural, or open-space-designated lands. This and similar ordinances are in effect for much of the FCGMA area, including the Cities of Camarillo, Oxnard, and Ventura and unincorporated County areas, through at least 2050 (VCPD 2015). Should implementation of the

GSP result in the conversion of agricultural, rural, or open space lands to other uses, either to accommodate GSP projects or as a result of management actions that reduce water demand, a vote of the electorate would be required.

It is not the role of a general plan to make water supply assumptions, but to take into consideration existing and anticipated water supply conditions in planning for growth. This includes FCGMA's water supply allocations, as incorporated into the 5-year UWMPs. General plan policies for all jurisdictions include provisions to maximize water conservation for both indoor use and outdoor irrigation/landscaping. Furthermore, the areas zoned for development are generally already built out, so growth, where it occurs, is likely to consist of redevelopment projects or small areas of new development. As all new development is subject to supply mitigation, which includes installing dual plumbing and the use of nonpotable water where feasible, any offset of or increase in the volume of water used on the land being developed or redeveloped is mitigated; land conversion and changes in land use planning are not anticipated to adversely affect implementation of the GSP. Furthermore, city and County officials make up part of the FCGMA Board, and like the SGMA process, both UWMPs and general plans are living documents subject to periodic updates and reviews.

1.6.2 Urban Water Management Plans

UWMPs are prepared by urban water suppliers every 5 years. These plans support the suppliers' long-term resource planning to ensure that adequate water supplies are available to meet existing and future water needs (California Water Code, Sections 10610–10656 and 10608). Every urban water supplier that either provides over 3,000 AF of water annually or serves more than 3,000 urban connections is required to submit a UWMP. Within UWMPs, urban water suppliers must:

- Assess the reliability of water sources over a 20-year planning time frame.
- Describe demand management measures and water shortage contingency plans.
- Report progress toward meeting a targeted 20% reduction in per-capita (per-person) urban water consumption by the year 2020.
- Discuss the use and planned use of recycled water.

The information collected from the submitted UWMPs is useful for local, regional, and statewide water planning. Besides annual review of the GSP, the 5-year evaluation interval required for GSPs under SGMA works well with the equivalent review interval for UWMPs, ensuring that information on water supply, and groundwater in particular, is updated appropriately. Water suppliers that operate groundwater wells within the jurisdiction of FCGMA and the other GSAs (County and CWD) in the Subbasin will update their water supply projections in accordance with the allocation of groundwater production available. Groundwater supply assumptions made by urban water suppliers in their 2015 UWMPs will be superseded by the groundwater allocation reduction management actions discussed in Chapter 5 of this GSP.

Calleguas Municipal Water District UWMP

Description/Summary of Agency and Plan

CMWD is an independent special district and a wholesale water provider, the service area of which includes significant parts of each of the basins and the Oxnard Subbasin within the FCGMA area (Figure 1-8, Ventura County Water Purveyors; FCGMA et al. 2007). Within the Oxnard Plain, CMWD supplies the Cities of Oxnard and Port Hueneme (Figure 1-8). It has been a member agency of MWD since 1960, and provides wholesale water to 19 retail water purveyors. CMWD supplies water mainly for M&I uses. Most of the water supplied by CMWD is water from the SWP purchased from MWD. Storage facilities available to CMWD include a surface water reservoir in Thousand Oaks and underground storage in the LPVB via the Las Posas Aquifer Storage and Recovery Project (see Table 1-11).

CMWD does not operate any wastewater treatment facilities but supports the use of recycled water through the ownership and operation of recycled water pipelines and pumping facilities. The Salinity Management Pipeline transfers salty water away from surface waters in the southwestern Ventura County region to other beneficial uses or the Pacific Ocean (Table 1-11). CMWD actively conducts water conservation programs. Such programs include rebate/incentive programs, school programs, social media campaigns, and workshops.

The UWMP, adopted June 15, 2016, has a planning horizon of 25 years. The production of the UWMP was coordinated with, and obtained information from, numerous water suppliers and management agencies, including CWD, City of Camarillo, City of Oxnard, City of Port Hueneme, City of Moorpark, Ventura County Waterworks District 1, Ventura County Waterworks District 19, FCGMA, MWD, and UWCD. CMWD notified the appropriate agencies and the public of the production of the UWMP, conducted a public hearing, and incorporated public comments prior to adopting the plan.

Coordination with SGMA and Other Agencies

The UWMP contains a section describing FCGMA and the programs that it implements (CMWD 2016, Section 6-2). The SGMA legislation and GSP requirements are also described in this section, including FCGMA's role as the GSA and its role in preparing the GSPs.

In January of 2016, the CMWD Board of Directors adopted a strategic plan, one of the provisions of which is to, "Work with FCGMA, United Water Conservation District, agricultural pumpers, purveyors, and other groundwater interests to encourage, support, and facilitate the development and implementation of groundwater sustainability plans within the service area that increase certainty in groundwater management and promote conjunctive use operations" (CMWD 2016, p. 7-13).

How the Plan May Change Water Demands within the Subbasin

Due to the extensive collaboration between FCGMA as the historical management agency and GSA and the CMWD as a major wholesale water supplier within the FCGMA basins, the UWMP incorporates and reflects water demand and sustainability issues that must be addressed under SGMA. Implementation of this GSP will require continued coordination between the many agencies and stakeholders within the Oxnard Subbasin and periodic adjustment of assumptions regarding climate, population, land use, environmental requirements, and other factors impacting water demand. The CMWD UWMP recognizes those factors and provides for adaptation where necessary.

Such adaptation includes support of Senate Bill (SB) X7-7 goals for conservation, an extensive demand management program, and participation in capital projects that provide for conjunctive use on a regional scale.

How the Plan May Affect Sustainable Groundwater Management within the Subbasin

For the reasons noted previously, the CMWD UWMP largely fosters the goals of sustainable management within the Oxnard Subbasin. Both CMWD and MWD have recognized and are pursuing remedies to improve the reliability of water supplies within their respective service areas. UWMP strategies to remediate reliability issues of water supplies include pursuing demand management programs and local water supply projects such as increased use of recycled and brackish groundwater. In regard to SWP supply reliability, MWD and CMWD support DWR in projects and strategies to increase reliability from the Sacramento/San Joaquin Delta. These programs include California WaterFix and California EcoRestore (CMWD 2016, p. 7-2).

How the GSP May Impact the Assumptions of the UWMP

The UWMP presents strategies for preparing for SWP reliability challenges, climate variability, and emergency shortages. For planning purposes, the UWMP considers demand to be the total demand within the service area after accounting for local supplies. The GSP anticipates groundwater extraction reductions for M&I and agricultural uses even if planned projects discussed in the 2015 UWMP are developed. The UWMP assumes an increase in imported normal year demand of 5% between 2020 and 2040. Therefore, the UWMP may underestimate the demand upon which supply calculations are made. The UWMP assumes future water projects and demand management measures in water demand and reliability calculations. Those assumptions may be modified by those projects and management actions included in the GSP.

United Water Conservation District UWMP (Oxnard–Hueneme Water System)

Description/Summary of Agency and Plan

UWCD is a wholesale water supplier that was established as a public agency in 1950; its predecessor agency, the Santa Clara Water Conservation District, had been in existence since 1927. UWCD is also a water conservation district established under the California Water Code. UWCD is tasked with managing, protecting, and supplying water within the Santa Clara River Valley and the Oxnard Plain. It provides potable water to several retail systems within the Oxnard Subbasin, including the City of Oxnard, PHWA, and several mutual water companies (Figure 1-8). Its service area encompasses the entire extent of the Oxnard Plain, as well as portions of the Las Posas Valley and Pleasant Valley, and part of the Santa Clara River Watershed (Figure 1-8). The UWCD UWMP applies only to the Oxnard–Hueneme Water System (OHWS) within the Oxnard Plain.

UWCD facilities include the OHWS, the Freeman Diversion, Lake Piru Reservoir, the Pumping Trough Pipeline, the Pleasant Valley Pipeline, and multiple recharge basins located in the Oxnard Forebay (see Table 1-11). Components of the OHWS include 12 extraction wells proximal to the recharge basins of the Oxnard Forebay, the El Rio Treatment Plant, and approximately 12 miles of transmission pipelines (UWCD 2016, p. 7). The OHWS supplies water mainly for residential, commercial, and industrial uses. The Pumping Trough Pipeline and Pleasant Valley Pipeline provide non-potable surface water or blended surface water and groundwater to agriculture in the central and southern portions of the Subbasin, thus offsetting groundwater pumping in the area in order to reduce the risk of seawater intrusion.

As a party to the SWP contract between Ventura County Flood Control District and DWR, UWCD purchased 1,260 AF of SWP water from Casitas Mutual Water District in 2012 and 1,890 AF of SWP water from the City of San Buenaventura in 2013. This water was released from Lake Piru into the Santa Clara River, from which it could be diverted at the Freeman Diversion, and served as a potential supply source for the OHWS (UWCD 2016, p. 17). The UWCD also routinely purchases Table A SWP water when available.

Potential UWCD projects to be implemented in the future could include the Full Advanced Treatment Program, which would entail a collaborative agreement between the City of Oxnard or another source and several agricultural entities to deliver recycled water through UWCD's Pumping Trough Pipeline and the Pleasant Valley Pipeline for agricultural users in the Oxnard Plain. A study completed by UWCD indicated that desalination opportunities may be feasible. However, such a system would not supply water to the OHWS (UWCD 2016).

As a wholesale supplier, UWCD complies with demand management requirements through metering, public education, and stakeholder outreach. All components of the OHWS are fully metered, including the 12 supply wells at the El Rio Spreading Grounds. The UWCD conducts

tours, lectures, workshops, and other outreach as part of their water conservation program. In addition, UWCD is subject to demand management and other programs instituted by FCGMA. The UWCD UWMP was adopted June 8, 2016, and included coordination with Ventura County and the Cities of Oxnard and Port Hueneme, among other entities.

Coordination with SGMA and Other Agencies

As a wholesale water provider located within the Oxnard Plain, UWCD is within the jurisdiction of, and therefore subject to the allocations and requirements of, FCGMA. A UWCD representative sits on the FCGMA Board of Directors.

UWCD conducts monitoring programs for groundwater levels, surface flow, and water quality and produces an annual report summarizing these data (Table 1-10). This information is vital for the implementation of monitoring and management programs within the Oxnard Plain. The UWCD Resolution 2014-01, adopted March 12, 2014, addresses cooperation among all of the water users within FCGMA jurisdiction and the Santa Clara River basins to undertake conservation measures, support the FCGMA emergency ordinance, and pursue alternative water supplies (UWCD 2016, Appendix E).

How the Plan May Change Water Demands within the Subbasin

Due to the high level of coordination among agencies within the Oxnard Plain and FCGMA jurisdiction, it is anticipated that water demand among users of the OHWS will be monitored and managed consistent with the provisions of SGMA and this GSP. In addition, UWCD conducts demand management programs and activities in conjunction with the other water agencies in the Oxnard Plain.

How the Plan May Affect Sustainable Groundwater Management within the Subbasin

Because UWCD takes an active role in FCGMA, the implementation of SGMA, and monitoring programs within the Oxnard Plain, this and future versions of the UWMP will continue to support sustainable groundwater management. The UWMP states that aquifer protection is mainly the responsibility of FCGMA and that, "As the designated Groundwater Sustainability Agency, FCGMA has the primary responsibility for aquifer protection … FCGMA has the legal authority to implement the GSP when adopted" (UWCD 2016, p. 34). Historically, the OHWS has had little reliance on imported water supplies and therefore is minimally subject to issues related to declining reliability of that source.

Water quality concerns within the Oxnard Subbasin include seawater intrusion, release of connate brines, nitrate concentrations, and salt accumulation. To the extent that UWCD operations allow for diversion of generally higher-quality surface water than that usually found in groundwater and

offset pumping in coastal areas, the plan fosters sustainable management with respect to water quality. Nitrate concentrations in water extracted from UWCD shallow supply wells have been found to increase during periods of drought, when artificial recharge of diverted Santa Clara River water decreases. The UWMP recommends the deepening of existing wells in the vicinity of the El Rio Spreading Grounds in order to draw water from areas with lower nitrate concentrations.

How the GSP May Impact the Assumptions of the UWMP

The UWCD UWMP assumes a 75% reduction in groundwater extractions from historical levels. Those provisions are superseded by the yields determined in this GSP (see Chapter 2). In addition, the GSP proposes minimum thresholds for water levels in coastal wells that are significantly higher than those of the recent past in order to reduce the impacts of seawater intrusion (see Section 3.4.3, Seawater Intrusion). These provisions of the GSP will impact UWCD operations within the Subbasin, including groundwater extractions from UWCD wells, and deliveries through the OHWS.

The UWMP assumes future water projects and demand management measures in water demand and reliability calculations. Those assumptions may be modified by those projects and management actions included in the GSP.

City of Oxnard UWMP

Description/Summary of Agency and Plan

The City of Oxnard was incorporated in 1903. The City of Oxnard serves as a retail water purveyor, providing potable and recycled water for commercial, industrial, residential, and agricultural use. The City of Oxnard's water service area includes the City of Oxnard and limited unincorporated areas of Ventura County. Oxnard's water supplies include imported water from CMWD, groundwater from UWCD, and groundwater produced from local wells. These sources may be blended to meet water quality requirements and to optimize for cost and supply. The City of Oxnard also operates wastewater treatment facilities for its own service area and surrounding areas. The City of Oxnard conducts a water conservation program with public information, water efficiency rebates, and water waste patrols. It is also compliant with SB X7-7, requiring a 20% reduction in per-capita urban water use by the year 2020.

As part of its water supply infrastructure, the City of Oxnard owns and operates 10 groundwater wells and 6 blending stations within the Oxnard Subbasin boundary. In 2009, as part of its GREAT Program, the City constructed the AWPF, which produces recycled water. The GREAT Program also includes brackish water desalters, one of which currently operates at a production rate of 7,500 AFY, and is planned to expand to 15,000 AFY. The AWPF now has a capacity of 7,000 AFY and its use is expected to increase as consumers are identified and pipelines are constructed. The facility recycles effluent from, and is located near, the wastewater treatment plant in the southern

part of the City of Oxnard. Consumers of this recycled water include PVCWD and some other agricultural operators. Potential consumers could include PHWA and UWCD (City of Oxnard 2015). In addition to recycling water for landscape and agricultural irrigation, the City of Oxnard plans to construct and operate an aquifer storage and recovery well program through which recycled water may be stored or extracted.

The City of Oxnard is considering future water projects, including expansion of the AWPF by 7,000 AFY for groundwater recharge and expansion of aquifer storage and recovery facilities to inject and store treated water in the LAS. A dozen or more wells may be constructed by the early 2030s as part of this program (City of Oxnard 2015). This program has the capacity to provide predictable quantities of reclaimed water to the region for a variety of conjunctive uses, without borrowing from existing sources of water. The project reclaims and reuses treated effluent that would otherwise be conveyed to the ocean.

Coordination with SGMA and Other Agencies

The UWMP was adopted June 20, 2016, and has a planning horizon of 25 years. The production of the UWMP was coordinated with, and obtained information from, numerous water suppliers and management agencies, including the CMWD, UWCD, MWD, PHWA, FCGMA, and the Ventura County Local Agency Formation Commission (LAFCo). The City of Oxnard notified the appropriate agencies and the public of the production of the UWMP, conducted a public hearing, and incorporated public comment prior to adopting the plan.

How the Plan May Change Water Demands within the Subbasin

The City of Oxnard is entirely within FCGMA jurisdiction. As such, it is subject to the FCGMA ordinances and groundwater management activities described in Table 1-11. Many of the City of Oxnard's plans for water project expansion have been developed with, and require approval by, FCGMA. Implementation of this GSP will require continued coordination between the agencies and stakeholders within the Oxnard Subbasin and periodic adjustment of assumptions regarding climate, population, land use, environmental requirements, and other factors impacting water demand. Currently, the City has a net-zero policy on new development, which requires a proposed development to provide their groundwater allocation to the City (subject to FCGMA approval) or contribute to City programs designed to offset potable water use. Because of the existing level of coordination with FCGMA, the Oxnard UWMP is not expected to affect the water demand within the Oxnard Subbasin.

How the Plan May Affect Sustainable Groundwater Management within the Subbasin

Due to the jurisdictional overlap of FCGMA and the City of Oxnard, the Oxnard UWMP largely fosters the goals of sustainable management within the Oxnard Subbasin. Because the City of

Oxnard at times relies on imported water from MWD via CMWD, the declining reliability of that supply may affect future management decisions. MWD is strategically addressing issues related to source reliability (CMWD 2016). Assumptions within the UWMP that may impact sustainable management of the basin include the continuation of current pumping allocations and the future availability of potable reuse supplies.

How the GSP May Impact the Assumptions of the UWMP

The UWMP indicates consistency with FCGMA management actions, including extraction reductions in accordance with Ordinance 8, Ordinance E, and the 100,000 acre-foot (AF) basin maximum extraction target of the 2007 FCGMA Basin Management Plan. However, the GSP contemplates reductions in groundwater extractions as compared to the historical averages and maintaining increased groundwater elevations near the coast for the management of seawater intrusion (see Chapters 2 and 3). Because the City of Oxnard is a coastal city partially dependent on groundwater extractions and UWCD supplies, its UWMP will be impacted by these GSP components. The UWMP assumes future water projects and demand management measures in water demand and reliability calculations. Those assumptions may be modified by those projects and management actions included in the GSP.

City of Ventura UWMP

Description/Summary of Agency and Plan

The City of Ventura, which was originally incorporated in 1866, is located on the Pacific Coast to the north of the Oxnard Subbasin, with a small portion of the city extending into the Subbasin. The City of Ventura Water Department (VWD), a retail water provider, supplies water to the city and several unincorporated areas of Ventura County. Parts of the city's water system are within both Casitas Municipal Water District and UWCD jurisdictions. VWD provides potable water for commercial, industrial, residential, and irrigation customers. VWD also provides recycled water for the irrigation of parks and golf courses (City of Ventura 2016).

VWD's supplies are from Lake Casitas, the Ventura River, groundwater, and reclamation facilities. Although the City of Ventura has a 10,000 AFY allocation of SWP water, there are currently no facilities by which SWP water can be delivered to the city. VWD extracts groundwater from the Oxnard Subbasin for use within the City's service area. The City's full Historical Allocation (HA) was 5,472 AFY (in 1990) and has since been adjusted by FCGMA ordinances to 4,104 AFY (a 25% reduction of HA in 2013) and 3,862 AFY (20% reduced Temporary Extraction Allocation since 2016). The City of Ventura has complied with SB X7-7, requiring 20% reduction in per-capita water use, and implements demand management programs, including a prohibition on water waste, conservation pricing, and public education.

Wells used by the City of Ventura for its municipal water supply that are located within the Oxnard Subbasin consist of three wells at the Buenaventura Golf Course (City of Ventura Well Nos. 5, 6, and 7) (City of Ventura 2016).

Coordination with SGMA and Other Agencies

The City of Ventura UWMP was adopted in June 2016, and has a planning horizon of 25 years. The production of the UWMP was coordinated with, and obtained information from, numerous water suppliers and management agencies, including FCGMA, CMWD, UWCD, City of Oxnard, and Ventura County LAFCo. The City of Ventura notified the appropriate agencies and the public of the production of the UWMP, conducted a public hearing, and incorporated public comments prior to adopting the plan.

How the Plan May Change Water Demands within the Subbasin

The City of Ventura UWMP will not likely change the water demand within the Oxnard Subbasin.

How the Plan May Affect Sustainable Groundwater Management within the Subbasin

Although the City of Ventura is located primarily outside the Oxnard Subbasin and the FCGMA area, the City extracts approximately 3,860 AFY of groundwater from the Subbasin that FCGMA has approved to be exported for use within the City's service area. To the extent that the UWMP assumes continuation of this exportation of groundwater, these continued extractions will need to be addressed as part of FCGMA's ongoing efforts to sustainably manage groundwater in the Oxnard Subbasin. However, the extraction has historically been subject to FCGMA management ordinances and will be subject to future FCGMA policies.

How the GSP May Impact the Assumptions of the UWMP

The UWMP assumes continued extractions from the Oxnard Subbasin. This assumption may be impacted by GSP management actions that reduce annual extractions within the Subbasin. These management actions would be undertaken to maintain coastal groundwater levels at higher than historic averages (see Chapters 2 and 3).

1.6.3 Additional Plan Summaries

Port Hueneme Water Agency UWMP

PHWA is a wholesale urban water supplier that delivers approximately 4,000 AFY of SWP water and groundwater to Naval Base Ventura County, the City of Port Hueneme, and the Channel Islands Beach Community Services District (PHWA 2016). Approximately 20% of the PHWA water supply is purchased SWP water from CMWD. The remaining 80% of the water supply is

groundwater, provided to PHWA by UWCD as part of a 40-year supply agreement negotiated in 1996 (PHWA 2016). PHWA does not directly pump groundwater from the Oxnard Subbasin, but relies on the groundwater produced by UWCD.

City of Port Hueneme UWMP

The City of Port Hueneme is a retail water agency that supplies approximately 1,903 AFY of SWP water and groundwater purchased from PHWA (City of Port Hueneme 2016b). The City of Port Hueneme does not directly pump groundwater in the Oxnard Subbasin (City of Port Hueneme 2016b).

Metropolitan Water District UWMP

MWD is a public agency that delivers water from the Colorado River and the SWP to its member agencies (MWD 2016). The member agencies of MWD include 14 cities, 11 municipal water districts, and 1 county water agency (MWD 2016). Relevant to water supplies in the Oxnard Basin, PHWA purchases water from CMWD, which is a member agency of MWD. MWD supplies imported water to CMWD. MWD does not directly or indirectly pump groundwater in the Oxnard Subbasin.

City of Oxnard General Plan

The City of Oxnard owns and operates a municipal water supply system, providing both imported water and local groundwater in its service area. The General Plan addresses groundwater resources in both the Infrastructure and Community Services Goals section and the Environmental Resources Goals section of the General Plan. These goals include supporting the FCGMA policies that protect, enhance, and replenish the aquifers of the Oxnard Subbasin and adhering to recommendations regarding groundwater extractions and quality from the Ventura County Regional Water Quality Planning Program (City of Oxnard 2011, Goals ICS-11.5 and ICS-11.9). Additionally, Goal ER-5 states: "well managed water supply and wastewater treatment programs that together meet expected demand, prevent groundwater overdraft, and ensure water quality" (City of Oxnard 2011). Under this goal, reducing dependence on groundwater through development of the GREAT Program is specified as supporting the policies of FCGMA (City of Oxnard 2011). Specifically, Policy ER-5.3 states "The City shall maintain a minimal dependence on Basin 4A groundwater consistent with the Groundwater Resource Encroachment and Treatment (GREAT) Program and support the policies of the Fox Canyon Groundwater Management Agency to protect, enhance, and replenish the aquifers underlying the Oxnard Plain" (City of Oxnard 2011).

The City of Oxnard General Plan includes several policies that address a range of water supply and groundwater resource issues. These include the following (City of Oxnard 2011):

- **Policies ICS-1.1 (Maintain Existing Service Levels), ICS-1.2 (Development Impacts to Existing Infrastructure), and ICS-1.3 (Funding for Public Facilities)** require the City

to plan and ensure that a variety of funding methods (including developer fees, grants, and public facility fees) are used to expand the range of public services and utilities (including water supply infrastructure) consistent with community needs.

- **Policy ICS-11.4 (GREAT Program Implementation)** requires the City to continue supporting and implementing this program as a key way to meet the City's long-term water supply needs.
- **Policies ICS-11.2 and ICS-11.7** encourage the City to continue its promotion of a variety of water conservation measures (including landscaping and low-flow fixtures) as part of all future development.
- **Policy ICS-11.6 (Sustainability of Groundwater)** calls for the continued support of the various policies of the local groundwater management agency and **Policy ICS-11.9 (Groundwater Extractions)** calls for continued adherence to the Ventura County Regional Water Quality Planning Program's recommendations regarding groundwater quality and extractions.
- **Policy ICS-11.12 (Water for Irrigation)** encourages the use of non-potable water supplies for landscape irrigation.
- **Policy ICS-11.10 (Water Supply Assessment for All Projects)** requires the preparation of water supply studies prior to the approval of future development projects.
- **Implementation Measure No. 59** requires the City to maintain and periodically update water, wastewater, and drainage infrastructure master plans to ensure that sufficient levels of infrastructure are planned for and financed in the City.

The General Plan does not contain water supply assumptions that would conflict with the sustainable management criteria or the projects and management actions proposed in this GSP. The City General Plan recognizes the existing constraints water resources that exist in supporting future development, as evidenced through its various policies encouraging development of alternative water supplies, promoting conservation and use of non-potable water, and requiring completion of water supply assessments for all projects prior to approval. In addition, the City has a net-zero policy on new development, which requires a proposed development to provide their groundwater allocation to the City (subject to FCGMA approval) or contribute to City programs designed to offset potable water use. The General Plan also includes policies that promote redevelopment of old and/or blighted areas, development of mixed-use urban villages, and/or expansion of existing business and attraction of new business. Such development and investments would undoubtedly require additional water resources to support, and implementation of this GSP is likely to increase existing limitations on water availability. However, as discussed in detail in Section 1.4.3 (Operational Flexibility Limitations) and Chapter 5 (Projects and Management Actions) of the FCGMA, the

City and other jurisdictions within the Oxnard Plain continue to implement projects that increase operational flexibility within the Oxnard Subbasin.

Naval Base Ventura County

Naval Base Ventura County (NBVC) is composed of three main operating areas (Point Mugu, Port Hueneme, and San Nicolas Island) and eight special areas. NBVC Point Mugu is located in unincorporated Ventura County, and NBVC Port Hueneme is located in the City of Port Hueneme. NBVC plays a vital role in national security missions, supporting approximately 80 tenant commands and over 20,000 direct, indirect, and induced jobs within Ventura County. Water sustainability is critical to military sustainability, resiliency, and compatibility. NBVC's primary water supply is groundwater extracted from the Forebay by UWCD, blended with imported water from the CMWD, and delivered to NBVC Port Hueneme and NBVC Point Mugu via the Oxnard Hueneme Pipeline, contracted through and in partnership with the Port Hueneme Water Agency. NBVC also operates one groundwater well on Port Hueneme with limited pumping, listed as a back-up drinking water source, and used primarily for landscaping and water system operations. NBVC groundwater use currently represents approximately 1 percent of groundwater pumped in the Oxnard Subbasin and Pleasant Valley Basin.

The Channel Islands Air National Guard Station (ANGS) shares the airfield with NBVC Point Mugu, but is housed on property owned by the United States Air Force and is located in unincorporated Ventura County. Channel Islands ANGS supports missions for both the Federal government and the State of California. Channel Islands ANGS is supported by two water sources; a groundwater well, permitted through the County of Ventura, which is used for irrigation only; and a potable water pipeline that is part of the NBVC groundwater pipeline. All permitting, reporting and other requirements are provided as a matter of comity and in support of good water management.

The SGMA provides that the federal government, appreciating the shared interest in assuring the sustainability of groundwater resources, may voluntarily agree to participate in the preparation or administration of a groundwater sustainability plan, per Water Code Section 10720.3. Recognizing this shared interest, NBVC has voluntarily engaged in the development of the GSP for the Oxnard Subbasin by FCGMA.

While welcoming federal government participation, SGMA recognizes Federal Reserve Water Rights (FRWR) as distinct from those water rights based in state law and directs that Federal Reserve Water Rights be respected in full, and in case of any conflict between federal and state law, federal law shall prevail. Water Code § 10720.3(d). SGMA also directs that the groundwater sustainability agency consider the interests of all beneficial uses and users of groundwater, listing

the federal government, including, but not limited to, the military and managers of federal lands among those interests. Water Code § 10723.2.

Under U.S. Supreme Court case law defining the FRWR, federal agencies have an implied right to water to support the primary mission for which Congress and the Federal government have designated that land, including a provision of water for growth to support that mission.[3] It is well established in the Supremacy Clause of the U.S Constitution, Article VI, Clause 2, that the Federal Government is not subject to state regulation, unless Congress clearly and unambiguously waives this sovereign immunity.

Consistent with its proactive and cooperative engagement with FCGMA, NBVC has a vested interest in participating in the SGMA effort to support a groundwater basin that achieves a sustainable yield. NBVC may voluntarily agree to an allocation under the GSP less than its full FRWR. In recognition and acknowledgment of the limits on FCGMA to regulate the federal government, any such allocation shall be directly assigned to the federal agency and shall not be subject to the requirements of any allocation ordinance, including but not limited to allocation carryovers, borrowing, transfers, reductions and/or variances and fees.

Although not subject to formal regulation under SGMA, NBVC is committed to being a good steward of water resources and to exploring partnerships that help to achieve groundwater sustainability, including projects that benefit both the Navy and the community.

Naval Base Ventura County Joint Land Use Study

The NBVC prepared a Joint Land Use Study that includes a discussion of water supply and potential impacts to Naval Base Ventura County water quality and quantity (NBVC 2015). This report, which was prepared in cooperation with the Cities of Camarillo, Oxnard, and Port Hueneme and the County of Ventura, identifies saltwater intrusion and impacts to storm drain flows as potential concerns for adequate supplies of good quality water to Naval Base Ventura County. To avoid these potential impacts, the Joint Land Use Study suggests coordination with the FCGMA GSP efforts (NBVC 2015).

1.7 WELL PERMITTING POLICIES AND PROCEDURES

The three permitting agencies requiring well permits within FCGMA jurisdiction are FCGMA, Ventura County Public Works Agency, and the City of Oxnard. The FCGMA well permit requirements pertain to the entirety of FCGMA's jurisdiction. The Ventura County ordinances do

[3] The FRWR was first recognized by the U.S. Supreme Court in the context of tribal interests (*See Winters v. United States*, 207 U.S. 564 5090 (1908)) and subsequently expanded to federal agencies (*See Cappaert v. United States*, 426 U.S. 128 (1976)), *Federal Power Commission v. Oregon*, 349 US 435 (1955)).

not preclude or supplant any other agency requirements. To construct a well within the City of Oxnard, a permit is required from both FCGMA and the City of Oxnard.

Each well permitting agency, as a minimum standard, implements California's Water Well Standards, which include requirements to avoid sources of contamination or cross-contamination, proper sealing of the upper annular space (i.e., first 50 feet), disinfection of the well following construction work, use of appropriate casing material, and other requirements. The permitting agencies require wells to meet certain setback criteria (e.g., septic system setback) and specific construction and sealing requirements. In addition, well-drilling activities are required to reduce pollution to the maximum extent practicable using best management practices such as installing a sediment basin to contain runoff, using geotextile fabric to contain sediments and drilling mud, or eliminating the use of drilling foam.

The permitting agencies monitor and enforce these standards by requiring drilling contractors with a valid C-57 license to submit permit applications for the construction, modification, reconstruction (i.e., deepening), or destruction of any well within their jurisdiction. The processing and issuance of a water well permit is currently considered a ministerial action, meaning permits are issued to drillers meeting California Water Well Standards and County sealing requirements, and notwithstanding errors in the application. Certain circumstances, however, such as when installing a well could cause the spread of contaminants to uncontaminated water zones, may prevent FCGMA from issuing a well permit.

The passage of SB 252 added Article 5, Wells in Critically Overdrafted Groundwater Basins, to Chapter 10 of the California Water Code, requiring collection of specific information for water wells proposed in critically overdrafted groundwater basins. The provisions of SB 252 are effective until January 30, 2020.

1.7.1 FCGMA

Since its inception, FCGMA has implemented multiple ordinances and policies related to the extraction and use of groundwater. FGMA did not impose a permit requirement for the Oxnard Subbasin until 2010 (Ordinance 8.2). A complete list of historical policies and ordinances is kept and updated on the FCGMA website (FCGMA 2019c). Those currently pertaining to well permits are described here.

Emergency Ordinance E, adopted April 11, 2014, in response to severe drought, declining water levels, and seawater intrusion, prohibits the issuance of permits for new groundwater wells associated with new or increased groundwater use, and limits extractions from existing wells (FCGMA 2014b). The ordinance limits groundwater extractions for M&I and agricultural users.

Ordinance E temporarily replaced the then-in-use allocation systems (HA and Baseline Allocation [BA]) for M&I well operators with a Temporary Extraction Allocation that uses average annual extractions from the base period 2003 to 2012. The ordinance sets a series of allocation reductions from the base amount to take effect beginning July 1, 2014, with a 10% reduction. The ordinance requires an additional 5% reduction every 6 months through January 2016, resulting in a total reduction of 20%.

Ordinance E requires all agricultural well operators to apply for a 25% reduced Efficiency Allocation. An Efficiency Allocation is based on a well operator demonstrating that water used for agriculturally developed land is at least 80% efficient (FCGMA 2011, Resolution No. 2011-04). Ordinance E also contains provisions for the FCGMA Board to undertake additional adjustments to irrigation allowances by resolution.

Under Emergency Ordinance E, accounts that are solely associated with domestic wells operate well(s) using a 25% reduced HA (also known as an Adjusted Historical Allocation [AHA]) and/or a BA. An HA is an average of annual extractions from the base period 1985 to 1989. A BA is associated with a parcel and is based on new development after the close of the HA base period.

Since 1983, FCGMA ordinances have required registration of wells, reporting of extractions, and payment of pumping fees. Currently, the FCGMA Ordinance Code continues these requirements. Additionally, the code (Chapter 2) requires that permits be obtained from FCGMA for new wells prior to construction. For wells installed within the FCGMA area, the applicant must subsequently obtain a permit from the Ventura County Public Works Agency or the City of Oxnard if within the City's jurisdiction. The FCGMA Ordinance Code requires the installation and maintenance of flow meters, providing proof of flowmeter accuracy, and reporting of all extractions semi-annually (Table 1-11). In 2018, FCGMA adopted an ordinance that will require all wells within the Agency to be equipped with advanced metering infrastructure telemetry by October 1, 2020.

1.7.2 Ventura County

The ordinances relating to groundwater wells in Ventura County are contained in Ventura County Ordinances, Division 4, Chapter 8, Water, Article 1 – Groundwater Conservation, Sections 4811–4828 (County of Ventura 2016). These ordinances regulate the construction, maintenance, operation, modification, and destruction of groundwater wells. Ventura County requires well permits for any construction, modification, replacement, repair, or destruction of wells. Permit requirements include "information as the Agency may deem necessary in order to determine whether underground waters will be protected" (County of Ventura 2016, Chapter 8, 4813, C8). Ventura County requires that a well permit application from FCGMA be completed and authorized prior to consideration for a Ventura County permit. Ventura County well construction or destruction activity standards are required to comply with the DWR Well Standards Bulletins Nos.

74-81 and 74-90. New water wells must be equipped with a flow meter and calibrated every 3 years; however, de minimis extractors (those producing less than 2 AFY) are exempt from this requirement. Completion logs are required for all wells, and geophysical logs are required where necessary to prevent cross contamination of pumping zones.

Section 4826 pertains to the Aquifer Protection Program, the purpose of which is to require destruction or repair of wells that are causing groundwater pollution. The provision requires annual reporting of water extractions, time of operation, static water levels, and pump test data if available. Based on these data, all wells are classified with regard to location and operational condition.

Due to pervasive drought conditions, as of October 28, 2014, Section 4826.1 prohibited the construction of new wells within the unincorporated area of Ventura County except under specific circumstances. With the initiation of SGMA, the ordinance was modified to include only basins designated as high or medium priority by DWR, which includes all of the FCGMA basins in the Oxnard Subbasin except the Arroyo Santa Rosa Valley Basin.

1.7.3 City of Oxnard

Chapter 22, Article VII, of the Oxnard City Code includes requirements for the construction, repair, modification, and destruction of wells. The City of Oxnard requires a fee and permit for the construction of water wells. Notable among the permit requirements is a statement confirming that the aquifers underlying the City of Oxnard are no longer in a state of overdraft. Applications for new wells require a public hearing and are considered by City Council (Oxnard City Code, Section 22-101). Permits are also required for the repair, modification, or destruction of existing wells.

1.7.4 Additional Well Permitting Policies and Procedures

In addition to State of California, County of Ventura, and FCGMA well permitting policies and procedures, a permit in the form of a well agreement with the City of Ventura is required to construct a well within the City of Ventura's jurisdictional boundary.

1.8 NOTIFICATION AND COMMUNICATION

1.8.1 Notification and Communication Summary

Notification and communication regarding the development of the Oxnard Subbasin GSP takes place in the following four key phases:

1. Initial Notification
2. GSP Development

3. Draft GSP Review and Comment
4. GSP Implementation

The Initial Notification was completed with the FCGMA submittal of the Notice of Intent on February 24, 2017, to the DWR to develop a GSP for the Oxnard Subbasin. The GSP Development phase included extensive outreach and engagement with the stakeholders, including beneficial users, as described in more detail in Section 1.8.3, Public Meetings Summary, and Section 1.8.6, Communication.

The Draft GSP Review and Comment phase will include the formal public comment period for the Draft GSP and response to comments, as discussed in Section 1.8.4, Summary of Comments and Responses. The GSP Implementation notification and communication period will begin once FCGMA submits the final GSP to DWR and will include engagement with the public and beneficial users regarding the progress of monitoring and reporting updates on the GSP to DWR, establishment of fees, and the development and implementation of management strategies, including projects as needed.

1.8.2 Summary of Beneficial Uses and Users

Beneficial uses of groundwater from the Oxnard Subbasin include agricultural, M&I, and environmental uses. As discussed in Section 1.3.2.3, Historical, Current, and Projected Land Use, land use on the Oxnard Plain is 47% agriculture, 47% urban, and 6% open space. Of the groundwater produced from the UAS and the LAS, approximately 60% is used for agriculture and the remaining 40% is used for M&I and urban uses. GDEs are the primary environmental users of groundwater in the Subbasin. The GDEs are connected to the semi-perched aquifer, which is separated from the underlying UAS by a clay layer throughout much of the Oxnard Subbasin, and from which there is limited groundwater production.

Beneficial users of groundwater and property interests potentially affected by the use of groundwater are described in the following paragraphs.

Surface Water Users. The primary surface water users within the Oxnard Subbasin are UWCD and CWD, which both operate conjunctive-use programs. The interests of UWCD and CWD are represented on the FCGMA Board, as discussed in Section 1.2.3, Organization and Management Structure. Consultation with UWCD and CWD staff has occurred formally and informally throughout the development of the GSP, including participation in public meetings and the Technical Advisory Group (TAG). UWCD has also contributed data from their monitoring programs. There are also environmental uses of surface water, as discussed in this section under Environmental Users. All identified surface water users in the Oxnard Subbasin were added to the interested parties list that is sent monthly electronic newsletters and meeting notices regarding the status of the GSP.

Municipal Well Operators and Public and Private Water Purveyors. There are over 40 public and private water purveyors in the Oxnard Plain, as shown on Figure 1-8. A detailed description of each purveyor is included in the VCWPD Inventory of Public and Private Water Purveyors (2006). All of the purveyors in the Oxnard Plain, including all municipal well operators, are supplied water by either UWCD or CMWD. The interests of both UWCD and CMWD are represented on the FCGMA Board, as previously discussed in Section 1.2.3. Staff from both UWCD and CMWD have provided groundwater monitoring data, have participated in public meetings, and regularly collaborate with FCGMA staff. The Cities of Oxnard and Port Hueneme also have direct representation on the FCGMA Board by the representative appointed to serve on behalf of the five incorporated cities within FCGMA jurisdiction. Several of the smaller water districts and mutuals have also participated in FCGMA public meetings and provided comments throughout the development of the GSP.

Agricultural Users. Agricultural users have been identified as key stakeholders since the creation of FCGMA in 1982 and have direct representation through one of five members on the FCGMA Board. The primary crops grown in the Oxnard Plain are strawberries, raspberries, celery, peppers, beans, cabbage, lettuce, spinach, kale, cut flowers, and nursery stock. Agricultural user interests are represented within the Oxnard Plain by the Ventura County Agricultural Commissioner, the Ventura County Farm Bureau, individual pumpers, and groups of pumpers that have organized to advocate for their interests during the GSP development process. The FCGMA Board directed staff to work with pumpers' groups on the development of proposed allocation systems that will be brought before the FCGMA Board for consideration. FCGMA maintains a database of well owners, including agricultural well owners. Email addresses in the database have been added to the list of interested parties who receive electronic newsletters regarding the status and development of the Oxnard Subbasin GSP.

Domestic Users. The majority of domestic groundwater users in the Subbasin are supplied water from a city, special district, or mutual water company. FCGMA maintains a database of well owners, including domestic well owners. Email addresses in the database have been added to the list of interested parties who receive electronic newsletters regarding the status and development of the Subbasin GSP.

Local Land Use Planning Agencies. FCGMA staff members have reached out to all local land use planning agencies with jurisdiction over the Oxnard Plain, including the County of Ventura, the City of Oxnard, and the City of Port Hueneme. The County of Ventura holds one of five seats on the FCGMA Board. The FCGMA Board also has a member appointed to represent the five incorporated cities, including the cities of Oxnard and Port Hueneme. As discussed in Section 1.6, Land Use Elements or Topic Categories of Applicable General Plans, FCGMA has established working relationships with the land use planning agencies. FCGMA staff has participated on the

Ventura County General Plan Update Water Element Focus Group and continues to work with Ventura County planning staff to ensure that the GSP and General Plan Update are consistent.

Environmental Users. Environmental users of groundwater are concentrated in the four GDEs and two potential GDEs described further in Section 2.3.7, Groundwater-Dependent Ecosystems. These GDEs include aquatic habitat, in-channel wetlands, riparian forest, and coastal marshes. FCGMA has taken steps to incorporate the interests of environmental users in the development of the GSP through appointing an environmental representative to the TAG. The TAG held a special meeting focusing on potential groundwater-dependent ecosystems and accepted comments from the public on the potential impacts to surface water bodies. There are several non-governmental organizations with missions associated with environmental water uses on the list of interested parties who receive electronic newsletters regarding the status and development of the Oxnard Subbasin GSP.

The Federal Government. As discussed in Section 1.3.2.3, the federal government is a landowner and groundwater user in the Oxnard Basin through the Naval Base Ventura County. Representatives from the U.S. Navy have been coordinating with FCGMA staff regarding the development of the GSP, have participated in FCGMA public meetings, and are on the list of interested parties who receive electronic newsletters regarding the status and development of the Oxnard Subbasin GSP.

California Native American Tribes. According to the U.S. Bureau of Indian Affairs California Tribal Homelands and Trust Land Map, updated in 2011 and available from the DWR website, the entire Oxnard Subbasin is within the Chumash Tribal/Cultural area. There are not currently any federally recognized Indian Tribes, Indian land currently or historically held in trust by the U.S. government, or smaller Reservation or Rancheria areas in the Oxnard Plain. FCGMA recognizes that the Chumash culture and associated cultural resources are important in Ventura County. Several active local groups and individuals representing the interests of tribal communities in Ventura County have been added to the list of interested parties, including representatives from the Barbareno/Ventureno Band of Mission Indians (Chumash) and the Wishtoyo Chumash Foundation. FCGMA has reached out to the DWR Southern Region Office Tribal Liaison, Jennifer Wong, and added her to the list of interested parties. The San Gabriel Band of Mission Indians has also shown an interest in the groundwater sustainability planning process and has been added to the list of interested parties.

Disadvantaged Communities. The majority of the Disadvantaged Communities (DACs) within the Oxnard Plain receive water from cities, special districts, or mutual water companies. FCGMA works closely with these water agencies and mutuals that represent the interests of the DACs. The Watersheds Coalition of Ventura County has established a DAC Involvement Committee to discuss DAC needs and project opportunities related to Integrated Regional Water Management. FCGMA staff participates in the DAC Involvement Committee. Representatives from Integrated

Regional Water Management and the DAC Involvement Committee have participated in FCGMA public meetings and are on the list of interested parties who receive electronic newsletters regarding the status and development of the Subbasin GSP.

1.8.3 Public Meetings Summary

FCGMA has been discussing the development of a GSP since March 2015. Table 1-12 lists the FCGMA public meetings in which the participants discussed or took action on the Subbasin GSP. Note that the list will be updated as additional meetings occur.

1.8.4 Summary of Comments and Responses

The FCGMA Board approved release of a Preliminary Draft GSP in January 2018, with a 90-day comment period. An evening public workshop was held on February 8, 2018, to present the Preliminary Draft GSP, answer questions, and solicit comments. Formal comments were accepted in writing only. The comments were submitted in person at the public workshop and electronically via email to fcgma-gsp@ventura.org. A total of 32 comment letters were received by FCGMA on all three GSPs. A summary of the comments was presented to the FCGMA Board at the May 23, 2018, meeting. In consideration of these comments, FCGMA completed an independent peer review of the numerical groundwater models, completed additional analysis for the water quality approach, and extended the timeline for completion of the GSP. Comments on the Preliminary Draft GSP and direction from the FCGMA Board after consideration of public comments have been incorporated in the Draft GSP.

Before completing the Draft GSP, additional information was made available to the public to enhance understanding of the technical information and processes used for the development of the Draft GSP. The following documents were posted on the FCGMA website, discussed in public FCGMA meetings, and sent to the list of interested parties in electronic newsletters:

- Minimum Thresholds and Measurable Objectives Data, March 2019
- Peer Review of the United Water Conservation District and Calleguas Municipal Water District Models for the Oxnard Subbasin, Pleasant Valley Basin, and Las Posas Valley Basin, March 2019
- Approach for GSP Modeling of Future Conditions in the Oxnard Subbasin, Pleasant Valley Basin and Las Posas Valley Basin, January 2019
- Minimum Thresholds and Measurable Objectives in the Las Posas Valley Basin, Oxnard Subbasin, and Pleasant Valley Basin, January 2019
- Assessing the Sustainable Yield of the Oxnard Subbasin, Pleasant Valley Basin, and Las Posas Valley Basin, January 2019

A public workshop was held on March 15, 2019, to discuss the estimated sustainable yield, minimum thresholds, and measurable objectives proposed for the Draft GSP. Comments received at the public workshop were incorporated into the Draft GSP. The Draft GSP was approved by the FCGMA Board and released for a 60-day public comment period on July 29, 2019, during which time FCGMA solicited formal comments on the Draft GSP.

Before completing this Final GSP, the public comments received on the Draft GSP were reviewed and where appropriate incorporated into this Final GSP. Public comments on the Draft GSP are included in Appendix A.

1.8.5 Summary of Initial Information on Relationships between State and Federal Regulatory Agencies

FCGMA has not entered into any formal agreements with the federal government regarding preparation or administration of this GSP or groundwater management pursuant to SGMA, Section 10720.3(c). The U.S. Navy is a current beneficial user of water within the Subbasin and has initiated informal coordination with FCGMA staff, including a presentation to the FCGMA Board on May 24, 2017, detailing the Navy's interests and operations related to water use within the FCGMA boundaries. There are no federally recognized Indian Tribes within the Subbasin boundaries.

FCGMA recognizes the need for both formal and informal consultation with state and federal regulatory agencies throughout the implementation of the GSP. FCGMA received a formal request from the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service on October 11, 2016, to be added to the list of interested parties for the development of the GSP. FCGMA has added National Marine Fisheries Service to the list of interested parties, as well as the following state and federal regulatory agencies:

- Los Angeles Regional Water Quality Control Board
- U.S. Fish and Wildlife Service
- California Department of Fish and Wildlife
- California Department of Water Resources

1.8.6 Communication

A public outreach and engagement plan was developed for all of the GSPs that FCGMA is developing (included as Appendix B to this GSP). The purpose of the public outreach and engagement plan was to create a common understanding and transparency throughout the groundwater sustainability planning process, including fulfilling the requirements of SGMA as described in DWR 2016b, Section 354.10.d. The public outreach and engagement plan discusses the FCGMA decision-making process; identifies opportunities for public engagement and

provides a discussion of how public input and response will be used; describes how FCGMA encourages the active involvement of diverse social, cultural, and economic elements of the population within the Subbasin; and describes the method FCGMA shall follow to inform the public about progress implementing the public outreach and engagement plan, including the status of projects and actions.

FCGMA has provided ongoing and innovative opportunities for stakeholders to engage in the GSP development process. FCGMA has provided regular updates to interested parties through monthly electronic newsletters highlighting monthly progress on the GSP development, upcoming meetings, and opportunities for engagement. Monthly updates and opportunities for public comment were provided at FCGMA Regular Board Meetings, FCGMA Special Board Meetings, and TAG Meetings. Meeting agendas and minutes, as well as video recordings of all FCGMA Board Meetings and Workshops, were made available on the FCGMA website. Additional technical information about the GSP development was made available on the FCGMA website including the Preliminary Draft GSP, Technical Memoranda, and TAG Meeting Materials. The Preliminary Draft GSP was available online for more than 120 days, including an official 90-day public comment period. FCGMA encouraged active participation from stakeholders through four public workshops (November 15, 2016; September 20, 2017; February 8, 2019; and March 15, 2019), a survey for input on sustainability indicators, and a public call for project ideas for incorporation into the GSP.

1.9 REFERENCES CITED

Bureau of Reclamation. 2013. *Los Angeles Basin Stormwater Conservation Study: Task 3.1. Development of Climate-Adjusted Hydrologic Model Inputs.* U.S. Department of the Interior, Technical Service Center, Bureau of Reclamation. October 2013.

CIMIS (California Irrigation Management Information System). 2018. "Historical climate data provided for the Oxnard weather station" [data]. California Irrigation Management Information System. Accessed 12 Dec. 2018. http://wwwcimis.water.ca.gov/WSNReportCriteria.aspx.

City of Camarillo. 2016. *2015 Urban Water Management Plan for the City of Camarillo*. Final Draft. Prepared by Water Systems Consulting Inc. August 2016.

City of Oxnard. 2011. *2030 General Plan Goals and Policies*. October 2011.

City of Oxnard. 2015. *City of Oxnard 2015 Urban Water Management Plan*. Prepared by MNS Engineers Inc. July 1, 2016.

City of Oxnard. 2016a. Planning Division Quarterly Projects List. Updated October 2016. https://www.oxnard.org/wp-content/uploads/2016/10/October-Project-List.pdf.

City of Oxnard. 2016b. *Salt and Nutrient Management Plan (SNMP) for the Oxnard Plain and Pleasant Valley Basins – Preliminary Draft.* Prepared by Hydrometrics WRI and Carollo. July 2016.

City of Port Hueneme. 2016a. "Fact Sheet." Accessed on October 25, 2016. http://www.ci.port-hueneme.ca.us/index.aspx?nid=919.

City of Port Hueneme. 2016b. *City of Port Hueneme 2015 Urban Water Management Plan.* Final. Prepared by Water Consultancy. August 2016.

City of Ventura. 2016. *2015 Urban Water Management Plan for the City of Ventura*. Final. Prepared by Kennedy/Jenks Consultants. June 2016.

CMWD (Calleguas Municipal Water District). 2016. *2015 Urban Water Management Plan*. Final. Prepared by Black and Veatch. June 2016.

County of Ventura. 2016. "Ventura County, California – Code of Ordinances. Division 4, Chapter 8, Article 1, Section 4813 – Well Permits." September 27, 2016. Accessed November 14, 2016. https://www.municode.com/library/ca/ventura_county/codes/code_of_ordinances?nodeId=DIV4PUHE_CH8WA_ART1GRCO_4813WEPE.

CWD (Camrosa Water District). 2016. *2015 Agricultural Water Management Plan*. Adopted March 10, 2016.

DWR (California Department of Water Resources). 2016a. *California's Groundwater, Bulletin 118*. 2016 Interim Update. Accessed May 29, 2019, 2016. https://water.ca.gov/Programs/Groundwater-Management/Bulletin-118.

DWR. 2016b. "Approved Groundwater Sustainability Plan Emergency Regulations." May 18, 2016. Accessed November 14, 2016. http://water.ca.gov/groundwater/sgm/pdfs/GSP_Emergency_Regulations.pdf.

DWR. 2016c. *2015 Urban Water Management Plans Guidebook for Urban Water Suppliers*. Final. March 2016.

DWR. 2019. Sustainable Groundwater Management Act 2018 Basin Prioritization Process and Results. January 2019.

FCGMA. 2011. "Ordinance No. 8.4. An Ordinance to Amend the Fox Canyon Groundwater Management Agency Ordinance Code Relating to Annual Efficiency Extraction Allocations." Resolution 2011-04. October 26, 2011. Accessed October 2017. http://www.fcgma.org/images/ordinances_legislation/Ord_8.4_AMENDS_-_adopted_10-26-2011_web.pdf.

FCGMA. 2014a. "A Resolution Establishing the Conejo Creek Water Pumping Program Involving Camrosa Water District and Pleasant Valley County Water District Using the Conejo Creek Diversion." Adopted March 26, 2014. Accessed January 15, 2018. http://fcgma.org/images/ordinances_legislation/Resolutions/Resolution_2014-01_optimized.pdf.

FCGMA. 2014b. "Emergency Ordinance E: An Ordinance Limiting Extractions from Groundwater Extraction Facilities, Suspending Use of Credits and Prohibiting Construction of any Groundwater Extraction Facility and/or the Issuance of any Permit Therefor." Adopted April 11, 2014. Accessed October 24, 2016. http://www.fcgma.org/images/ordinances_legislation/Emergency_Ordinance_E_-_Orig._Signed_optimized.pdf.

FCGMA. 2016. "Wells by Water Use Sector."

FCGMA. 2019a. "Organizational Chart." Fox Canyon Groundwater Management Agency, About. Accessed May 29, 2019. http://www.fcgma.org/about-fcgma/organizational-chart.

FCGMA. 2019b. "Board of Directors." Fox Canyon Groundwater Management Agency, About. Accessed May 29, 2019. http://www.fcgma.org/about-fcgma/board-of-directors.

FCGMA. 2019c. "Ordinances and Legislation." Accessed May 29, 2019. http://www.fcgma.org/public-documents/ordinances-legislation.

FCGMA. 2019d. "Fox Canyon Groundwater Management Agency Boundary." [Map.] http://www.fcgma.org/charts-maps/fcgma-boundary. Accessed June 20, 2019.

FCGMA, UWCD, and CMWD (Fox Canyon Groundwater Management Agency, United Water Conservation District, and Calleguas Municipal Water District). 2007. *2007 Update to the Groundwater Management Agency Groundwater Management Plan.* May 2007.

Hanson, R.T., P. Martin, and K.M. Koczot. 2003. *Simulation of Ground-Water/Surface-Water Flow in the Santa Clara–Calleguas Ground-Water Basin, Ventura County, California.* U.S. Geological Survey Water-Resources Investigations Report 02-4136. Sacramento: U.S. Geological Survey.

MWD (Metropolitan Water District). 2016. *2015 Urban Water Management Plan.* June 2016.

PHWA (Port Hueneme Water Agency). 2016. *Port Hueneme Water Agency 2015 Urban Water Management Plan.* Final. Prepared by Water Consultancy. August 2016.

NBVC (Naval Base Ventura County). 2015. *Naval Base Ventura County Joint Land Use Study*. Prepared by Matrix Design Group. September 2015.

SCAG (Southern California Association of Governments). 2005. "land_use_scag_2005.lpk" (GIS Data: Land Use Data [1990, 1993, 2001, 2005]). Accessed October 20, 2016. http://gisdata.scag.ca.gov/SitePages/GIS%20Library.aspx.

SCAG. 2016. *2016–2040 Regional Transportation Plan/ Sustainable Communities Strategy*. Appendix: Demographics and Growth Forecast. Adopted April 2016.

SWRCB (State Water Resources Control Board). 1956. *Bulletin No. 12: Ventura County Investigation Volume I*. October 1953. Revised April 1956.

U.S. Census Bureau. 2016. 2010 Census [GIS data]. Accessed October 2016. http://www.census.gov/geo/maps-data/.

UWCD (United Water Conservation District). 2014. "Groundwater and Surface Water Conditions Report – 2013." UWCD Open-File Report 2014-02.

UWCD. 2016. 2015 *Urban Water Management Plan for the Oxnard–Hueneme System*. Westlake Village, California: MNS Engineering. June 28, 2016.

UWCD. 2018. Administrative Draft *Multiple Species Habitat Plan*. United Water Conservation District, September 7, 2018.

VCFB (Ventura County Farm Bureau). 2016. *Ventura County's 2015 Crop & Livestock Report.* December 13, 2016. Accessed January 15, 2018. http://www.farmbureauvc.com/county-crop-data.

VCPD (Ventura County Planning Department). 2005. *Final Subsequent Environmental Impact Report for Focused General Plan Update and Related Amendments to the Non-Coastal Zoning Ordinance and Zone Change ZN05-0008*. June 22, 2005.

VCPD. 2015. *Ventura County General Plan: Goals Policies and Programs*. Amended October 20, 2015.

VCWPD (Ventura County Watershed Protection District). 2006. *Inventory of Public and Private Water Purveyors in Ventura County*. March 2006.

VCWPD. 2009. *Calleguas Creek IWPP Phase II Management Strategy Study*. Prepared by CH2MHill. August 19, 2009.

VCWPD. 2015. *Lower Santa Clara River Salt and Nutrient Management Plan*. Prepared by Larry Walker Associates, Carollo, Hydrometrics WRI, Rincon Consulting, and Dr. Norm Brown. April 2015.

VCWPD. 2016. "VCWPD Mapped Reaches" [shapefile dataset]. Provided by Richard Mendez (VCWPD) to Dudek. August 17, 2016.

Table 1-1
Estimate of Project Cost and Water Supply for First 5 Years

Proposed Project	Estimated Annual Costs	Estimated Acre-Feet of Water	Estimated Cost per Acre-Foot
Oxnard Groundwater Recovery Enhancement and Treatment Program Advanced Water Purification Facility	$7,000,000	2,000	$3,500
RiverPark–Saticoy Groundwater Replenishment Reuse Project Recycled Water Project	$6,885,000	4,500	$1,530
Freeman Diversion Expansion	$6,426,000	7,400	$870
Temporary Land Fallowing	$954,000	530	$1,800
Total	**$21,265,000**	**14,430**	**—**

Table 1-2
Groundwater Sustainability Plan Estimated Implementation Cost through 2040

Fiscal Year	Operations and Monitoring Costs	Management, Administration and Other Costs	5-Year GSP Evaluation[a]	10% Contingency	Total[b]
2020	$1,000,000	$1,455,000	$300,000	$275,500	$3,030,500
2021	$1,028,000	$1,495,740	$308,400	$283,214	$3,115,354
2022	$1,056,784	$1,537,621	$317,035	$291,144	$3,202,584
2023	$1,086,374	$1,580,674	$325,912	$299,296	$3,292,256
2024	$1,116,792	$1,624,933	$335,038	$307,676	$3,384,439
2025	$1,148,063	$1,670,431	$114,806	$293,330	$3,226,630
2026	$1,180,208	$1,717,203	$118,021	$301,543	$3,316,976
2027	$1,213,254	$1,765,285	$121,325	$309,986	$3,409,851
2028	$1,247,225	$1,814,713	$124,723	$318,666	$3,505,327
2029	$1,282,148	$1,865,525	$128,215	$327,589	$3,603,476
2030	$1,318,048	$1,917,759	$65,902	$330,171	$3,631,881
2031	$1,354,953	$1,971,457	$67,748	$339,416	$3,733,573
2032	$1,392,892	$2,026,658	$69,645	$348,919	$3,838,113
2033	$1,431,893	$2,083,404	$71,595	$358,689	$3,945,581
2034	$1,471,986	$2,141,739	$147,199	$376,092	$4,137,016
2035	$1,513,201	$2,201,708	$75,660	$379,057	$4,169,626
2036	$1,555,571	$2,263,356	$77,779	$389,671	$4,286,376
2037	$1,599,127	$2,326,730	$79,956	$400,581	$4,406,394
2038	$1,643,903	$2,391,878	$82,195	$411,798	$4,529,773
2039	$1,689,932	$2,458,851	$168,993	$431,778	$4,749,553
2040	$1,737,250	$2,527,699	$86,862	$435,181	$4,786,992
Total[b]	**$28,067,603**	**$40,838,363**	**$3,187,009**	**$7,209,297**	**$79,302,272**

Notes: GSP = Groundwater Sustainability Plan.
Costs are in 2020 dollars.

[a] The 5-year update costs include costs for the Oxnard Subbasin as well as the PVB and LPVB, for which FCGMA is the GSA.

[b] Amounts may not sum precisely due to rounding.

Table 1-3
Groundwater Sustainability Agencies in the Oxnard Subbasin

GSA Name	Total Area of GSA (Acres)	% of GSA area within Oxnard Subbasin	Acres within Oxnard Subbasin	% of Oxnard Subbasin
Fox Canyon Groundwater Management Area	117,280	46.0	53,941	94.1
Camrosa Water District–Oxnard Subbasin	3,880	4.4	171	0.3
Oxnard Subbasin Outlying Areas (Ventura County)	3,236	100	3,236	5.6
		Total	**57,348**	**100**

Notes: GSA = Groundwater Sustainability Agency.

Table 1-4
Summary of Land Ownership in the Oxnard Subbasin

Ownership	Jurisdiction	Description	Acres within Subbasin	% of Total
Private Land				
Private	County of Ventura	Privately owned land under County jurisdiction, largely agriculture and open space.	31,825	55.5%
Private	City of Oxnard	Privately owned land under municipal jurisdiction, largely consisting of urban development.	15,959	27.8%
Private	Port Hueneme	Privately owned land under municipal jurisdiction, largely consisting of urban development.	1,134	2.0%
Private	City of Ventura	South edge of the City consisting of an office park/warehouse/retail/commercial district (water served by Ventura Water Department)	407	0.7%
Private	City of Camarillo	Consists of the western end of the Camarillo Airport and part of a commercial+mobile/pre-fab home subdivision	281	0.5%
		Subtotal (Private Land)	*49,606*	*86.5%*
Public Land				
Municipal	City of Oxnard, City of Ventura, City of Camarillo, Port Hueneme	Parks, and/or Golf Courses (Buenaventura Golf Course uses recycled water for irrigation)	663	1.2%
County	County of Ventura	Mandalay County Park	8	0.01%
State	California Department of Park and Recreation, California State University, California Department of Corrections and Rehabilitation	State Beaches (McGrath State Beach, Mandalay State Beach), California State University Channel Islands, Ventura Youth Correctional Facility	230	0.4%

Table 1-4
Summary of Land Ownership in the Oxnard Subbasin

Ownership	Jurisdiction	Description	Acres within Subbasin	% of Total
Federal	U.S. Navy	Naval Base Ventura County (Naval Construction Battalion Center Port Hueneme and Point Mugu Naval Air Station)	6,046	10.5%
Non-Profit	The Nature Conservancy	Lower Santa Clara River/Ormond Beach	795	1.4%
		Subtotal (Public Land)	*7,742*	*13.5%*
		Total	**57,348**	**100%**

Table 1-5
Oxnard Plain Stream Gauge Information

Station Number	Station Name	Record Start	Record End	Active?	Latitude	Longitude	Elevation (ft msl)	Station Type
Santa Clara River								
708	Santa Clara River at Montalvo Highway 101	1927	1993	No	34.241944	−119.189	70	Recording Stream Gauge
708A	Santa Clara River at Saticoy Highway 118	1967	2004	No	34.278889	−119.141	105	Recording Stream Gauge
723	Santa Clara River at Victoria Avenue	2007	N/A	Yes	34.234917	−119.217	62	Recording Stream Gauge
724	Santa Clara River at Freeman Diversion	2004	2005	No	34.299222	−119.108	161	Recording Stream Gauge
Revolon Slough Watershed								
776	Revolon Slough at Laguna Road	1979	2006	No	34.176072	−119.100	11	Recording Stream Gauge
776A	Revolon Slough at Pleasant Valley Road	2005	N/A	Yes	34.192592	−119.108	20	Recording Stream Gauge
780	Beardsley Wash at Central Avenue	1993	N/A	Yes	34.2305	−119.112	60	Recording Stream Gauge
782	Las Posas Estates Drain	1999	2008	No	34.230816	−119.106	76	Recording Stream Gauge
Calleguas Creek								
805	Calleguas Creek at California State University Channel Islands	1968	N/A	Yes	34.179028	−119.040	58	Recording Stream Gauge

Sources: VCWPD 2009, 2016.
Notes: ft msl = feet above mean sea level. N/A = not applicable, because gauge is active.

Table 1-6
Oxnard Plain Precipitation Station Information

Station Number	Station Name	Record Start	Record End	Active?	Latitude	Longitude	Elevation (ft msl)	Station Type	Mean Annual Rainfall (inches) for Period of Record
017	Hueneme Lighthouse near Port Hueneme	1890	1972	No	34.143333	−119.21	10	Standard Precipitation	13.4
017A	Port Hueneme–U.S. Navy	1972	1982	No	34.146389	−119.205	10	Standard Precipitation	15.6
017B	Port Hueneme–U.S. Navy	1982	1996	No	34.146389	−119.204	10	Standard Precipitation	14.9
017C	Port Hueneme–Oxnard Sewer Plant	1996	N/A	Yes	34.141684	−119.187	10	Recording Precipitation Gauge	11.4
032	Oxnard–Water Department	1902	2003	No	34.201389	−119.175	53	Standard Precipitation	14.7
032A	Oxnard Civic Center	2003	N/A	Yes	34.200087	−119.18	53	Recording Precipitation Gauge	10.0
168	Oxnard Airport	1956	N/A	Yes	34.201647	−119.208	34	Recording Precipitation Gauge	14.1
156	Oxnard CIMIS Station	2001	N/A	Yes	34.2233639	−119.196920	77	CIMIS Station	12.4
177	Camarillo–Pacific Sod	1956	2004	No	34.156446	−119.079	20	Standard Precipitation	12.7
177A	Camarillo–Pacific Sod	2004	N/A	Yes	34.155471	−119.073	20	Recording Precipitation Gauge	9.9
215	Channel Islands Harbor	1963	N/A	Yes	34.162042	−119.223	5	Standard Precipitation	13.4
215A	Channel Islands Harbor–Kiddie Beach	2015	N/A	Yes	34.158944	−119.222	15	Recording Precipitation Gauge	2.5
223	Point Mugu–U.S. Navy	1946	1976	No	34.118333	−119.107	5	Standard Precipitation Midnight	10.0
223A	Point Mugu–U.S. Navy	1976	N/A	Yes	34.112778	−119.119	12	Standard Precipitation Midnight	13.8
231	El Rio–County Yard	1966	2006	No	34.241111	−119.177	79	Standard Precipitation	16.7
231A	El Rio–Riverpark	2006	2008	No	34.245417	−119.181	Unknown (near sea level)	Recording Precipitation Gauge	8.8

Table 1-6
Oxnard Plain Precipitation Station Information

Station Number	Station Name	Record Start	Record End	Active?	Latitude	Longitude	Elevation (ft msl)	Station Type	Mean Annual Rainfall (inches) for Period of Record
239	El Rio–UWCD Spreading Grounds	1972	N/A	Yes	34.239405	−119.153	105	Recording Precipitation Gauge	15.2
257	Oxnard South–Vance	1979	1989	No	34.171944	−119.192	27	Standard Precipitation	15.7
261	Saticoy–Recharge Facility	1984	N/A	Yes	34.278889	−119.123	145	Standard Precipitation	16.0
267	Ormond Beach–Occidental Chemical	1989	1993	No	34.140556	−119.171	10	Standard Precipitation	14.1
273A	Oxnard NWS	2010	N/A	Yes	34.207207	−119.137	63	National Weather Service Site	8.6
403	Silverstrand Alert (Type B)	2008	N/A	Yes	34.15271	−119.219	18	Non-Standard Recorder	8.2
412	El Rio–Mesa School APCD	2012	N/A	Yes	34.252361	−119.143	131	Recording Precipitation Gauge	6.7
503	Oxnard Plain–Laguna Road (Type B)	2008	2010	No	34.176072	−119.1	28	Non-Standard Recorder	6.6

Notes: APCD = Air Pollution Control District; CIMIS = California Irrigation Management Information System; ft msl = feet above mean sea level; N/A = not applicable, because gauge is active; NWS = National Weather Service; UWCD = United Water Conservation District.

Table 1-7
Drought Periods in the Oxnard Plain

Drought Period	Duration (years)	Cumulative Deficit (inches)
1918–1936	18	−47.2
1944–1951	7	−31.5
1958–1964	6	−25.2
1969–1977	8	−24.8
1986–1991	5	−25.1
2011–2016	5	−27.7

Table 1-8
Past and Present Land Uses within the Oxnard Plain, 1990–2015

Land Use Category	1990		1993		2001		2005		2015	
	Acres	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*
Agriculture										
Orchards and Vineyards	4,863	8%	5,088	9%	4,438	8%	2,491	4%	—	—
Cropland and Improved Pasture Land	23,080	40%	22,921	40%	21,917	38%	22,188	39%	—	—
Nurseries	698	1%	743	1%	1,343	2%	1,677	3%	—	—
Horse Ranches	9	0%	9	0%	5	0%	8	0%	—	—
Other Agriculture	252	0%	245	0%	271	0%	265	0%	—	—
Dairy/Livestock	66	0%	66	0%	37	0%	25	0%	—	—
Total	**28,969**	**51%**	**29,073**	**51%**	**28,011**	**49%**	**26,654**	**47%**	**26,636**	**47%**
Vacant/Open Space										
Open Space	5,070	9%	4,713	8%	4,247	7%	4,007	7%	—	—
Water	358	1%	472	1%	461	1%	533	1%	—	—
Total	**5,429**	**9%**	**5,185**	**9%**	**4,707**	**8%**	**4,540**	**8%**	**3,662**	**6%**
Urban/Built-Up										
Residential	8,061	14%	8,211	14%	8,810	15%	9,339	16%	—	—
Mixed Commercial and Industrial	2,399	4%	2,340	4%	2,403	4%	3,156	6%	—	—
Commercial and Services	8,136	14%	8,277	14%	8,556	15%	8,795	15%	—	—
Industrial	1,977	3%	1,835	3%	2,083	4%	2,111	4%	—	—
Transportation, Communication, and Utilities	2,335	4%	2,384	4%	2,734	5%	2,695	5%	—	—
Total	**22,907**	**40%**	**23,047**	**40%**	**24,586**	**43%**	**26,096**	**46%**	**26,542**	**47%**

Sources: SCAG 2005 (for 1990–2005); VCPD 2015 (for 2015).
Notes: Acres and percentages are rounded to the nearest whole number. The land use data for 2015 is based on the Ventura County General Plan land use map (VCPD 2015), which has a lower geographic resolution and uses fewer land use categories than data provided by SCAG for prior years; therefore, only the total amounts/percentages for the larger land use categories are provided for 2015.
The Naval Base Ventura County is primarily included in the "Commercial and Services" category.

Table 1-9
Past, Current, and Projected Population for Ventura County, the Cities of Oxnard and Port Hueneme, and the Oxnard Plain

Population	1990	2000	2010	2012	2015	2040
Ventura County	669,016	756,902	825,378	833,000	853,188	965,210
Oxnard	142,216	170,358	197,899	200,100	206,908	237,300
Port Hueneme	20,322	21,845	21,723	21,800	22,399	22,400
Oxnard Plain	—	—	237,871	—	—	—

Sources: SCAG 2016 (for Ventura County 1990–2040, Oxnard 2012 and 2040, and Port Hueneme 1990–2012 and 2040); City of Oxnard 2011 (for Oxnard 1990–2010); City of Port Hueneme 2016a (Port Hueneme 2015); U.S. Census Bureau 2016 (Oxnard Plain 2010); U.S. Census Bureau 2015 (Oxnard 2015).
Note: — = not available or unknown.

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Table 1-10
Oxnard Subbasin Existing Water Resources Monitoring Programs

Program	Program Agency	Program Description	Parameter	Multi-Basin Program	Source	Link
Surface Water Monitoring Programs						
Ventura County Precipitation Monitoring	VCWPD	Collection of real-time and historical data from a network of precipitation gauges throughout Ventura County (approximately 22 within the Oxnard Subbasin). Data is available on the Web, along with some statistical reports. Gauge data are available in various time increments, depending on gauge type.	Precipitation	LPVB, PVB, ASRVB, Oxnard Subbasin	VCWPD. 2016. Hydrology Section Website. Accessed September 15, 2016.	http://vcwatershed.net/hydrodata/gmap.php?param=rain
Ventura County Streamflow Monitoring Program	VCWPD, in cooperation with USGS	Approximately 64 stream locations are monitored county wide (approximately 13 active and inactive gauges in the Oxnard Subbasin). Available data include average daily flow, event hydrographs, and peak flows.	Streamflow	LPVB, PVB, ASRVB, Oxnard Subbasin	VCWPD. 2016. Hydrology Section Website. Accessed September 15, 2016.	http://vcwatershed.net/hydrodata/gmap.php?param=rain
Ventura County Stream Gauging Program	USGS, UWCD	Approximately 64 stream locations are monitored county wide. Available data include average daily flow, event hydrographs, and peak flows.	Streamflow	Oxnard Subbasin, PVB	UWCD. 2014. Groundwater and Surface Water Conditions Report – 2013. UWCD Open-File Report 2014-12 (p. 31).	http://www.unitedwater.org/images/stories/reports/GW-Conditions-Reports/2013%20GW%20and%20SW%20Conditions%20Report%20(UWCD%202014)%20FINAL.pdf
Surface Water Quality Monitoring Program	UWCD	Monitoring of surface water quality at variable intervals. Parameters monitored include general minerals, temperature, and pH. Data are used to confirm that water quality is acceptable for groundwater recharge and agricultural irrigation.	Streamflow	Oxnard Subbasin, PVB	UWCD. 2014. Groundwater and Surface Water Conditions Report – 2013. UWCD Open-File Report 2014-12 (p. 31).	http://www.unitedwater.org/images/stories/reports/GW-Conditions-Reports/2013%20GW%20and%20SW%20Conditions%20Report%20(UWCD%202014)%20FINAL.pdf
Los Angeles Regional Water Quality Control Board Surface Water Quality Sampling	—	—	—	—	UWCD. 2014. Groundwater and Surface Water Conditions Report – 2013. UWCD Open-File Report 2014-12 (p. 32).	—
Existing Groundwater Monitoring Programs						
California Statewide Groundwater Elevation Monitoring (CASGEM)	DWR program implemented by VCWPD	DWR-mandated program (Senate Bill X7-6) to track seasonal and long-term groundwater elevation trends.	Groundwater Elevation	LPVB, PVB, ASRVB, Oxnard Subbasin	DWR. 2016. California Statewide Groundwater Elevation Monitoring (CASGEM) Program. 2016. Accessed September 15, 2016.	http://www.water.ca.gov/groundwater/casgem/
Groundwater Ambient Monitoring and Assessment Program (GAMA)	SWRCB	SWRCB Program implemented in 2000 (modified by Assembly Bill 599 in 2001) to monitor and assess groundwater basins throughout the state.	Groundwater Quality	LPVB, PVB, ASRVB, Oxnard Subbasin	SWRCB. 2016. GAMA – Groundwater Ambient Monitoring and Assessment Program Website. Accessed September 22, 2016.	http://www.swrcb.ca.gov/gama/
Ventura County Groundwater Elevation Monitoring Program	VCWPD	Quarterly measurement of approximately 200 groundwater well elevations (approximately 38 within the Oxnard Subbasin) throughout Ventura County by VCWPD staff.	Groundwater Elevation	Oxnard Subbasin, LPVB, PVB, ASRVB	VCWPD. 2015. 2014 Annual Report of Groundwater Conditions (p. 12.)	http://pwaportal.ventura.org/WPD/docs/Groundwater-Resources/2014%20Annual%20Report-Web.pdf
Ventura County Groundwater Quality Monitoring Program	VCWPD	Approximately 150 wells sampled throughout the County (approximately 46 in the Oxnard Subbasin) and analyzed for general minerals and other constituents.	Groundwater Quality	Oxnard Subbasin, LPVB, PVB, ASRVB	VCWPD. 2015. 2014 Annual Report of Groundwater Conditions (p. 12).	http://pwaportal.ventura.org/WPD/docs/Groundwater-Resources/2014%20Annual%20Report-Web.pdf
UWCD Groundwater Quality Monitoring Program	UWCD	Measurement of groundwater water quality throughout the UWCD boundaries to comply with state standards for aesthetics and safety, monitor saltwater intrusion and saline migration, and track changes to water quality. Approximately 120 wells are sampled in the Oxnard Subbasin.	Groundwater Quality	Oxnard Subbasin, PVB	UWCD. 2014. Groundwater and Surface Water Conditions Report – 2013. UWCD Open-File Report 2014-12 (p. 26).	http://www.unitedwater.org/images/stories/reports/GW-Conditions-Reports/2013%20GW%20and%20SW%20Conditions%20Report%20(UWCD%202014)%20FINAL.pdf
FCGMA Groundwater Extraction Reporting Program (1985)	FCGMA	Since 1985, FCGMA has collected extraction records from well operators on a semi-annual basis. Requirements include periodic calibration of meters.	Groundwater Extraction	Oxnard Subbasin, LPVB, PVB, ASRVB	FCGMA, UWCD, and CMWD. 2007. 2007 Update to the Fox Canyon Groundwater Management Agency Groundwater Management Plan. May 2007 (p. 17).	http://www.fcgma.org/component/content/article/20-public-documents/plans/95-groundwater-management-plan

Table 1-10
Oxnard Subbasin Existing Water Resources Monitoring Programs

Program	Program Agency	Program Description	Parameter	Multi-Basin Program	Source	Link
Basin Management Objectives Monitoring	FCGMA	FCGMA has established a set of Basin Management Objectives that pertain to the overall health of the groundwater basins, including water levels and water quality. Each year, FCGMA publishes a report tracking the progress toward meeting the objectives.	Groundwater Conditions	Oxnard Subbasin, LPVB, PVB, ASRVB	FCGMA, UWCD, and CMWD. 2007. 2007 Update to the Fox Canyon Groundwater Management Agency Groundwater Management Plan. May 2007 (p. iii).	http://www.fcgma.org/component/content/article/20-public-documents/plans/95-groundwater-management-plan
Other Existing Programs						
Ventura County Evaporation Monitoring	VCWPD	There is an evaporation gauge that records monthly evaporation from El Rio Spreading Grounds.	Evaporation	Oxnard Subbasin	VCWPD. 2016. Hydrology Section Website. Accessed September 15, 2016.	http://vcwatershed.net/hydrodata/gmap.php?param=rain
California Irrigation Management Information System (CIMIS)	DWR	CIMIS manages a network of over 145 automated weather stations in California.	Temperature, Precipitation, Evapo-transpiration	LPVB, PVB	CIMIS. 2018. CIMIS Data Website. Accessed January 15, 2018.	http://www.cimis.water.ca.gov
California Water Rights Permit 18908	UWCD, Water Rights Decision	Specifies conditions of release and diversion for habitat conservation.	Surface Water, Environmental	—	UWCD. 2014. Groundwater and Surface Water Conditions Report – 2013. UWCD Open-File Report 2014-12 (p. 18).	http://www.unitedwater.org/images/stories/reports/GW-Conditions-Reports/2013%20GW%20and%20SW%20Conditions%20Report%20(UWCD%202014)%20FINAL.pdf
Salt Nutrient Management Plans	VCWPD	Complies with the SWRCB Recycled Water Policy.	Water Quality	Oxnard Forebay	VCWPD. 2015. Lower Santa Clara River Salt and Nutrient Management Plan. Prepared by Larry Walker Associates. April 2015.	http://www.waterboards.ca.gov/losangeles/water_issues/programs/salt_and_nutrient_management/docs/2015/May/DraftSaltandNutrientManagementPlan/Section1IntroductionandGoals.pdf

Notes: ASRVB = Arroyo Santa Rosa Valley Basin; CIMIS = California Irrigation Management Information System; CMWD = Calleguas Municipal Water District; DWR = California Department of Water Resources; FCGMA = Fox Canyon Groundwater Management Agency; LPVB = Las Posas Valley Basin; PVB = Pleasant Valley Basin; SWRCB = State Water Resources Control Board; USGS = U.S. Geological Survey; UWCD = United Water Conservation District; VCWPD = Ventura County Watershed Protection District.

Table 1-11
Oxnard Subbasin Existing Water Resources Management Projects, Programs, and Strategies

Program/Project	Program Agency	Program Description	Parameter	Conjunctive Use Program?	Multi-Basin Program	Source	Link
Existing Surface Water Management Projects, Programs, and Strategies							
Ventura County Stormwater Quality Monitoring Program	Ventura County Watershed Protection District, Camarillo, Moorpark, Oxnard, Port Hueneme, and others.	Program meets the requirements of the Ventura County Stormwater Permits. Includes water quality sampling, watershed assessments, business inspections, and pollution prevention programs.	Surface Water Quality	No	Oxnard Subbasin, LPVB, PVB, ASRVB	Ventura Countywide Stormwater Quality Management Program Website. Accessed September 15, 2016.	http://www.vcstormwater.org/
State Water Project Importation	DWR, Ventura County, UWCD, CMWD, and City of Ventura	Purchase of up to 5,000 AFY of Ventura County's 20,000 AFY State Water Project allocation for release and percolation from Lake Piru, the Freeman Diversion, and surface deliveries to Pleasant Valley through the PTP. The water reaching the Freeman Diversion is considered a "foreign water supply" and is credited to UWCD.	Supplemental Water	Yes	Oxnard, LPVB, PVB, ASRVB	UWCD. 2014. Groundwater and Surface Water Conditions Report - 2013. UWCD Open-File Report 2014-12 (p. 36). FCGMA, UWCD, and CMWD. 2007. 2007 Update to the Fox Canyon Groundwater Management Agency Groundwater Management Plan. May 2007 (p. 50).	http://www.unitedwater.org/images/stories/reports/GW-Conditions-Reports/2013%20GW%20and%20SW%20Conditions%20Report%20(UWCD%202014)%20FINAL.pdf

Table 1-11
Oxnard Subbasin Existing Water Resources Management Projects, Programs, and Strategies

Program/Project	Program Agency	Program Description	Parameter	Conjunctive Use Program?	Multi-Basin Program	Source	Link
Importation of Metropolitan Water District Water	CMWD	Import and deliver water from wholesaler Metropolitan Water District. Water purchased by water retailers such as the City of Oxnard to supplement water supply instead of pumping groundwater.	Supplemental Water	Yes	Oxnard Subbasin, PVB, LPVB	CMWD. 2015. Urban Water Management Plan – Final, pp. 1-1, 4-1, 4-2 (Figure 4-1), 6-1, 6-13.	http://www.mwdh2o.com/Who%20We%20Are%20%20.2007Fact%20Sheets/Member%20Agency%20Map.pdf http://www.mwdh2o.com/WhoWeAre/Member-Agencies/.2007Pages/default.aspx http://www.mwdh2o.com/WhoWeAre/History/Pages/default.aspx http://www.calleguas.com/images/docs-documents-reports/cmwdfinal2015uwmp.pdf
Salinity Management Pipeline	CMWD	A brine disposal pipeline that collects brine generated by desalting facilities in the LPVB, PVB, and Oxnard Subbasin and conveys it to an ocean outfall for disposal. Future construction of the pipeline is expected to serve additional facilities, including those in the ASRVB.	Surface Water	Yes	Oxnard Subbasin, LPVB, PVB, ASRVB	CMWD. 2015. Urban Water Management Plan – Final, p. 6-1.	http://www.calleguas.com/images/docs-documents-reports/cmwdfinal2015uwmp.pdf
Existing Groundwater Management Projects, Programs, and Strategies							
Basin Management Objective Program	FCGMA	FCGMA has established a set of Basin Management Objectives that pertain to the overall health of the groundwater basins, including water levels and water quality. Each year, FCGMA publishes a report tracking the progress toward meeting the objectives.	Groundwater Conditions	No	Oxnard Subbasin, LPVB, PVB, ASRVB	FCGMA, UWCD, and CMWD. 2007. 2007 Update to the Fox Canyon Groundwater Management Agency Groundwater Management Plan. May 2007 (p. iii).	http://www.fcgma.org/component/content/article/20-public-documents/plans/95-groundwater-management-plan
FCGMA Groundwater Storage (including In-Lieu) Credit Program	FCGMA	This is a program by which credits are issued to the deliverer in equal amounts to the amount of delivered "newly available" water, imported water from outside the County, recycled water, or diverted surface water that would otherwise be wasted to the ocean. Delivered water used in lieu of pumping.	Groundwater	Yes	Oxnard Subbasin, LPVB, PVB, ASRVB	FCGMA. 2015. Fox Canyon Groundwater Management Agency, Calendar Year 2014 Annual Report (p. 23).	http://www.fcgma.org/public-documents/reports
FCGMA Groundwater Injection Credit Program	FCGMA	This is a program by which credits are issued to operators that inject "newly available" water, water from outside the County, or recycled water.	Groundwater	Yes	LPVB, PVB, ASRVB, Oxnard Subbasin	FCGMA. 2015. Fox Canyon Groundwater Management Agency, Calendar Year 2014 Annual Report (p. 23).	http://www.fcgma.org/public-documents/reports
Salinity Management Pipeline	CMWD	A brine disposal pipeline that collects brine generated by desalting facilities in the LPVB, PVB, and Oxnard Subbasin and conveys it to an ocean outfall for disposal. Future construction of the pipeline is expected to serve additional facilities, including those in the ASRVB.	Groundwater	Yes	Oxnard Subbasin, LPVB, PVB, ASRVB	CMWD. 2015. Urban Water Management Plan – Final, p. 6-1.	http://www.calleguas.com/images/docs-documents-reports/cmwdfinal2015uwmp.pdf
Groundwater Supply Policy (Formerly Brackish Groundwater Policy)	FCGMA	The FCGMA Board of Directors adopted Resolution No. 2016-05, a policy for evaluating and authorizing proposals for groundwater supply projects. It allows for consideration of development of brackish groundwater for supply projects subject to monitoring requirements and other constraints and restrictions including compliance with SGMA.	Groundwater	Yes	Oxnard Subbasin, LPVB, PVB, ASRVB	FCGMA. n.d. Draft Brackish Groundwater Project Pumping Policy.	http://www.fcgma.org/images/Erin/Draft%20Brackish%20Groundwater%20Project%20Pumping%20Policy%20revised%2020160720.pdf

Table 1-11
Oxnard Subbasin Existing Water Resources Management Projects, Programs, and Strategies

Program/Project	Program Agency	Program Description	Parameter	Conjunctive Use Program?	Multi-Basin Program	Source	Link
Extraction Fee Program	FCGMA	Groundwater extractors are assessed fees per acre-foot of extraction. Fees have been used by FCGMA to finance its management activities since its enabling legislation in 1983.	Groundwater	No	Oxnard Subbasin, LPVB, PVB, ASRVB	Assembly Bill No. 2995, Article 9.	http://www.fcgma.org/fcgma.old/publicdocuments/ordinances/ordinanceAB-2995.pdf
Groundwater Extraction Limitation Program	FCGMA	FCGMA has implemented a program of reduced allocations.	Groundwater	No	Oxnard Subbasin, LPVB, PVB, ASRVB	FCGMA, UWCD, and CMWD. 2007. 2007 Update to the Fox Canyon Groundwater Management Agency Groundwater Management Plan. May 2007 (p. 45).	http://www.fcgma.org/component/content/article/20-public-documents/plans/95-groundwater-management-plan
Extraction Surcharge Program	FCGMA	FCGMA charges a fee to well operators for groundwater extractions in excess of annual allocation amounts	Groundwater	No	Oxnard Subbasin, LPVB, PVB, ASRVB	FCGMA, UWCD, and CMWD. 2007. 2007 Update to the Fox Canyon Groundwater Management Agency Groundwater Management Plan. May 2007 (p. 45).	http://www.fcgma.org/component/content/article/20-public-documents/plans/95-groundwater-management-plan
Prohibition of export of groundwater	FCGMA	FCGMA Ordinance requires Board of Directors approval for the export of groundwater from within the FCGMA boundary for use outside of the boundary	Groundwater	No	Oxnard Subbasin, LPVB, PVB, ASRVB	FCGMA Ordinance Code, Chapter 5, 5.2.2.1.	http://www.fcgma.org/images/ordinances_legislation/Ord_Code_FINAL_-_amended_01-09-2015.pdf
Other Existing Programs							
IRWM Program	WCVC	Initiated with Proposition 50 in 2006, the program provides competitive grant funds for projects and studies in accordance with a comprehensive IRWM Plan.	Groundwater, Surface Water	No	Oxnard Subbasin, LPVB, PVB, ASRVB	Ventura County Watersheds Coalition. 2016. WCVC. Accessed September 15, 2016.	http://www.ventura.org/wcvc/IRWMP/2014IRWMP.htm
Oxnard–Hueneme Pipeline (1954)	UWCD	Pumping of Oxnard Forebay wells to supply water to the Cities of Oxnard and Port Hueneme, thus avoiding coastal pumping and exacerbation of seawater intrusion.	Groundwater Quality	Yes	Oxnard Subbasin	UWCD. 2014. Groundwater and Surface Water Conditions Report – 2013. UWCD Open-File Report 2014-12 (pp. 7–8).	http://www.unitedwater.org/images/stories/reports/GW-Conditions-Reports/2013%20GW%20and%20SW%20Conditions%20Report%20(UWCD%202014)%20FINAL.pdf
Pumping Trough Pipeline (1986)	UWCD	Supplies agriculture on the Oxnard Subbasin with a combination of surface water diverted from the Santa Clara River and groundwater, thus reducing the need for groundwater pumpage in the central Oxnard Plain pumping depression (1986).	Surface/ Groundwater	Yes	Oxnard Subbasin and PVB	UWCD. 2014. Groundwater and Surface Water Conditions Report – 2013. UWCD Open-File Report 2014-12 (p. 5).	http://www.unitedwater.org/images/stories/reports/GW-Conditions-Reports/2013%20GW%20and%20SW%20Conditions%20Report%20(UWCD%202014)%20FINAL.pdf
The Freeman Diversion (1991)	UWCD	Diversion of Santa Clara River flood flows to Saticoy, El Rio, and Noble Basins for groundwater recharge and surface deliveries through the PTP and PVP. The Freeman Diversion allows for surface water supply in place of groundwater pumping, thus reducing the risk of seawater intrusion.	—	Yes	Oxnard Subbasin and PVB	UWCD. 2014. Groundwater and Surface Water Conditions Report – 2013. UWCD Open-File Report 2014-12 (p. 39).	http://www.unitedwater.org/images/stories/reports/GW-Conditions-Reports/2013%20GW%20and%20SW%20Conditions%20Report%20(UWCD%202014)%20FINAL.pdf
The Noble Spreading Grounds (1995)	UWCD	Diversion of Santa Clara River flows to spreading grounds recharging both the UAS and LAS.	—	Yes	—	UWCD. 2014. Groundwater and Surface Water Conditions Report – 2013. UWCD Open-File Report 2014-12 (p. 5).	http://www.unitedwater.org/images/stories/reports/GW-Conditions-Reports/2013%20GW%20and%20SW%20Conditions%20Report%20(UWCD%202014)%20FINAL.pdf
Saticoy Well Field (2003)	UWCD	Draws from the mound beneath the Saticoy Spreading Grounds and allows for additional Santa Clara River recharge.	—	Yes	—	UWCD. 2014. Groundwater and Surface Water Conditions Report – 2013. UWCD Open-File Report 2014-12 (p. 5).	http://www.unitedwater.org/images/stories/reports/GW-Conditions-Reports/2013%20GW%20and%20SW%20Conditions%20Report%20(UWCD%202014)%20FINAL.pdf

Table 1-11
Oxnard Subbasin Existing Water Resources Management Projects, Programs, and Strategies

Program/Project	Program Agency	Program Description	Parameter	Conjunctive Use Program?	Multi-Basin Program	Source	Link
Rose and Ferro Spreading Grounds	UWCD	Diversion of Santa Clara River Water to former mining pits for the recharge of groundwater.	—	Yes	—	UWCD. 2014. Groundwater and Surface Water Conditions Report – 2013. UWCD Open-File Report 2014-12 (p. 6).	http://www.unitedwater.org/images/stories/reports/GW-Conditions-Reports/2013%20GW%20and%20SW%20Conditions%20Report%20(UWCD%202014)%20FINAL.pdf
El Rio Spreading Grounds	UWCD	Diversion of Santa Clara River flows to spreading grounds recharging both the UAS and LAS.	—	Yes	—	UWCD. 2014. Groundwater and Surface Water Conditions Report – 2013. UWCD Open-File Report 2014-12 (p. 5).	http://www.unitedwater.org/images/stories/reports/GW-Conditions-Reports/2013%20GW%20and%20SW%20Conditions%20Report%20(UWCD%202014)%20FINAL.pdf
Pleasant Valley Pipeline	UWCD	Water diverted from Santa Clara River is provided to the PVCWD via a pipeline that terminates at the Pleasant Valley Reservoir. This water is supplied to agricultural users and offsets the need for groundwater pumping.	—	Yes	Oxnard Subbasin and PVB	UWCD. 2014. Groundwater and Surface Water Conditions Report – 2013. UWCD Open-File Report 2014-12 (p. 8).	http://www.unitedwater.org/images/stories/reports/GW-Conditions-Reports/2013%20GW%20and%20SW%20Conditions%20Report%20(UWCD%202014)%20FINAL.pdf
Conejo Creek Diversion (2002)	CWD	PVCWD receives surface water from CWD's Conejo Creek Diversion.	Surface Water	Yes	—	UWCD. 2014. Groundwater and Surface Water Conditions Report – 2013. UWCD Open-File Report 2014-12 (p. 9).	http://www.unitedwater.org/images/stories/reports/GW-Conditions-Reports/2013%20GW%20and%20SW%20Conditions%20Report%20(UWCD%202014)%20FINAL.pdf
FCGMA M&I Allocation Program	FCGMA	The current M&I allocation program, also known as a Temporary Extraction Allocation, was implemented with the passage of Ordinance E in 2014. It was implemented for M&I users, replacing HA and BA.	Groundwater	Yes	Oxnard Subbasin, LPVB, PVB, ASRVB	FCGMA. 2015. Calendar Year 2014 Annual Report (p. 10).	http://www.fcgma.org/public-documents/reports
FCGMA Irrigation Allocation Program	FCGMA	Requirement for agricultural irrigation efficiency as compared to FCGMA calculations for required irrigation for specific crop types with consideration of weather conditions.	Groundwater Extractions	Yes	Oxnard Subbasin, LPVB, PVB, ASRVB	FCGMA. 2015. Calendar Year 2014 Annual Report (p. 10).	http://www.fcgma.org/public-documents/reports
Groundwater Recovery Enhancement and Treatment (GREAT) Program – 2013	City of Oxnard	A desalination facility, recycled water system, ASR facility, and brine disposal line combine to provide non-potable M&I water and agricultural irrigation water, to reduce pumping of LAS groundwater.	Groundwater/ Surface Water	Yes	Oxnard Subbasin and Oxnard Forebay	FCGMA, UWCD, and CMWD. 2007. 2007 Update to the Fox Canyon Groundwater Management Agency Groundwater Management Plan. May 2007 (p. 54).	http://www.fcgma.org/component/content/article/20-public-documents/plans/95-groundwater-management-plan
Various Water Conservation Programs	Ventura County, Cities, and Water Districts	There are numerous conservation programs conducted by Cities, Ventura County, and other entities within FCGMA jurisdiction that provide education, incentives, and regulations to encourage water savings from both the M&I and agricultural sectors. The exact configuration of these programs change with climate and local and state requirements.	Surface Water, Groundwater	No	Oxnard Subbasin, LPVB, PVB, ASRVB	—	—

Notes: AFY = acre-feet per year; ASR = aquifer storage and recovery; ASRVB = Arroyo Santa Rosa Valley Basin; BA = Baseline Allocation; CMWD = Calleguas Municipal Water District; CWD= Camrosa Water District; DWR = California Department of Water Resources; FCGMA = Fox Canyon Groundwater Management Agency; HA = Historical Allocation; IRWM = Integrated Regional Water Management; LPVB = Las Posas Valley Basin; M&I = municipal and industrial; PTP = Pumping Trough Pipeline; PVB = Pleasant Valley Basin; PVCWD= Pleasant Valley County Water District; PVP = Pleasant Valley Pipeline; UWCD = United Water Conservation District; WCVC = Watersheds Coalition of Ventura County.

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Table 1-12
FCGMA Public Meetings on Oxnard Subbasin GSP

Meeting	Date
FCGMA Special Board Meeting	November 8, 2019
TAG Meeting	October 31, 2019
FCGMA Regular Board Meeting	August 28, 2019
GSP Work Shops	August 21,22, 2019
TAG Meeting	August 1, 2019
FCGMA Regular Board Meeting	July 24, 2019
FCGMA Regular Board Meeting	June 26, 2019
FCGMA Special Board Meeting	May 22, 2019
TAG Meeting	May 5, 2019
FCGMA Regular Board Meeting	April 24, 2019
FCGMA GSP Public Workshop No. 4	March 15, 2019
FCGMA Special Board Meeting	March 15, 2019
FCGMA Regular Board Meeting	February 27, 2019
Special TAG Meeting	February 19, 2019
FCGMA Special Board Meeting	February 8, 2019
Special TAG Meeting	February 6, 2019
FCGMA Regular Board Meeting	January 23, 2019
Special TAG Meeting	January 17, 2019
TAG Meeting	December 6, 2018
FCGMA Regular Board Meeting	December 5, 2018
FCGMA Special Board Meeting	November 20, 2018
TAG Meeting	November 1, 2018
FCGMA Regular Board Meeting	October 24, 2018
FCGMA Special Board Meeting	October 12, 2018
TAG Meeting	October 4, 2018
FCGMA Regular Board Meeting	September 26, 2018
FCGMA Special Board Meeting	September 14,2018
TAG Meeting	September 6, 2018
FCGMA Special Board Meeting	August 29, 2018
FCGMA Special Board Meeting Oxnard and Pleasant Valley Pumping Allocation Workshop	July 25, 2018
FCGMA Regular Board Meeting	July 25, 2018
TAG Meeting	July 5, 2018
FCGMA Special Board Meeting	June 20, 2018
Special TAG Meeting	June 19, 2018
TAG Meeting	June 14, 2018
FCGMA Regular Board Meeting	May 23, 2018
TAG Meeting	May 3, 2018
FCGMA Regular Board Meeting	April 25, 2018
TAG Meeting	April 5, 2018
FCGMA Regular Board Meeting	March 28, 2018

Table 1-12
FCGMA Public Meetings on Oxnard Subbasin GSP

Meeting	Date
FCGMA Special Board Meeting	March 9, 2018
TAG Meeting	March 1, 2018
FCGMA Regular Board Meeting	February 28,2018
FCGMA Special Board Meeting	February 26, 2018
FCGMA GSP Public Workshop No. 3	February 8, 2018
TAG Meeting	February 1, 2018
Special TAG Meeting	January 30, 2018
FCGMA Regular Board Meeting	January 24, 2018
TAG Meeting	January 4, 2018
FCGMA Special Board Meeting	January 3, 2018
Special TAG Meeting	December 14, 2018
FCGMA Special Board Meeting	November 13, 2017
TAG Meeting	November 2, 2017
TAG Meeting	October 6, 2017
FCGMA Special Board Meeting	October 13, 2017
FCGMA Regular Board Meeting	October 25, 2017
FCGMA Regular Board Meeting	September 27, 2017
FCGMA GSP Public Stakeholder Workshop No. 2A – Oxnard and Pleasant Valley	September 20, 2017
FCGMA Operations Committee Meeting	September 14, 2017
TAG Meeting	September 7, 2017
FCGMA Special Board Meeting	August 11, 2017
FCGMA Operations Committee Meeting	August 10, 2017
TAG Meeting	August 3, 2017
Special TAG Meeting – Sustainability Objective Concepts	July 27, 2017
FCGMA Regular Board Meeting	July 26, 2017
FCGMA Fiscal Committee Budget Workshop	July 25, 2017
Water Market Pilot Program Ad Hoc Committee Meeting	July 24, 2017
FCGMA Board Executive Committee Meeting	July 12, 2017
TAG Meeting	July 6, 2017
Special TAG Meeting – Groundwater-Dependent Ecosystems	June 29, 2017
FCGMA Regular Board Meeting	June 28, 2017
FCGMA Board Executive Committee Meeting	June 15, 2017
TAG Meeting	June 1, 2017
FCGMA Regular Board Meeting	May 24, 2017
TAG Meeting	May 4, 2017
Special TAG Meeting – Groundwater Models	April 27, 2017
FCGMA Regular Board Meeting	April 26, 2017
Special TAG Meeting	March 24, 2017
Special TAG Meeting – Groundwater Models	March 24, 2017
FCGMA Regular Board Meeting	March 22, 2017

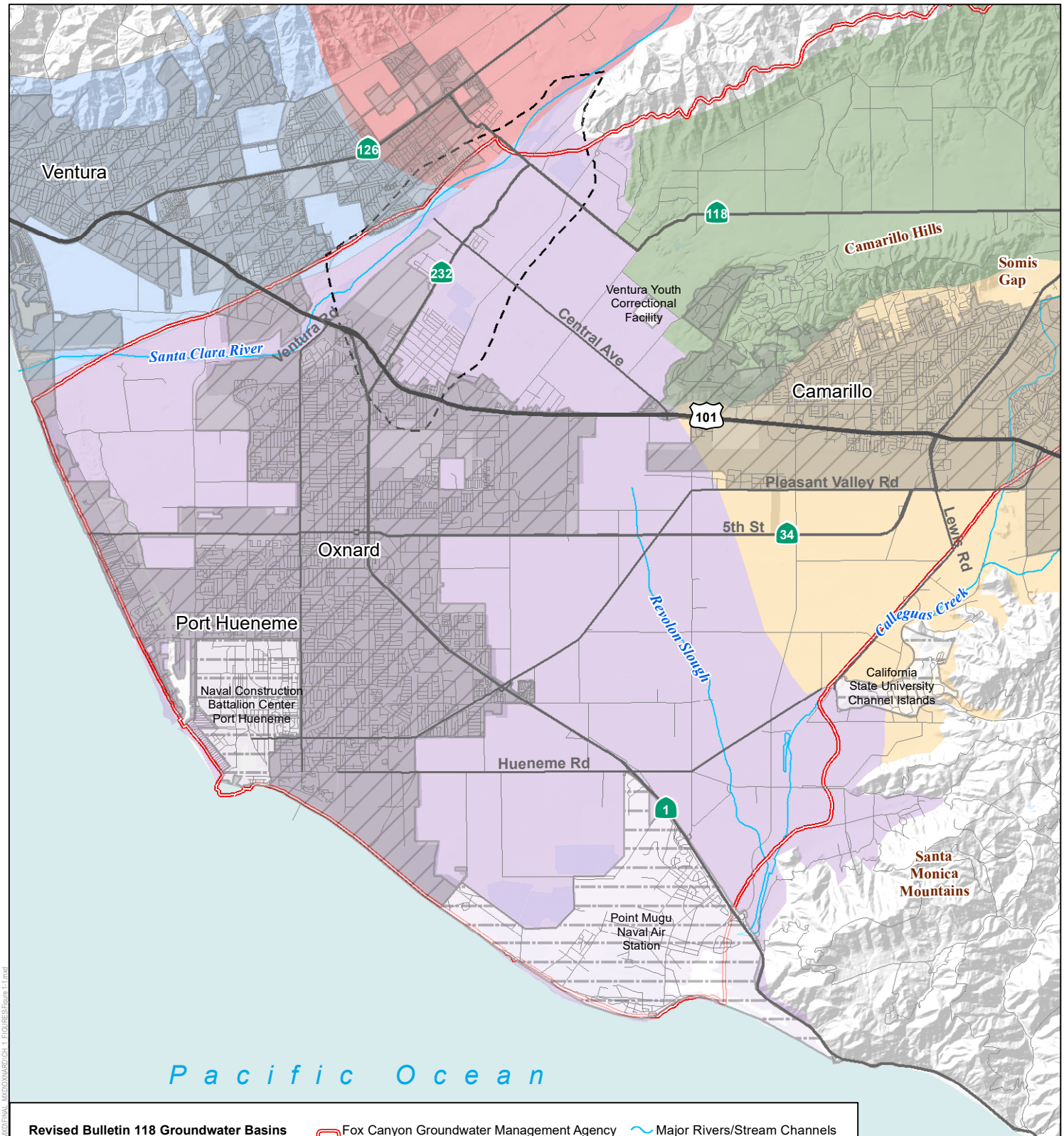
Table 1-12
FCGMA Public Meetings on Oxnard Subbasin GSP

Meeting	Date
TAG Meeting	March 3, 2017
FCGMA Regular Board Meeting	February 22, 2017
TAG Meeting	February 2, 2017
FCGMA Regular Board Meeting	January 25, 2017
TAG Meeting	December 16, 2016
FCGMA Regular Board Meeting	December 9, 2016
TAG Meeting	November 18, 2016
FCGMA GSP Public Workshop No. 1	November 15, 2016
FCGMA Regular Board Meeting	October 26, 2016
TAG Meeting	October 7, 2016
FCGMA Executive Committee	October 3, 2016
FCGMA Regular Board Meeting	September 28, 2016
TAG Meeting	August 26, 2016
TAG Meeting	July 29, 2016
FCGMA Regular Board Meeting	July 20, 2016
FCGMA Regular Board Meeting	June 22, 2016
TAG Meeting	May 27, 2016
FCGMA Regular Board Meeting	May 25, 2016
FCGMA Special Board Meeting	May 13, 2016
TAG Meeting	April 29, 2016
FCGMA Regular Board Meeting	April 27, 2017
TAG Meeting	March 25, 2016
FCGMA Regular Board Meeting	March 23, 2016
FCGMA Special Board Meeting	March 11, 2016
TAG Meeting	February 26, 2016
TAG Meeting	January 29, 2016
FCGMA Regular Board Meeting	January 27, 2016
TAG Meeting	December 18, 2015
FCGMA Regular Board Meeting	December 11, 2015
TAG Meeting	November 20, 2015
FCGMA Special Board Meeting	November 13, 2015
TAG Meeting	October 30, 2015
FCGMA Regular Board Meeting	October 28, 2015
TAG Meeting	September 25, 2015
FCGMA Regular Board Meeting	September 23, 2015
TAG Meeting	August 28, 2015
FCGMA Special Board Meeting	August 13, 2015
TAG Meeting	July 30, 2015
FCGMA Regular Board Meeting	July 22, 2015
FCGMA Regular Board Meeting	June 24, 2015

Table 1-12
FCGMA Public Meetings on Oxnard Subbasin GSP

Meeting	Date
FCGMA Regular Board Meeting	May 27, 2015
FCGMA Regular Board Meeting	April 22, 2015
FCGMA Regular Board Meeting	March 25, 2015

Notes: FCGMA = Fox Canyon Groundwater Management Agency; GSP = Groundwater Sustainability Plan; TAG = Technical Advisory Group.



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SOURCE: DWR; County of Ventura; FCGMA

FIGURE 1-1

Vicinity Map for the Oxnard Subbasin

Groundwater Sustainability Plan for the Oxnard Subbasin

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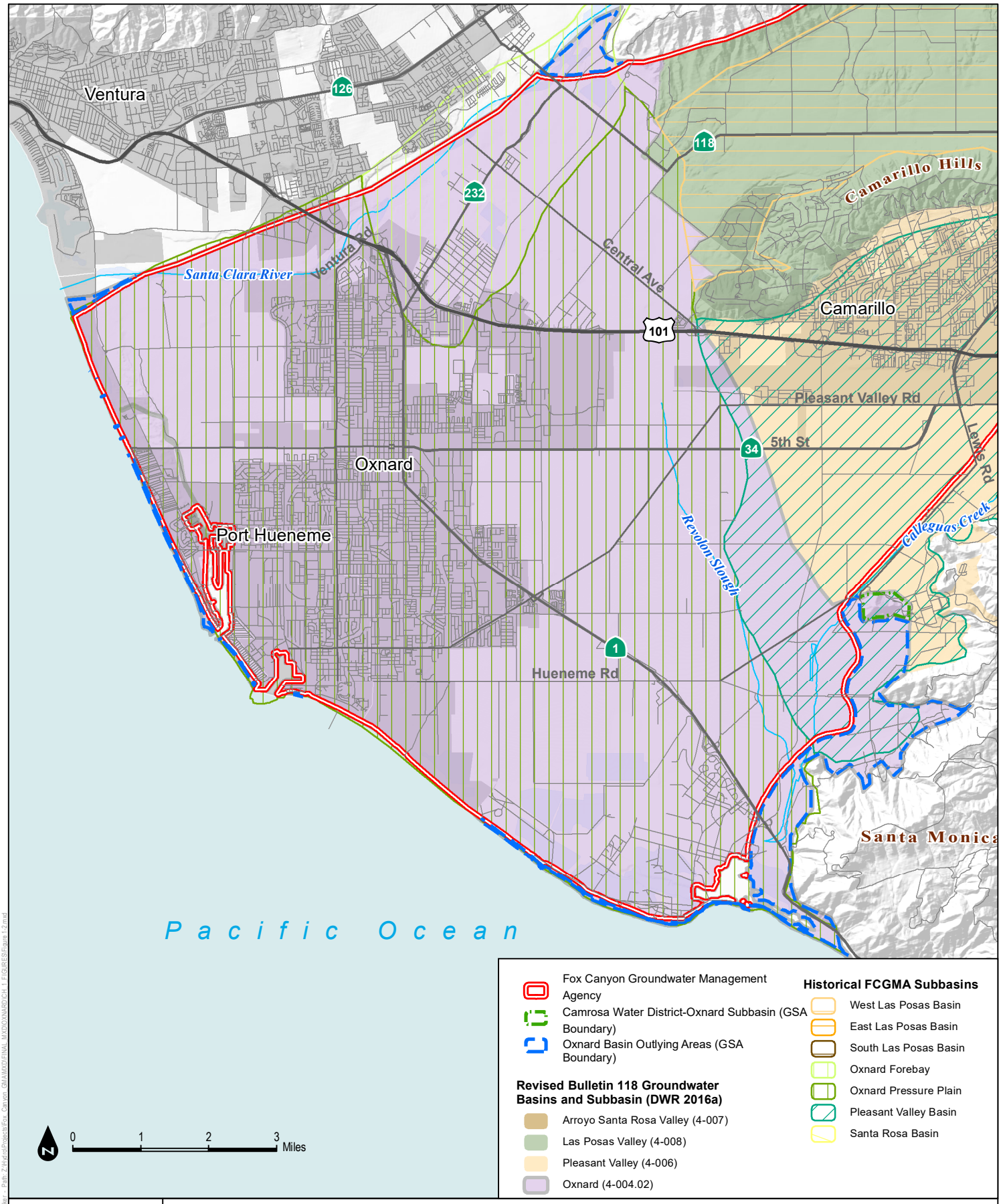

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SOURCE: DWR; County of Santa Barbara; FCGMA

FIGURE 1-2

Administrative Boundaries for the Oxnard Subbasin

Groundwater Sustainability Plan for the Oxnard Subbasin

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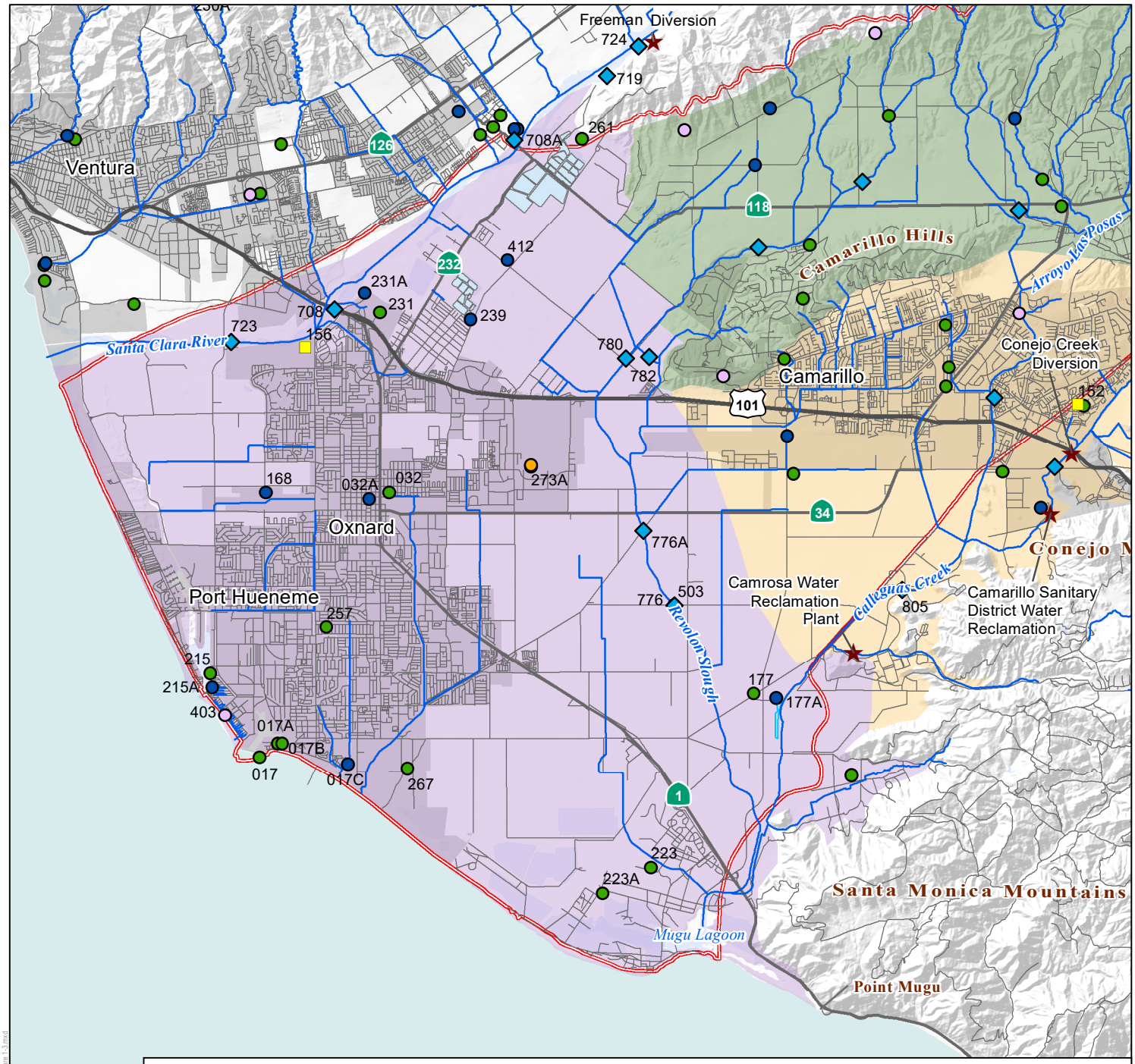

SOURCE: DWR; County of Santa Barbara; VCWPD; USGS NHD

FIGURE 1-3

Weather Station and Stream Gauge Locations

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Groundwater Sustainability Plan for the Oxnard Subbasin

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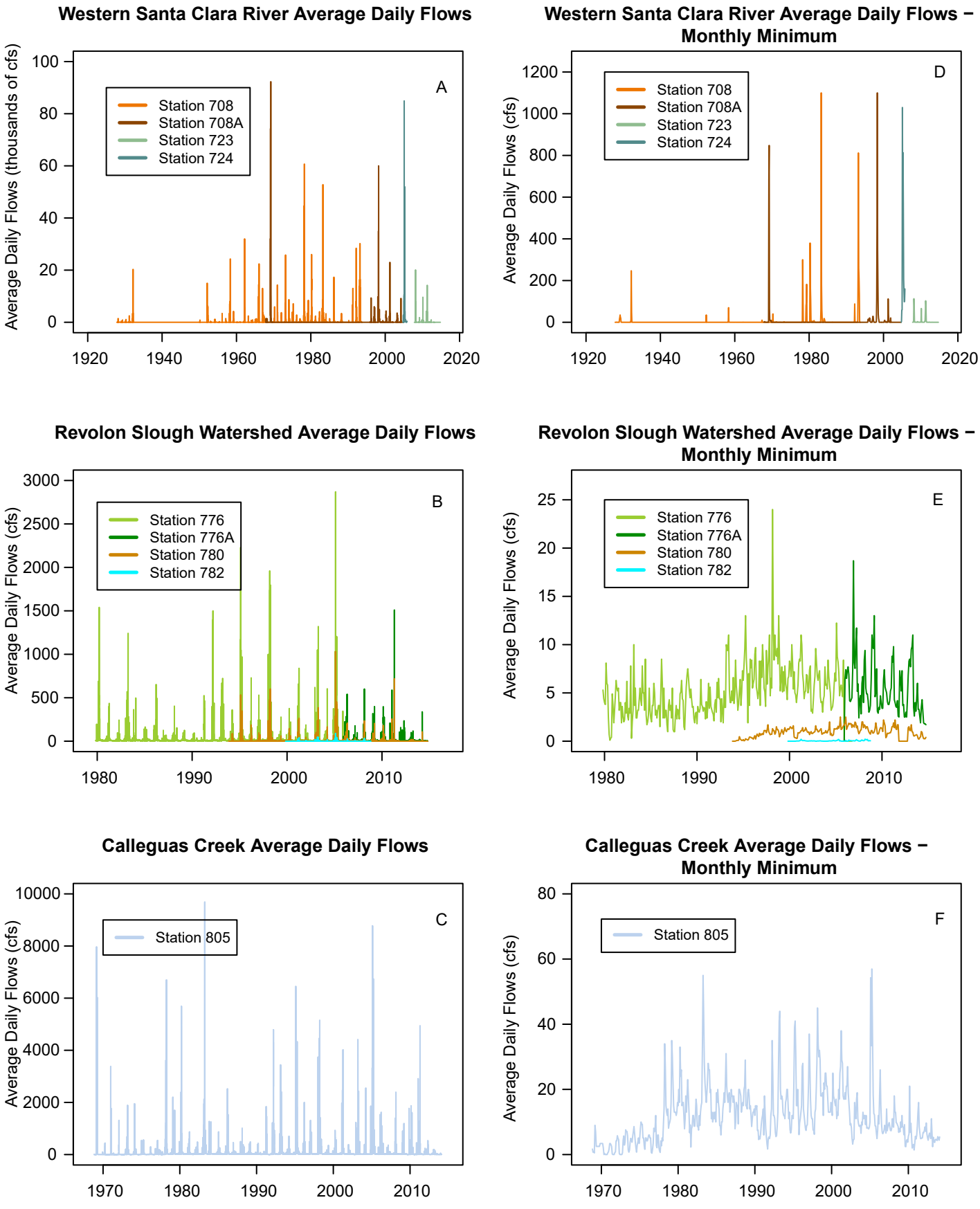

SOURCE: Ventura County Watershed Protection District

FIGURE 1-4

Average Daily Flows (ADF) and Monthly Minimum ADF in Oxnard Surface Waters

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Groundwater Sustainability Plan for the Oxnard Subbasin

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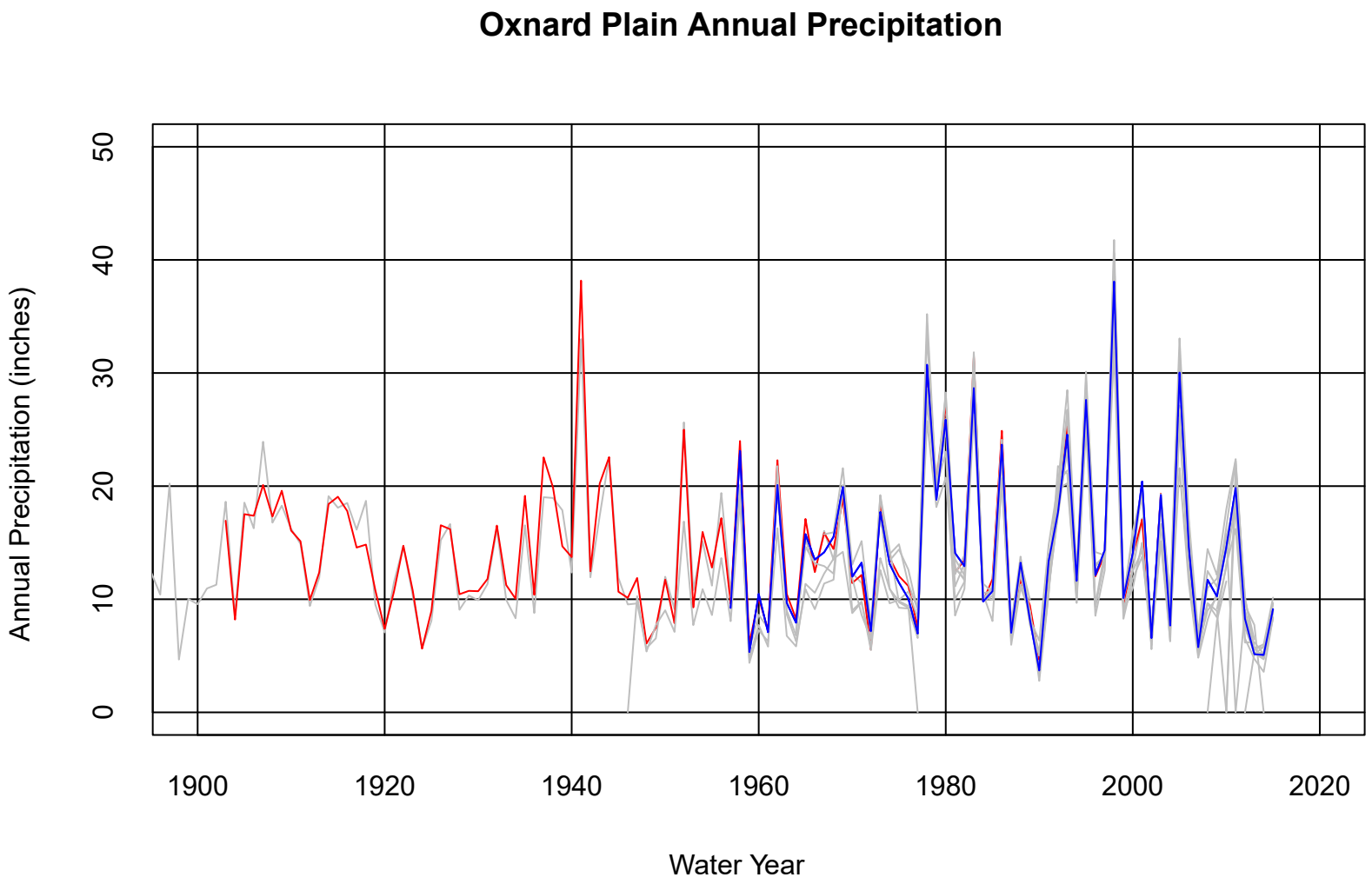

Note: Annual precipitation values recorded at rain gauges within the Oxnard Plain are shown. The majority of the precipitation records are depicted as gray lines. The two gauges used to create a long-term precipitation record, Stations 032 (Oxnard Water Department) and 168 (Oxnard Airport), are displayed in red and blue, respectively. Records plotted in gray are for Stations 017 (and 017A, B and C), 032A, 177 and 177A, 215 and 215A, 223 and 223A, 231A, 239, 257, 261, 267, 273A, 403, 412, and 503.

SOURCE: Ventura County Watershed Protection District

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FIGURE 1-5
Oxnard Plain Annual Precipitation

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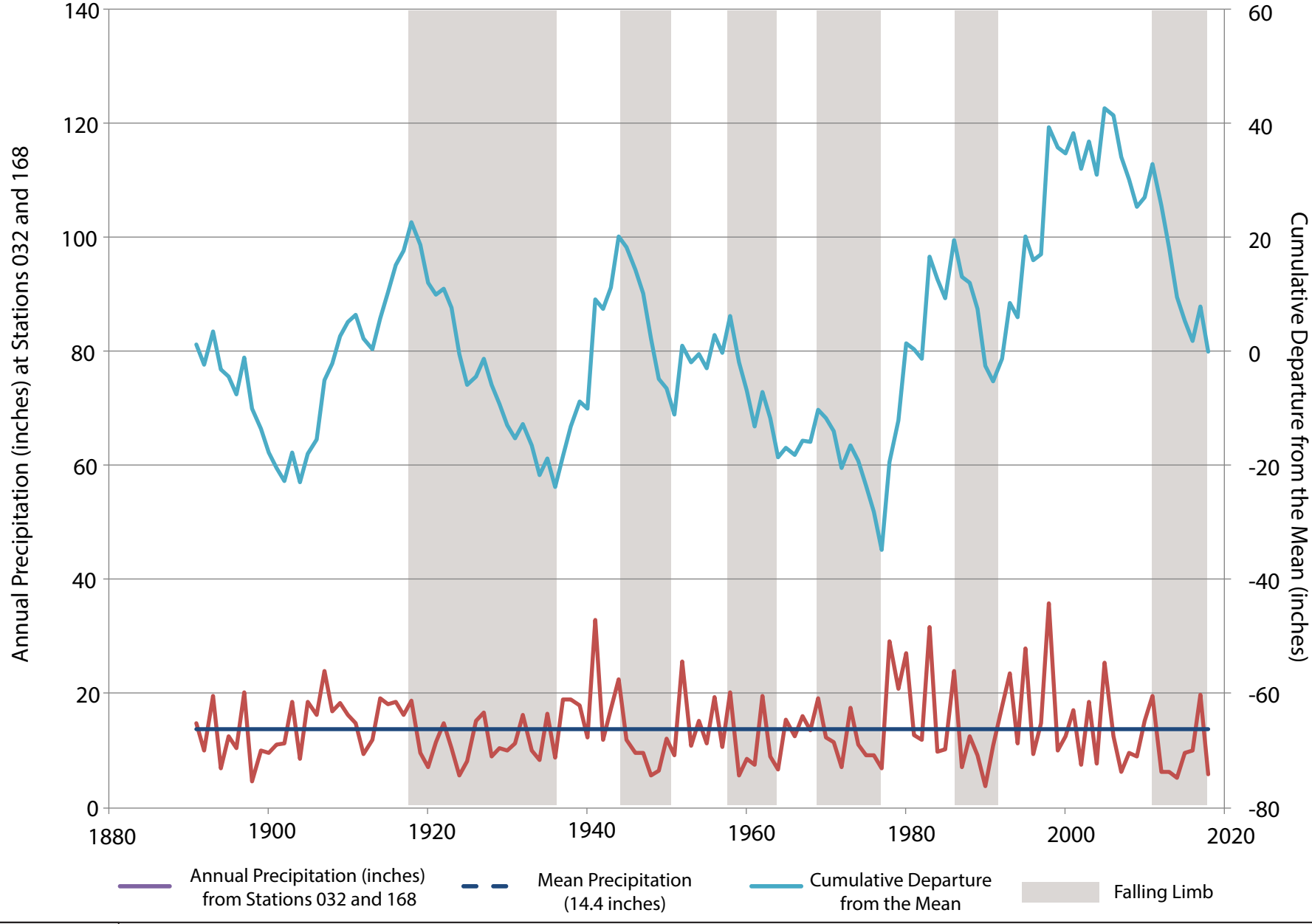

SOURCE: Ventura County Watershed Protection District

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FIGURE 1-6

Long-Term Precipitation Trends in the Oxnard Plain

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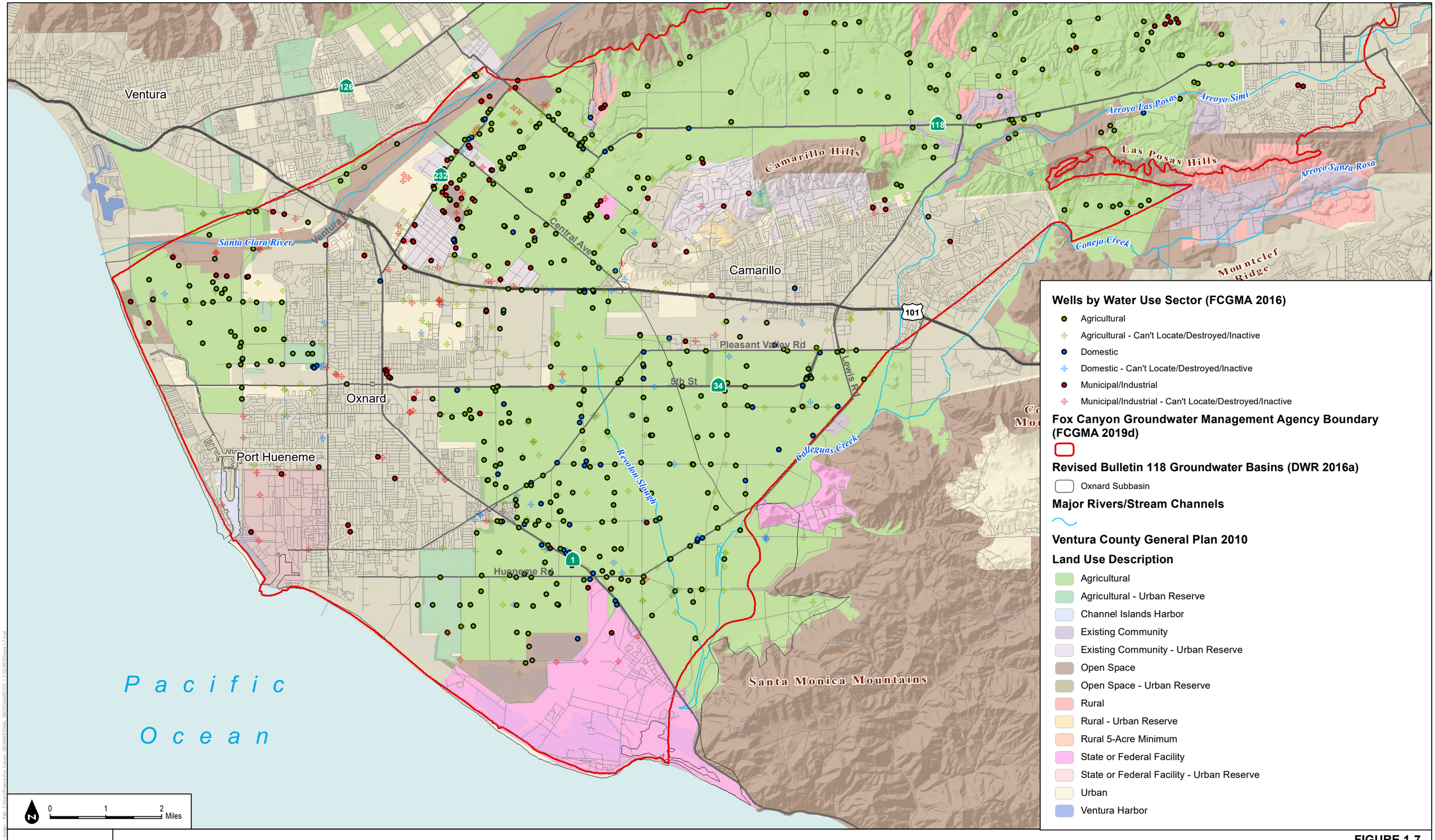

Wells by Water Use Sector (FCGMA 2016)

- Agricultural
- Agricultural - Can't Locate/Destroyed/Inactive
- Domestic
- Domestic - Can't Locate/Destroyed/Inactive
- Municipal/Industrial
- Municipal/Industrial - Can't Locate/Destroyed/Inactive

Fox Canyon Groundwater Management Agency Boundary (FCGMA 2019d)

Revised Bulletin 118 Groundwater Basins (DWR 2016a)

- Oxnard Subbasin

Major Rivers/Stream Channels

Ventura County General Plan 2010

Land Use Description

- Agricultural
- Agricultural - Urban Reserve
- Channel Islands Harbor
- Existing Community
- Existing Community - Urban Reserve
- Open Space
- Open Space - Urban Reserve
- Rural
- Rural - Urban Reserve
- Rural 5-Acre Minimum
- State or Federal Facility
- State or Federal Facility - Urban Reserve
- Urban
- Ventura Harbor

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SOURCE: DWR; County of Ventura; FCGMA

FIGURE 1-7

Land and Water Use

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Ventura County Water Purveyors

CALLEGUAS WHOLESALE DISTRICT

SUPPLIER	WATER COMPANY
Calleguas (CAL-001)	ACADEMY MWC
Calleguas (CAL-002)	ARROYO LAS POSAS MWC
Calleguas (CAL-003)	BALCOLM BIXBY MWA
Calleguas (CAL-004)	BERYLWOOD HEIGHTS MWC
Calleguas (CAL-005)	BRANDES-BARDIN MWC
Calleguas (CAL-006)	CONEJO TRAILER PARK
Calleguas (CAL-007)	CALIFORNIA WATER SERVICE COMPANY
Calleguas (CAL-008)	CALIFORNIA AMERICAN WATER COMPANY
Calleguas (CAL-009)	CALLEGUAS MWD
Calleguas (CAL-011)	CAMROSA WATER DISTRICT
Calleguas (CAL-012)	CITY OF CAMARILLO
Calleguas (CAL-013)	CITY OF OXNARD
Calleguas (CAL-014)	CITY OF THOUSAND OAKS
Calleguas (CAL-015)	CRESTVIEW MWC
Calleguas (CAL-016)	DEL NORTE MWC
Calleguas (CAL-017)	EPWORTH MWC
Calleguas (CAL-019)	FOXFIELD RIDING CLUB
Calleguas (CAL-020)	FULLER FALLS MWC
Calleguas (CAL-022)	SUNSHINE RANCH
Calleguas (CAL-023)	LA LOMA RANCH MWC
Calleguas (CAL-024)	LAKE SHERWOOD CSD
Calleguas (CAL-025)	LAS LOMAS WATER SYSTEM
Calleguas (CAL-026)	MESA WATER COMPANY
Calleguas (CAL-027)	OAK PARK WATER SERVICE
Calleguas (CAL-028)	OXNARD UNION HIGH SCHOOL DISTRICT
Calleguas (CAL-029)	PLEASANT VALLEY MWC
Calleguas (CAL-030)	RANCHO CANADA WATER COMPANY
Calleguas (CAL-031)	TOM GRETHER FARMS, Inc
Calleguas (CAL-036)	GOLDEN STATE WATER CO - Simi Valley
Calleguas (CAL-038)	THERMIC MWC
Calleguas (CAL-038)	VENTURA COUNTY WATERWORKS DISTRICT NO. 1
Calleguas (CAL-039)	VENTURA COUNTY WATERWORKS DISTRICT NO. 8
Calleguas (CAL-040)	VENTURA COUNTY WATERWORKS DISTRICT NO.17
Calleguas (CAL-041)	VENTURA COUNTY WATERWORKS DISTRICT NO.19
Calleguas (CAL-042)	WATERS ROAD USERS GROUP
Calleguas (CAL-044)	ZONE MWC
Calleguas (CAL-179)	BUTLER RANCH MWC
Calleguas (CAL-190)	BALCOM CANYON WATER WELL
Calleguas (CAL-195)	EL CAMPECON RANCH
Calleguas (CAL-196)	COMMANDA RANCH

CASITAS WHOLESALE DISTRICT

SUPPLIER	WATER COMPANY
Casitas (CAS-046)	CASITAS MWD
Casitas (CAS-047)	CASITAS MWC
Casitas (CAS-048)	CITY OF SAN BUENAVENTURA
Casitas (CAS-049)	DENNISON PARK WATER SYSTEM
Casitas (CAS-051)	GRIDLEY ROAD WATER GROUP*
Casitas (CAS-052)	HERMITAGE MWC
Casitas (CAS-053)	HYOTONA INSTITUTE OF THEOSOPHY
Casitas (CAS-054)	MEINERS OAKS CWD
Casitas (CAS-055)	NORTH FORK SPRINGS MWC
Casitas (CAS-056)	OAKLA
Casitas (CAS-058)	OLD CREEK ROAD MWC
Casitas (CAS-060)	OVANT WATER ASSOCIATION
Casitas (CAS-061)	RANCHO del CIELO MWC
Casitas (CAS-062)	RANCHO MATILIJA MWC
Casitas (CAS-063)	SAN WATER AND ROADWORKS
Casitas (CAS-064)	OJAI WATER CONSERVATION DISTRICT
Casitas (CAS-064)	SENIOR CANYON MWC
Casitas (CAS-066)	SHERIFF'S HONOR FARM
Casitas (CAS-066)	SIETE ROBLES MWC
Casitas (CAS-067)	SSAR MWC
Casitas (CAS-068)	GOLDEN STATE WATER CO - Ojai
Casitas (CAS-069)	SULPHUR MOUNTAIN ROAD WATER ASSOCIATION
Casitas (CAS-070)	TICO MWC
Casitas (CAS-071)	TRES CONDADOS
Casitas (CAS-072)	VENTURA RIVER COUNTY WATER DISTRICT
Casitas (CAS-073)	VILLANOVA ROAD WATER WELL ASSOCIATION

UNITED WHOLESALE DISTRICT

SUPPLIER	WATER COMPANY
United (U-074)	ALISO MWC
United (U-075)	ALTA MWC
United (U-076)	BEECH STREET WELL
United (U-079)	BROWNSTONE MWC
United (U-080)	CAMARILLO AIRPORT UTILITY ENTERPRISE
United (U-081)	CHANNEL ISLANDS BEACH COMMUNITY SERVICES DISTRICT
United (U-082)	CITY OF FILLMORE
United (U-083)	CITY OF PORT HUENEME
United (U-084)	CLOVERDALE MWC
United (U-086)	COMMUNITY MWC
United (U-087)	CYPRESS MWC
United (U-088)	SUNSHINE TRAILER PARK
United (U-089)	DEMPSEY ROAD MWC
United (U-091)	SEACOAST COOLING
United (U-092)	EUKING RANCH COMPANY
United (U-093)	EVERGREEN TRAILER PARK
United (U-094)	FARMERS IRRIGATION COMPANY
United (U-095)	FILLMORE IRRIGATION COMPANY
United (U-096)	FILLMORE WEST MOBILE HOME PARK
United (U-097)	GARDEN ACRES MWC
United (U-099)	GLENVIEW MOBILE HOME PARK
United (U-101)	GOODENOUGH MWC
United (U-102)	HALWOOD, INC.
United (U-103)	CB SOUTH
United (U-104)	PORKETTA STOCK FARM
United (U-106)	LAKE PIRU RECREATION AREA
United (U-107)	LIMONEIRA ASSOCIATED
United (U-108)	LINDA VISTA JUNIOR ACADEMY
United (U-109)	MIDDLE ROAD MWC
United (U-110)	MONTALVO MWC
United (U-111)	NAVAJA/FMOBILEHOME COURT
United (U-112)	NYELAND ACRES MWC
United (U-113)	OCEAN VIEW MWC
United (U-114)	OCEAN VIEW SCHOOL DISTRICT (LAGUNA VISTA SCHOOL)
United (U-115)	OXNARD LEMON MWC
United (U-119)	PLEASANT VALLEY CWD
United (U-121)	RIO MANOR MWC
United (U-122)	RIO PLAZA WATER COMPANY
United (U-123)	RIO REALRIO DEL VALLE SCHOOLS
United (U-126)	SAN CAYETANO MWC
United (U-127)	CITY OF SANTA PAULA
United (U-128)	SAVIERS ROAD MWC
United (U-130)	SILVER WHEEL RANCH MOBILE HOME PARK
United (U-131)	SOUTH MOUNTAIN MWC
United (U-132)	SOUTHSIDE IMPROVEMENT CO
United (U-133)	STORKE MWC
United (U-134)	STRICKLAND MWC
United (U-135)	TEAGUE-McKEVETT CO. LIMONEIRA
United (U-136)	THERMAL BELT MWC
United (U-137)	THOMAS AQUINAS COLLEGE
United (U-138)	TIMBER CANYON MWC
United (U-139)	TOBOCK RANCH MWC
United (U-140)	U.S.N.A.S. - Point Mugu
United (U-141)	U.S.N.C.B.C. - Port Hueneme
United (U-142)	UNITED WCD
United (U-144)	VENTURA COUNTY WATERWORKS DISTRICT NO.16
United (U-145)	G.P. RESOURCES
United (U-146)	VENTURA SCHOOL
United (U-147)	VINEYARD AVENUE ACRES MWC
United (U-148)	THE MUTUAL WATER COMPANY OF VINEYARD AVENUE ESTATES
United (U-149)	VINEYARD MWC
United (U-150)	WARRING WATER SERVICE
United (U-181)	PIRU MWC
United (U-183)	VENTURA COUNTY PROPERTY ADMINISTRATOR
United (U-184)	VENTURA COUNTY DEPT. of AIRPORTS
United (U-185)	HARDSCRABBLE MWC
United (U-186)	SESPE AGRICULTURAL WATER
United (U-187)	GUADALASCA MWC
United (U-191)	SANTA CLARA HIGH SCHOOL
United (U-192)	CITRUS MWC
United (U-200)	LLOYD-BUTLER MWC
United (U-201)	OXNARD MWC
United (U-202)	RANCHO SESPE WORKERS IMPROVEMENT ASSOCIATION
United (U-203)	TOLAND ROAD WATER SYSTEM
United (U-204)	THORNHILL MWC
United (U-205)	SANTA CLARA RESOURCES
United (U-206)	HOLWELING'S NURSERY
United (U-207)	PYRAMID FLOWERS
United (U-208)	SATICOY COUNTRY CLUB
United (U-209)	VUJOVICH RANCH
United (U-210)	BOUQUET MULTIMEDIA

SUPPLIERS WITHOUT WHOLESALE DISTRICT

SUPPLIER	WATER COMPANY
None (W-152)	ANTELOPE VALLEY - EAST KERN WATER AGENCY
None (W-153)	WILSHIRE BLVD. TEMPLE CAMPS & CONFERENCE CENTER
None (W-154)	CAMP SCHREIBER'S LODGE
None (W-155)	CAMP THREE FALLS - BSA
None (W-156)	CASTAIC LAKE WATER AGENCY
None (W-157)	CHANNEL ISLANDS NATIONAL MONUMENT
None (W-158)	CHUCHUPATE CAMPGROUND
None (W-159)	CHUCHUPATE RANGER STATION
None (W-160)	COMPTON HUNTING and FISHING CLUB
None (W-163)	HIDDEN VALLEY MWD
None (W-164)	LAZY J RANCH
None (W-168)	CIRCLE I RANCH
None (W-169)	NEW CAMP BARTLETT
None (W-170)	OZENA RANGER STATION
None (W-171)	PINE MOUNTAIN INN
None (W-174)	SWEETWATER SPRING RANCH
None (W-179)	YERBA BUENA WATER COMPANY
None (W-182)	U.S. NAVY - San Nicolas Island
None (W-188)	POINT MUGU STATE PARK
None (W-193)	LAKE OF THE WOODS MWC
None (W-194)	OZENA VALLEY SPORTSMANS CLUB

DWR Bulletin 118 Groundwater Basins

1. Las Posas Valley
2. Arroyo Santa Rosa Valley
3. Pleasant Valley
4. Santa Clara River Valley - Santa Paula
5. Santa Clara River Valley - Mound
6. Santa Clara River Valley - Oxnard

Pacific Ocean

San Nicolas Island Inset

Inventory of Public & Private Water Purveyors In Ventura County Figure 3.0

Northern Ventura County Inset

Plate 1

Ventura County Watershed Protection District

Water & Environmental Resources Division
Groundwater Section
800 South Victoria Ave.
Ventura, CA 93009-1600
Ph: (805) 654-2088
Fx: (805) 677-8762

Created: Feb 2006
By: JPD

Legend

DWR Bull. 118 GW Basins; FoxCynGMA-bdy; Roads; Calleguas MWD; Casitas MWD; UWCD; Water Bodies; County Boundary

1:87,500

1 inch equals 3 miles

0 1.5 3 6 Miles

DISCLAIMER: The information contained herein was created by the Ventura County Watershed Protection District solely for its own use. The VCWPD assumes no liability for damages incurred directly or indirectly as a result of errors, omissions or discrepancies.

SOURCE: Ventura County Watershed Protection District;
FCGMA , UWCD, and CMWD. 2007. "2007 Update to the Groundwater Management Agency Groundwater Management Plan." May 2007. Plate 1.

DUDEK

FIGURE 1-8
Ventura County Water Purveyors

Groundwater Sustainability Plan in the Oxnard Subbasin

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CHAPTER 2
BASIN SETTING

2.1 INTRODUCTION TO BASIN SETTING

Physical Setting and Characteristics

The Oxnard Subbasin (Subbasin) of the Santa Clara River Valley Groundwater Basin is located near the western edge of the Transverse Ranges Geomorphic Province, which extends from the San Bernardino Mountains in the east to the San Miguel, Santa Rosa, and Santa Cruz Islands in the west (Figure 2-1, Oxnard Subbasin Vicinity Map; CGS 2002). The Transverse Ranges Geomorphic Province is characterized by a series of east-to-west-trending mountain ranges and valleys that are formed by north–south compression across a restraining bend in the San Andreas Fault (Hadley and Kanamori 1977; Bohannon and Howell 1982; Eberhart-Philips et al. 1990; Nicholson et al. 1994). Compression across this restraining bend is responsible for rapid, ongoing uplift of the mountain ranges (Yeats 1988; Feigl et al. 1993; Marshall et al. 2008) and extensive folding and faulting of the Pleistocene and older geologic formations in the province (Rockwell et al. 1988; Huftile and Yeats 1995).

The Oxnard Subbasin underlies the Oxnard Plain, an approximately 58,000-acre coastal plain formed by deposition of sediments from the Santa Clara River and Calleguas Creek, in southwestern Ventura County (DWR 1965, 2006). The northern boundary of the Oxnard Subbasin is the Oak Ridge Fault, and the southern boundary is the contact between permeable alluvium and semipermeable rocks of the Santa Monica Mountains (SWRCB 1956; DWR 2006). The eastern boundary of the Oxnard Subbasin lies against the Las Posas Valley Basin (LPVB) and Pleasant Valley Basin (PVB). The western boundary of the Oxnard Subbasin is the Pacific Ocean (SWRCB 1956; DWR 2006).

The stratigraphic sequence underlying the Oxnard Plain comprises an upper unit of younger and older alluvial deposits that unconformably overlies the San Pedro and Santa Barbara Formations (Table 2-1). The San Pedro Formation is a lower to middle Pleistocene shallow marine deposit that grades upward from a white-gray sand and gravel basal layer into an overlying series of interbedded silts, clays, and gravels. The Santa Barbara Formation is a lower Pleistocene marine sand and clay deposit (SWRCB 1956; Weber and Kiessling 1976; Turner 1975). The primary water-bearing units in the Oxnard Subbasin are the alluvial deposits that compose the Oxnard and Mugu Aquifers and the white-gray sand and gravel layer of the San Pedro Formation that composes the Fox Canyon Aquifer (FCA; Table 2-1). In addition, wells in the Oxnard Subbasin also produce water from the Hueneme Aquifer in the Upper San Pedro Formation and the Grimes Canyon Aquifer (GCA) in the Santa Barbara Formation.

The shallowest aquifer in the Oxnard Subbasin is a semi-perched aquifer comprising sands and gravels deposited by the Santa Clara River. This unit is underlain by a clay layer, commonly referred to as the "clay cap," that is nearly continuous throughout the Subbasin, with the notable exception of an approximately 10-square-mile area in the northeastern part of the Subbasin, adjacent to and south of the Santa Clara River, referred to as the "Forebay area" (Figure 2-1; Mukae and Turner 1975). In this region, the Oxnard and underlying Mugu Aquifers are unconfined. In the areas where the clay cap separates the semi-perched aquifer from the underlying Oxnard Aquifer, the Oxnard Aquifer is confined. The area in which the Oxnard Aquifer is confined is referred to as the "pressure plain area" of the Oxnard Subbasin (Figure 2-1; Mukae and Turner 1975).

The majority of the Oxnard Subbasin lies within the jurisdiction of the Fox Canyon Groundwater Management Agency (FCGMA), with two exceptions (Figure 2-1). These exceptions include an area in the northeastern corner of the Oxnard Subbasin, at the western end of South Mountain, and along the southeastern edge of the Oxnard Subbasin adjacent to the foothills of the Santa Monica Mountains. The reason for the discrepancy is that the FCGMA boundary was established based on a vertical projection of the FCA as defined by the Fox Canyon Groundwater Management Agency Act in 1982, whereas the Oxnard Subbasin boundary is based on the surface extent of the alluvium in the Oxnard Plain, and the location of both geologic structures and facies changes that impede flow between the Oxnard Subbasin and neighboring groundwater basins (DWR 2006). The geologic and hydrologic descriptions of the Oxnard Subbasin in this Groundwater Sustainability Plan (GSP) are based on the boundaries of the Oxnard Subbasin, including the areas to the northeast and southeast which are outside of the FCGMA jurisdictional boundaries.

2.2 HYDROGEOLOGIC CONCEPTUAL MODEL

The six commonly recognized water-bearing units in the Oxnard Subbasin are the semi-perched aquifer and the Oxnard, Mugu, Hueneme, Fox Canyon, and Grimes Canyon Aquifers (DWR 1965, 2006; Turner 1975). Of the six commonly recognized water-bearing units, five are considered primary aquifers in the Oxnard Subbasin. The semi-perched aquifer is a water-bearing unit, but is not considered a primary aquifer in the Subbasin. The five aquifers are grouped into an Upper Aquifer System (UAS) and Lower Aquifer System (LAS), with the Oxnard and Mugu Aquifers composing the UAS and the Hueneme, Fox Canyon, and Grimes Canyon Aquifers composing the LAS. The UAS primarily comprises recent to upper Pleistocene age alluvial deposits of the Santa Clara River system. The LAS is primarily composed of upper to lower Pleistocene age marine sediments.

The Forebay area is the primary recharge area for the primary aquifers in the Oxnard Subbasin. In this area, the UAS rests directly on the folded and eroded upper surface of the Hueneme Aquifer and FCA. Water that recharges the UAS in the Forebay area is able to migrate throughout the Subbasin. Both the lithologic units and geologic structures present in the Oxnard Subbasin affect the hydrology of the Subbasin. These features are discussed in more detail in Sections 2.2.1 through 2.2.5.

2.2.1 Geology

Geologic Units and Variation

Tertiary Sedimentary and Igneous Formations

Tertiary sedimentary and igneous rocks that underlie the Oxnard Subbasin are generally considered semipermeable or non-water-bearing (Turner and Mukae 1975). These tertiary formations include the Oligocene/Eocene-age Sespe Formation, the lower Miocene Conejo Volcanics, the upper Miocene Modelo and Monterey Formations, and the Pliocene Pico Formation (Table 2-1; Weber and Kiessling 1976; Dibblee 1992a, 1992b). These formations have been sampled in deep wells drilled in the Oxnard Subbasin (Figure 2-2, Geology of the Oxnard Subbasin; Turner 1975; Weber and Kiessling 1976). These formations are not considered an important source of groundwater in the Oxnard Subbasin (Turner 1975).

Quaternary Sedimentary Formations

Santa Barbara Formation (Lower Pleistocene; Marine)

The Santa Barbara Formation typically comprises laminated, poorly indurated blue-gray marine mud- and siltstone with sand and gravel (Table 2-1; Turner and Mukae 1975). The upper clay-rich sediments act as an aquitard between the Santa Barbara Formation and the overlying San Pedro Formation (Weber and Kiessling 1976). The localized basal conglomerate within the upper member of the Santa Barbara Formation hosts the GCA (Weber and Kiessling 1976).

San Pedro Formation (Lower to Middle Pleistocene; Marine and Nonmarine)

The San Pedro Formation is an interbedded, poorly lithified fine marine, silty sandstone, shale, and mudstone with local pebble conglomerate and an extensive basal sand unit that unconformably overlies the Santa Barbara Formation in the Oxnard Subbasin (Mukae and Turner 1975; Weber and Kiessling 1976).

The upper and lower parts of the San Pedro Formation are separated by a laterally extensive clay marker bed (Turner 1975). Overlying the clay marker bed are lenticular layers of sand, gravel, and silt (Mukae and Turner 1975). The lenticular deposits of sand and gravel in the Upper San Pedro Formation are known as the Hueneme Aquifer in the Oxnard Subbasin. The sediments of the Upper San Pedro Formation coarsen to the west, with a larger percentage of sand and gravel in the western part of the Subbasin and a larger percentage of fines in the eastern part of the Subbasin, particularly in the area adjacent to the boundary with the LPVB.

In contrast, the basal unit of the San Pedro Formation fines to the west. This unit comprises a 100- to 600-foot-thick continuous white or gray fine to medium marine sand with stringers of gravel

and local silt and clay lenses (Turner 1975).[1] The lower part of the San Pedro Formation is the FCA, which is an important source of groundwater supply in the Oxnard Subbasin (Turner 1975).

Older Alluvium (Upper Pleistocene; Terrestrial)

The older alluvium, which comprises gravel, sand, silt, and clay, unconformably overlies the Upper San Pedro Formation. The older alluvium can be divided into two units: an upper clay zone and a lower sand and gravel zone (Mukae and Turner 1975). The Mugu Aquifer occurs in the sand and gravel zone at the base of the older alluvium (Mukae and Turner 1975).

Recent Alluvium (Holocene; Terrestrial)

The recent alluvium in the Oxnard Subbasin comprises sands and gravels interbedded with silt and clay (DWR 1965). These sediments, which unconformably overlie the older alluvium, reach a thickness of up to 300 feet. The basal unit includes coarse sands and gravels intercalated with clay layers (Mukae and Turner 1975). Overlying the basal unit throughout much of the Subbasin is a laterally continuous clay layer that reaches a thickness of up to 160 feet locally. The Oxnard aquifer occurs in the sand and gravel layer below the clay. Above the clay is the semi-perched aquifer.

Geologic Structure

Wright Road Fault

The Wright Road Fault is an active oblique right reverse fault that generally parallels the eastern jurisdictional boundary of the Oxnard Subbasin, separating the LPVB to the east from the Oxnard Subbasin to the west (Figure 2-2; DeVecchio et al. 2007). The fault trace is characterized by a 20-meter-high (66-foot-high) topographic scarp with up-to-the-east displacement along the north-northwest-trending fault (DeVecchio et al. 2007). There is no evidence that the Wright Road Fault impacts groundwater flow between the Oxnard Subbasin and the LPVB.

Oak Ridge and McGrath Faults

The Oak Ridge Fault is a high-angle, south-dipping, left-lateral reverse fault that juxtaposes water-bearing alluvium and older, semipermeable formations in the subsurface (Figure 2-2; SWRCB 1956). To the east of the Oxnard Subbasin, anticlinal folding in the hanging wall of the Oak Ridge Fault resulted in the Oak Ridge and South Mountain uplift (Yeats 1988). In the Oxnard Subbasin, the western extent of the Oak Ridge Fault is concealed beneath the recent alluvium (Mukae and Turner 1975).

[1] This marine sand has been identified as both the Saugus Formation (Kew 1924; Jakes 1979) and the Las Posas Sand (Pressler 1929, as cited in DeVecchio et al. 2012a.; Dibblee 1992a, 1992b; DeVecchio et al. 2012b). The term "San Pedro Formation" is used here for consistency with California Department of Water Resources nomenclature (DWR 2006).

The McGrath Fault, located approximately 1 mile south of the Oak Ridge Fault along the coast in the Oxnard Subbasin, is a branch of the Oak Ridge Fault system with the same sense of motion (Mukae and Turner 1975). The McGrath Fault defines the northerly limit of the Forebay area (Turner 1975). Together, the McGrath and Oak Ridge Faults limit hydraulic communication between the Oxnard Subbasin to the south and the Mound and Santa Paula Subbasins of the Santa Clara River Valley Groundwater Basin to the north.

Bailey Fault

Along the northern edge of the Santa Monica Mountains, the Bailey Fault Zone trends northeast–southwest through the Oxnard Subbasin (Figure 2-2; Turner 1975). The Bailey Fault is a near-vertical fault with up-to-the-south displacement in the subsurface that offsets quaternary sedimentary formations to the north with older formations to the south (Turner 1975). Groundwater elevation differences and chloride ion concentration differences across the fault suggest that it is a barrier to groundwater movement (Turner 1975). The FCA is absent to the south of the Bailey Fault.

Las Posas Syncline

The Las Posas syncline has resulted in thickening and downwarping of the San Pedro Formation and older formations in the central part of the Oxnard Subbasin (Figure 2-2). The axis of the Las Posas syncline trends northeast from its western mapped extent at the intersection of West 5th Avenue and Harbor Boulevard, through El Rio, and into the Las Posas Valley (Turner 1975). At the deepest part of the Las Posas syncline, the Upper San Pedro Formation reaches a thickness of approximately 1,150 feet (Mukae and Turner 1975).

Montalvo Anticline

Deformation in the hanging wall of the Oak Ridge and McGrath Faults has resulted in anticlinal structures on the northern boundary of the Oxnard Subbasin, including the Montalvo anticline (Figure 2-2). The Upper San Pedro Formation has been eroded away in the Forebay area of the Oxnard Subbasin along the axis of the anticline (Turner 1975). Erosion of the Upper San Pedro Formation results in direct communication between the alluvium and the white and gray marine sands of the Lower San Pedro Formation that compose the FCA.

2.2.2 Basin Bottom

The bottom of the Oxnard Subbasin generally corresponds to the base of the San Pedro Formation and the base of the FCA in the northern and western parts of the Subbasin, where the Santa Barbara Formation is absent (Figure 2-2 and Figure 2-3, Cross Section A–A′; Turner 1975). In the southern and eastern parts of the Subbasin, where the Santa Barbara Formation is present, the bottom of the

Subbasin is defined by the contact between the upper member of the Santa Barbara Formation, the GCA, and the underlying strata that have poor water quality (Figure 2-4, Cross Section B–B′).

In general, the bottom of the Oxnard Subbasin is shallower in the east and deeper in the west. Along the eastern margin of the Subbasin, the Subbasin bottom has been mapped at elevations between 0 feet above mean sea level (msl) and −1,200 feet msl (Turner 1975). Along the western edge of the Subbasin, the Subbasin bottom depth ranges from −400 to more than −1,800 feet msl (Turner 1975). The deepest part of the Subbasin occurs along the axis of the Las Posas syncline in the north-central part of the Subbasin.

2.2.3 Principal Aquifers and Aquitards

Semi-Perched Aquifer

River-deposited sands and gravels interbedded with minor silt and clay compose the semi-perched aquifer in the Oxnard Subbasin (DWR 1965; Turner 1975). The term "semi-perched aquifer" is used in this GSP as the name for the uppermost unit of the Oxnard Subbasin, which overlies the extensive clay cap in the pressure plain area of the Oxnard Subbasin (Figure 2-2 and Table 2-1). This name was used in the State Water Resources Control Board's Bulletin 12 (SWRCB 1956) to distinguish the water-bearing sedimentary units in the pressure plain area from those in the Forebay area, and this terminology has been adopted by subsequent investigators (Mukae and Turner 1975; Turner 1975; Hanson et al. 2003; DWR 2006). Water-level data indicate that the sediments underlying the semi-perched aquifer are saturated. Therefore, the term "semi-perched aquifer" is used in this GSP to denote the limited migration of water from the uppermost aquifer to the underlying confined aquifer in the pressure plain area. It is not used to denote a discontinuity in saturation. Furthermore, there is limited groundwater production (<50 acre-feet per year [AFY]) from this unit (see Section 2.4, Water Budget). Therefore, although this unit is referred to as the "semi-perched aquifer," it is not considered to be a principal aquifer in the Subbasin.

The semi-perched aquifer is part of the recent alluvium described in Section 2.2.1, Geology. This aquifer extends from the base of developed soil horizons to a depth of approximately 75 feet throughout most of the Subbasin (Turner 1975). Notably, this aquifer is absent in the Forebay area of the Oxnard Subbasin adjacent to and south of the present course of the Santa Clara River. The permeable sand and gravel deposits of the semi-perched aquifer tend to be continuous in a northeast–southwest orientation, which is similar to the present orientation of the Santa Clara River and lenticular to the northwest and southeast (Turner 1975).

The lenticular shape of the semi-perched aquifer deposits limits flow in the northwest–southeast direction and facilitates flow in the northeast–southwest direction. These deposits have not been affected by faulting or folding in the Subbasin, and there are no structural restrictions to flow through the semi-perched aquifer (UWCD Model Report [2018], provided as Appendix C to this GSP).

Agricultural return flows, saline connate water, and coastal flooding affect both groundwater quality and groundwater elevation in the semi-perched aquifer (Mukae and Turner 1975). The highest water levels in the aquifer, which are typically within a few feet of land surface, are found in heavily irrigated areas (Turner 1975). Tile drains are used throughout the Oxnard Subbasin to alleviate the high groundwater conditions. Agricultural return flows that cause the high water conditions have resulted in high concentrations of total dissolved solids (TDS) and chloride (as high as 23,000 milligrams per liter [mg/L]) in the semi-perched aquifer (Turner 1975; USGS 1996).

Clay Cap

Underlying the semi-perched aquifer is a clay layer that separates the semi-perched aquifer from the Oxnard Aquifer below (Turner 1975). The thickness of the clay cap is approximately 160 feet adjacent to the Pacific Ocean. The clay cap is absent in the Forebay area (DWR 1968; Mukae and Turner 1975). Although the clay cap functions as an aquitard, water can migrate vertically through the clay cap under conditions of differential head (Turner 1975), and in some cases, through casings of wells that have been improperly abandoned.

Oxnard Aquifer

The Oxnard Aquifer is a laterally continuous layer of upper Pleistocene and Holocene nonmarine gravel and cobbles (up to 6 inches in diameter); coarse to fine sand; and interbedded clay, silty clay, and silt lenses (Turner 1975). The deposits that compose this aquifer are part of the recent alluvium and are found beneath the entire Oxnard Subbasin and extend several miles offshore, where they are exposed in the walls of the Hueneme and Mugu submarine canyons (DWR 1965, 1968). The deposits tend to be finer near the coast and coarsen to the east (Turner 1975; DWR 2006). The local silty clay and silt lenses restrict both horizontal and vertical movement of water through the aquifer, and distinct permeable horizons have been identified in logs (DWR 1971).

The top of the Oxnard Aquifer has been shaped by differential erosion and sedimentation of the Santa Clara River (Turner 1975). Throughout much of the Oxnard Subbasin, a clay-rich aquitard that ranges in thickness from 10 to 100 feet separates the Oxnard Aquifer system from the underlying Mugu Aquifer (Mukae and Turner 1975). The basal surface of the clay is more uniform than the upper surface and generally deepens to the west–southwest (DWR 1968). The thickness of the Oxnard Aquifer also generally increases to the west-southwest, with a minimum thickness of less than 50 feet in the vicinity of the Forebay area and reaching a maximum thickness of greater than 150 feet in the vicinity of Point Mugu (DWR 1968; Turner 1975).

Flow of groundwater through the Oxnard Aquifer is controlled by lithologic variability. The only structural feature that restricts flow in this aquifer is the Bailey Fault, in the southern Oxnard Subbasin (Appendix C). The Oxnard Aquifer crops out offshore in the Hueneme and Mugu canyons, making it susceptible to seawater intrusion. The chloride concentration of native water

in the Oxnard Aquifer is approximately 40 mg/L (similar to background values in the Mugu and Hueneme Aquifers), although this concentration varies with geographic location in the Subbasin (USGS 1996). In the vicinity of the Hueneme and Mugu submarine canyons, chloride concentrations have been affected by seawater intrusion. In 2016, the chloride concentration in the vicinity of Hueneme Canyon was as high as 4,800 mg/L, and in the vicinity of Mugu Canyon the chloride concentration was as high as 16,600 mg/L (FCGMA 2016).

The specific yield of the gravels of the Oxnard Aquifer is about 16% in the Forebay area where there are few clay deposits and the aquifer is unconfined (SWRCB 1956; DWR 2006). Wells screened in the Oxnard Aquifer are typically screened in multiple aquifers, including the underlying Mugu Aquifer. (For information on well construction requirements intended to prevent degradation of water quality of the aquifers in the LAS—referred to as requirements for "sealing zone"—see DWR 1968). The California Department of Water Resources (DWR) reports that the average well yield in the Oxnard Aquifer is about 900 gallons per minute (gpm; DWR 2006). Aquifer test results for two wells screened solely within the Oxnard Aquifer, however, have a higher average well yield, of approximately 1,500 gpm, with an average specific capacity of 47 gpm per foot (Hopkins, pers. comm. 2016). Storage coefficients of 6.18×10^{-4} and 3×10^{-4} were estimated from pumping test data at these two wells, and the transmissivity was estimated to be approximately 20,400 feet squared per day (Hopkins, pers. comm. 2016). The well yield and specific capacity were measured at three additional wells screened solely in the Oxnard Aquifer, although aquifer tests were not performed at these wells. The average well yield and specific capacity for these wells is 2,450 gpm and 108 gpm per foot. Based on these measurements, the average transmissivity is approximately 32,000 feet squared per day (Hopkins, pers. comm. 2016).

Water quality in the Oxnard Aquifer has been degraded by seawater intrusion and leakage of agricultural return flows through the clay cap separating the Oxnard Aquifer from the overlying semi-perched aquifer (UWCD 2016a). Seawater intrusion has been documented in both the Port Hueneme and Port Mugu areas (Turner 1975; UWCD 2016a). Water produced from this aquifer is used for agricultural and municipal and industrial (M&I) purposes.

Mugu Aquifer

The sediments that compose the Mugu Aquifer are upper Pleistocene age fine to coarse sands and gravels (DWR 1965; Turner 1975). These sand and gravel deposits are laterally extensive throughout the Subbasin and represent the basal deposits of the older alluvium. In general, the sediments of the Mugu Aquifer are finer near the coast and coarsen to the east (Turner 1975). A low-permeability clay deposit that ranges in thickness from 10 to 100 feet separates the Mugu Aquifer from the overlying Oxnard Aquifer throughout much of the Oxnard Subbasin. However, the clay layer is absent in the Forebay area of the Subbasin near the Santa Clara River (DWR 1965; SWRCB 1979; Turner 1975). The Mugu Aquifer ranges in thickness from approximately 30 feet in the Forebay to approximately 270 feet in the vicinity of Point Mugu (DWR 1965; Turner 1975).

The Mugu Aquifer extends several miles offshore and crops out offshore in the Hueneme and Mugu canyons, making it susceptible to seawater intrusion. The chloride concentration of native water in the Mugu Aquifer is approximately 40 mg/L (USGS 1996). In the vicinity of the Hueneme and Mugu submarine canyons, however, chloride concentrations have been affected by seawater intrusion. In 2016, the chloride concentration in the vicinity of Mugu Canyon was as high as 3,200 mg/L (FCGMA 2016).

The base of the Mugu Aquifer was deposited over an irregular surface that has been affected by both folding and erosion (Turner 1975). The extensive folding of the aquifers underlying the Mugu Aquifer, however, has not been documented within the sediments of the Mugu Aquifer. Within the boundaries of the DWR Bulletin 118 basin, the only documented fault that acts as a barrier to flow is the Bailey Fault in the southern part of the Subbasin. Offshore, however, additional faults that act as barriers to flow exist in the vicinity of the Mugu submarine canyon (Hanson et al. 2003; Appendix C).

Wells screened in the Mugu Aquifer are typically screened in multiple aquifers, including the overlying Oxnard Aquifer. DWR does not report aquifer properties specifically for the Mugu Aquifer (DWR 2006). In the Forebay, Well 02N22W36E04S, screened solely within the Mugu Aquifer, has a well yield of 1,500 gpm, a specific capacity of 17.8 gpm per foot, and an estimated transmissivity of 7,900 feet squared per day (Hopkins, pers. comm. 2016). For wells screened in both the Oxnard and Mugu Aquifers, the average yield is 2,300 gpm, the average specific capacity is 110 gpm per foot, and the average estimated transmissivity is 29,000 feet squared per day (Hopkins, pers. comm. 2016). Water produced from this aquifer is used for agricultural and M&I purposes.

Hueneme Aquifer

The Hueneme Aquifer comprises a series of lenticular silts, sands, and gravels in the Upper San Pedro Formation. This aquifer is present in the northern part of the Oxnard Subbasin but is absent to the south of Hueneme Roads (Mukae and Turner 1975). Within the Oxnard Subbasin, the Hueneme Aquifer is up to 1,150 feet thick along the axis of the Las Posas syncline (Turner 1975). The Hueneme Aquifer extends several miles offshore and crops out in the Hueneme and Mugu submarine canyons.

Changes in lithologic composition, with the aquifer generally containing a higher percentage of fine materials adjacent to the LPVB and PVB, affect flow through the aquifer. The change in composition is accompanied by an increase in the lenticular nature of the deposits that compose the Hueneme Aquifer along the eastern boundary of the Oxnard Subbasin. These changes limit subsurface flow between the Oxnard Subbasin and the LPVB and PVB to the east.

In addition to changes in lithology, structural folding of the Hueneme Aquifer also affects subsurface flow (Turner 1975). Folding, subsequent erosion, and recent deposition have resulted in a direct hydraulic connection between the Hueneme Aquifer and the overlying Mugu Aquifer throughout much of the Oxnard Subbasin (Turner 1975). However, in the southwestern portion of the basin, where seawater intrusion has affected the Mugu Aquifer, the Mugu and Hueneme Aquifers are not in direct hydraulic communication. As a result, water quality in the Hueneme Aquifer has not been affected by seawater intrusion in this area (Turner 1975; Hanson et al. 2003). Offshore faulting in the Hueneme Aquifer also limits direct seawater intrusion into the aquifer in the vicinity of Mugu Canyon, and faulting along the northern and southern boundaries of the Oxnard Subbasin limit flow out of the Hueneme Aquifer to the Mound Basin or to the south of the Bailey Fault (Hanson et al. 2003; Appendix C).

The chloride concentration of native water in the Hueneme Aquifer is approximately 40 mg/L (USGS 1996). In the vicinity of Point Hueneme, the chloride concentration of the Hueneme Aquifer was as high as 9,900 mg/L in 2016 (FCGMA 2016).

Wells screened solely within the Hueneme Aquifer have an average yield of approximately 2,500 gpm and an average specific capacity of 38 gpm per foot (Hopkins, pers. comm. 2016). Storage coefficients of 2×10^{-4} and 3×10^{-4} were estimated from pumping test data at two wells and the transmissivity was estimated to be approximately 13,400 feet squared per day (Hopkins, pers. comm. 2016). Water produced from this aquifer is used for agricultural and M&I purposes.

Fox Canyon Aquifer

The FCA is a 100- to 600-foot-thick marine sand and gravel deposit in the Lower San Pedro Formation (Mukae and Turner 1975). The water-bearing deposits of the FCA fine toward the west (Turner 1975). This unit is laterally continuous throughout the Oxnard Subbasin except at the western tip of South Mountain, where the Santa Barbara Formation is in direct contact with the Mugu Aquifer, and in the southwestern part of the Subbasin, where uplift and erosion have removed the FCA (Turner 1975). In the northern and western parts of the Subbasin, the FCA defines the base of the freshwater zone.

In the Oxnard Subbasin, the FCA is thickest along the axis of the Las Posas syncline. In this area, the FCA reaches thickness in excess of 500 feet, and the base of the aquifer is below −2,000 feet msl (Turner and Mukae 1975; Turner 1975). The primary source of freshwater recharge to the FCA is infiltration through the Oxnard and Mugu Aquifer systems in the Forebay area (Turner 1975; FCGMA 2007).

As with the other primary aquifers in the Oxnard Subbasin, the FCA extends several miles offshore and water quality in the FCA has been impacted by seawater intrusion. The native water in the FCA had a chloride concentration of 40 mg/L (USGS 1996). Chloride concentration measured in

2002 from a well in the southeastern part of the Subbasin ranged from 183 to 367 mg/L (Izbicki et al. 2005). However, the concentration of chloride measured in Well 01N21W32Q04, located inland of Mugu Canyon in the southern part of the Subbasin, was 5,070 mg/L in 2015.

Offshore faulting in the vicinity of Mugu Canyon is thought to limit direct seawater intrusion into the FCA (Hanson et al 2003; Appendix C). Instead, increasing concentrations of chloride in the FCA near Mugu Canyon are thought to originate in the aquifers of the UAS and migrate vertically into the FCA.

There are no aquifer-specific hydraulic parameter measurements for the FCA. Several specific capacity aquifer tests have been conducted in the Oxnard Subbasin, but typically these tests occur in wells screened across multiple aquifers (Appendix C). More detail on the limitations of hydraulic parameter measurements is found in the UWCD model documentation report (Appendix C). Well 02N22W20J02S, in the northern Oxnard Subbasin, is screened in both the FCA and overlying Hueneme Aquifer. This well has a yield of 3,030 gpm, a specific capacity of 95.3 gpm per foot, and a transmissivity of 40,100 feet squared per day (Hopkins, pers. comm. 2016). Water produced from this aquifer is used for agricultural and M&I purposes.

Grimes Canyon Aquifer

The GCA comprises lower Pleistocene age sand with minor amounts of gravel. This aquifer corresponds with the basal conglomerate within the upper member of the Santa Barbara Formation and is only found underlying the southern and eastern parts of the Oxnard Subbasin (Turner 1975). In the southern part of the Subbasin, the GCA is found in a band approximately 5 miles wide along the base of the Santa Monica Mountains from the Pacific Ocean to the boundary with the PVB to the east (Turner 1975). Throughout the rest of the Subbasin, the Grimes Canyon member of the Santa Barbara Formation is absent. As with the other aquifers in the Subbasin, the GCA extends several miles offshore.

The GCA, where present in the Oxnard Subbasin, is in hydraulic communication with the overlying FCA, and there are no production wells perforated solely in the GCA (Turner 1975; VCWPD 2013). As a result, there is little information on the water quality or aquifer properties of the GCA. Water quality has been sampled in some basal portions of the aquifer, and has been found to have brackish water that is likely a result of limited flushing since deposition and upward migration of brines from underlying formations (Mukae and Turner 1975; Turner 1975; Hanson et al. 2003).[2, 3] In addition, seawater intrusion may have impacted some wells screened in the GCA (see Section 2.3.3, Seawater Intrusion). Direct seawater flow into the GCA in the vicinity of Mugu Canyon is thought to be limited

[2] Brackish water is typically defined as water with a concentration of total dissolved solids (TDS) between 3,000 and 10,000 mg/L.

[3] Brines typically have concentrations of TDS greater than 35,000 mg/L.

by offshore faulting (Hanson et al 2003; Appendix C). Concentrations of chloride have been increasing in this area since the 1990s. In 2016 the groundwater concentration measured in a sample collected from Well 01S21W08L03S was 6,428 mg/L (FCGMA 2016). Measured aquifer properties specific to the GCA are not currently available.

2.2.4 Data Gaps and Uncertainty in the Hydrogeologic Conceptual Model

The primary data gaps in the hydrogeologic conceptual model are as follows:

- Distributed measurements of aquifer properties from wells screened solely in a single aquifer
- Distributed measurements of groundwater quality from wells screened solely in a single aquifer
- Measurements of groundwater quality that distinguish the sources of high TDS concentrations in the FCA and the GCA
- Temporal limitations on groundwater elevation data
- Spatial limitations on groundwater elevation data
- The relative impacts of production from areas within the Subbasin on seawater intrusion
- Connection between the semi-perched aquifer and potential groundwater-dependent ecosystems (GDEs)
- Potential impacts of increased production in the semi-perched aquifer

The data gaps listed above create uncertainty in the understanding of the impacts of water level changes on change in storage in the aquifer and on the inland extent of seawater intrusion in the aquifers. Additional aquifer tests, groundwater elevations, and groundwater quality sampling in the future would help reduce the uncertainty associated with these data gaps. Closing the data gaps is discussed further in Chapter 4, Monitoring Networks, of this GSP.

2.3 GROUNDWATER CONDITIONS

2.3.1 Groundwater Elevation Data

Groundwater elevations in the Oxnard Subbasin were first measured in agricultural wells in the 1930s, and multiple entities, including the United Water Conservation District (UWCD), DWR, and the County of Ventura (the County), have recorded water elevations in the Oxnard Subbasin over the intervening decades. In the early 1990s, after the U.S. Geological Survey (USGS) installed a series of nested monitoring wells during the Regional Aquifer System Analysis (Densmore 1996), an annual groundwater monitoring program was initiated in the Subbasin by the County, UWCD, and USGS (FCGMA 2007). The groundwater monitoring programs conducted by the

Ventura County Watershed Protection District and other agencies, including UWCD, include production wells and multiple-completion nested monitoring wells. Many of the production wells included in the monitoring program are screened across multiple aquifers. Historically, the FCGMA annual reports have included potentiometric surface maps for wells screened in the UAS and wells screened in the LAS since 2013 (FCGMA 2015).

To conform with the DWR GSP Regulations, Section 354.16, the following discussion of groundwater elevation is limited to production and monitoring wells screened in a single aquifer. Water level measurements collected between March 2 and March 29, 2015, are used to represent groundwater elevations in spring 2015. Water level measurements collected between October 2 and 29, 2015, are used to represent groundwater elevations in fall 2015.

Because many production wells within the Subbasin are screened across multiple aquifers and there are a limited number of dedicated monitoring wells, the depiction of representative regional potentiometric surfaces in each aquifer is limited. Similarly, the depiction of groundwater trends is also limited by spatial and temporal constraints that are imposed when only using wells screened in a single aquifer. Groundwater pumping data for the year 2015 were mapped to provide context for interpreting the potentiometric surfaces presented in this section (see Figure 2-5, Upper Aquifer System 2015 Extraction [acre-feet] in Oxnard and Pleasant Valley and Figure 2-6, Lower Aquifer System 2015 Extraction [acre-feet] in Oxnard and Pleasant Valley). Self-reported groundwater extraction data for 2015 are shown in Figures 2-5 and 2-6 for wells screened in the UAS and LAS, respectively. In the UAS, the location of the greatest amount of extraction is within the Forebay, with additional extraction areas both west and southeast of the City of Oxnard (Figure 2-5). The majority of the production from the LAS is in the southeastern portion of the Subbasin (Figure 2-6). The volume of groundwater extracted from the LAS is greater than that extracted from the UAS.

Current and historical groundwater elevations are discussed below by aquifer. Full hydrographs for all Oxnard Subbasin wells in which five or more water level measurements have been recorded are included in Appendix D, Water Elevation Hydrographs. In general, climate cycles, management actions, and the construction of water conservation facilities have impacted water elevations in the Oxnard Subbasin. The Freeman Diversion, completed in 1991, allows UWCD to divert surface water from the Santa Clara River to spreading basins, where it can infiltrate into the aquifers of the UAS and be transported via pipelines to other areas. This additional recharge enhanced aquifer recovery in the 1990s after a period of drought (FCGMA 2007). Additionally, UWCD's Pumping Trough Pipeline (PTP), constructed in 1986, which delivers diverted Santa Clara River water to agricultural parcels on the Oxnard Plain in lieu of groundwater production from that area, resulted in rising groundwater elevations during the late 1980s. In 1991, Ventura County adopted Ordinance 3991, which provided a temporary prohibition on drilling of new wells in the UAS, which also contributed to water elevation recovery in the UAS in the 1990s.

2.3.1.1 Oxnard Aquifer

Spring and Fall 2015 Groundwater Elevations

In the spring of 2015, recorded groundwater elevations in the Oxnard Aquifer wells ranged from −27.2 to 46.3 feet msl (Figure 2-7, Groundwater Elevation Contours in the Oxnard Aquifer, March 2–29, 2015). In the fall of 2015, recorded groundwater elevations ranged from −30.7 to 37.9 feet msl (Figure 2-8, Groundwater Elevation Contours in the Oxnard Aquifer, October 2–29, 2015).

Groundwater flows from areas of high groundwater elevation to areas of low groundwater elevation. The highest groundwater elevations in the Oxnard Aquifer are found in the Forebay in both the fall and spring of 2015 (Figures 2-5 and 2-7). The hydraulic gradient in the Forebay in the spring of 2015 was approximately 0.005 feet/feet with groundwater flowing to the south and southwest, toward the pumping centers west and southeast of the City of Oxnard. In the fall of 2015, the hydraulic gradient was approximately 0.005 feet/feet with groundwater flowing to the southwest and southeast.

Elsewhere in the Subbasin, groundwater elevations in the Oxnard Aquifer are higher on the western and eastern boundaries of the Subbasin than they are in the center of the Subbasin. In this central area, groundwater elevations are more than −20 feet msl in both the spring and fall of 2015, though the areal extent of lower elevations is much greater in fall than in spring (Figures 2-7 and 2-8). In general, elevations in the UAS in the central Oxnard Subbasin are above sea level during wet climatic periods and fall below sea level during droughts (UWCD 2016a). Artesian conditions can occur in the western Oxnard Subbasin during wet climatic cycles (UWCD 1999).

The central area of low elevations reflects the groundwater production from wells southeast of the City of Oxnard in the central Oxnard Subbasin (Figure 2-5). The hydraulic gradient, directed toward the production wells, was less than approximately 0.001 feet/feet in both the spring and fall of 2015. Coastal elevations were measured below or near sea level in both spring and fall of 2015, and consequently, the hydraulic gradient was generally landward at the coast (Figures 2-7 and 2-8).

There is uncertainty associated with the groundwater elevation contours, hydraulic gradient, and groundwater flow direction in the Oxnard Aquifer in the spring and fall of 2015. Fewer wells are screened solely within the Oxnard Aquifer than are producing groundwater from the Oxnard Aquifer. The majority of the wells that produce groundwater in the Oxnard Aquifer are screened across multiple aquifers. These wells were not used to create the contour maps in order to conform with the DWR GSP Regulations, Section 354.14. The uncertainty in hydraulic gradient, flow direction, and groundwater elevation within the Oxnard Aquifer is particularly pronounced in the southern Oxnard Subbasin, where there are few wells screened solely within the Oxnard Aquifer but several production wells screened in multiple aquifers (Figures 2-7 and 2-8).

Vertical Gradients

Groundwater elevations in the Oxnard Aquifer are higher than those in the underlying Mugu Aquifer, resulting in a downward vertical gradient from the Oxnard Aquifer to the Mugu Aquifer in all areas of the Oxnard Subbasin for which Mugu-specific elevation data are available (Table 2-2). The magnitude of the vertical gradient varies with distance from the coast. The downward vertical gradient between the Oxnard and Mugu Aquifers was calculated for five wells in the fall of 2015 (Table 2-2). The wells in Table 2-2 were selected from a larger group of nested groundwater monitoring wells to represent the vertical gradient at different geographic locations in the Subbasin.

In the spring of 2015, the vertical gradient from the Oxnard Aquifer to the underlying Mugu Aquifer ranged from 0.004 feet/feet at the coast near Port Hueneme to 0.278 feet/feet inland of Point Mugu (Table 2-2). In the fall of 2015, the vertical gradient from the Oxnard Aquifer to the underlying Mugu Aquifer ranged from 0.002 feet/feet at the coast near Port Hueneme to 0.468 feet/feet inland of Point Mugu (Table 2-2). The vertical gradients along the coast are lower than they are inland, possibly reflecting the influence of seawater in the aquifer, moderating water levels at the coast. Alternatively, the vertical gradients may be lower at the coast because there is less pumping near the coast (Figures 2-5 and 2-6), and gradients may be higher in some inland areas that are closer to the Forebay area, as recharge in the Forebay affects water pressure in the Oxnard Aquifer more than the other aquifers.

The vertical gradient between the Oxnard and Mugu Aquifers was higher in the fall than in the spring, except at the coast where it was the same in the spring and fall (Wells 01N22W20M02S and 01N22W20M03S), and in the Forebay where the gradient was higher in the spring than in the fall (Wells 02N22W23B07S and 02N22W23B08S). The vertical gradient in the Forebay was higher in the spring because of surface water spreading grounds in the Forebay that are primarily used during periods of higher flow in the Santa Clara River.

Vertical gradients within the Oxnard Aquifer were determined from monitoring well clusters 01N21W19L, 02N22W23B, and 01N22W28G, which have two screen intervals within the Oxnard Aquifer (Table 2-2). For each of these locations, the vertical hydraulic gradient within the Oxnard Aquifer was directed downward. The downward vertical hydraulic gradient ranged from 0.009 to 0.278 feet/feet in the spring of 2015. In the fall of 2015, the downward vertical gradient ranged from 0.016 to 0.643 feet/feet. The downward vertical hydraulic gradient was larger in the fall than in the spring, and the largest downward vertical hydraulic gradient was in the Oxnard Forebay (Forebay). The smallest downward vertical hydraulic gradient within the Oxnard Aquifer was adjacent to the coast (Table 2-2; Figure 2-8).

Historical Groundwater Elevation Trends

Groundwater elevations in the Oxnard Aquifer have declined and recovered over climatic cycles since the 1930s (Figure 2-9a, Groundwater Well Hydrographs in the Oxnard Aquifer – Oxnard Plain). Management policies and the construction and operation of water conservation facilities have also impacted historical groundwater elevations (see Section 2.3.1, Groundwater Elevation Data). Full hydrographs for Oxnard Subbasin wells with five or more groundwater elevation measurements are included in Appendix D.

Groundwater elevation trends in Well 01N21W07H01S, the well with the longest historical groundwater elevation record in the Oxnard Subbasin, track with the trends observed in the record of cumulative departure from the mean precipitation on the Oxnard Plain (Figure 2-9a). Declines in groundwater elevation occurred between 1941 and 1966, 1970 and 1977, 1984 and 1990, and 2011 and 2016, coincident with periods of drought shown in the declining limb of the cumulative departure from the mean precipitation curve (Figure 2-9a). Groundwater elevations recovered after each historical drought period, but have not yet recovered from the drought beginning in 2011. The amount of historical recovery depended on the length of time between droughts and the amount of precipitation received in each of the water years between the droughts, as well as management measures, including surface water spreading and deliveries, operative during the various periods. By 1980, the groundwater elevation recovered to within 10 feet of the previous maximum measured in 1941, and by 1999, water levels exceeded the 1941 maximum (Figure 2-9a), likely due to several wet years during the 1990s and the influence of management actions taken, and water conservation facilities constructed, in the 1980s and 1990s (see Section 2.3.1). In the late 1990s, artesian conditions were documented in the western Oxnard Subbasin (UWCD 1999). Since 2011, groundwater elevations in this well have declined approximately 40 feet.

The patterns of water level decline and recovery observed in Well 01N21W07H01S are observed in Oxnard Aquifer wells throughout the Oxnard Subbasin, although absolute changes in water level vary geographically within the Oxnard Subbasin (Figure 2-9a and Figure 2-9b, Groundwater Well Hydrographs in the Oxnard Aquifer – Forebay Area). Wells in the Forebay area and northeastern Oxnard Subbasin have experienced water level declines of approximately 90 feet since 2011 (Figure 2-9b), while water levels in wells adjacent to the coast and in wells farther south have declined between 18 and 40 feet over the same period (Figure 2-9a). The larger water level changes observed in the northeastern Oxnard Subbasin reflect the influence of UWCD's managed aquifer recharge activities in the Forebay area; additionally, water level changes at the coast may be smaller due to the fact that seawater may be intruding and occupying volume within the aquifer as freshwater recedes.

Although groundwater elevations in the Oxnard Subbasin recover to some degree after each drought period, elevations in coastal wells do not always recover to mean sea level. Historical elevations of coastal wells over time in relation to sea level are discussed in Section 2.3.3.

2.3.1.2 Mugu Aquifer

Spring and Fall 2015 Groundwater Elevations

In the spring of 2015, recorded groundwater elevations in the Mugu Aquifer in the Oxnard Subbasin ranged from −60.7 to 8.2 feet msl (Figure 2-10 Groundwater Elevation Contours in the Mugu Aquifer, March 2–29, 2015). In the fall of 2015, groundwater elevations ranged from −97.7 to −12.1 feet msl (Figure 2-11, Groundwater Elevation Contours in the Mugu Aquifer, October 2–29, 2015).

The highest groundwater elevations in the Mugu Aquifer are found in the Forebay in both the fall and spring of 2015 (Figures 2-10 and 2-11). The hydraulic gradient in the Forebay in the spring of 2015 was approximately 0.003 feet/feet with groundwater flowing to the south and southwest. In the fall of 2015, the hydraulic gradient was approximately 0.002 feet/feet with groundwater flowing to the south and southwest. These gradients are based on the wells that are screened solely within the Mugu Aquifer, which are primarily located in the eastern part of the Subbasin. Groundwater elevations in the Mugu Aquifer are lowest in the southeastern area of the Subbasin. In general, elevations in the UAS in the southernmost corner of the Subbasin tend to be lower than in the central Subbasin (by as much as 40 to 80 feet), regardless of climatic cycles (FCGMA 2013).

In the southeastern area of the Subbasin, groundwater elevations were −30 to −100 feet msl in 2015 (Figures 2-10 and 2-11). The hydraulic gradient, directed toward the area of low groundwater elevations, was approximately 0.002 feet/feet to the southeast in the spring of 2015. In the fall of 2015, the hydraulic gradient directed toward the area of low groundwater elevations ranged from approximately 0.004 to 0.009 feet/feet to the east-southeast. Coastal groundwater elevations were measured below or near sea level in both spring and fall of 2015, creating a presumably landward hydraulic gradient at the coast (Figures 2-10 and 2-11).

There is uncertainty associated with the groundwater elevation contours, hydraulic gradient, and groundwater flow direction in the Mugu Aquifer in the spring and fall of 2015. The gradient is unknown in the northwestern area of the Subbasin, where there are no wells screened solely within the Mugu Aquifer. Additionally, fewer wells are screened solely within the Mugu Aquifer than are producing groundwater from the Mugu Aquifer. The majority of the wells that produce groundwater in the Mugu Aquifer are screened across multiple aquifers. These wells were not used to create the contour maps, in order to conform with the DWR GSP Regulations, Section 354.14. For the central and eastern areas of the Subbasin in which there are well data in the Mugu Aquifer, the uncertainty in hydraulic gradient, flow direction, and groundwater elevation within the aquifer is particularly pronounced. In this area, groundwater appears to flow to the south-southeast from the Oxnard Subbasin to the PVB (Figures 2-10 and 2-11).

Vertical Gradients

Groundwater elevations in the Mugu Aquifer are lower than those in the overlying Oxnard Aquifer, resulting in a downward vertical gradient from the Oxnard Aquifer to the Mugu Aquifer throughout the Oxnard Subbasin (Table 2-2; Section 2.3.1.1, Oxnard Aquifer). Groundwater elevations in the Mugu Aquifer are higher than those in the underlying Hueneme Aquifer, resulting in a downward vertical gradient from the Mugu Aquifer to the Hueneme Aquifer in the Forebay and adjacent to Port Hueneme (Table 2-2). At monitoring well cluster 01N22W20M, adjacent to Port Hueneme, the downward vertical hydraulic gradient was 0.033 feet/feet in the spring of 2015 and 0.039 feet/feet in the fall of 2015. At monitoring well cluster 02N22W23B, in the Forebay, the downward vertical hydraulic gradient was 0.012 feet/feet in the spring of 2015 and 0.028 feet/feet in the fall of 2015.

Within the Mugu Aquifer, a downward vertical gradient of 0.365 feet/feet was calculated in the spring of 2015 between Wells 01N21W32Q07S and 01N21W32Q05S (Figure 2-10). In the fall of 2015, the downward vertical gradient was 0.560 feet/feet (Table 2-2; Figure 2-11).

Historical Groundwater Elevation Trends

Groundwater elevations in the Mugu Aquifer have declined and recovered over climatic cycles since the 1970s (Figure 2-12, Groundwater Well Hydrographs in the Mugu Aquifer). Management policies and the construction and operation of water conservation facilities have also impacted historical groundwater elevations (see Section 2.3.1). Full hydrographs for Oxnard Subbasin wells with five or more groundwater elevation measurements are included in Appendix D.

Groundwater elevation trends in Well 02N22W24P01S, the well with the longest historical groundwater elevation record in the Mugu Aquifer, track with the trends observed in the record of cumulative departure from the mean precipitation on the Oxnard Plain (Figure 2-12). Declines in groundwater elevation occurred between 1974 and 1977, 1984 and 1990, and 2011 and 2016, coincident with periods of drought shown in the declining limb of the cumulative departure from the mean precipitation curve (Figure 2-12). Groundwater elevations recovered after each historical drought period, but have not yet recovered from the drought beginning in 2011. The amount of historical recovery depends on the length of time between droughts and the amount of precipitation received in each of the water years between the droughts, as well as management measures, including artificial recharge and surface water deliveries, operative during the various periods. In 1996, water levels exceeded the previous maximum in 1980 (Figure 2-12), likely due to several wet years during the 1990s and the influence of management actions taken, and water conservation facilities constructed in the 1980s and 1990s (see Section 2.3.1). In the late 1990s, artesian conditions were documented in the western Oxnard Subbasin (UWCD 1999). Since 2011, groundwater elevations in this well have declined approximately 100 feet.

The patterns of water level decline and recovery observed in Well 02N22W24P01S are observed in Mugu Aquifer wells throughout the Oxnard Subbasin, although absolute changes in water level vary geographically within the Subbasin (Figure 2-12). Well 02N22W24P01S is located near the Forebay area. Other wells in the Forebay area experienced similar water level declines and recoveries to those observed in Well 02N22W24P01S (Figure 2-12). Water levels in wells adjacent to the coast and in wells farther south, however, tend to have larger intra-annual variation (variation that occurs within a single year) in groundwater level, but a smaller drought response (e.g., Wells 01N21W32Q05S and 01N21W19L11S; see Figure 2-12). The groundwater elevation in these wells declined between 20 and 80 feet between 2011 and 2015, whereas the groundwater elevation in wells in the Forebay area declined approximately 100 feet over the same period. The larger groundwater level changes observed in the northeastern Oxnard Subbasin likely reflect the influence of groundwater recharge from spreading basins in the Forebay area; additionally, groundwater level changes at the coast may be smaller due to the fact that seawater may be intruding and occupying volume within the aquifer as freshwater recedes.

Although groundwater elevations in the Oxnard Subbasin recover after each drought period, groundwater elevations in coastal Mugu-specific wells in the southern Subbasin typically remain below mean sea level. Historical elevations of coastal wells over time in relation to sea level are discussed in Section 2.3.3.

2.3.1.3 Hueneme Aquifer

Spring and Fall 2015 Groundwater Elevations

In the spring of 2015, recorded groundwater elevations in the Hueneme Aquifer in the Oxnard Subbasin ranged from −89.4 to 10.2 feet msl (Figure 2-13, Groundwater Elevation Contours in the Hueneme Aquifer, March 2–29, 2015). In the fall of 2015, groundwater elevations ranged from −115.5 to 2.1 feet msl (Figure 2-14, Groundwater Elevation Contours in the Hueneme Aquifer, October 2–29, 2015). There are fewer wells screened solely in the Hueneme Aquifer than are screened in the Oxnard Aquifer, Mugu Aquifer, or FCA in the Oxnard Subbasin. The small number of wells screened solely within the Hueneme Aquifer creates uncertainty in the groundwater elevation contours, hydraulic gradient, and groundwater flow direction (Figures 2-13 and 2-14). This aquifer is present in the northern part of the Oxnard Subbasin but is absent to the south of Etting and Hueneme Roads (Mukae and Turner 1975).

The highest groundwater elevations in the Hueneme Aquifer are found in the Forebay in both the fall and spring of 2015 (Figures 2-13 and 2-14). The hydraulic gradient in the Forebay in the spring of 2015 was approximately 0.008 feet/feet, with groundwater flowing to the southwest. In the fall of 2015 the hydraulic gradient was approximately 0.007 feet/feet, with groundwater flowing to the south-southwest.

Groundwater elevations in the Hueneme Aquifer are lowest south of the Forebay and west of Central Avenue (Figures 2-13 and 2-14). In this area, groundwater elevations were −80 to −100 feet msl in 2015 (Figures 2-13 and 2-14). This area of lower groundwater elevations coincides with the location of several production wells that are screened solely within the Hueneme Aquifer (Figure 2-6). The hydraulic gradient, directed toward the area of low groundwater elevations, ranged from approximately 0.003 feet/feet to the southeast in the spring of 2015 to approximately 0.008 feet/feet to the east-southeast in the fall of 2015. Coastal groundwater elevations were below or near sea level in both spring and fall of 2015, resulting in a landward hydraulic gradient at the coast (Figures 2-13 and 2-14).

Vertical Gradients

Groundwater elevations in the Hueneme Aquifer are lower than those in the overlying Mugu Aquifer, resulting in a downward vertical gradient from the Mugu Aquifer to the Hueneme Aquifer (Table 2-2; Section 2.3.1.2, Mugu Aquifer). Groundwater elevations in the Hueneme Aquifer were higher than those in the underlying FCA in both the spring and fall of 2015, except in the Forebay at Wells 02N22W23B03 and 02N22W23B04. In these wells, the groundwater elevation in the Hueneme Aquifer was higher than it was in the FCA in the spring of 2015, and lower than that in the FCA in the fall of 2015 (Table 2-2). In the spring of 2015, the downward vertical hydraulic gradient between the Hueneme Aquifer and FCA ranged from 0.014 feet/feet to 0.040 feet/feet. In the fall of 2015, the vertical hydraulic gradient between the Hueneme Aquifer and FCA ranged from 0.050 feet/feet downward adjacent to the coast, to 0.032 upward in the Forebay (Table 2-2).

Within the Hueneme Aquifer, a downward vertical gradient of 0.017 feet/feet was calculated for Wells 01N22W20M03S and 01N22W20M02S in the spring of 2015 (Figure 2-13). In the fall of 2015, the gradient in these wells was 0.019 feet, which is the same as it was in the spring. Farther north, in Wells 01N23W01C03S and 01N23W01C04S, the vertical gradient within the Hueneme Aquifer was similar to that calculated for Wells 01N22W20M03S and 01N22W20M02S. In the spring of 2015, the downward vertical hydraulic gradient was 0.009 feet/feet in Wells 01N23W01C03S and 01N23W01C04S. In the fall, the downward vertical hydraulic gradient was 0.010 feet/feet between Wells 01N23W01C03S and 01N23W01C04S (Table 2-2).

In Wells 02N22W23B07S and 02N22W23B08S, in the Forebay, the downward vertical gradient is greater in the upper Hueneme Aquifer than in the lower Hueneme Aquifer (Table 2-2). The gradients within the Hueneme Aquifer in the Forebay are similar to those within the Hueneme Aquifer along the coast.

Historical Groundwater Elevation Trends

Groundwater elevations in the Hueneme Aquifer have declined and recovered over climatic cycles (Figure 2-15, Groundwater Well Hydrographs in the Hueneme Aquifer). Management policies and

the construction and operation of water conservation facilities have also impacted historical groundwater elevations (see Section 2.3.1). Full hydrographs for Oxnard Subbasin wells with five or more groundwater elevation measurements are included in Appendix D.

Groundwater elevation trends in Well 02N21W31P03S, the well with the longest historical groundwater elevation record in the Hueneme Aquifer, track with the trends observed in the record of cumulative departure from the mean precipitation on the Oxnard Plain (Figure 2-15). Declines in groundwater elevation occurred between 1974 and 1977, 1984 and 1990, and 2011 and 2016, coincident with periods of drought shown in the declining limb of the cumulative departure from the mean precipitation curve (Figure 2-15). Groundwater elevations largely recovered after each historical drought period, but have not yet recovered from the drought beginning in 2011. The amount of historical recovery depends on the length of time between droughts and the amount of precipitation received in each of the water years between the droughts, as well as the management measures, including artificial recharge and surface water deliveries, operative during the various periods. Since 2011, groundwater elevations in this well have declined approximately 60 feet (Figure 2-15).

The patterns of water level decline and recovery observed in Well 02N21W31P03S are also observed in Hueneme Aquifer Wells 01N22W03F05S and 01N22W26M03S, although the magnitude of the change in groundwater levels varies between the wells (Figure 2-15). Ignoring seasonal variations reflecting pumping, the spring high elevations between 1996 and 2010 were relatively stable in Well 01N22W26M03S and declined by approximately 32 feet in Well 01N22W03F05S. Between 2011 and 2015, during a period of drought, groundwater elevations declined approximately 47 feet in Well 01N22W26M03S and approximately 55 feet in Well 01N22W03F05S (Figure 2-15).

Although groundwater elevations in the Oxnard Subbasin recover after each drought period, groundwater elevations in coastal wells can remain below mean sea level, resulting in a landward gradient near the coast.

2.3.1.4 Fox Canyon Aquifer

Spring and Fall 2015 Groundwater Elevations

In the spring of 2015, recorded groundwater elevations in the FCA in the Oxnard Subbasin ranged from −107.3 to 3.9 feet msl (Figure 2-16, Groundwater Elevation Contours in the Fox Canyon Aquifer, March 2–29, 2015). In the fall of 2015, groundwater elevations ranged from −156.3 to −24.6 feet msl (Figure 2-17, Groundwater Elevation Contours in the Fox Canyon Aquifer, October 2–29, 2015).

The highest groundwater elevations in the FCA are found in the Forebay in both the fall and spring of 2015 (Figures 2-16 and 2-17). The lowest recorded groundwater elevations are found at Well 01N21W06J05S, south of 5th Street, west of Pleasant Valley Road (Figures 2-16 and

2-17). The low groundwater elevations in this well reflects the production from the FCA at this location (Figure 2-6). However, there are several wells in the surrounding areas that produced more groundwater in 2015, but are screened across multiple aquifers in the LAS. The hydraulic gradient in the FCA was directed toward Well 01N21W06J05S in both the spring and fall of 2015. In the spring of 2015, the hydraulic gradient was approximately 0.001 to 0.002 feet/feet. In the fall of 2015, the hydraulic gradient ranged from approximately 0.002 to approximately 0.005 feet/feet. These gradients may not fully depict the direction and magnitude of flow within the FCA because more production wells are screened across multiple aquifers in the LAS than are screened solely within the FCA, and consequently production is occurring in areas of the aquifer that lack aquifer-specific groundwater elevation data. Coastal groundwater elevations were measured below or near sea level in both spring and fall of 2015, resulting in a landward hydraulic gradient (Figures 2-16 and 2-17).

Vertical Gradients

Groundwater elevations in the FCA are generally lower than those in the overlying aquifers (Figures 2-16 and 2-17; Table 2-2). In the spring of 2015, the downward vertical gradient from the Mugu Aquifer to the FCA ranged from 0.012 feet/feet in the Forebay to 0.390 feet/feet adjacent to Highway 1 (Figure 2-16; Table 2-2). In the fall of 2015, the downward vertical gradient from the Mugu Aquifer to the FCA ranged from 0.620 feet/feet in the Forebay to 0.028 feet/feet south of Hueneme Road.

In the spring of 2015, the downward vertical gradient from the Hueneme Aquifer to the FCA was similar geographically, ranging from 0.014 feet/feet in the Forebay and along the coast north of Port Hueneme to 0.040 feet/feet adjacent to the coast at Port Hueneme (Table 2-2). In the fall of 2015, the vertical hydraulic gradient between the Hueneme Aquifer and FCA ranged from 0.050 feet/feet downward along the coast near Port Hueneme to 0.032 feet/feet upward in the Forebay (Table 2-2).

Within the FCA, a downward vertical gradient of 0.005 feet/feet was calculated for Wells 01N22W36K06S and 01N22W36K07S in the spring of 2015. The vertical hydraulic gradient in these wells, near Point Mugu, was 0.019 feet/feet downward in the fall of 2015. In the Mugu area the vertical flow to the FCA is a major mechanism for seawater intrusion. In the Forebay area, the vertical hydraulic gradient within the FCA was 0.014 feet/feet downward in the spring of 2015 and 0.022 feet/feet upward in the fall of 2015 (Table 2-2; Wells 02N21W07L04S and 02N21W07L06S).

Groundwater elevations in the FCA are higher than those in the underlying GCA, except adjacent to Port Hueneme in Wells 01N22W28G04S and 01N22W28G05S (Table 2-2).

Historical Groundwater Elevation Trends

Groundwater elevations in the FCA have declined and recovered over climatic cycles (Figure 2-18, Groundwater Well Hydrographs in the Fox Canyon Aquifer). Management policies and the construction and operation of water conservation facilities have also impacted historical groundwater elevations (see Section 2.3.1). Full hydrographs for Oxnard Subbasin wells with five or more groundwater elevation measurements are included in Appendix D.

Groundwater elevation trends in Well 01N22W26K04S, the well with the longest historical groundwater elevation record in the FCA, track with the trends observed in the record of cumulative departure from the mean precipitation on the Oxnard Plain (Figure 2-18). Declines in groundwater elevation occurred between 1974 and 1977, 1984 and 1990, and 2011 and 2016, coincident with periods of drought shown in the declining limb of the cumulative departure from the mean precipitation curve (Figure 2-18). Groundwater elevations recovered after each drought period prior to the most recent drought. Groundwater elevations have not yet recovered to pre-2011 levels.

The amount of historical recovery depends on the length of time between droughts and the amount of precipitation received in each of the water years between the droughts, as well as management measures, including artificial recharge and surface water deliveries, operative during the various periods. In 1999, water levels exceeded the previous maximum in 1983 (Figure 2-18), likely due to several wet years during the 1990s and the influence of management actions taken, and water conservation facilities constructed, in the 1980s and 1990s (see Section 2.3.1). In the late 1990s, artesian conditions were documented in the western Oxnard Subbasin (UWCD 1999).

The patterns of groundwater level decline and recovery observed in Well 01N22W26K04S are observed in FCA wells throughout the Oxnard Subbasin, although absolute changes in groundwater level vary geographically within the Oxnard Subbasin (Figure 2-18). Well 01N22W26K04S is located south of Hueneme Road. Other wells in this area experienced similar groundwater level declines and recoveries to those observed in Well 01N22W26K04S (Figure 2-18). Wells farther inland tend to have larger intra-annual variations in groundwater level (e.g., Wells 01N21W06J05S and 01N21W09C04S; see Figure 2-18). The groundwater elevation in these wells declines by 40 to 50 feet each year between the spring high and fall low groundwater levels. In contrast, Well 01N23W01C02S, adjacent to the coast, declines approximately 5 feet between the spring high and fall low groundwater level (Figures 2-16, 2-17, and 2-18). Groundwater level changes at the coast may be smaller due to the fact that seawater may be intruding and occupying volume within the aquifer as freshwater recedes.

Although groundwater elevations in the Oxnard Subbasin recover after each drought period, groundwater elevations in coastal FCA-specific wells in the southern Subbasin typically remain below mean sea level.

2.3.1.5 Grimes Canyon Aquifer

Spring and Fall 2015 Groundwater Elevations

The GCA is only found underlying the southern and eastern parts of the Oxnard Subbasin (Turner 1975). Only six wells in the Oxnard Subbasin are screened solely within the GCA. These wells are located in the southern part of the Subbasin, all located west of Revolon Slough (Figure 2-19, Groundwater Elevation Contours in the Grimes Canyon Aquifer, March 2–29, 2015). In the spring of 2015, recorded groundwater elevations in the GCA ranged from −31.3 to −75.6 feet msl (Figure 2-19). In the fall of 2015, groundwater elevations ranged from −38.6 feet msl to −114.2 feet msl (Figure 2-20, Groundwater Elevation Contours in the Grimes Canyon Aquifer, October 2–29, 2015).

Where measured, groundwater in the GCA flows to the east-northeast from the coast toward the Revolon Slough (Figures 2-19 and 2-20). In the spring of 2015, the hydraulic gradient in the vicinity of Point Mugu was approximately 0.003 feet/feet (Figure 2-19). In the fall of 2015, the hydraulic gradient was approximately 0.008 feet/feet (Figure 2-20).

There is a large degree of uncertainty associated with the groundwater elevation contours, hydraulic gradient, and groundwater flow direction in the GCA in the spring and fall of 2015 because so few wells are screened solely within the GCA. The direction of flow, as contoured by the wells that are screened within the GCA, likely reflects the LAS groundwater production south of Hueneme Road (Figure 2-6). However, no wells are screened solely within the GCA north of Hueneme Road; therefore, the groundwater elevation, hydraulic gradient, and direction of flow in the GCA is unknown for much of the Oxnard Subbasin. Coastal groundwater elevations were measured below or near sea level in both spring and fall of 2015, and consequently the hydraulic gradient was landward at the coast (Figures 2-19 and 2-20).

Vertical Gradients

Groundwater elevations in the GCA are generally lower than those in the overlying FCA, except adjacent to Port Hueneme in Wells 01N22W28G04S and 01N22W28G05S (Table 2-2). The downward vertical hydraulic gradient in the spring of 2015 ranged from 0.047 feet/feet downward at Wells 01N21W32Q04S and 01N21W32Q05S to 0.01 feet/feet upward Wells 01N22W28G04S and 01N22W28G05S (Table 2-2). Vertical hydraulic gradients were similar in the fall of 2015, ranging from 0.044 feet/feet downward to 0.019 feet/feet upward, in the same wells.

Only well cluster 01N21W32Q has two wells screened within the GCA (Wells 01N21W32Q02 and 01N21W32Q03; Figure 2-19). Within the GCA, the vertical hydraulic gradient was 0.084 feet/feet upward in both the spring and fall of 2015 (Table 2-2).

Historical Groundwater Elevation Trends

Groundwater elevations in the GCA have been measured since 1989. Similar to the water levels in the overlying FCA, the groundwater levels in the GCA recovered between 1990 and 1996 (Figure 2-21, Groundwater Well Hydrographs in the Grimes Canyon Aquifer). Between 1996 and 2010, groundwater elevations were relatively stable, with intra-annual variation of up to 80 feet per year, but with inter-annual variation (variation that occurs over a series of years) of 10 feet or less. Between 2011 and 2015 groundwater elevations in the GCA declined, coincident with a period of drought. Groundwater elevations in Wells 01N22W28G01S and 01N22W35E01S vary less than groundwater elevations in other GCA wells, potentially because they are relatively far from major centers of groundwater extraction or because they are adjacent to the coast, and the intrusion of seawater may moderate freshwater elevation changes (Figures 2-19 and 2-21).

Although groundwater elevations in the Oxnard Subbasin recover to some degree after each drought period, elevations in coastal GCA-specific wells in the southern Subbasin remain below mean sea level.

2.3.2 Estimated Change in Storage

Estimated monthly change in storage values for the Oxnard Subbasin were generated by the numerical groundwater flow model prepared by UWCD (Appendix C). Monthly data reported from the model was summed to get the annual change in storage for the period from water year 1986 to water year 2015. There are inherent uncertainties in using any numerical groundwater flow model. The uncertainty associated with the UWCD model estimates is explored in more detail in Appendix E, UWCD Model Peer Review. Model estimated change in storage for the aquifer, the UAS, and the LAS is presented below.

The annual change in storage in the semi-perched aquifer ranged from an increase of approximately 16,300 AF in water year 1995 to a decrease of approximately 11,000 AF in water year 2014. The average annual change in storage in the semi-perched aquifer was a loss of storage of approximately 410 AFY.

In the UAS, the annual change in storage ranged from an increase of approximately 63,000 AF in water year 2005 to a decrease of approximately 34,200 AF in water year 1987. The average annual change in storage in the UAS was a loss of approximately 2,800 AFY.

The LAS had a maximum annual increase in storage of approximately 7,300 AF in water year 2005 and a maximum annual decrease in storage of approximately 8,000 AF in water year 1987. The average annual change in the LAS was a loss of approximately 220 AFY.

Total average annual change in storage in the Oxnard Subbasin was a decrease in storage of approximately 3,400 AFY. For the entire Oxnard Subbasin, the annual change in storage ranged from an increase of approximately 81,000 AF in water year 2005 to a decrease of approximately 48,700 AF in water year 1987 (Figure 2-22, Oxnard Subbasin Annual Change in Storage).

The cumulative change in storage calculated by the model over the period of record, water years 1986 through 2015, is presented on Figure 2-23, Oxnard Subbasin Cumulative Change in Storage. For the semi-perched aquifer, the UAS, and the LAS, the cumulative change in storage was a loss of approximately 12,300 AF, 82,500 AF, and 6,600 AF, respectively. The total cumulative loss for the entire Oxnard Subbasin was approximately 101,400 AF (Figure 2-23). Groundwater extraction (pumping) in the FCGMA is reported on a calendar year basis, so pumping and artificial recharge in figures is per calendar year, while change in storage is per water year. Annual change in storage is not strongly correlated to groundwater pumping in the Oxnard Plain ($R^2 < 0.5$). In contrast, artificial groundwater recharge at the UWCD spreading grounds is correlated with change in storage ($R^2 > 0.8$; see Figures 2-22 and 2-23). Therefore, maintaining the ability to recharge groundwater via the UWCD spreading grounds is critical to maintaining groundwater production in the Subbasin.

The model results illustrated in Figures 2-22 and 2-23 represent the net change in groundwater storage in each of the aquifer systems in the Subbasin. These results, however, include flux of seawater into the coastal areas of the aquifer systems from offshore. The volume of seawater that intruded between 1986 and 2015 was calculated for the UAS and LAS. The volume of seawater calculated does not include coastal flux into or out of the semi-perched aquifer, as few production wells are screened solely in the semi-perched aquifer. In order to assess the change in freshwater storage in the Subbasin, the annual volume of seawater that intruded was subtracted from the annual total storage change discussed above.

In the UAS, the average annual change in freshwater storage is a loss of approximately 6,600 AFY, which is more than two times greater than the total average annual change in storage for the UAS (2,800 AFY), including seawater intrusion (Figure 2-24, Oxnard Subbasin Annual Change in Storage Without Coastal Flux). In other words, approximately 3,800 AFY of seawater intrusion occurred in the UAS between water years 1986 and 2015. The maximum annual increase in freshwater storage was approximately 61,500 AF in water year 2005 and the maximum annual decrease in freshwater storage was approximately 48,500 AF in water year 1990.

The average annual change in freshwater storage in the LAS is a loss of approximately 5,700 AFY, which is 26 times greater than the total average annual change in storage for the LAS (220 AFY), including seawater intrusion (Figure 2-24). Therefore, there was approximately 5,500 AFY of seawater intrusion into the LAS between water years 1986 and 2015. The maximum increase of freshwater in storage in the LAS was approximately 2,820 AF in water year 1998 and the maximum decrease of freshwater in storage was approximately 15,150 AF in water year 1990.

For the entire Oxnard Subbasin, there was an average decrease in freshwater storage of approximately 12,700 AFY, when coastal flux is removed, with a maximum increase in storage of approximately 74,700 AF in water year 2005 and a maximum decrease in storage of approximately 73,500 AF in water year 1990 (Figure 2-24). Cumulatively between 1986 and 2015, the loss of freshwater in storage in the UAS was approximately 197,200 AF and the loss of freshwater in storage in the LAS was approximately 170,200 AF. The cumulative change in freshwater storage for both the UAS and LAS was a loss of approximately 367,400 AF. The cumulative change in storage for the entire Oxnard Subbasin, including the semi-perched aquifer, calculated by the model over the period of record, was a loss of approximately 380,200 AF of freshwater in storage, excluding coastal flux (Figure 2-25, Oxnard Subbasin Cumulative Change in Storage Without Coastal Flux).

Estimates of model changes in storage have a level of uncertainty and are dependent on model input parameters. These parameters include groundwater pumping, artificial aquifer recharge, interbasin flows, recharge from precipitation and irrigation returns, stream leakage and groundwater discharge to streams, and inflows from the ocean. Numbers may also initially be biased due to assumptions about the initial groundwater levels used in the model, which are based on available well locations and measurements that may bias starting groundwater elevations modeled in the aquifers. These inputs were estimated using the best available data and calibrated to groundwater levels in the model to a reasonable extent (Appendix C). Changes in these input values from additional monitoring wells, the filling of data gaps, and model calibration and validation may result in changes in the modeled estimates of change in storage in the future.

2.3.3 Seawater Intrusion

Evidence of seawater intrusion in the Oxnard Subbasin was first documented in the 1930s in the vicinity of Port Hueneme and Point Mugu (DWR 1965). Since that time, the landward extent of the saline water impact front has been monitored and the causes and sources of increasing chloride concentrations have been studied. Table 2-3 lists historical seawater intrusion reports and studies on the Oxnard Subbasin.

An elevated risk of seawater intrusion has been found to exist near Port Hueneme and Point Mugu due to the near shore presence of the groundwater–seawater contact in deeply incised submarine canyons (UWCD 2016a).

Seawater intrusion has been documented in both aquifer systems, and in each primary aquifer, in the Oxnard Subbasin. Seawater preferentially intrudes the aquifers in permeable sand and gravel beds (UWCD 2016a). As a result, the eastward extent of the saline water impact front varies from north to south along the coastline and within each aquifer (UWCD 2016a). In the Oxnard Subbasin, seawater that has intruded the aquifers in the vicinity of Port Hueneme tends to flow southward toward Point Mugu even after groundwater elevations rise and the landward hydraulic gradient is reversed (UWCD 2016a). As a result, higher groundwater elevations in the aquifer do not tend to flush the seawater back out of the aquifer via the original intrusion pathway (UWCD 2016a). Consequently, impacts associated with seawater intrusion have not been eliminated during wetter-than-average climatic periods.

2.3.3.1 Causes of Saline Impacts in the Oxnard Subbasin

Under seaward groundwater gradients, groundwater in the Oxnard Subbasin generally flows south and west from the Oxnard Forebay area toward the Pacific Ocean and out to sea. When groundwater heads near the coast fall below sea level or, in confined aquifers, the sea-level-equivalent elevation according to the depth of the aquifer outcrop, the gradient reverses.[4]

In addition to seawater intrusion, low groundwater heads in confined zones in the Oxnard Subbasin can create conditions under which high-salinity waters from non-marine sources impact freshwater aquifers. These sources include connate (groundwater trapped in sedimentary rocks due their deposition) brines released during compaction of aquitards and older, higher-salinity groundwater upwelling from geologic formations deeper than the lower extent of the freshwater aquifers (Izbicki 1991, 1996; UWCD 2016a; Izbicki et al. 2005).

Thirdly, although the major aquifer units in the Oxnard Subbasin are commonly separated by low-permeability units, vertical gradients, long-screened wells, and areas of mergence between aquifers can result in vertical groundwater movement between major aquifers (UWCD 2016a). In particular, because water elevations are typically higher in the semi-perched aquifer than in the deeper confined aquifers, higher-salinity water from the semi-perched aquifer may reach confined aquifers via one or more of these mechanisms. Seawater intrusion also enters the FCA from vertical flow from the Mugu aquifer in the Mugu area.

Because zones of low groundwater head cause seawater intrusion and release of connate water from aquitards, and potentially influence non-marine brine migration into freshwater aquifers, distinguishing the source of salts in any given well is not always possible, particularly at chloride concentrations less than 500 mg/L (Izbicki 1996). In the southeastern Subbasin, near the Mugu

[4] Because seawater is approximately 1.025 times denser than freshwater (using the Ghyben-Herzberg theory [De Wiest 1998]), the elevation of confined freshwater necessary to counterbalance the pressure of the water in the sea can be several feet above sea level, and depends on the depth at which an aquifer crops out in the ocean (i.e., the deeper the outcrop, the higher the freshwater elevation necessary to counterbalance the pressure of seawater).

submarine canyon, upward migration of brines can cause chloride concentrations to increase before the saline water impact front reaches a well (Izbicki 1996). Because the chloride concentration measured in wells near the Mugu submarine canyon reflect the combined effects of brine migration and seawater intrusion, it is difficult to define the leading edge of the saline water impact front using chloride concentrations in this area (Izbicki 1996). The USGS and UWCD models included faults in the Mugu Lagoon area that limit the hydraulic connection of the LAS in the Oxnard Basin to the Pacific Ocean (Hanson et al. 2003; Appendix C).

2.3.3.2 Current Extent of Seawater Intrusion

The known extent of saline water intrusion in the UAS and LAS in 2015 generally occurred near and southeast of Port Hueneme and in the area surrounding Mugu Lagoon. As of 2015, although seawater intrusion had been reduced in the Oxnard Subbasin due to management actions and wet climatic conditions in the 1990s and 2000s, TDS and chloride concentrations as high as 49,600 and 20,700 mg/L, respectively, were found in wells inland of the southern Oxnard coast (both measured in Well 01N22W07R05S; see Appendix F, Coastal Seawater Intrusion WL vs. CL Plots, and recent water quality data in Section 2.3.4, Groundwater Quality). The extent of saline water intrusion in the Oxnard Subbasin in 2015 is shown in cross section on Figure 2-26 (Approximate 2015 North–South Saline Water Intrusion Extent) and in plan view on Figures 2-27 through 2-32 (Coastal Chloride Concentrations, Fall 2015).[5] As discussed, chloride concentrations above 500 mg/L in the area of the Mugu Lagoon can be caused by both seawater intrusion and brine migration. Although this section focuses on areas that are known to be susceptible to seawater intrusion, the precise extent of current seawater intrusion impacts is difficult to separate from the areas that are impacted by release of saline water from connate brines. Therefore, the current area of seawater intrusion is smaller than the area of high chloride concentrations shown in Figures 2-27 through 2-32.

Additionally, the inland extent of seawater intrusion varies by aquifer (see Figure 2-26). Between 1985 and 2015, UWCD groundwater model estimates suggest that approximately 1,800 AFY of groundwater flowed from the semi-perched aquifer to the Pacific Ocean. In the UAS (Oxnard and Mugu Aquifers), in years characterized by relatively high rainfall, groundwater flowed from the aquifers to the ocean in the spring, and the flow reversed in the fall; conversely, in dry years ocean water flowed into the aquifers in all seasons. On average, over the entire model period, there was approximately 3,900 AFY of seawater intrusion into the UAS in the Oxnard Subbasin. In the LAS, the direction of flow varied by aquifer. The direction of flow in the Hueneme Aquifer was primarily from the ocean to the aquifer, though there are some months in which the flow direction was seaward. In the FCA and the GCA, ocean water flowed into the aquifers in every month in the period of record. The average seawater intrusion in the LAS was approximately 5,500 AFY during the model period.

[5] Saline water is typically defined as groundwater with a TDS concentration between 10,000 and 35,000 mg/L.

2.3.3.3 Historical Progression of Seawater Intrusion

Chloride concentrations were first measured in the Oxnard Subbasin in the 1920s. Between 1920 and 1929, the chloride concentration in three wells in the UAS ranged from 40 to 81 mg/L, with the lowest chloride concentration detected at the coast near Port Hueneme (FCGMA 2007). Groundwater elevations at this time ranged from 2 to 22 feet msl (FCGMA 2007). By 1934, when groundwater elevations in the UAS declined to −2 to 9 feet msl, the chloride concentration at a coastal well near Port Hueneme was 1,346 mg/L (FCGMA 2007). This was the first evidence of a potential saline water impact front in the vicinity of Port Hueneme. Between 1935 and 1940, chloride concentrations at the coast declined again and remained below 50 mg/L from 1934 to 1949 (FCGMA 2007). By 1954, however, as groundwater elevations in the UAS had declined to as much as −35 feet msl, seawater intrusion is interpreted to have affected an approximately 1-square-mile area near Port Hueneme, where two UAS wells had chloride concentrations of 1,070 and 1,925 mg/L.

This area of seawater intrusion expanded to the north and east between 1954 and 1959, and by 1959 an additional area of seawater intrusion was identified in the UAS north and east of Point Mugu (FCGMA 2007). Chloride concentrations near Port Hueneme reached 27,350 mg/L and those near Point Mugu reached 11,475 mg/L (FCGMA 2007). As groundwater elevations remained below sea level, the two areas of seawater intrusion continued to expand through the 1960s and 1970s, with the saline water impact front eventually reaching as much as 3 miles inland near Port Hueneme by the early 1980s (Izbicki 1996; FCGMA 2007).

The implementation of management strategies and pumping allocations by the FCGMA, along with increased rainfall in the late 1970s and early 1980s, reduced the area of the UAS affected by seawater intrusion, even as groundwater elevations remained below sea level throughout much of the Subbasin (FCGMA 2007). With the completion of the Freeman Diversion, which allowed for increased aquifer recharge at the spreading basins operated by UWCD, and additional above-average rainfall years, groundwater elevations in much of the UAS rose above sea level and the area of the UAS affected by seawater intrusion decreased in the 1990s (FCGMA 2007).

At the same time that seawater intrusion in the UAS was being managed and mitigated in the 1980s and 1990s, seawater intrusion began to affect the LAS (FCGMA 2007). By 1989, chloride was detected at a concentration of 6,700 mg/L at a well near Port Hueneme (FCGMA 2007). By 1994, chloride concentrations between 1,000 and 7,000 mg/L were detected near both Port Hueneme and Point Mugu (FCGMA 2007). The area impacted by seawater intrusion remained smaller in the LAS than in the UAS throughout the 1980s and 1990s.

Between 2000 and 2013, groundwater elevations in the UAS remained above sea level and there was little change in the extent of seawater intrusion near Port Hueneme (UWCD 2016a). As

groundwater elevations dropped below sea level during the recent drought, however, chloride concentrations in UAS monitoring wells near the coast began to increase and the saline water impact front expanded eastward again (UWCD 2016a). Near the Mugu submarine canyon, the groundwater elevations in the UAS have remained below sea level and chloride concentrations in wells near the coast are close to those of seawater (UWCD 2016a). The current extent of saline water intrusion in both the UAS and the LAS is shown in Figures 2-27 through 2-32.

2.3.3.4 Relationships between Groundwater Elevation and Seawater Intrusion

The relationship between groundwater elevations and seawater intrusion, as measured by changes in chloride concentration, is complex. Since the 1950s, water levels in the Oxnard and Mugu Aquifers in coastal areas have historically fallen below sea level in response to increased production and drought cycles (Figures 2-9a and 2-12). Unlike areas farther inland, the water levels below sea level resulted in seasonal seawater intrusion during the fall irrigation season and during droughts in coastal wells in the vicinity of Point Hueneme and Point Mugu (Figure 2-33, Groundwater Flux along the Coast in the Upper Aquifer System). In contrast, as groundwater production increased in the LAS, water levels in the FCA and the GCA near the coast quickly fell below sea level and have remained there since the 1980s, even after periods of above-average precipitation (Figures 2-18 and 2-21). The UWCD model indicates continuous flux from the ocean into these aquifers since 1985 (Figure 2-34, Groundwater Flux along the Coast in the Lower Aquifer System).

Some wells located near Port Hueneme and screened in the Oxnard Aquifer and the Hueneme Aquifer have chloride concentrations that rise as groundwater elevations decline and that decline as groundwater elevations rise. This relationship is shown in Wells 01N22W20M05S and 01N22W29D03S on Figure 2-35 (Selected Historical Records of Water Elevation and Chloride Concentration). All the wells with chloride and groundwater measurements are shown on Figure 2-36 (Locations of Selected Coastal Wells with Historical Measurements of Chloride Concentration and Water Elevation). It should be noted, however, that changes in chloride concentration in groundwater lag behind changes in groundwater elevation by up to 2 years in these wells. This response suggests that by the time the chloride response to declining groundwater elevations is measured, seawater intrusion has already begun.

The relationship between chloride concentration and groundwater elevation observed in Wells 01N22W20M05S and 01N22W29D03S is not universal throughout the Subbasin. In Well 01N22W29D02S, which is located in the same well cluster as Well 01N22W29D03S and is screened deeper in the Hueneme Aquifer, the concentration of chloride increased from 1995 through 2015, independent of groundwater elevation (Figures 2-35[C] and 2-36). The long-term increase in chloride concentration observed in this well suggests that groundwater elevations, even when above sea level, are not limiting the increasing chloride concentrations. A similar trend is observed in Well 01S21W08L03S, which is screened in the GCA and is

located near Point Mugu; however, in this well groundwater elevations have remained below sea level since 1990 (Figures 2-35[D] and 2-36). One explanation is that the southern flow of groundwater along the coast from Port Hueneme discussed above may limit the ability to flush some areas of saltwater back out of Grimes Canyon.

A complete set of hydrographs for all wells from which both chloride and groundwater elevation data have been collected, showing the relationship between chloride concentration and groundwater elevation, is provided in Appendix F. A summary of the relationship between chloride concentration and groundwater elevation by region within the Oxnard Subbasin is provided below.

North Coast

In the north coastal Oxnard Plains, groundwater elevations in one nested well cluster (01N23W01C02S-05S) screened in the Oxnard Aquifer, the Hueneme Aquifer, and the FCA, were below sea level in the early 1990s, generally remained above or near sea level between the mid-1990s and early 2010s, and dropped below sea level between 2013 and 2015 (Appendix F). In spite of the low groundwater elevations in the historical record, the chloride concentration in the four nested wells 01N23W01C02S–01N23W01C05S (Figure 2-36) has not exceeded 55 mg/L since the wells were completed in 1990 (Appendix F). Additionally, recent chloride concentrations in both the UAS and the LAS are typically below 100 mg/L (see Section 2.3.4). The aquifers of the Oxnard Subbasin are believed to crop out on the ocean floor where direct documentation of seawater intrusion cannot be measured.

Port Hueneme

In the vicinity of Port Hueneme, groundwater elevations in confined aquifers were below sea level in the early 1990s, recovered to elevations above sea level, remained there for two decades, and dropped below sea level between 2011 and 2014 after the onset of the recent drought. Records from nested wells 01N22W20M01 through 01N22W20M06 (which are screened in the semi-perched aquifer, the Oxnard Aquifer, the Mugu Aquifer, two zones in the Hueneme Aquifer, and the FCA; see Figure 2-36 and Appendix F) underscore the variability in the relationships between groundwater elevation and seawater intrusion in different water-bearing units. Despite the similarity in the five profiles of groundwater elevation over time, seawater preferentially intruded the Oxnard Aquifer in the past, and rising concentrations of chloride are observed in the Oxnard Aquifer, the Hueneme Aquifer, and the FCA in response to the recent decline in groundwater elevations. In this area, offshore outcrops of the older alluvium and the San Pedro Formation occur in the Hueneme submarine canyon. These outcrops provide a direct link between the Pacific Ocean and the freshwater aquifers of the Oxnard Subbasin. This region is susceptible to seawater intrusion, as demonstrated by chloride concentrations and groundwater elevations since the 1950s.

South Coast

In general, groundwater elevations in the Mugu Aquifer, FCA, and GCA in the South Coast Region have remained near or below sea level since the early 1990s (Figure 2-36 and Appendix F). Elevations in the Hueneme and Oxnard Aquifers largely remained above sea level between the mid-1990s and early 2010s. Within the upper Oxnard Aquifer, chloride concentrations have been decreasing, while rising chloride concentrations have been measured in the lower Oxnard Aquifer. In this area, elevated chloride concentrations in the Oxnard Aquifer likely result from southward migration of seawater that intruded the aquifer in the vicinity of Port Hueneme during earlier periods of low groundwater elevations (UWCD 2016a). This region does not typically experience direct seawater intrusion via offshore outcrops, but rather rising chloride concentrations indicate previous episodes of seawater intrusion via the Hueneme Canyon to the north.

Point Mugu

In all but one case, groundwater elevations in the vicinity of Mugu Lagoon have remained below sea level since the 1990s. Chloride concentrations exceeding 1,000 mg/L are measured in the majority of monitoring wells in this region (Figure 2-36; Appendix F). However, as noted above, some of the elevated chloride concentrations in this area are from the upwelling of connate water and the migration of groundwater to the LAS from the UAS.

2.3.4 Groundwater Quality

FCGMA adopted Basin Management Objectives (BMOs) for nitrate, chloride, and TDS in the Oxnard Subbasin for its 2007 Groundwater Management Plan Update (FCGMA 2007; Table 2-4). Additionally, the Water Quality Control Plan: Los Angeles Region (Basin Plan) specifies Water Quality Objectives (WQOs) for TDS, chloride, nitrate, sulfate (SO_4), boron, and nitrogen (mg/L nitrate) (LARWQCB 2013; Table 2-4). The current and historical distribution of these five constituents are discussed below. There are too few measurements of water quality in wells screened solely within a single aquifer to allow for meaningful discussion of water quality by aquifer. Additionally, as discussed in Section 2.3.1, the majority of the groundwater production in the Oxnard Subbasin occurs in wells that are screened across multiple aquifers. This production has the potential to impact water quality in multiple aquifers simultaneously. Therefore, impacts to groundwater quality in the Oxnard Subbasin are considered based on aquifer system.

Groundwater quality monitoring within the Oxnard Subbasin occurs on different schedules for different wells. In order to assess the current groundwater quality conditions within the Oxnard Subbasin, the most recent concentration of each of the five constituents listed above was mapped for samples collected between 2011 and 2015. Historical groundwater quality hydrographs are presented in Appendix G, Water Quality Hydrographs. Statistics on the most recent sample date, the maximum and minimum concentrations measured, the number of times sampled, and the

number of samples whose concentration exceeded the relevant water quality threshold are presented in Appendix H, FCGMA Water Quality Statistics.

2.3.4.1 Total Dissolved Solids

Sources of high TDS water in the Oxnard Subbasin include seawater and brines migrating via faults or upwelling from older geologic formations (see Section 2.3.3). Additionally, in the UAS, improperly abandoned wells in the semi-perched aquifer and high chloride brines in fine-grained lagoonal deposits in the Oxnard and Mugu Aquifers, can contribute to high concentrations of TDS in the groundwater (Izbicki 1996). The water quality objective for TDS is 1,200 mg/L in the Forebay and confined aquifers, and 3,000 mg/L in the unconfined aquifers (LARWQCB 2013). The 2007 FCGMA BMO for TDS is 1,200 mg/L for the Forebay (FCGMA 2007). UAS wells with concentrations of TDS greater than 1,200 mg/L are found throughout the Oxnard Subbasin.

Upper Aquifer System

Concentration of TDS in groundwater in the UAS ranged from 652 mg/L to 49,600 mg/L between 2011 and 2015 (Figure 2-37a, Upper Aquifer System – Most Recent Total Dissolved Solids [mg/L] Measured 2011–2015, and Figure 2-37b, Upper Aquifer System, Forebay Area – Most Recent Total Dissolved Solids [mg/L] Measured 2011–2015). Water with TDS concentrations greater than 35,000 mg/L is considered brine. Both the highest and lowest concentrations of TDS were measured adjacent to the coast in Wells 01N22W27R05S and 01N22W27C02S, respectively (Figure 2-37a). The highest concentrations of TDS are found in coastal wells in areas known to be impacted by seawater intrusion (e.g., Well 01S21W08L04S) and release of connate brines from clay layers (e.g., Well 01N22W27R05S). The concentration of TDS in Well 01N22W27R05S has been increasing since 2013, while the concentration of TDS in Well 01S21W08L04S has remained stable over the last 5 years.

In the Forebay, Wells 02N22W23B02S and 02N22W23C05S have been used as BMO wells for TDS. In 2015, the concentration of TDS measured in a sample collected from Well 02N22W23B02S was 1,230 mg/L, and the concentration of TDS measured in a sample collected from Well 02N22W23C05S was 1,070 mg/L. The concentration of TDS in each of these wells has been increasing over the past 5 years (FCGMA 2016).

Lower Aquifer System

In general, TDS concentrations in the LAS are higher in the southern Oxnard Subbasin than in the northern part of the Subbasin (Figure 2-38, Lower Aquifer System – Most Recent Total Dissolved Solids [mg/L] Measured 2011–2015). Concentration of TDS in groundwater in the LAS ranged from 392 mg/L to 37,200 mg/L between 2011 and 2015 (Figure 2-38). The highest concentration was measured in Well 01N21W32Q03S, which is in the southern Oxnard Subbasin, inland from

the coast, and is screened within the GCA (Figure 2-38). The higher concentration of TDS in this area likely resulted from upward migration of brines in deeper formations. This migration may have been induced or exacerbated by lowered groundwater elevations from groundwater production in the LAS, although the concentration of TDS in this well has increased steadily since 1995, even during periods when groundwater elevations were 40 to 100 feet higher than they were in 2015 (Izbicki 1991; Izbicki et al. 2005; UWCD 2016a).

The lowest concentration of TDS was measured in Well 01N22W35E03S, screened in the FCA south of Port Hueneme (Figure 2-38). The concentration of TDS in this well was 392 mg/L in 2015. TDS concentrations in this well have remained relatively stable over the last 5 years, neither increasing nor decreasing with the onset of the 2011 drought.

2.3.4.2 Chloride

Sources of water high in chloride in the Oxnard Subbasin include modern seawater, groundwater from the semi-perched aquifer, connate water from fine-grained lagoonal deposits in the Oxnard and Mugu formations, and brines migrating via faults or upwelling from older geologic formations (see Section 2.3.3). The UAS has a long history of seawater intrusion, with groundwater elevations below sea level measured as early as the 1930s (see Section 2.3.3; UWCD 2016a). Seawater intrusion affects a smaller area of the LAS than the UAS, and is more pronounced near Point Mugu than near Port Hueneme (UWCD 2016a). Brine migration along faults and from deeper geologic formations also affects the chloride concentration in the LAS (Izbicki 1991).

The water quality objective for chloride is 150 mg/L in the Forebay and confined aquifers, and 500 mg/L in the unconfined aquifers (LARWQCB 2013). The BMO for chloride is 150 mg/L for the UAS and LAS.

Upper Aquifer System

Concentration of chloride in groundwater in the UAS ranged from 23 mg/L to 20,700 mg/L between 2011 and 2015 (Figure 2-39a, Upper Aquifer System – Most Recent Chloride [mg/L] Measured 2011–2015, and Figure 2-39b, Upper Aquifer System, Forebay Area – Most Recent Chloride [mg/L] Measured 2011–2015). Chloride concentrations in the UAS are higher near the coast, from Point Hueneme south to Point Mugu, than inland or north of Port Hueneme (Figure 2-39a). The lowest concentration of chloride was measured in Well 01N22W11C02S in the central Oxnard Subbasin (Figure 2-39a). This well was only sampled one other time, in 1952, and the concentration of chloride measured at that time was 83 mg/L. Between 2011 and 2015, the concentration of chloride was less than 150 mg/L in the Forebay (Figure 2-39b).

The highest concentration of chloride (20,700 mg/L) was measured in Well 01N22W27R05S, adjacent to the coast south of Port Hueneme (Figure 2-39a). Groundwater from this well also had

the highest concentration of TDS. The concentration of chloride in this well has been increasing since 2013. The concentration of chloride in Well 01S21W08L04S, a BMO well near Point Mugu, was 17,500 mg/L in 2015. The concentration of chloride in this well has been stable over the last 5 years (FCGMA 2016). Of the nine BMO wells with chloride concentration objectives in the UAS, three have had increasing chloride concentrations over the past 5 years (Wells 01N22W20J07S, 01N22W20J08S, and 01S22W01H03S), although all of the BMO wells have had water levels below their targets as a result of the drought.

Lower Aquifer System

In general, chloride concentrations in the LAS are higher in the southern Oxnard Subbasin than they are elsewhere in the Oxnard Subbasin (Figure 2-40, Lower Aquifer System – Most Recent Chloride [mg/L] Measured 2011–2015). In the Forebay, the concentration of chloride in groundwater is less than 100 mg/L, while concentrations of chloride south of Port Hueneme exceed 500 mg/L (Figure 2-40).

Concentration of chloride in groundwater in the LAS ranged from 33 mg/L to 14,300 mg/L between 2011 and 2015 (Figure 2-40). The lowest concentration of chloride was measured in Well 01N23W01C02S on the coast, north of Port Hueneme (Figure 2-40). The concentration of chloride in this well has remained stable since it was first measured in 1990.

The highest concentration of chloride was measured in Well 01N21W32Q03S, in the southern Oxnard Subbasin (Figure 2-40). In this well, the concentration of chloride has increased since it was first measured in 1991. At that time the concentration of chloride in the well was 340 mg/L. BMO Well 01S21W08L03S is also located in the southern Oxnard Subbasin, in the vicinity of Point Mugu. This is the only BMO well in the LAS that has had increasing concentrations of chloride over the past 5 years despite all of the BMO wells having water levels below their targets (FCGMA 2016).

2.3.4.3 Nitrate

Nitrate concentrations above WQOs and BMOs are present in the Forebay of the Oxnard Subbasin (UWCD 2008). These concentrations are likely a legacy of historical septic discharges and agricultural fertilizer application practices.[6] Historical discharges have resulted in concentrations that impact beneficial uses and users of the Oxnard Subbasin. In particular, not all municipal users of groundwater in this area have the ability to blend groundwater with nitrate exceeding the federal maximum contaminant level for nitrate as NO_3 of 45 mg/L.

[6] Ventura County extended sewer lines into this area in the years between 2000 and 2011 to address additional discharges of nitrate.

Historical nitrate concentrations in the Forebay are most impacted by the quantity of surface water available for spreading from the Santa Clara River. The river water has lower concentrations of nitrate than the groundwater. Therefore, during periods when Santa Clara River water is used to recharge the Subbasin, groundwater concentrations of nitrate decrease. Conversely, during periods of drought, groundwater concentrations of nitrate in the Forebay tend to increase.

The BMO for nitrate is 22.5 mg/L in the Forebay (FCGMA 2007). The WQO for nitrate as NO_3 is 45 mg/L for the entire Oxnard Subbasin (LARWQCB 2013).

Upper Aquifer System

Between 2011 and 2015, concentrations of nitrate as NO_3 in groundwater in the UAS ranged from below the detection limit to 240 mg/L (Figure 2-41a, Upper Aquifer System – Most Recent Nitrate [mg/L as Nitrate] Measured 2011–2015, and Figure 2-37B). The highest concentration was measured in Well 02N22W26C01S in the Forebay (Figure 2-41b, Upper Aquifer System, Forebay Area – Most Recent Nitrate [mg/L as Nitrate] Measured 2011–2015). However, the concentration of nitrate measured in a sample collected from the same well in 2011 was only 4.9 mg/L. Similarly, nitrate concentrations in Wells 02N22W23B02 and 02N33W23C05S, which are both BMO wells, increased between 2011 and 2016. The concentration of nitrate in Well 02N22W23B02 was 4.1 mg/L in 2011 and was as high as 127 mg/L in 2015. The concentration of nitrate in Well 02N22W23C05 was 2.8 mg/L in 2011 and was as high as 31.9 mg/L in 2015.

Outside of the Forebay, the concentration of nitrate in the groundwater decreases rapidly and is not correlated with recharge from the spreading basins. In general, nitrate as NO_3 concentrations are highest in the southern Forebay and northeastern Oxnard Subbasin. The lowest concentrations are found in the southern Oxnard Subbasin, with the concentration of nitrate below the detection limit in the majority of the wells in the southern Subbasin (Figure 2-41a).

Lower Aquifer System

Concentrations of nitrate as NO_3 in groundwater in the LAS are lower than they are in the UAS. Between 2011 and 2015, the concentration of nitrate as NO_3 in wells screened in the LAS ranged from below the detection limit to 57 mg/L. The highest concentration was measured in Well 02N21W19A03S, in the northeastern Oxnard Subbasin. The concentration of nitrate in this well may be influenced by downward migration of water and is not representative of general nitrate concentrations within the LAS. The next-highest concentration of nitrate was measured in Well 01N22W23R02. The concentration of nitrate in the well was 22.1 mg/L (Figure 2-42, Lower Aquifer System – Most Recent Nitrate [mg/L as Nitrate] Measured 2011–2015). The majority of the wells in the LAS have nitrate as NO_3 concentrations below the detection limit. In the Forebay, the concentration of nitrate as NO_3 is lower in the LAS than it is in the UAS (Figures 2-41b and 2-42).

2.3.4.4 Sulfate

Sources of sulfate in the Oxnard Subbasin include mineral dissolution in groundwater and seawater intrusion. The majority of the wells in the Oxnard Subbasin have sulfate concentrations below 600 mg/L. Similar to nitrate, wells in the Forebay tend to have higher concentrations of sulfate than wells farther south, with the notable exception of Wells 01N22W27R05S and 01S21W08L04S (Figure 2-43a, Upper Aquifer System – Most Recent Sulfate [mg/L] Measured 2011–2015). The water quality objective for sulfate is 600 mg/L in the Forebay and confined aquifers, and 1,000 mg/L in the unconfined aquifers (LARWQCB 2013).

Upper Aquifer System

Concentrations of sulfate in the UAS ranged from 100 mg/L to 5,740 mg/L between 2011 and 2015 (Figure 2-43a and Figure 2-43b, Upper Aquifer System, Forebay Area – Most Recent Sulfate [mg/L] Measured 2011–2015). High concentrations of sulfate near the coast are generally indicative of seawater intrusion. The highest concentration was measured in Well 01N22W27R05S, which also had the highest concentration of chloride and TDS. The concentrations of each of these constituents has increased since 2013. The lowest concentration was measured in Well 01N22W36K09S in the southern Oxnard Subbasin.

Lower Aquifer System

Concentrations of sulfate in the LAS ranged from below the detection limit to 2,030 mg/L between 2011 and 2015 (Figure 2-44, Lower Aquifer System – Most Recent Sulfate [mg/L] Measured 2011–2015). High concentrations of sulfate near the coast are generally indicative of seawater intrusion. The highest concentration was measured in Well 01N21W32Q03S, which also had the highest concentration of chloride and TDS. Only four wells in the LAS had concentrations of sulfate that exceeded 600 mg/L. These wells are distributed throughout the Oxnard Subbasin and do not follow a clear geographic pattern. Similar to nitrate, LAS wells in the Forebay have lower concentrations of sulfate than UAS wells in the Forebay (Figure 2-44).

2.3.4.5 Boron

Sources of boron in the Oxnard Subbasin include seawater intrusion in coastal areas and release of anthropogenic (introduced by human activities) boron from past septic tank uses. The WQO for boron in the Oxnard Subbasin is 1 mg/L (LARWQCB 2013).

Upper Aquifer System

Concentrations of boron in the UAS ranged from 0.05 mg/L to 5.9 mg/L between 2011 and 2015 (Figure 2-45a, Upper Aquifer System – Most Recent Boron [mg/L] Measured 2011–2015, and

Figure 2-45b, Upper Aquifer System, Forebay Area – Most Recent Boron [mg/L] Measured 2011–2015). The highest concentration was measured in Well 01N22W27R05S, which also had the highest concentrations of sulfate, chloride, and TDS. The lowest concentration was measured in Well 02N22W24A01S, in the northeastern Oxnard Subbasin (Figure 2-45a). Only seven wells in the UAS had boron concentrations greater than 1 mg/L between 2011 and 2015.

Lower Aquifer System

Concentrations of boron in the LAS ranged from 0.3 mg/L to 2.2 mg/L between 2011 and 2015 (Figure 2-46, Lower Aquifer System – Most Recent Boron [mg/L] Measured 2011–2015). The highest concentration was measured in Well 01N21W32Q03S, which also had the highest concentrations of sulfate, chloride, and TDS. Only five wells in the LAS had boron concentrations greater than 1 mg/L between 2011 and 2015.

2.3.4.6 Map of Oil and Gas Deposits

In the database maintained by the County of Ventura (2016), five oil fields entirely or partially fall within the Oxnard Subbasin: Montalvo, W.; Oxnard; El Rio; Santa Clara Avenue; and Saticoy (Figure 2-47, Oil Fields in the Vicinity of FCGMA Groundwater Basins). Petroleum extraction in the FCGMA basins occurs below the deepest freshwater aquifer (Hopkins 2013). While no evidence of impacts of petroleum extraction on beneficial use of groundwater in the FCGMA basins has been identified, there are limited available data. Few wells exist in deep aquifers near oil fields that could be monitored for potential impact. However, trace amounts of organic compounds have been found in deeper wells in southeastern Pleasant Valley (Izbicki et al. 2005), and there have been anecdotal reports of trace petroleum hydrocarbons observed in irrigation wells near some oil fields.

2.3.4.7 Maps of Locations of Impacted Surface Water, Soil, and Groundwater

Impacted surface water, soil, and groundwater have been documented in the Oxnard Subbasin, although these impairments tend to be limited to the semi-perched aquifer. This uppermost unit in the Oxnard Subbasin is underlain by a clay cap layer that limits the vertical migration of impaired water to the underlying UAS.

Impaired surface waters (i.e., 303(d) Listed Reaches) that overlie the Oxnard Subbasin include approximately 3 miles of the Santa Clara River, the Revolon Slough, Calleguas Creek, and a number of lined drains serving agricultural areas south of the City of Oxnard (Figure 2-48, Impaired Surface Waters in the Vicinity of FCGMA Groundwater Basins; SWRCB 2004). The names of the reaches used by the State Water Resources Control Board, and the impairments listed for each, are included in tabulated form in Appendix I, Oxnard 303(d) List Reaches.

Locations of impacted soil and groundwater were assessed on a basin-wide scale by reviewing information available on the SWRCB GeoTracker website and the California Department of Toxic Substances Control EnviroStor website. Cases that were closed by the supervisory agency were not considered.

Of the 290 open cases located within the boundaries of the Oxnard Subbasin and Pleasant Valley, groundwater was impacted in 77. Dudek reviewed and catalogued the constituents of concern (COCs) present on site in these 77 cases (Figure 2-49, Constituents of Concern at Open GeoTracker Cases with Impacted Groundwater within FCGMA Groundwater Basin Boundaries). Case details are included in Appendix J, GeoTracker Open Sites.

Of the 71 open cases in the Oxnard Plain in which groundwater is, or is potentially, impacted, the following COCs were identified as present at the following number of sites (Figure 2-49; Appendix J):

- Chlorinated volatile organic compounds (VOCs), including COCs marked as *solvents*, *VOCs*, and *chlorinated hydrocarbons*, were present at 34 sites.
- Gasoline and diesel, including COCs marked *TPH* and *petroleum*, were present at 32 sites.
- Metals were present at 27 sites.
- Polychlorinated biphenyls (PCBs) were present at 23 sites.
- Benzene, toluene, ethylbenzene, and/or xylenes (BTEX) were present at 18 sites.
- Pesticides were present at 12 sites.
- Methyl tert-butyl ethylene (MTBE) and/or tert-butyl alcohol (TBA) were present at seven sites.
- Two sites listed other COCs.

Many of these sites are located on land administered by the U.S. military (Figure 2-49). Outside of military bases, these sites tend to occur within the city limits of the Cities of Oxnard, Port Hueneme, and Camarillo.

The risk that contamination in the shallow groundwater of the Oxnard Subbasin would reach the UAS is somewhat mitigated by the presence of a confining layer that separates the semi-perched aquifer from the water-bearing units of the UAS throughout much of the Oxnard Plain (Turner and Mukae 1975). However, the vertical gradient is directed downward from the semi-perched aquifer to the underlying Oxnard Aquifer, indicating the potential for groundwater movement from the semi-perched aquifer to the Oxnard Aquifer.

Based on a review of open GeoTracker and EnviroStor cases with impacted groundwater, it does not appear that existing groundwater contamination in the semi-perched aquifer poses a substantial threat to beneficial use of groundwater in the UAS and the LAS. Based on a review of the files

available on GeoTracker for each of the cases in the Oxnard Subbasin that fell outside the bounds of a military base, it appears that in none of the cases were any liable parties required to investigate deeper than 50 feet below ground surface (bgs), indicating that impacts to groundwater in the UAS were not a concern for regulatory agencies.

2.3.5 Subsidence

Inelastic, or irrecoverable, land subsidence (subsidence) can be a concern in areas of active groundwater extraction, including the Oxnard Subbasin. Active causes of land subsidence in the Oxnard Subbasin include tectonic forces, petroleum reservoir compaction, and clay compaction (Hanson et al. 2003). Significant water level declines in the FCGMA groundwater basins since the early 1900s suggest that fluid extraction, rather than tectonic activity, is the major cause of land subsidence (Hanson et al. 2003). Subsidence resulting from any of these sources can cause increased flood risk, well casing collapse, and a permanent reduction in the specific storage of the aquifer (Hanson et al. 2003).

Direct measurement of subsidence within the Oxnard Subbasin is limited. Elevation data from USGS benchmark (BM) E548 in the southern part of the Oxnard Plain indicate subsidence of about 1.6 feet (0.49 meters) during the period from 1939 to 1960, and an additional 1 foot (0.31 meters) of subsidence from 1960 to 1978 (Hanson et al. 2003). The average rate of subsidence for these two periods was similar, averaging approximately 0.07 feet (0.02 meters) per year from 1939 to 1960, and approximately 0.06 feet (0.02 meters) per year from 1960 to 1978 (Hanson et al. 2003). In contrast, elevation data from USGS BM Z901, located approximately 2.6 miles southeast of BM E548, indicate subsidence of approximately 0.3 feet (0.10 meters) between 1960 and 1978. The average rate of subsidence at BM E548 was 0.02 feet (0.01 meters) per year for this period. The rate of subsidence at BM Z901 decreased to approximately 0.01 feet per year from 1978 to 1992. Data are not available for BM E548 after 1978. The amount of subsidence measured at both BM E548 and BM Z901is the cumulative subsidence from all possible sources, including groundwater pumping, tectonic activity, and petroleum reservoir compaction.

In addition to direct measurement of subsidence in the southern part of the Oxnard Plain, potential subsidence was modeled for the entire Oxnard Plain for different future water production scenarios (Hanson et al. 2003). The scenarios included consideration of proposed water projects and ordinances for the FCGMA Basins. The model results suggest that areas within the Oxnard Plain may experience an additional 0.1 to 1 feet of subsidence by 2040 (Hanson et al. 2003). DWR classified the Subbasin as an area that has a medium to high potential for future subsidence. The amount of future subsidence will depend on whether future water levels decline below previous low levels and remain there for a considerable amount of time (Hanson et al. 2003). Maintaining water levels above the previous low water levels will limit the risk of future subsidence.

From March 2015 to June 2016, the Jet Propulsion Laboratory (JPL) analyzed interferometric synthetic aperture radar (InSAR) data from the European Space Agency's satellite-borne Sentinel-1A and NASA's airborne UAVSAR, along with similar previous studies from 2006 to 2015, to examine subsidence in areas of California. The study included the south-central coast of California in Ventura and Oxnard (Farr et al. 2017). The map generated from this study for this area of the south-central coast of California (Farr et al. 2017, Figure 23) showed less than 1 foot of subsidence for the Oxnard Subbasin.

2.3.6 Groundwater–Surface Water Connections

The Santa Clara River, Calleguas Creek, Revolon Slough, Mugu Lagoon, Ormond Beach, and McGrath Lake have all been identified as surface water bodies that may have a connection to the semi-perched aquifer in the Oxnard Subbasin (see Section 2.3.7, Groundwater-Dependent Ecosystems). However, groundwater elevation data for the semi-perched aquifer in the Oxnard Subbasin are extremely limited, with no monitoring sites near enough to surface water bodies to establish the extent of the connection between these surface water bodies and underlying groundwater (Figure 2-50, Groundwater Elevation Contours in the Semi-Perched Aquifer, March 2–29, 2015, and Figure 2-51, Groundwater Elevation Contours in the Semi-Perched Aquifer, October 2–29, 2015).The spatial extents of gaining, losing, and dry reaches in the Santa Clara River are seasonally variable (UWCD 2014, 2018).

The best available estimates for groundwater–surface water connections comes from the UWCD numerical model, which simulates the leakage from major surface water bodies in the Oxnard Subbasin using data from stream gauges and estimated aquifer properties (Appendix C). The UWCD model reports stream leakage from the Santa Clara River and Calleguas Creek into the underlying semi-perched aquifer. Numbers from the model represent net stream leakage and do not necessarily indicate direct connection between surface water bodies and groundwater in the semi-perched aquifer.

The UWCD model calculated stream percolation for water years from 1986 to 2015 (Table 2-5). The Santa Clara River had net recharge to groundwater in 26 of 30 water years, with an average net recharge to groundwater of approximately 5,700 AFY. The recharge to groundwater primarily occurs in the vicinity of the Forebay, where Santa Clara River water percolates into the UAS. Downstream of the Forebay, some reaches of the Santa Clara River are typically gaining in most years, generally from the semi-perched aquifer. Net groundwater discharge to the Santa Clara River was identified as occurring during 1999, 2002, 2006, and 2013. Calleguas Creek exhibited net recharge to groundwater in all years modeled, with an average net recharge to groundwater of approximately 3,450 AFY.

2.3.7 Groundwater-Dependent Ecosystems

Six potential GDE units, defined by dominant surface hydrologic features, were identified in the Oxnard Subbasin (Appendix C, UWCD Model Report; TNC 2017 [see Appendix K of this GSP]; Figure 2-52, Groundwater-Dependent Ecosystems for the Oxnard Subbasin). The potential GDE units were identified using the statewide potential GDE map (Appendix K). Of the six potential GDE units identified, the Lower Santa Clara River, McGrath Lake, Ormond Beach, and Mugu Lagoon units were validated using groundwater elevations measured in wells within or adjacent to the unit to confirm the potential hydrologic connection to groundwater in the semi-perched aquifer, as described in The Nature Conservancy's GDE Guidance Framework (Appendix K). Insufficient well data are available to confirm the depth to groundwater in the Revolon Slough unit or the Lower Calleguas Creek unit. Therefore, in the discussion below, these units remain as potential GDEs. Groundwater elevation in the vicinity of these units will be required in order to confirm whether or not the habitat is supported by groundwater (see Section 4.6.5, Shallow Groundwater Monitoring near Surface Water Bodies and GDEs).

Lower Santa Clara River GDE

The lower Santa Clara River GDE (located downstream of Highway 101 and upstream of the estuary) comprises approximately 750 acres of aquatic habitat, in-channel wetland, and a range of willow–cottonwood riparian forest (Figure 2-53, Lower Santa Clara River Groundwater-Dependent Ecosystems; Appendix K, The Nature Conservancy GDE Tech Memo). The GDE is located in the floodplain of the lower Santa Clara River, which undergoes substantial transformations in vegetation composition and distribution due to the dynamic nature of the river flows during winter. The lower Santa Clara River GDE supports habitat for several state- and federally listed species (Table 2-6).

Flow in the lower Santa Clara River downstream of Highway 101 has historically been perennial (SFEI 2011; City of Ventura 2016). The source of the perennial flow in this region is groundwater from the semi-perched aquifer, which is separated from the underlying UAS by a clay cap that limits groundwater migration and allows differences in groundwater elevation between the semi-perched aquifer and the Oxnard Aquifer. In the spring of 2015, groundwater elevations in the Oxnard Aquifer were below sea level (Figure 2-7).

Groundwater from the semi-perched aquifer provides the dry summer baseflow, if it exists, and a quarter of the winter flow (City of Ventura 2011). Groundwater flow direction between the semi-perched aquifer and the lower Santa Clara River, its estuary, and nearby McGrath Lake, depends on tidal conditions, river stage, and recharge rates due to agricultural irrigation (City of Ventura 2016). Groundwater levels from wells in the vicinity of the lower Santa Clara River GDE generally range between 7 and 11 feet bgs (Figure 2-53). The groundwater depths are within the range

considered necessary for juvenile establishment (<10 feet) and mature vegetation growth (<20 feet) (City of Ventura 2016).

McGrath Lake GDE

The McGrath Lake GDE includes a coastal freshwater back-dune lake, arroyo willow riparian forest, freshwater emergent marsh, and saline emergent marsh (Figure 2-54, McGrath Lake Groundwater-Dependent Ecosystems). The McGrath Lake GDE supports critical habitat for several state- and federally listed endangered species as well as many special-status bird species (Table 2-6).

McGrath Lake is formed by shallow groundwater that remains perched above a clay layer in the semi-perched aquifer (ESA 2003). McGrath Lake operational water surface elevations are maintained between 2.7 and 3.6 feet msl (City of Ventura 2011). Groundwater flows toward the Santa Clara River during open-mouth conditions and towards McGrath Lake when the Santa Clara River Estuary fills following mouth closure (City of Ventura 2011). As measured since 2009, depths to groundwater around the McGrath Lake GDE range from ground surface to 10 feet bgs, depending on the well (Appendix K).

Ormond Beach GDE

The Ormond Beach GDE, which includes isolated patches of southern coastal salt marsh and coastal freshwater/brackish marsh that have been drained, filled, and degraded by past industrial and agricultural use, is part of a larger 1,500-acre coastal dune–marsh system of dunes, lakes, lagoons, and saltwater and freshwater marshes (WRA 2007; CCC 2017; Figure 2-55, Ormond Beach Groundwater-Dependent Ecosystems). The Ormond Beach GDE supports habitat for state- and federally listed species as well as 27 special-status plant species and 42 special-status wildlife species (Table 2-6).

The Ormond Beach GDE is hydrologically connected to the semi-perched aquifer. Shallow groundwater elevations are influenced by rainfall, tidal events, and the surface water elevations of the agricultural drains and flood control channels. Depth to groundwater ranges from ground surface to 15 feet bgs (Appendix K).

Mugu Lagoon GDE

Mugu Lagoon GDE is the largest salt marsh estuary in Southern California (USFWS 2016a). The GDE provides habitat for several state- and federally listed species (Table 2-6; Figure 2-56, Mugu Lagoon Groundwater-Dependent Ecosystems).

The estimated groundwater depth in the Mugu Lagoon GDE varies between ground surface and 6 feet bgs (Appendix K). Estimated depths to groundwater in the GDE, are based on interpolation of water elevation data from representative wells at Naval Base Ventura County Point Mugu to reference point locations within the Mugu Lagoon GDE. Mugu Lagoon receives groundwater discharge from the semi-perched aquifer along with freshwater from Calleguas Creek, the drainage ditches, primarily Oxnard Drainage Ditch No. 2, and salt water from tidal fluctuations.

Lower Calleguas Creek Potential GDE

The lower Calleguas Creek potential GDE includes aquatic habitat and mulefat and willow riparian forest. This potential GDE may support native special-status species (Table 2-6).

The Lower Calleguas Creek potential GDE overlies the semi-perched aquifer. The channel has been separated from the adjacent floodplain since the 1960s by a riprap and earthen levee countersunk about 3 feet below the surrounding grade. Thus, Calleguas Creek is a losing reach in the Oxnard Plain. Lower Calleguas Creek maintains a perennial streamflow due to a combination of wastewater effluent and pumped tile drain discharge from adjacent agricultural fields, with the addition of natural precipitation and stormwater runoff during winter months. The degree of groundwater recharge and/or discharge has not been studied and groundwater elevation data are not available for this area. Groundwater elevations at semi-perched aquifer monitoring wells (located approximately 1 mile to the southwest at Naval Base Ventura County Point Mugu) indicate typical groundwater elevations range from −1 to 6 feet msl. Extrapolated depths to groundwater at the downstream end of the Calleguas Creek GDE, at approximately 12 feet msl, are between 6 to 13 feet bgs. The extrapolated groundwater depths indicate the potential for the riparian vegetation to access shallow groundwater. Additional data need to be collected within the boundaries of the Calleguas Creek potential GDE in order to determine whether or not the riparian vegetation is accessing shallow groundwater.

Revolon Slough Potential GDE

The Revolon Slough potential GDE comprises aquatic habitat and willow riparian forest. This potential GDE may support native special-status species (Table 2-6). The riparian habitat within this potential GDE is considered “de minimis” because of its poor quality and limited extent adjacent to the waterway. Streamflow in lower Revolon Slough is considered to be a combination of agricultural return flow and precipitation and stormwater runoff. The degree of groundwater recharge and/or discharge has not been studied and groundwater elevation data are not available for this area. Groundwater elevations at semi-perched aquifer monitoring wells located approximately 1 mile to the southwest at Naval Base Ventura County Point Mugu indicate typical groundwater elevations range from −1 to 6 feet msl. Extrapolated depths to groundwater at the downstream end of the Revolon Slough potential GDE would be between 9 and 16 feet bgs. The extrapolated groundwater

depths indicate the potential for the riparian vegetation to access shallow groundwater. Additional data need to be collected within the boundaries of the Revolon Slough potential GDE in order to determine whether or not the riparian vegetation is accessing shallow groundwater.

2.3.8 Potential Recharge Areas

To evaluate potential future recharge areas within the Oxnard Subbasin, soil types were obtained from the Web Soil Survey, available online at https://websoilsurvey.nrcs.usda.gov/ (USDA 2019). Soil Ksat rates (saturated hydraulic conductivity rates) for soils of 92 micrometers per second or greater were plotted. Figure 2-57, Oxnard Potential Recharge Areas, shows the results of this evaluation and areas with the most favorable soil recharge rates. The most favorable areas are near the current UWCD spreading grounds, along the Santa Clara River, in sands along the northern coastal areas, and in loamy sands, which may represent old Santa Clara River drainages.

2.4 WATER BUDGET

This section presents the current, historical, and simulated future water budget analysis for the Oxnard Subbasin. This water budget analysis has been completed in accordance with the DWR GSP Regulations. The historical water budget has been prepared for the 31-year period from the beginning of calendar year 1985 through 2015 (the current year for the Sustainable Groundwater Management Act [SGMA]) and is described in units of AF or AFY. The five commonly recognized aquifer units in the Oxnard Subbasin are the Oxnard, Mugu, Hueneme, Fox Canyon, and Grimes Canyon Aquifers (DWR 1965, 2006; Turner 1975). As described in Section 2.2, Hydrogeologic Conceptual Model, these aquifers are grouped into a UAS and an LAS, with the Oxnard and Mugu Aquifers composing the UAS and the Hueneme, Fox Canyon, and Grimes Canyon Aquifers composing the LAS. The UAS primarily comprises recent to upper Pleistocene age alluvial deposits of the Santa Clara River system.

UWCD (2018; Appendix C) developed the "Ventura Regional Groundwater Flow Model (VRGWFM)," a MODFLOW numerical groundwater flow model, for the Oxnard Subbasin, the Mound Basin, the western part of the LPVB, and the PVB. Details of the UWCD modeling effort are included in Appendix C. The groundwater budget analysis for the Oxnard Subbasin is based on the DWR Bulletin 118 basin boundary for the Oxnard Subbasin, and does not incorporate the remainder of the model domain. As with all groundwater flow models, the UWCD model has undergone several revisions and will continue to be revised as additional data are collected and the understanding of the hydrogeologic interactions in the model domain improves. This GSP uses the version of the model finalized in June 2018, which was developed to support the GSP process. This version of the model was used for the current and historical water budget analysis as well as for the future projected groundwater scenarios discussed in Section 2.4.5, Projected Future Water Budget and Sustainable Yield.

2.4.1 Sources of Water

Aquifer systems in the Oxnard Subbasin receive water from several sources. Native sources consist predominantly of rainfall infiltration within the Oxnard Subbasin and along its margins (mountain-front recharge), and subsurface inflows from the adjacent basins.

Water sources consist predominantly of streambed seepage from Calleguas Creek where it enters the Oxnard Subbasin from the adjoining PVB; streambed seepage from the Santa Clara River; artificial recharge by the UWCD; deep percolation of a portion of the irrigation water that is applied to agricultural, residential, and commercial lands, and to public open spaces; leakage from water distribution systems; septic system return flows; and wastewater treatment plant (WWTP) percolation ponds. Two small community WWTPs are located adjacent to the Santa Clara River in the Oxnard Subbasin. The Saticoy and the Montalvo WWTPs discharge treated effluent to percolation ponds.

Water supplies for the Oxnard Subbasin consist of locally pumped potable and nonpotable groundwater; imported water provided by UWCD (nonpotable) and Calleguas Municipal Water District (CMWD) (potable); nonpotable surface water provided by UWCD from its Freeman Diversion on the Santa Clara River and delivered to agricultural users in the Oxnard Subbasin via the PTP and to agricultural users in the Oxnard Subbasin and PVB via the Pleasant Valley Pipeline (PVP); the Oxnard Subbasin portion of a nonpotable water supplied provided by the Camrosa Water District (CWD) to the Pleasant Valley County Water District (PVCWD) from a diversion on Conejo Creek; and fully advanced treated recycled water produced by the City of Oxnard (the Groundwater Recovery Enhancement and Treatment (GREAT) Program) that began to be delivered to PVCWD and a few other agricultural users in early 2016.

The predominant municipal water suppliers in the Oxnard Subbasin are the City of Oxnard, the Port Hueneme Water Agency, the City of Ventura, and the Naval Base Ventura County. Water supplies for these municipal users include deliveries by UWCD via the Oxnard–Hueneme Pipeline, which obtains its water exclusively from wells located at the El Rio Spreading Grounds and along Rose Avenue. These municipal users may also receive imported water supplied by the CMWD. The City of Oxnard has wells within the Oxnard Subbasin. The City of Ventura also has wells in the Oxnard Subbasin, but uses water in their service areas inside and outside of the Oxnard Subbasin. Figure 1-8 shows a map of water purveyors with service areas within the Oxnard Subbasin.

In addition to groundwater pumping, agricultural water supplies are provided by UWCD via its PTP and PVP. The PTP services users in the Oxnard Subbasin, and the PVP services users in both the Oxnard Subbasin and the PVB. UWCD's water source for the PTP and PVP consists primarily of surface water obtained at the Freeman Diversion, which may include State Water Project water from Lake Piru. Groundwater is also extracted at five LAS wells located along the PTP pipeline

in many years and is included in the water supplied by the PTP. Occasionally, temporarily stored recharge water is pumped from shallow wells at UWCD's Saticoy Spreading Grounds and included in water supplied by the PVP.[7]

2.4.1.1 Surface Water

Figure 2-58, Oxnard Subbasin Stream Gauges and Water Infrastructure, shows the locations of streams and primary drainage systems in and around the Oxnard Subbasin, as well as water infrastructure locations including WWTP ponds, stream gauge stations, and the two diversion structures (Freeman and Conejo Creek Diversions) that provide a portion of the water supply for the Oxnard Subbasin.

Santa Clara River

The Santa Clara River interacts with the groundwater system in the Oxnard Subbasin. Reaches of the Santa Clara River in the Oxnard Subbasin range from perennial to intermittent to ephemeral (Appendix C). The river flows through the adjoining Santa Paula Basin into the Oxnard Subbasin in the Forebay area, and then out of the Oxnard Subbasin to the Mound Basin. Climatic and geologic characteristics of the Santa Clara River watershed result in an intermittent flow regime; however, flows can increase rapidly in response to high-intensity rainfall with the potential for severe flooding. During winter months, storm events may cause periods of continuous surface flow to the Pacific Ocean in the Santa Clara River.

Santa Clara River Recharge

The UWCD groundwater model used the MODFLOW STR stream package to simulate stream flow recharge. The stream flow discharge and percolation for the Santa Clara River were estimated using this stream package and the results are provided in Table 2-7a (for the semi-perched aquifer) Table 2-7b (for the UAS), and Table 2-7c (for the LAS). Except for 1998, 1999, and 2006, following the high rains in 1998 and 2005, the net effect of surface-water/groundwater interaction along the Santa Clara River was recharge to the UAS and the semi-perched aquifer in the Oxnard Subbasin (Appendix C). During these years, the net effect of surface-water/groundwater interaction was discharge from the UAS to the Santa Clara River. From 1985 to 2015, the average estimated recharge from the Santa Clara River to the semi-perched aquifer was 661 AFY, and the average estimated recharge to the UAS was 4,848 AFY (Tables 2-7a and 2-7b). These numbers do not include diversions from the Santa Clara River by the UWCD for artificial recharge at their spreading grounds or for direct use, which are discussed below.

[7] UWCD extracts limited amounts of temporarily stored water from shallow wells at its Saticoy Spreading Grounds to the PVP during periods of mounding, as authorized by FCGMA Resolution 2011-02.

Santa Clara River Diversions and Recharge

Table 2-8 summarizes the historical diversions of Santa Clara River water by UWCD and deliveries to both the Oxnard Subbasin and the PVB. On average, UWCD diverted 62,467 AFY from the Santa Clara River between 1985 and 2015, although diversion volumes, which depend on local climatic conditions, are highly variable (Table 2-8). These diversions may include State Water Project water held at Lake Piru and then delivered to the UWCD via the Santa Clara River. UWCD diverts surface water from the Santa Clara River in the Santa Paula Basin, just upstream of the Oxnard Forebay. The majority of this water, on average, is used for groundwater recharge in its spreading basins within the Oxnard Forebay (Table 2-8). Additionally, the water is used as supply for the PTP that services agricultural water users on the Oxnard Plain and as supply for the PVP agricultural water supply line that services agricultural water users in both the PVB and the Oxnard Subbasin. During drought periods, the relative percentage of diverted water used to recharge groundwater in the spreading basins declines, and the relative percentage of groundwater delivered through the PTP increases.

Table 2-9 provides the amounts of diverted water recharged by the UWCD in the three UWCD recharge grounds. Approximately 93% of the diverted water is recharged in the El Rio and Saticoy Spreading Grounds, on average, and the remaining 7% is recharged in the Noble Spreading Grounds (Table 2-9). Figure 2-59, Freeman Diversion and Uses in the Oxnard Subbasin, shows the amounts of diverted water by UWCD, and Figure 2-60, UWCD Groundwater Recharge, shows the annual recharge by UWCD. As shown in Table 2-10, the UWCD supply delivered in the PTP supply line is a mixture of surface water, and groundwater pumped by UWCD from their PTP wellfield, which pumps from the LAS, and less frequently, from their Saticoy wellfield.

Recharge from the UWCD groundwater recharge spreading grounds is included with recharge in Table 2-7a and Table 2-7b, but identified individually in Table 2-11. Of the total average annual recharge shown in Table 2-11 (73,669 AFY), UWCD groundwater recharge accounts for 48,306 AFY, or 65.6%. Recharge related to the PTP/PV system averaged 3,319 AFY from 1985 to 2015 as shown in Table 2-11, this is 4.5% of the total recharge. Of the average 62,467 AFY diverted from the Santa Clara River (Table 2-8), the average of 48,306 AFY (Table 2-11) recharged to the UWCD spreading grounds constitutes 77%.

The water delivered in the Oxnard–Hueneme Pipeline consists of groundwater pumped from the UAS and LAS near the El Rio Spreading Grounds. As shown in Table 2-10, deliveries from the Oxnard–Hueneme Pipeline are primarily used for municipal purposes, but small volumes are occasionally used for agricultural water supply along Hueneme Road on the southern part of the Oxnard Subbasin.

Calleguas Creek

Calleguas Creek enters the Oxnard Subbasin almost 2 miles upstream of its confluence with Revolon Slough and discharges to the Pacific Ocean at Mugu Lagoon. This reach of Calleguas Creek is perennial, with flow occurring primarily as maintenance flows provided by CWD (6 cubic feet per second required bypass flow at its diversion on Conejo Creek), inflows from agricultural field tile drains, inflows from Revolon Slough, and treated wastewater discharges into the lower reaches of Conejo Creek from the Camarillo Water Reclamation Plant (in the PVB) and the Hill Canyon WWTP in the City of Thousand Oaks. Table 2-12 summarizes the estimated flows in Arroyo Las Posas and Conejo Creek that enter Calleguas Creek, which then flows into the Oxnard Subbasin.

Table 2-12 summarizes the historical diversions of water from Conejo Creek by CWD at the Conejo Creek Diversion near Highway 101 that are supplied to the Oxnard Subbasin via PVCWD (Figure 2-58). The estimated diversions by CWD that are used in the Oxnard Subbasin are shown on Table 2-10. The source of water to Conejo Creek is mostly wastewater discharge from the Hill Canyon WWTP upstream of the Arroyo Santa Rosa Valley Basin. Table 2-10 shows only that portion of this water that is supplied to PVCWD and used in the Oxnard Subbasin.

Calleguas Creek Recharge

The UWCD (2018; Appendix C) groundwater model used the MODFLOW STR stream package to simulate recharge for Calleguas Creek in the Oxnard Subbasin. Calleguas Creek in the Oxnard Subbasin does not have hydraulic communication with the underlying UAS, but modeling indicates recharge to the semi-perched aquifer from 1985 to 2015 averaged 3,394 AFY (Table 2-7a).

Beardsley Wash/Revolon Slough

Beardsley Wash/Revolon Slough is a shallow drainage that captures shallow groundwater and stormwater from agricultural field tile drains and is lying at a similar elevation as the surrounding fields in its lower reaches where it is perennial. Consequently, it is not thought to be a recharge source.

2.4.1.2 Imported Water Supplies

Table 2-13 and Figure 2-61, Water Deliveries to the PVCWD and UWCD, show the historical volumes of water sold to the two water retailers (City of Oxnard and Port Hueneme Water Agency) that have historically purchased imported water from the CMWD. As shown in the table, sales to Port Hueneme Water Agency and to the City of Oxnard have occurred since 1996 and 1964, respectively. Sales have averaged approximately 1,564 AFY (from 1996 to 2015) and 13,500 AFY (from 1985 to 2015) to the Port Hueneme Water Agency and to the City of Oxnard, respectively.

As discussed in Section 2.4.1.1, Surface Water, the UWCD-diverted surface water from the Santa Clara River may include State Water Project water used for groundwater recharge in UWCD spreading basins or water directly delivered to water users by either the PVP or the PTP.

Percolation of Outdoor Irrigation (Urban Return Flows)

In the UWCD (2018; Appendix C) model, an assumed amount of M&I delivered water (5%) is estimated as groundwater recharge. This water is included as recharged water in Tables 2-7a and 2-7b and the total is provided in Table 2-11 by sources. Of the total annual recharge shown in Table 2-11 (73,669 AFY), percolation of applied water accounts for 928 AFY, or 1.3%.

2.4.1.3 Recycled Water Supplies

Two small community WWTPs are located adjacent to the Santa Clara River in the Oxnard Subbasin (Figure 2-58). The Saticoy WWTP and the Montalvo WWTP discharge treated effluent to percolation ponds. According the UWCD (Appendix C, p. 47), the average annual volumes of effluent discharged to the percolation ponds are approximately 80 and 200 AF, respectively, based on reports provided by California's State Water Resources Control Board online database, GeoTracker (http://geotracker.waterboards.ca.gov/). The Saticoy WWTP is within the Oxnard Forebay, where percolating water can directly recharge the UAS. The Montalvo WWTP is farther downstream, in an area of the Oxnard Subbasin where percolating water recharges the semi-perched aquifer, which is not used for water supply. According to UWCD (Appendix C), the Montalvo WWTP ceased operating in 2016, subsequent to the model calibration period.

Recycled water by the City of Oxnard began to be provided to PVCWD and other agricultural users in early 2016. Wastewater effluent generated by the City of Oxnard historically has been treated at the Oxnard WWTP and discharged directly to the Pacific Ocean. However, the first phase of the GREAT Program's Advanced Water Purification Facility (AWPF) was completed in 2015, which provides this supply to PVCWD and other growers on the southern part of the Oxnard Subbasin.

Recycled Water Recharge

Recharge from the Saticoy and Montalvo WWTPs is simulated in the UWCD model using the recharge package. The monthly percolation volumes reported in the state's GeoTracker system were added to other areal recharge rates specified for the model grid cells corresponding to the WWTP percolation-pond sites (Appendix C, p. 83).

2.4.1.4 Percolation of Precipitation

Much of the rain that falls in the Oxnard Subbasin quickly returns to the atmosphere via evaporation, or runs off to creeks, storm drains, and ultimately the ocean; the remainder percolates into the soil where it is subject to evapotranspiration (ET), soil absorption, or for plant use.

However, some precipitation can percolate into the soil and downward past the plant root zone and reach an underlying aquifer. This recharge process is referred to as deep infiltration (or percolation) of precipitation.

Deep percolation of precipitation depends on many factors, including: precipitation rate and duration, evaporation rate, ambient temperature, texture and slope of land surface, soil type and texture, antecedent soil moisture, vegetation cover, seasonal plant activity, and others is highly variable over time and location (Appendix C). Thus estimates of the percolation of precipitation is subject to substantial uncertainty.

UWCD downloaded monthly precipitation data for 180 rainfall gauge stations across the model domain from the Ventura County Watershed Protection District (http://www.vcwatershed.net/hydrodata/) (Appendix C, p. 80). UWCD used the Kriging method of geostatistical analysis to generate monthly precipitation distributions across model area, and the areal recharge from deep infiltration of precipitation was input to the model using the recharge package and was calculated as follows:

- If monthly precipitation is less than 0.75 inches, the precipitation is lost to evapotranspiration.
- If monthly precipitation is 0.75 to 1 inch, then recharge is assigned from 0% to 10% of precipitation (on a sliding scale).
- If monthly precipitation is 1 to 3 inches, then recharge is assigned from 10% to 30% of precipitation.
- If monthly precipitation is greater than 3 inches, then recharge is assigned as 30% of precipitation.
- Urban (non-agricultural) land use, including residential, commercial, and industrial areas: 5% of the total water precipitation.
- Undeveloped land: 10% of the total water precipitation.

Precipitation Recharge

Recharge from the percolation of precipitation is include with recharge in Tables 2-7a and 2-7b, but identified individually in Table 2-11. Of the total annual recharge shown in Table 2-11 (73,669 AFY), percolation of precipitation accounts for 8,947 AFY, or 12.1%.

2.4.1.5 Basin Groundwater Subsurface Inflow and Outflow

UWCD (Appendix C) provided model monthly groundwater inflows and outflows between the Oxnard Subbasin and the Pleasant Valley, Mound, west Las Posas Valley, and Santa Paula Basins, and unincorporated areas, as well as for three coastal segments adjacent to the Pacific Ocean. These inflows and outflows were combined to generate the annual estimates used for the groundwater budget. Additionally Table 2-7b shows the subsurface flows between the UAS and the semi-perched aquifer as well as the UAS and the LAS.

2.4.1.6 Mountain-Front Recharge

UWCD (Appendix C) used the MODFLOW WEL package to input mountain-front recharge specified flux amounts into model grid cells adjacent to each small drainage system (sub-watershed) along the margins of the model area, and to the base of elevated bedrock or mountains areas. In the Oxnard Subbasin, mountain-front recharge was applied at the base of the volcanic outcrops adjacent to the southwest side of the CWD Water Reclamation Plant shown on Figure 2-58, and along the Santa Monica Mountains. Recharge rates were calculated from monthly precipitation rates for the area receiving the precipitation. The monthly mountain-front-recharge rate inputs to the model followed the precipitation/recharge-percentage relationship used for agricultural return flows (Section 2.4.1.9, Percolation of Agricultural Irrigation Water [Agricultural Return Flows]). For the Oxnard Subbasin, mountain-front recharge from and to the volcanic outcrops and the Santa Monica Mountains (Unincorporated Areas) are shown in Tables 2-7a and 2-7b.

2.4.1.7 Septic Systems Recharge

The number and location of septic systems in the Oxnard Subbasin were estimated by DBS&A (2017) based on the Ventura County septic database. If septic systems were present within any parcel within a tract, it was assumed that all parcels in the tract contained septic systems. The number of septic systems in the Forebay decreased beginning in 2011 due to a County of Ventura program to phase out septic systems in the area. It was estimated that the number of systems in the Forebay decreased from 1,823 in 1985 to 485 in 2015 (DBS&A 2017).

Household water use and annual disposal was estimated to decrease from 0.21 AFY per household for 1985 to 1997, 0.20 AFY per household for 1988 to 2010, and 0.16 AFY per household from 1998 to 2015 based on DeOreo and Meyer (2012, as cited in DBS&A 2017). The resulting estimated percolation from all septic systems was estimated to decrease from 382 AFY in 1985 to 75 AFY in 2015 (DBS&A 2017). These values are small compared to known recharge values (UWCD spreading) and other estimated recharge values (Santa Clara River recharge; agricultural and municipal return flows).

The UWCD groundwater model assumed that septic system recharge was widespread and small relative to other recharge sources and incorporated septic system return flows implicitly as a component of agricultural and municipal return flows.

2.4.1.8 Distribution Systems Leakage

Distribution system losses from leakage of water-supply pipelines, sewer lines, and storm drains are included with M&I return flows in the UWCD model.

2.4.1.9 Percolation of Agricultural Irrigation Water (Agricultural Return Flows)

Groundwater pumping is discussed in Section 2.4.2.1; only recharge from agricultural return flow is discussed in this section. The UWCD groundwater model used the following water sources that were applied to irrigated land and assumed an agricultural return flow of 14%:

- Extracted groundwater from wells for agricultural use
- Groundwater and surface water delivered by the PVCWD pipeline
- Surface water diverted from Conejo Creek to PVCWD

If the precipitation is more than 1 inch per month, the agricultural return flow ratio is compared with precipitation recharge ratio. If the precipitation recharge ratio is larger than 14%, the agricultural return flow is replaced by the precipitation recharge ratio.

Agricultural Recharge

Recharge from the agricultural return flow is included with recharge in Tables 2-7a and 2-7b, and identified individually in Table 2-11. Of the total annual recharge shown in Table 2-11 (73,669 AFY), agricultural return flow accounts for 12,169 AFY, or 16.5%.

2.4.2 Sources of Water Discharge

Sources of groundwater discharge predominantly include groundwater pumping, tile drain discharges, and evapotranspiration. However, depending on groundwater levels (as noted in Section 2.4.1.1), groundwater/surface interactions can also discharge groundwater to surface water, which can then either be lost from the Subbasin or recharge elsewhere in the Subbasin. Likewise, groundwater pumped and used for agricultural, M&I, and domestic purposes can produce return flows (Section 2.4.1.2, Imported Water Supplies; Section 2.4.1.7, Septic Systems Recharge; Section 2.4.1.8, Distribution Systems Leakage; and Section 2.4.1.9). Subsurface groundwater flows (interbasin flows) can discharge groundwater from the Oxnard Subbasin to the adjacent groundwater basins, unincorporated areas, and the Pacific Ocean (Section 2.4.1.5, Basin Groundwater Subsurface Inflow and Outflow).

2.4.2.1 Groundwater Pumping

Table 2-14 shows the amount of groundwater pumped for agricultural, M&I, and domestic uses by aquifer systems from the UWCD model results. UWCD modeled groundwater withdrawals using the multi-node well (MNW2) package. The extraction amounts in Table 2-14 were combined with well types from the FCGMA well database to distinguish the amounts extracted by type. Figure 2-62, Groundwater Pumping, shows the amounts of agricultural, M&I, domestic, and total groundwater pumped from the Oxnard Subbasin. Groundwater pumping is also shown in the Oxnard Subbasin groundwater budget in Tables 2-7a through 2-7c.

Available data indicate that during the calendar year 2015, a total of 80,814 AF (Table 2-14) of groundwater was extracted from the Oxnard Subbasin, of which, about 69% was for agricultural use (55,973 AF), 30% was for M&I use (24,648 AF), and about 0.2% was for domestic use (193 AF). For the Oxnard Subbasin, the FCGMA groundwater pumping database contains 732 known wells, of which 403 are currently listed as active use, 217 have been destroyed, 106 are inactive, and 6 could not be located. An additional 13 agricultural wells are in the UWCD database outside the FCGMA boundary.

Not all the groundwater produced in the Oxnard Subbasin remains in the Subbasin. Four agricultural users (PVCWD, Coastal Berry Co., Montalvo Water Co., Alta Mutual Water Co., and Guadalasca Mutual Water Co.) may export a portion of the groundwater that they pump from the Oxnard Subbasin to areas inside the PVB. The PVCWD uses a combination of pumped groundwater from the Oxnard Subbasin and the PVB, delivered UWCD water from the PVP, CWD-delivered water from Conejo Creek, and other sources. FCGMA groundwater pumping records indicate that from 1985 to 2015, approximately 41% and 59% of PVCWD's pumped groundwater has come from the PVB and the Oxnard Subbasin, respectively. A geographic information system (GIS) calculation of the area of the PVCWD in Figure 1-8 indicates that approximately 56% of the PVCWD service area is in the Oxnard Subbasin, and the remaining 44% is in the PVB. For purposes of estimating PVCWD water deliveries, a ratio of 44% PVB and 56% Oxnard Subbasin area was assumed to be a reasonable basis for PVCWD water supplies between the two basins. As shown in Table 2-10, during some years, groundwater pumping by PVCWD in the Oxnard Subbasin is less than this ratio resulting in a net import from the PVB. Conversely, in some years, groundwater pumping in the Oxnard Subbasin is more than this ratio, resulting in a negative import (an export) to the adjacent PVB.

2.4.2.2 Tile Drain Recharge Losses

Tile drains are used beneath many agricultural lands in the Oxnard Subbasin to maintain a sufficiently deep groundwater table where poorly drained soils create shallow groundwater conditions that can negatively affect plant health and crop yields. These conditions prompted the installation of tile drains across most of the Oxnard Plain in the 1900s. Tile drains are present beneath many agricultural land parcels in the PVB as well. These drains discharge to local drainage ditches and then to surface water bodies Revolon Slough and Calleguas Creek. The flows in the tile drains are not metered.

Tile drains were implemented in the UWCD groundwater model using MODFLOW's drain package (DRN). Model grid cells with simulated tile drains in the uppermost active layer correspond with agricultural areas where tile drains are known or suspected to exist. The UWCD model has calculated losses to tile drains based on groundwater model simulated water levels and the results are provided in Tables 2-7a and 2-7b. Average annual loss to tile drains in the UWCD model is 10,752 AFY.

2.4.2.3 Evapotranspiration (ET)

The UWCD model used the U.S. Fish and Wildlife Service online "Wetlands Mapper" (https://www.fws.gov/wetlands/data/mapper.html) to indicate areas of riparian vegetation along stream channels. These areas, together with parts of the Santa Clara River (including its estuary), Revolon Slough/Beardsley Wash, McGrath Lake, Ormond Beach wetlands, and Mugu Lagoon wetlands were used to estimate evapotranspiration (ET) (Appendix C). ET is the discharge of groundwater from the saturated zone where the water table is present at very shallow depths. Such conditions mostly occur in the Oxnard Subbasin where the semi-perched aquifer interacts with surface water bodies, which is also where riparian vegetation is typically found in the Oxnard Subbasin. These areas are hydraulically connected to, and exchange fresh- to brackish-water with, the semi-perched aquifer near the coast. It should be noted that nearly all of the riparian vegetation that takes up groundwater in the Oxnard Subbasin occurs in land overlying the semi-perched aquifer, which is rarely, if ever, pumped as a source of agricultural or M&I water supply. Additional discussions about these areas are in Sections 2.3.6 and 2.3.7.

UWCD (Appendix C) applied USGS estimates for ET rates from 1.1 to 5.2 feet per year to calculated long-term annual average groundwater discharge as ET. UWCD implemented ET using MODFLOW's ET package, EVT. Model grid cells corresponding to areas of mapped wetlands with shallow groundwater were simulated. The maximum ET flux was 0.010 feet per day (3.65 feet per year) for model grid cells subject to ET over their entire area. The maximum ET flux is scaled down proportionally for grid cells that are only partially occupied by wetlands. The ET surface elevation was set at 3 feet bgs, and the ET extinction depth was set at 5 feet bgs (Appendix C, p. 84).

According to UWCD model results, the estimated annual loss from ET is 8,328 AFY, with most coming from the semi-perched aquifer (8,291 AFY, a shown in Table 2-7a) and a small amount from the UAS (37 AFY, as shown in Table 2-7b).

2.4.3 Current and Historical Water Budget Analysis

2.4.3.1 Water Year Types

Water year type is based on the percentage of the water year precipitation compared to the 30-year precipitation average. Types are defined in this GSP as wet ($\geq$ 150% of average), above normal ($\geq$ 100% to <150% of average), below normal (> 75% to <100% of average), dry (> 50% to <75% of average), and critical (<50% of average). Figures 2-22 through 2-25 show the water year type from 1986 to 2015. The water type year for 2015 is dry.

2.4.3.2 Historical Water Budget Analysis

DWR has designated the Oxnard Subbasin as a high-priority basin. The DWR GSP Regulations, Section 354.18, Water Budget, states that, "If overdraft conditions occur, as defined in Bulletin 118, the water budget shall include a quantification of overdraft over a period of years during which water year and water supply conditions approximate average conditions." According to the DWR Bulletin 118, "A basin is subject to critical overdraft when continuation of present water management practices would probably result in significant adverse overdraft-related environmental, social, or economic impacts" (DWR 2006). Bulletin 118 Interim Update 2016 (October 18, 2016) lists the Oxnard Subbasin (Basin 4-004.02) as being in critical overdraft (DWR 2016).

Because of Bulletin 118's listing of the Oxnard Subbasin as being in critical overdraft, the DWR GSP Regulations, Section 354.18 (b)(5), requires a quantification of the overdraft over a period of years during which water years and water supply conditions approximated average conditions. Using the water year types discussed in Section 2.4.3.1, and the above normal (> 100% to <150% of average) and the below normal (> 75% to <100% of average) water year types to bracket water supply conditions approximating average conditions, the following years have near average conditions: 1988, 1991, 1992, 1994, 1996, 1997, 2000, 2001, 2003, 2006, 2008, 2010, and 2011.

The change in storage during these years was an increase of 6,045 AFY in the UAS and an increase of 1,029 AFY in the LAS (Tables 2-7b and 2-7c). However, the net seawater intrusion during these years was 4,189 AFY in the UAS, and 5,225 AFY in the LAS (Table 2-7c). Thus, the net change in groundwater storage for the UAS without seawater intrusion was an increase in 1,856 AFY in the UAS and the net change in storage without seawater intrusion in the LAS was a decrease of 4,196 AFY. Total groundwater pumping during these years averaged 47,080 AFY in the UAS and 28,893 AFY in the LAS for a total of 65,973 AFY (Tables 2-7b and 2-7c). This quantification of the overdraft over a period of years during which water years and water supply conditions approximated average conditions would indicate that the Oxnard Subbasin was in overdraft of about 2,340 AFY (4,196 AFY [LAS] − 1,856 AFY [UAS]). It should be noted that except for 2011, Tables 2-7b and 2-7c show net seawater intrusion for the UAS and LAS for each of the years that approximated average conditions. This seawater intrusion analysis suggests that based on the historical pumping patterns and pumping amounts, the Oxnard Subbasin was in overdraft by about 2,340 AFY during average water supply conditions.

GSP regulation Section 354.18 (c)(2) requires that the historical water budget information be used to evaluate availability or reliability of past surface water supply deliveries and aquifer response to water supply and demand trends relative to water year type. Historically, the Oxnard Subbasin has received surface water supply deliveries directly from one main source: the Santa Clara River. Additionally, but to a lesser degree, Calleguas Creek, imported water delivered by the CMWD, and Conejo Creek water diversions have contributed surface water supplies to the Oxnard

Subbasin. Table 2-8 shows that the diversion of Santa Clara River from 1985 to 2015 have averaged 62,467 AFY, and leakage from the Santa Clara River has averaged about 5,650 AFY (770 AFY [see Tables 2-7a and 2-7b] + 4,989 AFY [see Table 2-7b] – 109 AFY [see Table 2-7b]). This indicates a total Santa Clara River supply of approximately 68,117 AFY. In comparison, Calleguas Creek has supplied approximately 3,394 AFY (see Table 2-7a) to the semi-perched aquifer, CMWD has delivered 14,543 AFY of imported water (see Table 2-13), and Conejo Creek diverted flows have averaged 1,159 AFY (see Table 2-10). These last three sources total 19,096 AFY, or 22% of the total surface water deliveries (87,213 AFY) or only 28% of the total Santa Clara River. Tables 2-7a, 2-13, and 2-10 for Calleguas Creek, CMWD imported water, and Conejo Creek (starting in 2002), respectively, suggest that these sources are reliable and not significantly affected by the water year type. However, diversions from the Santa Clara River as shown in Table 2-8 and on Figure 2-59 vary widely depending on climate conditions. The high diversion years of 1993, 1998, and 2005 were wet years (Figures 2-22 and 2-59). The low diversion years of 1990, 2013 and 2014 were critical dry years, and 2015 was a dry year (Figures 2-22 and 2-59). Diversions of surface water by the UWCD from the Santa Clara River are critical to the surface water supplies of the Oxnard Subbasin.

2.4.3.3 Current (2015) Groundwater Conditions

Groundwater level data presented in Section 2.3, Groundwater Conditions, and the change in storage estimates for the calendar year 2015 from Tables 2-7a through 2-7c indicate that the Oxnard Subbasin had greater groundwater outflows than inflows in 2015. The estimated 2015 groundwater change in storage is a loss of about 38,703 AF (Tables 2-7a through 2-7c). This change in groundwater storage would be larger and groundwater storage declines greater if seawater intrusion had not replaced groundwater in the Oxnard Subbasin. Model results in Tables 2-7a through 2-7c indicate a net seawater intrusion in 2015 of approximately 19,200 AF. There was a net outflow of water to the Pacific Ocean in the semi-perched aquifer of approximately 504 AF (Table 2-7a), but a positive inflow (seawater intrusion) in the UAS of approximately 11,633 AF (Table 2-7b) and a positive inflow in the LAS of approximately 8,081 AF (Table 2-7c).

Tables 2-7a through 2-7c show that from 1985 to 2015, seawater intrusion has replaced freshwater in storage in the Oxnard Subbasin in the LAS every year, and 23 of 31 years in the UAS. Tables 2-7a and 2-7b indicate that seawater flows both in and out of the Oxnard Subbasin in the semi-perched aquifer and the UAS. However, groundwater generally flows out of the Subbasin from the semi-perched aquifer (which is not currently a usable aquifer), and seawater usually inflows to the UAS and LAS, which affects usable groundwater aquifers.

2.4.3.4 Estimates of Historical Sustainable Yield

Historical estimates for the Oxnard Subbasin sustainable yield[8] have also included the PVB. These historical sustainable yield estimates include the following:

- FCGMA, 1985, Groundwater Management Plan
- FCGMA, 2007, 2007 Update to the Fox Canyon Groundwater Management Agency Groundwater Management Plan
- UWCD and CMWD, 2012, Preliminary Draft Yield Analysis (UWCD 2016c)
- UWCD, 2016, Proposed Method for Estimating Sustainable Yield (UWCD 2016c)

All of these historical estimates for the combined Oxnard Subbasin and PVB sustainable yield are about 65,000 AFY, but do not demonstrate that this groundwater pumping rate prevents seawater intrusion. The UWCD Open-File Report 2017-02 (UWCD 2017a) Scenario D estimated that seawater intrusion would be halted if: (1) there were no groundwater pumping in what the report refers to as an assumed future "seawater intrusion management area," (2) groundwater pumping were reduced by about 70% in LAS in the Oxnard Plain (excluding the Forebay) and in the PVB, and (3) there were no reduction in UAS pumping. However, this scenario assumed that groundwater for irrigation in the assumed future "seawater intrusion management area" would be supplied by a project to be implemented in the future. The combined estimated sustainable yield under Scenario D was 59,900 AFY for the Oxnard Subbasin (excluding the seawater intrusion management area) and the PVB.

To estimate the sustainable yield under historical conditions where no future project is implemented, the UWCD conducted Scenario F in Addendum Open-File Report 2017-02a (UWCD 2017b). In Scenario F, the assumed seawater intrusion management area was eliminated, and a uniform reduction in groundwater pumping was simulated to achieve sustainable yield. The scenario defined a sustainable yield as maintaining groundwater elevations along the coast at levels sufficiently high to prevent seawater intrusion and other forms of saline water intrusion. In the Port Hueneme area, where the UAS and LAS are believed to have direct hydraulic connection with the Pacific Ocean, UWCD assumed minimum thresholds[9] as defined in Open File Report 2017-02. However, under Scenario F, UWCD assumes a minimum threshold for the LAS near Mugu Lagoon to be −20 feet msl instead of 18.5 feet msl, as assumed in Open File Report 2017-02. This is because the most recent UWCD Saline Intrusion Update report (UWCD 2016b) interpreted the source of elevated

[8] SGMA requires that an estimate of the "sustainable yield" be made for the Oxnard Subbasin based on historical data. However, as used in this section the sustainable yield does not address undesirable results, which are discussed in Chapter 3, Sustainable Management Criteria.

[9] "Minimum threshold" used here is in reference to the Open File Report 2017-02 usage and not to the minimum threshold discussed in Chapter 3 of this GSP.

chloride concentrations in the LAS near Mugu Lagoon to be saline water yielded from marine clays and/or from adjacent Tertiary-age sedimentary rocks, as a result of large declines in potentiometric head in the LAS over the past several decades, and not a direct result of current seawater intrusion. Additional discussion of saline water and seawater intrusion can be found in Section 2.3.3.

Based on the results from UWCD Scenario F (UWCD 2017b, Table 2-2), the sustainable yield under historical conditions with no changes from the current pumping locations (i.e., without water supply or infrastructure projects) for the Oxnard Subbasin would be a total of 39,000 AFY (27,000 AFY from the Oxnard Plain and 12,000 AFY from the Oxnard Forebay area). The results from UWCD Scenario F (2017b, Table 2-2) would indicate a total of 10,000 AFY for the PVB. Evaluation of the volume of water entering and leaving the model along the Pacific coastline under Scenario F indicated that there is a net outflow of water from the model to the Pacific Ocean over the 31-year simulation period. Groundwater left the model to the ocean in the UAS, while a smaller amount of seawater intruded the LAS. This suggests that additional production may be possible from the Oxnard Subbasin by reducing groundwater pumping in the LAS and increasing it in the UAS. This shift in pumping may also better protect against seawater intrusion.

2.4.4 General Uncertainties in the Water Budget

There are several limitations and uncertainties associated with other water budget terms used for both the historical and future conditions due to necessary simplifying of assumptions and data gaps. Uncertainties about the groundwater models used are discussed in Section 2.4.5.8. Some of the general water budget limitations and/or uncertainties include the following:

1. The reporting of groundwater pumping outside the boundaries of the FCGMA is limited and there is a possibility of underreporting of pumping within the FCGMA boundaries due to non-reporting, inaccurate reporting, and equipment problems. Additional future data collection is needed to verify the existence and extent of and to eliminate this data gap. However, the amount of pumping outside the FCGMA boundary is expected to be minor given the limited number of wells (estimated at fewer than 12).
2. The hydrologic base period (calendar years 1985–2015, DWR's 31-year base period) may not necessarily be representative of long-term average conditions. As shown on Figure 1-6, Long-Term Precipitation Trends in the Oxnard Plain, this was a generally wetter-than-average period. However, the future water budget analysis in Section 2.4.5, which used a model 50-year period with an average precipitation period (1939 to 1979), does not suggest that the historical sustainable yield estimate based on this wetter-than-average period is too high. The combined UAS and LAS sustainable yield for the future water budget ranged from 30,000 AFY to 48,000 AFY (Section 2.4.5.9). The estimated historical sustainable yield using UWCD Scenario F (Section 2.4.3.4) of 39,000 AFY is within this range. The uncertainty associated with the future water budget sustainable yield is discussed in Section 2.4.5.8.

3. Conclusions regarding uncertainties in the UWCD model are discussed in Section 2.4.5.8, Uncertainty Analysis, and in the Dudek peer review of the UWCD model (Appendix E).
4. Subsurface inflows and outflows across basin boundaries are not measurable. The groundwater level data in these areas by themselves do not provide a clear indication of groundwater flow directions because of the limited water level measurements and the variation in time between measurements. The UWCD model provides a significantly improved understanding of these boundary fluxes and their variability under different pumping and recharge conditions in the region, but checking model values with observations and calculating the gradient with three-point groundwater flow problems should be considered to verify model estimates. Attempts to estimate inflows and outflows across basin boundaries using well groundwater level data was attempted for this GSP, but data gaps and limited well locations screened in one aquifer made the results unreliable.
5. Some semi-perched groundwater in the Oxnard Subbasin is potentially captured by tile drains, rather than recharging the UAS. This uncertainty could be reduced through installation of instrumentation and measurement of discharges from the tile drains.
6. Currently, aquifer-specific water level maps are not reliable to estimate aquifer change in groundwater storage due to the limited number and distribution of aquifer-specific water wells. Dedicated monitoring wells could installed and equipped with water-level measuring data loggers in all of the aquifers. This would help decrease uncertainty in estimates of future changes in groundwater storage by enabling use of aquifer-specific water-level maps to check groundwater model change in storage calculations.

2.4.5 Projected Future Water Budget and Sustainable Yield

Several model scenarios were developed in accordance with SGMA guidelines to assess the future sustainable yield of the Oxnard Subbasin. Each future scenario covered a 50-year time frame, from 2020 to 2069. In this GSP, the period from 2020 to 2039 is referred to as the implementation period, and the period from 2040 to 2069 is referred to as the sustaining period. The sustainable yield was determined from the model scenarios that did not result in a net flux of seawater into either the UAS or the LAS in Oxnard Subbasin, within the level of the model uncertainty, during the 30-year sustaining period (Figure 2-63, Coastal Flux from the UWCD Model Scenarios).

Because the Oxnard Subbasin is hydraulically connected to the PVB and the WLPMA, the sustainable yield of the Oxnard Subbasin is influenced by groundwater production and projects in these adjacent basins. The UWCD model used to assess the sustainable yield of the Oxnard Subbasin includes both the PVB and the WLPMA in the model domain, and the modeling assumptions associated with each scenario discussed below include the assumptions made for these adjacent basins.

The model scenarios developed for Oxnard Subbasin, the PVB, and the WLPMA all included existing projects and the 2070 DWR climate-change factor applied to the 1930–1970 historical precipitation and hydrology base period. The model scenarios are the following:

- Future Baseline Simulation (2015–2017 average production rates adjusted by surface water deliveries)
- Future Baseline Simulation With Projects (2015–2017 average production rates adjusted by surface water deliveries; potential future projects that met the DWR conditions for incorporation in the GSP)
- Reduction With Projects (35% reduction of 2015–2017 average production rates adjusted by surface water deliveries for the UAS and LAS in the Oxnard Subbasin, 20% reduction for the UAS and LAS in PVB; and 20% in the LAS in the WLPMA; potential future projects that met the DWR conditions for incorporation in the GSP)
- Reduction Without Projects 1 (reduction of 2015–2017 average production rates adjusted by surface water deliveries by 25% in the UAS, 60% in the LAS, and 45% for wells screened in both aquifer systems in the Oxnard Subbasin; 25% reduction for the UAS and the LAS in the PVB; and 25% in the LAS in the WLPMA)
- Reduction Without Projects 2 (reduction of 2015–2017 average production rates adjusted by surface water deliveries by 55% in the UAS and the LAS in the Oxnard Subbasin; 20% reduction for the UAS and the LAS in the PVB; and 20% in the LAS in the WLPMA)
- Reduction Without Projects 3 (reduction of 2015–2017 average production rates adjusted by surface water deliveries by 55% in the UAS and the LAS in the Oxnard Subbasin; 0% reduction for the UAS and the LAS in the PVB; and 0% in the LAS in the WLPMA)

Two of the model scenarios listed above, the Future Baseline Simulation With Projects Scenario and the Reduction With Projects Scenario, incorporated projects that were approved for inclusion in the GSP model scenarios by the FCGMA Board. The Board's approval of these projects only indicates that they were sufficiently defined by the project proponent to be analyzed as part of the GSP. It does not indicate that these specific projects will necessarily be constructed or, conversely, that other projects will not be developed in the future. The projects included are discussed in more detail with the description of each scenario below.

An initial set of four modeling simulations were conducted using the future baseline conditions with two 50-year average climate cycles (1930–1979 and 1940–1989), and two DWR climate-change factors (2030 and 2070) applied to each of the 50-year periods. The 1930 to 1979 50-year period with the 2070 DWR climate-change factor was found to be the most conservative and was used for the comparison with the other modeling simulations conducted. Additional details about the selection of the two 50-year average climate cycles is provided in Section 2.4.5.7.

In addition to the initial set of four modeling simulations and the six model scenarios listed above, the Reduction Without Projects Scenario 1 was simulated with the DWR 2030 climate-change factor and with a historical precipitation and hydrology base period from 1940 to 1989. These simulations were conducted to better understand the potential impact of precipitation patterns and climate-change factors on the model results. While the results of these simulations were primarily used as a check on the minimum threshold groundwater elevations discussed in Chapter 3, the predicted impact on seawater intrusion is discussed in Section 2.4.5.7.

Over the next 5 years, as additional projects are developed the model assumptions discussed below will need to be altered and incorporated into the 5-year GSP evaluation.

2.4.5.1 Future Baseline Model Simulation

SGMA requires that the GSP include an assessment of the "future baseline" conditions. In the Future Baseline Scenario, in order to assess whether or not groundwater extractions from the Oxnard Subbasin, PVB, and WLPMA were sustainable at their current rates, the average annual 2015–2017 production rates, adjusted by surface water deliveries, were simulated. Future surface water deliveries were estimated by UWCD using Santa Clara River flows for historical periods, the 1930–1979 climate period adjusted for future DWR climate-change factors, and estimated diversions based on similar historical Santa Clara River flows. UWCD also considered current allowable diversions, which accounts for current environmental restraints and diversion operating conditions, and optimization of water deliveries for the PVP and spreading basins. Additional details about the UWCD future model scenarios are included in Appendix L, UWCD GSP Model Documentation. For the Oxnard Subbasin, this rate is approximately 68,000 AFY without surface diversions, for the combined UAS and LAS (Table 2-15).

Future Baseline Scenario Model Assumptions

The Future Baseline model simulation included the following:

- Constant pumping at the 2015–2017 average rate of approximately 68,000 AFY adjusted for surface water deliveries in the Oxnard Subbasin (39,000 AFY in the UAS; 29,000 AFY in the LAS), 13,000 AFY in the WLPMA, and approximately 14,000 AFY in the PVB
- Starting water levels equal to the final 2015 water levels from the historical simulations
- Precipitation and streamflow for two 50-year periods (1930–1979 and 1940–1989), with an average precipitation that equaled the average precipitation for the entire historical record
- Estimates of Santa Clara River surface water available for diversion prepared by UWCD staff using climate-change factors provided by DWR and historical measured flow in the river for the 50-year periods

- East Las Posas Management Area outflows to Arroyo Las Posas to the PVB from the CMWD model
- Projects that are currently operating in the Subbasin or currently under development

The historical measurements of precipitation for the two 50-year periods were modified using the DWR 2030 and 2070 climate-change factors. Stream flows were estimated using the adjusted rainfall. UWCD estimated Santa Clara River flow and the volume of water diverted to direct delivery and spreading. Pumping was decreased where the water is delivered to account for the surface water delivered. Future streamflow in Conejo and Calleguas Creeks in Pleasant Valley was estimated by regression.

No projects currently under development were identified in the Oxnard Subbasin, but two projects under development in the PVB were incorporated into the future baseline simulation because these projects affect inflows to the Oxnard Subbasin. The two projects in PVB are the City of Camarillo's North Pleasant Valley Desalter (desalination) Project and Conejo Creek Diversion deliveries to Pleasant Valley County Water District. The North Pleasant Valley Desalter Project was simulated by dividing the total project pumping of 4,500 AFY between project extraction wells 02N20W19L05 and 02N20W19F04. Additionally, pumping from Well 02N21W34C01 increased by 1,300 AFY to reflect a shift in areas of production.

In this scenario, Conejo Creek diversions will increase deliveries to agriculture by an additional 2,200 AFY to make the total deliveries in the PVB 4,500 AFY starting in 2020. The Conejo Creek Project allows CWD to increase pumping by up to 4,500 AFY based on credits for surface water delivered to PVCWD. However, in running the future simulations, it became apparent that the model area identified for production from the CWD wells was not able to extract the full amount. The amount of simulated CWD pumping that was achievable in the future baseline simulation was therefore limited to 2,816 AFY.

It is important to remember that groundwater extractions are not the only source of water to the Oxnard Subbasin. Surface water deliveries vary between the model scenarios because the model adjusts the deliveries of Santa Clara River water based on simulated groundwater elevations in the Oxnard Subbasin Forebay. Therefore, the total water available to the Oxnard Subbasin in the Future Baseline Scenario is approximately 72,000 AFY. Additionally, although the model calculates the groundwater extractions and surface water deliveries with precision, the values reported in Table 2-15 have been rounded to the nearest 1,000 AFY to reflect the uncertainty in the model calculations.

Future Baseline Scenario Model Results

Both the modeled flux of seawater and the particle tracks from the Future Baseline Scenario indicate that continuing the 2015–2017 extraction rate for the next 50 years would cause net seawater intrusion in both the UAS and LAS as well as ongoing inland migration of the saline water impact front (Figure 2-63 and Figure 2-64a through 2-64e, UWCD Model Particle Tracks, Future Baseline). The average annual flux of seawater into the UAS during the sustaining period was 4,400 AFY and the average annual flux of seawater into the LAS during the sustaining period was 5,300 AFY. The saline water impact front continued to migrate landward throughout the sustaining period, even during wetter than average climate periods. Based on these factors, the current areal and aquifer-system distribution of groundwater production at the extraction rates modeled in the Future Baseline Scenario was determined not to be sustainable.

2.4.5.2 Future Baseline With Projects Model Simulation

Future Baseline With Projects Scenario Model Assumptions

Modeling of future conditions included all of the assumptions incorporated into the Future Baseline simulation, and also incorporated potential future projects approved for inclusion by the FCGMA Board. Incorporation of the potential future projects in the Future Baseline With Projects Scenario neither represents a commitment by FCGMA to impose pumping reductions in the amounts specified at the wells identified below nor a commitment to move forward with each project included in the future model scenarios. Assumptions about projects and project implementation may have changed since the modeling was conducted and will continue to change over the next 5 years. These changes should be incorporated into the modeling for the 5-year GSP evaluation.

In the Oxnard Subbasin simulated future projects included delivery of 4,600 AFY of recycled water to farmers in the vicinity of Hueneme Road, expansion of the GREAT Program to increase groundwater recharge by 4,500 AFY in the Saticoy Spreading Grounds, and a 504 AFY reduction of pumping through temporary fallowing. These projects are discussed in detail in Chapter 5 of this GSP.

To simulate the delivery of 4,600 AFY of recycled water to farmers in the vicinity of Hueneme Road, pumping from wells near the coast in the pumping depression area (UWCD model parameter zone 4; Figure 2-65, UWCD Model Zones) was reduced uniformly and proportionally by 4,600 AFY. Additionally, pumping from Wells 02N22W23C05S and 02N22W23C07S in the Forebay was adjusted to allow the City of Oxnard to pump up to 8,000 AFY of accumulated credits for 2,600 AF recycled agricultural water delivered annually from the GREAT Program (FCGMA 2018).

To simulate the expansion of the GREAT Program, spreading recharge was increased by 4,500 AFY starting in 2025. To simulate the 504 AFY reduction of pumping through fallowing, pumping from Wells 01N22W26K04S, 01N22W27H02S, 01N22W26M03S, 01N22W26K03S, 01N22W26P02S, 01N22W26Q03S, and 01N22W26D05S was reduced uniformly and proportionally by 504 AFY. It should be noted that these wells were selected for modeling purposes only and use of these wells in the model simulations was not intended to represent any planned pumping restrictions or limitations on these wells.

In the PVB, a proposed temporary fallowing project was simulated near the pumping depression (in model parameter zone 11; Figure 2-65). This project would generate a 2,407 AFY reduction in pumping, however, actual simulated fallowing totaled 2,234 AFY due to considerations of existing contracts for the delivery of surface water from the Santa Clara River. Pumping was preferentially reduced in wells in the LAS within the PVB to the extent possible.

In the WLPMA, future projects included the purchase of 1,762 AFY of water to be delivered to the eastern portion of the WLPMA in lieu of groundwater extraction. Simulated pumping was reduced in Zone Mutual Water Company Wells 02N20W07R03, 02N20W07R02, 02N20W08M01, 02N20W08E01, and 02N20W08F01, as well as Ventura County Waterworks District No. 19 Wells 02N20W06R01 and 02N20W08B01. The pumping reductions of 1,762 AFY were applied uniformly and proportionally across the wells.

After incorporating the potential future projects, the average groundwater production rate for the UAS in the Oxnard Subbasin was 41,000 AFY and the average groundwater production rate for the LAS in the Oxnard Subbasin was 24,000 AFY for the Future Baseline With Projects Scenario. In the PVB, the average groundwater production rate was 4,300 AFY in the UAS and 7,600 AFY in the LAS. In the WLPMA, the average production rate in the LAS was 11,200 AFY.

Because the projects that were incorporated into the Future Baseline With Projects Scenario included reduction of approximately 500 AFY from temporary fallowing in Oxnard, and deliveries of recycled water from the GREAT Program, the groundwater extractions in the LAS decreased by approximately 4,000 AFY, relative to the Future Baseline Scenario. At the same time, the groundwater extractions from the UAS increased by approximately 2,000 AFY, relative to the Future Baseline Scenario, in the Future Baseline With Projects Scenario (Table 2-15). Consequently, the effect of incorporating the projects was to shift groundwater extraction from the LAS to the UAS, and reduce overall groundwater extraction by approximately 2,000 AFY. The total water available to the Oxnard Subbasin in the Future Baseline With Projects Scenario was approximately 73,000 AFY, with the reduction in groundwater production being offset by the addition of approximately 3,000 AFY of project water.

Future Baseline With Projects Scenario Model Results

Although the shift in groundwater extractions from the LAS to the UAS and reduction in the total extractions helped reduce the flux of seawater into the Oxnard Subbasin, overall the Future Baseline With Projects Scenario resulted in approximately 3,000 AFY of seawater flux into the UAS and 2,700 AFY into the LAS during the sustaining period (Figures 2-66a through 2-66e, UWCD Model Particle Tracks, Base Case with Projects). Particle tracks for the Future Baseline With Projects Scenario also showed net landward migration of the saline water impact front during the sustaining period (Figures 2-66a through 2-66e). Based on these factors, the current areal and aquifer-system distribution of groundwater production at the extraction rates modeled in the Future Baseline With Projects Scenario was determined not to be sustainable.

2.4.5.3 Reduction With Projects Scenario

Reduction With Projects Scenario Model Assumptions

The Reduction With Projects Scenario included all of the assumptions incorporated into both the Future Baseline simulation and the Future Baseline With Projects Scenario. The Reduction With Projects Scenario also included a 35% reduction of 2015–2017 average production rates for the UAS and LAS in the Oxnard Subbasin, 20% reduction for the UAS and LAS in the PVB, and 20% in the LAS in the WLPMA. Groundwater production rates were reduced linearly over the implementation period and held constant during the sustaining period. In the Oxnard Subbasin UAS, the simulated groundwater production rate in model year 2020 was 40,000 AFY. The production rate in model year 2040 at the beginning of the sustaining period was 24,300 AFY.[10] The average production from the UAS for the sustaining period was 26,500 AFY. In the LAS, the simulated groundwater production rate in model year 2020 was 28,500 AFY and the simulated groundwater production rate in model year 2040 was 14,000 AFY. The average production rate from the LAS for the sustaining period was 12,800 AFY.

Reduction With Projects Model Scenario Results

Reducing groundwater production in the UAS and LAS, and shifting some groundwater extractions from the LAS to the UAS via the potential future projects in the Reduction With Projects Scenario, resulted in an average flux of groundwater out of the UAS into the Pacific Ocean of approximately 3,300 AFY during the sustaining period. In the LAS, the Reduction With Projects Scenario resulted in an average flux of approximately 1,200 AFY of seawater into the LAS during the sustaining period (Figures 2-67a through 2-67e, UWCD Particle Tracks, Reduction With

[10] Modeled extraction rates depend on climate, surface water availability, and simulated groundwater elevations for each model year. The reductions implemented reflect a reduction in overall water demand for the Oxnard Subbasin and are not the exact percentage specified for any given year. Therefore, the extraction rate from the UAS in 2040 is 39% of the extraction rate in 2020 rather than the 35% specified in the model scenario description.

Projects Simulation). Particle tracks for the Reduction With Projects Scenario indicate that the location of the 2015 saline water impact front would likely migrate toward the Pacific Ocean in the UAS as freshwater diluted saline concentrations, while it would experience some landward migration in the LAS (Figures 2-67a through 2-67e). The continued landward migration of the saline water impact front in the LAS suggests that groundwater production in the LAS may need to be reduced further than it was in this model scenario, while at the same time the groundwater production rate in the UAS was likely lower than it needed to be, as groundwater left the aquifers of the UAS and entered the Pacific Ocean.

2.4.5.4 Reduction Without Projects Scenario 1

Reduction Without Projects Scenario 1 Model Assumptions

The Reduction Without Projects Scenario 1 included all of the assumptions incorporated into the Future Baseline simulation but did not include the projects that were incorporated into the Future Baseline With Projects and Reduction With Projects Scenarios. In the Oxnard Subbasin, the Reduction Without Projects Scenario 1 also included a 25% reduction of 2015–2017 average production rates for wells screened solely in the UAS, a 60% reduction of the 2015–2017 average production rates for wells screened solely in the LAS, and a 45% reduction of the 2015–2017 average production rates for wells screened in both aquifer systems. The 2015–2017 average pumping rate was reduced by 25% in the UAS and LAS in the PVB, and 25% in the LAS in the WLPMA. Groundwater production rates were reduced linearly over the implementation period and held constant during the sustaining period.

In the Oxnard Subbasin UAS, the simulated groundwater production rate in model year 2020 was 40,300 AFY. The production rate in model year 2040 at the beginning of the sustaining period was 27,300 AFY.[11] The average production from the UAS for the sustaining period was 27,200 AFY. In the LAS, the simulated groundwater production rate in model year 2020 was 33,100 AFY and the simulated groundwater production rate in model year 2040 was 13,000 AFY. The average production rate from the LAS for the sustaining period was 11,600 AFY. The resulting average combined extraction rate from the two aquifer systems was approximately 39,000 AFY for the 30-year sustaining period (Table 2-15).

Reduction Without Projects Scenario 1 Model Results

The fluxes in the UAS and LAS in the Reduction Without Projects Scenario 1 were similar to those simulated in the Reduction With Projects Scenario (Figures 2-68a through 2-68e, UWCD Model

[11] Modeled extraction rates depend on climate, surface water availability, and simulated groundwater elevations for each model year. The reductions implemented reflect a reduction in overall water demand for the Oxnard Subbasin and are not the exact percentage specified for any given year. Therefore, the extraction rate from the UAS in 2040 is 32% of the extraction rate in 2020 rather than the 25% specified in the model scenario description.

Particle Tracks, Reduction Without Projects Scenario (1) Simulation). There was an average flux of groundwater out of the UAS into the Pacific Ocean of approximately 2,800 AFY during the sustaining period in the Reduction Without Projects Scenario 1. In the LAS, the Reduction Without Projects Scenario 1 resulted in an average flux of approximately 1,300 AFY of seawater into the LAS during the sustaining period. Particle tracks for this scenario indicate that the 2015 saline water impact front would likely migrate toward the Pacific Ocean in the UAS as freshwater diluted saline concentrations in the UAS, while it would migrate farther landward in the LAS than in the Reduction With Projects Scenario (Figures 2-68a through 2-68e). As in the Reduction With Projects Scenario, the continued landward migration of the saline water impact front in the LAS suggests that groundwater production in the LAS may need to be reduced further than it was in the Reduction Without Projects Scenario 1, while at the same time the groundwater production rate in the UAS was likely lower than it needed to be, as groundwater left the aquifers of the UAS and entered the Pacific Ocean.

2.4.5.5 Reduction Without Projects Scenario 2

Reduction Without Projects Scenario 2 Model Assumptions

The Reduction Without Projects Scenario 2 included all of the assumptions incorporated into the Future Baseline simulation but did not include the projects that were incorporated into the Future Baseline With Projects and Reduction With Projects Scenarios. In the Oxnard Subbasin, the Reduction Without Projects Scenario 2 also included a 55% reduction of 2015–2017 average production rates for the UAS and LAS. The 2015–2017 average pumping rate was reduced by 20% in the UAS and LAS in the PVB, and 20% in the LAS in the WLPMA. Groundwater production rates were reduced linearly over the implementation period and held constant during the sustaining period.

In the Oxnard Subbasin UAS, the simulated groundwater production rate in model year 2020 was 40,000 AFY. The production rate in model year 2040 at the beginning of the sustaining period was 17,600 AFY.[12] The average production from the UAS for the sustaining period was 17,600 AFY. In the LAS, the simulated groundwater production rate in model year 2020 was 33,100 AFY and the simulated groundwater production rate in model year 2040 was 12,800 AFY. The average production rate from the LAS for the sustaining period was 11,500 AFY. The resulting average combined extraction rate from the two aquifer systems was approximately 29,000 AFY for the 30-year sustaining period (Table 2-15).

[12] Modeled extraction rates depend on climate, surface water availability, and simulated groundwater elevations for each model year. The reductions implemented reflect a reduction in overall water demand for the Oxnard Subbasin and are not the exact percentage specified for any given year. Therefore, the extraction rate from the UAS in 2040 is 56% of the extraction rate in 2020 rather than the 55% specified in the model scenario description.

Model results indicate that under this scenario the groundwater flux in the LAS between the PVB and the Oxnard Subbasin is mostly reversed from the above scenarios from model year 2027 to 2055. The groundwater flow during this period (2027 to 2055) in the LAS is from the Oxnard Subbasin to the PVB. This increased the seawater intrusion in the LAS in the Oxnard Subbasin, exacerbating Oxnard Subbasin's seawater intrusion problem.

Reduction Without Projects Scenario 2 Model Results

There was an average flux of groundwater out of the UAS into the Pacific Ocean of approximately 4,700 AFY during the sustaining period in the Reduction Without Projects Scenario 2 and an average flux of approximately 900 AFY of seawater into the LAS. As in the Reduction Without Projects Scenario 1, the continued inflow of seawater into the LAS suggests that groundwater production in the LAS may need to be reduced further than it was in the Reduction Without Projects Scenario 2, while at the same time the groundwater production rate in the UAS was likely lower than it needed to be, as groundwater left the aquifers of the UAS and entered the Pacific Ocean.

2.4.5.6 Reduction Without Projects Scenario 3

Reduction Without Projects Scenario 3 Model Assumptions

The Reduction Without Projects Scenario 3 included all of the assumptions incorporated into the Future Baseline simulation but did not include the projects that were incorporated into the Future Baseline With Projects and Reduction With Projects Scenarios. In the Oxnard Subbasin, the Reduction Without Projects Scenario 3 also included a 55% reduction of 2015–2017 average production rates for the UAS and LAS. The 2015–2017 average pumping rate was not reduced in the UAS and LAS in the PVB or in the LAS in the WLPMA. Groundwater production rates were reduced in the Oxnard Subbasin linearly over the implementation period and held constant during the sustaining period.

In the Oxnard Subbasin UAS, the simulated groundwater production rate in model year 2020, at the beginning of the implementation period, was 40,000 AFY. The production rate in model year 2040 at the beginning of the sustaining period was 18,100 AFY. The average production from the UAS for the sustaining period was 18,100 AFY. In the LAS, the simulated groundwater production rate in model year 2020 was 33,200 AFY and the simulated groundwater production rate in model year 2040 was 13,700 AFY. The average production rate from the LAS for the sustaining period was 12,300 AFY. The resulting average combined extraction rate from the two aquifer systems was approximately 30,000 AFY for the 30-year sustaining period (Table 2-15).

Reduction Without Projects Scenario 3 Model Results

There was an average flux of groundwater out of the UAS into the Pacific Ocean of approximately 3,700 AFY during the sustaining period in the Reduction Without Projects Scenario 3 and an average flux of approximately 1,400 AFY of seawater into the LAS. As in the Reduction Without Projects Scenarios 1 and 2, the continued inflow of seawater into the LAS suggests that groundwater production in the LAS may need to be reduced further than it was in the Reduction Without Projects Scenario 3, while at the same time the groundwater production rate in the UAS was likely lower than it needed to be, as groundwater left the aquifers of the UAS and entered the Pacific Ocean.

Model results indicate that under this scenario the groundwater flux in the LAS between the PVB and the Oxnard Subbasin is reversed from model year 2027 to the end of the model period (2070). The groundwater flow during this period (after 2027) in the LAS is from the Oxnard Subbasin to the PVB. This significantly increases the seawater intrusion in the LAS in the Oxnard Subbasin exacerbating Oxnard Subbasin's seawater intrusion problem.

2.4.5.7 Alternative Climate and Rainfall Patterns

To assess the potential impacts on model predictions from alternate climate-change assumptions and precipitation patterns, two additional simulations were conducted using the Reduction Without Projects Scenario 1. These additional simulations changed the scenario assumptions in two ways. First, the Reduction Without Projects Scenario 1 was simulated using the DWR 2030 climate-change factor, rather than the more conservative 2070 climate-change factor. This revised scenario is referred to as the Reduction Without Projects Scenario 1a. Second, the Reduction Without Projects Scenario 1a was simulated with the DWR 2030 climate-change factor applied to the historical precipitation and hydrology period from 1940 to 1989, rather than the original period from 1930 to 1979. This revised scenario is referred to as the Reduction Without Projects Scenario 1b.

The 50-year periods from 1930 to 1979 and 1940 to 1989 were selected because they were the two periods from the entire historical record with the closest mean, or average, precipitation to the mean precipitation for the entire historical record of 14.4 inches. The mean precipitation for the historical period from 1930 to 1979 is also 14.4 inches and the mean precipitation from the historical period from 1940 to 1989 is 14.6 inches. These periods also have a similar distribution of precipitation years to the historical record and a similar average drought length to the average drought length in the historical record. The primary difference between the two periods is the timing of the dry periods in the records. The period from 1930 to 1979 begins with a 7-year dry period from 1930 to 1936 (model years 2020–2026), while the period from 1940-1989 begins with a 5-year wetter than average period (model years 2020–2024). The differences between these scenarios are discussed below.

Reduction Without Projects Scenario 1a

The Reduction Without Projects Scenario 1a had approximately 2,200 AFY of freshwater flowing out of the UAS to the Pacific Ocean and 1,500 AFY of seawater intrusion into the LAS during the sustaining period. Compared to the Reduction Without Projects Scenario 1, there was approximately 600 AFY less flow out of the UAS and approximately 200 AFY more flow into the LAS from the Pacific Ocean (Figure 2-63). This is the result of lower water levels in the UAS and LAS under this scenario than the Reduction Without Projects Scenario 1. The 2030 climate-change factor showed lower potential water levels and more seawater intrusion than the 2070 climate-change factor; however, the difference between the simulated fluxes in the two scenarios is within the uncertainty of the model predictions and is not significant compared to other uncertainties in the future simulations, including the actual precipitation pattern that will prevail over the period from 2020 to 2069.

Reduction Without Projects Scenario 1b

The Reduction Without Projects Scenario 1b had approximately 4,300 AFY of freshwater flowing out of the UAS to the Pacific Ocean and 760 AFY of seawater intrusion into the LAS during the sustaining period. Compared to the Reduction Without Projects Scenario 1a, the Reduction Without Projects Scenario 1b had 2,100 AFY more freshwater leaving the UAS and 800 AFY less seawater intrusion in the LAS during the sustaining period (Figure 2-63). The reduced seawater intrusion and increased freshwater outflow are the result of higher simulated groundwater levels during the sustaining period than in the Reduction Without Projects Scenario 1a. The groundwater elevations in the Reduction Without Projects Scenario 1b rise faster in response to the wetter than average precipitation pattern that occurs at the beginning of the model period (model years 2020–2024) and remain higher during the sustaining period (model years 2040–2069) than they do in the Reduction Without Projects Scenario 1a. The differences in seawater intrusion and water levels between the Reduction Without Projects Scenarios 1a and 1b show that the model is more sensitive to actual precipitation patterns than it is to the predicted relative changes in climate between 2030 and 2070. The actual climate and precipitation patterns over the next 5 years should be used to revise the model simulations and refine the estimated potential for net seawater intrusion during the sustaining period.

2.4.5.8 Uncertainty Analysis

A review of the UWCD model was conducted to provide an independent evaluation of the model for use in the context of developing a GSP and to quantify the uncertainty associated with the modeling estimates of the sustainable yield for the basins in the model domain (Appendix E). UWCD conducted a *local* sensitivity analysis of its model prior to this review, in order to evaluate how the model input parameters obtained via the model calibration affect the model outputs. The peer review conducted an additional *global* sensitivity analysis that keys off of their local sensitivity analysis, and allows for a quantitative assessment of uncertainty in seawater flux and sustainable yield.

General Results

Results of the model scenarios discussed above indicate that changes to groundwater production rates or to extraction locations for the Oxnard Subbasin are needed to avoid seawater intrusion in the LAS during the sustaining period. Understanding the uncertainties in the model predictions underscores the desirability of making gradual changes in production rates while additional monitoring and studies help to reduce these uncertainties.

The largest potential sources of uncertainty in the model were found to be hydraulic properties, for a given precipitation pattern. As discussed in Section 2.4.5.7, Alternative Climate and Rainfall Patterns, precipitation and surface water availability are a critical input parameter for predictive simulations. Critical areas of hydraulic properties were constrained in the historical simulations by aquifer testing. In particular, the model parameters that accounted for the most variance (approximately 37% of total variance) in minimizing error between observed groundwater levels and model simulated heads throughout the model were the horizontal hydraulic conductivities assigned to the Oxnard and Mugu Aquifers in the Forebay. The values assigned in the model were consistent with horizontal hydraulic conductivities determined from aquifer testing in that area. The fact that the most sensitive parameter assignments were well constrained by observations reduces uncertainty and provides good confidence in model predictions of groundwater levels overall.

Additionally and importantly, these same zones of horizontal hydraulic conductivity accounted for approximately 24% of total variance in model calculations of seawater flux across the ocean boundary. In contrast, the conductance of the ocean general head boundaries only accounted for approximately 3% of the variance in seawater flux. This indicates that the movement of artificially recharged groundwater from the Forebay to the coast is key in seawater flux. Additionally, the amount of Forebay recharge that enters the WLPMA rather than moving toward the coast was found to affect the seawater flux more than the conductance of the general head boundaries representing the ocean outcrops at the model boundary.

Stream infiltration, a parameter that was estimated based on the correlation between predicted and observed water levels accounted for approximately 5% of the variance in seawater flux and horizontal and vertical hydraulic conductivity of the aquitard separating Layer 5 (Mugu Aquifer) from Layer 7 (the Hueneme Aquifer) in the PVB accounted for approximately 3% of the variance in seawater flux. This sensitivity is associated with the flux across the basin boundary and flow between the UAS and the LAS. Again, these parameters in the PVB accounted for more seawater flux than that accounted for by the conductance of the aquifer outcrops beneath the ocean.

Quantifying Uncertainty

The uncertainty associated with model simulations of seawater flux was calculated by determining the relationship between simulated groundwater levels in wells near the coast and simulated seawater

flux at the ocean boundary for the six model scenarios described in Section 2.4.5. This relationship was established by calculating the mean errors between observed and simulated groundwater levels at the coastal wells and applying the relationship between simulated groundwater levels and seawater flux to determine what the flux would have been had the model exactly reproduced observed groundwater levels. This analysis was conducted for both the entire model period from 2020 to 2069 and the sustaining period from 2040 to 2060. In general the analysis indicated that there is approximately 2,000 AFY uncertainty due to model error in simulated total seawater flux, though this varies depending on which time frame is analyzed. Alternatively, using calculated seawater flux from 121 realizations in a global sensitivity analysis yielded a comparable result of approximately 3,000 AFY uncertainty in seawater flux. The global sensitivity analysis is discussed in Appendix E. For the sustaining period, the relationship between seawater flux and pumping gives a confidence interval for the sustainable yield of approximately ± 6,000 AFY for the UAS and ± 3,600 AFY for the LAS. For the entire model period from 2020 to 2069, the relationship between seawater flux and pumping gives a confidence interval for the sustainable yield of approximately ± 4,100 AFY for the UAS and ± 2,300 AFY for the LAS. The relationship between seawater flux and water levels will continue to be refined through data collection and analysis over successive 5-year periods for the GSP evaluations, and these uncertainty estimates are anticipated to contract accordingly.

2.4.5.9 Estimates of Future Sustainable Yield

The sustainable yield for Oxnard Subbasin was assessed by examining the modeled flux of seawater into the Subbasin over the 50-year model period and 30-year sustaining period predicted by the UWCD model for the Subbasin, the PVB, and the WLPMA. The sustaining period was assessed because SGMA recognizes that undesirable results may occur during the 20-year implementation period, as basins move toward sustainable groundwater management. In addition to the flux of seawater, particle tracks from the model runs were analyzed to evaluate the potential migration of the current extent of saline water impact in the UAS and the LAS. The particles were placed along the approximate inland extent of the zone of saline water impact in 2015. Scenarios that minimize the net flux of seawater into the Oxnard Subbasin and the landward migration of the saline water impact front over the 30-year sustaining period are sustainable for Oxnard, while those that allow for net seawater intrusion and landward migration of the saline water impact front are not.

None of the model scenarios described in Section 2.4.5 successfully eliminated seawater intrusion in the LAS during the 50-year model period or the 30-year sustaining period, while the majority of the model scenarios resulted in net freshwater loss from the UAS to the Pacific Ocean. Therefore, none of the direct model scenarios was used to estimate the sustainable yield of the Oxnard Subbasin. Instead, the relationship between seawater flux and groundwater production from the model scenarios for both the 50-year period and the 30-year period were plotted graphically and the linear relationship between the seawater flux and groundwater production was used to predict the quantity of groundwater production that would result in no net seawater

intrusion over the periods in either the UAS or the LAS. This method is also discussed in Appendix E, Section 2.3.2.2, and the seawater flux and groundwater production plots are provided in Appendix E as Figures 4 and 5. In order to provide separate estimates for the two aquifer systems, independent relationships between groundwater production and seawater intrusion were developed for the UAS and LAS. It was possible to develop relationships for each aquifer within the UAS and LAS, but in general wells in the Oxnard Subbasin are screened in multiple aquifers in each aquifer system. Therefore, for management purposes, the sustainable yield estimates were developed for the aquifer systems rather than for independent aquifers.

The sustainable yield of the UAS was calculated to be approximately 32,000 AFY for both the entire 50-year model period and the 30-year sustaining period. The uncertainty in the estimated sustainable yield for the UAS is lower if only the sustaining period is used. For the entire model period, the uncertainty in the sustainable yield is approximately ± 6,000 AFY, whereas for the sustainable period the uncertainty in the sustainable yield is approximately ± 4,100 AFY. Consequently, this analysis suggests that the sustainable yield of the UAS may be as high as 38,000 AFY or as low as 26,000 AFY.

The sustainable yield of the LAS was calculated to be approximately 7,000 AFY for both the entire 50-year model period and the 30- year sustaining period. The uncertainty in the estimated sustainable yield for the LAS is lower if the entire model period is used. For the entire model period, the uncertainty in the sustainable yield of the LAS is approximately ± 2,300 AFY, whereas for the sustainable period the uncertainty in the sustainable yield is approximately ± 3,600 AFY. Consequently, this analysis suggests that the sustainable yield of the LAS may be as high as 10,600 AFY or as low as 3,400 AFY.

It is anticipated that the analysis for the 5-year update to the GSP will focus on differential extractions on the coast and inland, particularly in the LAS. Additional modeling is recommended for the 5-year update process to understand how changes in pumping patterns can increase the overall sustainable yield of the Oxnard Subbasin. As this understanding improves, projects to support increases in the overall sustainable yield can be developed.

2.5 MANAGEMENT AREAS

In order to sustainably manage the groundwater resources of the Oxnard Subbasin, the Subbasin has been divided into five management areas (Figure 2-69, Oxnard Subbasin Management Areas). These areas are the Forebay Management Area, the West Oxnard Plain Management Area, the Oxnard Pumping Depression Management Area, the Saline Intrusion Management Area, and the East Oxnard Plain Management Area (EOPMA). These areas are separated by hydrogeologic and water quality characteristics.

The Forebay Management Area is in the northeastern Oxnard Subbasin. In this area of the Subbasin, the semi-perched aquifer and clay cap are absent, resulting in direct communication between the alluvium and the underlying aquifer systems. The majority of surface water recharge to the Oxnard Subbasin occurs within the UWCD spreading grounds located in the Forebay Management Area.

The West Oxnard Plain Management Area lies within the Oxnard Subbasin jurisdictional boundaries. The West Oxnard Plain Management Area, which includes the City of Oxnard, is south and west of the Forebay Management Area.

The Oxnard Pumping Depression Management Area is south and east of the West Oxnard Plain Management Area. The boundaries of the Oxnard Pumping Depression Management Area include are Highway 101 to the north, North Rice Avenue and North Rose Avenue to the west, East Hueneme Road and Highway 1 to the south, and the Bailey Fault and the PVB to the east. This management area was established based on the low groundwater elevations historically recorded in both the UAS and the LAS in the area.

The Saline Intrusion Management Area lies to the west of the Oxnard Pumping Depression Management Area, and south of the West Oxnard Plain Management Area. The Saline Intrusion Management Area includes both Port Hueneme and Point Mugu, where saline intrusion has occurred historically and has impacted wells in both the UAS and LAS.

The EOPMA lies to the east of the Bailey Fault and is predominantly within the jurisdiction of the County of Ventura. A small area on the northern boundary between the EOPMA and the PVB is covered by the Camrosa Water District–Oxnard Subbasin GSA (see Figure 1-2).The FCGMA jurisdictional boundary extends into the EOPMA along the boundary with the Oxnard Pumping Depression Management Area (Figure 2-69). This management area was established based on groundwater elevation and chloride concentration differences across the Bailey Fault, which acts as a barrier to groundwater flow (Turner 1975; Section 2.2.1).

This GSP has been prepared for the entire Oxnard Subbasin and management areas defined in this GSP will be managed by the FCGMA. The minimum thresholds and measurable objectives developed in Chapter 3 are based on the data available in the Forebay Management Area, the West Oxnard Plain Management Area, the Oxnard Pumping Depression Management Area, and the Saline Water Intrusion Management Area. Comparable historical data on groundwater elevation, storage, production, and quality are not available for the EOPMA. Therefore, the minimum thresholds and measurable objectives for the West Oxnard Plain and Oxnard Pumping Depression Management Areas, which are adjacent to the EOPMA, will be applied to age and/or depth equivalent hydrostratigraphic units in the EOPMA. As additional data are collected in the EOPMA, separate minimum thresholds and management objectives may be developed. If changes to the minimum thresholds and management objectives are warranted, justification will be provided in the 5-year GSP updates.

2.6 REFERENCES CITED

Bohannon, R.G., and D.G. Howell. 1982. "Kinematic Evolution of the Junction of the San Andreas, Garlock, and Big Pine Faults, California." *Geology* 10:358–363. https://doi.org/10.1130/0091-7613(1982)10<358:KEOTJO>2.0.CO.

CCC. 2017. "Ormond Beach Wetlands Restoration Project." Accessed April 2017. http://scc.ca.gov/2010/01/07/ormond-beach-wetlands-restoration-project/.

CDFW (California Department of Fish & Wildlife). 2016. California Natural Diversity Database (CNDDB), Rarefind, Version 3.1.1 (Commercial Subscription). Sacramento, California: CDFW, Biogeographic Data Branch. Accessed October 2016.

CGS (California Geological Survey). 2002. *Note 36: California Geomorphic Provinces*. Revised December 2002.

City of Ventura. 2011. *City of Ventura Special Studies: Estuary Subwatershed Study Assessment of the Physical and Biological Condition of the Santa Clara River Estuary, Ventura County, California*. Final Synthesis Report. Prepared by Stillwater Sciences, Berkeley, California for City of Ventura, California. March 2011.

City of Ventura. 2016. Groundwater data collected by Stillwater Sciences in support of City of Ventura Special Studies compiled from Bailard Landfill monitoring program.

County of Ventura. 2016. Shapefile data of oil fields in Ventura County. *Oil Fields.shp.* December 22, 2016.

Densmore, J.N. 1996. *Lithologic and ground-water data for monitoring wells in the Santa Clara-Calleguas ground-water basin, Ventura County, California, 1989-1995*. U.S. Geological Survey Open-File Report 96-120.

DeVecchio, D.E., R.V. Heermance, M. Fuchs, and L.A. Owen. 2012b. "Climate-Controlled Landscape Evolution in the Western Transverse Ranges, California: Insights from Quaternary Geochronology of the Saugus Formation and Strath Terrace Flights." *Lithosphere* 4(2): 110–130. https://doi.org/10.1130/L176.1.

DeVecchio, D.E., E.A. Keller, M. Fuchs, and L.A. Owen. 2012a. "Late Pleistocene Structural Evolution of the Camarillo Fold Belt: Implications for Lateral Fault Growth and Seismic Hazard in Southern California." *Lithosphere* 4(2): 91–109. https://doi.org/10.1130/L136.1.

DeVecchio, D.E., E.A. Keller, L.A. Owen, and M. Fuchs. 2007. "Earthquake Hazard of the Camarillo Fold Belt: An Analysis of the Unstudied Fold Belt in Southern California Hot Zone." Final. U.S. Geological Survey/National Earthquake Hazards Reduction Program Award Number 07HQGR0040.

De Wiest, R.J.M. 1998. "Ghyben–Herzberg Theory." In *Encyclopedia of Hydrology and Water Resources*, edited by R.W. Herschy and R.W. Fairbridge. Encyclopedia of Earth Science series. Dordrecht, Netherlands: Springer. Accessed January 17, 2018. https://link.springer.com/referenceworkentry/10.1007%2F1-4020-4513-1_104.

Dibblee, T.W., Jr. 1992a. "Geologic Map of the Moorpark Quadrangle, Ventura County: Santa Barbara California, Dibblee Geological Foundation" [map]. 1:24,000.

Dibblee, T.W., Jr. 1992b. "Geologic Map of the Simi Quadrangle, Ventura County: Santa Barbara California, Dibblee Geological Foundation" [map]. 1:24,000.

DWR (California Department of Water Resources). 1965. *Bulletin No. 63-1: Seawater Intrusion Oxnard Plain of Ventura County*. October 1965.

DWR. 1968. *Bulletin No. 74-9: Well Water Standards, Ventura County*. August 1968.

DWR. 1971. *Bulletin No. 63-4: Sea-Water Intrusion: Aquitards in the Coastal Ground Water Basin of Oxnard Plain, Ventura County*. September 1971.

DWR. 2006. *California's Groundwater Bulletin 118: Santa Clara River Valley Groundwater Basin, Oxnard Subbasin*. Last updated January 20, 2006. Accessed October 2016. http://www.water.ca.gov/pubs/groundwater/bulletin_118/basindescriptions/4-4.02.pdf.

DWR. 2016. *Bulletin 118 Interim Update 2016: California's Groundwater—Working Toward Sustainability*. December 22, 2016. www.water.ca.gov/groundwater/bulletin118/index.cfm.

Eberhart-Phillips, D., M. Lisowski, and M.D. Zoback. 1990. "Crustal Strain near the Big Bend of the San Andreas Fault: Analysis of the Los Padres–Tehachapi Trilateration Networks, California." *Journal of Geophysical Research* 95(B2): 1139–1153.

ESA (Environmental Science Associates). 2003. *McGrath State Beach Natural Resources Management Plan*. Prepared for California Department of Parks and Recreation. April 2003.

Farr, T.G., C.E. Jones, and Z. Liu. 2017. "Progress Report: Subsidence in California, March 2015–September 2016." California Institute of Technology, Jet Propulsion Laboratory.

FCGMA (Fox Canyon Groundwater Management Agency). 1985. *Groundwater Management Plan*.

FCGMA. 2007. *2007 Update to the Fox Canyon Groundwater Management Agency Groundwater Management Plan*. Prepared by FCGMA, United Water Conservation District, and Calleguas Municipal Water District. May 2007.

FCGMA. 2013. Water Elevation Maps, 1972–2012, Adopted by the FCGMA Board. Item 7, FCGMA Board Meeting, December 4, 2013.

FCGMA. 2015. *Annual Report for Calendar Year 2015*. Prepared by FCGMA.

FCGMA. 2016. *Basin Management Objectives Report Card*.

FCGMA. 2018. "Full Agenda Package: Special Board Meeting of August 29, 2018." Meeting agenda, minutes, and preliminary project descriptions for GSPs currently in progress. August 29, 2018.

Feigl, K.L., D.C. Agnew, Y. Bock, D. Dong, A. Donnellan, B.H. Hager, T.A. Herring, and D.D. Jackson. 1993. "Space Geodetic Measurement of Crustal Deformation in Central and Southern California, 1984–1992." *Journal of Geophysical Research* 98(B12): 21677–21712.

GreenInfo Network. 2016. California Protected Areas Data Portal. Accessed August 8, 2017. http://www.calands.org/.

Hadley, D., and H. Kanamori. 1977. "Seismic Structure of the Transverse Ranges, California." *Geological Society of America Bulletin* 88:1469–1478.

Hanson, R.T., P. Martin, and K. Koczot. 2003. *Simulation of Ground-Water/Surface-Water Flow in the Santa Clara–Calleguas Ground-Water Basin, Ventura County, California*. U.S. Geological Survey Water Resources Investigation Report 2002-4136.

Hopkins (Hopkins Groundwater Consultants Inc.). 2013. Preliminary Hydrogeological Study: Anterra Energy Services, Inc. Fluid Disposal Wells, Injection Well Construction and Injection Practices Review. Prepared for the City of Oxnard, California. October 2013.

Hopkins, C. 2016. Oxnard Plain and Vicinity Aquifer Properties Data Request. Email from C. Hopkins (Hopkins Groundwater Consultants Inc.) to M. Naftaly (Dudek). October 18, 2016.

Huftile, G.J., and R.S. Yeats. 1995. "Convergence Rates across a Displacement Transfer Zone in Western Transverse Ranges, Ventura Basin, California." *Journal of Geophysical Research* 100(B2): 2043–2067.

Izbicki, J.A. 1991. "Chloride Sources in a California Coastal Aquifer." In: American Society of Civil Engineers Symposium on Groundwater in the Pacific Rim. Honolulu, Hawaii, July 22-26, 1991. Proceedings, p. 71-77.

Izbicki, J.A. 1996. "Use of $\delta^{18}O$ and δD to Define Seawater Intrusion." In *North American Water Congress, Anaheim, California, June 23–28*, edited by C.T. Bathala. Proceedings: New York American Society of Civil Engineers.

Izbicki, J.A., A.H. Christensen, M.W. Newhouse, G.A. Smith, and R.T. Hanson. 2005. "Temporal Changes in the Vertical Distribution of Flow and Chloride in Deep Wells." *Groundwater* 43(4): 531–544.

Jakes, M.C. 1979. "Surface and Subsurface Geology of the Camarillo and Las Posas Hills Area: Ventura County, California." Master's thesis; Oregon State University.

Kew, W.S. 1924. "Geology and Oil Resources of a Part of Los Angeles and Ventura Counties California." In *United States Geological Survey Bulletin 753*.

LARWQCB. 2013. "Chapter 3: Water Quality Objectives." In *Water Quality Control Plan: Los Angeles Region Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties.* Updated April 19, 2013. Accessed February 20, 2017. https://www.waterboards.ca.gov/losangeles/water_issues/programs/basin_plan/electronics_documents/Final%20Chapter%203%20Text.pdf.

Marshall, S.T., M.L. Cooke, and A.E. Owen. 2008. "Effects of Nonplanar Fault Topology and Mechanical Interaction on Fault-Slip Distributions in the Ventura Basin, California." *Bulletin of the Seismological Society of America* 98(3): 1113–1127. https://doi.org/10.1785/0120070159.

Mukae, M.M., and J.M. Turner. 1975. "Geologic Formations, Structures and History in the Santa Clara–Calleguas Area." In *Compilation of Technical Information Records for the Ventura County Cooperative Investigation: Volume I,* 1–28. Prepared by the Ventura County Public Works Agency Flood Control and Drainage Department for the California Department of Water Resources.

Nicholson, C., C.C. Sorlien, T. Atwater, J.C. Crowell, and B.P. Luyendyk. 1994. "Microplate Capture, Rotation of the Western Transverse Ranges, and Initiation of the San Andreas Transform as a Low-Angle Fault System." *Geology* 22:491–495.

Rockwell, T.K., E.A. Keller, and G.R. Dembroff. 1988. "Quaternary Rate of Folding of the Ventura Avenue Anticline, Western Transverse Ranges, Southern California." *Geological Society of America Bulletin* 100:850–858.

SFEI (San Francisco Estuary Institute). 2011. *Historical Ecology of the Lower Santa Clara River, Ventura River, and Oxnard Plain: An Analysis of Terrestrial, Riverine, and Coastal Habitats.* SFEI Publication No. 641. A report of SFEI's Historical Ecology Program prepared for the State Coastal Conservancy. Oakland, California: San Francisco Estuary Institute.

SWRCB (State Water Resources Control Board). 1956. *Bulletin No. 12: Ventura County Investigation Volume I*. October 1953. Revised April 1956.

SWRCB. 2004. Resolution No. 2004-0063: Adoption of the Water Quality Control Policy (Policy) for Developing California's Clean Water Act Section 303(d) List.

Turner, J.M. 1975. "Aquifer Delineation in the Oxnard–Calleguas Area, Ventura County." In *Compilation of Technical Information Records for the Ventura County Cooperative Investigation: Volume I,* 1–45. Prepared by the Ventura County Public Works Agency Flood Control and Drainage Department for the California Department of Water Resources.

Turner, J.M., and M.M. Mukae. 1975. "Effective Base of Fresh Water Reservoir in the Oxnard–Calleguas Area." In *Compilation of Technical Information Records for the Ventura County Cooperative Investigation: Volume I,* 1–15. Prepared by the Ventura County Public Works Agency Flood Control and Drainage Department for the California Department of Water Resources.

USDA (U.S. Department of Agriculture). 2019. *Web Soil Survey*. USDA Natural Resources Conservation Service, Soil Survey Staff. Accessed January 2019. http://websoilsurvey.nrcs.usda.gov/.

USFWS (U.S. Fish and Wildlife Service). 2016a. *National Wetlands Inventory.* Accessed August 2016. fws.gov/wetlands/NWI/index.html.

USFWS. 2016b. Endangered Species Program, ECOS Joint Development Team. 2016. Critical Habitat Polygons and Lines. https://ecos.fws.gov/ecp/report/table/critical-habitat.html in December 2016.

USGS (U.S. Geological Survey). 1993. *A Study of Seawater Intrusion Using Direct-Current Soundings in the Southeastern Part of the Oxnard Plain, California.* USGS Open-File Report 93-524. Prepared by A.A.R. Zohdy, P. Martin, and R.J. Bisdorf.

USGS. 1996. *Seawater Intrusion in a Coastal California Aquifer*. U.S. Geological Survey Fact Sheet 125-96.

UWCD (United Water Conservation District). 1999. *Surface and Groundwater Conditions Report, Water Year 1998.* July 1999.

UWCD. 2007. *Mugu Seawater/Saline Water Intrusion Monitoring Program: AB303 Grant, Agreement No. 4600004100*. Exhibit U41. Prepared by P. Dal Pozzo, D. Detmer, and K. Turner (UWCD, Groundwater Resources Department). April 2007.

UWCD. 2008. *Nitrate Observations in the Oxnard Forebay and Vicinity, 1995–2006.* Prepared by D. Detmer. Santa Paula, California: UWCD. July 2008.

UWCD. 2010. *Oxnard Plain Time Domain Electromagnetic Study for Saline Intrusion*. UWCD Open-File Report 2010-003. Prepared by UWCD, Groundwater Resources Department. October 2010.

UWCD. 2014. *Groundwater and Surface Water Conditions Report – 2013.* United Water Conservation District Open-File Report 2014-02. May 2014.

UWCD. 2016a. *Saline Intrusion Update, Oxnard Plain and Pleasant Valley Basins.* United Water Conservation District Open-File Report 2016-04. October 2016.

UWCD. 2016b. *United Water Conservation District Multiple Species Habitat Conservation Plan Study: Effects of Freeman Diversion on Riparian Vegetation in the Santa Clara River.* Prepared by Stillwater Sciences, Berkeley, California for United Water Conservation District, Santa Paula, California.

UWCD. 2016c. "Technical Advisory Group: UWCD Groundwater Model." Presentation by J. Sun (UWCD) to the Fox Canyon Groundwater Management Agency Technical Advisory Group. December 16, 2016.

UWCD. 2017a. *Preliminary Evaluation of Impacts of Potential Groundwater Sustainability Indicators on Future Groundwater Extraction Rates – Oxnard Plain and Pleasant Valley Groundwater Basins*. Open-File Report 2017-02. April 2017.

UWCD. 2017b. *Addendum to Preliminary Evaluation of Impacts of Potential Groundwater Sustainability Indicators on Future Groundwater Extraction Rates – Oxnard Plain and Pleasant Valley Groundwater Basins*. Open-File Report 2017-02a. November 2017.

VCWPD (Ventura County Watershed Protection District). 2013. *2013 Groundwater Section Annual Report*. VCWPD, Water and Environmental Resources Division. Accessed August 8, 2017. http://pwaportal.ventura.org/WPD/docs/Groundwater-Resources/2013-Groundwater-Section-Annual-Report-Final_Web.pdf.

Weber, F.H., and E.W. Kiessling. 1976. "General Features of Seismic Hazards of Ventura County, California." In *Seismic Hazards Study of Ventura County, California.* Prepared by the California Division of Mines and Geology in cooperation with the County of Ventura. Adopted 1975. Revised July 1976.

WRA (WRA Environmental Consultants). 2007. *Final Biological Assessment Ormond Beach, Oxnard, Ventura County, California.*

Yeats, R.S. 1988. "Late Quaternary Slip Rate on the Oak Ridge Fault, Transverse Ranges, California: Implications for Seismic Risk." *Journal of Geophysical Research* 93(B10): 12137–12149.

Table 2-1
Oxnard Subbasin Stratigraphic and Hydrostratigraphic Nomenclature

<table>
<tr><th rowspan="2">Geologic Period</th><th rowspan="2">Geologic Epoch</th><th>Mukae and Turner (1975)</th><th>Kew (1924); Bailey (1951)[a]</th><th>Weber and Kiessling (1976)</th><th>Dibblee (1992a, 1992b)</th><th colspan="3">Mukae and Turner (1975); DWR (2006)</th></tr>
<tr><td colspan="5">Lithologic Units and Formations</td><td colspan="3">Hydrostratigraphy</td></tr>
<tr><td rowspan="7">Quaternary</td><td rowspan="2">Holocene</td><td rowspan="3">Alluvium: Active stream deposits, sand, and gravel; stream, swamp, and lagunal deposits of clay, sand, and gravel</td><td colspan="3">Recent Alluvium: Active lagoonal, beach, river, and floodplain and alluvial deposits</td><td rowspan="2">Oxnard</td><td>Semi-Perched</td><td rowspan="3">Upper Aquifer System</td></tr>
<tr><td rowspan="2">Upper Pleistocene</td><td>Terrace deposits: Deformed river deposits</td><td colspan="2" rowspan="2">Older Alluvium: Deformed beach, river, floodplain, and terrace deposits</td><td>Oxnard</td></tr>
<tr><td>Older Alluvium: Clays silts, sands, and gravels from the Santa Clara River</td><td colspan="2">Mugu</td></tr>
<tr><td rowspan="4">Lower Pleistocene</td><td rowspan="3">Saugus Formation: Terrestrial and marine sand and gravel</td><td>Saugus Formation: Terrestrial fluvial</td><td rowspan="2">Saugus Formation: Terrestrial</td><td colspan="2">Hueneme</td><td rowspan="4">Lower Aquifer System</td></tr>
<tr><td>San Pedro Formation: Marine and nonmarine clay, sand, and gravel</td><td rowspan="2">San Pedro Formation: Marine clays and sand and terrestrial sediment</td><td colspan="2">Fox Canyon</td></tr>
<tr><td>Santa Barbara Formation: Marine clay, sand, and gravel</td><td>Las Posas Sand: Shallow marine sand</td><td colspan="2">Grimes Canyon (upper member)</td></tr>
<tr><td>Santa Barbara Formation: Shallow marine sand</td><td colspan="3"></td></tr>
<tr><td rowspan="4">Tertiary</td><td>Pliocene</td><td>Pico Formation: Shale, sandstone, and conglomerate</td><td>Fernando Group</td><td colspan="2"></td><td colspan="3" rowspan="4">Non-Freshwater Bearing</td></tr>
<tr><td rowspan="2">Miocene</td><td>Santa Margarita and Modelo Formations</td><td colspan="2">Modelo Formation: Marine mudstones</td><td>Monterey Formation</td></tr>
<tr><td>Topanga Formation and Volcanics</td><td colspan="3">Conejo Volcanics: Terrestrial and marine extrusive and intrusive igneous rocks</td></tr>
<tr><td>Oligocene/ Eocene</td><td>Older Rocks</td><td colspan="3">Sespe Formation: Sandstone and cobble conglomerate</td></tr>
</table>

Note:
[a] As cited in DeVecchio et al. 2012a.

Table 2-2
Vertical Gradient

Location	Nested Group (First 9 Digits of SWN)	Well (Penultimate 2 Digits of SWN)	Screen Interval		Spring 2015 Elevation (ft msl)	Spring 2015 Gradient (ft/ft)[a]	Fall 2015 Elevation (ft msl)	Fall 2015 Gradient (ft/ft)[a]	Aquifer[b]
			Top	*Bottom*					
Forebay	02N22W23B	09	75	95	NA	—	10.41	−0.643	Oxnard
		08	135	155	−13.06	−0.057	−28.19	−0.019	Oxnard
		07	260	300	−20.72	−0.012	−30.81	−0.028	Mugu
		06	460	500	−23.2	−0.114	−36.43	−0.107	Hueneme
		05	830	870	−65.53	−0.036	−75.84	−0.039	Hueneme
		04	1,110	1,150	−75.59	−0.014	−86.77	0.032	Hueneme
		03	1,210	1,250	−77	—	−83.55	—	Fox
Forebay	02N21W07L	06	135	155	8.2	−0.012	−12.07	−0.042	Mugu
		04	500	540	3.88	−0.014	−27.9	0.022	Fox
		03	640	700	1.84	—	−24.59	—	Fox
North - Coastal	01N23W01C	05	120	145	1.18	−0.040	−0.92	−0.048	Oxnard
		04	630	695	−20.03	−0.009	−26.52	−0.010	Hueneme
		03	965	1,065	−23.24	−0.014	−29.95	−0.010	Hueneme
		02	1,390	1,490	−29.31	—	−34.34	—	Fox
Port Hueneme	01N22W20M	06	50	70	1.27	−0.071	1.8	−0.131	Semi-Perched
		05	150	170	−5.78	−0.004	−11.27	−0.002	Oxnard
		04	280	300	−6.26	−0.033	−11.55	−0.039	Mugu
		03	520	560	−14.6	−0.017	−21.3	−0.019	Hueneme
		02	700	740	−17.57	−0.040	−24.8	−0.048	Hueneme
		01	900	940	−25.65		−34.47		Fox
Port Hueneme	01N22W28G	5	180	200	−7.4	−0.009	−12.4	−0.016	Oxnard
		4	255	275	−8.1	−0.030	−13.6	−0.032	Oxnard
		3	720	760	−22.3	−0.039	−28.8	−0.051	Hueneme
		2	995	1,095	−34.2	0.010	−44.2	0.019	Fox
		1	1,295	1,395	−31.3	—	−38.6	—	GCA

Table 2-2
Vertical Gradient

Location	Nested Group (First 9 Digits of SWN)	Well (Penultimate 2 Digits of SWN)	Screen Interval		Spring 2015 Elevation (ft msl)	Spring 2015 Gradient (ft/ft)[a]	Fall 2015 Elevation (ft msl)	Fall 2015 Gradient (ft/ft)[a]	Aquifer[b]
			Top	*Bottom*					
Point Mugu	01N22W36K	09	175	195	−13.07	−0.110	−24.14	−0.156	Oxnard
		08	310	330	−27.89	−0.220	−45.17	−0.561	Mugu
		07	410	450	−52.06	−0.005	−106.82	−0.019	FCA
		06	540	580	−52.71	−0.025	−109.32	−0.014	FCA
		05	680	720	−56.26	—	−111.34	—	GCA
South/ Central	01N21W19L	14	18	38	11.97	−0.278	10.1	−0.331	Semi-Perched
		13	110	130	−13.63	−0.048	−20.33	−0.096	Oxnard
		12	200	220	−17.93	−0.109	−28.96	−0.119	Oxnard
		11	300	320	−28.85	−0.390	−40.87	−0.620	Mugu
		10	394	414	−65.55	—	−99.19	—	FCA
South	01N21W32Q	06	275	285	−41.21	−0.278	−65	−0.468	Oxnard
		07	180	220	−12.7	−0.356	−20.24	−0.560	Mugu
		05	330	370	−60.7	−0.021	−97.74	−0.028	Mugu
		04	600	640	−66.3	−0.047	−105.38	−0.044	FCA
		03	800	840	−75.6	0.084	−114.17	0.084	GCA
		02	930	970	−64.7	—	−103.2	—	GCA

Notes: FCA = Fox Canyon Aquifer; ft/ft = feet per feet; ft msl = feet above mean sea level; GCA = Grimes Canyon Aquifer; SWN = State Well Number.

[a] Negative gradients are directed downward.

[b] The Oxnard and Mugu Aquifers compose the UAS, and the Hueneme, Fox, and Grimes Aquifers compose the LAS. Aquifer designations were provided by UWCD.

Table 2-3
Seawater/Saline Water Historical Reports and Studies

Title	Author/Agency	Date
Sea Water Intrusion, Oxnard Plain Ventura County	California Department of Water Resources	October 1965
Sea-Water Intrusion: Aquitards in the Coastal Ground Water Basin of Oxnard Plain, Ventura County	California Department of Water Resources, Bulletin No. 63-4	September 1971
Oxnard Plain Groundwater Study	State Water Resources Control Board	March 1979
Chloride Sources in a California Aquifer	John A. Izbicki, U.S. Geological Survey	July 1991
A Study of Seawater Intrusion Using Direct-Current Soundings in the Southeastern Part of the Oxnard Plain, California	U.S. Geological Survey, Open File Report 93-524	1993
Use of δ18O and δD to Define Seawater Intrusion	John A. Izbicki, U.S. Geological Survey	1996
Simulation of Ground-Water/Surface-Water Flow in the Santa Clara–Calleguas Ground-Water Basin, Ventura County, California	Hanson et al., U.S. Geological Survey; Water Resources Investigation Report 02-4136	2003
Mugu Seawater/Saline Water Intrusion Monitoring Program: AB303 Grant, Agreement No. 4600004100	United Water Conservation District	April 2007
2007 Update to the Fox Canyon Groundwater Management Agency Management Plan	Fox Canyon Groundwater Management Agency	2007
Oxnard Plain Time Domain Electromagnetic Study for Saline Intrusion	United Water Conservation District, Open-File Report 2010-003	2010
Saline Intrusion Update, Oxnard Plain and Pleasant Valley Basins	United Water Conservation District	October 2016

Table 2-4
Basin Plan and FCGMA Water Quality Thresholds for Groundwater in the Oxnard Subbasin

Threshold Source	Sub-Area/Zone Description	Threshold Concentration (mg/L)				
		TDS	*Chloride*	*Nitrate*	*Sulfate*	*Boron*
LARWQCB Basin Plan WQO	Oxnard Forebay and Confined Aquifers	1,200	150	45	600	1
	Unconfined and Perched Aquifers	3,000	500	45	1,000	—
FCGMA 2007 BMO	Oxnard Forebay	1,200	—	22.5	—	—
	Oxnard Plain	—	150	—	—	—

Sources: LARWQCB 2013; FCGMA 2007.
Notes: BMO = Basin Management Objective; FCGMA = Fox Canyon Groundwater Management Agency; LARWQCB = Los Angeles Regional Water Quality Control Board; mg/L = milligrams per liter; TDS = total dissolved solids; WQO = Water Quality Objective.

Table 2-5
Modeled Surface Water Percolation from Streams in the Oxnard Subbasin

Water Year[a]	Santa Clara River Percolation (acre-feet)[b]	Calleguas Creek Percolation (acre-feet)
1986	8,466	4,423
1987	115	2,586
1988	10,402	3,572
1989	780	3,308
1990	943	2,140
1991	11,306	2,357
1992	18,255	5,290
1993	19,821	6,274
1994	3,303	3,468
1995	9,085	5,846
1996	560	3,687
1997	3,386	3,953
1998	3,922	6,760
1999	−4,404	3,699
2000	2,973	3,707
2001	4,225	4,770
2002	−521	3,341
2003	10,382	3,571
2004	3,913	1,873
2005	17,975	6,536
2006	−890	3,184
2007	47	1,802
2008	7,073	3,159
2009	4,281	2,617
2010	14,173	2,732
2011	10,803	3,763
2012	3,023	1,890
2013	−268	968
2014	5,821	819
2015	1,520	1,476
Average	**5,682**	**3,452**

Notes:

[a] Results presented are in water years, and will not match values presented in Section 2.4 text and Tables 2-7a through 2-7c, which are presented in calendar years.

[b] Negative numbers represent discharge of groundwater to the stream.

Table 2-6
Ecological Assets

Ecological Assets	Lower Santa Clara River	McGrath Lake	Ormond Beach Wetlands	Mugu Lagoon and Wetlands	Lower Calleguas Creek	Revolon Slough
Locally important, special-status, rare, threatened, or endangered plants or animals supported by the GDE	• Santa Ana sucker • western pond turtle • tidewater goby • coast horned lizard • white rabbit-tobacco • southern riparian scrub • least Bell's vireo *(CDFW 2016)* • steelhead	• Belding's savannah sparrow • burrowing owl • California least tern • least Bell's vireo • salt marsh bird's-beak • sandy beach tiger beetle • silvery legless lizard • Ventura Marsh milk-vetch *(CDFW 2016)* • sandy beach tiger beetle • brown pelican • western least bittern • white-faced ibis • osprey • white-tailed kite • northern harrier • sharp-shinned hawk • Cooper's hawk • light-footed clapper rail • western snowy plover • long-billed curlew • California least tern • western yellow-billed cuckoo • burrowing owl • southwestern willow flycatcher • loggerhead shrike • least Bell's vireo • yellow warbler • yellow-breasted chat • Belding's savannah sparrow • California red-legged frog • southwestern pond turtle • silvery legless lizard • San Diego horned lizard • two-striped garter snake • south coast garter snake • Townsend's big-eared bat *(ESA 2003, Table 3-2)*	• Belding's savannah sparrow • California least tern • Coulter's goldfields • California brackish water snail • salt marsh bird's-beak • tidewater goby • western snowy plover *(CDFW 2016)* • western snowy plover • California least tern • California brown pelican • light-footed clapper rail • least Bell's vireo • Southern California saltmarsh shrew • San Diego black-tailed jackrabbit • double-crested cormorant • American bittern • great blue heron • great egret • snowy egret • black-crowned night heron • white-faced ibis • white-tailed kite • northern harrier • Cooper's hawk • sharp-shinned hawk • merlin • mountain plover • long-billed curlew • western burrowing owl • loggerhead shrike • yellow warbler • California horned lark • tricolored blackbird • south coast garter snake • tiger beetle • sandy beach tiger beetle • wandering skipper • globose dune beetle • red sand-verbena • spiny rush • woolly seablite *(WRA 2007)*	• arroyo chub • Belding's savannah sparrow • burrowing owl • California brown pelican • California least tern • Coulter's goldfields • estuary seablite • ferruginous hawk • globose dune beetle • least Bell's vireo • light-footed clapper rail • salt marsh bird's-beak • sandy beach tiger beetle • senile tiger beetle • southern coastal salt marsh • tidewater goby • wandering (=saltmarsh) skipper • western snowy plover *(CDFW 2016)* • peregrine falcon	• arroyo chub • two-striped gartersnake • least Bell's vireo *(CDFW 2016)*	• arroyo chub *(CDFW 2016)* • least Bell's vireo *(Appendix K)*

Table 2-6
Ecological Assets

Ecological Assets	Lower Santa Clara River	McGrath Lake	Ormond Beach Wetlands	Mugu Lagoon and Wetlands	Lower Calleguas Creek	Revolon Slough
Important or critical habitat provided for native species (USFWS 2016b)	• southwestern willow flycatcher critical habitat (569 acres) • tidewater goby critical habitat (22 acres) • western snowy plover critical habitat (35 acres) • steelhead critical habitat • Audubon California Important Bird Area	• southwestern willow flycatcher critical habitat (32 acres) • tidewater goby critical habitat (18 acres) • Ventura Marsh milk-vetch critical habitat (78 acres) • Audubon California Important Bird Area	• tidewater goby critical habitat (88 acres) • western snowy plover critical habitat (26 acres) • Audubon California Important Bird Area	• western snowy plover critical habitat (51 acres) • Wetland of Regional Importance in the Western Hemisphere Shorebird Reserve Network • Essential Fish Habitat (EFH) and Habitat Areas of Particular Concern (HAPC) are designated for Pacific Coast groundfish and coastal pelagic species in the nearshore marine and estuarine habitats • Laguna Point to Latigo Point Area of Special Biological Significance • Audubon California Important Bird Area	None	None
Portion of GDE that is a recognized wetland (USFWS 2016a; Appendix K)	1,180 acres (93%)	197 acres (71%)	207 acres (96%)	5,943 acres (93%)	6 acres (4%)	2 acres (8%)
Protected area, locally important conservation or wildlife corridor plan areas within the GDE	• The Nature Conservancy (160 acres) • City of Ventura (1.2 acres)	• McGrath State Beach (56 acres) • Mandalay State Beach (29 acres) • Mandalay County Park (0.7 acres)	• The Nature Conservancy (129 acres) • Port Hueneme Beach Park (1.3 acres)	• Point Mugu State Park (0.1 acres)	None	None
List any environmental beneficial uses designated in the RWQCB Basin Plan for the surface water found in the groundwater basin.	• Wildlife Habitat (WILD) • Rare, Threatened, or Endangered Species (RARE) • Migration of Aquatic Organisms (MIGR) • Spawning, Reproduction, and/or Early Development (SPWN) • Wetlands (WET) Also REC1, REC2	• Estuarine Habitat (EST) • Wildlife Habitat (WILD) • Rare, Threatened, or Endangered Species (RARE) • Wetlands (WET) Also REC1, REC2	• Estuarine Habitat (EST) • Wildlife Habitat (WILD) • Rare, Threatened, or Endangered Species (RARE) • Wetlands (WET) Also, REC1, REC2	• Estuarine Habitat (EST) • Marine Habitat (MAR) • Wildlife Habitat (WILD) • Preservation of Biological Habitats of Special Significance (BIOL) • Rare, Threatened, or Endangered Species (RARE) • Migration of Aquatic Organisms (MIGR) • Spawning, Reproduction, and/or Early Development (SPWN) • Shellfish Harvesting (SHELL) • Wetlands (WET) Also REC1 (potential), REC2	**Reach 2:** • WARM • COLD • Wildlife Habitat (WILD) • Rare, Threatened, or Endangered Species (RARE) • Wetlands (WET) Also REC1, REC2	**Reach 4 (Revolon Slough):** • WARM • Wildlife Habitat (WILD) • Wetlands (WET) Also REC1, REC2
Is the GDE area composed of >30% native vegetation? (Appendix K)	Yes	Yes	Yes	Yes	Yes	Yes

Sources: CDFW 2016; GreenInfo Network 2016; USFWS 2016a, 2016b; Appendix K; WRA 2007; ESA 2003.

Table 2-7a
Groundwater Recharge and Discharge in the Semi-Perched Aquifer

Calendar Year[a]	Groundwater Recharge (AF)										Groundwater Discharge (AF)											Storage Change (AF)
	Stream Leakage (Santa Clara River in Oxnard Forebay)	*Recharge*	*Subsurface Inflow from PVB*	*Unincorporated Areas*	*Subsurface Inflow from West LPVB*	*Subsurface Inflow from the UAS*	*Sum of Coastal Flux from Arnold Road to Point Mugu*	*Coastal flux from Channel Islands Harbor to Arnold Road*	*Stream Leakage Calleguas Creek*	*Total Inflow*	*Pumping*	*Tile Drains*	*Subsurface Outflow to UAS*	*Groundwater Discharge to Streams (Santa Clara River in Oxnard Forebay)*	*Evapotranspiration*	*Unincorporated Areas*	*Subsurface Outflow to West LPVB*	*Coastal Flux North to Channel Islands Harbor*	*Coastal flux from Channel Islands Harbor to Arnold Rd*	*Subsurface Outflow to Mound Basin*	*Total Outflow*	*Change in Groundwater Storage[b]*
1985	0	23,081	1,525	152	0	0	843	0	2,592	28,192	−44	−2,983	−15,889	−404	−5,765	0	−374	−2,076	−266	−1,247	−29,050	857
1986	1,133	28,960	1,720	59	0	0	632	0	4,243	36,748	−65	−6,579	−13,989	0	−8,312	0	−66	−1,789	−235	−844	−31,879	−4,869
1987	0	24,587	1,780	16	0	0	672	0	3,097	30,153	−65	−5,886	−18,182	−407	−7,100	0	−335	−1,628	−243	−626	−34,472	4,319
1988	1,021	23,162	1,758	0	0	0	658	0	3,236	29,836	−61	−5,715	−17,824	0	−7,138	−25	−72	−1,442	−206	−622	−33,105	3,269
1989	0	20,613	1,641	0	0	0	667	0	3,146	26,068	−73	−4,848	−19,673	−245	−6,582	−57	−10	−1,315	−188	−451	−33,441	7,373
1990	0	18,731	1,312	0	0	0	701	0	1,901	22,645	−141	−3,032	−22,805	−136	−5,008	−89	0	−1,076	−176	−362	−32,825	10,180
1991	1,857	26,208	1,074	0	0	0	652	0	2,526	32,316	−128	−2,856	−23,955	0	−5,207	−107	−2	−854	−119	−470	−33,698	1,382
1992	4,382	28,816	1,448	0	0	0	567	0	5,661	40,875	−92	−5,605	−19,636	0	−7,684	−84	−47	−773	−25	−645	−34,589	−6,285
1993	3,165	29,069	2,161	0	8	0	552	21	6,209	41,186	−70	−8,637	−8,873	0	−9,404	−25	0	−950	0	−594	−28,553	−12,633
1994	42	21,586	2,249	0	0	0	668	0	3,240	27,784	−89	−7,101	−6,674	0	−7,680	−5	−349	−1,219	−12	−607	−23,735	−4,048
1995	1,563	31,175	3,070	53	105	2,351	558	0	6,037	44,912	−55	−13,095	0	0	−10,618	0	0	−1,449	−85	−609	−25,912	−19,001
1996	521	25,153	3,281	58	0	0	650	0	4,168	33,831	−27	−12,061	−1,148	0	−9,283	0	−223	−1,592	−105	−892	−25,332	−8,498
1997	0	26,109	3,628	69	0	0	652	0	4,050	34,508	−20	−14,177	−6,733	−187	−9,647	0	−266	−1,821	−200	−855	−33,905	−602
1998	598	32,461	4,336	134	811	5,986	542	0	6,184	51,052	−6	−20,912	0	0	−12,445	0	0	−2,006	−257	−575	−36,199	−14,852
1999	0	19,869	4,254	94	0	0	680	0	3,506	28,404	−10	−15,444	−3,958	−585	−9,755	0	−392	−2,008	−244	−975	−33,371	4,967
2000	0	22,718	4,259	69	0	0	660	0	3,706	31,412	−11	−15,051	−8,528	−360	−9,840	0	−342	−2,128	−321	−836	−37,418	6,006
2001	0	27,888	4,414	87	0	0	611	0	4,974	37,974	−8	−17,135	−3,472	−18	−10,797	0	−41	−2,073	−324	−720	−34,589	−3,385
2002	0	19,479	4,219	60	0	0	686	0	3,562	28,007	0	−12,918	−10,775	−199	−8,925	0	−455	−1,944	−299	−779	−36,294	8,287
2003	624	20,846	4,207	62	0	0	664	0	2,610	29,012	0	−13,054	−9,433	0	−9,096	0	−125	−1,897	−290	−755	−34,649	5,637
2004	1,268	23,658	4,131	50	0	0	683	0	3,262	33,052	0	−11,527	−13,653	0	−8,265	0	−59	−1,791	−293	−646	−36,234	3,182
2005	2,113	26,133	4,668	91	430	0	581	0	5,453	39,468	0	−16,632	−625	0	−10,950	0	0	−1,681	−232	−548	−30,668	−8,800
2006	406	22,032	4,622	75	56	2,744	681	0	2,975	33,590	0	−14,711	0	0	−9,156	0	0	−1,697	−189	−794	−26,547	−7,043
2007	0	17,401	4,673	40	0	0	726	0	1,982	24,822	0	−12,812	−9,238	−533	−7,984	0	−626	−1,809	−222	−812	−34,036	9,213
2008	595	21,781	4,791	45	0	0	680	0	3,613	31,505	0	−13,449	−9,365	0	−8,859	0	−156	−1,812	−254	−689	−34,584	3,079
2009	789	19,847	4,711	46	0	0	696	0	2,370	28,458	0	−12,256	−10,893	0	−8,129	0	−157	−1,685	−235	−622	−33,978	5,521
2010	1,851	27,065	4,706	72	0	0	652	0	2,737	37,083	0	−13,439	−10,338	0	−8,689	0	−59	−1,613	−229	−655	−35,022	−2,060
2011	1,022	20,056	4,774	85	0	0	644	0	3,648	30,229	0	−14,172	−3,689	0	−9,306	0	−10	−1,513	−177	−638	−29,506	−723
2012	115	17,308	4,651	59	0	0	720	0	1,813	24,665	0	−11,317	−7,982	0	−7,644	0	−203	−1,498	−166	−622	−29,431	4,766
2013	0	14,694	4,237	23	0	0	745	0	437	20,136	0	−8,415	−13,937	−234	−6,478	0	−17	−1,483	−212	−539	−31,316	11,180
2014	809	18,636	3,467	−9	0	0	720	0	1,489	25,112	0	−6,185	−19,272	0	−5,952	−9	0	−1,358	−257	−534	−33,567	8,446

Table 2-7a
Groundwater Recharge and Discharge in the Semi-Perched Aquifer

Calendar Year[a]	Groundwater Recharge (AF)										Groundwater Discharge (AF)											Storage Change (AF)
	Stream Leakage (Santa Clara River in Oxnard Forebay)	*Recharge*	*Subsurface Inflow from PVB*	*Unincorporated Areas*	*Subsurface Inflow from West LPVB*	*Subsurface Inflow from the UAS*	*Sum of Coastal Flux from Arnold Road to Point Mugu*	*Coastal flux from Channel Islands Harbor to Arnold Road*	*Stream Leakage Calleguas Creek*	*Total Inflow*	*Pumping*	*Tile Drains*	*Subsurface Outflow to UAS*	*Groundwater Discharge to Streams (Santa Clara River in Oxnard Forebay)*	*Evapotranspiration*	*Unincorporated Areas*	*Subsurface Outflow to West LPVB*	*Coastal Flux North to Channel Islands Harbor*	*Coastal flux from Channel Islands Harbor to Arnold Rd*	*Subsurface Outflow to Mound Basin*	*Total Outflow*	*Change in Groundwater Storage[b]*
2015	0	13,543	2,760	−36	0	0	721	0	801	17,790	−2	−4,451	−18,043	−80	−5,322	0	0	−1,048	−177	−401	−29,524	11,734
Maximum	**4,382**	**32,461**	**4,791**	**152**	**811**	**5,986**	**843**	**21**	**6,209**	**51,052**	**0**	**−2,856**	**0**	**0**	**−5,008**	**0**	**0**	**−773**	**0**	**−362**	**−23,735**	**11,734**
Minimum	**0**	**13,543**	**1,074**	**−36**	**0**	**0**	**542**	**0**	**437**	**17,790**	**−141**	**−20,912**	**−23,955**	**−585**	**−12,445**	**−107**	**−626**	**−2,128**	**−324**	**−1,247**	**−37,418**	**−19,001**
Average	**770**	**22,989**	**3,372**	**47**	**45**	**357**	**663**	**1**	**3,394**	**31,639**	**−31**	**−10,531**	**−10,600**	**−109**	**−8,291**	**−13**	**−141**	**−1,582**	**−201**	**−676**	**−32,175**	**535**

Notes: AF = acre-feet; LPVB = Las Posas Valley Basin; PVB = Pleasant Valley Basin; UAS = Upper Aquifer System.

[a] Results from these tables are in calendar years, and will not exactly match data in Table 2−5 and Sections 2.3.2 and 2.3.6, which are presented in water years.

[b] A negative number indicates that water entered storage.

Table 2-7b
Groundwater Recharge and Discharge in the Upper Aquifer System

Calendar Year[a]	Groundwater Recharge (AF)												Groundwater Discharge (AF)												Storage Change (AF)
	Stream Leakage (Santa Clara River in Oxnard Forebay)	*Volcanic Outcrops*	*Recharge*	*Subsurface Inflow from PVB*	*Unincorporated Areas*	*Subsurface Inflow from the Semi-Perched Aquifer*	*Subsurface Inflow from Santa Paula Basin*	*Subsurface Inflow from West LPVB*	*Coastal Flux north to Channel Islands Horbor*	*Coastal flux from Channel Islands Harbor to Arnold Rd*	*Sum of Coastal Flux from Arnold Rd to Point Mugu*	*Subsurface Inflow from the Mound Basin*	*Total Inflow*	*Pumping*	*Tile Drains*	*Subsurface Outflow to the Semi-Perched Aquifer*	*Subsurface Outflow to LAS*	*Subsurface Outflow to West LPVB*	*Groundwater Discharge to Streams (Santa Clara River in Oxnard Forebay)*	*Evapotranspiration*	*Unincorporated Areas*	*Subsurface Outflow to the Santa Paula Basin*	*Subsurface Outflow to PVB*	*Coastal Flux north to Channel Islands Harbor*	*Coastal flux from Channel Islands Harbor to Arnold Rd*	*Subsurface Outflow to Mound Basin*	*Total Outflow*	*Change in Groundwater Storage[b]*
1985	737	5	36,262	0	430	15,889	0	963	742	1,415	2,408	3,014	61,865	−71,157	−356	0	−21,581	0	0	0	0	−1,020	−1,551	0	0	0	−95,665	33,800
1986	6,880	17	63,061	0	0	13,989	0	0	1,254	1,454	2,316	2,227	91,198	−64,234	0	0	−20,735	−2,629	0	0	−52	−968	−613	0	0	0	−89,230	−1,968
1987	1,271	8	35,362	0	431	18,182	0	0	3,076	2,312	3,128	4,181	67,951	−67,347	0	0	−23,240	−137	0	0	0	−744	−15	0	0	0	−91,483	23,532
1988	9,147	8	42,938	142	136	17,824	2,145	0	3,434	2,458	3,150	1,233	82,614	−63,663	0	0	−24,847	−2,053	0	0	0	0	0	0	0	0	−90,563	7,949
1989	530	2	19,007	588	412	19,673	0	0	5,376	2,977	3,402	3,046	55,012	−61,443	0	0	−26,103	−778	0	0	0	−524	0	0	0	0	−88,848	33,835
1990	1,095	2	11,112	1,153	397	22,805	544	0	7,476	3,914	4,095	2,259	54,853	−57,820	0	0	−30,731	−109	0	0	0	0	0	0	0	0	−88,661	33,807
1991	10,696	15	42,247	956	0	23,955	2,244	0	7,221	3,974	4,092	463	95,863	−49,646	0	0	−27,671	−2,705	0	0	−9	0	0	0	0	0	−80,031	−15,832
1992	16,092	22	104,442	0	0	19,636	3,089	0	4,412	2,769	3,084	0	153,544	−45,853	0	0	−24,091	−7,151	0	0	−592	0	−73	0	0	−4,193	−81,953	−71,591
1993	13,448	19	97,426	0	0	8,873	2,372	0	287	1,145	2,051	0	125,620	−47,504	0	0	−25,390	−8,460	0	0	−194	0	−2,107	0	0	−5,603	−89,259	−36,360
1994	2,931	6	52,967	0	394	6,674	837	0	221	857	1,768	0	66,656	−49,868	0	0	−24,598	−4,155	0	0	0	0	−1,808	0	0	−422	−80,853	14,197
1995	8,600	25	102,350	0	0	0	1,039	0	0	133	1,212	0	113,359	−39,520	−292	−2,351	−24,364	−7,649	0	−127	−384	0	−1,346	−1,750	0	−4,568	−82,352	−31,008

Table 2-7b
Groundwater Recharge and Discharge in the Upper Aquifer System

Calendar Year[a]	Groundwater Recharge (AF)													Groundwater Discharge (AF)													Storage Change (AF)
	Stream Leakage (Santa Clara River in Oxnard Forebay)	*Volcanic Outcrops*	*Recharge*	*Subsurface Inflow from PVB*	*Unincorporated Areas*	*Subsurface Inflow from the Semi-Perched Aquifer*	*Subsurface Inflow from Santa Paula Basin*	*Subsurface Inflow from West LPVB*	*Coastal Flux north to Channel Islands Horbor*	*Coastal flux from Channel Islands Harbor to Arnold Rd*	*Sum of Coastal Flux from Arnold Rd to Point Mugu*	*Subsurface Inflow from the Mound Basin*	*Total Inflow*	*Pumping*	*Tile Drains*	*Subsurface Outflow to the Semi-Perched Aquifer*	*Subsurface Outflow to LAS*	*Subsurface Outflow to West LPVB*	*Groundwater Discharge to Streams (Santa Clara River in Oxnard Forebay)*	*Evapotranspiration*	*Unincorporated Areas*	*Subsurface Outflow to the Santa Paula Basin*	*Subsurface Outflow to PVB*	*Coastal Flux north to Channel Islands Harbor*	*Coastal flux from Channel Islands Harbor to Arnold Rd*	*Subsurface Outflow to Mound Basin*	*Total Outflow*	*Change in Groundwater Storage[b]*
1996	2,598	15	56,775	0	128	1,148	310	0	0	0	960	0	61,935	−35,068	−734	0	−22,583	−4,454	0	−119	0	0	−1,375	−2,233	−202	−401	−67,168	5,233
1997	2,300	14	54,861	0	221	6,733	0	0	0	181	1,231	1,123	66,666	−52,122	−532	0	−23,393	−3,560	0	−30	0	−387	−407	−1,139	0	0	−81,568	14,902
1998	0	26	122,199	0	0	0	0	0	0	0	509	0	122,734	−43,078	−967	−5,986	−21,766	−8,501	−663	−420	−625	−4,282	−67	−2,733	−589	−1,247	−90,925	−31,809
1999	0	5	37,762	0	529	3,958	0	0	0	0	639	1,413	44,305	−48,269	−1,180	0	−18,830	−1,847	−2,309	−131	0	−1,162	−106	−2,688	−590	0	−77,113	32,807
2000	3,677	9	54,044	1,084	0	8,528	0	0	0	90	1,047	749	69,228	−45,561	−454	0	−20,784	−2,743	0	0	−38	−500	0	−852	0	0	−70,931	1,704
2001	3,944	19	77,935	1,233	0	3,472	0	0	0	9	949	0	87,561	−42,551	−457	0	−20,746	−4,589	0	0	−69	−1,091	0	−1,447	0	−2,070	−73,019	−14,543
2002	3,129	7	22,151	1,150	432	10,775	1,237	0	0	427	1,191	861	41,360	−44,571	−191	0	−21,202	−1,420	0	0	0	0	0	−319	0	0	−67,703	26,344
2003	7,334	10	36,230	1,803	120	9,433	3,016	0	156	476	1,098	0	59,677	−47,327	0	0	−18,335	−2,591	0	0	0	0	0	0	0	−342	−68,596	8,919
2004	9,742	15	25,471	2,485	149	13,653	3,421	0	1,766	1,170	1,513	86	59,471	−46,670	0	0	−19,410	−2,397	0	0	0	0	0	0	0	0	−68,477	9,006
2005	8,009	18	121,368	1,757	0	625	0	0	0	219	937	0	132,932	−41,034	−222	0	−23,873	−10,233	0	−86	−615	−1,174	0	−1,101	0	−5,909	−84,247	−48,685
2006	0	10	82,755	1,283	72	0	0	0	0	0	665	0	84,785	−42,858	−1,041	−2,744	−22,640	−6,474	−1,416	−244	0	−3,135	0	−2,273	−301	−3,285	−86,411	1,626
2007	1,031	3	31,445	2,419	404	9,238	0	0	0	107	901	828	46,376	−54,564	−430	0	−18,531	−1,122	0	0	0	−683	0	−786	0	0	−76,116	29,740
2008	6,446	11	58,687	3,135	0	9,365	0	0	71	537	1,138	0	79,389	−51,775	−5	0	−21,473	−4,242	0	0	−52	−25	0	0	0	−405	−77,978	−1,412
2009	7,141	7	24,406	3,515	283	10,893	2,661	0	960	815	1,174	259	52,114	−51,431	0	0	−18,696	−1,734	0	0	0	0	0	0	0	0	−71,861	19,748
2010	12,155	20	48,796	3,938	32	10,338	3,016	0	834	785	1,134	0	81,048	−44,145	0	0	−17,864	−3,033	0	0	0	0	0	0	0	−1,365	−66,407	−14,641
2011	5,847	8	73,711	3,049	0	3,689	0	0	0	301	930	0	87,535	−41,608	0	0	−20,530	−6,136	0	0	−216	−244	0	−758	0	−2,941	−72,434	−15,101
2012	2,878	4	22,461	3,162	348	7,982	1,122	0	0	401	1,067	905	40,330	−43,460	0	0	−19,728	−2,338	0	0	0	0	0	−278	0	0	−65,803	25,472
2013	0	0	4,132	3,767	342	13,937	0	0	2,121	1,383	1,803	2,546	30,032	−44,900	0	0	−20,628	−1,388	0	0	0	−27	0	0	0	0	−66,943	36,911
2014	6,504	6	4,860	4,552	229	19,272	2,448	0	4,573	2,641	2,793	2,205	50,084	−43,012	0	0	−24,557	−1,603	0	0	0	0	0	0	0	0	−69,172	19,089
2015	506	1	3,843	4,639	186	18,043	357	0	5,641	3,037	2,955	2,145	41,354	−42,177	0	0	−21,886	−1,304	0	0	0	0	0	0	0	0	−65,367	24,013
Maximum	**16,092**	**26**	**122,199**	**4,639**	**529**	**23,955**	**3,421**	**963**	**7,476**	**3,974**	**4,095**	**4,181**	**153,544**	**−35,068**	**0**	**0**	**−17,864**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**−65,367**	**36,911**
Minimum	**0**	**0**	**3,843**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**509**	**0**	**30,032**	**−71,157**	**−1,180**	**−5,986**	**−30,731**	**−10,233**	**−2,309**	**−420**	**−625**	**−4,282**	**−2,107**	**−2,733**	**−590**	**−5,909**	**−95,665**	**−71,591**
Average	**4,989**	**11**	**50,680**	**1,478**	**183**	**10,600**	**963**	**31**	**1,601**	**1,161**	**1,785**	**953**	**74,434**	**−49,169**	**−221**	**−357**	**−22,284**	**−3,469**	**−142**	**−37**	**−92**	**−515**	**−305**	**−592**	**−54**	**−1,056**	**−78,295**	**3,861**

Notes: AF = acre-feet; LAS = Lower Aquifer System; LPVB = Las Posas Valley Basin; PVB = Pleasant Valley Basin.

[a] Results from these tables are in calendar years, and will not exactly match data in Table 2-5 and Sections 2.3.2 and 2.3.6, which are presented in water years.

[b] A negative number indicates that water entered storage.

Table 2-7c
Groundwater Recharge and Discharge in the Lower Aquifer System

Calendar Year[a]	Groundwater Recharge (AF)										Groundwater Discharge (AF)					Storage Change (AF)
	Subsurface Inflow from PVB	*Subsurface Inflow from the UAS*	*Unincorporated Areas*	*Subsurface Inflow from Santa Paula Basin*	*Subsurface Inflow from West LPVB*	*Coastal Flux north to Channel Islands Harbor*	*Coastal flux from Channel Islands Harbor to Arnold Road*	*Sum of Coastal Flux from Arnold Road to Point Mugu*	*Subsurface Inflow from the Mound Basin*	*Total Inflow*	*Pumping*	*Subsurface Outflow to West LPVB*	*Subsurface Outflow to Santa Paula Basin*	*Subsurface Outflow to PVB*	*Total Outflow*	*Change in Groundwater Storage[b]*
1985	0	21,581	81	0	292	2,954	1,763	1,016	2,014	29,702	−34,579	0	−123	−100	−34,802	5,100
1986	285	20,735	162	0	0	2,900	1,689	899	2,482	29,151	−28,475	−292	−162	0	−28,929	−223
1987	1,146	23,240	71	0	1,091	4,005	2,176	1,185	2,687	35,601	−38,471	0	−1	0	−38,473	2,872
1988	710	24,847	109	0	470	4,187	2,203	1,183	2,272	35,981	−37,023	0	−53	0	−37,076	1,094
1989	43	26,103	77	6	1,569	4,989	2,386	1,210	3,279	39,663	−44,754	0	0	0	−44,754	5,091
1990	1,027	30,731	93	130	1,838	6,233	2,890	1,450	3,174	47,566	−51,926	0	0	0	−51,926	4,359
1991	0	27,671	132	133	911	5,865	2,811	1,392	2,356	41,272	−37,084	0	0	−491	−37,575	−3,698
1992	0	24,091	223	120	0	4,288	2,198	1,070	1,033	33,023	−23,641	−1,474	0	−1,073	−26,188	−6,835
1993	0	25,390	217	63	0	2,764	1,733	964	1,829	32,960	−25,392	−2,170	0	−1,205	−28,767	−4,192
1994	0	24,598	121	48	0	2,964	1,763	952	1,937	32,383	−32,806	−719	0	−263	−33,789	1,406
1995	0	24,364	161	57	0	2,126	1,476	848	2,150	31,184	−24,584	−1,393	0	−235	−26,212	−4,972
1996	0	22,583	125	16	0	1,763	1,351	772	2,031	28,642	−27,440	−866	0	−117	−28,423	−220
1997	167	23,393	118	0	0	2,273	1,604	885	2,679	31,120	−32,248	−557	−28	0	−32,832	1,712
1998	109	21,766	194	0	0	1,114	1,130	656	3,186	28,156	−21,883	−2,093	−13	0	−23,989	−4,167
1999	116	18,830	89	0	0	977	1,132	742	1,285	23,171	−26,844	−834	−77	0	−27,755	4,584
2000	546	20,784	90	0	0	1,814	1,392	886	1,856	27,368	−27,819	−450	−27	0	−28,295	927
2001	1,030	20,746	118	0	0	1,784	1,388	882	1,361	27,310	−23,661	−620	−2	0	−24,282	−3,028
2002	913	21,202	63	14	470	2,483	1,631	875	1,961	29,612	−33,324	0	0	0	−33,324	3,712
2003	210	18,335	61	59	36	2,124	1,444	814	1,906	24,989	−24,017	0	0	0	−24,017	−972
2004	353	19,410	59	39	529	3,060	1,796	888	1,917	28,052	−30,513	0	0	0	−30,513	2,461
2005	819	23,873	211	0	0	1,959	1,426	733	2,961	31,983	−25,225	−1,799	−9	0	−27,033	−4,950
2006	1,430	22,640	120	0	0	1,436	1,284	696	2,672	30,278	−28,316	−999	−83	0	−29,398	−880
2007	1,266	18,531	57	0	0	1,565	1,299	705	2,349	25,772	−27,854	−55	−108	0	−28,016	2,244
2008	1,608	21,473	133	0	195	2,139	1,482	751	2,862	30,643	−30,891	0	−41	0	−30,933	290
2009	1,657	18,696	67	8	772	2,338	1,538	715	2,727	28,519	−30,458	0	0	0	−30,458	1,940
2010	1,162	17,864	103	126	0	2,171	1,402	660	2,719	26,208	−23,680	−136	0	0	−23,816	−2,393
2011	1,618	20,530	143	21	0	1,785	1,359	699	2,725	28,881	−26,984	−1,115	0	0	−28,099	−782
2012	1,431	19,728	71	9	463	2,032	1,405	666	2,864	28,670	−31,169	0	0	0	−31,169	2,500
2013	1,499	20,628	56	0	1,061	3,111	1,853	857	2,921	31,986	−39,159	0	−1	0	−39,160	7,175
2014	1,346	24,557	63	109	1,681	4,593	2,441	1,060	3,150	39,000	−39,905	0	0	0	−39,905	905
2015	1,420	21,886	86	113	1,264	4,690	2,343	1,038	2,838	35,679	−38,635	0	0	0	−38,635	2,956
Maximum	**1,657**	**30,731**	**223**	**133**	**1,838**	**6,233**	**2,890**	**1,450**	**3,279**	**47,566**	**−21,883**	**0**	**0**	**0**	**−23,816**	**7,175**
Minimum	**0**	**17,864**	**56**	**0**	**0**	**977**	**1,130**	**656**	**1,033**	**23,171**	**−51,926**	**−2,170**	**−162**	**−1,205**	**−51,926**	**−6,835**
Average	**707**	**22,284**	**112**	**35**	**408**	**2,854**	**1,735**	**908**	**2,393**	**31,436**	**−31,250**	**−502**	**−24**	**−112**	**−31,888**	**452**

Notes: AF = acre-feet; LPVB = Las Posas Valley Basin; PVB = Pleasant Valley Basin; UAS = Upper Aquifer System.

[a] Results from these tables are in calendar years, and will not exactly match data in Table 2-5 and Sections 2.3.2 and 2.3.6, which are presented in water years.

[b] A negative number indicates that water entered storage.

Table 2-8
UWCD Diversions and Usage of Santa Clara River Water (AF)

Calendar Year	Freeman Diversion	Recharge in Oxnard Forebay Spreading Grounds	PTP Supply Line Deliveries (To Oxnard Subbasin Only)	PVP Supply Line Deliveries to Oxnard Subbasin and Pleasant Valley Basin[a]
1985	42,802	33,837	0	8,738
1986	69,805	59,810	35	9,851
1987	37,638	32,825	2,492	4,560
1988	49,128	40,571	3,709	6,922
1989	24,123	16,920	6,653	5,702
1990	9,553	8,892	9,762	319
1991	44,646	39,289	7,827	1,674
1992	118,151	101,421	7,622	9,320
1993	117,937	94,241	8,462	15,294
1994	71,238	50,588	9,005	12,336
1995	121,235	98,952	8,616	14,014
1996	70,280	54,047	9,513	9,356
1997	71,115	52,006	9,631	11,375
1998	142,279	118,672	7,681	16,064
1999	56,401	35,816	9,017	12,856
2000	71,868	51,793	9,155	11,682
2001	97,061	75,176	6,223	15,635
2002	31,144	20,209	8,632	6,055
2003	47,630	34,111	7,464	6,311
2004	34,160	23,166	8,389	5,245
2005	138,246	118,629	6,470	13,047
2006	101,592	80,554	8,125	12,495
2007	46,430	29,703	8,806	9,908
2008	71,933	56,433	9,639	11,333
2009	40,872	22,438	9,180	14,589
2010	64,005	46,228	7,177	11,555
2011	92,119	71,959	8,700	12,672
2012	37,036	20,816	8,129	10,182
2013	8,941	2,686	8,691	3,230
2014	4,501	2,900	6,644	199
2015	2,607	2,516	5,476	0
Maximum	**142,279**	**118,672**	**9,762**	**16,064**
Minimum	**2,607**	**2,516**	**0**	**0**
Average	**62,467**	**48,297**	**7,320**	**9,114**

Note:

[a] For water supplied by the UWCD PVP to PVCWD, 56% is used in the Oxnard Subbasin and 44% in the Pleasant Valley Basin; only the 56% used in the Oxnard Subbasin is shown in this table.

Table 2-9
United Water Conservation District Water (AF)

Calendar Year	Recharge to Saticoy	Recharge to Noble	Recharge to El Rio	Total Recharge
1985	19,909	0	13,928	33,837
1986	43,407	0	16,403	59,810
1987	16,152	0	16,673	32,825
1988	21,496	0	19,075	40,571
1989	9,729	0	7,192	16,920
1990	3,308	0	5,584	8,892
1991	23,306	0	15,982	39,289
1992	55,606	0	45,815	101,421
1993	45,064	0	49,177	94,241
1994	17,982	0	32,606	50,588
1995	35,419	10,657	52,876	98,952
1996	25,608	3,806	24,633	54,047
1997	22,323	4,412	25,271	52,006
1998	56,935	18,710	43,027	118,672
1999	16,539	1,285	17,992	35,816
2000	28,620	0	23,173	51,793
2001	26,918	8,824	39,434	75,176
2002	5,291	32	14,886	20,209
2003	7,158	44	26,909	34,111
2004	8,105	0	15,061	23,166
2005	46,872	19,490	52,267	118,629
2006	29,005	10,709	40,840	80,554
2007	11,404	99	18,200	29,703
2008	28,631	8,562	19,240	56,433
2009	9,215	0	13,223	22,438
2010	15,108	995	30,125	46,228
2011	23,435	10,679	37,845	71,959
2012	3,985	538	16,293	20,816
2013	34	263	2,389	2,686
2014	387	578	1,935	2,900
2015	1,231	0	1,285	2,516
Maximum	**56,935**	**19,490**	**52,876**	**118,672**
Minimum	**34**	**0**	**1,285**	**2,516**
Average	**21,232**	**3,216**	**23,850**	**48,297**

Table 2-10
Summary of Water Deliveries

Calendar Year	PVCWD (AF)[a]			United Water Conservation District (AF)											Total UWCD and PVCWD Water Deliveries in Oxnard Subbasin (AF)
				PTP (Oxnard Subbasin Only)					O-H Supply Line (Oxnard Subbasin Only)			PVP (Oxnard Subbasin and Pleasant Valley Basin)[c]			
	Conejo Creek Flows Delivered by CWD for Agriculture[b]	Pumped Groundwater from Oxnard Subbasin Basin	Total PVCWD Water Delivered	PTP Wells 1–5 (LAS)	Saticoy Wells (UAS)	Total PTP Groundwater Pumpage	Total PTP Surface Water	Total PTP Water	Municipal Deliveries	Agriculture Deliveries	Total O-H Water	Diversions of Santa Clara River Water Used in the Oxnard Subbasin for Agriculture	Recharged Spreading Water Pumped and Used in the Oxnard Subbasin for Agriculture (Saticoy Wells)[d]	Total PVP Water	
1985	0	−170	−170	0	0	0	0	0	13,901	0	13,901	4,893	0	4,893	18,624
1986	0	−282	−282	0	0	0	35	35	14,096	0	14,096	5,517	0	5,517	19,366
1987	0	−231	−231	2,321	0	2,321	171	2,492	15,364	0	15,364	2,554	0	2,554	20,179
1988	0	387	387	2,184	0	2,184	1,525	3,709	15,513	0	15,513	3,876	0	3,876	23,486
1989	0	121	121	5,301	0	5,301	1,352	6,653	14,494	0	14,494	3,193	0	3,193	24,462
1990	0	273	273	9,506	0	9,506	256	9,762	14,757	0	14,757	179	0	179	24,971
1991	0	708	708	5,042	0	5,042	2,785	7,827	12,644	0	12,644	938	0	938	22,117
1992	0	−604	−604	989	0	989	6,633	7,622	12,669	0	12,669	5,219	0	5,219	24,906
1993	0	−197	−197	825	0	825	7,637	8,462	14,977	0	14,977	8,565	0	8,565	31,807
1994	0	−369	−369	1,564	0	1,564	7,441	9,005	13,092	0	13,092	6,908	0	6,908	28,635
1995	0	−308	−308	1,128	0	1,128	7,488	8,616	8,664	0	8,664	7,848	0	7,848	24,820
1996	0	−1,007	−1,007	3,264	0	3,264	6,249	9,513	6,881	0	6,881	5,239	0	5,239	20,627
1997	0	−425	−425	2,389	0	2,389	7,242	9,631	17,776	0	17,776	6,370	0	6,370	33,351
1998	0	107	107	511	0	511	7,170	7,681	16,784	0	16,784	8,996	0	8,996	33,567
1999	0	−119	−119	2,142	0	2,142	6,875	9,017	17,671	0	17,671	7,200	0	7,200	33,769
2000	0	−376	−376	1,341	0	1,341	7,814	9,155	14,043	79	14,122	6,542	0	6,542	29,442
2001	0	−484	−484	423	0	423	5,800	6,223	13,337	0	13,337	8,756	0	8,756	27,832
2002	1,468	−145	1,323	4,120	0	4,120	4,512	8,632	14,132	786	14,918	3,391	0	3,391	28,264
2003	3,364	−298	3,066	758	0	758	6,706	7,464	16,759	0	16,759	3,534	0	3,534	30,823
2004	2,995	−767	2,228	2,682	0	2,682	5,276	7,958	11,644	431	12,075	2,937	0	2,937	25,197
2005	3,115	−1,051	2,064	59	0	59	6,411	6,470	9,796	0	9,796	7,307	0	7,307	25,636
2006	3,607	2	3,609	105	0	105	8,020	8,125	9,906	0	9,906	6,997	0	6,997	28,637
2007	3,382	−41	3,342	898	696	1,594	7,211	8,806	22,763	0	22,763	5,245	303	5,548	40,459
2008	2,718	−213	2,505	2,936	1,452	4,388	5,251	9,639	17,304	51	17,356	5,534	813	6,347	35,846
2009	2,239	−218	2,021	2,995	685	3,680	5,500	9,180	18,160	68	18,228	7,179	990	8,170	37,598
2010	2,733	77	2,810	512	382	894	6,283	7,177	15,709	19	15,727	6,260	211	6,471	32,185
2011	3,598	164	3,762	817	254	1,071	7,629	8,700	10,747	0	10,747	6,826	271	7,096	30,305
2012	2,415	−5	2,410	929	1,031	1,960	6,169	8,129	14,210	0	14,210	5,389	313	5,702	30,451
2013	1,822	101	1,923	4,647	349	4,996	2,696	7,692	12,854	998	13,852	1,737	72	1,809	25,276

Table 2-10
Summary of Water Deliveries

Calendar Year	PVCWD (AF)[a]			United Water Conservation District (AF)											Total UWCD and PVCWD Water Deliveries in Oxnard Subbasin (AF)
				PTP (Oxnard Subbasin Only)					O-H Supply Line (Oxnard Subbasin Only)			PVP (Oxnard Subbasin and Pleasant Valley Basin)[c]			
	Conejo Creek Flows Delivered by CWD for Agriculture[b]	*Pumped Groundwater from Oxnard Subbasin Basin*	*Total PVCWD Water Delivered*	*PTP Wells 1–5 (LAS)*	*Saticoy Wells (UAS)*	*Total PTP Groundwater Pumpage*	*Total PTP Surface Water*	*Total PTP Water*	*Municipal Deliveries*	*Agriculture Deliveries*	*Total O-H Water*	*Diversions of Santa Clara River Water Used in the Oxnard Subbasin for Agriculture*	*Recharged Spreading Water Pumped and Used in the Oxnard Subbasin for Agriculture (Saticoy Wells)*[d]	*Total PVP Water*	
2014	1,151	−287	864	7,027	0	7,027	22	7,049	10,773	0	10,773	112	0	112	18,798
2015	1,319	−876	443	5,476	0	5,476	0	5,476	10,920	0	10,920	0	0	0	16,839
Maximum	**3,607**	**708**	**3,762**	**9,506**	**1,452**	**9,506**	**8,020**	**9,762**	**22,763**	**998**	**22,763**	**16,064**	**990**	**8,996**	**40,459**
Minimum	**0**	**−1,051**	**−1,007**	**0**	**0**	**0**	**0**	**0**	**6,881**	**0**	**6,881**	**0**	**0**	**0**	**16,839**
Average	**1,159**	**−211**	**948**	**2,351**	**156**	**2,508**	**4,779**	**7,287**	**13,947**	**78**	**14,025**	**9,113**	**96**	**5,104**	**27,364**

Notes: AF = acre-feet; CWD = Camrosa Water District; LAS = Lower Aquifer System; O-H = Oxnard–Hueneme; PTP = Pumping Trough Pipeline; PVCWD = Pleasant Valley County Water District; PVP = Pleasant Valley Pipeline; UAS = Upper Aquifer System; UWCD = United Water Conservation District.

[a] Negative value indicates groundwater pumped in the Oxnard Subbasin and used in Pleasant Valley.

[b] For water supplied by Camrosa Water District to PVCWD, 56% is used in the Oxnard Subbasin and 44% in the Pleasant Valley Basin; only the 56% used in the Oxnard Subbasin is shown in this table.

[c] For water supplied via the UWCD PVP to PVCWD, 56% is used in the Oxnard Subbasin and 44% in the PVB; only the 56% used in the Oxnard Subbasin is shown in this table.

[d] UWCD extracts limited amounts of temporarily stored water from shallow wells at its Saticoy Spreading Grounds to the PVP during periods of mounding, as authorized by FCGMA Resolution 2011-02.

Table 2-11
Recharge by Type (AF)

Calendar Year	UWCD Spreading	Precipitation	Pumped Groundwater	Applied Water (M&I and Domestic)	PTP/PVP System	Total Recharge
1985	33,837	4,937	18,562	753	1,254	59,343
1986	59,810	14,048	16,017	747	1,399	92,021
1987	32,825	7,149	17,878	744	1,353	59,949
1988	40,579	6,096	16,719	771	1,934	66,100
1989	16,920	2,130	17,158	869	2,542	39,620
1990	8,904	1,502	16,449	939	2,051	29,844
1991	39,289	11,869	14,044	745	2,510	68,455
1992	101,421	15,752	11,886	863	3,336	133,258
1993	94,241	15,461	11,778	784	4,230	126,494
1994	50,588	6,173	12,936	853	4,003	74,553
1995	98,952	19,121	10,501	874	4,075	133,525
1996	54,047	12,566	10,908	635	3,771	81,928
1997	52,261	10,592	13,396	725	3,995	80,970
1998	118,672	21,656	9,555	755	4,022	154,660
1999	35,816	4,927	11,928	846	4,114	57,631
2000	51,793	8,733	11,216	1,113	3,906	76,762
2001	75,176	15,715	10,105	1,079	3,748	105,823
2002	20,209	5,728	11,440	1,116	3,137	41,630
2003	34,111	8,670	9,949	1,003	3,343	57,076
2004	23,166	10,322	10,642	1,342	3,658	49,129
2005	118,629	14,794	8,733	1,292	4,053	147,501
2006	80,554	8,575	9,855	1,239	4,564	104,786
2007	29,703	2,704	11,588	779	4,072	48,846
2008	56,433	7,548	10,761	1,036	4,689	80,468
2009	22,438	6,057	10,135	932	4,690	44,252
2010	46,228	16,086	8,695	954	3,899	75,861
2011	71,959	6,759	9,425	1,079	4,544	93,767
2012	20,816	3,695	10,640	975	3,643	39,768
2013	2,686	735	11,663	1,044	2,698	18,825
2014	2,900	6,182	11,404	1,011	1,999	23,496
2015	2,516	1,064	11,278	857	1,671	17,386
Maximum	**118,672**	**21,656**	**18,562**	**1,342**	**4,690**	**154,660**

Table 2-11
Recharge by Type (AF)

Calendar Year	UWCD Spreading	Precipitation	Pumped Groundwater	Applied Water (M&I and Domestic)	PTP/PVP System	Total Recharge
Minimum	2,516	735	8,695	635	1,254	17,386
Average	48,306[a]	8,947	12,169	928	3,319	73,669

Notes: AF = acre-feet; M&I = municipal and industrial; PTP = Pumping Trough Pipeline; PVP = Pleasant Valley Pipeline; UWCD = United Water Conservation District.

[a] The difference between 48,306 AFY in this table and 48,279 AFY in Table 2-9 is caused by how UWCD tracks monthly spreading. The UWCD hydrologist entered a negative number in some of the monthly records to reconcile their percolation total. So for the following 3 months, Table 2-7 has:

- August 1988 recharge to Saticoy is −8 acre-feet.
- April 1990 recharge to Saticoy is −11.34 acre-feet.
- September 1997 recharge to Saticoy is −255.06 acre-feet.

Table 2-12
Stream Flows in Arroyo Las Posas and Conejo Creek, and Conejo Creek Diversion and Deliveries to the Pleasant Valley County Water District (AF)

Calendar Year	Arroyo Las Posas Flows Measured at Stream Gauge 806 until 1997 and 806A to 2005	Conejo Creek Flows Measured at Stream Gauge 800 until 2011 and 800A to 2012	Conejo Creek Water Delivered by CWD for Agriculture (AF)[a]	Conejo Creek Flows Delivered by CWD for Agriculture In PVCWD[b]	Conejo Creek Flows Delivered by CWD for M&I	Total CWD Conejo Creek Flows Diversions
1985	1,174	14,265	2,450	0	0	2,450
1986	11,707	25,621	2,450	0	0	2,450
1987	3,487	16,851	2,450	0	0	2,450
1988	3,256	16,922	2,450	0	0	2,450
1989	840	14,785	2,450	0	0	2,450
1990	1,068	12,608	2,450	0	0	2,450
1991	9,715	20,227	2,450	0	0	2,450
1992	26,792	44,305	2,450	0	0	2,450
1993	27,749	52,306	2,450	0	0	2,450
1994	2,956	16,195	2,450	0	0	2,450
1995	26,984	45,909	2,450	0	0	2,450
1996	9,919	22,862	2,450	0	0	2,450
1997	10,742	22,905	2,450	0	0	2,450
1998	47,361	49,704	2,450	0	0	2,450
1999	923	16,479	2,450	0	0	2,450
2000	4,884	18,000	2,450	0	0	2,450
2001	18,819	28,092	2,450	0	0	2,450
2002	3,003	16,744	2,450	2,621	0	5,071
2003	12,973	21,592	1,249	6,008	256	7,513
2004	13,757	23,522	1,345	5,348	276	6,969
2005	54,549	46,396	1,639	5,562	336	7,537
2006	NA	23,175	1,457	6,441	298	8,196

Table 2-12
Stream Flows in Arroyo Las Posas and Conejo Creek, and Conejo Creek Diversion and Deliveries to the Pleasant Valley County Water District (AF)

Calendar Year	Arroyo Las Posas Flows Measured at Stream Gauge 806 until 1997 and 806A to 2005	Conejo Creek Flows Measured at Stream Gauge 800 until 2011 and 800A to 2012	Conejo Creek Water Delivered by CWD for Agriculture (AF)[a]	Conejo Creek Flows Delivered by CWD for Agriculture In PVCWD[b]	Conejo Creek Flows Delivered by CWD for M&I	Total CWD Conejo Creek Flows Diversions
2007	NA	17,048	3,288	6,040	674	10,002
2008	NA	25,254	2,895	4,854	358	8,107
2009	NA	19,099	3,225	3,998	673	7,896
2010	NA	20,293	2,554	4,880	594	8,028
2011	NA	17,518	2,359	6,425	533	9,317
2012	NA	7,612	2,603	4,312	653	7,568
2013	NA	NA	2,999	3,253	754	7,006
2014	NA	NA	2,858	2,055	854	5,767
2015	NA	NA	2,555	2,355	794	5,704
Maximum	**54,549**	**52,306**	**3,288**	**6,441**	**854**	**10,002**
Minimum	**840**	**7,612**	**1,249**	**0**	**0**	**2,450**
Average	**13,936**	**24,153**	**2,423**	**2,069**	**227**	**4,720**

Notes: AF = acre-feet; CWD = Camrosa Water District; M&I = municipal and industrial; NA = not applicable; PVCWD = Pleasant Valley County Water District.

[a] 2,450 AFY between 1985 and 2002 accounts for riparian water rights holders' use of Conejo Creek water prior to development of CWD's Diversion Facility and non-potable surface water system. Between 2003 and 2006, deliveries are less than previous assumptions as not all riparian customers had connected to the CWD non-potable system. It is fair to assume the difference between those volumes and 2,450 were still applied to land.

[b] For water supplied by CWD to PVCWD, 56% is used in the Oxnard Subbasin and 44% in the PVB.

Table 2-13
Sales and Usage of Imported Water Supplied by the Calleguas Municipal Water District (AF)

Calendar Year	Delivered and Used by the City of Oxnard for M&I	Delivered and Used by Port Hueneme Water Agency for M&I	Total Imported Water Supplied
1985	14,094	0	14,094
1986	14,023	0	14,023
1987	14,422	0	14,422
1988	14,565	0	14,565
1989	15,026	0	15,026
1990	16,853	0	16,853
1991	12,705	0	12,705
1992	15,576	0	15,576
1993	14,799	0	14,799
1994	11,441	0	11,441
1995	14,513	0	14,513
1996	12,392	64	12,456
1997	13,615	641	14,256
1998	12,675	2,234	14,909
1999	14,721	2,615	17,336
2000	14,487	2,935	17,422
2001	13,201	1,731	14,932
2002	13,591	3,054	16,645
2003	12,858	1,072	13,930
2004	13,742	1,595	15,337
2005	12,447	1,590	14,037
2006	11,994	2,067	14,061
2007	14,008	2,221	16,229
2008	15,150	1,197	16,347
2009	10,431	1,278	11,709
2010	11,238	838	12,076
2011	11,506	1,072	12,578
2012	13,474	1,047	14,521
2013	15,331	2,011	17,342
2014	13,550	1,483	15,033
2015	11,116	556	11,672
Maximum[a]	**16,853**	**3,054**	**17,422**
Minimum[a]	**10,431**	**64**	**11,441**
Average[a]	**13,534**	**1,565**	**14,543**

Notes: AF = acre-feet; M&I = municipal and industrial.

[a] Maximum, minimum, and average values are calculated for the period over which water deliveries occurred.

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Table 2-14
Oxnard Subbasin Groundwater Used

Calendar Year	Agricultural Pumpage (AF)				M&I Pumpage (AF)				Domestic Pumpage (AF)				Totals (AF)			
	Pumpage (UAS)	*Pumpage (LAS)*	*Pumpage (Semi-Perched)*	*Total Agricultural*	*Pumpage (UAS)*	*Pumpage (LAS)*	*Pumpage (Semi-Perched)*	*Total M&I*	*Pumpage (UAS)*	*Pumpage (LAS)*	*Pumpage (Semi-Perched)*	*Total Domestic*	*Pumpage (UAS)*	*Pumpage (LAS)*	*Pumpage (Semi-Perched)*	*Total Pumpage*
1985	42,652	27,990	26	70,669	23,578	5,996	15	29,589	4,926	593	3	5,522	71,157	34,579	44	105,780
1986	36,285	23,167	37	59,489	24,196	5,038	24	29,258	3,752	270	4	4,026	64,234	28,475	65	92,773
1987	39,028	33,285	38	72,350	25,198	5,004	24	30,226	3,122	182	3	3,307	67,347	38,471	65	105,883
1988	34,505	31,938	33	66,476	26,475	4,574	25	31,074	2,683	511	3	3,196	63,663	37,023	61	100,746
1989	34,238	35,435	41	69,713	24,548	8,521	29	33,098	2,657	798	3	3,458	61,443	44,754	73	106,269
1990	34,082	42,137	83	76,302	23,000	9,780	56	32,837	738	8	2	748	57,820	51,926	141	109,887
1991	25,830	30,008	67	55,905	19,682	7,068	51	26,801	4,134	7	11	4,152	49,646	37,084	128	86,858
1992	24,076	20,070	48	44,194	21,286	3,562	43	24,892	491	9	1	501	45,853	23,641	92	69,587
1993	23,621	19,757	35	43,413	23,294	5,626	34	28,954	589	8	1	598	47,504	25,392	70	72,966
1994	26,820	23,981	48	50,849	22,505	8,818	40	31,363	544	7	1	552	49,868	32,806	89	82,764
1995	21,580	17,759	30	39,369	17,335	6,818	24	24,177	605	7	1	613	39,520	24,584	55	64,159
1996	21,642	22,211	17	43,870	12,866	5,221	10	18,096	560	8	0	568	35,068	27,440	27	62,535
1997	25,190	25,725	10	50,925	26,612	6,515	10	33,138	320	8	0	327	52,122	32,248	20	84,390
1998	20,263	15,279	3	35,545	22,611	6,597	3	29,211	204	7	0	211	43,078	21,883	6	64,966
1999	23,082	23,765	5	46,852	24,871	3,073	5	27,949	316	5	0	322	48,269	26,844	10	75,123
2000	21,982	21,027	5	43,014	23,380	6,788	6	30,174	199	4	0	203	45,561	27,819	11	73,390
2001	19,046	17,194	4	36,244	23,292	6,460	5	29,757	212	6	0	219	42,551	23,661	8	66,220
2002	20,837	24,502	0	45,338	23,555	8,819	0	32,374	179	3	0	182	44,571	33,324	0	77,895
2003	17,772	17,645	0	35,417	29,374	6,368	0	35,742	182	4	0	186	47,327	24,017	0	71,345
2004	19,299	21,732	0	41,031	27,091	8,775	0	35,866	280	6	0	286	46,670	30,513	0	77,183
2005	16,464	15,140	0	31,604	24,213	10,080	0	34,292	357	5	0	362	41,034	25,225	0	66,258
2006	18,290	16,268	0	34,558	24,405	12,044	0	36,449	163	4	0	168	42,858	28,316	0	71,174
2007	24,110	20,802	0	44,912	30,289	7,047	0	37,336	165	5	0	170	54,564	27,854	0	82,418
2008	23,618	22,853	0	46,471	27,999	8,034	0	36,033	159	5	0	163	51,775	30,891	0	82,667
2009	20,027	22,784	0	42,811	31,272	7,670	0	38,942	132	5	0	137	51,431	30,458	0	81,890
2010	17,056	16,767	0	33,822	26,963	6,890	0	33,853	126	23	0	150	44,145	23,680	0	67,825
2011	18,648	18,253	0	36,901	22,832	8,725	0	31,558	128	6	0	134	41,608	26,984	0	68,592
2012	20,914	22,376	0	43,290	22,415	8,790	0	31,205	131	3	0	134	43,460	31,169	0	74,629
2013	22,514	29,341	0	51,855	22,202	9,816	0	32,018	184	2	0	186	44,900	39,159	0	84,059
2014	22,536	32,236	0	54,772	20,224	7,667	0	27,891	252	2	0	254	43,012	39,905	0	82,917
2015	23,102	32,870	1	55,973	18,884	5,762	1	24,648	191	3	0	193	42,177	38,635	2	80,814
Maximum	**42,652**	**42,137**	**83**	**76,302**	**31,272**	**12,044**	**56**	**38,942**	**4,926**	**798**	**11**	**5,522**	**71,157**	**51,926**	**141**	**109,887**
Minimum	**16,464**	**15,140**	**0**	**31,604**	**12,866**	**3,073**	**0**	**18,096**	**126**	**2**	**0**	**134**	**35,068**	**21,883**	**0**	**62,535**
Average	**24,487**	**24,010**	**17**	**48,514**	**23,756**	**7,160**	**13**	**30,929**	**925**	**81**	**1**	**1,007**	**49,169**	**31,250**	**31**	**80,450**

Notes: AF = acre-feet; LAS = Lower Aquifer System; M&I = municipal and industrial; UAS = Upper Aquifer System.
Pumping amounts are from the UWCD model and usage type is from the FCGMA well database.

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Table 2-15
Modeled 2040–2069 Groundwater Extraction Rates and Surface Water Deliveries for the Oxnard Subbasin

Model Scenario	Upper Aquifer System Groundwater Extractions (AFY)	Lower Aquifer System Groundwater Extractions (AFY)	Total Groundwater Extractions (AFY)
Future Baseline	39,000	29,000	68,000
Future Baseline With Projects	41,000	25,000	66,000
Reduction With Projects	27,000	13,000	40,000
Reduction Without Projects Scenario 1	27,000	12,000	39,000
Reduction Without Projects Scenario 2	18,000	12,000	30,000
Reduction Without Projects Scenario 3	18,000	12,000	30,000

Notes: AFY = acre-feet per year.

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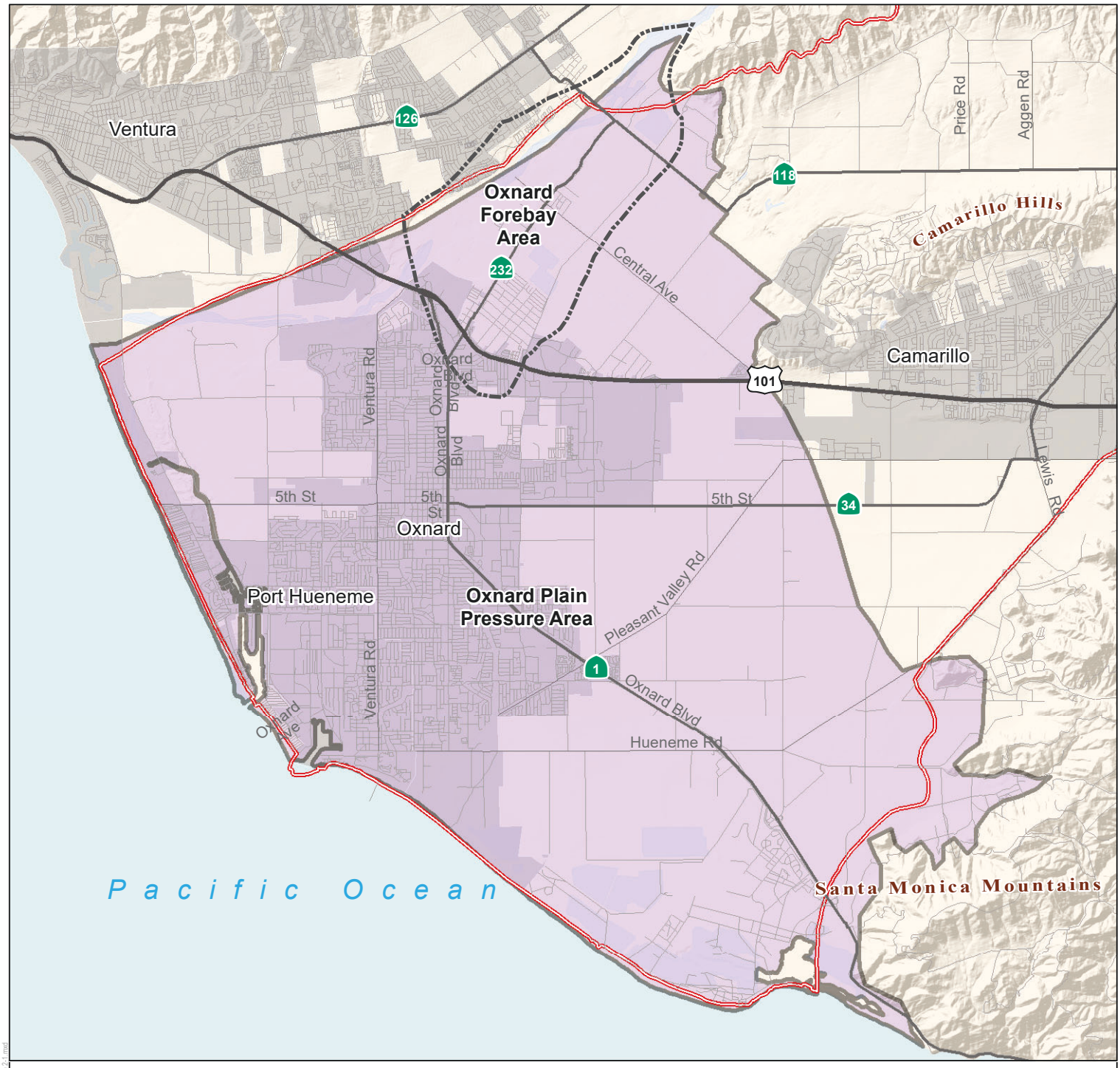


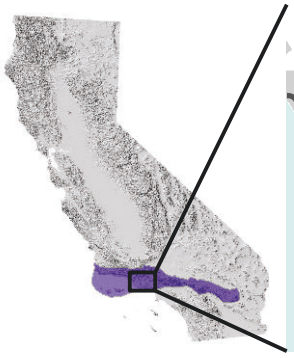
Legend

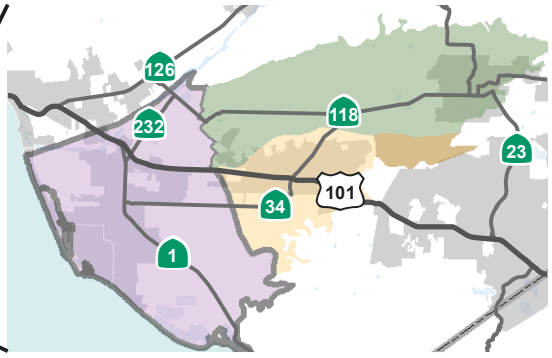
Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)
- Historical FCGMA Forebay Area
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Transverse Ranges Geomorphic Province

N

0 1 2 3 4 5 Miles





DUDEK

SOURCE: CGS 2002; DWR 2016; Cal-Atlas 2016; FCGMA 2016

FIGURE 2-1

Oxnard Subbasin Vicinity Map

Groundwater Sustainability Plan for the Oxnard Subbasin

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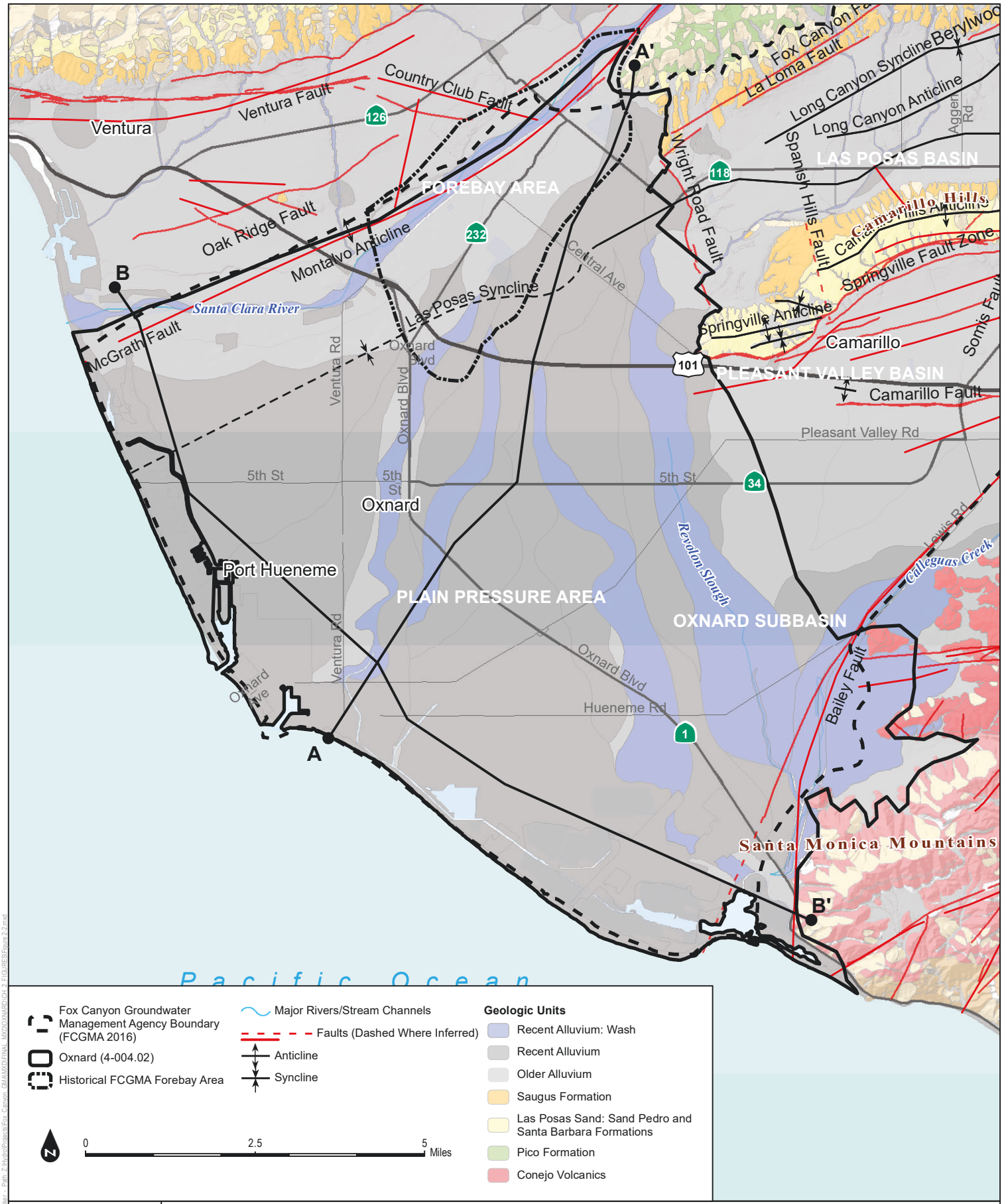

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SOURCE: DWR; FCGMA; surficial geology after California Geological Survey; folds after Dibblee 1992a and 1992b, Devecchio 2012a, Turner 1975; faults after DeVecchio et al. 2012a

FIGURE 2-2

Geology of the Oxnard Subbbasin

Groundwater Sustainability Plan for the Oxnard Subbasin

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West

East

A

A'

Oxnard Pressure Plain Area

Forebay Area

Pacific Ocean

South Mountain

Hueneme Road

State Hwy. 1

E. Fifth Street

Hwy. 101

Central Ave.

Hwy. 118

ELEVATION IN FEET

400
200
0
-200
-400
-600
-800
-1000
-1200
-1400
-1600
-1800
-2000

0
10,000
20,000
30,000
40,000
50,000
60,000

Shallow ("Semi-perched") aquifer

Upper Aquifer System (Oxnard and Mugu Aquifer Zones)

Lower Aquifer System: Fox Canyon Aquifer Zone

Clay Marker Bed / Low Permeability Sediments

Lower Aquifer System (Upper San Pedro / Hueneme Aquifer Zone)

SOURCE: Turner 1975; Based on Plates 9A and 9B (Cross Section C-C').

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FIGURE 2-3
Cross Section A-A'

Groundwater Sustainability Plan for the Oxnard Subbasin

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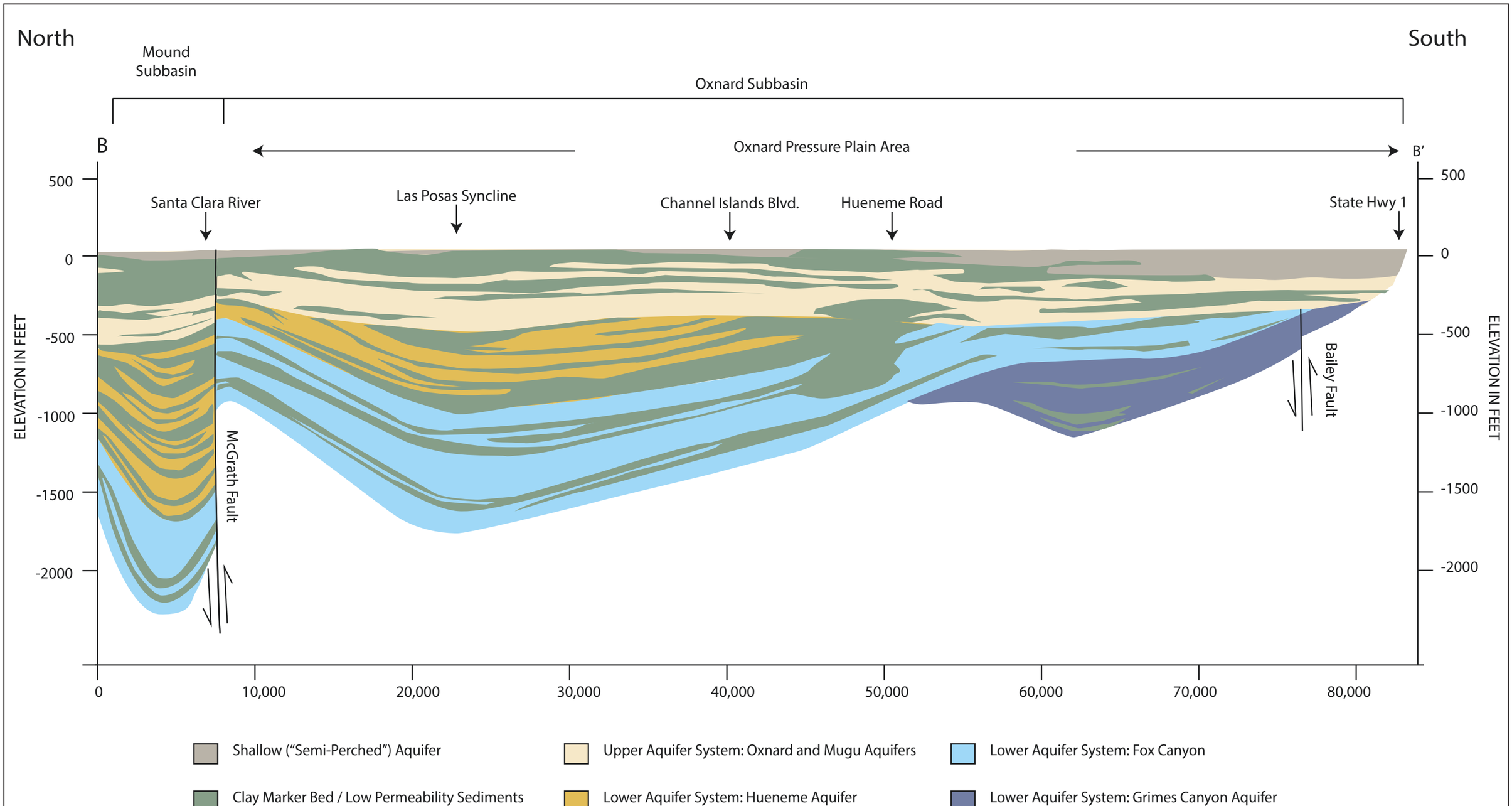

SOURCE: Turner 1975; Based on Plates 7A and 7B (Cross Section A-A').

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FIGURE 2-4
Cross Section B-B'

Groundwater Sustainability Plan for the Oxnard Subbasin

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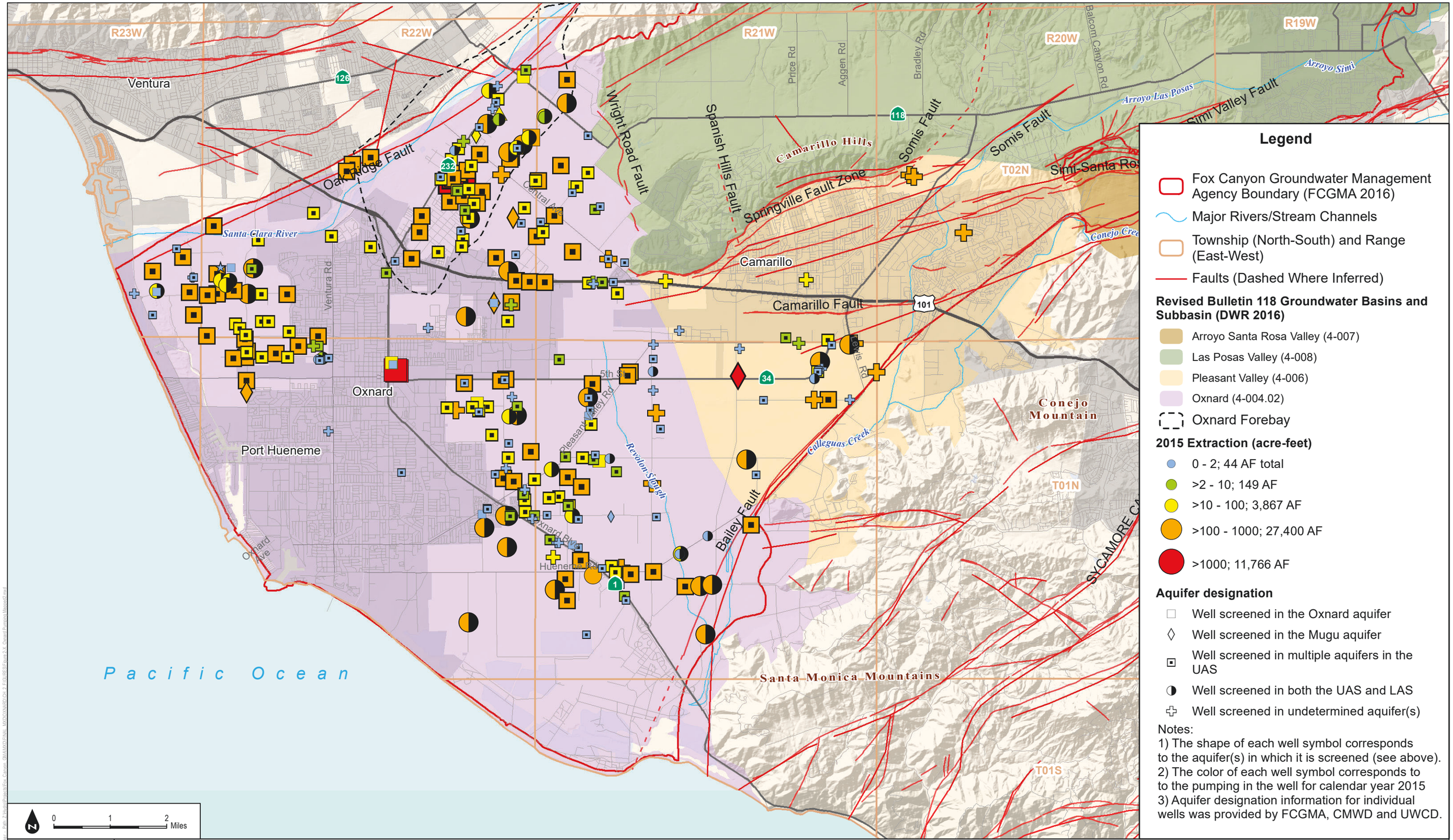

Legend

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Major Rivers/Stream Channels
- Township (North-South) and Range (East-West)
- Faults (Dashed Where Inferred)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)
- Oxnard Forebay

2015 Extraction (acre-feet)

- 0 - 2; 44 AF total
- >2 - 10; 149 AF
- >10 - 100; 3,867 AF
- >100 - 1000; 27,400 AF
- >1000; 11,766 AF

Aquifer designation

- Well screened in the Oxnard aquifer
- Well screened in the Mugu aquifer
- Well screened in multiple aquifers in the UAS
- Well screened in both the UAS and LAS
- Well screened in undetermined aquifer(s)

Notes:
1) The shape of each well symbol corresponds to the aquifer(s) in which it is screened (see above).
2) The color of each well symbol corresponds to to the pumping in the well for calendar year 2015
3) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-5

Upper Aquifer System 2015 Extraction (acre-feet) in Oxnard and Pleasant Valley

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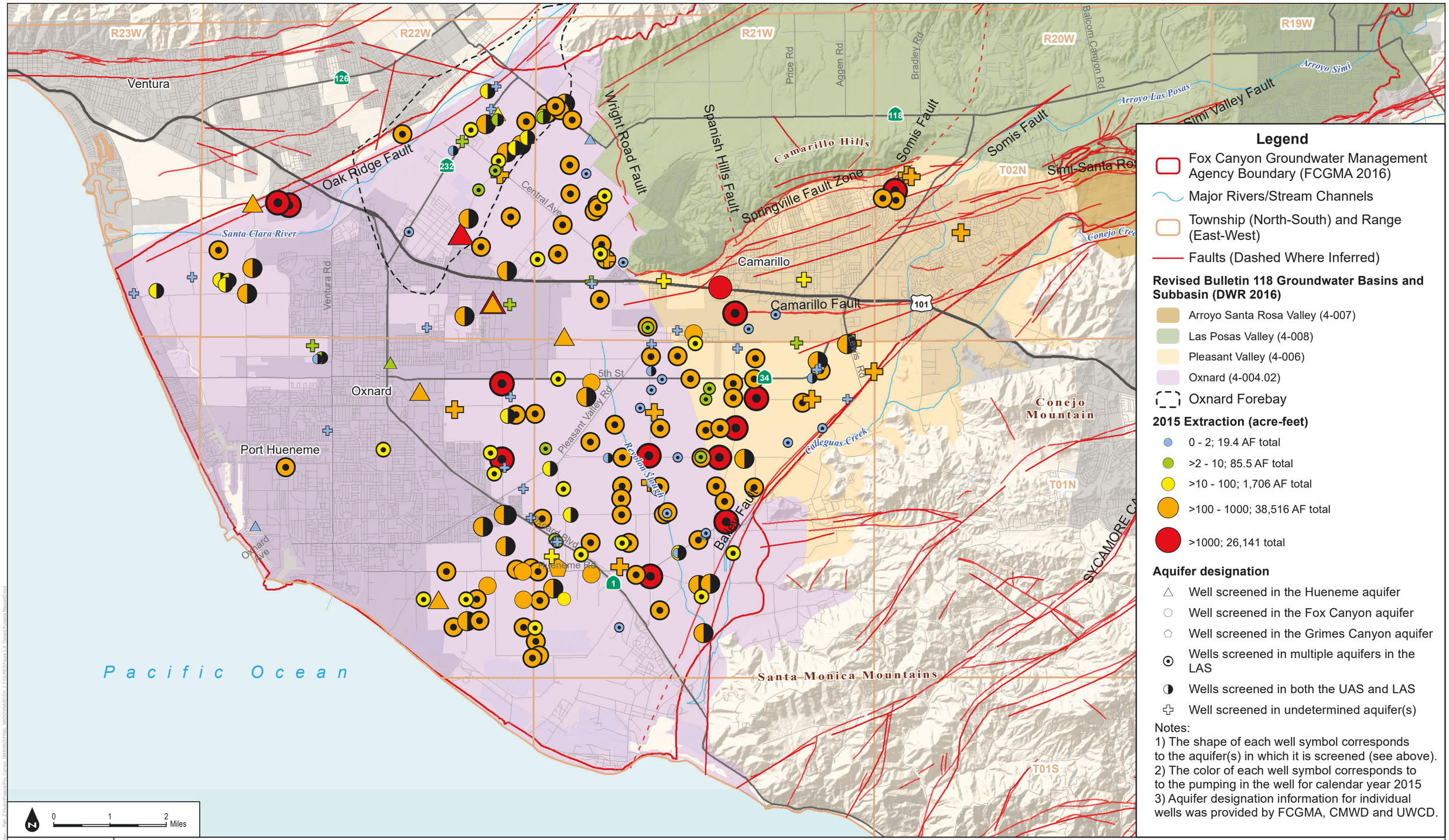

Legend

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Major Rivers/Stream Channels
- Township (North-South) and Range (East-West)
- Faults (Dashed Where Inferred)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)
- Oxnard Forebay

2015 Extraction (acre-feet)

- 0 - 2; 19.4 AF total
- >2 - 10; 85.5 AF total
- >10 - 100; 1,706 AF total
- >100 - 1000; 38,516 AF total
- >1000; 26,141 total

Aquifer designation

- Well screened in the Hueneme aquifer
- Well screened in the Fox Canyon aquifer
- Well screened in the Grimes Canyon aquifer
- Wells screened in multiple aquifers in the LAS
- Wells screened in both the UAS and LAS
- Well screened in undetermined aquifer(s)

Notes:
1) The shape of each well symbol corresponds to the aquifer(s) in which it is screened (see above).
2) The color of each well symbol corresponds to to the pumping in the well for calendar year 2015
3) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

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FIGURE 2-6

Lower Aquifer System 2015 Extraction (acre-feet) in Oxnard and Pleasant Valley

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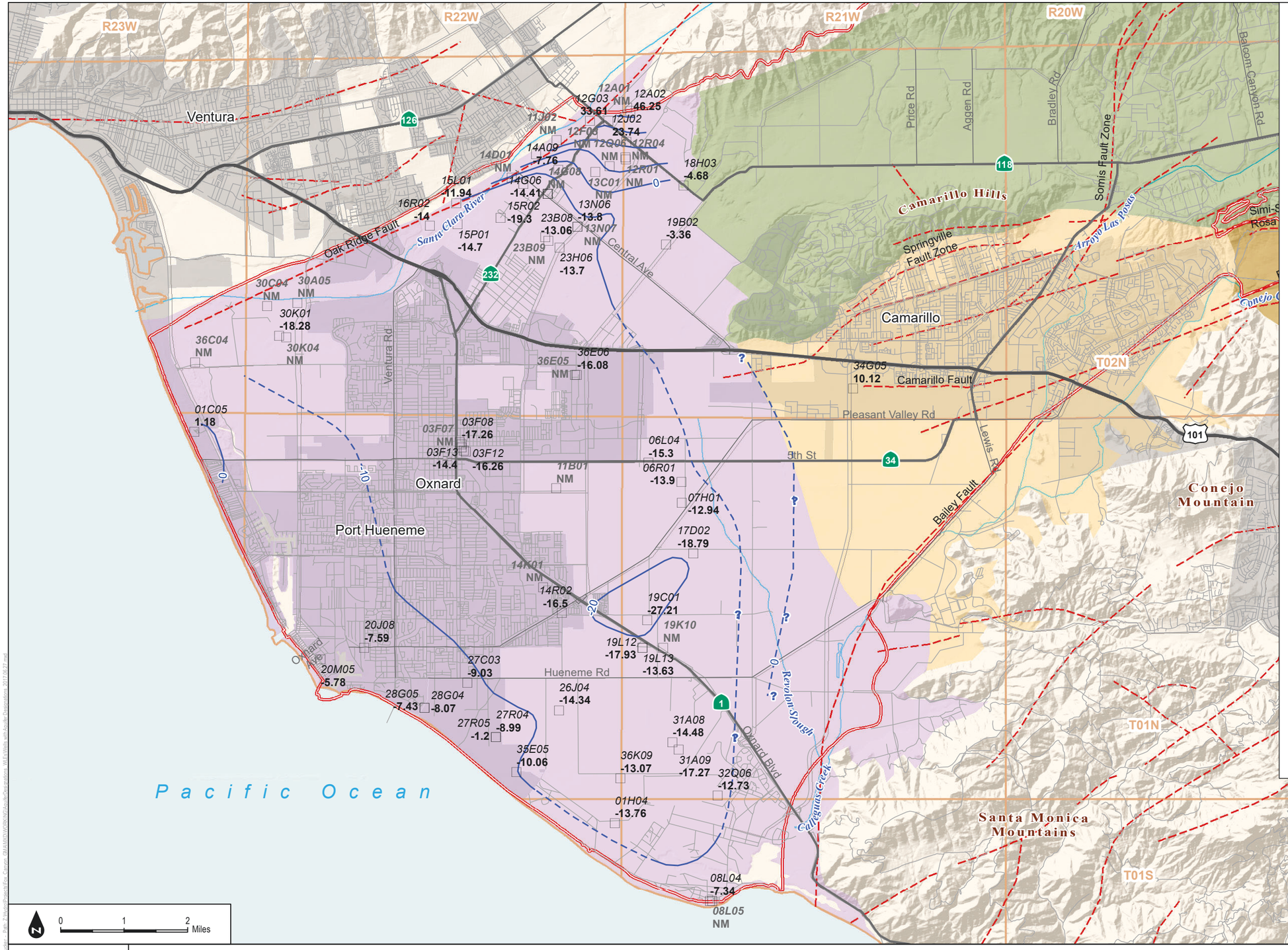

Legend

- Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.
- Well screened in the Oxnard aquifer
- 15P01 — Abbreviated State Well Number (see notes)
- -14.7 — Groundwater elevation feet AMSL
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (Ventura County 2016)
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Notes:

1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a groundwater elevation beneath it. SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S. Geotracker wells do not have SWN IDs and so are not labeled.

2) "NM" indicates no water level measurement was collected within the specified time window.

3) Groundwater elevations not used to create contours are shown in parentheses.

4) All elevation values are in feet above mean sea level (ft AMSL).

5) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-7

Groundwater Elevation Contours in the Oxnard Aquifer, March 2-29, 2015

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Groundwater Sustainability Plan for the Oxnard Subbasin

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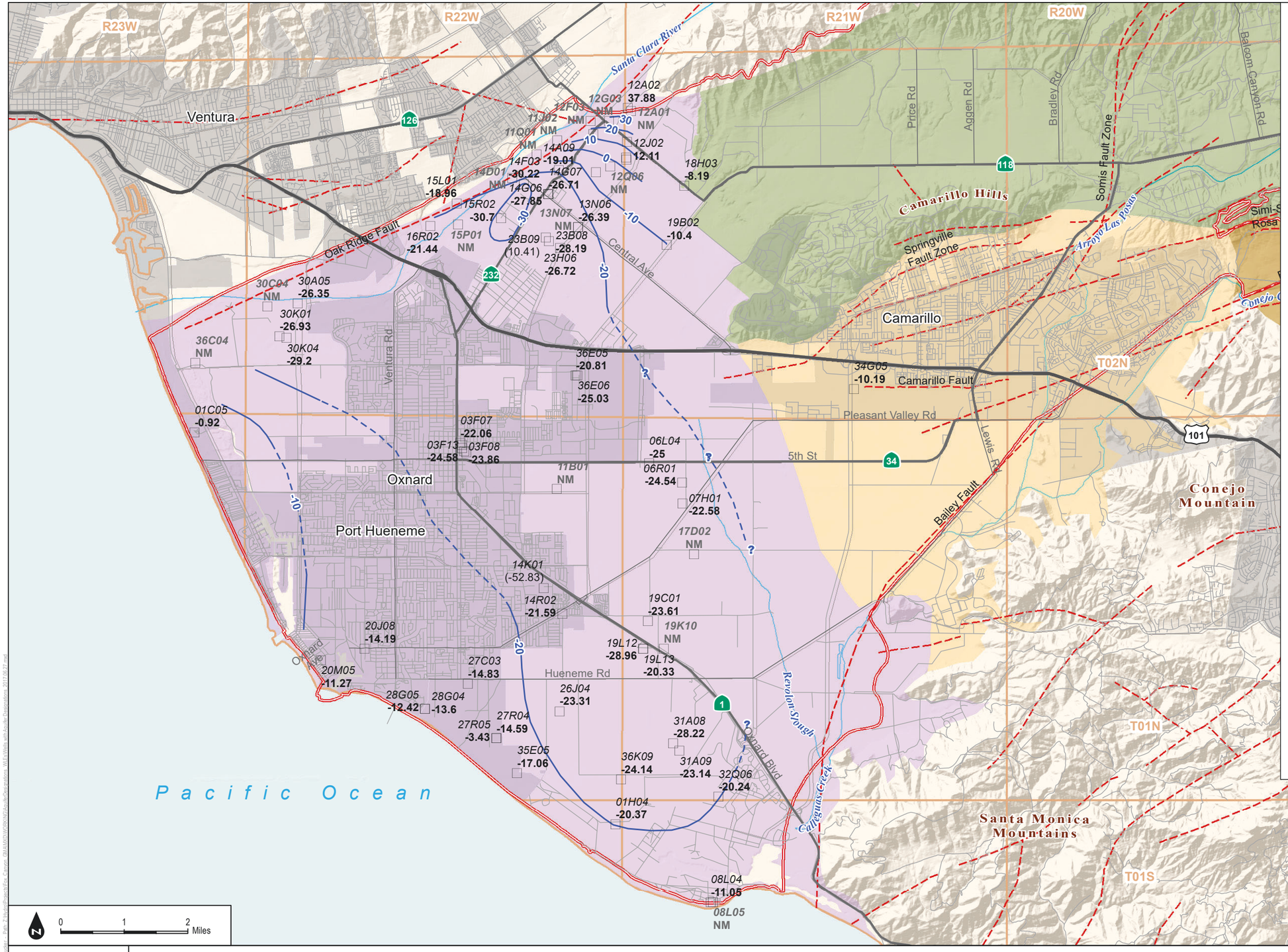

Legend

- Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.
- Well screened in the Oxnard aquifer
- *15P01* Abbreviated State Well Number (see notes)
- **-14.7** Groundwater elevation feet AMSL
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (Ventura County 2016)
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Notes:

1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a groundwater elevation beneath it. SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S. Geotracker wells do not have SWN IDs and so are not labeled.
2) "NM" indicates no water level measurement was collected within the specified time window.
3) Groundwater elevations not used to create contours are shown in parentheses.
4) All elevation values are in feet above mean sea level (ft AMSL).
5) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-8

Groundwater Elevation Contours in the Oxnard Aquifer, October 2-29, 2015

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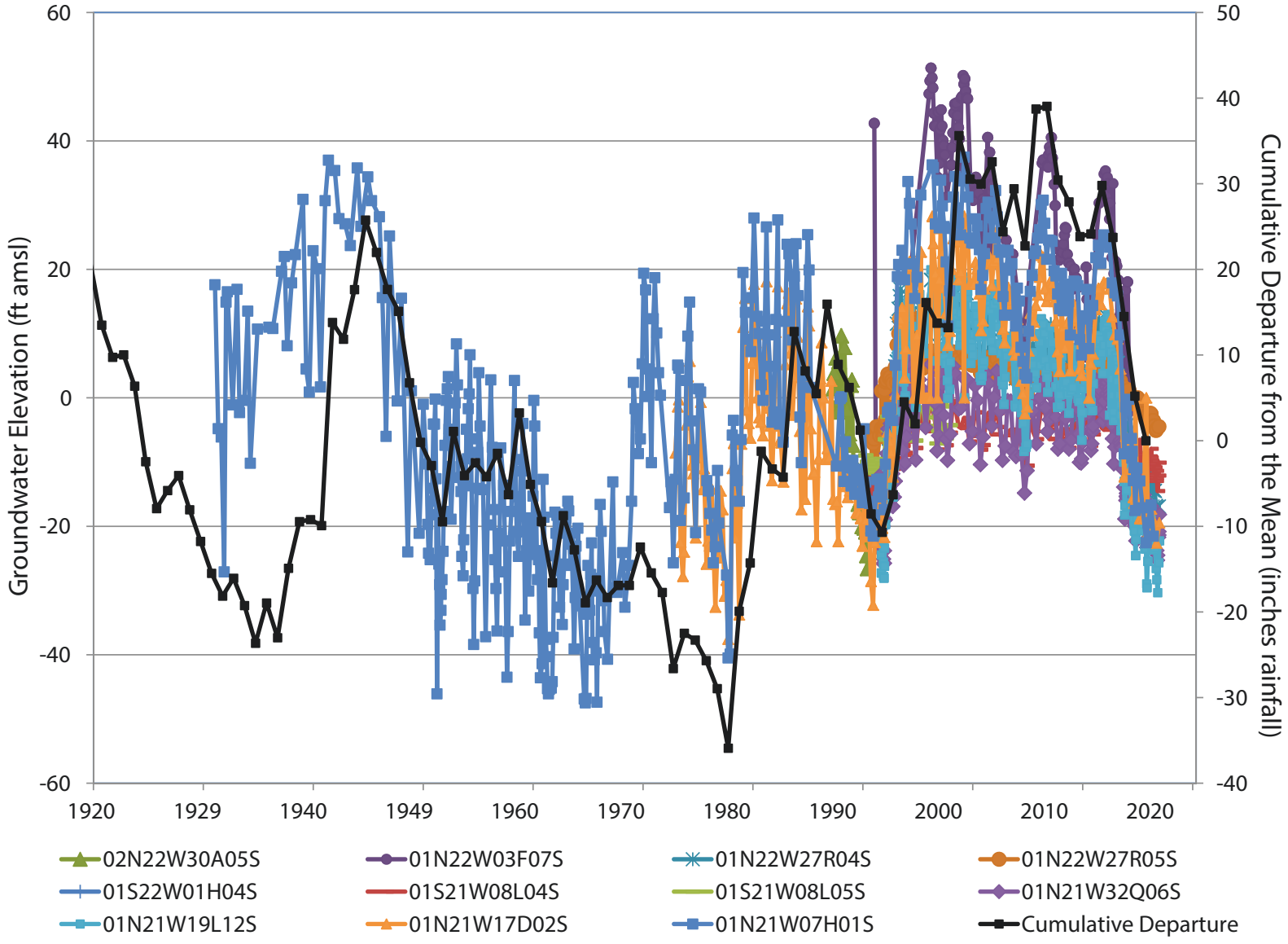

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FIGURE 2-9A

Groundwater Well Hydrographs in the Oxnard Aquifer - Oxnard Plain

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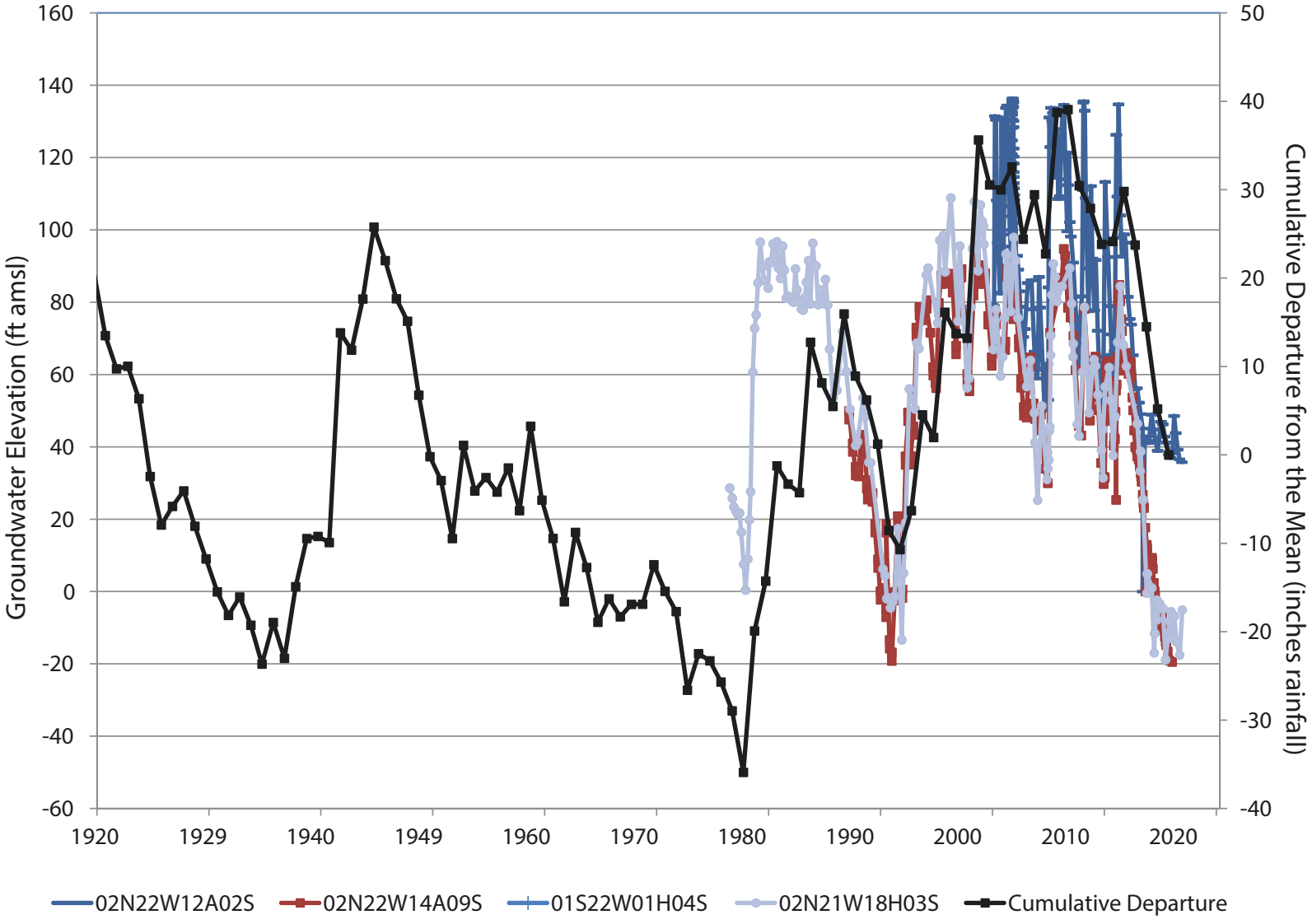

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FIGURE 2-9B

Groundwater Well Hydrographs in the Oxnard Aquifer - Forebay Area

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Legend

- Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.
- ◊ Well screened in the Mugu aquifer
- *15P01* Abbreviated State Well Number (see notes)
- **-14.7** Groundwater elevation feet AMSL
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (Ventura County 2016)
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Notes:

1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a groundwater elevation beneath it. SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S. Geotracker wells do not have SWN IDs and so are not labeled.

2) "NM" indicates no water level measurement was collected within the specified time window.

3) Groundwater elevations not used to create contours are shown in parentheses.

4) All elevation values are in feet above mean sea level (ft AMSL).

5) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

0 1 2 Miles

SOURCE: DWR; Ventura County; UWCD; CMWD

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FIGURE 2-10

Groundwater Elevation Contours in the Mugu Aquifer, March 2-29, 2015

Groundwater Sustainability Plan for the Oxnard Subbasin

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Legend

Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.

◊ Well screened in the Mugu aquifer

15P01 Abbreviated State Well Number (see notes)

-14.7 Groundwater elevation feet AMSL

Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)

Faults (Ventura County 2016)

Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a groundwater elevation beneath it. SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S. Geotracker wells do not have SWN IDs and so are not labeled.
2) "NM" indicates no water level measurement was collected within the specified time window.
3) Groundwater elevations not used to create contours are shown in parentheses.
4) All elevation values are in feet above mean sea level (ft AMSL).
5) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-11

Groundwater Elevation Contours in the Mugu Aquifer, October 2-29, 2015

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Groundwater Sustainability Plan for the Oxnard Subbasin

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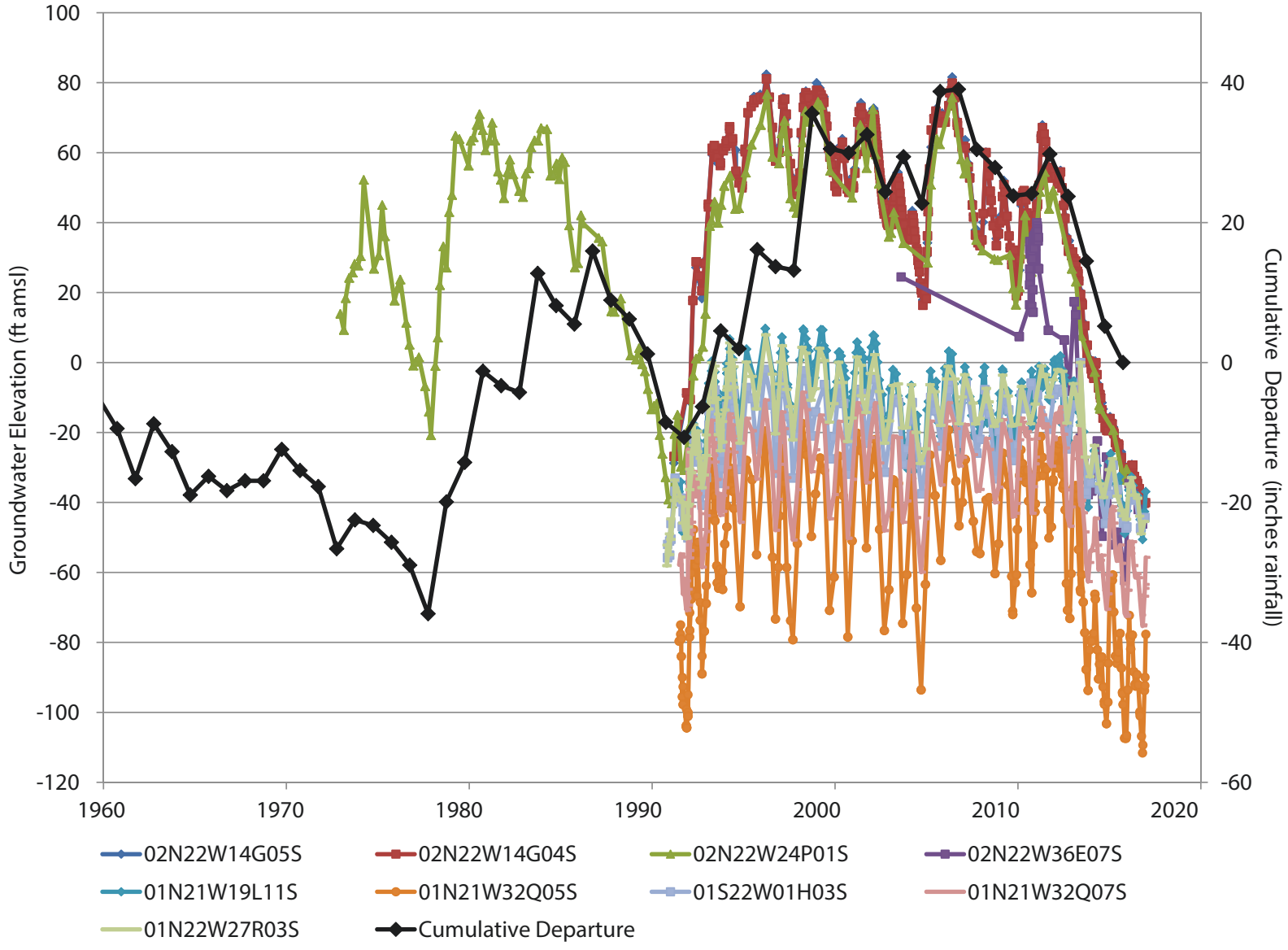

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FIGURE 2-12

Groundwater Well Hydrographs in the Mugu Aquifer

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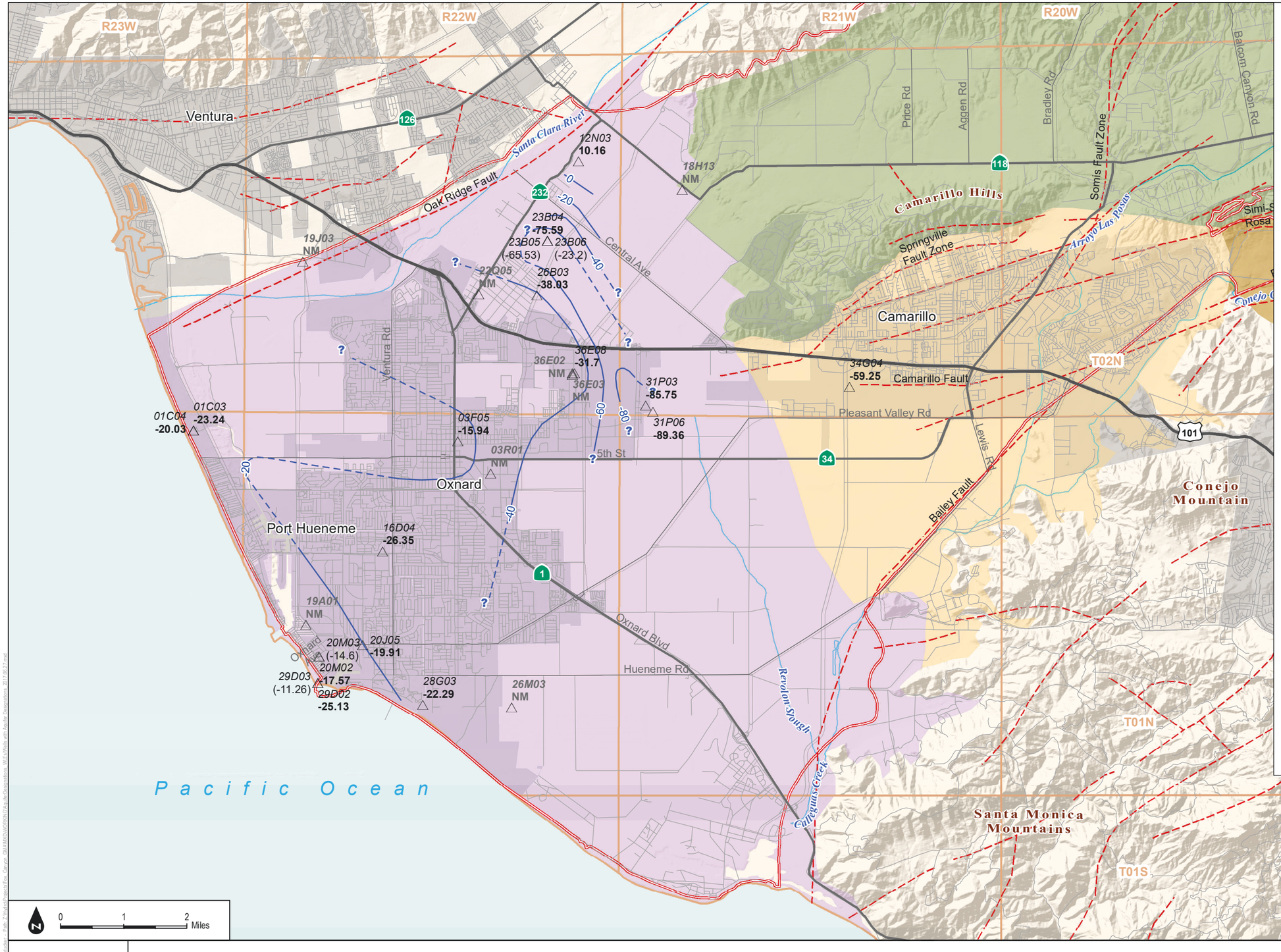

Legend

Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.

△ Well screened in the Hueneme aquifer

15P01 Abbreviated State Well Number (see notes)

-14.7 Groundwater elevation feet AMSL

Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)

Faults (Ventura County 2016)

Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

- Arroyo Santa Rosa Valley (4-007)
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- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Notes:

1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a groundwater elevation beneath it. SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S. Geotracker wells do not have SWN IDs and so are not labeled.

2) "NM" indicates no water level measurement was collected within the specified time window.

3) Groundwater elevations not used to create contours are shown in parentheses.

4) All elevation values are in feet above mean sea level (ft AMSL).

5) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-13

Groundwater Elevation Contours in the Hueneme Aquifer, March 2-29, 2015

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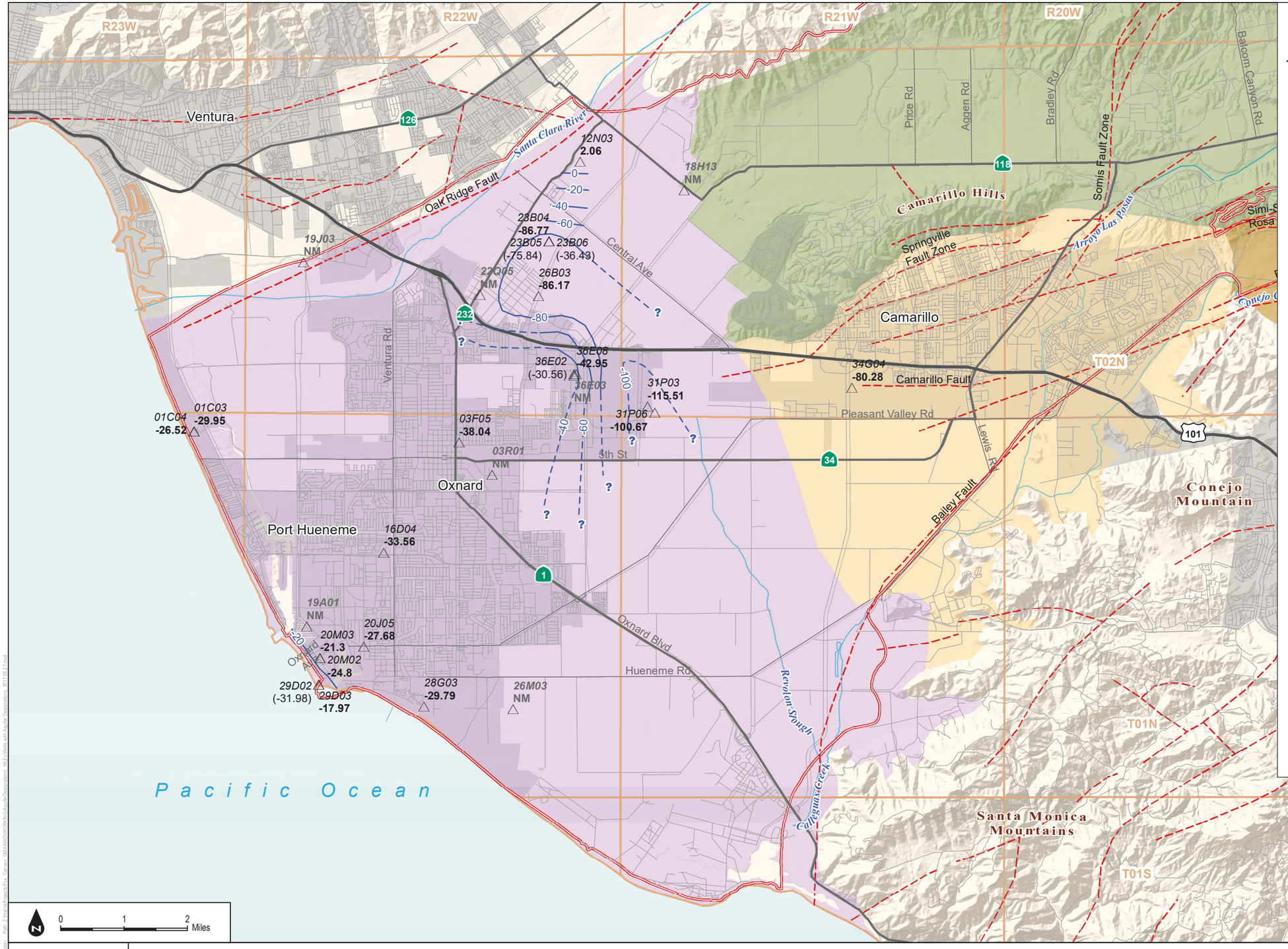

Legend

Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.

△ Well screened in the Hueneme aquifer

15P01 Abbreviated State Well Number (see notes)

-14.7 Groundwater elevation feet AMSL

Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)

Faults (Ventura County 2016)

Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

- Arroyo Santa Rosa Valley (4-007)
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Notes:

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2) "NM" indicates no water level measurement was collected within the specified time window.

3) Groundwater elevations not used to create contours are shown in parentheses.

4) All elevation values are in feet above mean sea level (ft AMSL).

5) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-14

Groundwater Elevation Contours in the Hueneme Aquifer, October 2-29, 2015

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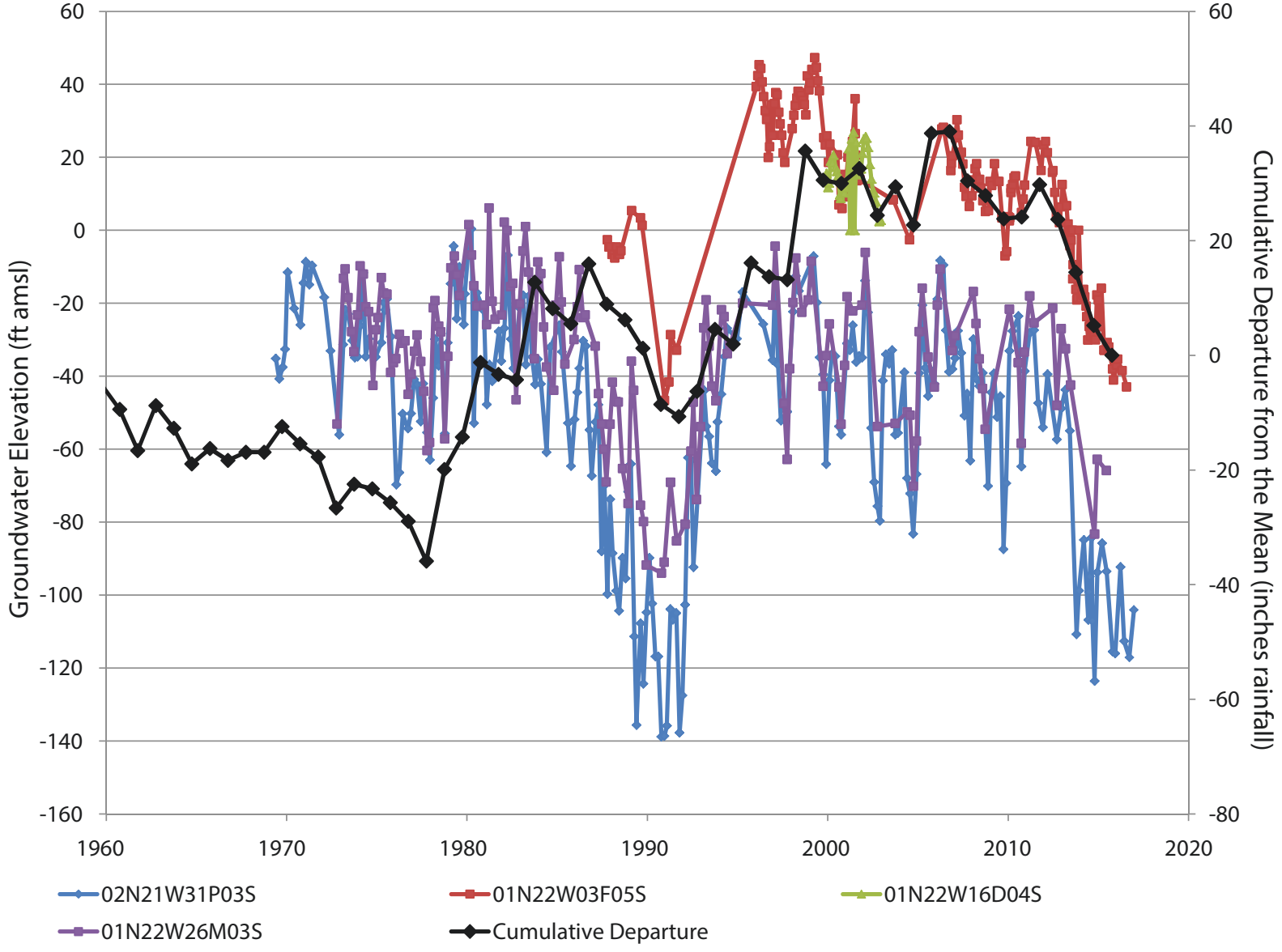

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FIGURE 2-15

Groundwater Well Hydrographs in the Hueneme Aquifer

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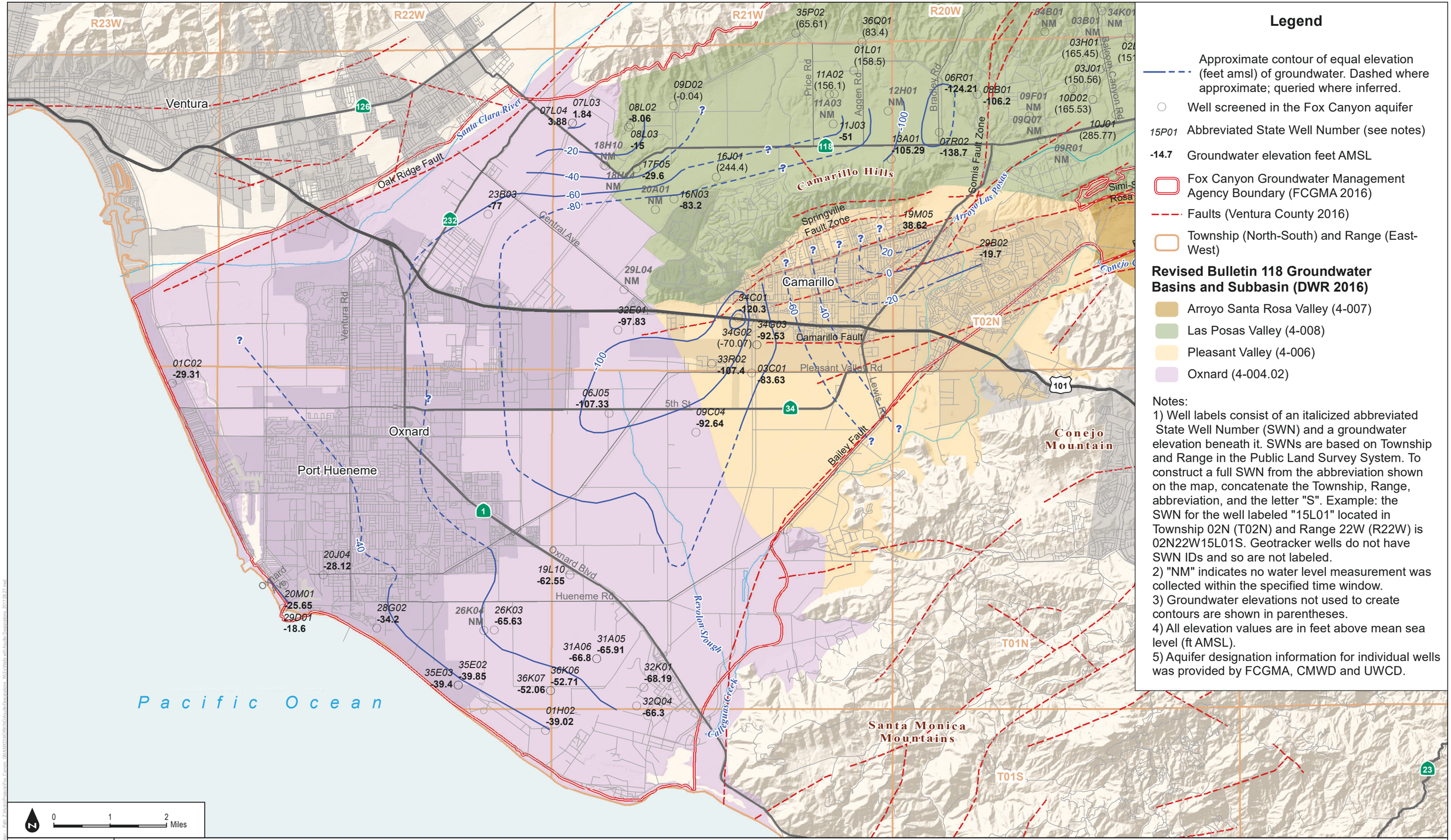

Legend

- Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.
- Well screened in the Fox Canyon aquifer
- 15P01 Abbreviated State Well Number (see notes)
- -14.7 Groundwater elevation feet AMSL
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (Ventura County 2016)
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a groundwater elevation beneath it. SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S. Geotracker wells do not have SWN IDs and so are not labeled.
2) "NM" indicates no water level measurement was collected within the specified time window.
3) Groundwater elevations not used to create contours are shown in parentheses.
4) All elevation values are in feet above mean sea level (ft AMSL).
5) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-16

Groundwater Elevation Contours in the Fox Canyon Aquifer, March 2-29, 2015

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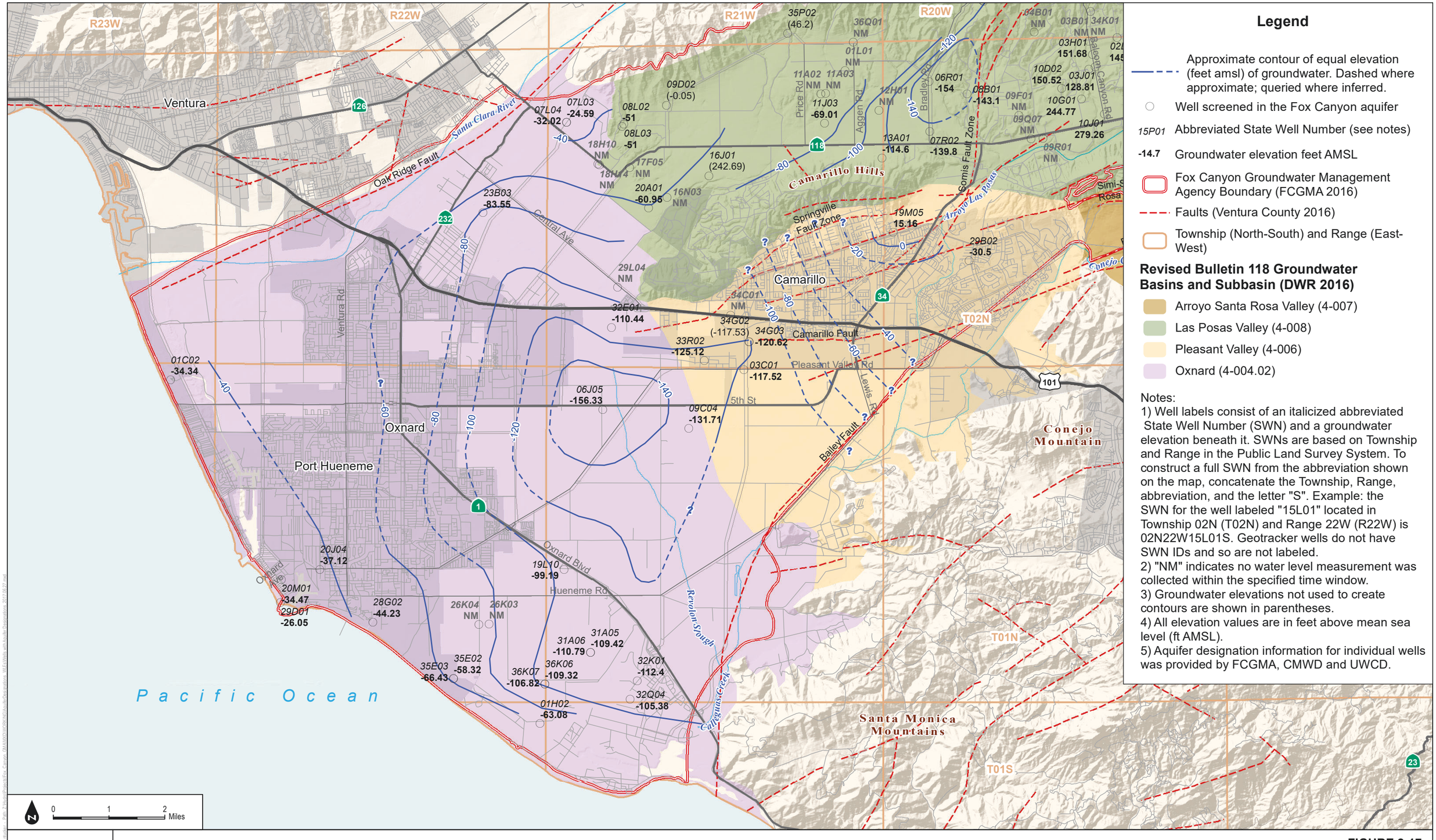

Legend

- Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.
- Well screened in the Fox Canyon aquifer
- 15P01 — Abbreviated State Well Number (see notes)
- -14.7 — Groundwater elevation feet AMSL
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (Ventura County 2016)
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

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- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a groundwater elevation beneath it. SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S. Geotracker wells do not have SWN IDs and so are not labeled.
2) "NM" indicates no water level measurement was collected within the specified time window.
3) Groundwater elevations not used to create contours are shown in parentheses.
4) All elevation values are in feet above mean sea level (ft AMSL).
5) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-17

Groundwater Elevation Contours in the Fox Canyon Aquifer, October 2-29, 2015

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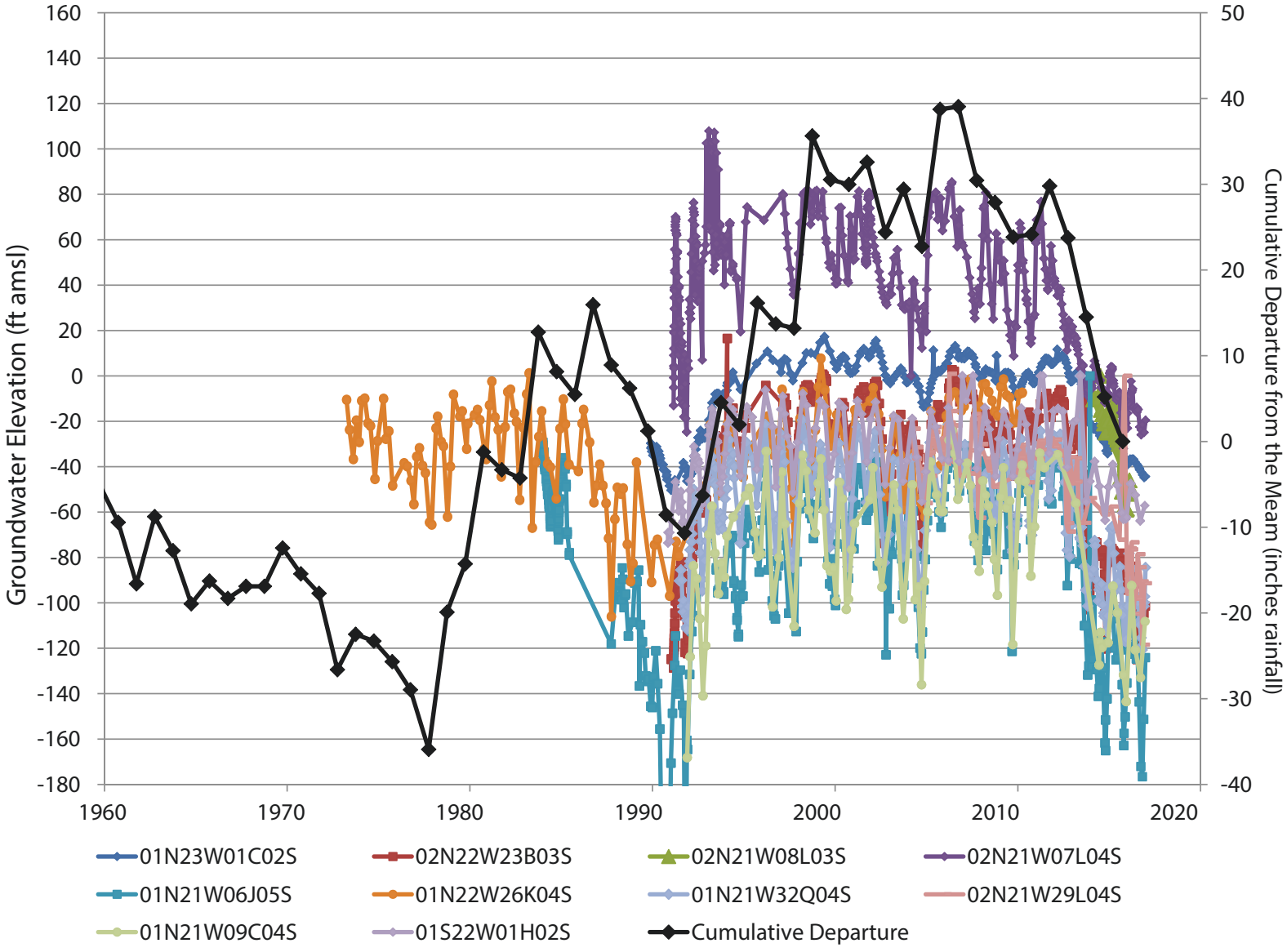

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FIGURE 2-18

Groundwater Well Hydrographs in the Fox Canyon Aquifer

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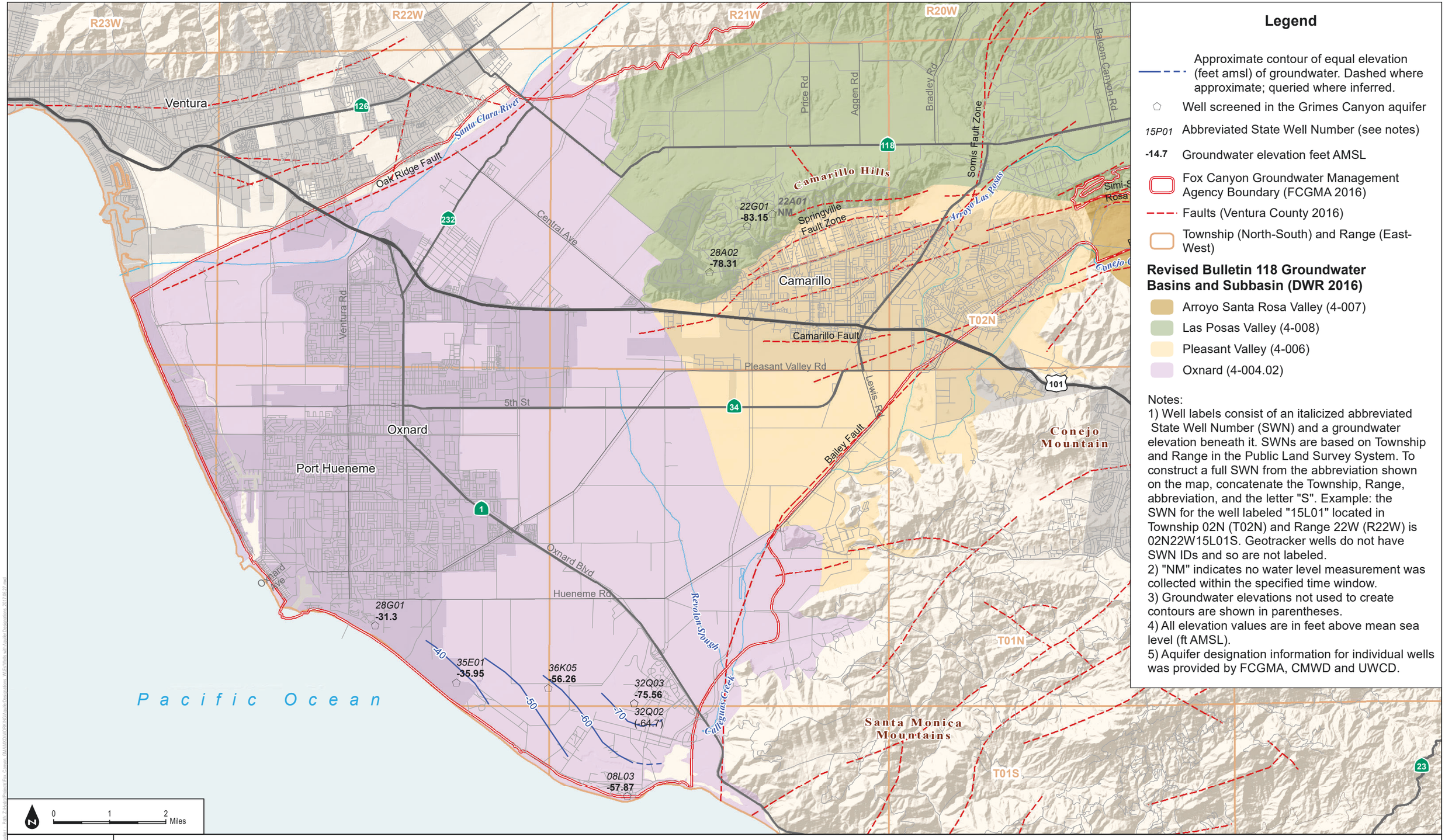

Legend

- Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.
- Well screened in the Grimes Canyon aquifer
- *15P01* Abbreviated State Well Number (see notes)
- **-14.7** Groundwater elevation feet AMSL
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (Ventura County 2016)
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Notes:

1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a groundwater elevation beneath it. SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S. Geotracker wells do not have SWN IDs and so are not labeled.
2) "NM" indicates no water level measurement was collected within the specified time window.
3) Groundwater elevations not used to create contours are shown in parentheses.
4) All elevation values are in feet above mean sea level (ft AMSL).
5) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-19

Groundwater Elevation Contours in the Grimes Canyon Aquifer, March 2-29, 2015

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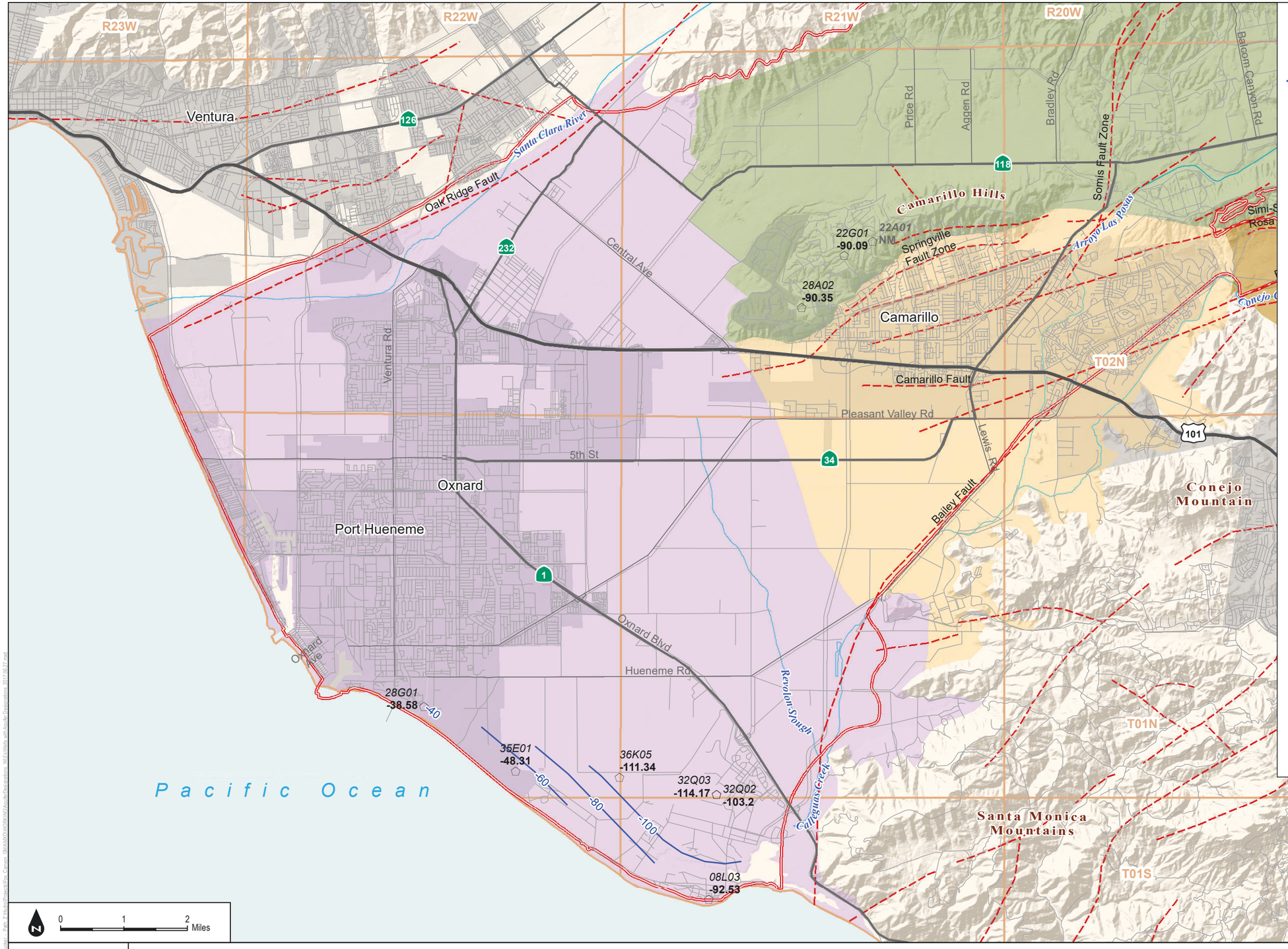

Legend

- Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.
- Well screened in the Grimes Canyon aquifer
- *15P01* Abbreviated State Well Number (see notes)
- **-14.7** Groundwater elevation feet AMSL
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (Ventura County 2016)
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Notes:

1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a groundwater elevation beneath it. SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S. Geotracker wells do not have SWN IDs and so are not labeled.
2) "NM" indicates no water level measurement was collected within the specified time window.
3) Groundwater elevations not used to create contours are shown in parentheses.
4) All elevation values are in feet above mean sea level (ft AMSL).
5) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-20

Groundwater Elevation Contours in the Grimes Canyon Aquifer, October 2-29, 2015

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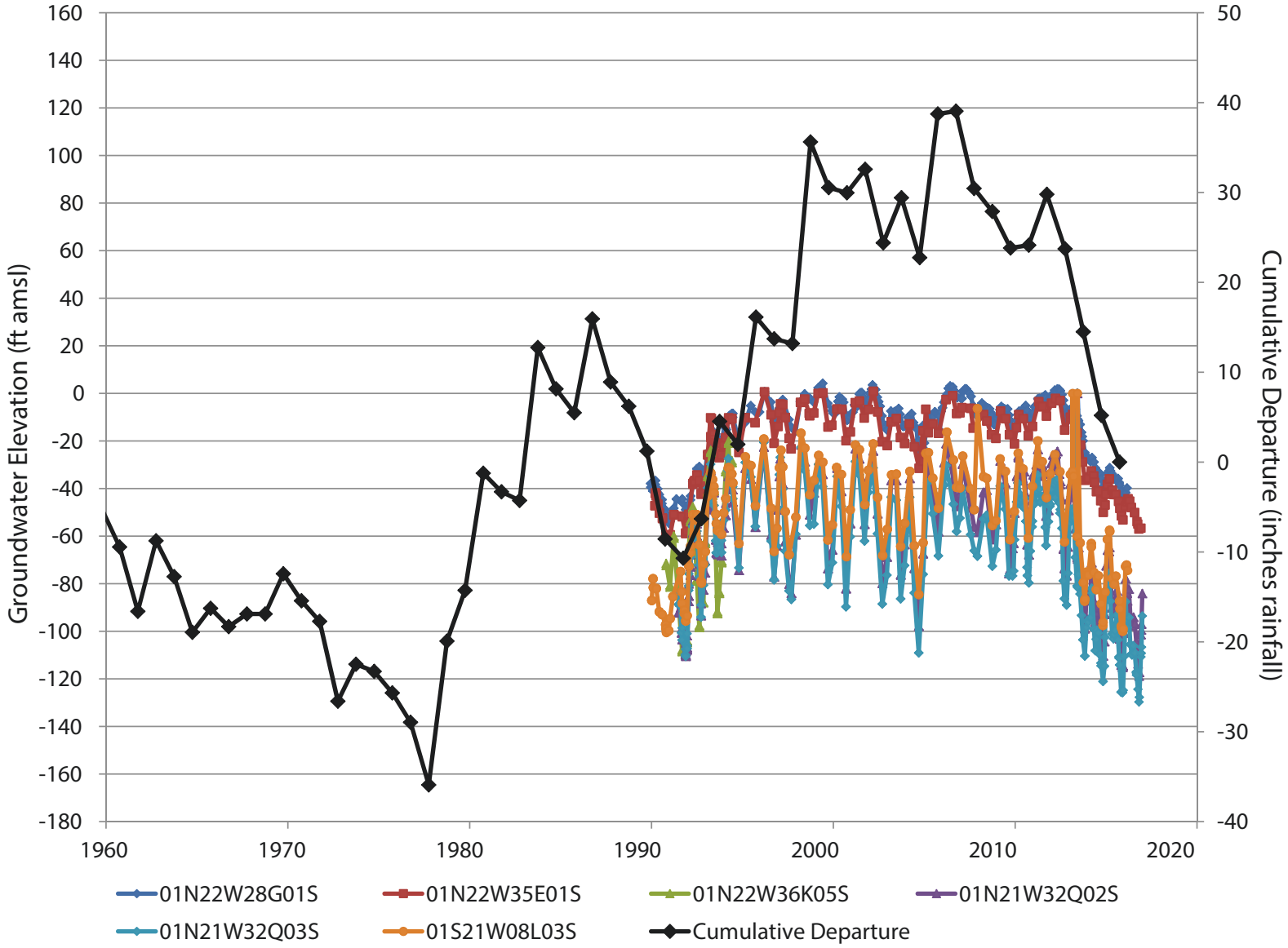

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FIGURE 2-21

Groundwater Well Hydrographs in the Grimes Canyon Aquifer

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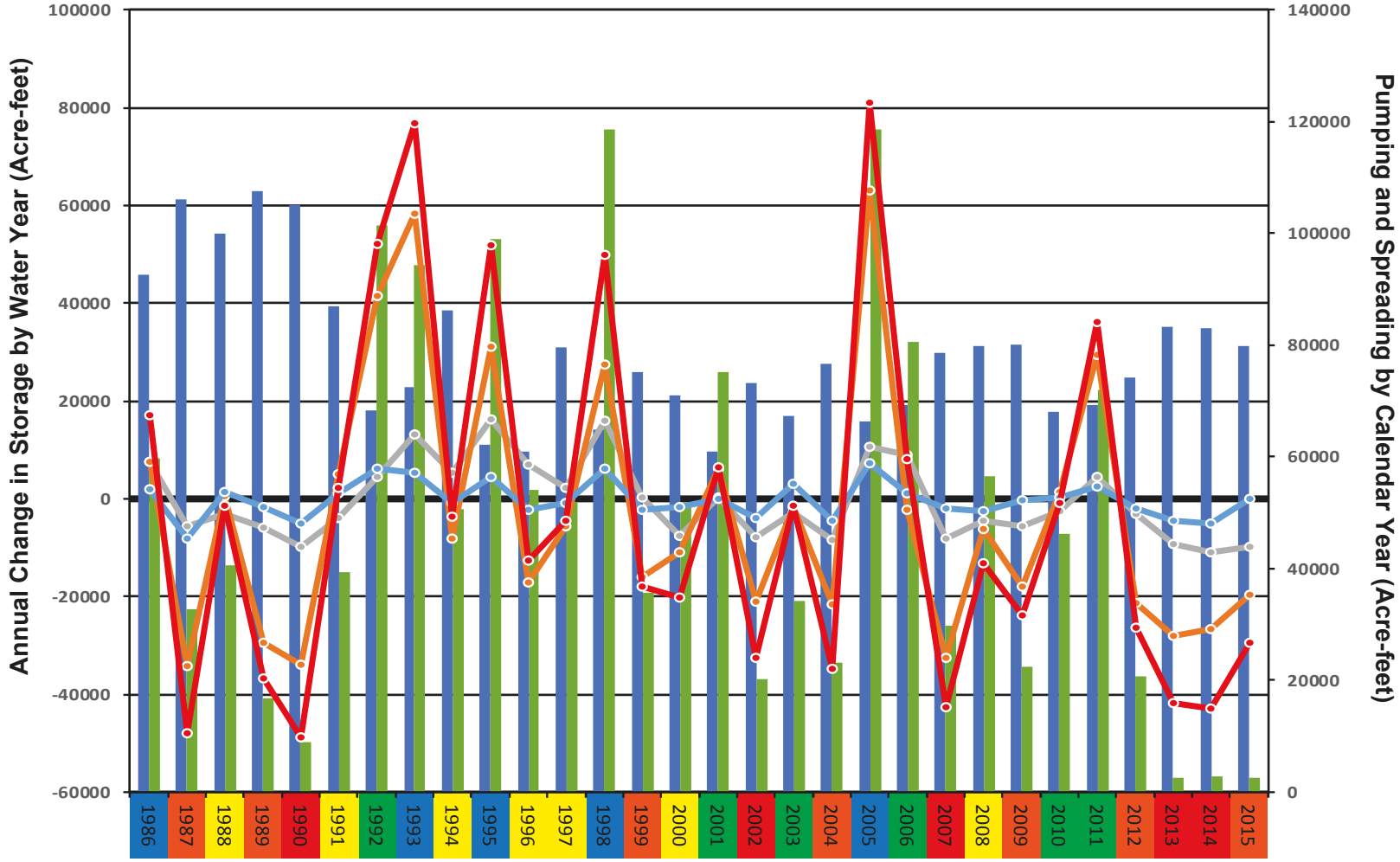

Notes:

1) Estimated Annual Change in Storage is from the United Water Conservation District (UWCD) numerical groundwater model report from July 2018. Estimated Change in Storage is the sum of the Change in Storage from all aquifers in the basin included in the UWCD numerical groundwater model.

2) Water year is October 1 to September 30 (e.g., water year 2012 is from October 1, 2011, to September 30, 2012)

3) Water year type is based on the percentage of the water year precipitation compared to the 30-year precipitation average. Types are defined as Wet (≥150% of average), Above Normal (≥100% to <150% of average), Below Normal (≥75% to <100% of average), Dry (≥50% to <75% of average), and Critical (<50% of average).

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FIGURE 2-22

Oxnard Subbasin Annual Change in Storage

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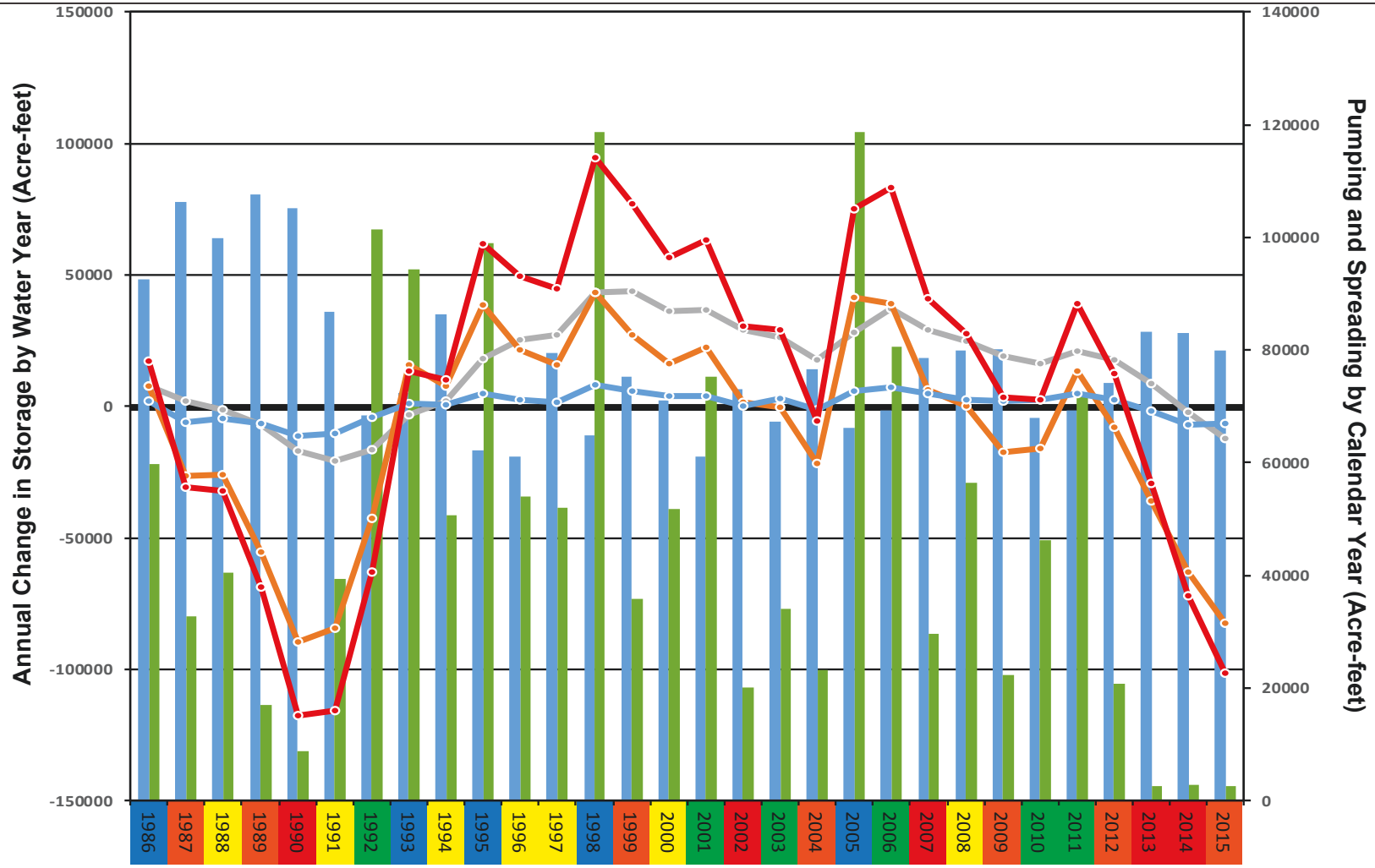

Notes:

1) Estimated Annual Change in Storage is from the United Water Conservation District (UWCD) numerical groundwater model report from July 2018. Estimated Change in Storage is the sum of the Change in Storage from all aquifers in the basin included in the UWCD numerical groundwater model.

2) Water year is October 1 to September 30 (e.g., water year 2012 is from October 1, 2011, to September 30, 2012)

3) Water year type is based on the percentage of the water year precipitation compared to the 30-year precipitation average. Types are defined as Wet (≥150% of average), Above Normal (≥100% to <150% of average), Below Normal (≥75% to <100% of average), Dry (≥50% to <75% of average), and Critical (<50% of average).

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FIGURE 2-23

Oxnard Subbasin Cumulative Change in Storage

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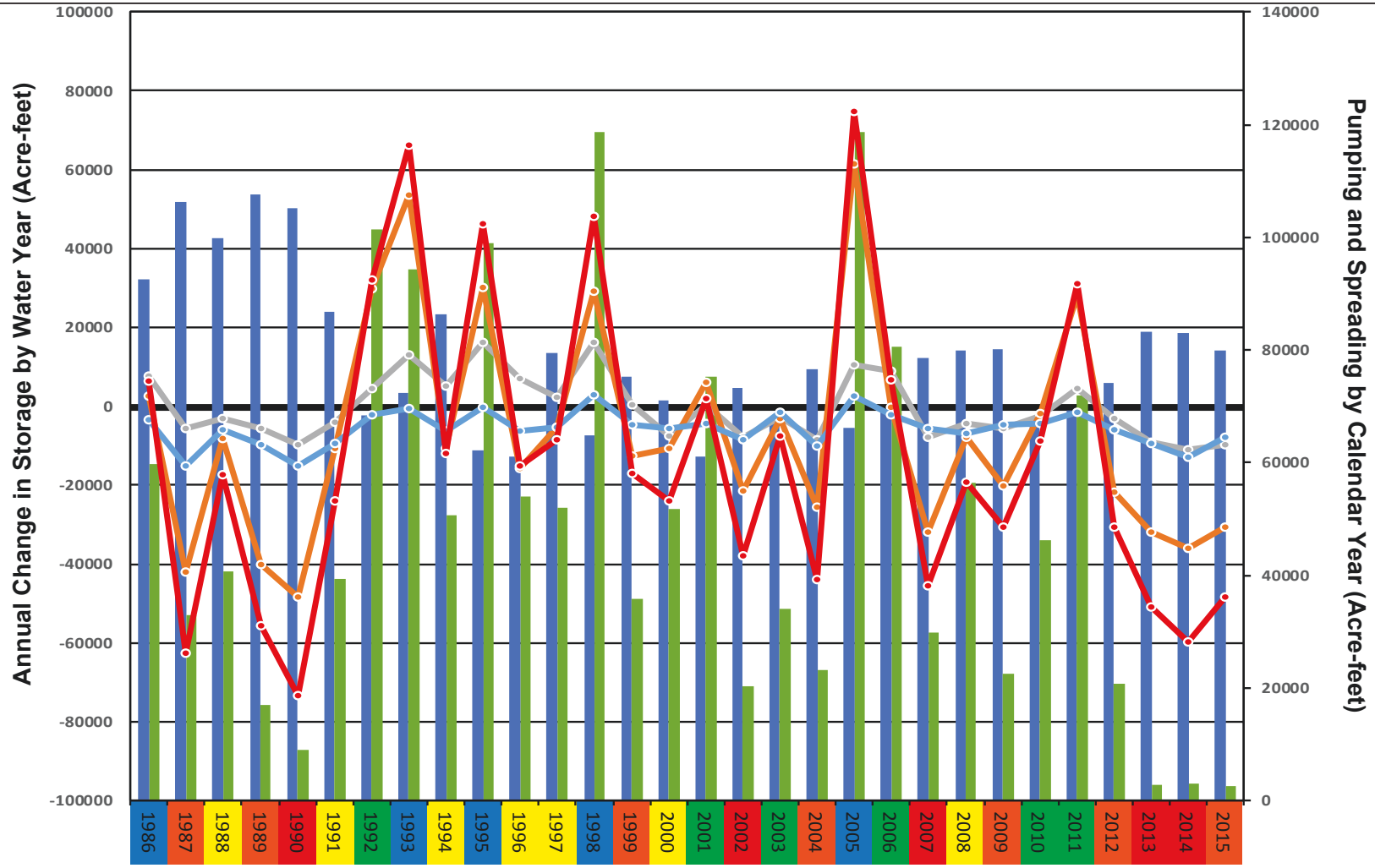

Notes:

1) Estimated Annual Change in Storage is from the United Water Conservation District (UWCD) numerical groundwater model report from July 2018. Estimated Change in Storage is the sum of the Change in Storage from all aquifers in the basin included in the UWCD numerical groundwater model.

2) Water year is October 1 to September 30 (e.g., water year 2012 is from October 1, 2011, to September 30, 2012)

3) Water year type is based on the percentage of the water year precipitation compared to the 30-year precipitation average. Types are defined as Wet (≥150% of average), Above Normal (≥100% to <150% of average), Below Normal (≥75% to <100% of average), Dry (≥50% to <75% of average), and Critical (<50% of average).

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FIGURE 2-24

Oxnard Subbasin Annual Change in Storage Without Coastal Flux

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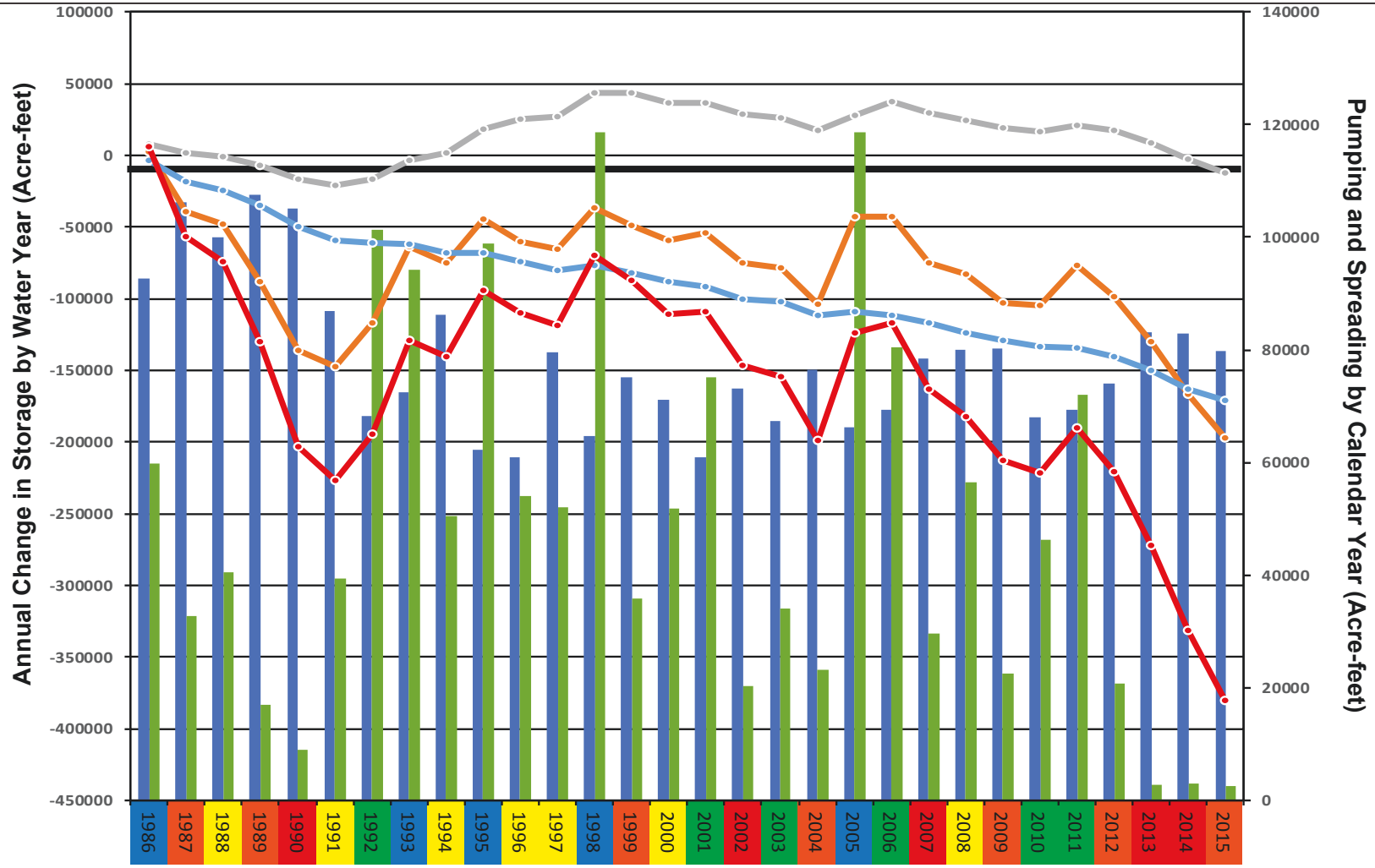

Notes:

1) Estimated Annual Change in Storage is from the United Water Conservation District (UWCD) numerical groundwater model report from July 2018. Estimated Change in Storage is the sum of the Change in Storage from all aquifers in the basin included in the UWCD numerical groundwater model.

2) Water year is October 1 to September 30 (e.g., water year 2012 is from October 1, 2011, to September 30, 2012)

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FIGURE 2-25

Oxnard Subbasin Cumulative Change in Storage Without Coastal Flux

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North

South

Mound Subbasin

Oxnard Subbasin

B

B′

500

0

-500

-1000

-1500

-2000

Santa Clara River

Las Posas Syncline

Channel Islands Blvd.

Hueneme Road

State Hwy 1

McGrath Fault

Bailey Fault

0

10,000

20,000

30,000

40,000

Shallow ("Semi-Perched") Aquifer

Upper Aquifer System: Oxnard and Mugu Aquifers

Lower Aquifer System: Fox Canyon

Clay Marker Bed / Low Permeability Sediments

Lower Aquifer System: Hueneme Aquifer

Lower Aquifer System: Grimes Canyon Aquifer

2015 Interpreted Saline Water Intrusion Extent

SOURCE: Cross Section: Turner 1975; Based on Plates 7A and 7B (Cross Section A-A')

Interpreted Seawater Inrusion Extent: United Water Conservation District Open File Report, October 2016

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FIGURE 2-26

Approximate 2015 North-South Saline Water Intrusion Extent

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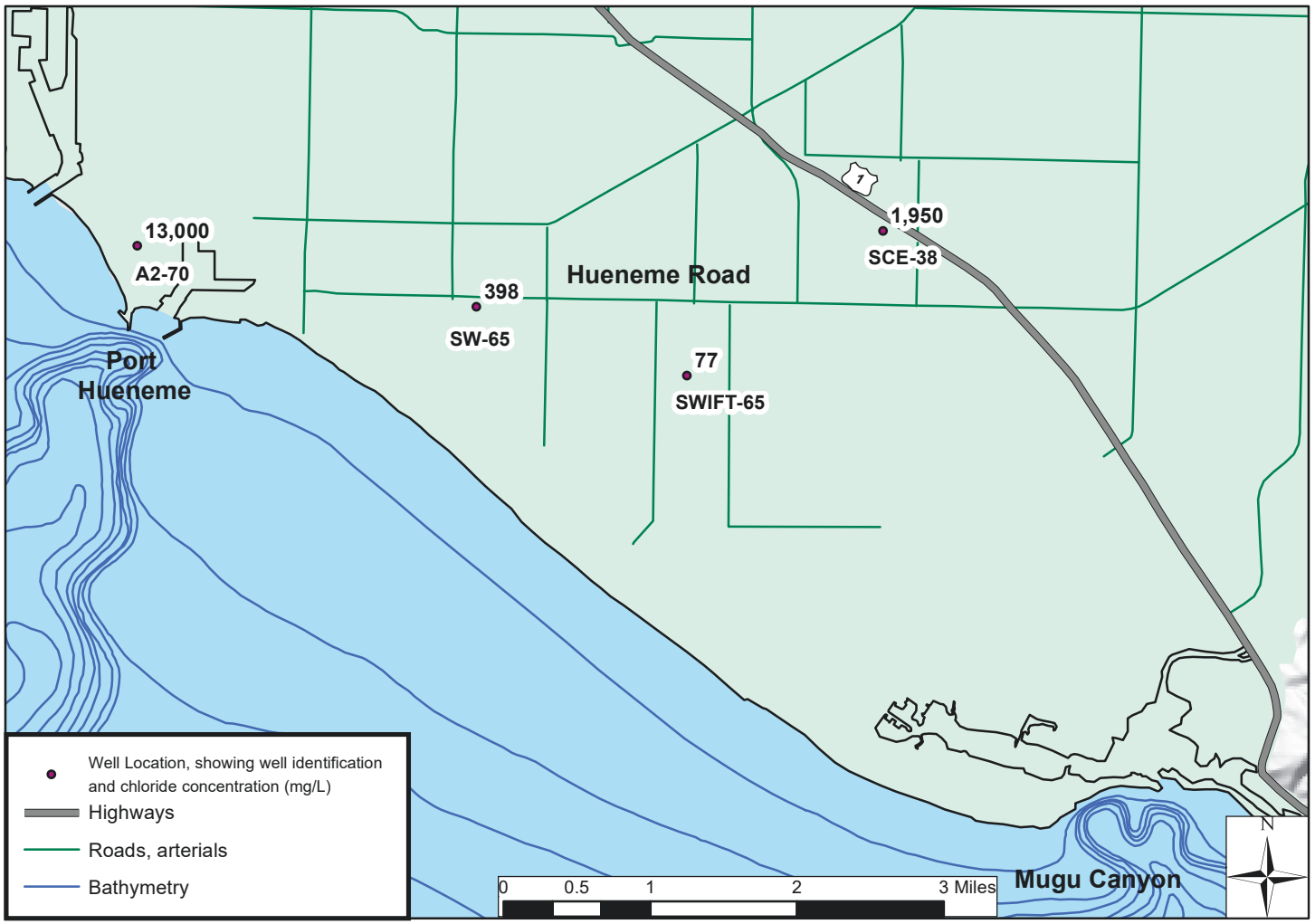

Source: UWCD 2016

FIGURE 2-27

Semi-Perched Aquifer Coastal Chloride Concentrations, Fall 2015

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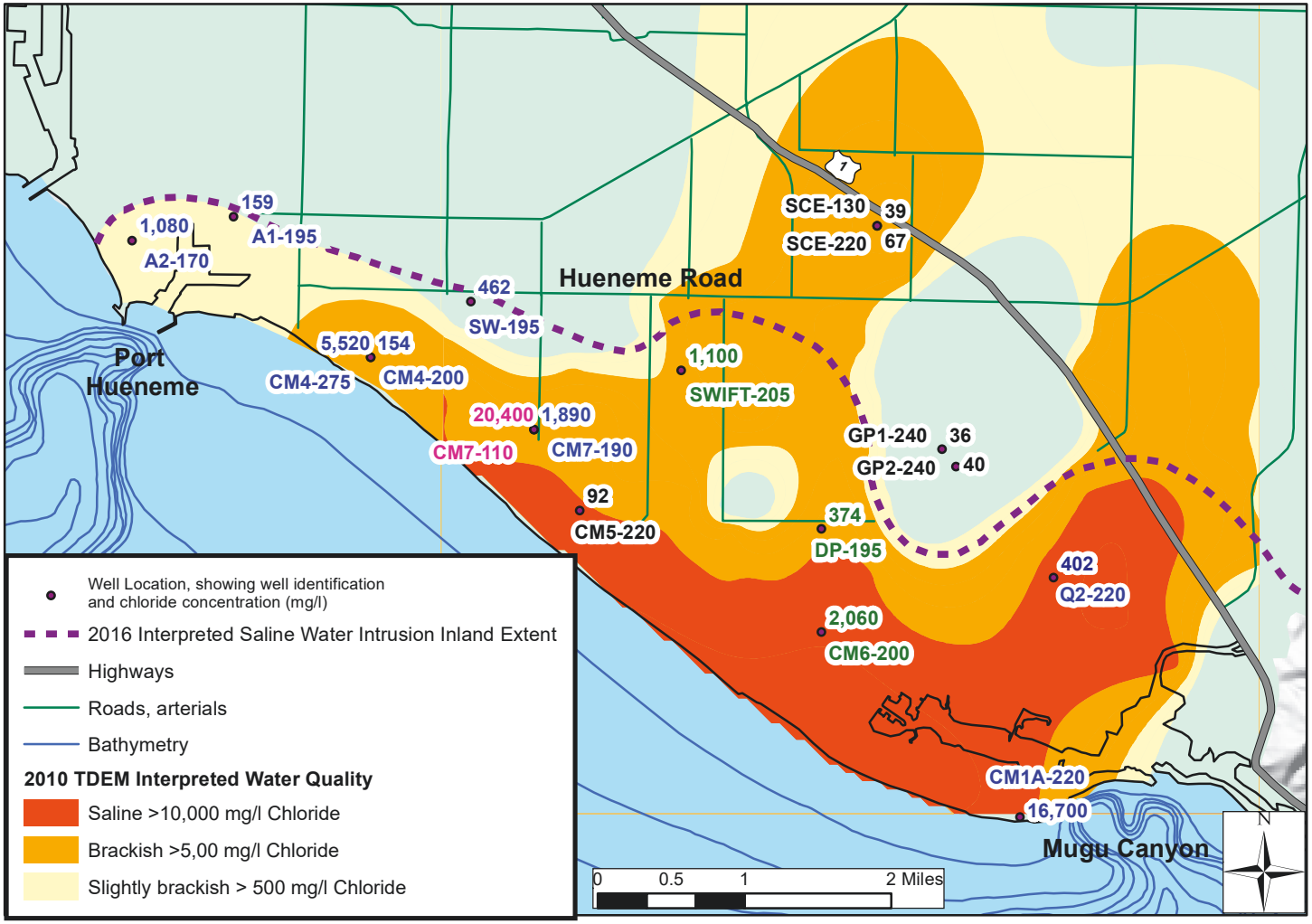

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Source: UWCD 2016

FIGURE 2-28

Oxnard Aquifer Coastal Chloride Concentrations, Fall 2015

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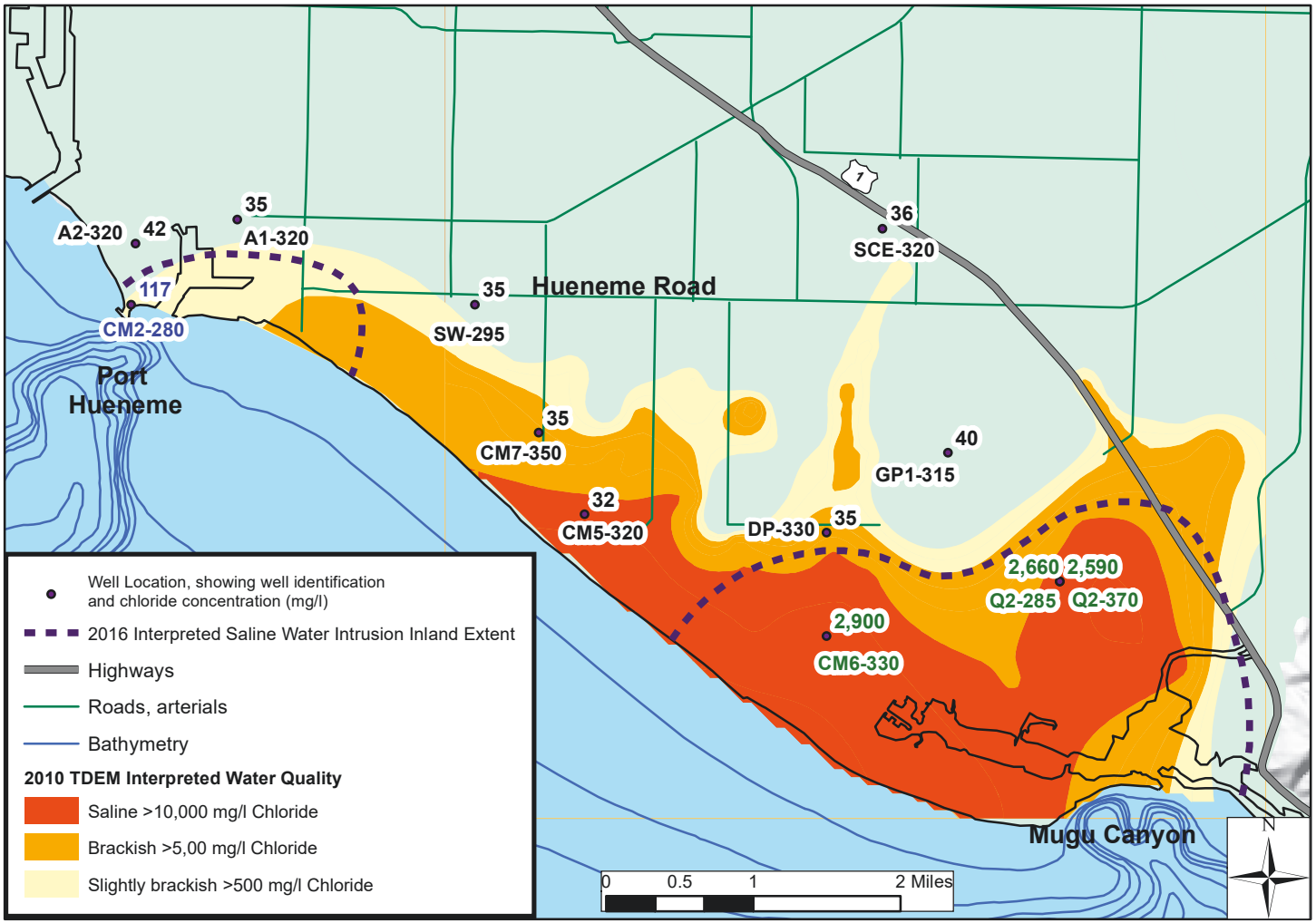

DUDEK

Source: UWCD 2016

FIGURE 2-29

Mugu Aquifer Coastal Chloride Concentrations, Fall 2015

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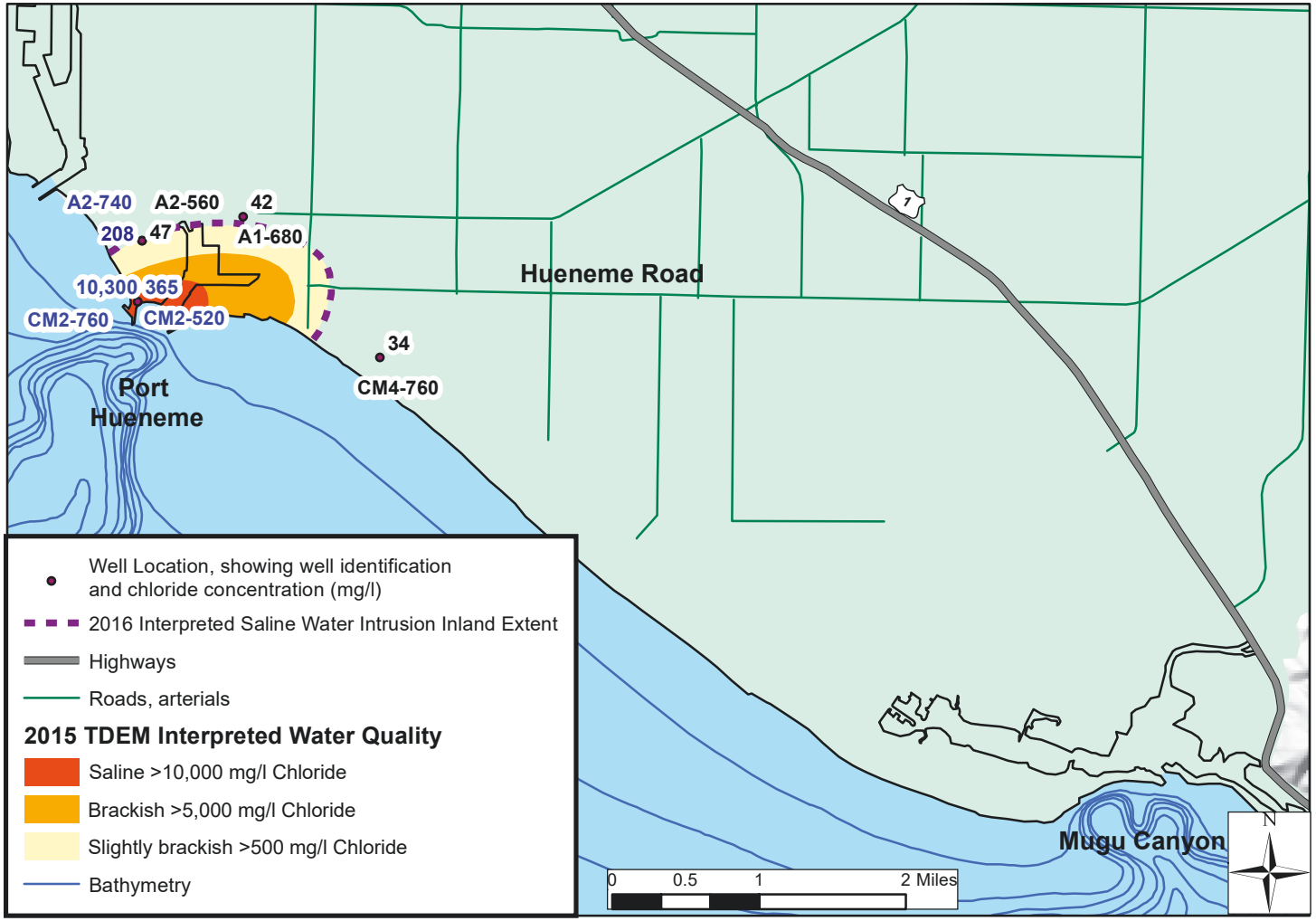

DUDEK

Source: UWCD 2016

FIGURE 2-30

Hueneme Aquifer Coastal Chloride Concentrations, Fall 2015

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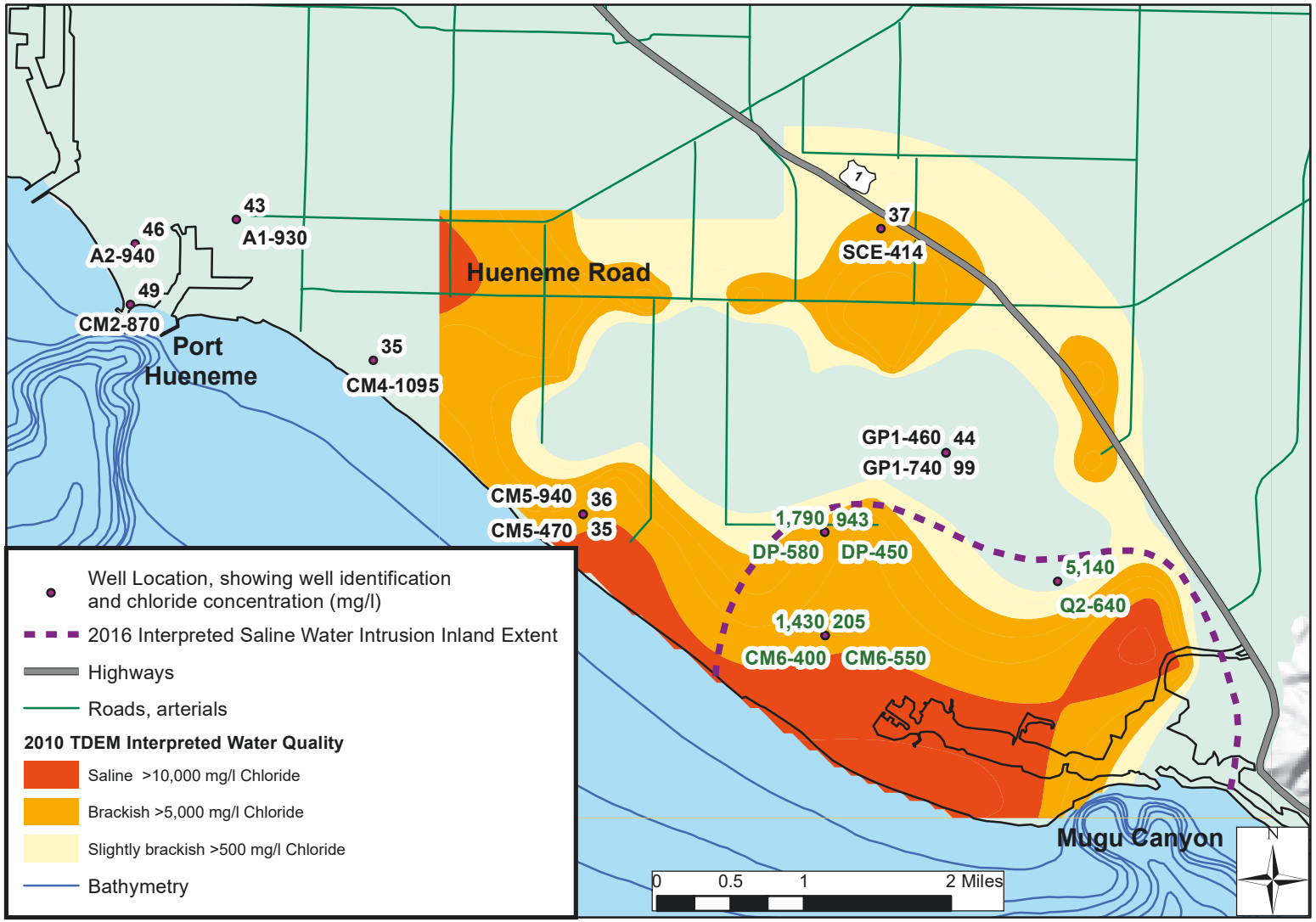

Source: UWCD 2016

FIGURE 2-31

Fox Canyon Aquifer Coastal Chloride Concentrations, Fall 2015

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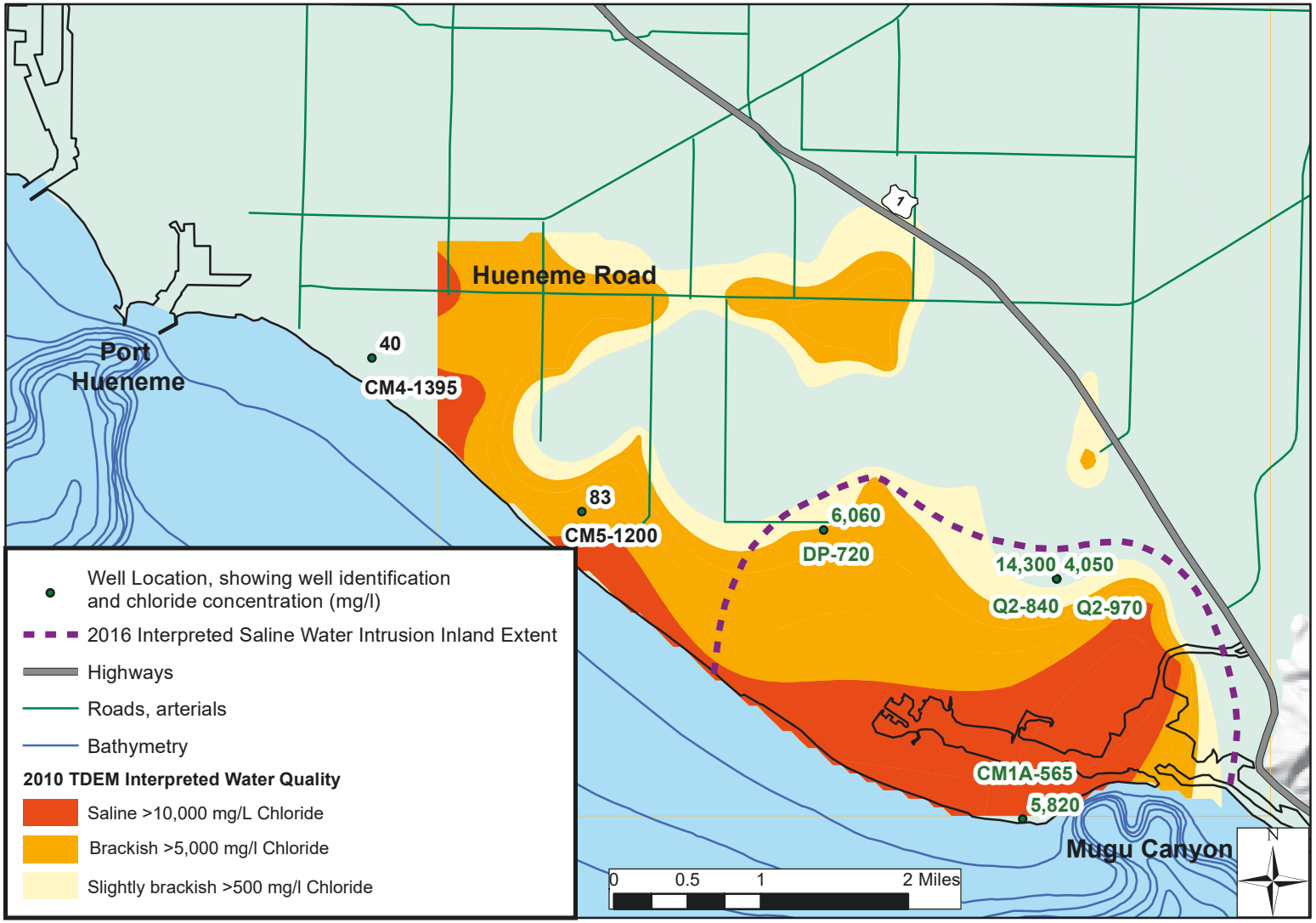

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Source: UWCD 2016

FIGURE 2-32

Grimes Canyon Aquifer Coastal Chloride Concentrations, Fall 2015

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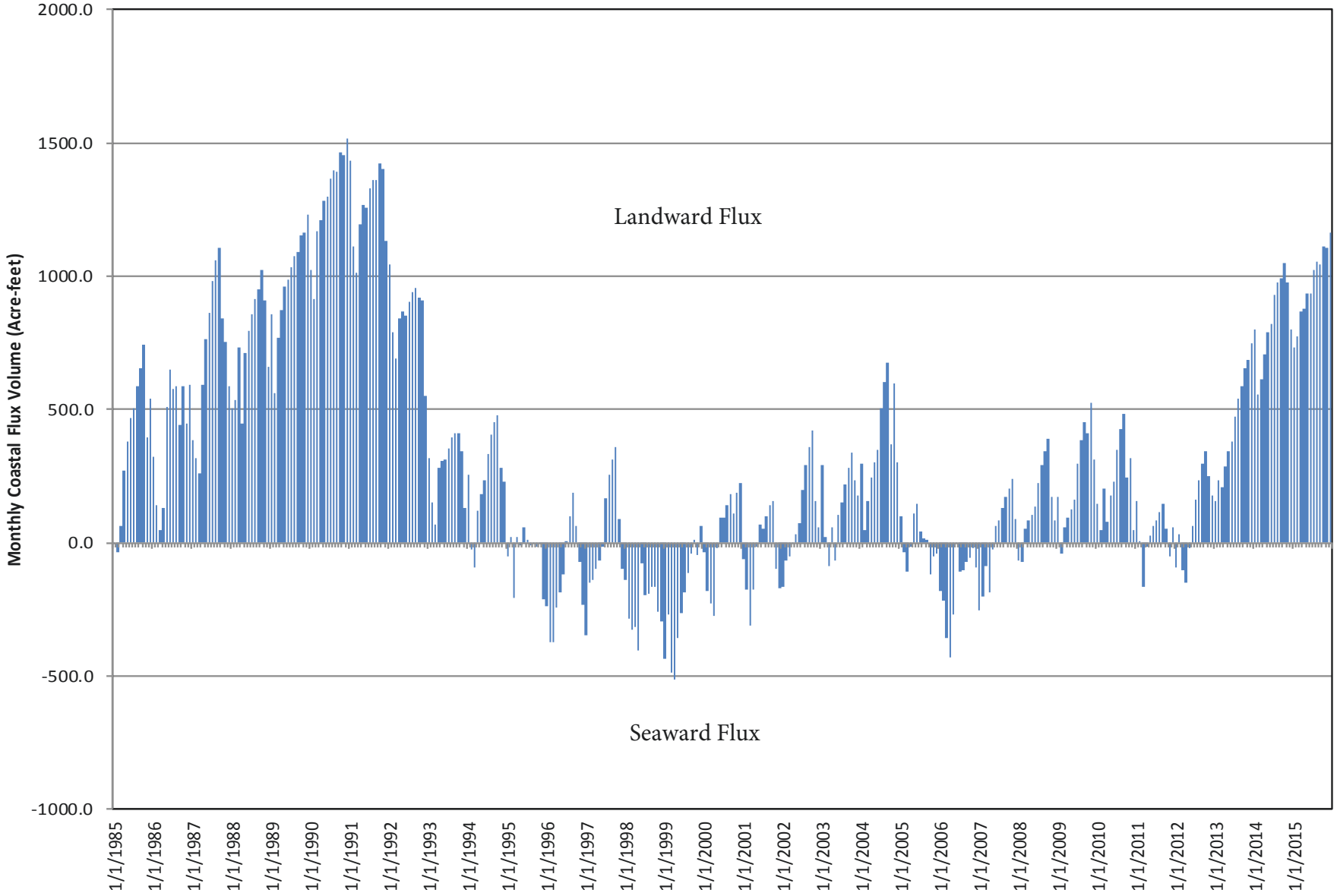

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FIGURE 2-33

Groundwater Flux along the Coast in the Upper Aquifer System

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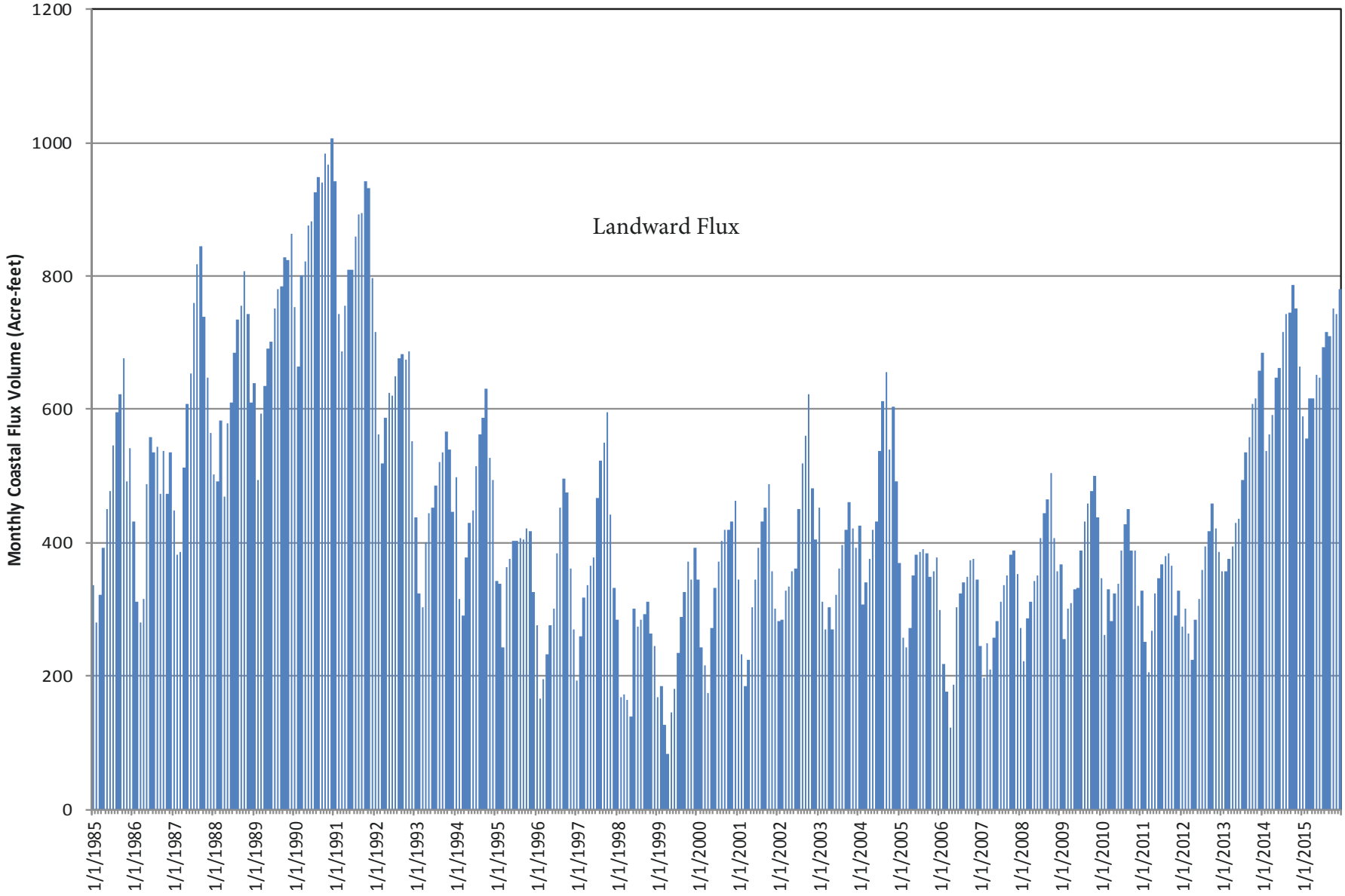

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FIGURE 2-34

Groundwater Flux along the Coast in the Lower Aquifer System

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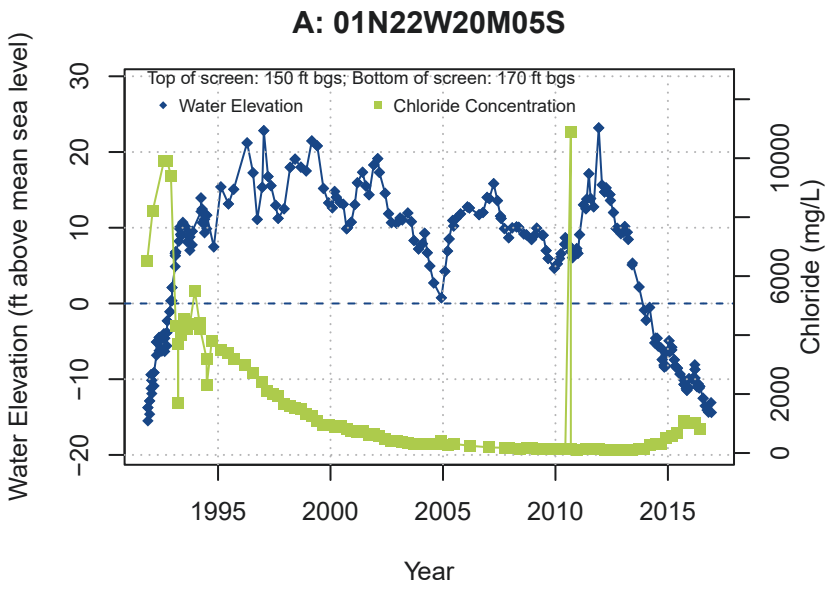
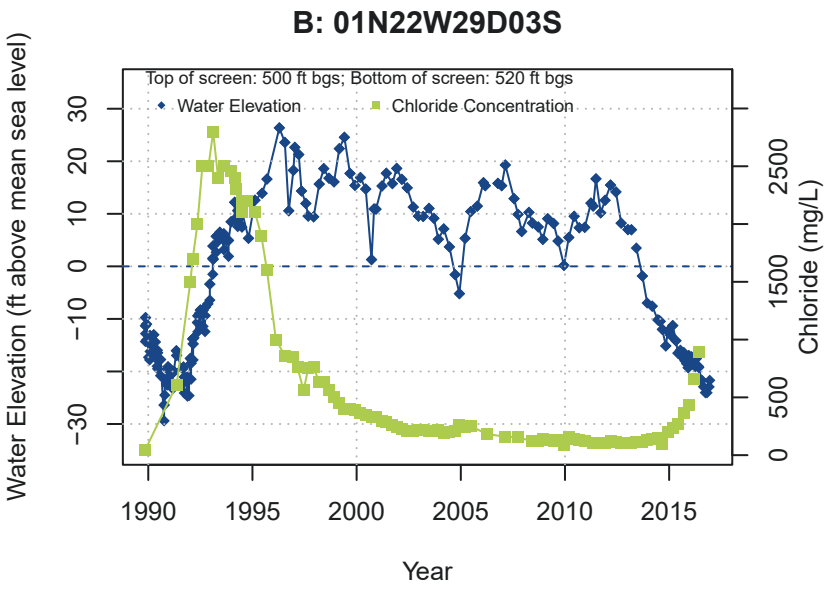
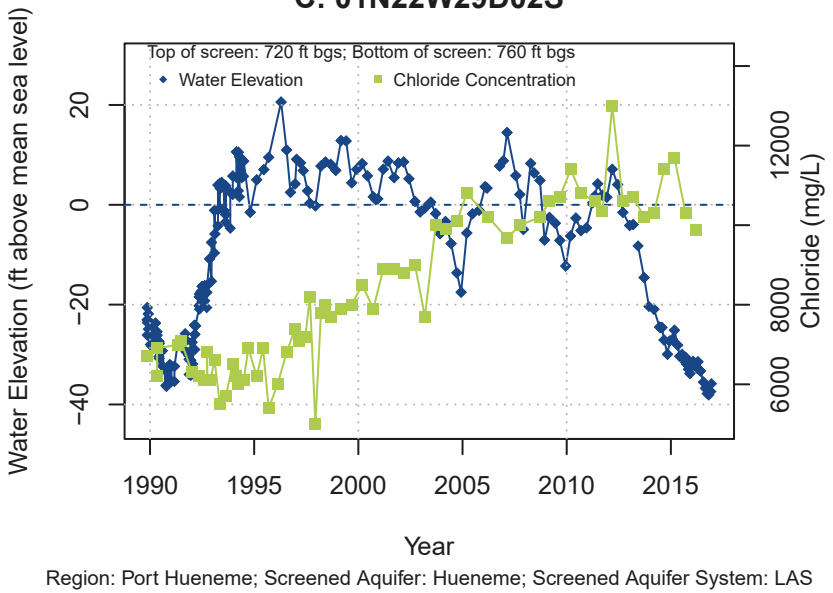


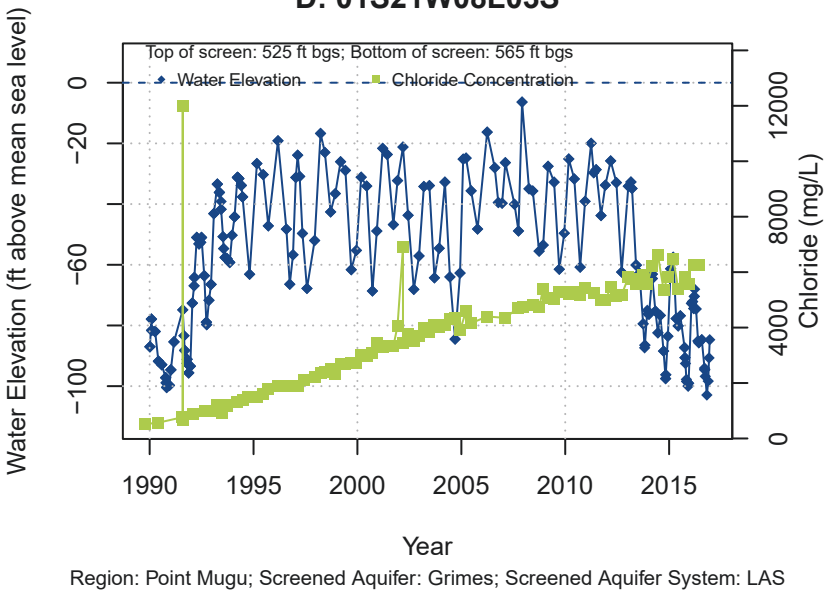
Region: Port Hueneme; Screened Aquifer: Oxnard; Screened Aquifer System: UAS



Region: Port Hueneme; Screened Aquifer: Hueneme; Screened Aquifer System: LAS



Region: Port Hueneme; Screened Aquifer: Hueneme; Screened Aquifer System: LAS



Region: Point Mugu; Screened Aquifer: Grimes; Screened Aquifer System: LAS

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FIGURE 2-35

Selected Historical Records of Water Elevation and Chloride Concentration

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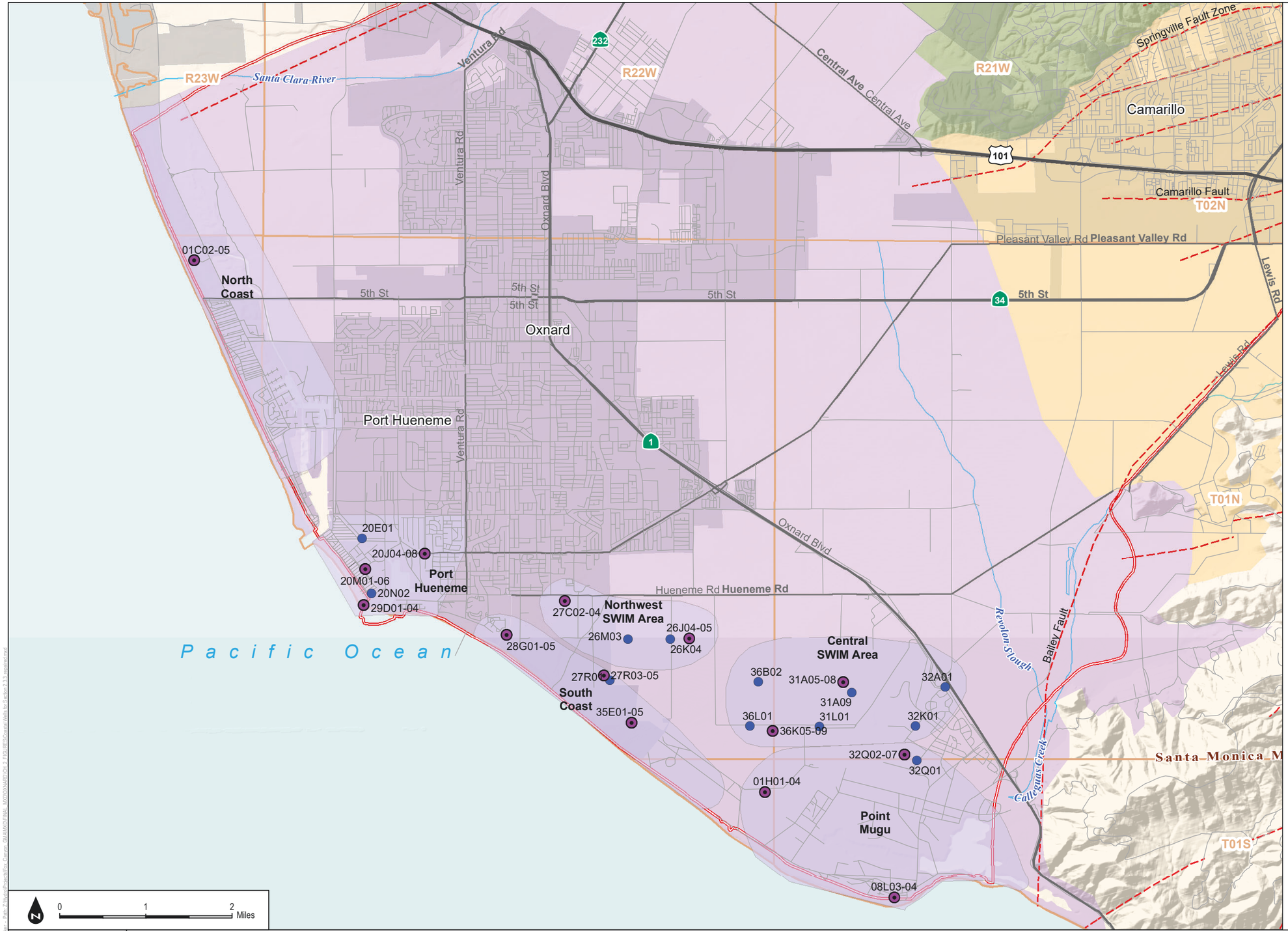

Legend

- Nested Well Set
- Single Well
- Regions for SWI Characterization
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Township (North-South) and Range (East-West)
- Faults (Ventura County 2016)
- Major Rivers/Stream Channels

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

15P01 Abbreviated State Well Number (see notes)

Notes:
1) Single well labels consist of an italicized abbreviated State Well Number (SWN). SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "20E01" located in Township 01N (T01N) and Range 22W (R22W) is 01N22W20E01S.
2) Labels for nested well sets indicate the range of the last two digits in the SWNs completed in each set. Example: The SWNs completed in the nested set labeled "01H01-04," located in Township 01S (T01S) and Range 22W (R22W) are 01S22W01H01S, 01S22W01H02S, 01S22W01H03S, and 01S22W01H04S.
3) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-36

Locations of Selected Coastal Wells with Historical Measurements of Chloride Concentration and Water Elevation

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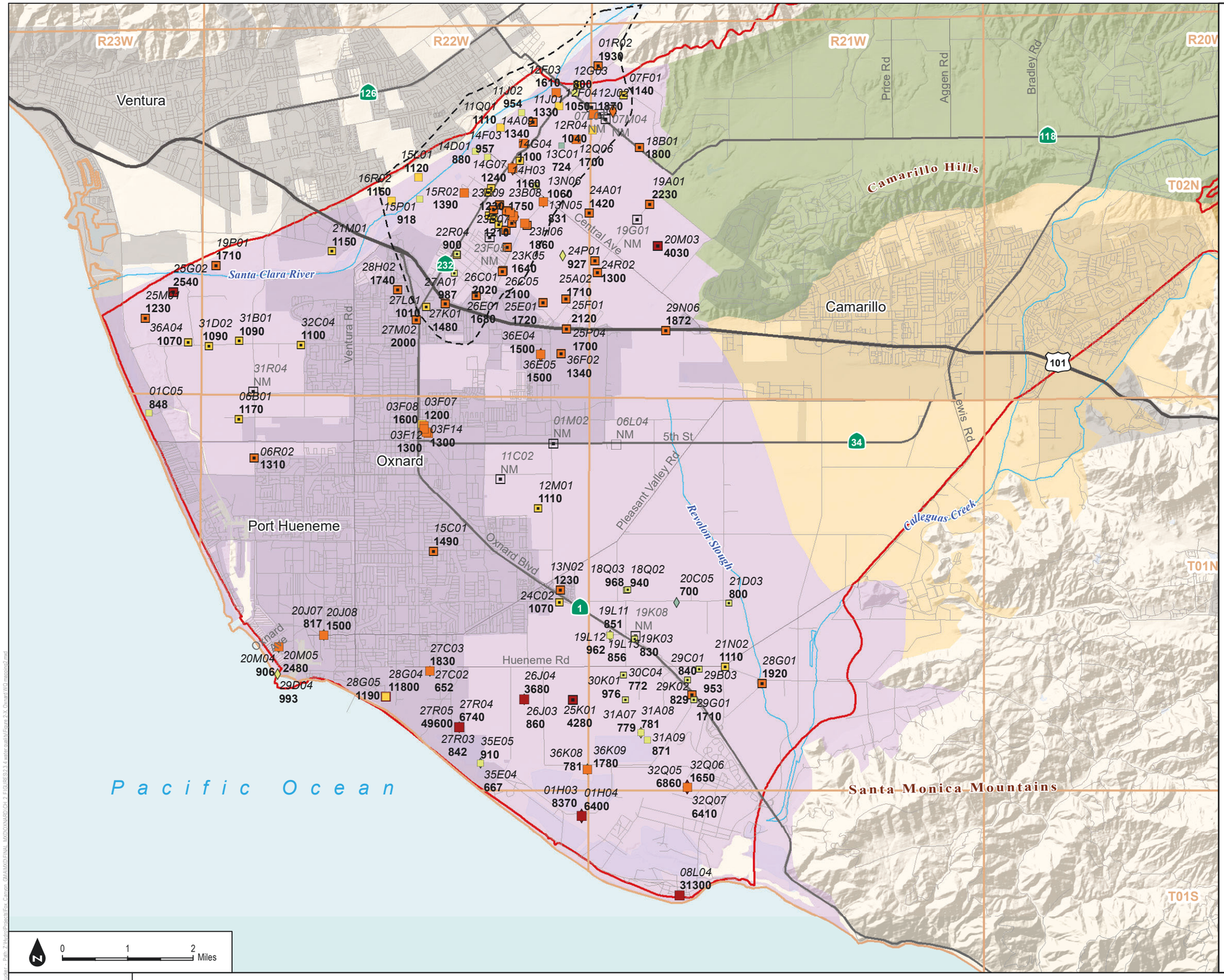

Legend

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Major Rivers/Stream Channels
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)
- Oxnard Forebay

TDS concentration (mg/L), 2011-2015

- 290 - 500
- >500 - 750
- >750 - 1000
- >1000 - 1200
- >1200 - 2500
- >2500 - 49,800

Aquifer designation

- Well screened in the Oxnard aquifer
- Well screened in the Mugu aquifer
- Wells screened in multiple aquifers in the UAS

15P01 Abbreviated State Well Number (see notes)
10.5 Concentration (mg/L)

Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a concentration value beneath it.The concentration is the most recent concentration measured in water quality samples collected at that well in the five years from 2011-2015. For a complete water quality record for each well, see Appendix X.
2) "ND" signifies non-detect.
3) SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map,concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
4) The shape of each well symbol correspondsto the aquifer(s) in which it is screened (see above).
5) The color of each well symbol corresponds to the most recent concentration measured in a water quality sample from that well.
6) All concentrations are in mg/L.
7) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-37A

Upper Aquifer System - Most Recent Total Dissolved Solids (mg/L) Measured 2011-2015

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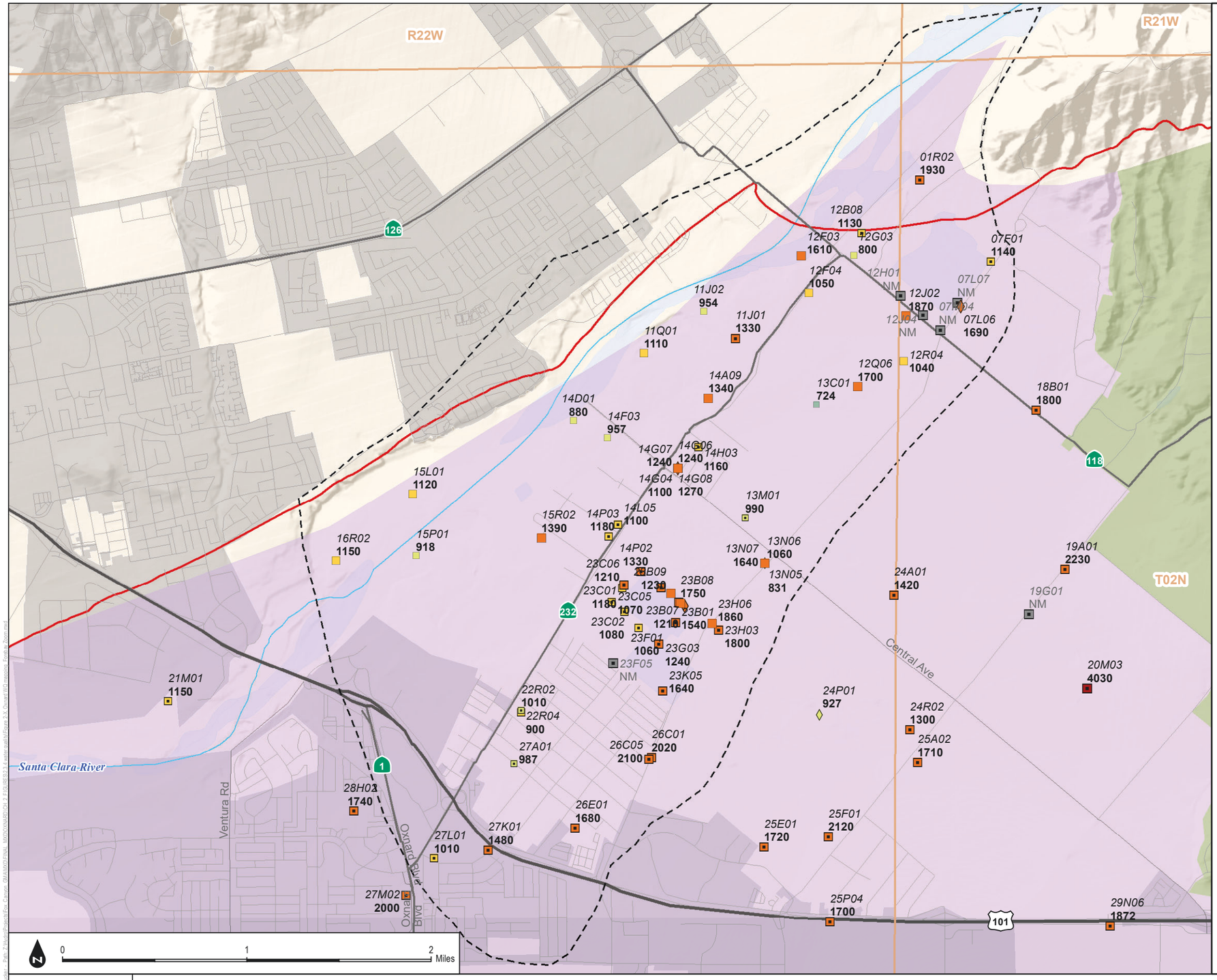

Legend

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Major Rivers/Stream Channels
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)
- Oxnard Forebay

Aquifer designation

- Well screened in the Oxnard aquifer
- Well screened in the Mugu aquifer
- Wells screened in multiple aquifers in the UAS

TDS concentration (mg/L), 2011-2015

- 290 - 500
- >500 - 750
- >750 - 1000
- >1000 - 1200
- >1200 - 2500
- >2500 - 49,800
- Not Measured (NM)

15P01 Abbreviated State Well Number (see notes)

10.5 Concentration (mg/L)

Notes:

1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a concentration value beneath it.The concentration is the most recent concentration measured in water quality samples collected at that well in the five years from 2011-2015. For a complete water quality record for each well, see Appendix C.
2) "ND" signifies non-detect. "NM" signifies not measured.
3) SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map,concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
4) The shape of each well symbol correspondsto the aquifer(s) in which it is screened (see above).
5) The color of each well symbol corresponds to the most recent concentration measured in a water quality sample from that well. A solid gray well symbol has no data between 2011 and 2015.
6) All concentrations are in mg/L.
7) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-37B

Upper Aquifer System, Forebay Area - Most Recent Total Dissolved Solids (mg/L) Measured 2011-2015

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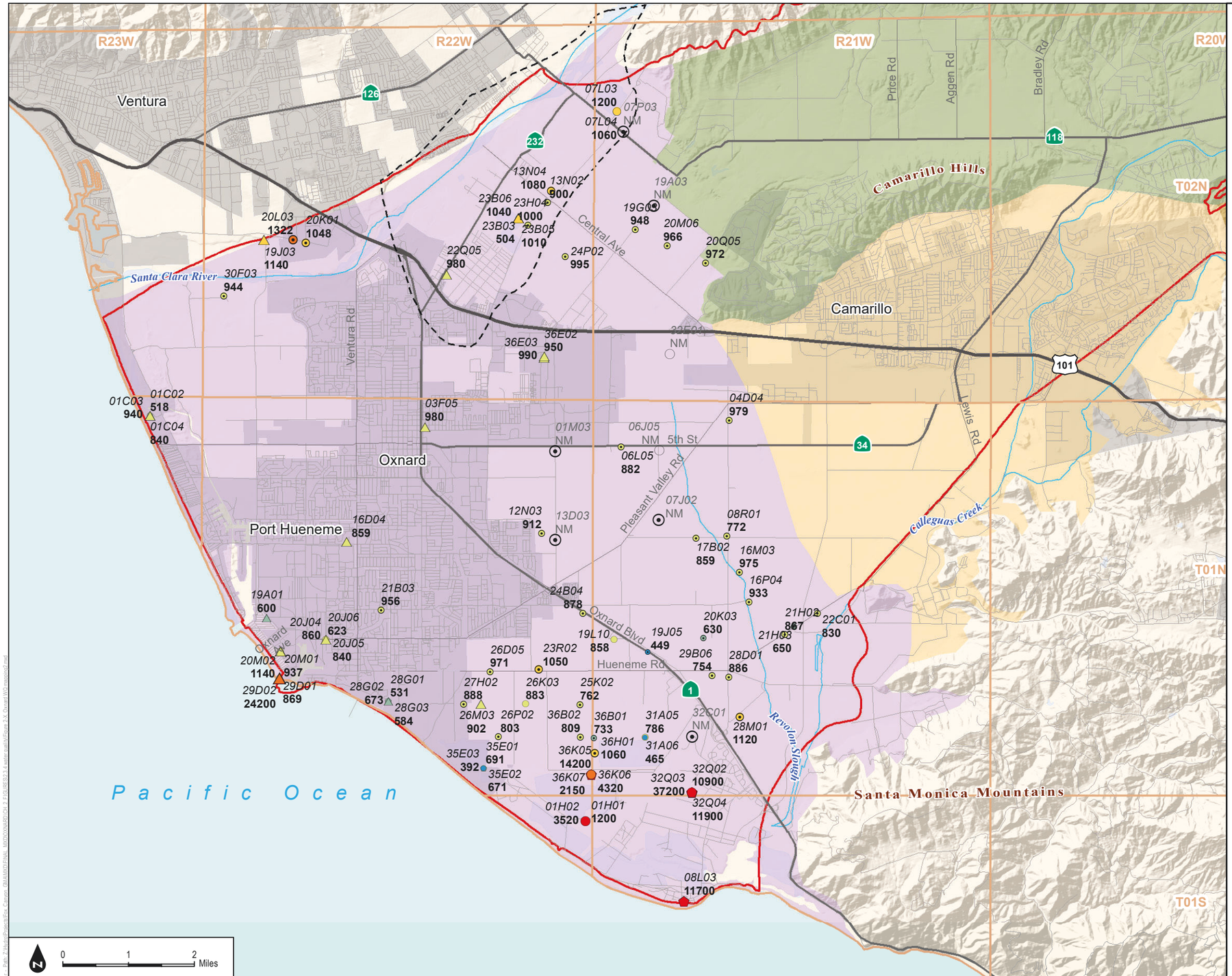

Legend

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Major Rivers/Stream Channels
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)
- Oxnard Forebay

TDS concentration (mg/L), 2011-2015

- 290 - 500
- >500 - 750
- >750 - 1000
- >1000 - 1200
- >1200 - 2500
- >2500 - 49,800

Aquifer designation

- Well screened in the Hueneme aquifer
- Well screened in the Fox Canyon aquifer
- Well screened in the Grimes Canyon aquifer
- Wells screened in multiple aquifers in the LAS
- 15P01 Abbreviated State Well Number (see notes)
- 10.5 Concentration (mg/L)

Notes:

1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a concentration value beneath it.The concentration is the most recent concentration measured in water quality samples collected at that well in the five years from 2011-2015. For a complete water quality record for each well, see Appendix X.
2) "ND" signifies non-detect.
3) SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map,concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
4) The shape of each well symbol correspondsto the aquifer(s) in which it is screened (see above).
5) The color of each well symbol corresponds to the most recent concentration measured in a water quality sample from that well.
6) All concentrations are in mg/L.
7) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-38

Lower Aquifer System - Most Recent Total Dissolved Solids (mg/L) Measured 2011-2015

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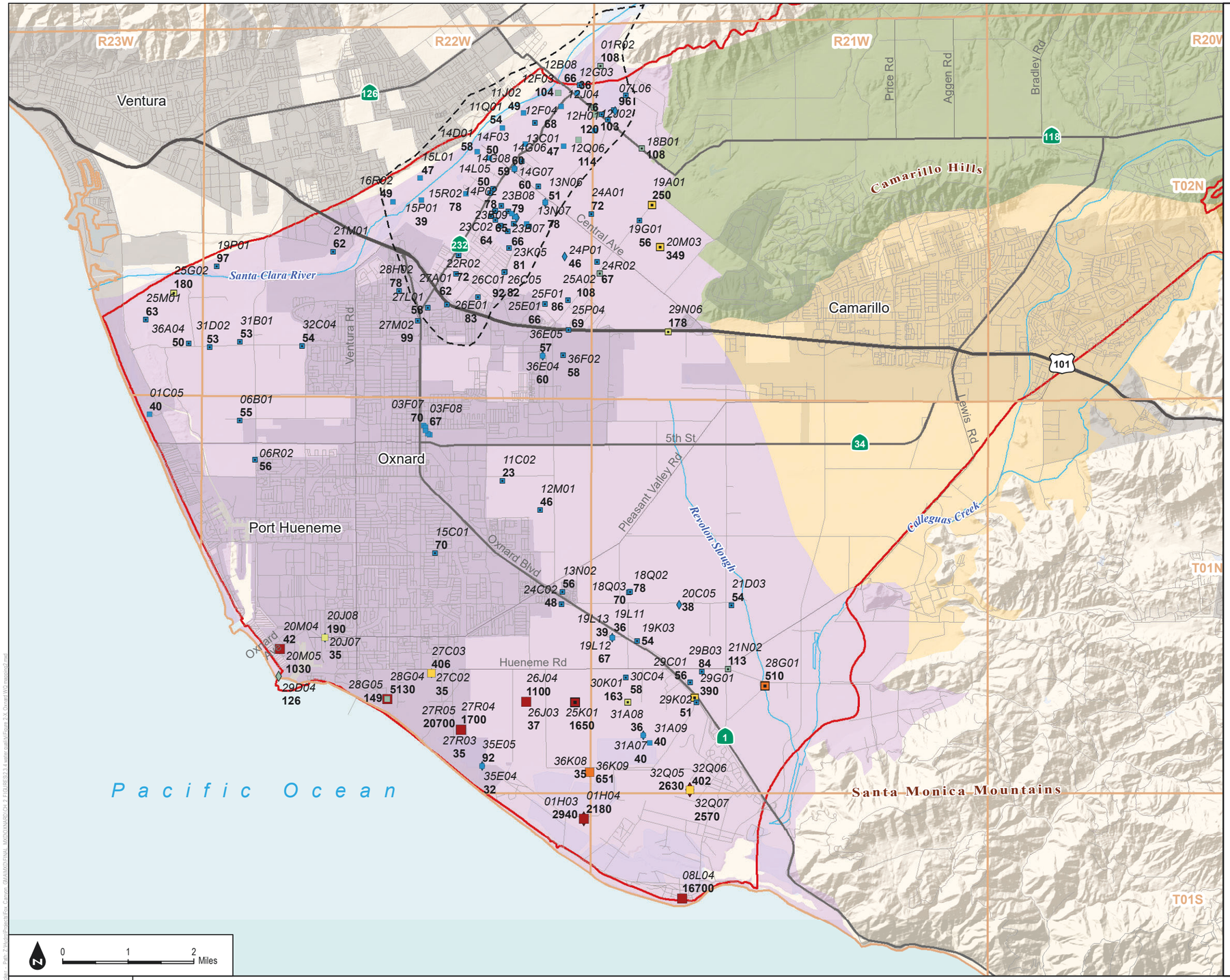

Legend

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Major Rivers/Stream Channels
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)
- Oxnard Forebay

Chloride concentration (mg/L), 2011-2015

- 23 - 100
- 101 - 150
- 151 - 200
- 201 - 500
- 501 - 1000
- 1001 - 22500

Aquifer designation

- Well screened in the Oxnard aquifer
- Well screened in the Mugu aquifer
- Wells screened in multiple aquifers in the UAS

15P01 Abbreviated State Well Number (see notes)
10.5 Concentration (mg/L)

Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a concentration value beneath it.The concentration is the most recent concentration measured in water quality samples collected at that well in the five years from 2011-2015. For a complete water quality record for each well, see Appendix X.
2) "ND" signifies non-detect.
3) SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map,concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
4) The shape of each well symbol correspondsto the aquifer(s) in which it is screened (see above).
5) The color of each well symbol corresponds to the most recent concentration measured in a water quality sample from that well.
6) All concentrations are in mg/L.
7) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

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FIGURE 2-39A

Upper Aquifer System - Most Recent Chloride (mg/L) Measured 2011-2015

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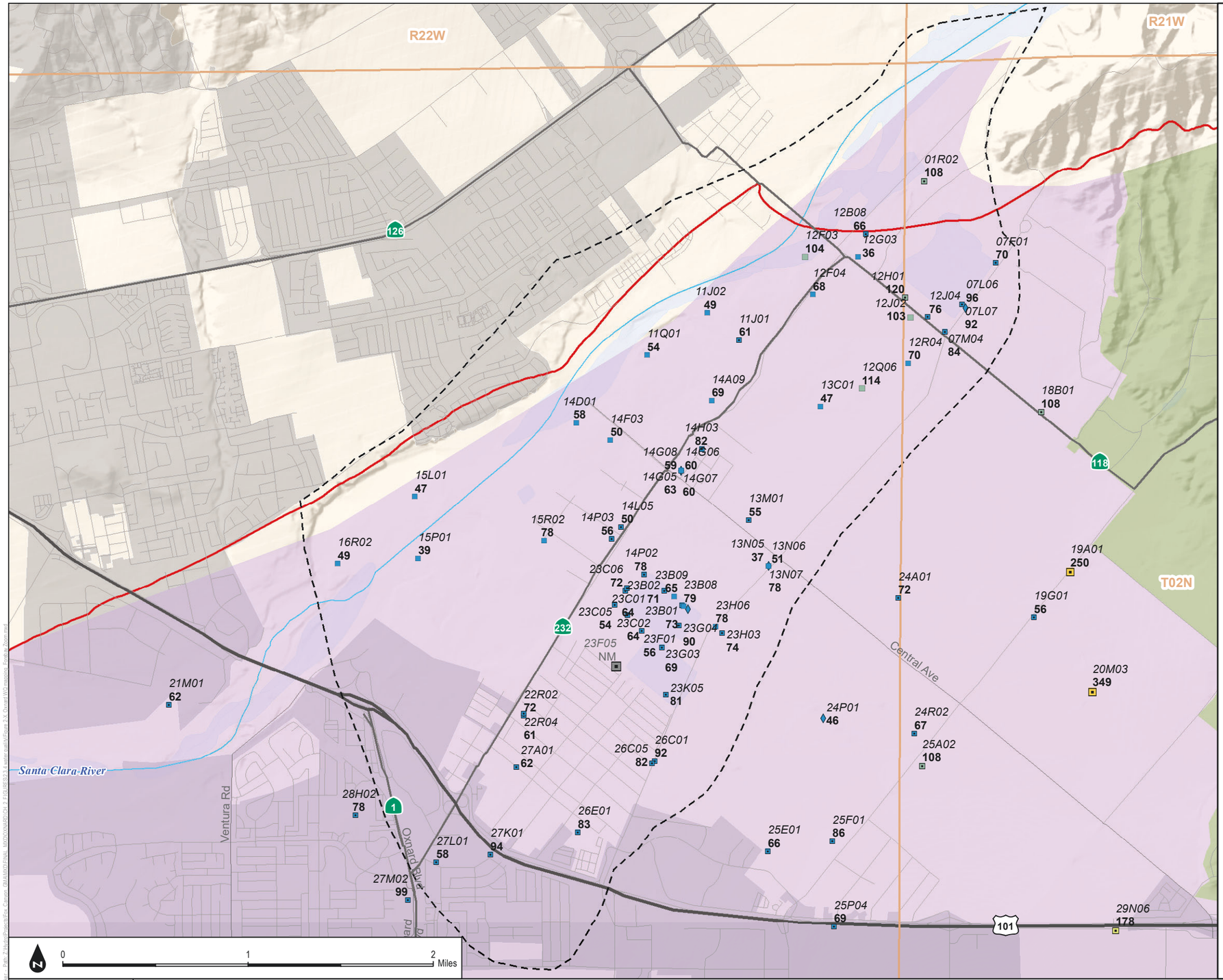

Legend

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Major Rivers/Stream Channels
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)
- Oxnard Forebay

Aquifer designation

- Well screened in the Oxnard aquifer
- Well screened in the Mugu aquifer
- Wells screened in multiple aquifers in the UAS

Chloride concentration (mg/L), 2011-2015

- 23 - 100
- 101 - 150
- 151 - 200
- 201 - 500
- 501 - 1000
- 1001 - 22500
- Not Measured (NM)
- *15P01* Abbreviated State Well Number (see notes)
- **10.5** Concentration (mg/L)

Notes:

1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a concentration value beneath it.The concentration is the most recent concentration measured in water quality samples collected at that well in the five years from 2011-2015. For a complete water quality record for each well, see Appendix C.
2) "ND" signifies non-detect. "NM" signifies not measured.
3) SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map,concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
4) The shape of each well symbol correspondsto the aquifer(s) in which it is screened (see above).
5) The color of each well symbol corresponds to the most recent concentration measured in a water quality sample from that well. A solid gray well symbol has no data between 2011 and 2015.
6) All concentrations are in mg/L.
7) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-39B

Upper Aquifer System, Forebay Area - Most Recent Chloride (mg/L) Measured 2011-2015

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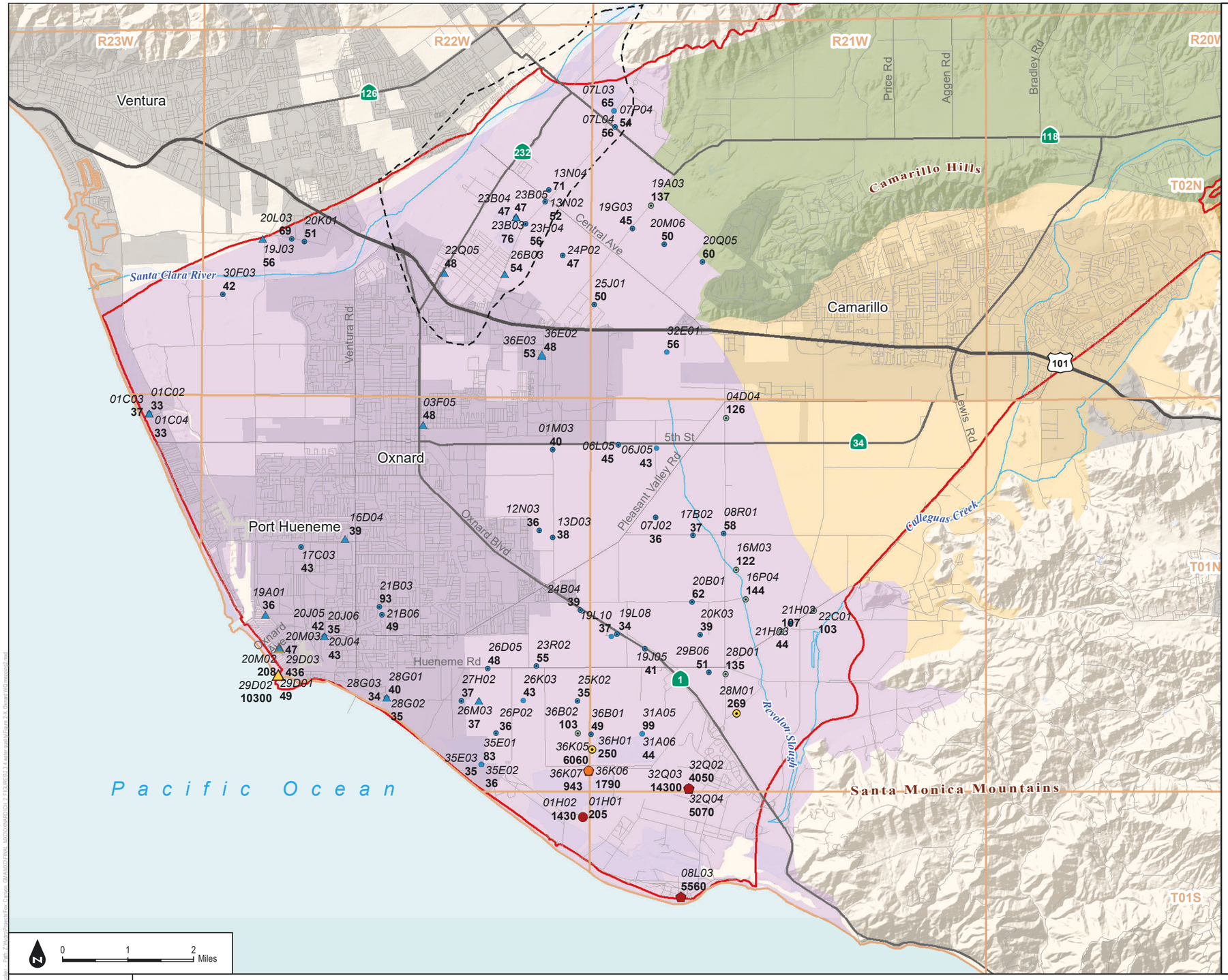

Legend

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Major Rivers/Stream Channels
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)
- Oxnard Forebay

Chloride concentration (mg/L), 2011-2015

- 23 - 100
- 101 - 150
- 151 - 200
- 201 - 500
- 501 - 1000
- 1001 - 22500

Aquifer designation

- △ Well screened in the Hueneme aquifer
- ○ Well screened in the Fox Canyon aquifer
- ⬠ Well screened in the Grimes Canyon aquifer
- ⦿ Wells screened in multiple aquifers in the LAS

15P01 Abbreviated State Well Number (see notes)
10.5 Concentration (mg/L)

Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a concentration value beneath it.The concentration is the most recent concentration measured in water quality samples collected at that well in the five years from 2011-2015. For a complete water quality record for each well, see Appendix X.
2) "ND" signifies non-detect.
3) SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map,concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
4) The shape of each well symbol correspondsto the aquifer(s) in which it is screened (see above).
5) The color of each well symbol corresponds to the most recent concentration measured in a water quality sample from that well.
6) All concentrations are in mg/L.
7) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-40

Lower Aquifer System - Most Recent Chloride (mg/L) Measured 2011-2015

DUDEK

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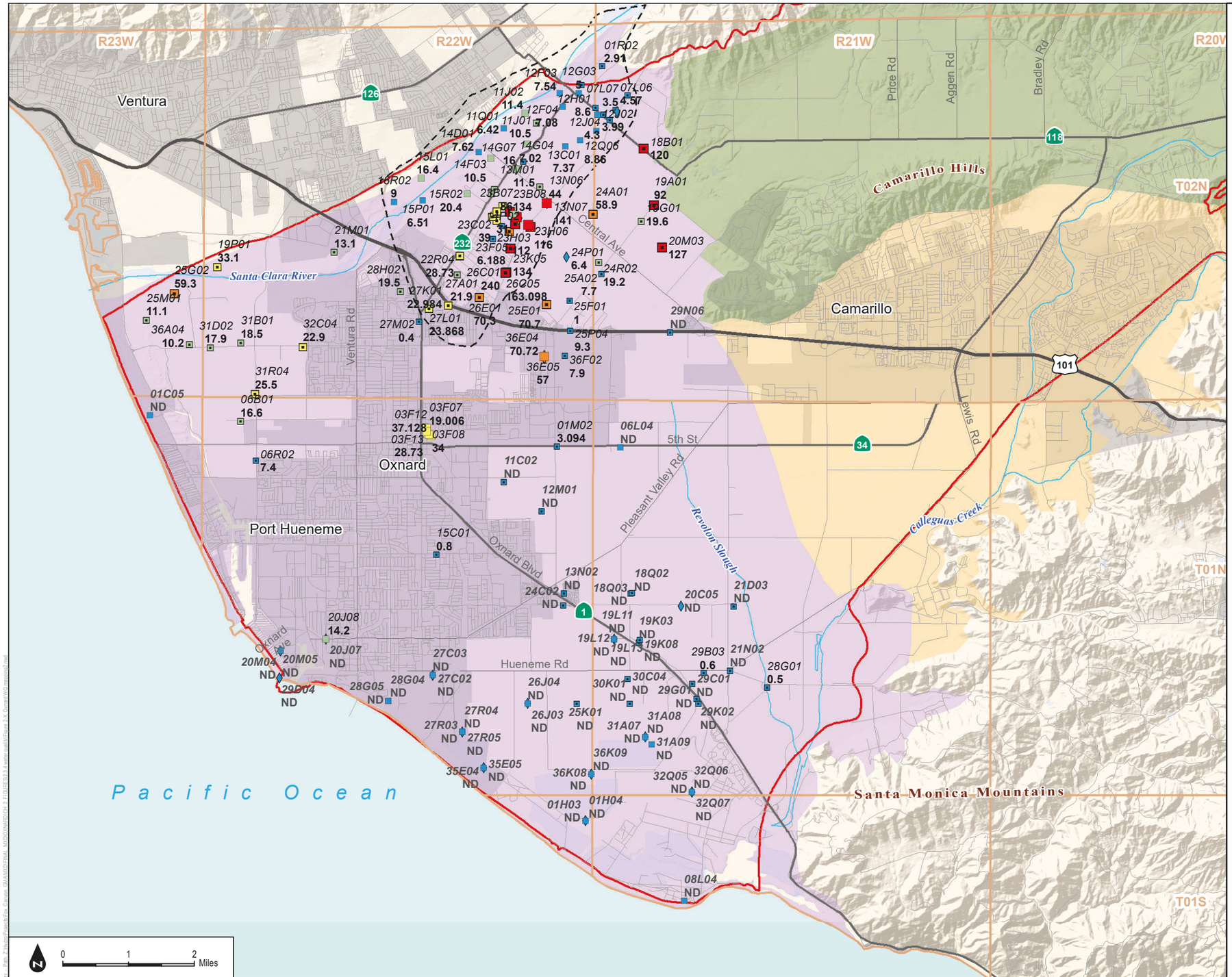

Legend

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Major Rivers/Stream Channels
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)
- Oxnard Forebay

Nitrate concentration (mg/L as Nitrate), 2011-2015

- 0 - 10
- >10 - 22.5
- >22.5 - 45
- >45 - 90
- >90 - 528

Aquifer designation

- Well screened in the Oxnard aquifer
- Well screened in the Mugu aquifer
- Wells screened in multiple aquifers in the UAS

15P01 Abbreviated State Well Number (see notes)
10.5 Concentration (mg/L)

Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a concentration value beneath it.The concentration is the most recent concentration measured in water quality samples collected at that well in the five years from 2011-2015. For a complete water quality record for each well, see Appendix X.
2) "ND" signifies non-detect.
3) SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map,concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
4) The shape of each well symbol correspondsto the aquifer(s) in which it is screened (see above).
5) The color of each well symbol corresponds to the most recent concentration measured in a water quality sample from that well.
6) All concentrations are in mg/L.
7) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-41A

Upper Aquifer System - Most Recent Nitrate (mg/L as Nitrate) Measured 2011-2015

DUDEK

Groundwater Sustainability Plan for the Oxnard Subbasin

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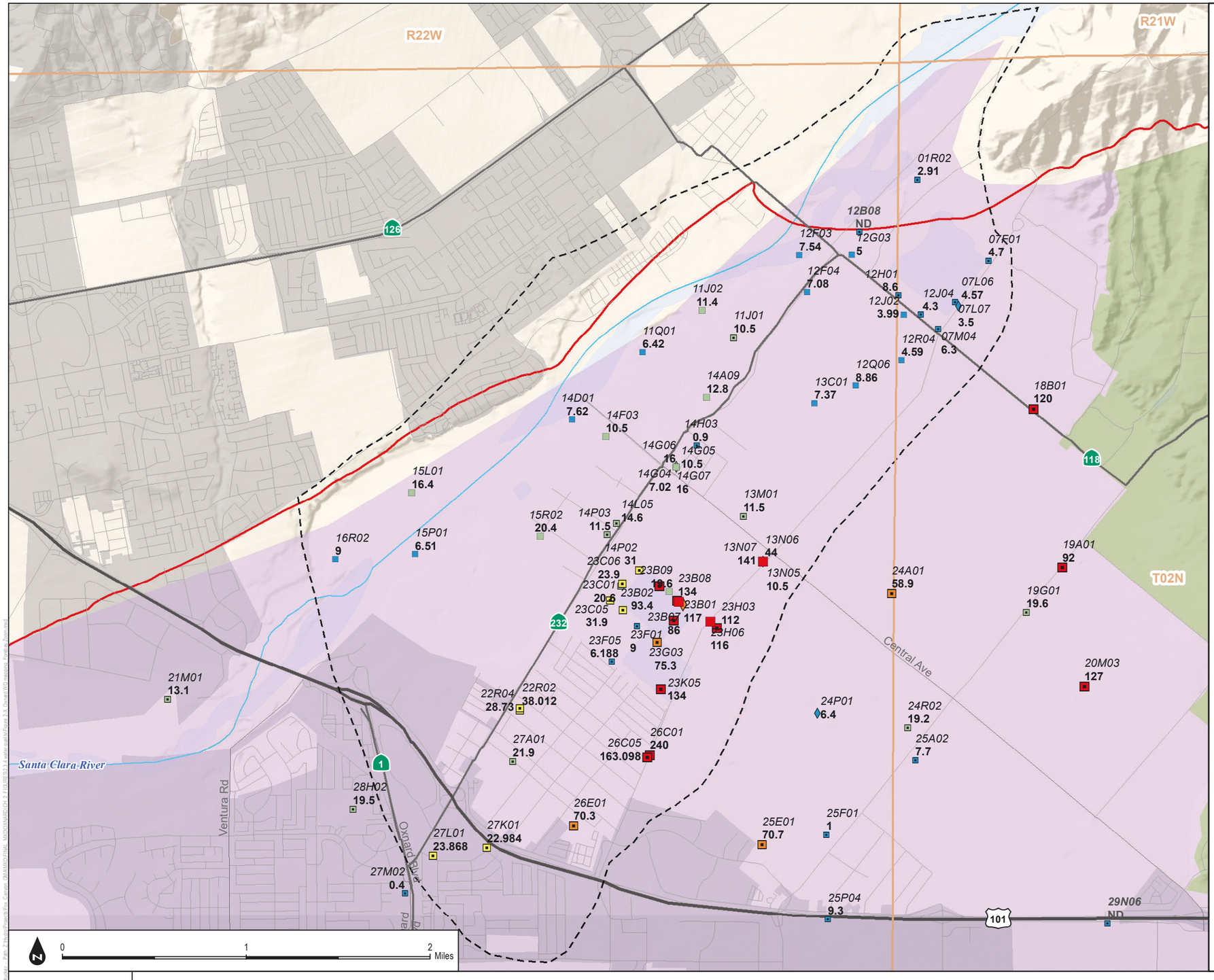

Legend

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Major Rivers/Stream Channels
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)
- Oxnard Forebay

Aquifer designation

- Well screened in the Oxnard aquifer
- Well screened in the Mugu aquifer
- Wells screened in multiple aquifers in the UAS

Nitrate concentration (mg/L), 2011-2015

- 0 - 10
- >10 - 22.5
- >22.5 - 45
- >45 - 90
- >90 - 528
- Not Measured (NM)

15P01 Abbreviated State Well Number (see notes)

10.5 Concentration (mg/L)

Notes:

1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a concentration value beneath it.The concentration is the most recent concentration measured in water quality samples collected at that well in the five years from 2011-2015. For a complete water quality record for each well, see Appendix C.
2) "ND" signifies non-detect. "NM" signifies not measured.
3) SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map,concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
4) The shape of each well symbol correspondsto the aquifer(s) in which it is screened (see above).
5) The color of each well symbol corresponds to the most recent concentration measured in a water quality sample from that well. A solid gray well symbol has no data between 2011 and 2015.
6) All concentrations are in mg/L.
7) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-41B

Upper Aquifer System, Forebay Area - Most Recent Nitrate (mg/L as Nitrate) Measured 2011-2015

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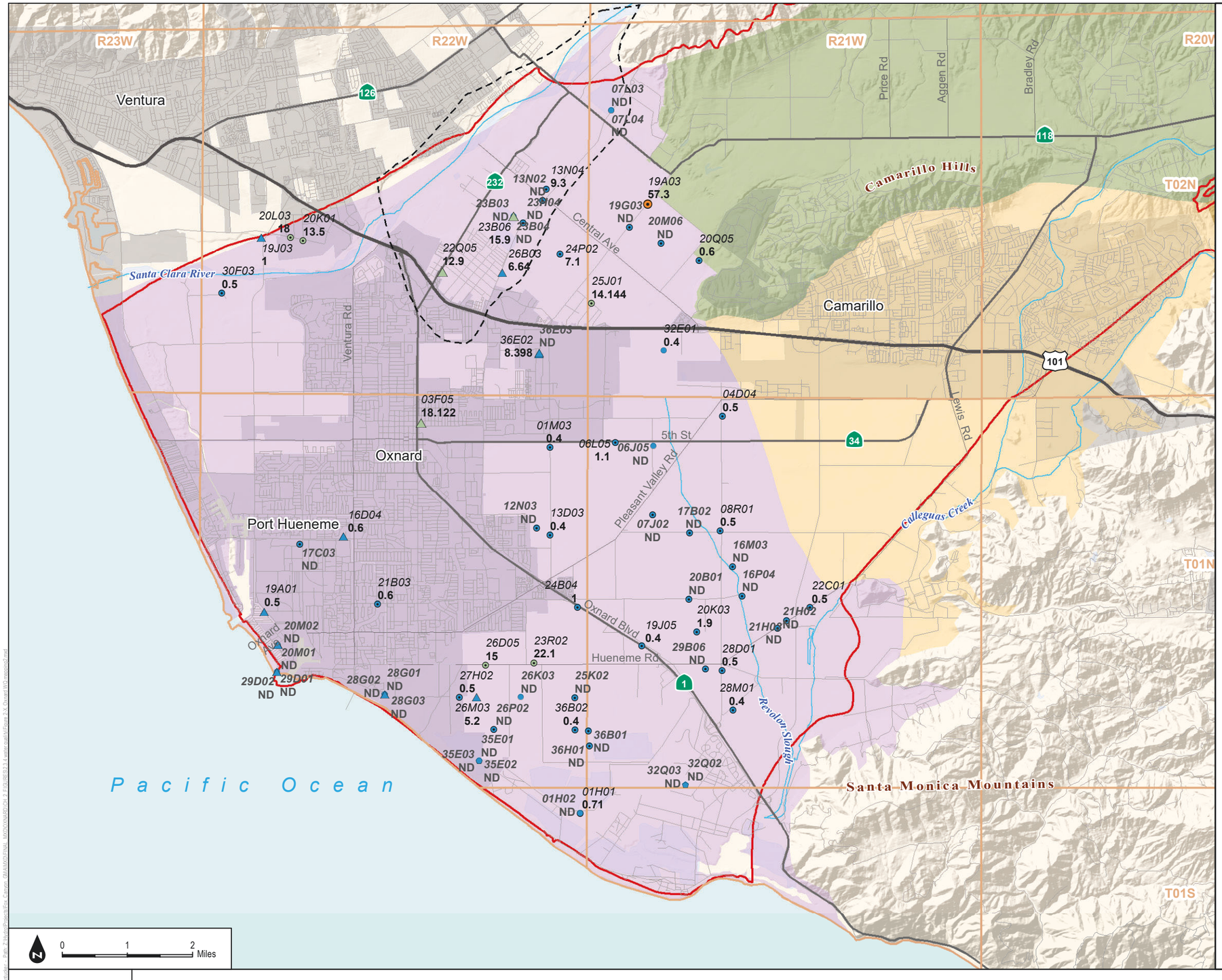

Legend

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Major Rivers/Stream Channels
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)
- Oxnard Forebay

Nitrate concentration (mg/L), 2011-2015

- 0 - 10
- >10 - 22.5
- >22.5 - 45
- >45 - 90
- >90 - 528

Aquifer designation

- △ Well screened in the Hueneme aquifer
- ○ Well screened in the Fox Canyon aquifer
- ⬠ Well screened in the Grimes Canyon aquifer
- ⊙ Wells screened in multiple aquifers in the LAS

15P01 Abbreviated State Well Number (see notes)
10.5 Concentration (mg/L)

Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a concentration value beneath it.The concentration is the most recent concentration measured in water quality samples collected at that well in the five years from 2011-2015. For a complete water quality record for each well, see Appendix X.
2) "ND" signifies non-detect.
3) SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map,concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
4) The shape of each well symbol correspondsto the aquifer(s) in which it is screened (see above).
5) The color of each well symbol corresponds to the most recent concentration measured in a water quality sample from that well.
6) All concentrations are in mg/L.
7) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-42

Lower Aquifer System - Most Recent Nitrate (mg/L as Nitrate) Measured 2011-2015

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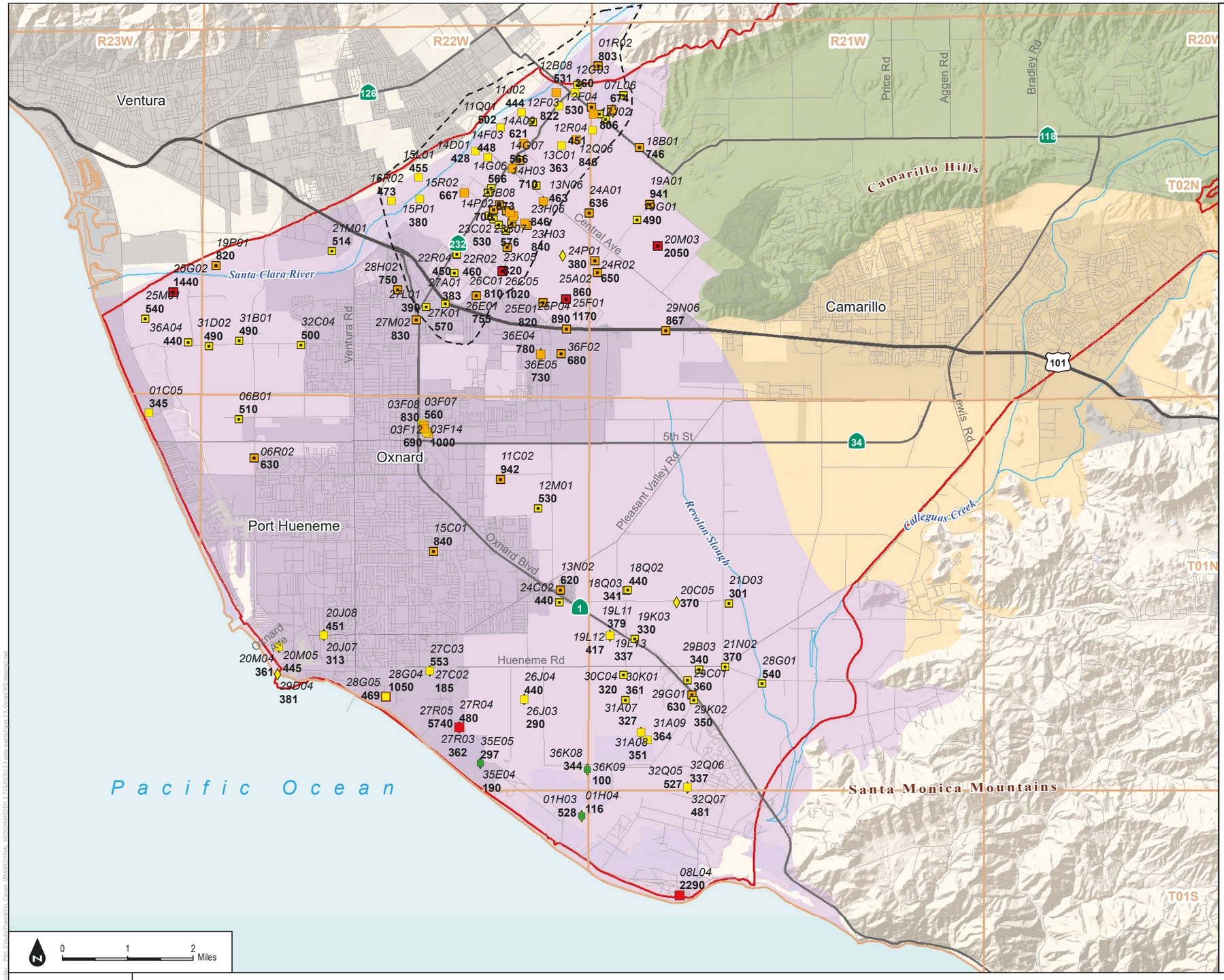

Legend

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Major Rivers/Stream Channels
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)
- Oxnard Forebay

Sulfate concentration (mg/L), 2011-2015

- 29 - 300
- 301 - 600
- 601 - 1000
- 1001 - 5740

Aquifer designation

- Well screened in the Oxnard aquifer
- Well screened in the Mugu aquifer
- Wells screened in multiple aquifers in the UAS

15P01 Abbreviated State Well Number (see notes)
10.5 Concentration (mg/L)

Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a concentration value beneath it.The concentration is the most recent concentration measured in water quality samples collected at that well in the five years from 2011-2015. For a complete water quality record for each well, see Appendix X.
2) "ND" signifies non-detect.
3) SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map,concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
4) The shape of each well symbol correspondsto the aquifer(s) in which it is screened (see above).
5) The color of each well symbol corresponds to the most recent concentration measured in a water quality sample from that well.
6) All concentrations are in mg/L.
7) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

DUDEK

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-43A

Upper Aquifer System - Most Recent Sulfate (mg/L) Measured 2011-2015

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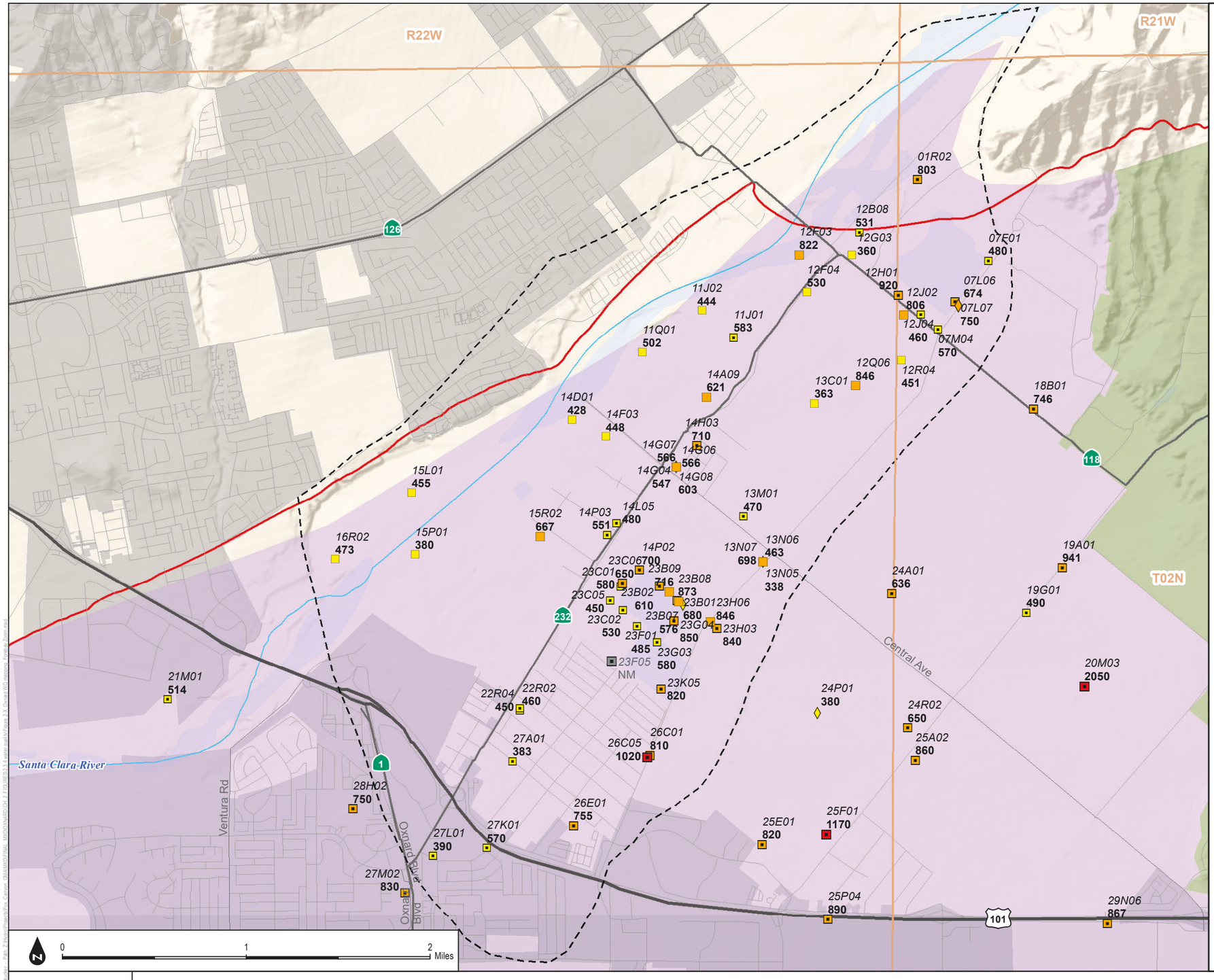

Legend

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Major Rivers/Stream Channels
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)
- Oxnard Forebay

Aquifer designation

- Well screened in the Oxnard aquifer
- Well screened in the Mugu aquifer
- Wells screened in multiple aquifers in the UAS

Sulfate concentration (mg/L), 2011-2015

- 29 - 300
- 301 - 600
- 601 - 1000
- 1001 - 5740
- Not Measured (NM)
- *15P01* Abbreviated State Well Number (see notes)
- **10.5** Concentration (mg/L)

Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a concentration value beneath it.The concentration is the most recent concentration measured in water quality samples collected at that well in the five years from 2011-2015. For a complete water quality record for each well, see Appendix C.
2) "ND" signifies non-detect. "NM" signifies not measured.
3) SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map,concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
4) The shape of each well symbol correspondsto the aquifer(s) in which it is screened (see above).
5) The color of each well symbol corresponds to the most recent concentration measured in a water quality sample from that well. A solid gray well symbol has no data between 2011 and 2015.
6) All concentrations are in mg/L.
7) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

DUDEK

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-43B

Upper Aquifer System, Forebay Area - Most Recent Sulfate (mg/L) Measured 2011-2015

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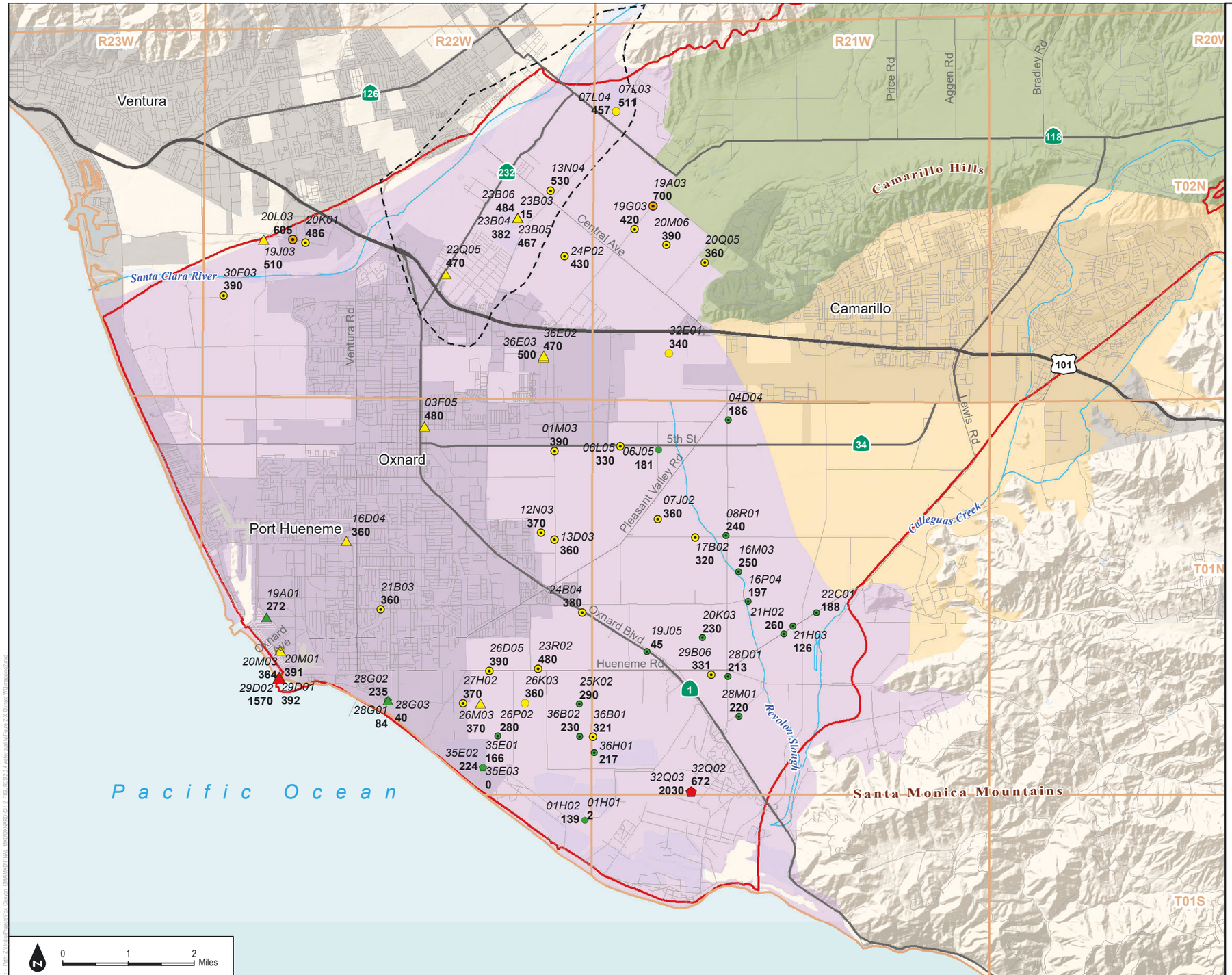

Legend

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Major Rivers/Stream Channels
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)
- Oxnard Forebay

Sulfate concentration (mg/L), 2011-2015

- 29 - 300
- 301 - 600
- 601 - 1000
- 1001 - 5740

Aquifer designation

- Well screened in the Hueneme aquifer
- Well screened in the Fox Canyon aquifer
- Well screened in the Grimes Canyon aquifer
- Wells screened in multiple aquifers in the LAS

15P01 Abbreviated State Well Number (see notes)
10.5 Concentration (mg/L)

Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a concentration value beneath it.The concentration is the most recent concentration measured in water quality samples collected at that well in the five years from 2011-2015. For a complete water quality record for each well, see Appendix X.
2) "ND" signifies non-detect.
3) SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map,concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
4) The shape of each well symbol correspondsto the aquifer(s) in which it is screened (see above).
5) The color of each well symbol corresponds to the most recent concentration measured in a water quality sample from that well.
6) All concentrations are in mg/L.
7) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-44

Lower Aquifer System - Most Recent Sulfate (mg/L) Measured 2011-2015

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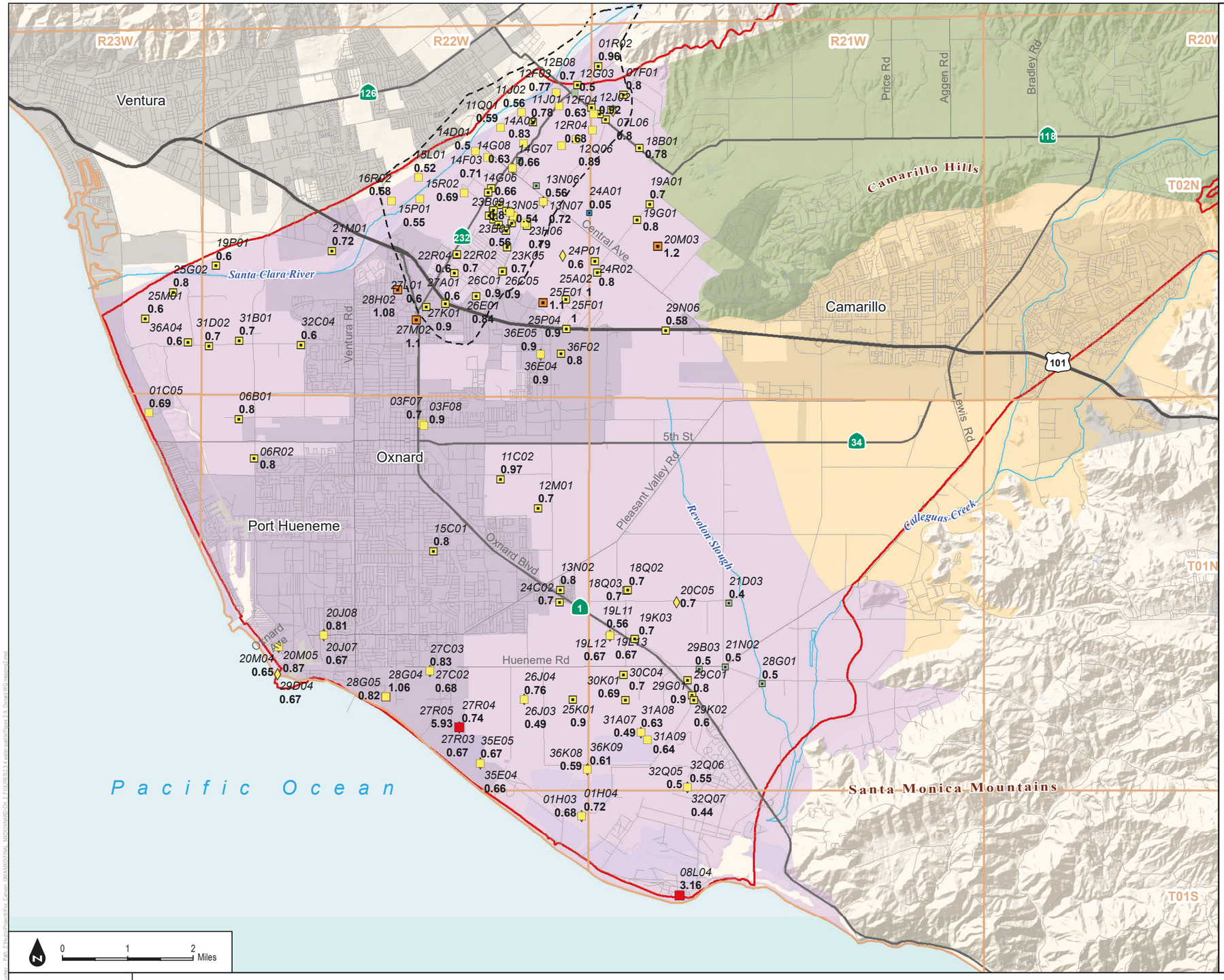

Legend

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Major Rivers/Stream Channels
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)
- Oxnard Forebay

Boron concentration (mg/L), 2011-2015

- 0 - 0.2
- >0.2 - 0.5
- >0.5 - 1.0
- >1.0 - 2.0
- >2.0 - 6.0

Aquifer designation

- Well screened in the Oxnard aquifer
- Well screened in the Mugu aquifer
- Wells screened in multiple aquifers in the UAS

15P01 Abbreviated State Well Number (see notes)
10.5 Concentration (mg/L)

Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a concentration value beneath it.The concentration is the most recent concentration measured in water quality samples collected at that well in the five years from 2011-2015. For a complete water quality record for each well, see Appendix X.
2) "ND" signifies non-detect.
3) SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map,concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
4) The shape of each well symbol correspondsto the aquifer(s) in which it is screened (see above).
5) The color of each well symbol corresponds to the most recent concentration measured in a water quality sample from that well.
6) All concentrations are in mg/L.
7) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

DUDEK

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-45A

Upper Aquifer System - Most Recent Boron (mg/L) Measured 2011-2015

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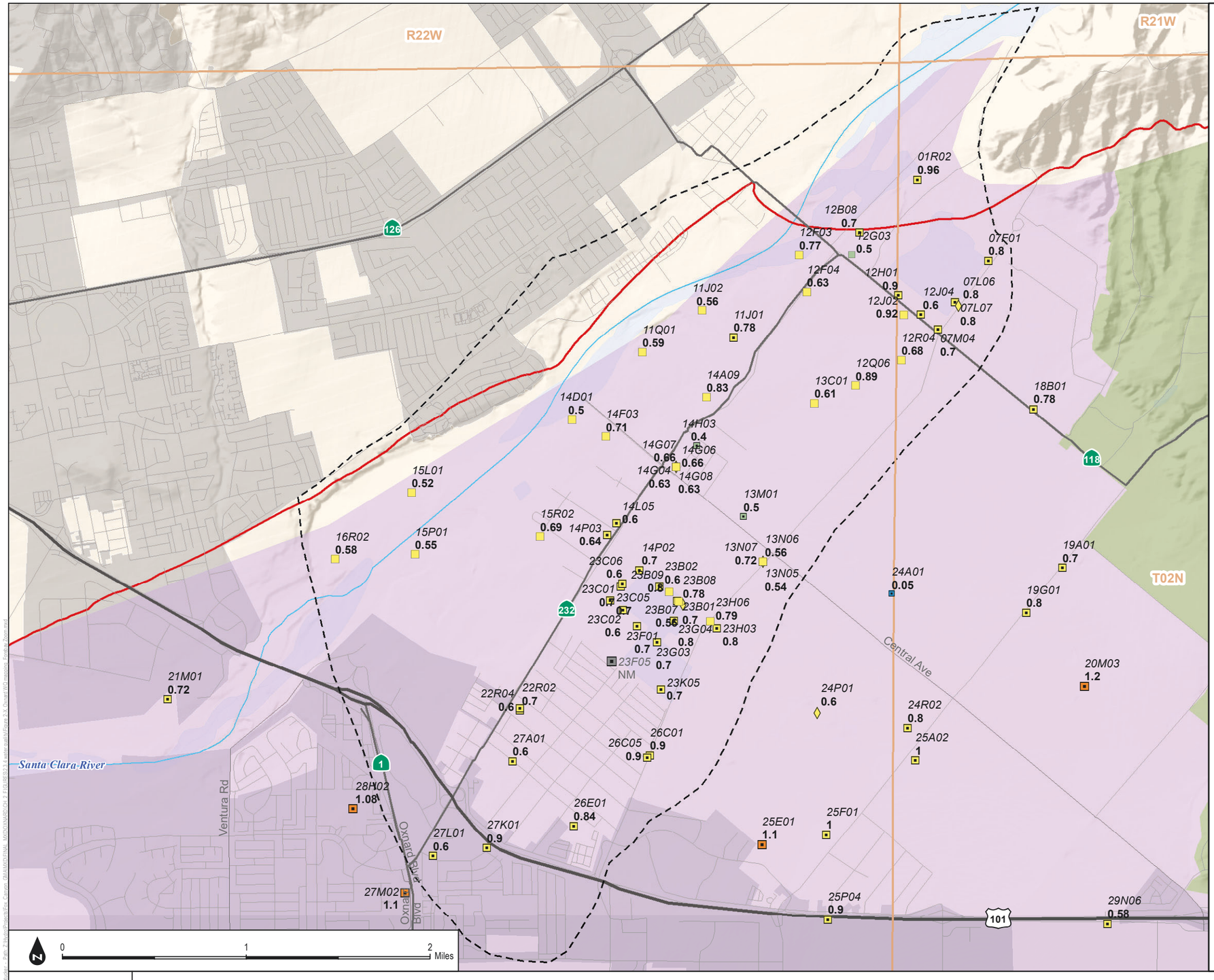

Legend

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Major Rivers/Stream Channels
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)
- Oxnard Forebay

Aquifer designation

- Well screened in the Oxnard aquifer
- Well screened in the Mugu aquifer
- Wells screened in multiple aquifers in the UAS

Boron concentration (mg/L), 2011-2015

- 0 - 0.2
- >0.2 - 0.5
- >0.5 - 1.0
- >1.0 - 2.0
- >2.0 - 6.0
- Not Measured (NM)

15P01 Abbreviated State Well Number (see notes)

10.5 Concentration (mg/L)

Notes:

1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a concentration value beneath it.The concentration is the most recent concentration measured in water quality samples collected at that well in the five years from 2011-2015. For a complete water quality record for each well, see Appendix C.
2) "ND" signifies non-detect. "NM" signifies not measured.
3) SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map,concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
4) The shape of each well symbol correspondsto the aquifer(s) in which it is screened (see above).
5) The color of each well symbol corresponds to the most recent concentration measured in a water quality sample from that well. A solid gray well symbol has no data between 2011 and 2015.
6) All concentrations are in mg/L.
7) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-45B

Upper Aquifer System, Forebay Area - Most Recent Boron (mg/L) Measured 2011-2015

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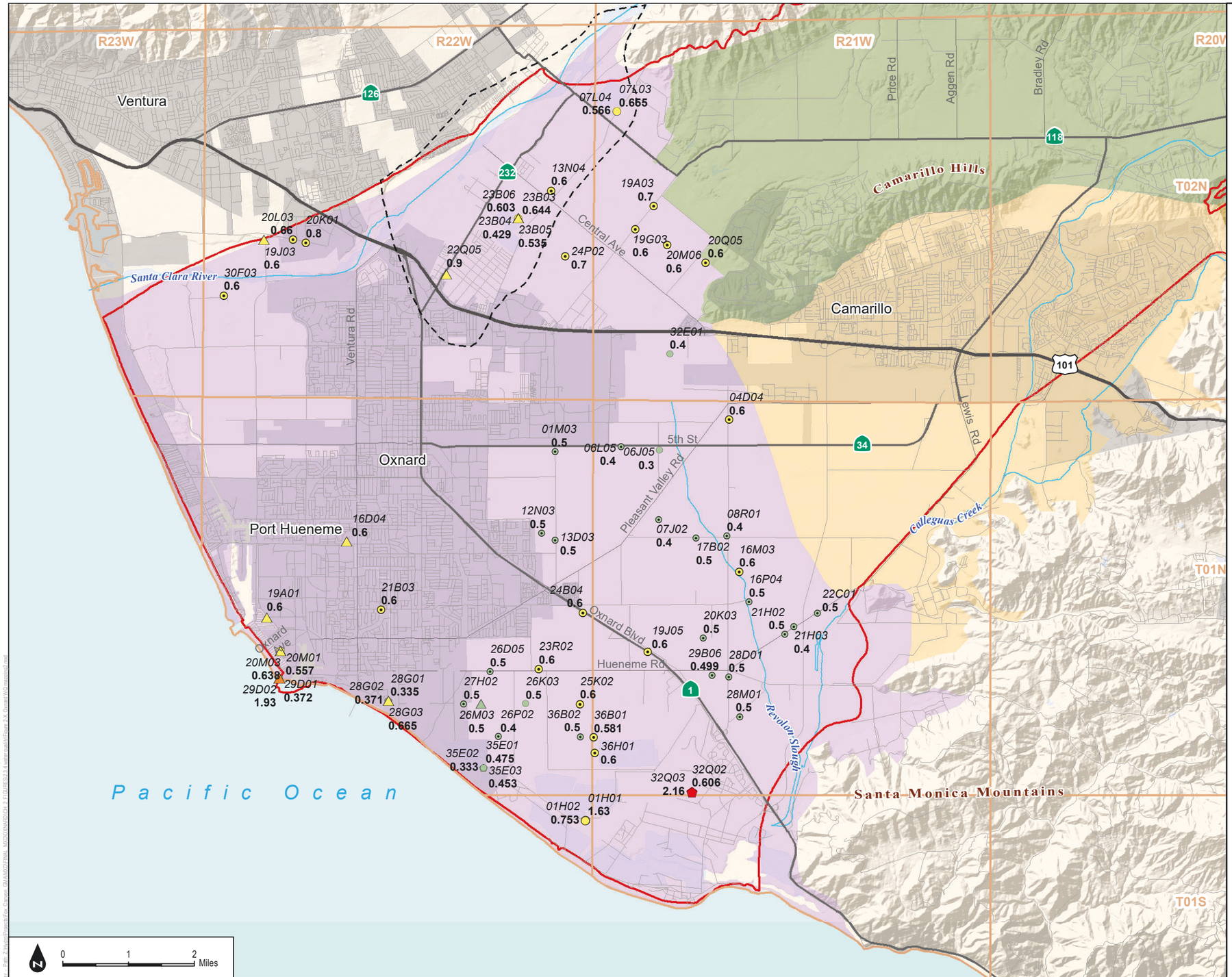

Legend

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Major Rivers/Stream Channels
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)
- Oxnard Forebay

Boron concentration (mg/L), 2011-2015

- 0 - 0.2
- >0.2 - 0.5
- >0.5 - 1.0
- >1.0 - 2.0
- >2.0 - 6.0

Aquifer designation

- △ Well screened in the Hueneme aquifer
- ○ Well screened in the Fox Canyon aquifer
- ⬠ Well screened in the Grimes Canyon aquifer
- ⦿ Wells screened in multiple aquifers in the LAS

15P01 Abbreviated State Well Number (see notes)
10.5 Concentration (mg/L)

Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a concentration value beneath it.The concentration is the most recent concentration measured in water quality samples collected at that well in the five years from 2011-2015. For a complete water quality record for each well, see Appendix X.
2) "ND" signifies non-detect.
3) SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map,concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
4) The shape of each well symbol correspondsto the aquifer(s) in which it is screened (see above).
5) The color of each well symbol corresponds to the most recent concentration measured in a water quality sample from that well.
6) All concentrations are in mg/L.
7) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-46

Lower Aquifer System - Most Recent Boron (mg/L) Measured 2011-2015

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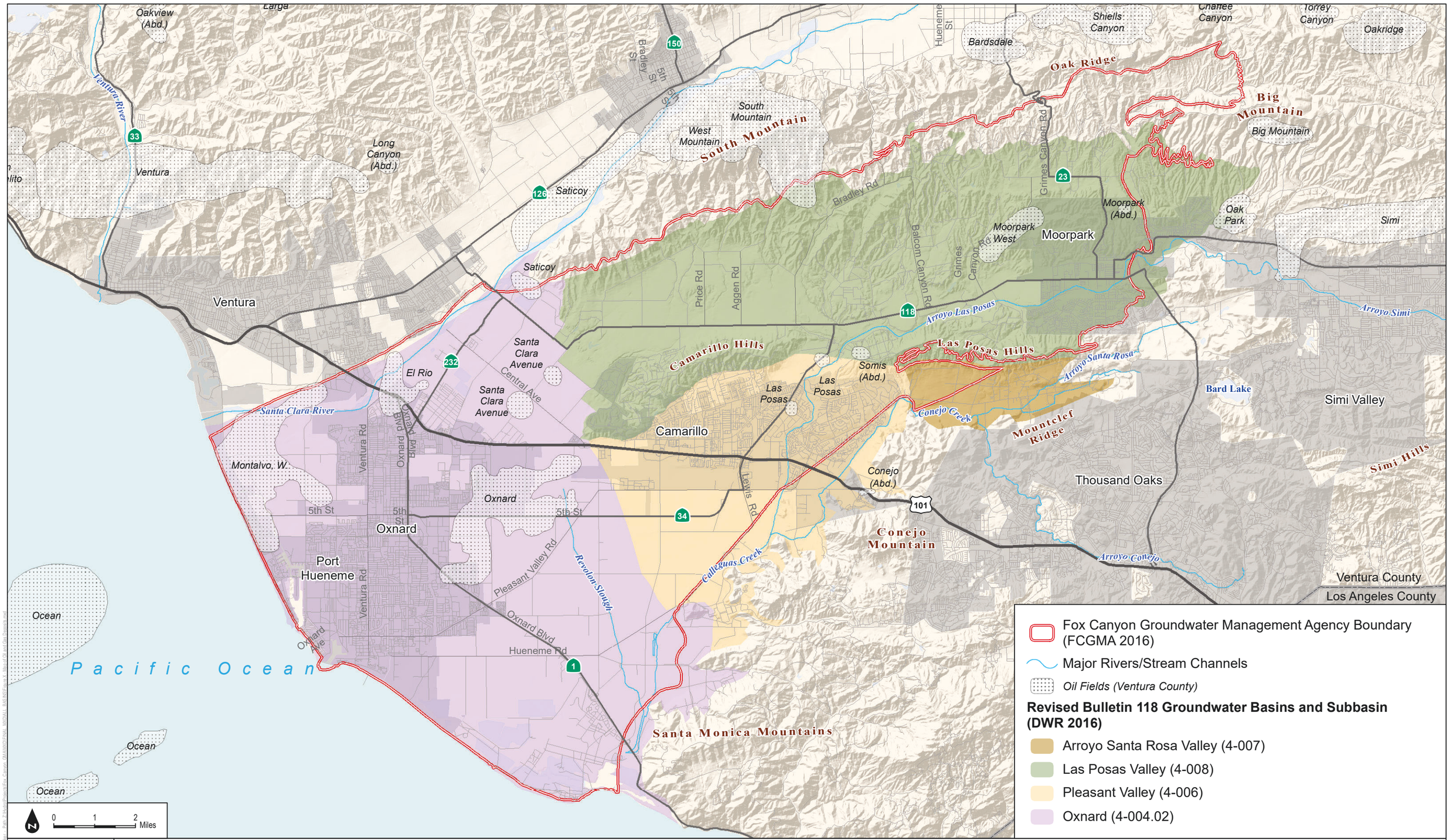

SOURCE: DWR; Ventura County

FIGURE 2-47

Oil Fields in the Vicinity of FCGMA Groundwater Basins

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Groundwater Sustainability Plan for the Oxnard Subbasin

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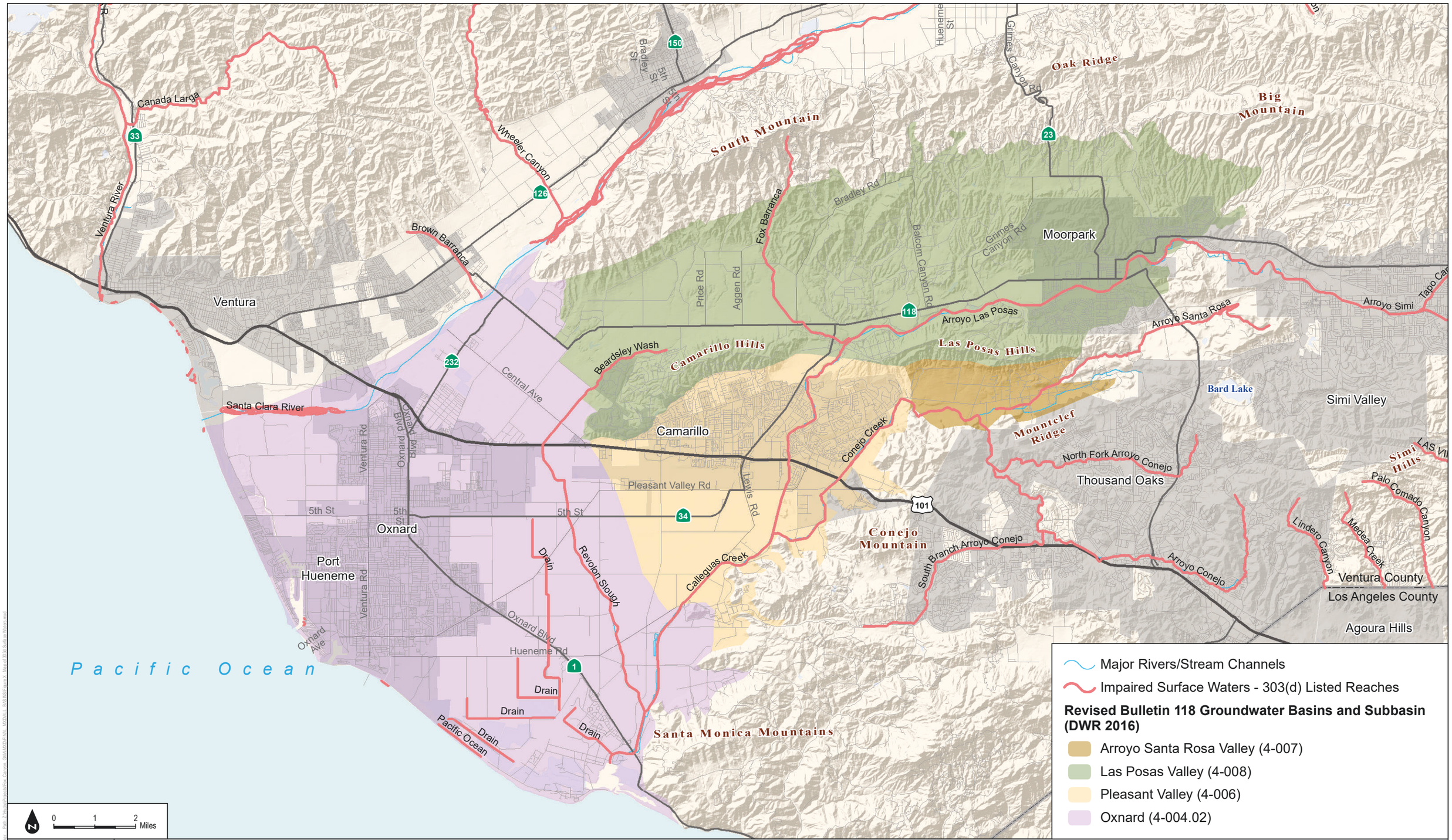

SOURCE: DWR; Ventura County

FIGURE 2-48

Impaired Surface Waters in the Vicinity of FCGMA Groundwater Basins

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Groundwater Sustainability Plan for the Oxnard Subbasin

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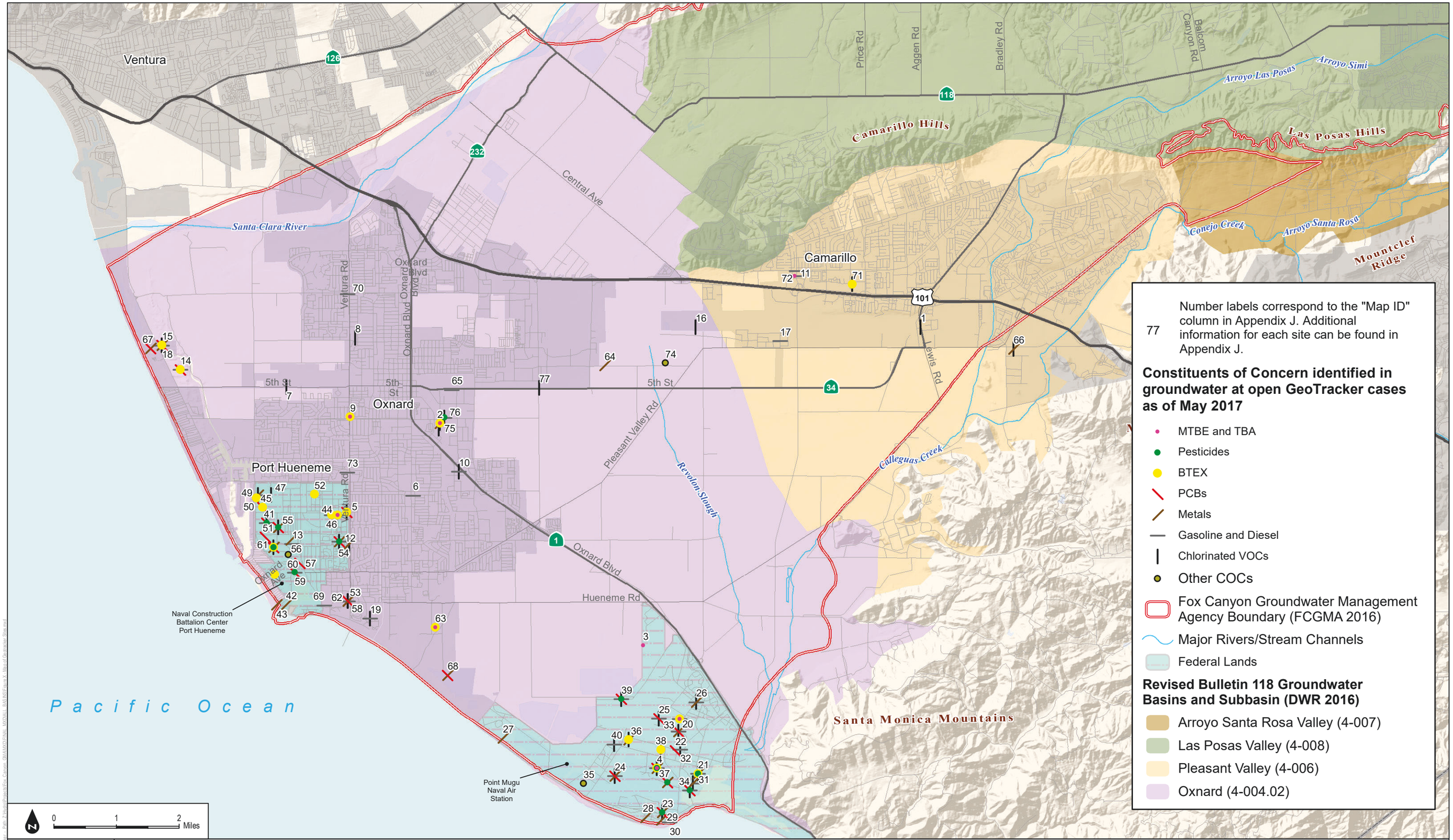

77 Number labels correspond to the "Map ID" column in Appendix J. Additional information for each site can be found in Appendix J.

Constituents of Concern identified in groundwater at open GeoTracker cases as of May 2017

- MTBE and TBA
- Pesticides
- BTEX
- PCBs
- Metals
- Gasoline and Diesel
- Chlorinated VOCs
- Other COCs
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Major Rivers/Stream Channels
- Federal Lands

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

SOURCE: DWR; Ventura County; Geotracker

FIGURE 2-49

Constituents of Concern at Open GeoTracker Cases with Impacted Groundwater within FCGMA Groundwater Basin Boundaries

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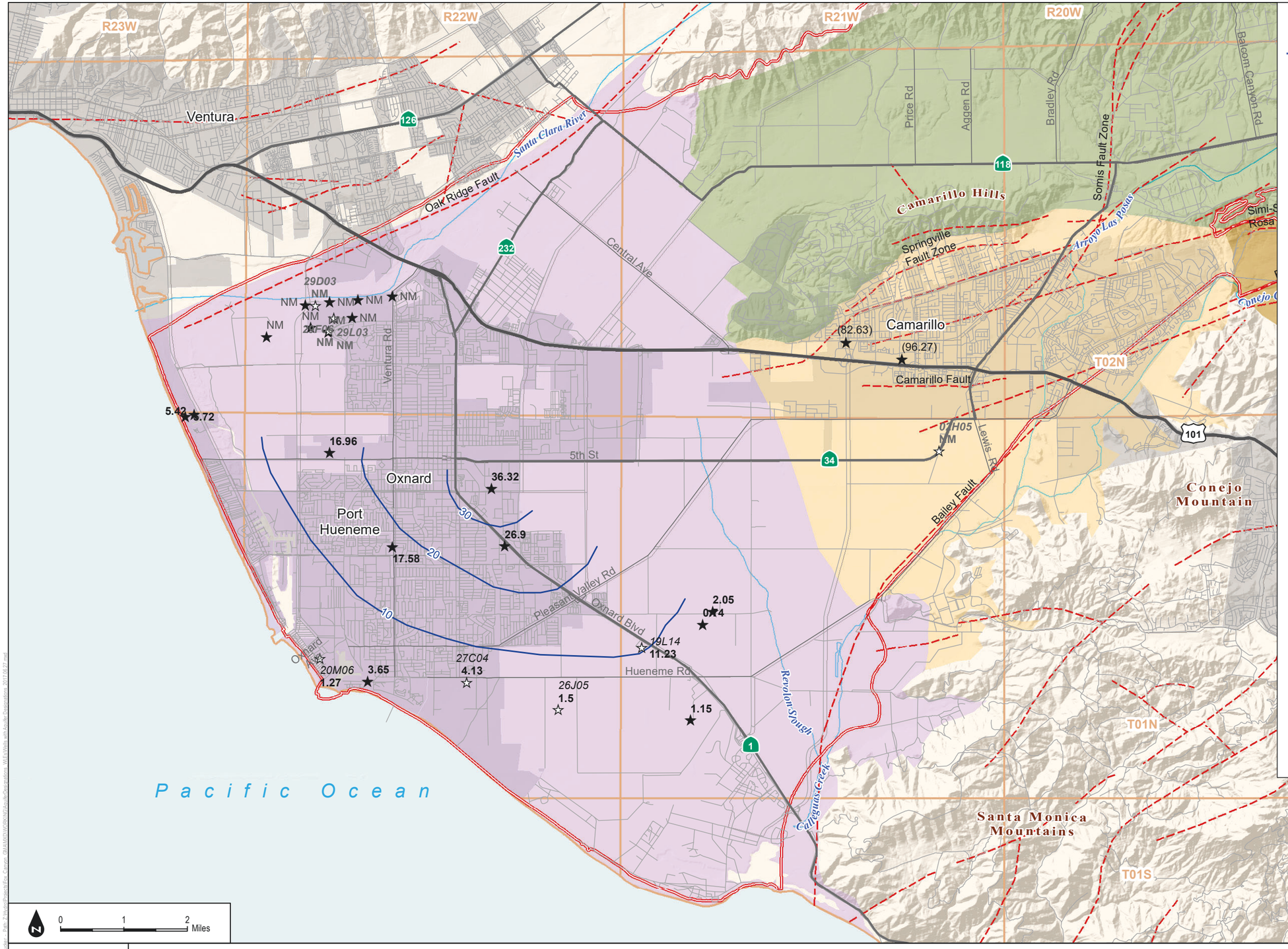

Legend

- Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.
- ☆ Semi-perched monitoring wells
- ★ Shallow Wells from Geotracker (UWCD 2017)
- *15P01* Abbreviated State Well Number (see notes)
- **-14.7** Groundwater elevation feet AMSL
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (Ventura County 2016)
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Notes:

1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a groundwater elevation beneath it. SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S. Geotracker wells do not have SWN IDs and so are not labeled.

2) "NM" indicates no water level measurement was collected within the specified time window.

3) Groundwater elevations not used to create contours are shown in parentheses.

4) All elevation values are in feet above mean sea level (ft AMSL).

5) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-50

Groundwater Elevation Contours in the Semi-Perched Aquifer, March 2-29, 2015

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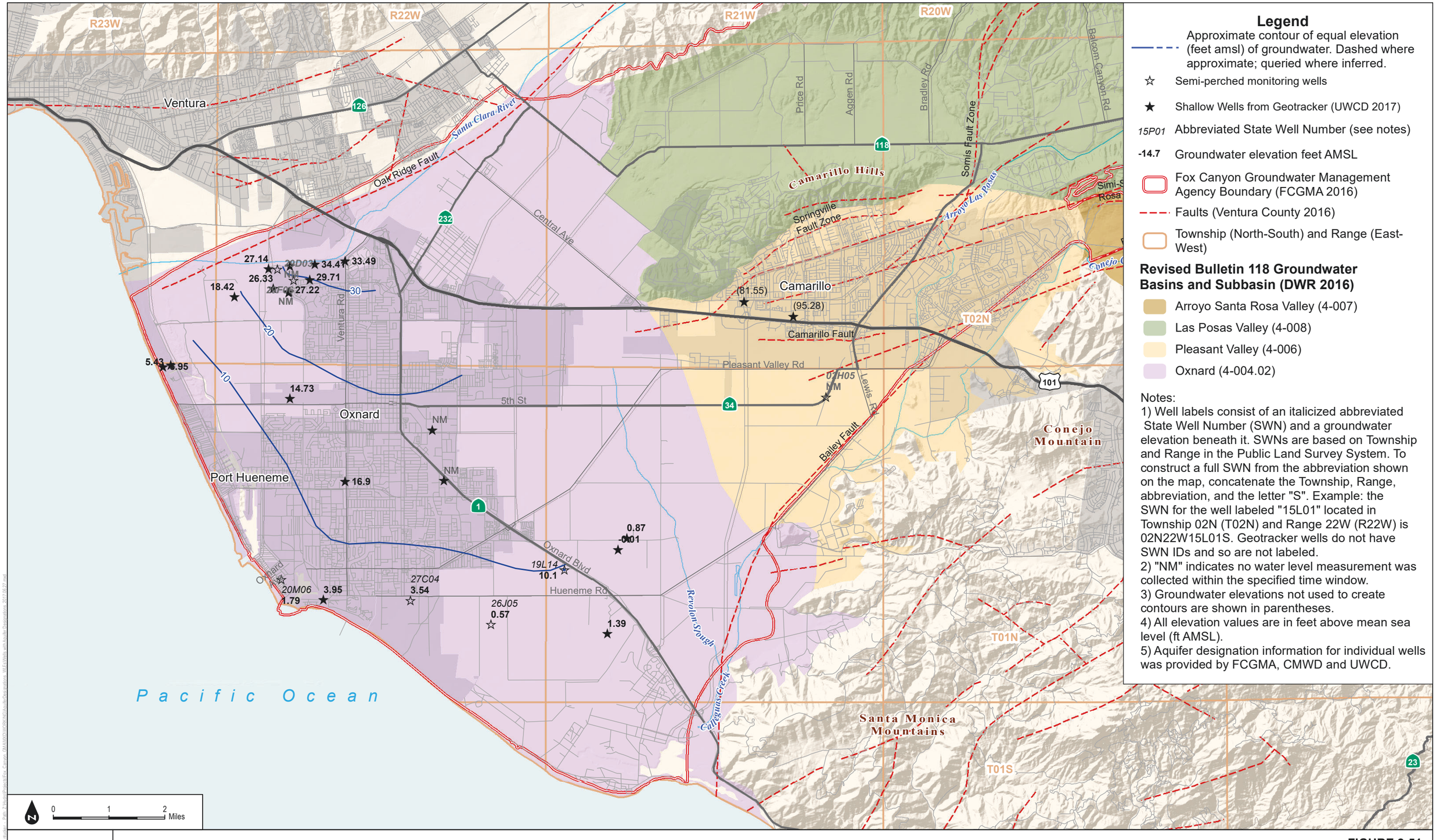

Legend

Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.

☆ Semi-perched monitoring wells

★ Shallow Wells from Geotracker (UWCD 2017)

15P01 Abbreviated State Well Number (see notes)

-14.7 Groundwater elevation feet AMSL

Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)

Faults (Ventura County 2016)

Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Notes:

1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a groundwater elevation beneath it. SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S. Geotracker wells do not have SWN IDs and so are not labeled.

2) "NM" indicates no water level measurement was collected within the specified time window.

3) Groundwater elevations not used to create contours are shown in parentheses.

4) All elevation values are in feet above mean sea level (ft AMSL).

5) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-51

Groundwater Elevation Contours in the Semi-Perched Aquifer, October 2-29, 2015

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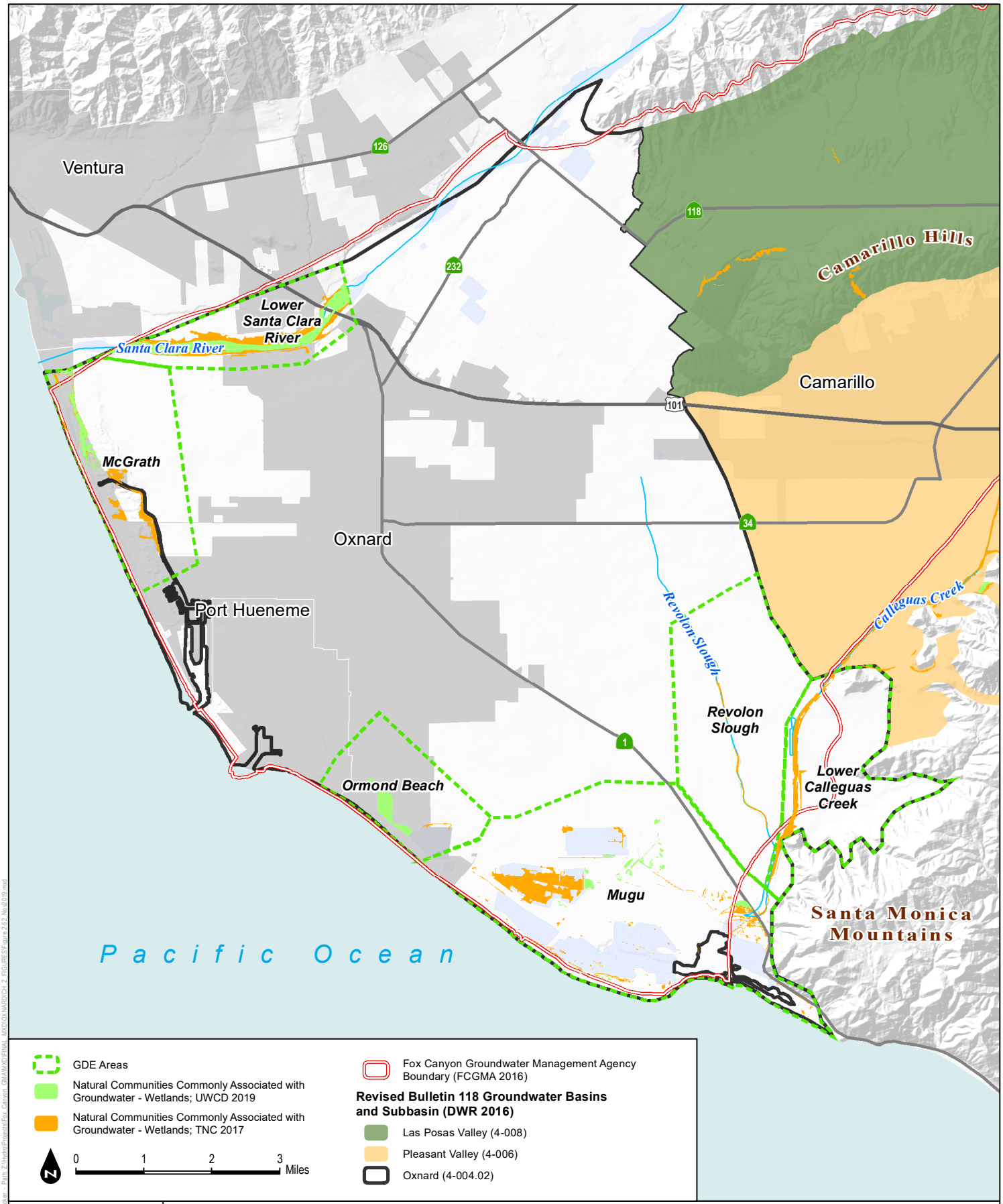

DUDEK

SOURCE: DWR; Santa Barbara County; FCGMA

FIGURE 2-52

Groundwater-Dependent Ecosystems for the Oxnard Subbasin

Date: 11/11/2019 Last saved by: mbaker Path: Z:\Hydro\Projects\Fox Canyon GMA\MXD\FINAL MXD\OXNARD\Ch 2 FIGURES\Figure 2-52 No-GW.mxd

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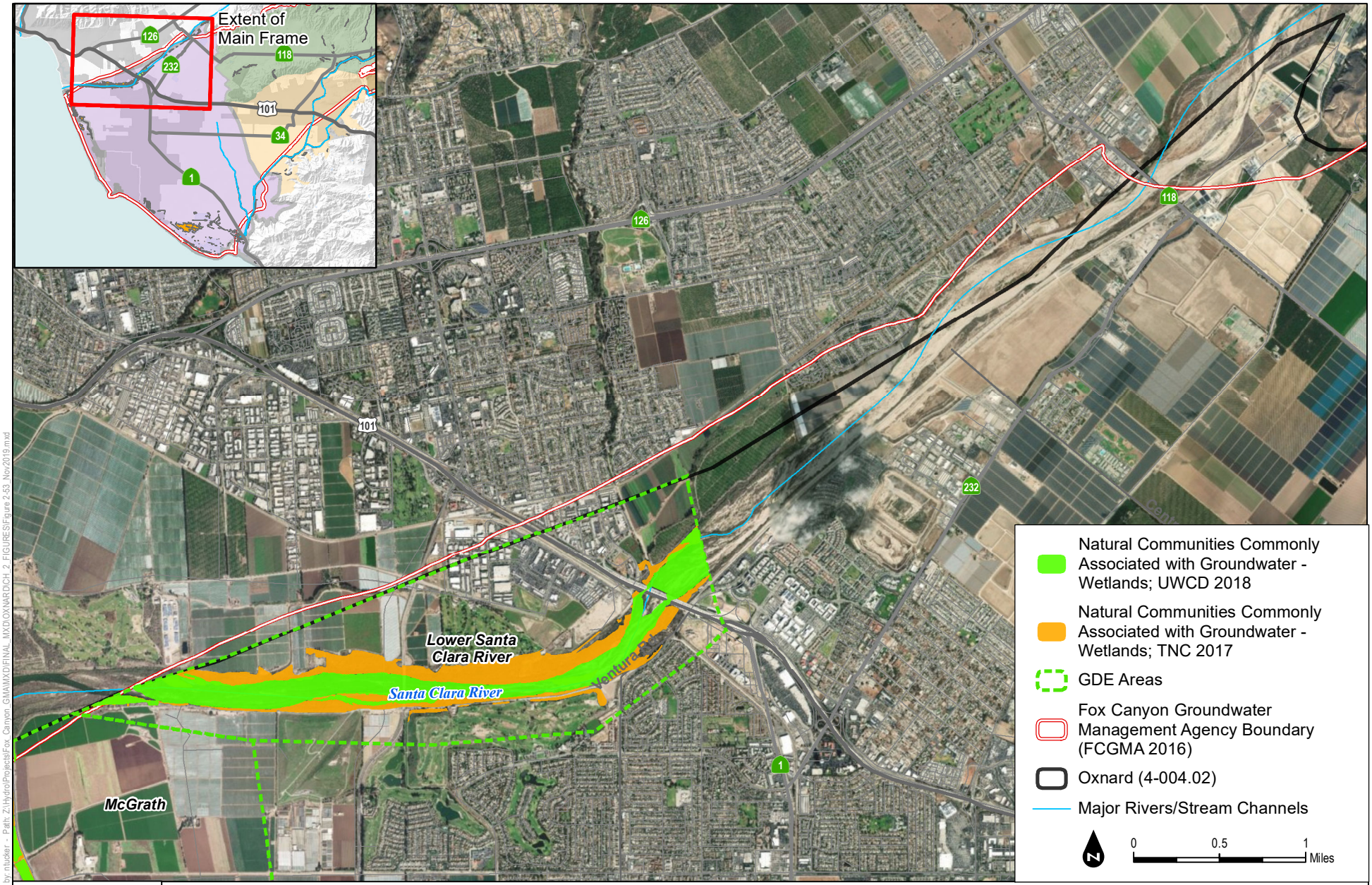

SOURCE: DWR; Santa Barbara County; FCGMA; Esri

FIGURE 2-53

Lower Santa Clara River Groundwater-Dependent Ecosystems

DUDEK

Groundwater Sustainability Plan for the Oxnard Subbasin

Date: 11/11/2019 Last saved by: mtudor Path: Z:\HydroProjects\Fox_Canyon_GMA\MXD\FINAL_MXD\OXNARD\CH_2_FIGURES\Figure 2-53_Nov2019.mxd

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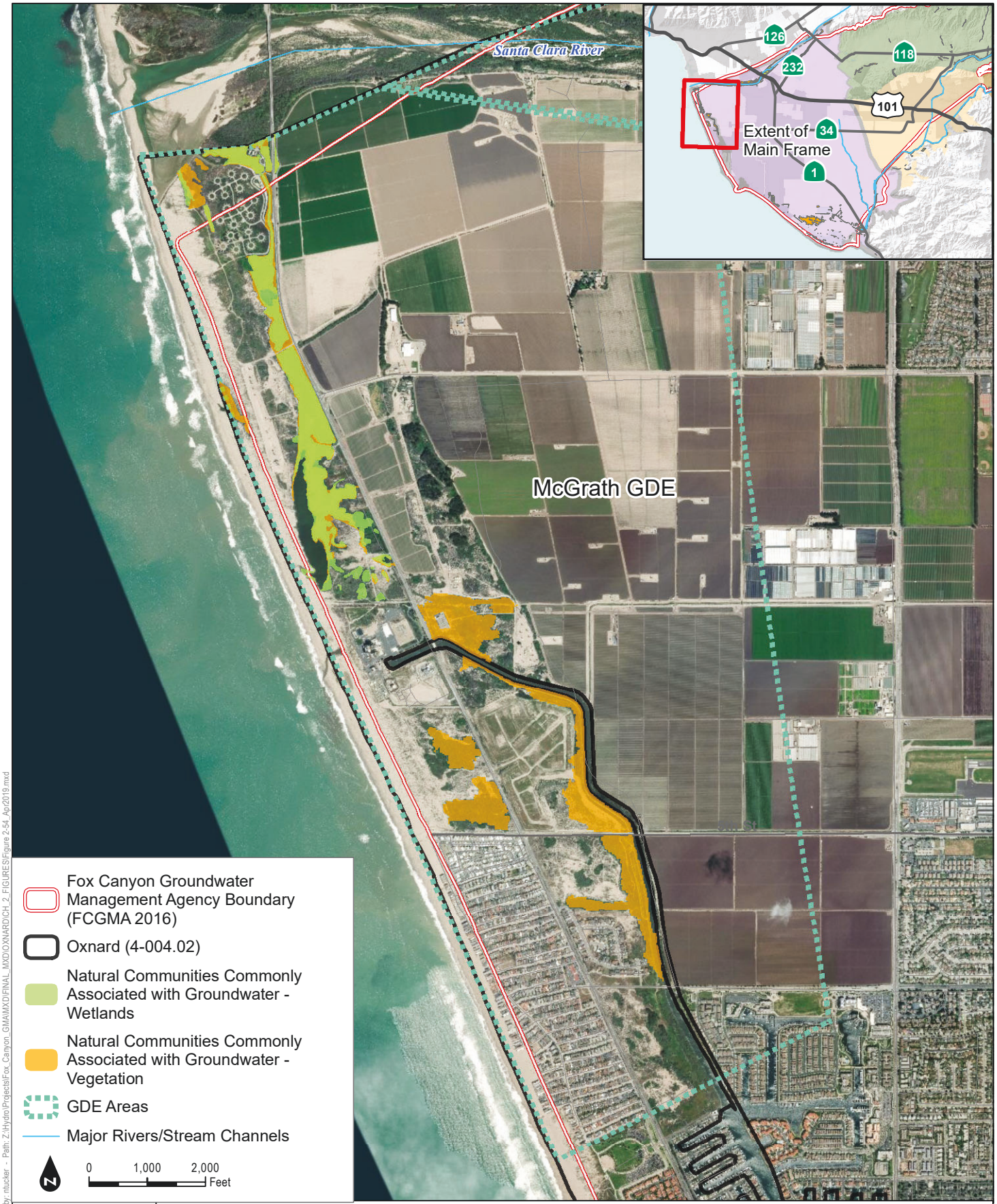

SOURCE: DWR; Santa Barbara County; FCGMA; Esri

FIGURE 2-54

McGrath Lake Groundwater Dependent Ecosystems

Groundwater Sustainability Plan for the Oxnard Subbasin

DUDEK

Date: 4/10/2019 - Last saved by: rtucker - Path: Z:\Hydro\Projects\Fox_Canyon_GMA\MXD\FINAL_MXD\OXNARD\CH_2_FIGURES\Figure 2-54_Apr2019.mxd

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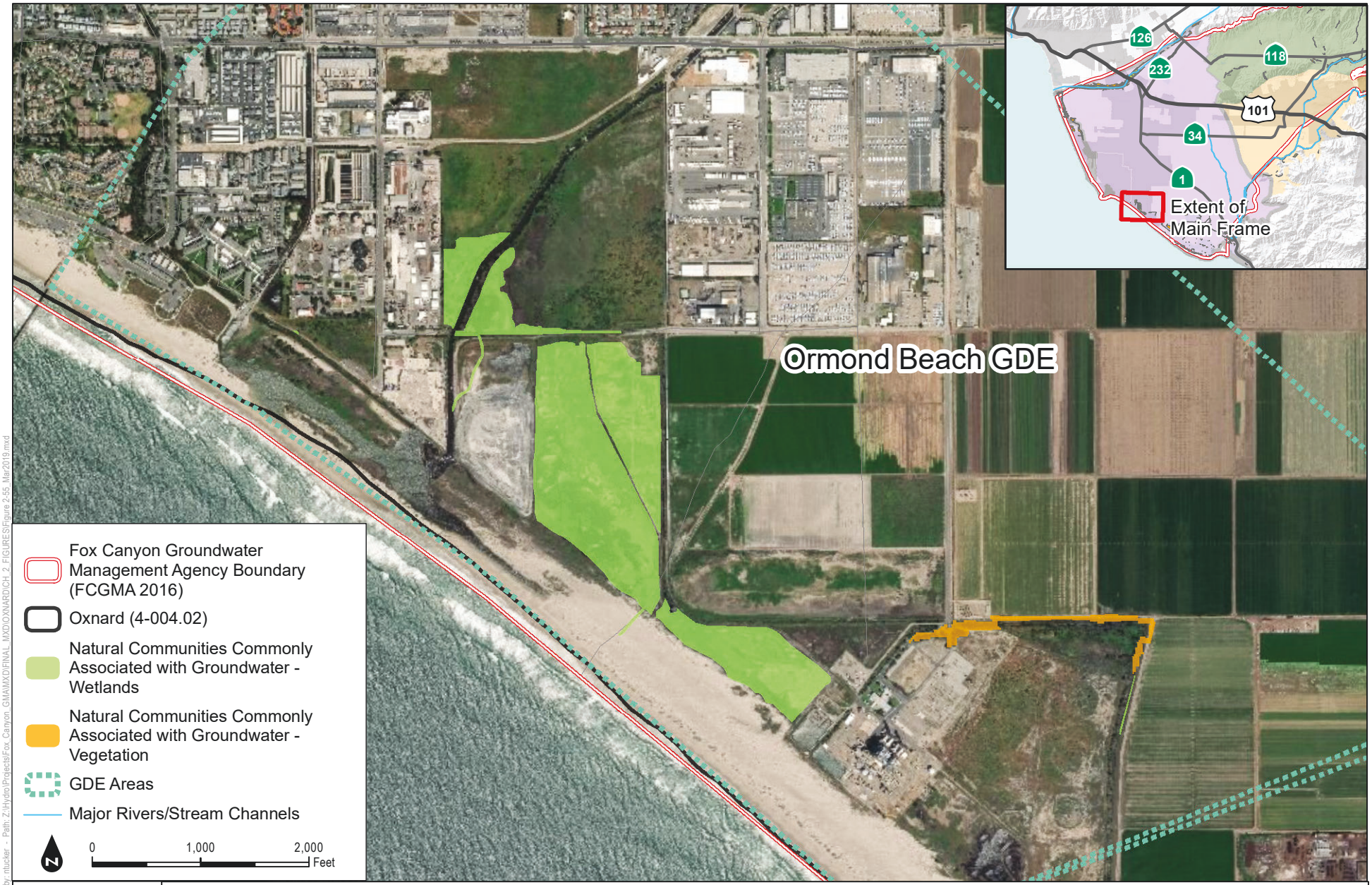

SOURCE: DWR; Santa Barbara County; FCGMA; Esri

FIGURE 2-55

Ormond Beach Groundwater Dependent Ecosystems

Groundwater Sustainability Plan for the Oxnard Subbasin

DUDEK

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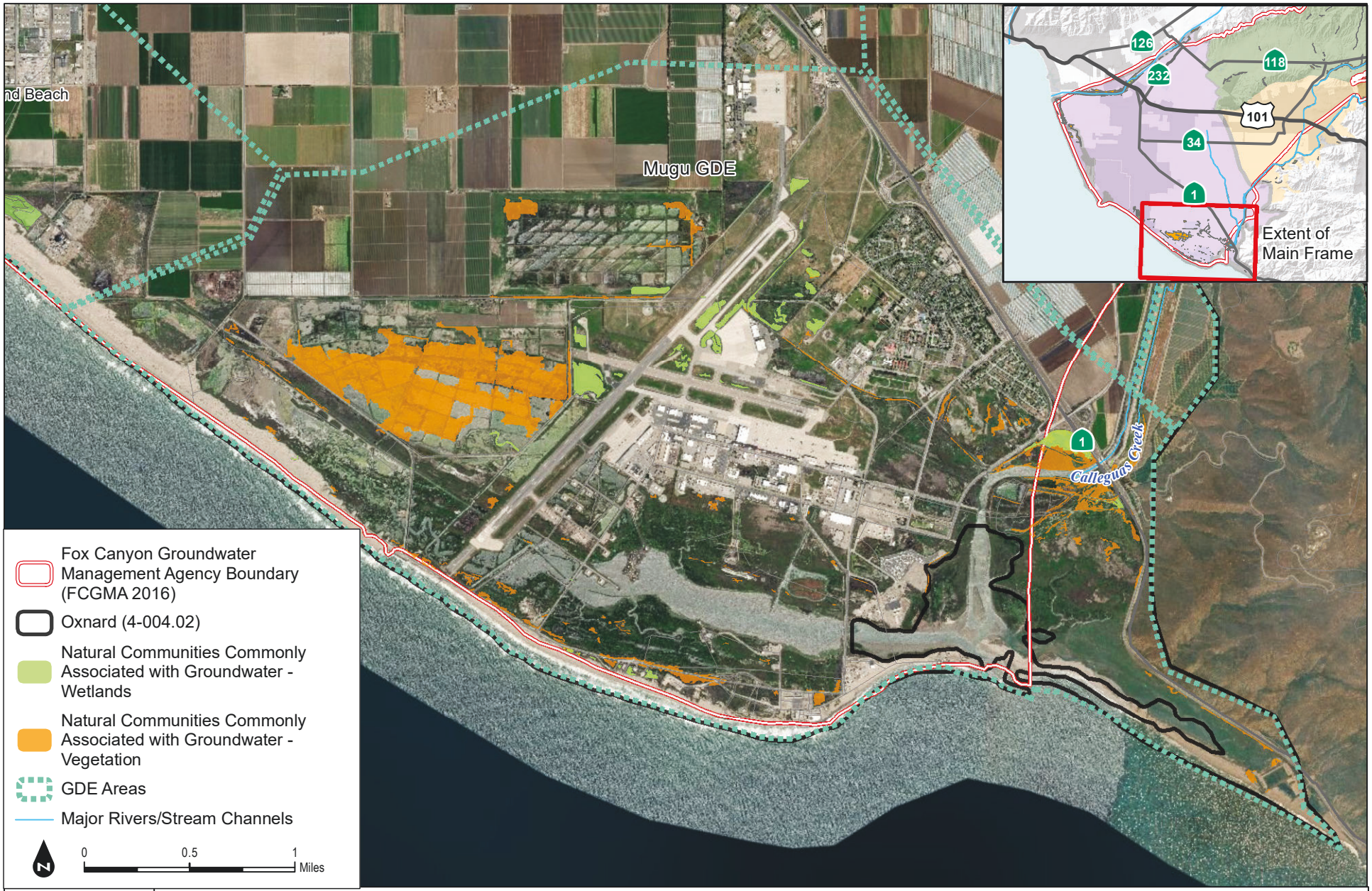

DUDEK

SOURCE: DWR; Santa Barbara County; FCGMA; Esri

FIGURE 2-56

Mugu Lagoon Groundwater Dependent Ecosystems

Groundwater Sustainability Plan for the Oxnard Subbasin

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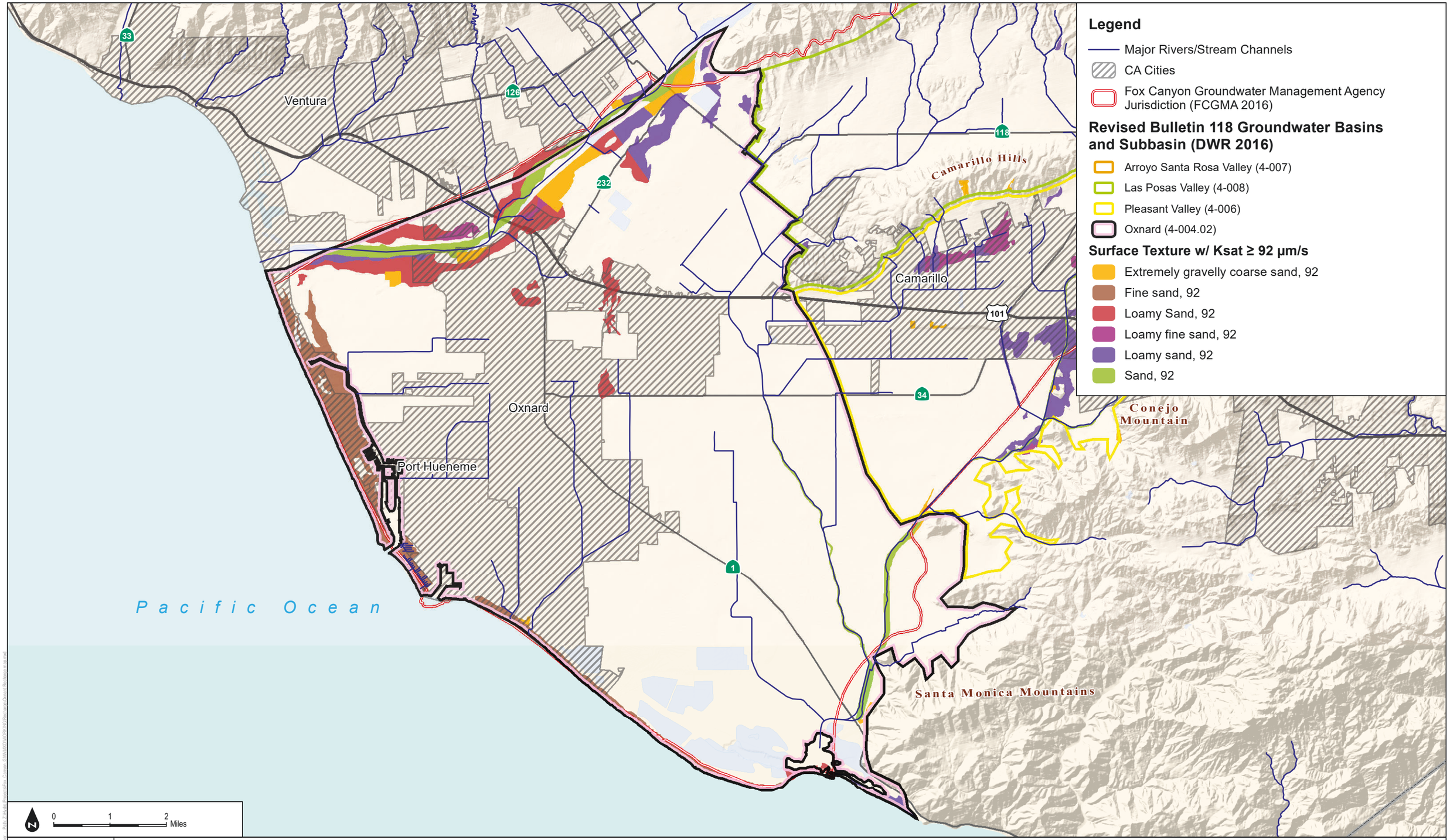

SOURCE: DWR, USGS, NRCS

DUDEK

FIGURE 2-57
Oxnard Potential Recharge Areas

Groundwater Sustainability Plan for the Oxnard Subbasin

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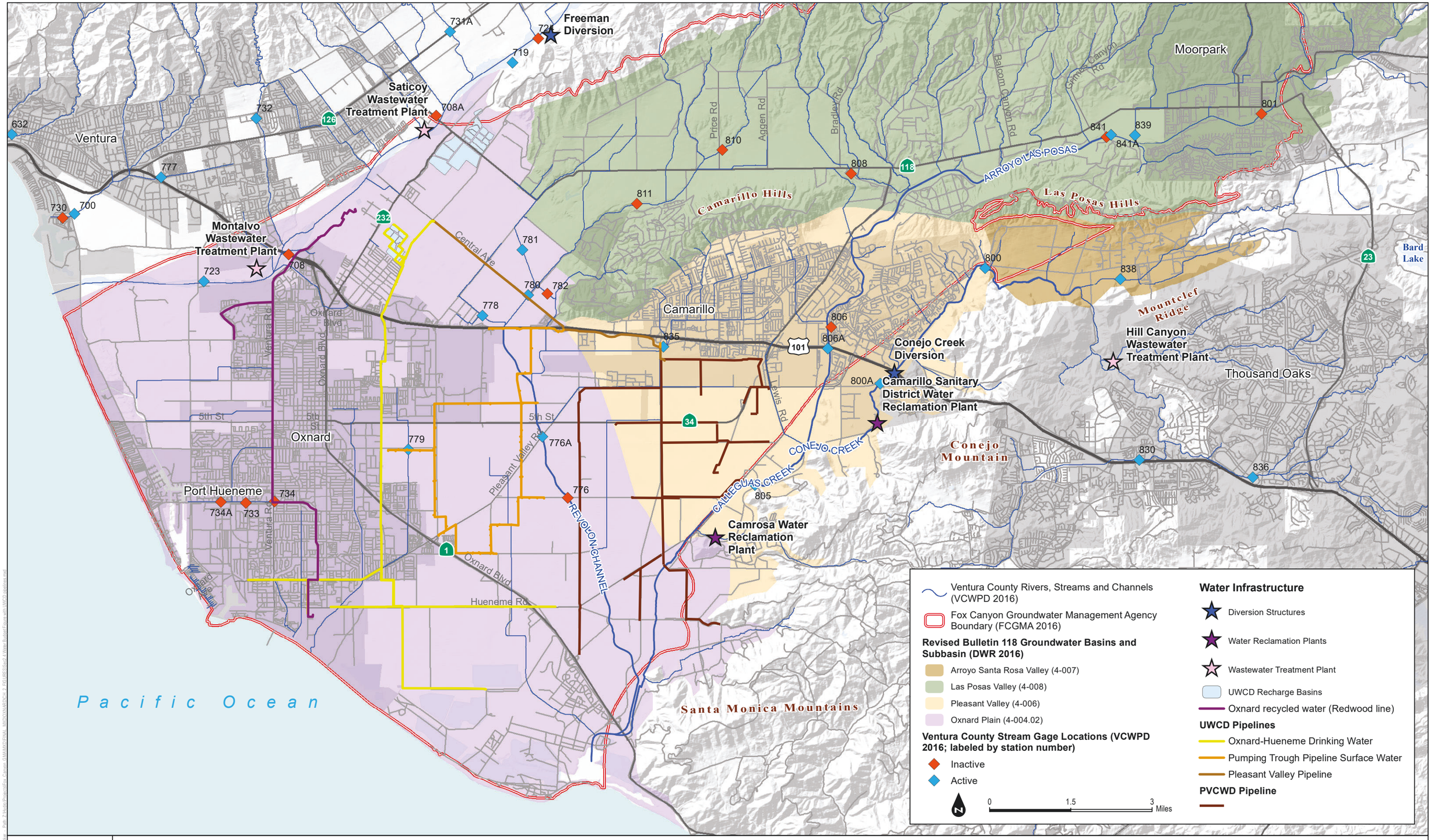

DUDEK

SOURCE: DWR; Ventura County; VCWPD

FIGURE 2-58

Oxnard Subbasin Stream Gauges and Water Infrastructure

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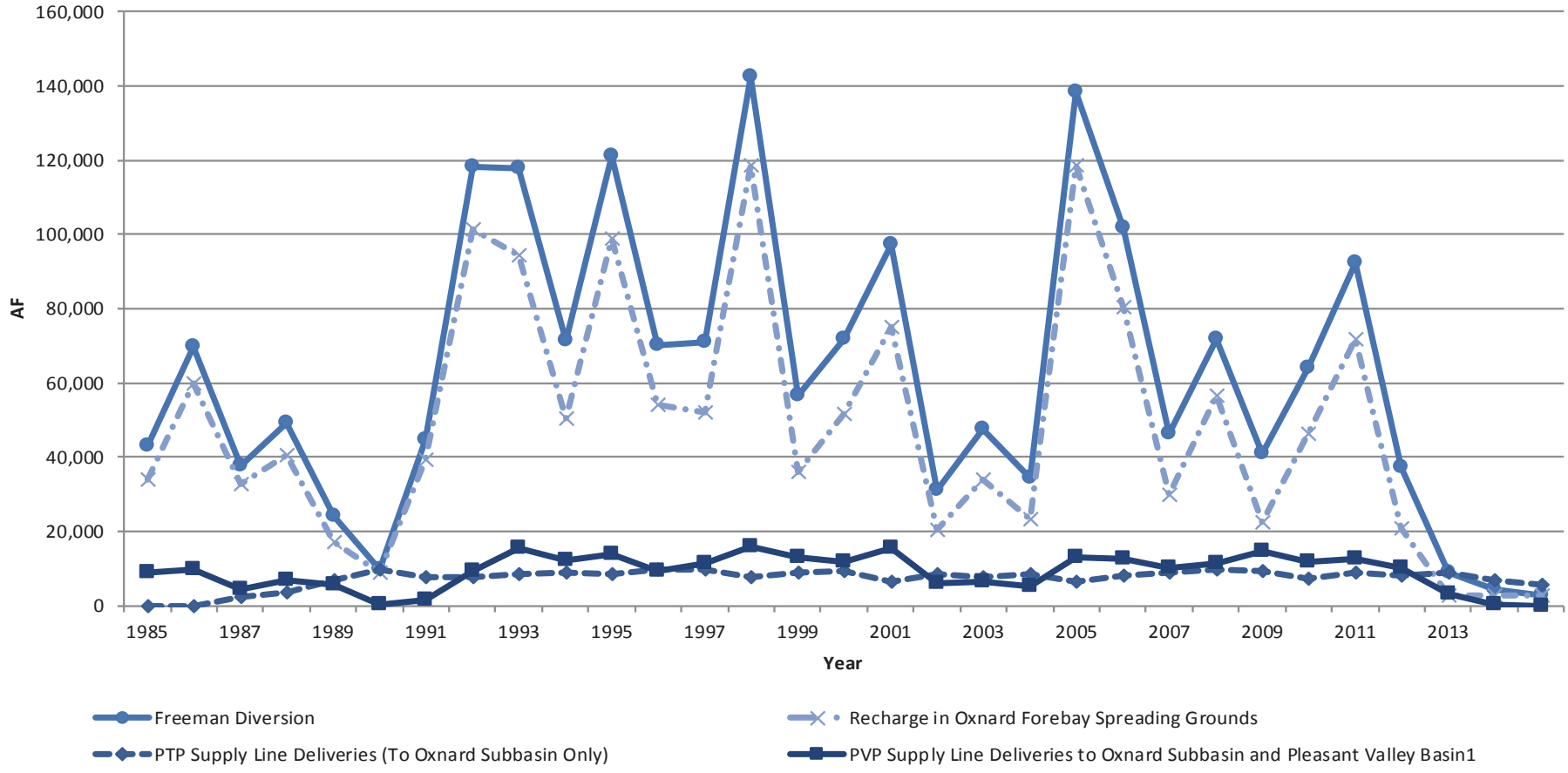

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FIGURE 2-59

Freeman Diversion and Uses in the Oxnard Subbasin

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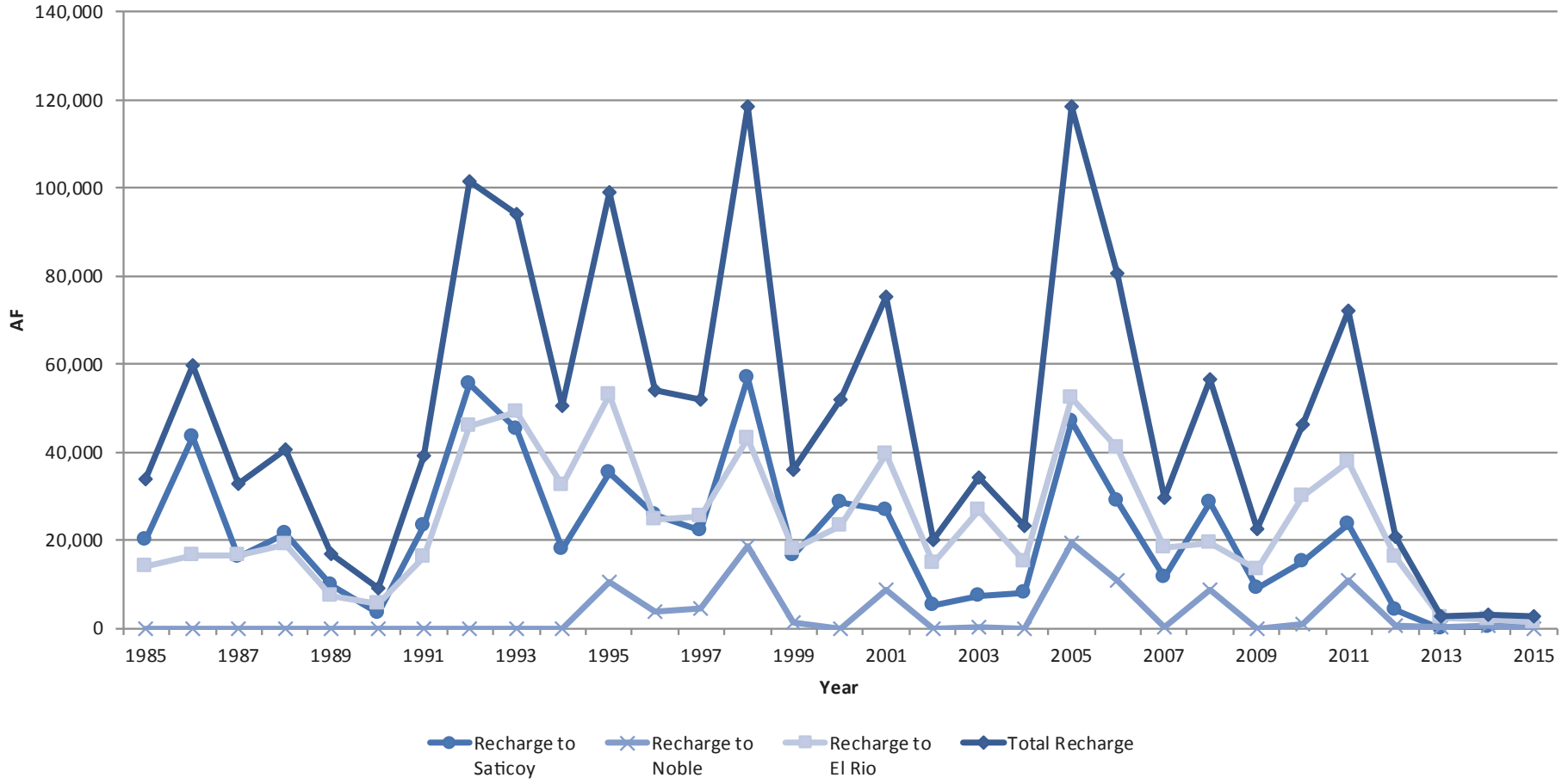

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FIGURE 2-60
UWCD Groundwater Recharge

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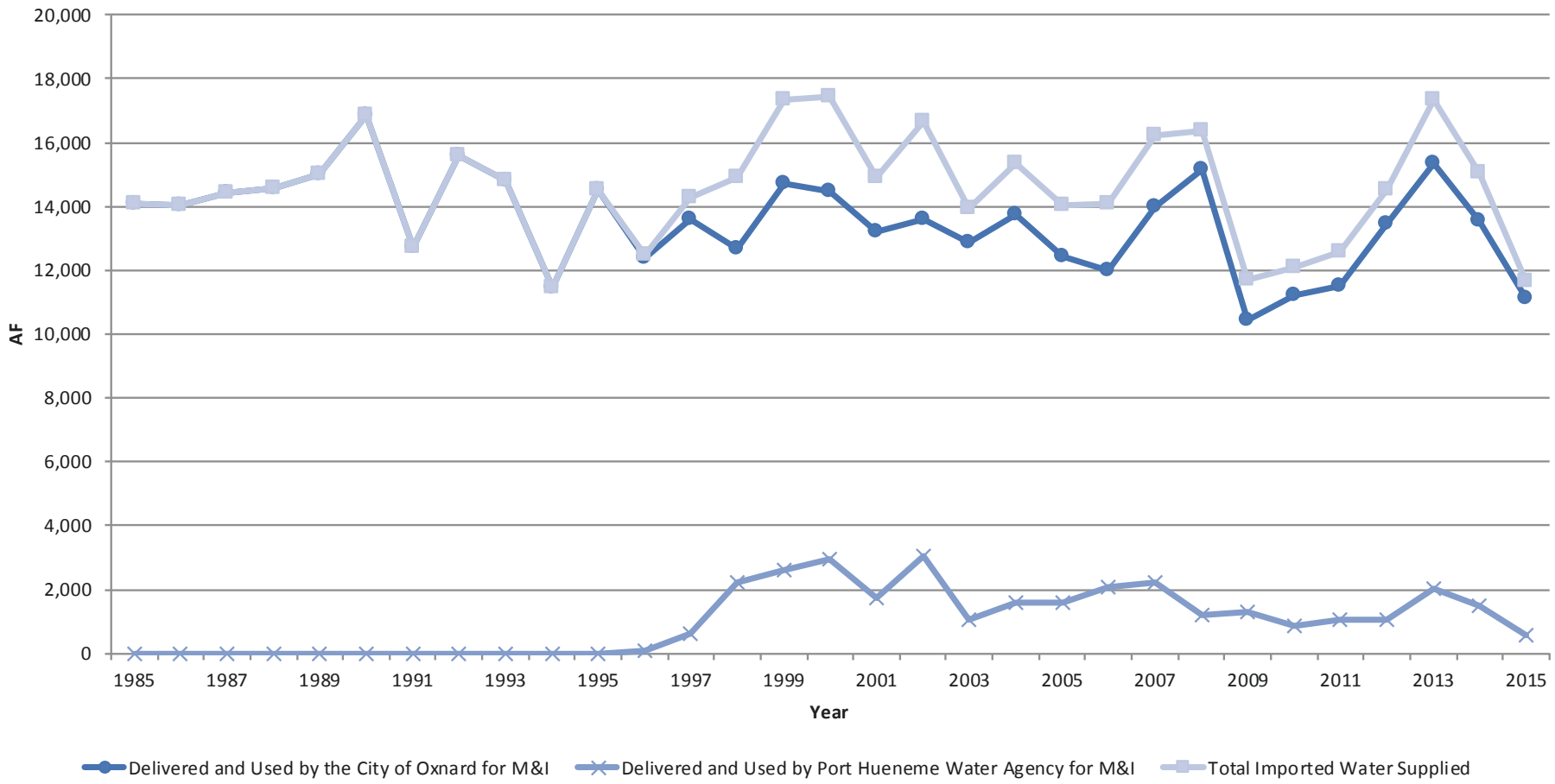

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FIGURE 2-61
Water Deliveries to the PVCWD and UWCD

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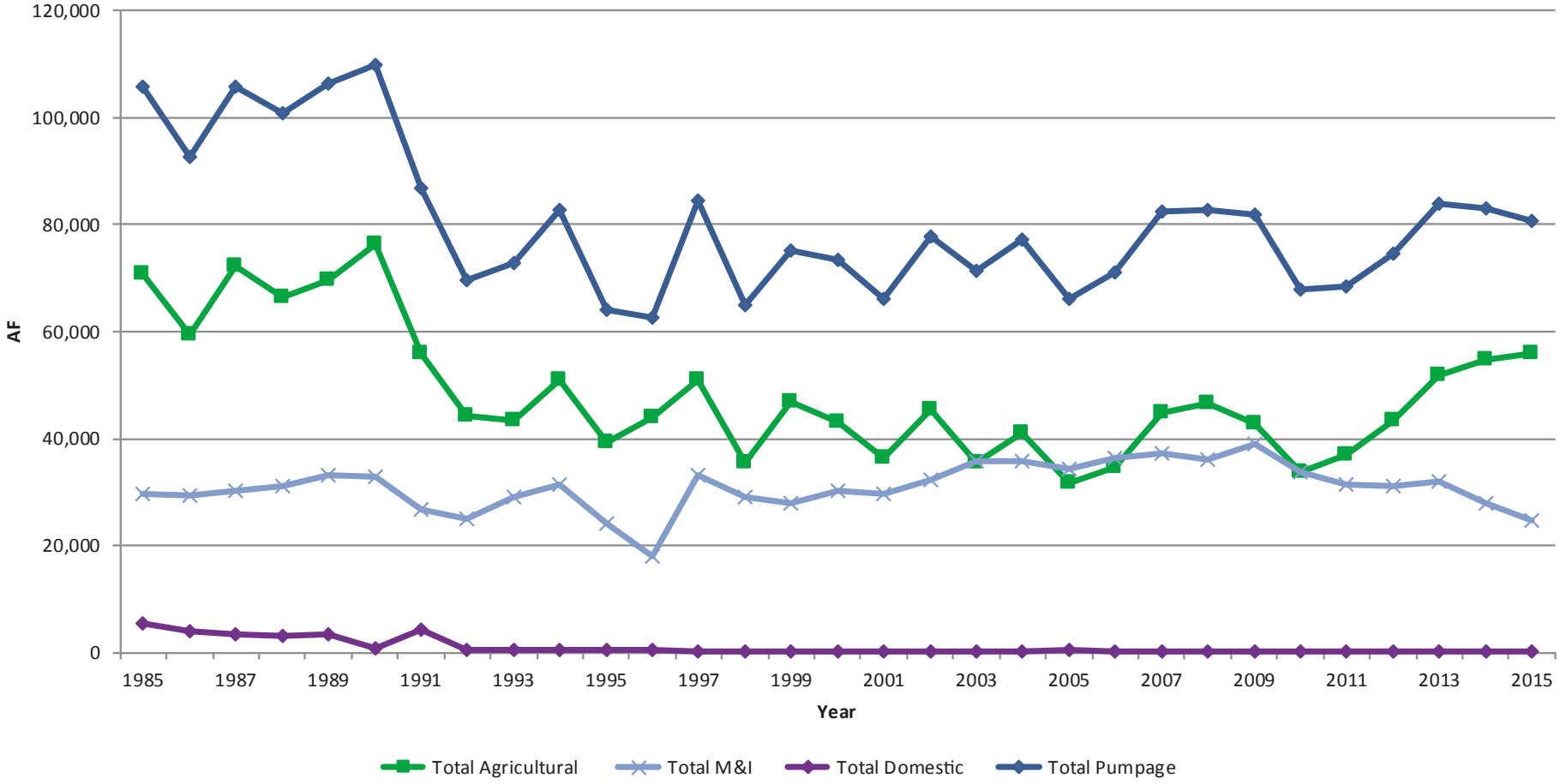

DUDEK

FIGURE 2-62
Groundwater Pumping

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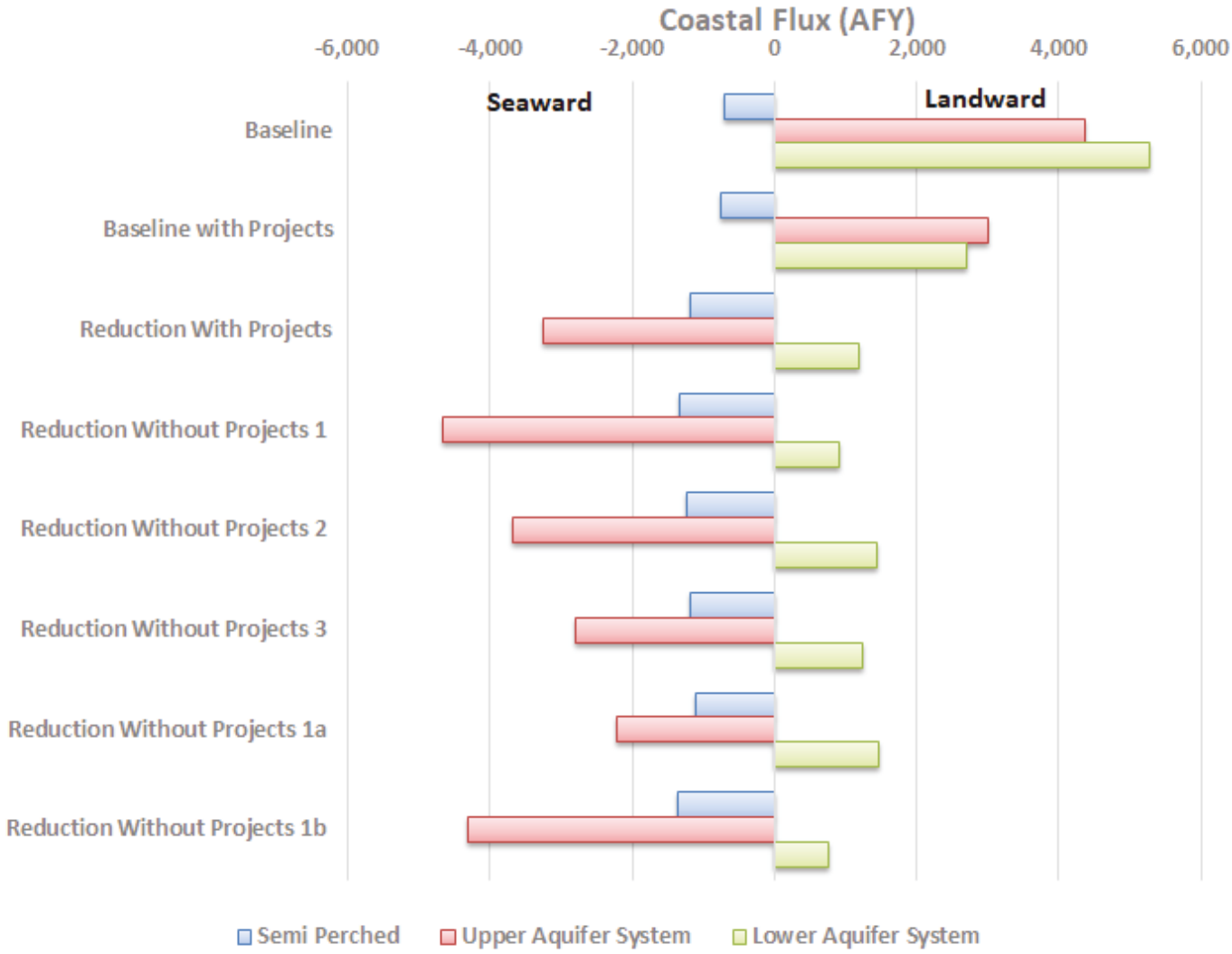

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FIGURE 2-63

Coastal Flux From the UWCD Model Scenarios

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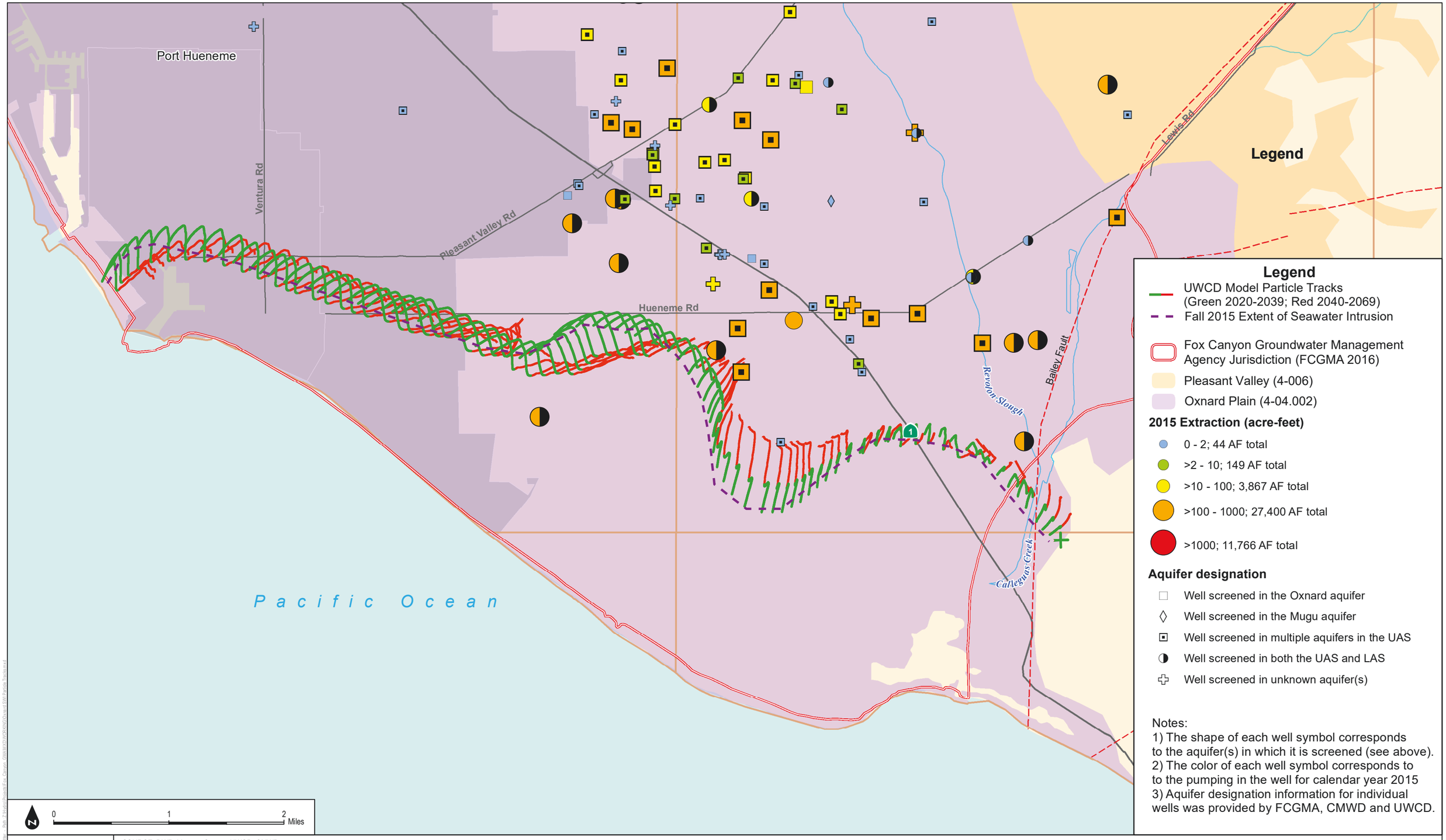

SOURCE: DWR; Ventura County; UWCD; CMWD
1930-1979 Climate Period; 2070 Climate Change Factor

DUDEK

Groundwater Sustainability Plan for the Oxnard Subbasin

Figure 2-64a
UWCD Model Particle Tracks, Oxnard Aquifer, Future Baseline

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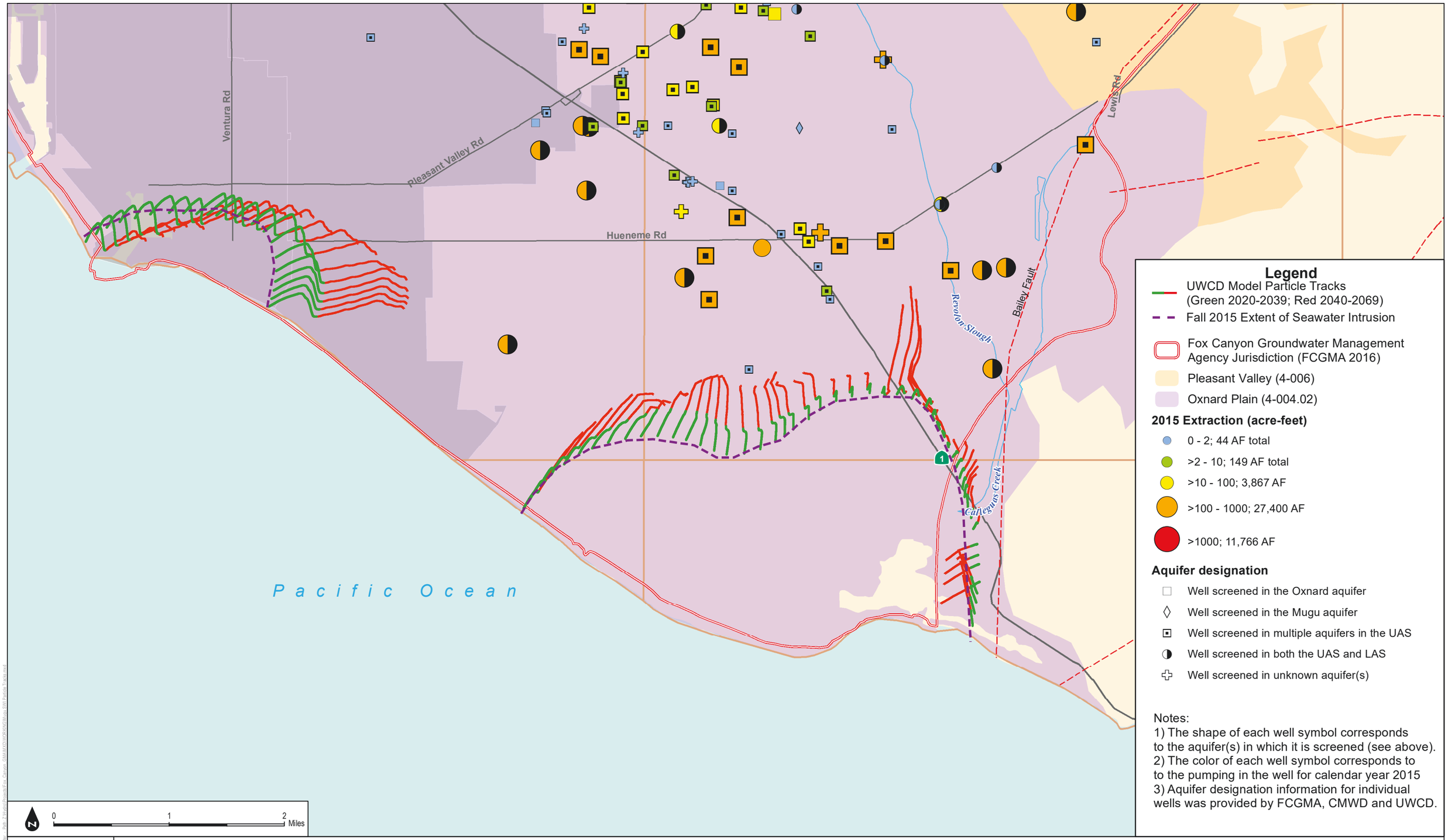

SOURCE: DWR; Ventura County; UWCD; CMWD
Climate Period 1930-1979; Climate Change Factor 2070

DUDEK

Figure 2-64b
UWCD Model Particle Tracks, Mugu Aquifer, Future Baseline

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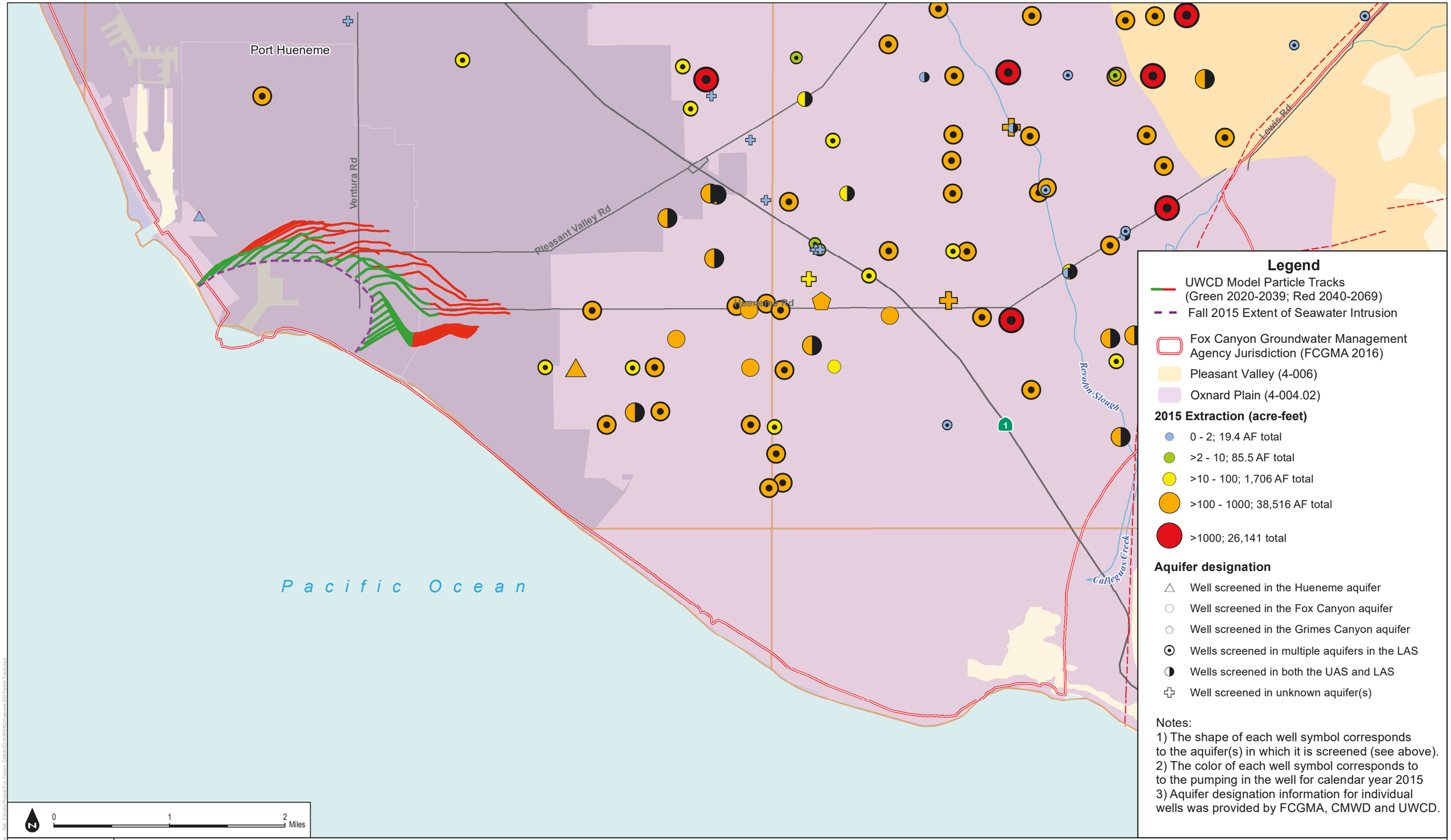

SOURCE: DWR; Ventura County; UWCD; CMWD
Climate Period 1930-1979; Climate Change Factor 2070

DUDEK

Figure 2-64c
UWCD Model Particle Tracks, Hueneme Aquifer, Future Baseline

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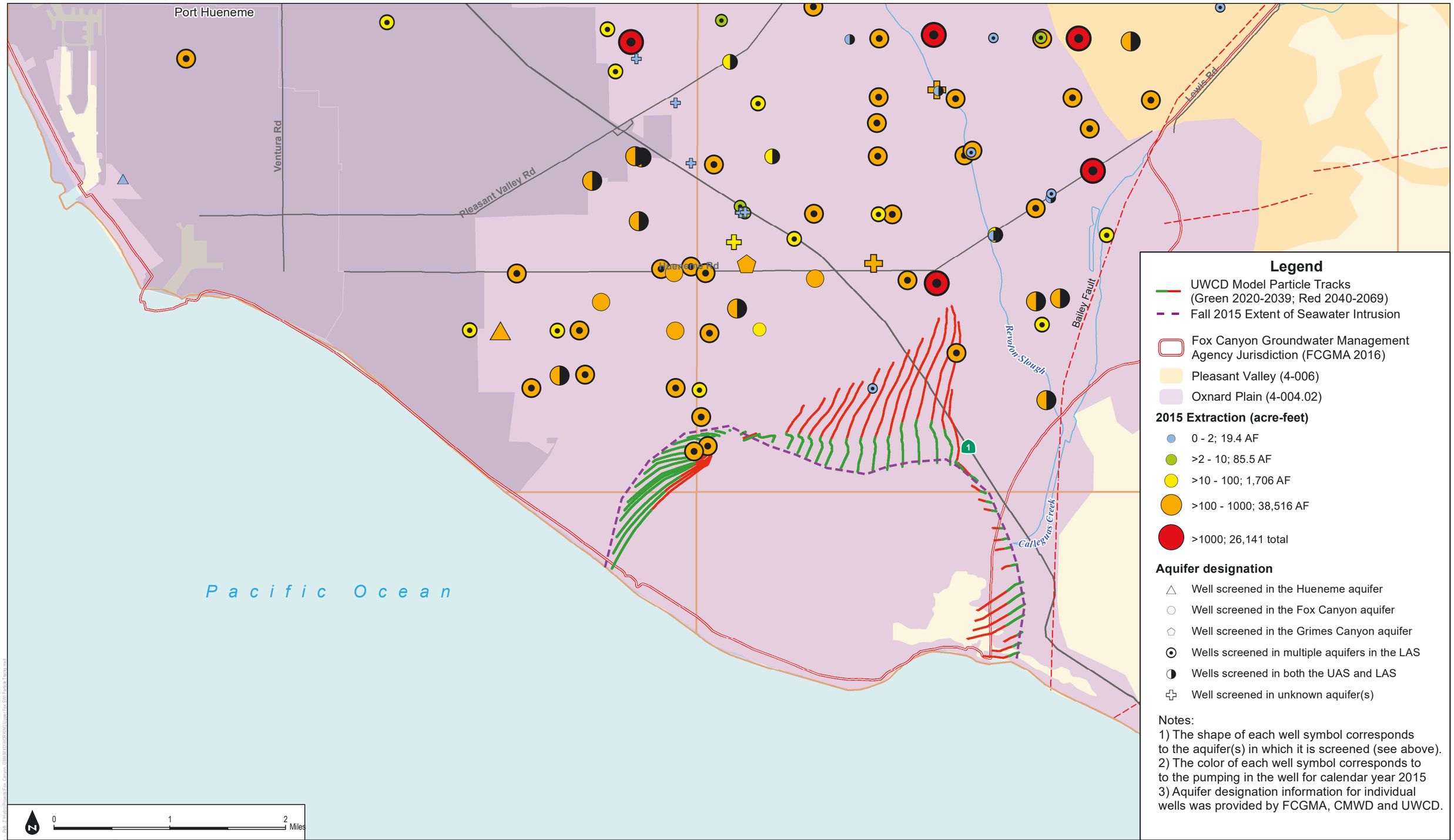

SOURCE: DWR; Ventura County; UWCD; CMWD
1930-1979 Climate Period; 2070 Climate Change Factor

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Groundwater Sustainability Plan for the Oxnard Subbasin

Figure 2-64d
UWCD Model Particle Tracks, Upper Fox Canyon Aquifer, Future Baseline

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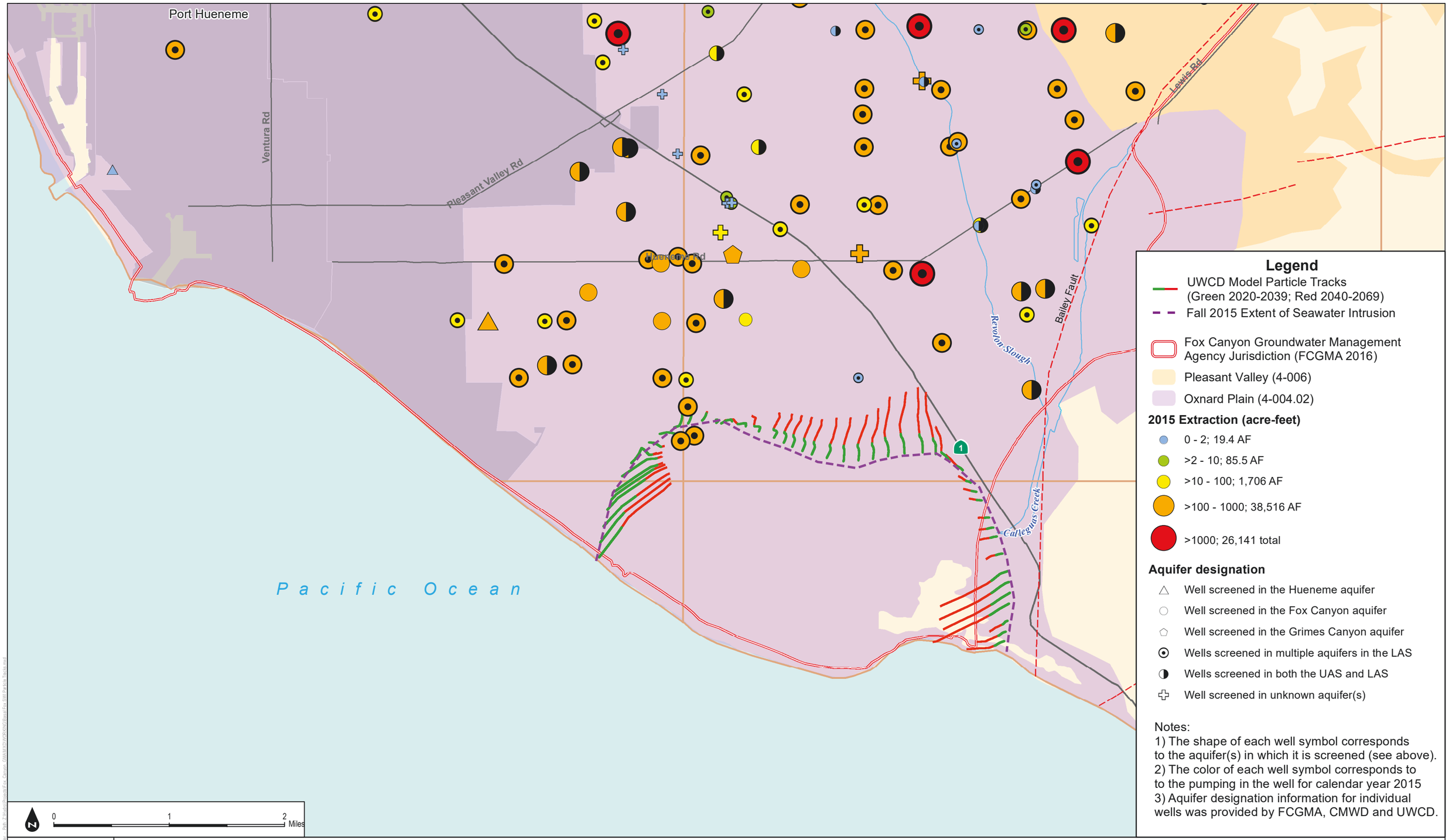

SOURCE: DWR; Ventura County; UWCD; CMWD
1930-1979 Climate Period; 2070 Climate Change Factor

DUDEK

Figure 2-64e
UWCD Model Particle Tracks, Basal Fox Canyon Aquifer, Future Baseline

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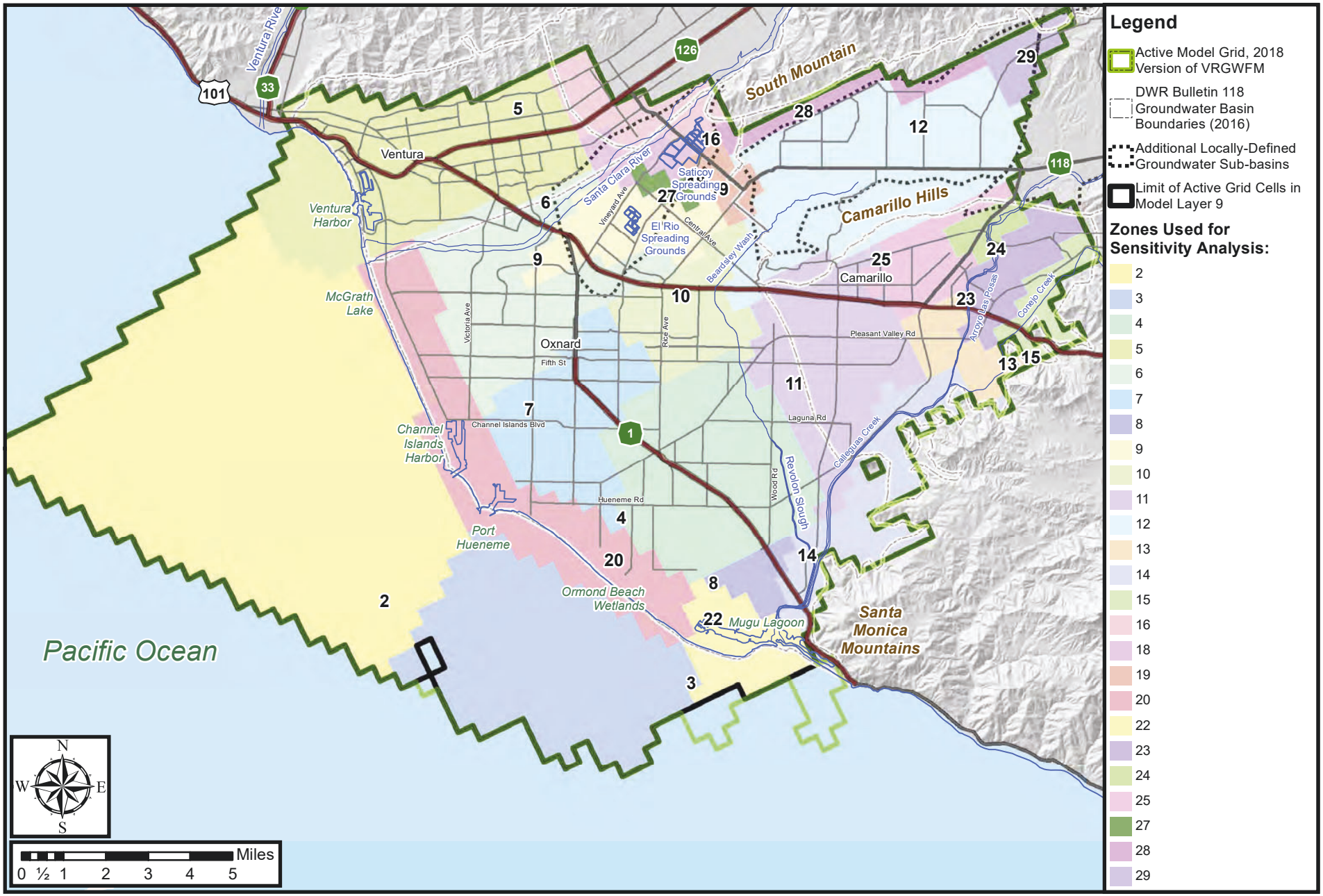

SOURCE: Figure 4-53; UWCD, 2018

DUDEK

FIGURE 2-65

UWCD Model Zones

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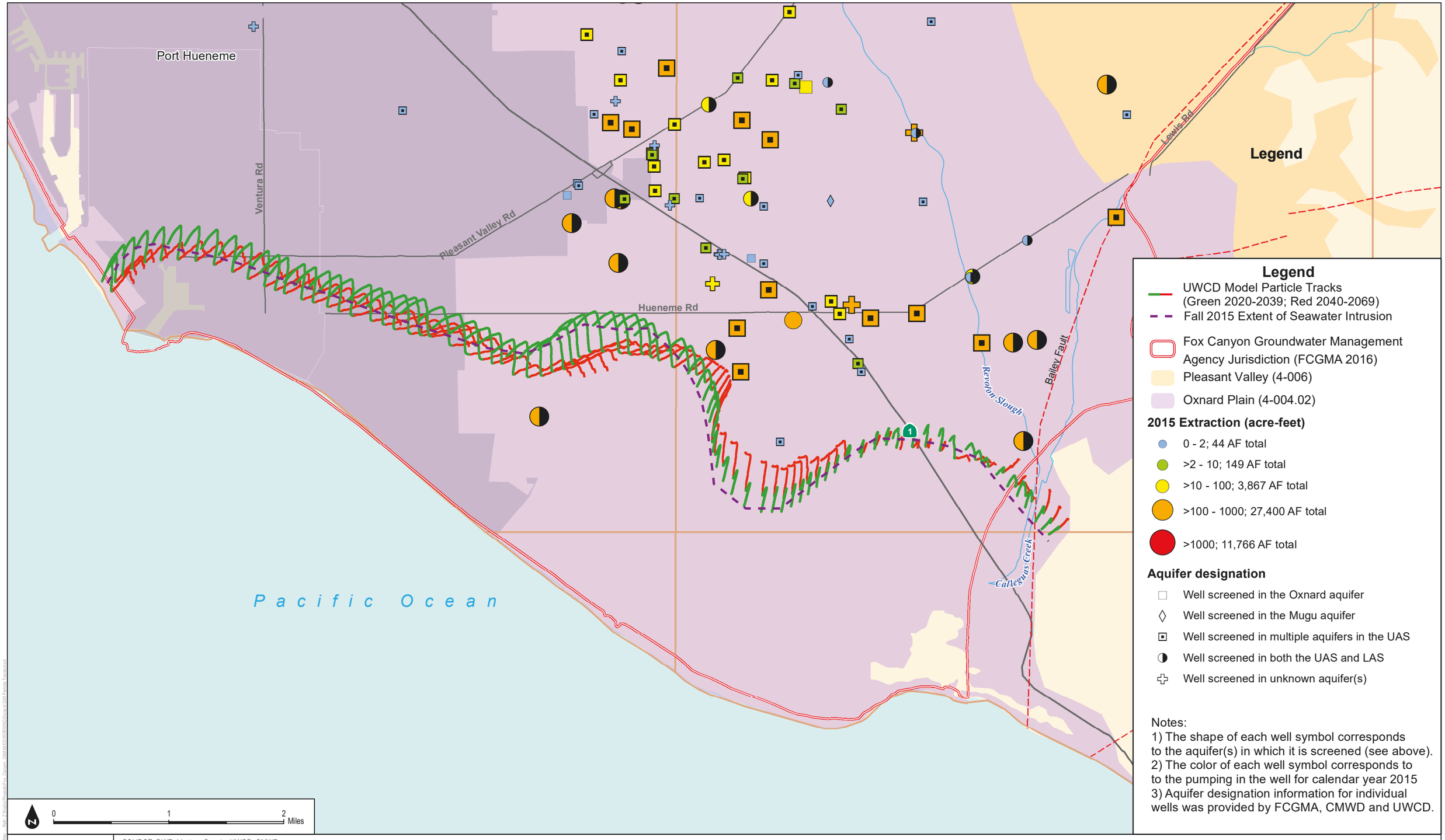

SOURCE: DWR; Ventura County; UWCD; CMWD
1930-1979 Climate Period; 2070 Climate Change Factor

DUDEK

Groundwater Sustainability Plan for the Oxnard Subbasin

Figure 2-66a
UWCD Model Particle Tracks, Oxnard Aquifer, Future Baseline With Projects

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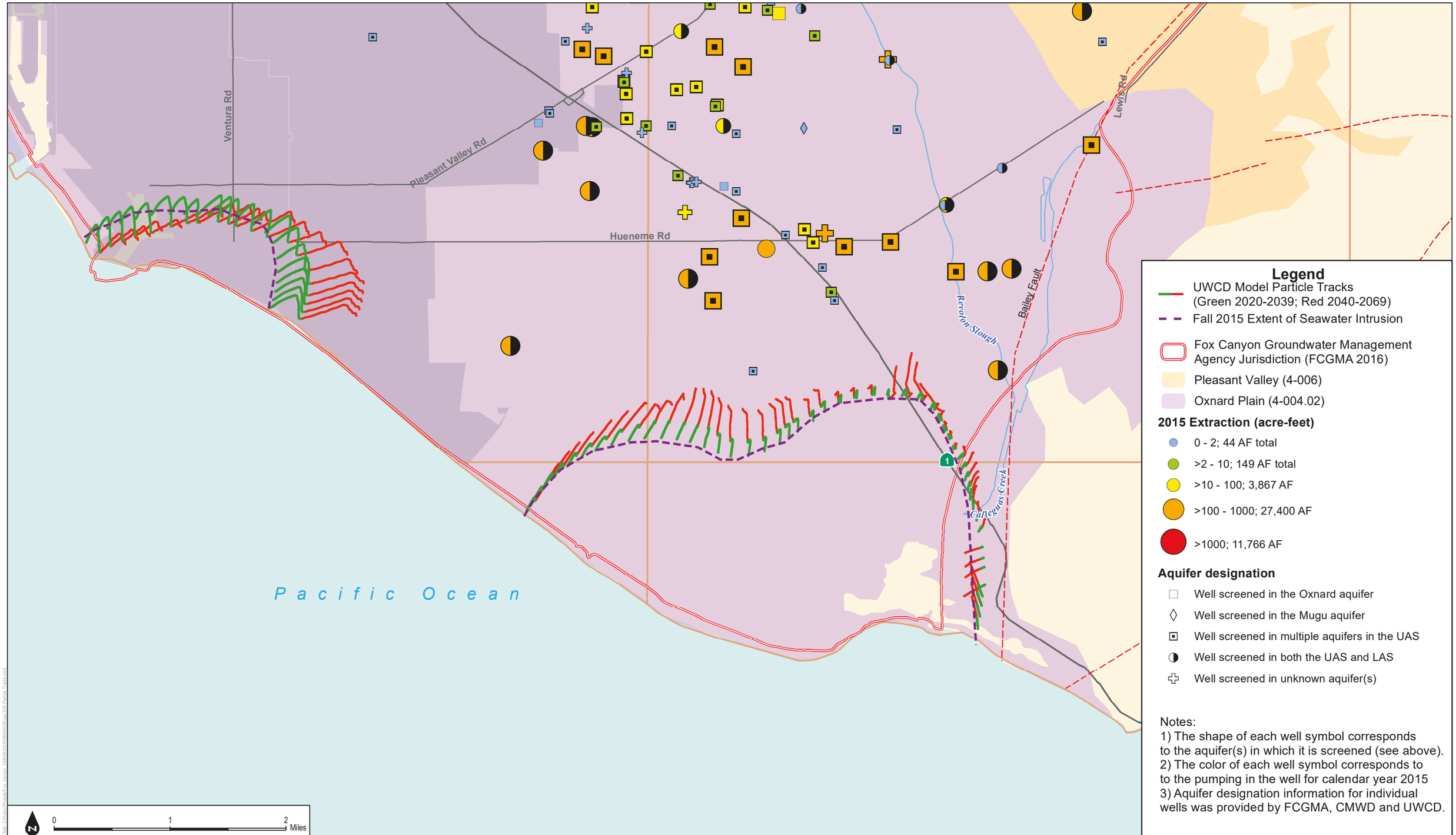

DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD
Climate Period 1930-1979; Climate Change Factor 2070

Figure 2-66b
UWCD Model Particle Tracks, Mugu Aquifer, Future Baseline With Projects

Groundwater Sustainability Plan for the Oxnard Subbasin

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Port Hueneme
Ventura Rd
Pleasant Valley Rd
Hueneme Rd
Lewis Rd
Revolon Slough
Calleguas Creek
1
Pacific Ocean

Legend

UWCD Model Particle Tracks
(Green 2020-2039; Red 2040-2069)
Fall 2015 Extent of Seawater Intrusion

Fox Canyon Groundwater Management Agency Jurisdiction (FCGMA 2016)
Pleasant Valley (4-006)
Oxnard Plain (4-004.02)

2015 Extraction (acre-feet)

- 0 - 2; 19.4 AF total
- >2 - 10; 85.5 AF total
- >10 - 100; 1,706 AF total
- >100 - 1000; 38,516 AF total
- >1000; 26,141 total

Aquifer designation

- Well screened in the Hueneme aquifer
- Well screened in the Fox Canyon aquifer
- Well screened in the Grimes Canyon aquifer
- Wells screened in multiple aquifers in the LAS
- Wells screened in both the UAS and LAS
- Well screened in unknown aquifer(s)

Notes:
1) The shape of each well symbol corresponds to the aquifer(s) in which it is screened (see above).
2) The color of each well symbol corresponds to to the pumping in the well for calendar year 2015
3) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

N
0 1 2 Miles

SOURCE: DWR; Ventura County; UWCD; CMWD
Climate Period 1930-1979; Climate Change Factor 2070

DUDEK

Figure 2-66c
UWCD Model Particle Tracks, Hueneme Aquifer, Future Baseline With Projects

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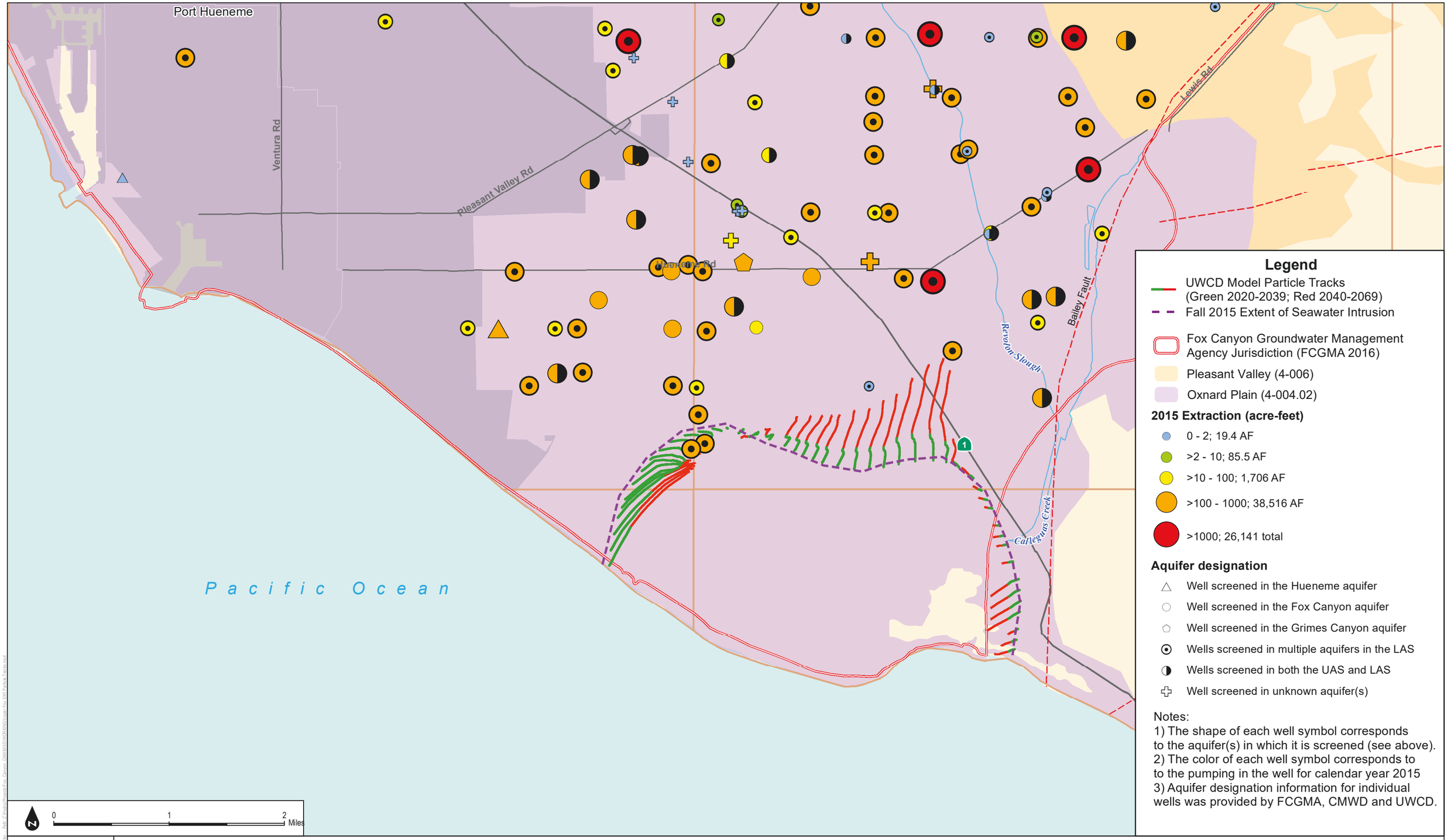

SOURCE: DWR; Ventura County; UWCD; CMWD
1930-1979 Climate Period; 2070 Climate Change Factor

D R A F T

DUDEK

FIGURE 2-66d
UWCD Model Particle Tracks, Upper Fox Canyon Aquifer, Future Baseline with Projects

Groundwater Sustainability Plan for the Oxnard Subbasin

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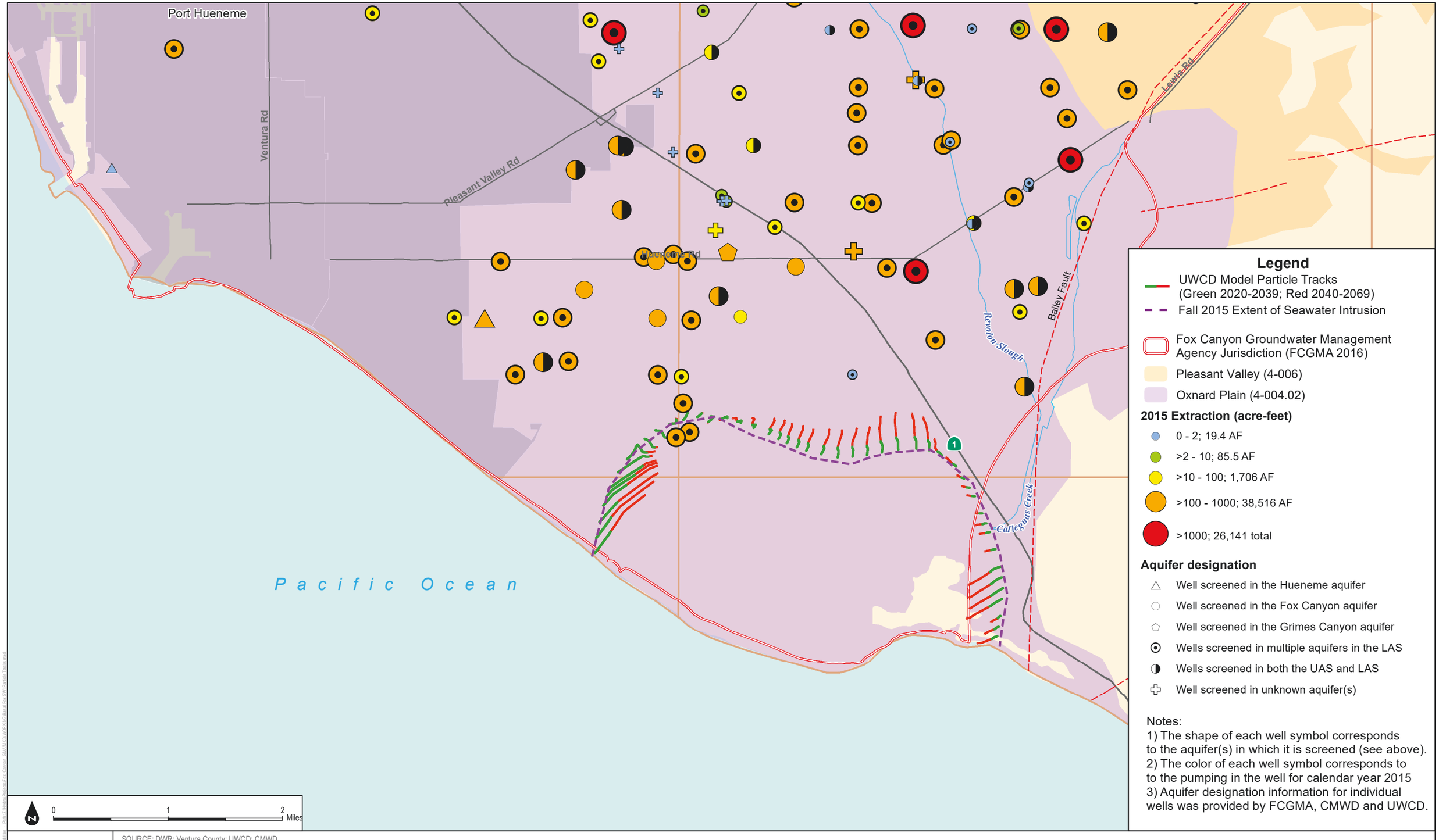

SOURCE: DWR; Ventura County; UWCD; CMWD
1930-1979 Climate Period; 2070 Climate Change Factor

DUDEK

Figure 2-66e
UWCD Model Particle Tracks, Basal Fox Canyon Aquifer, Future Baseline with Projects

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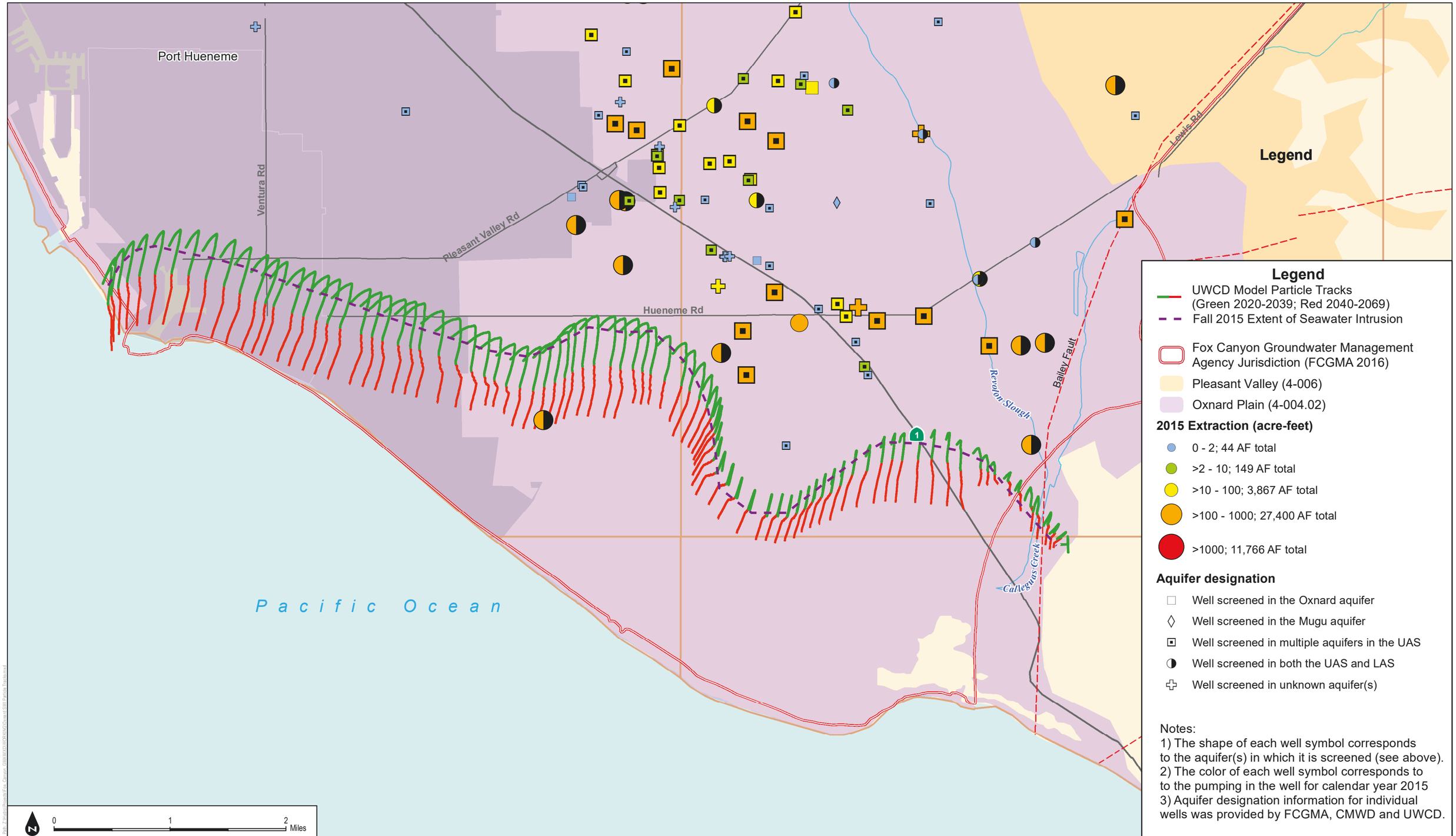

SOURCE: DWR; Ventura County; UWCD; CMWD
1930-1979 Climate Period; 2070 Climate Change Factor

DUDEK

Figure 2-67a
UWCD Model Particle Tracks, Oxnard Aquifer, Reduction with Projects Simulation - 26,500 AFY Groundwater Production in the UAS

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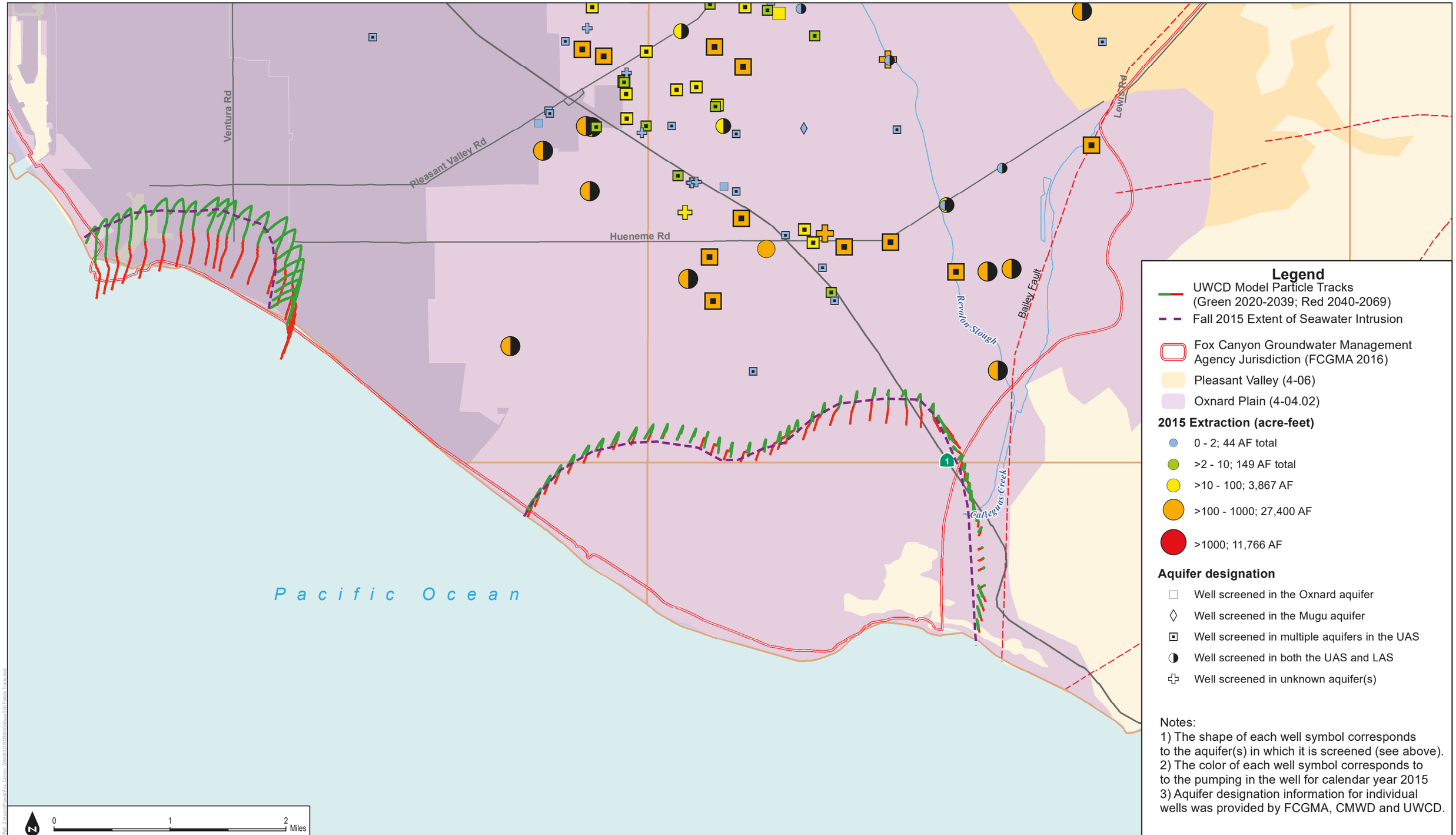

DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD
Climate Period 1930-1979; Climate Change Factor 2070

Figure 2-67b
UWCD Model Particle Tracks, Mugu Aquifer, Reduction with Projects Simulation - 26,500 AFY Groundwater Production in the UAS

Groundwater Sustainability Plan for the Oxnard Subbasin

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Port Hueneme

Ventura Rd

Pleasant Valley Rd

Hueneme Rd

Lewis Rd

Revolon Slough

Calleguas Creek

1

Pacific Ocean

Legend

UWCD Model Particle Tracks
(Green 2020-2039; Red 2040-2069)

Fall 2015 Extent of Seawater Intrusion

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2) The color of each well symbol corresponds to to the pumping in the well for calendar year 2015
3) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

N

0 1 2 Miles

SOURCE: DWR; Ventura County; UWCD; CMWD
Climate Period 1930-1979; Climate Change Factor 2070

DUDEK

Figure 2-67c
UWCD Model Particle Tracks, Hueneme Aquifer, Reduction with Projects Simulation - 12,800 AFY Groundwater Production in the LAS

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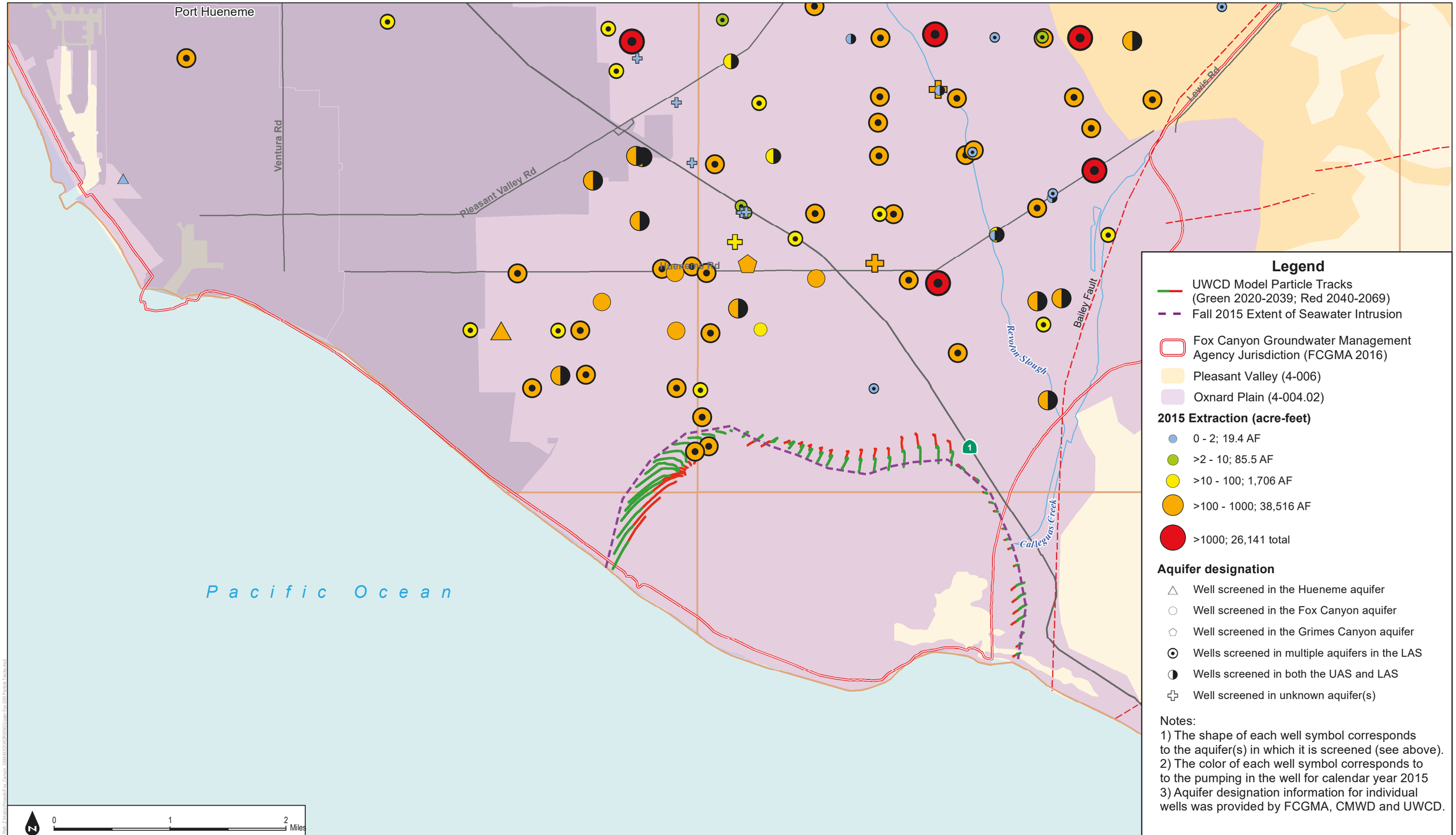

SOURCE: DWR; Ventura County; UWCD; CMWD
1930-1979 Climate Period; 2070 Climate Change Factor

DUDEK

Figure 2-67d
UWCD Model Particle Tracks, Upper Fox Canyon Aquifer, Reduction with Projects Simulation - 12,800 AFY Groundwater Production in the LAS

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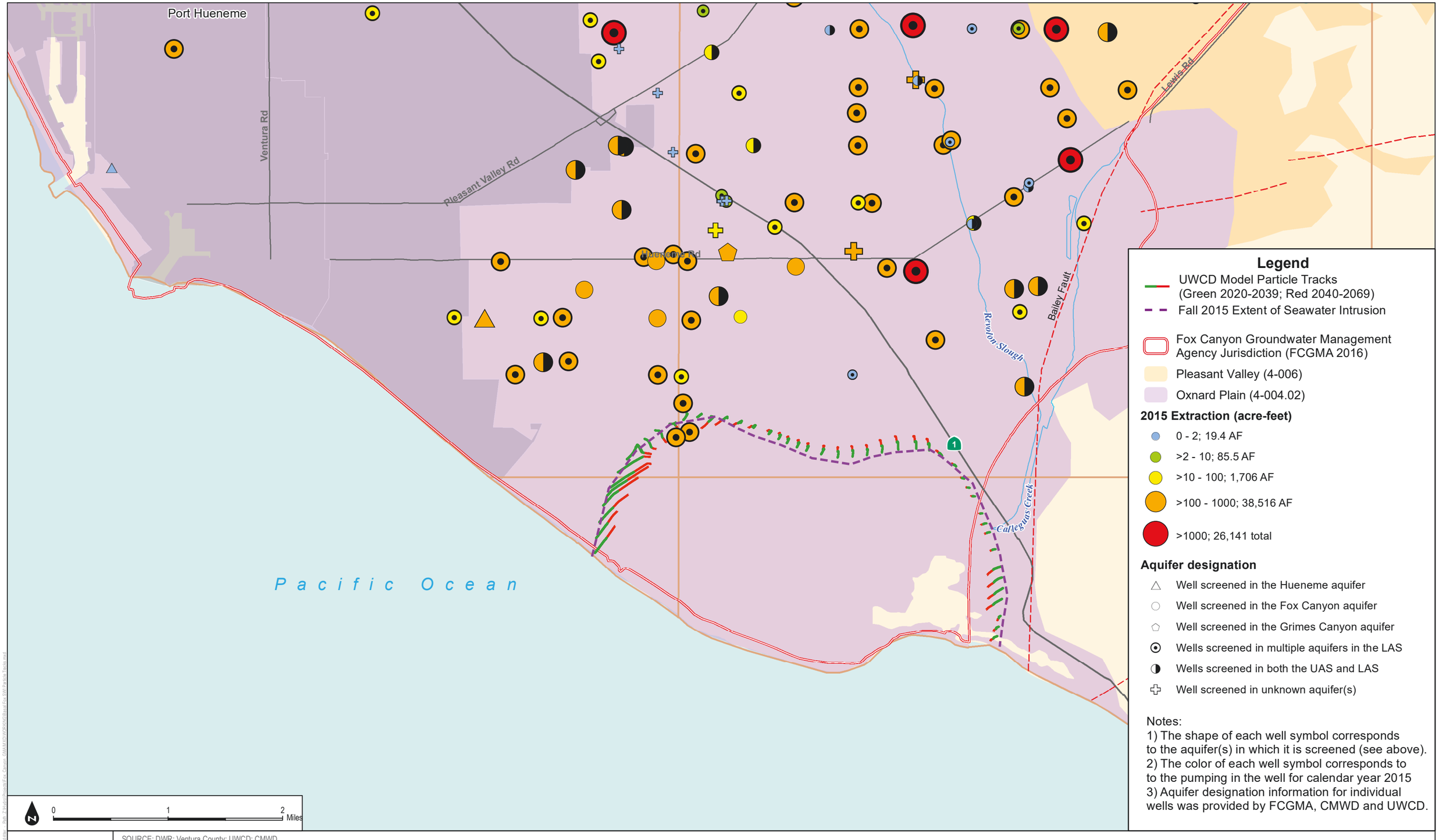

SOURCE: DWR; Ventura County; UWCD; CMWD
1930-1979 Climate Period; 2070 Climate Change Factor

DUDEK

Figure 2-67e
UWCD Model Particle Tracks, Basal Fox Canyon Aquifer, Reduction with Projects Simulation - 12,800 AFY Groundwater Production in the LAS

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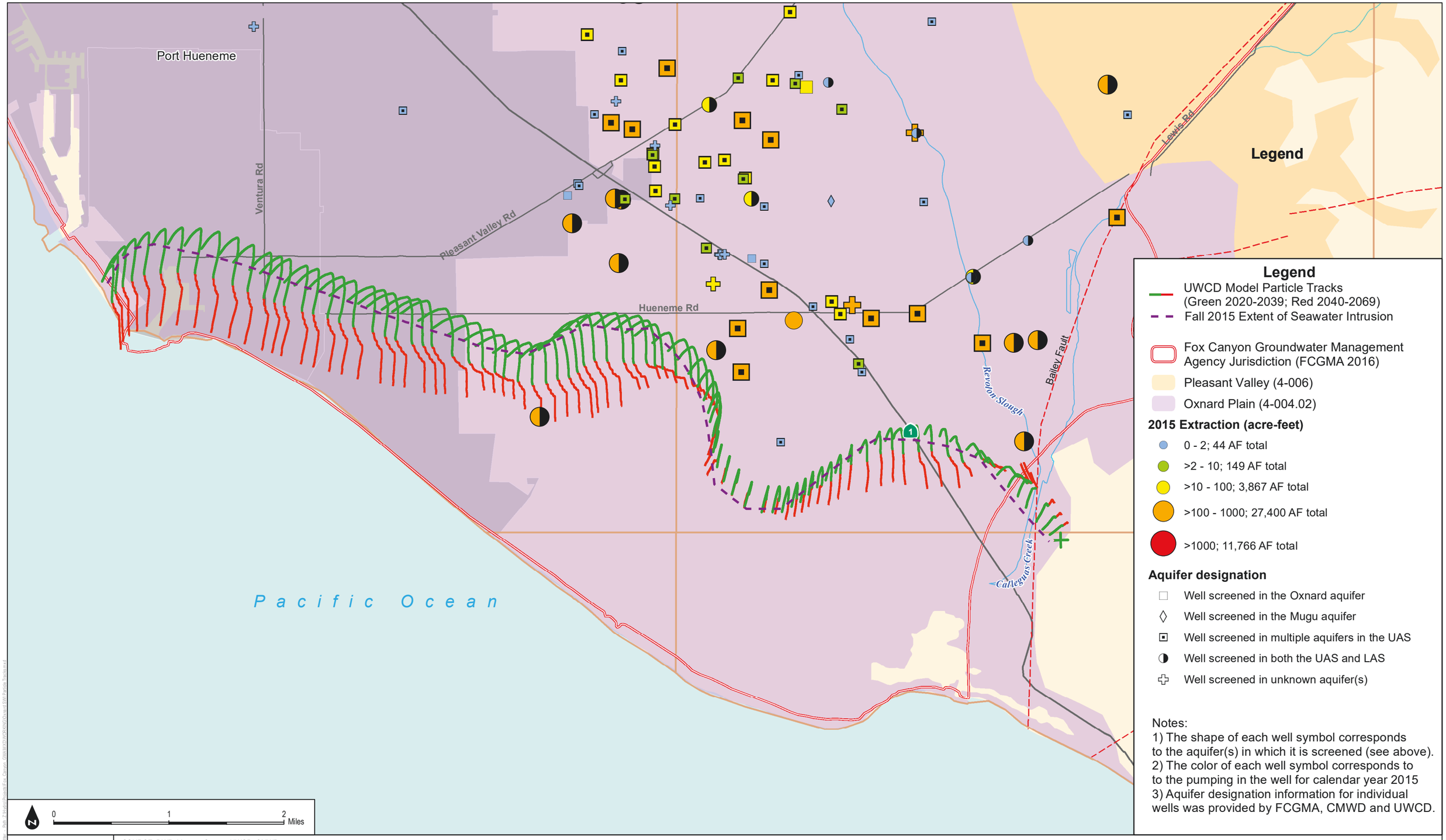

SOURCE: DWR; Ventura County; UWCD; CMWD
1930-1979 Climate Period; 2070 Climate Change Factor

DUDEK

Groundwater Sustainability Plan for the Oxnard Subbasin

Figure 2-68a
UWCD Model Particle Tracks, Oxnard Aquifer, Reduction Without Projects Simulation 1 - 27,200 AFY Groundwater Production in the UAS

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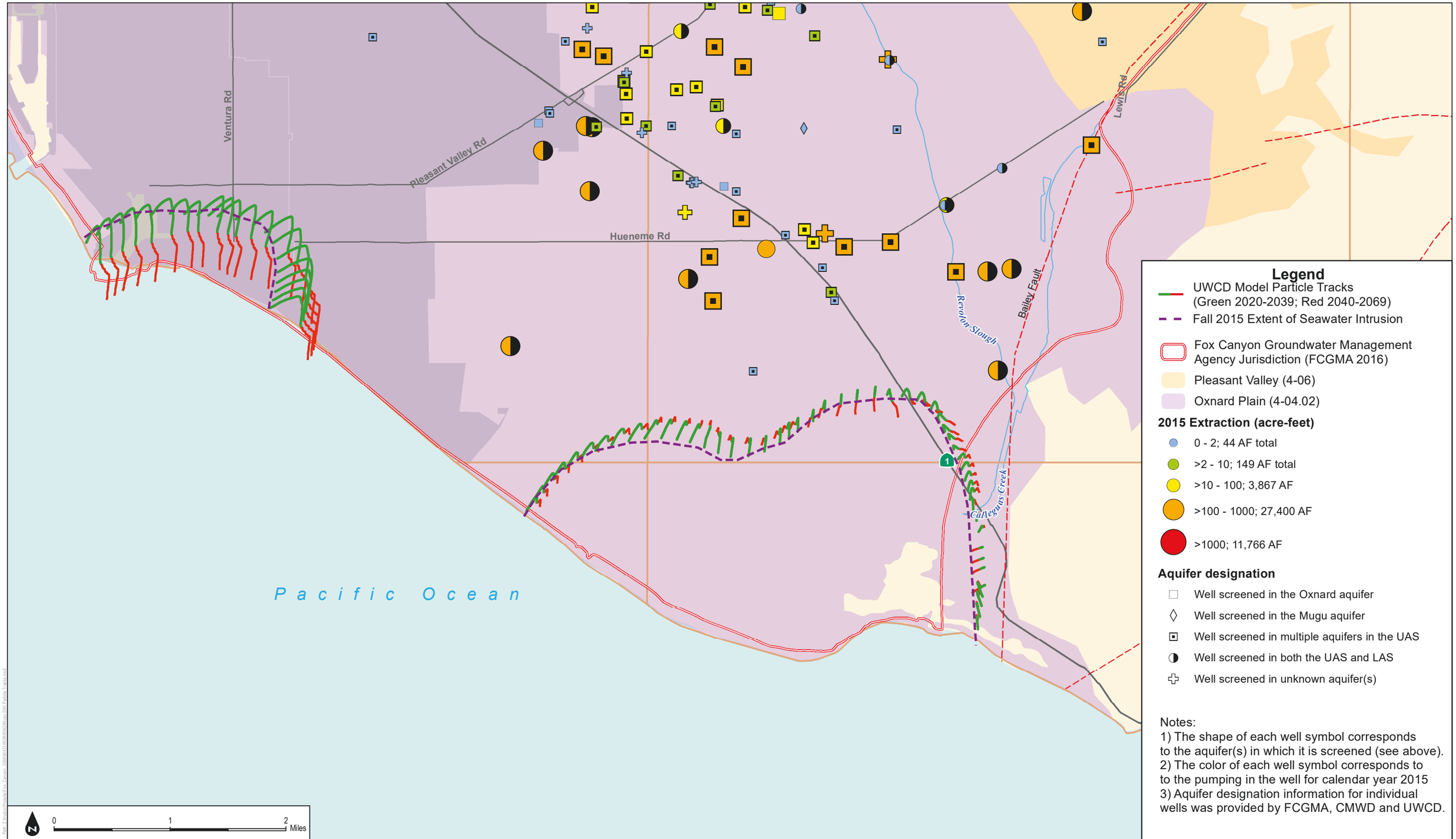

SOURCE: DWR; Ventura County; UWCD; CMWD
Climate Period 1930-1979; Climate Change Factor 2070

DUDEK

Figure 2-68b
UWCD Model Particle Tracks, Mugu Aquifer, Reduction Without Projects Simulation 1 - 27,200 AFY Groundwater Production in the UAS

Groundwater Sustainability Plan for the Oxnard Subbasin

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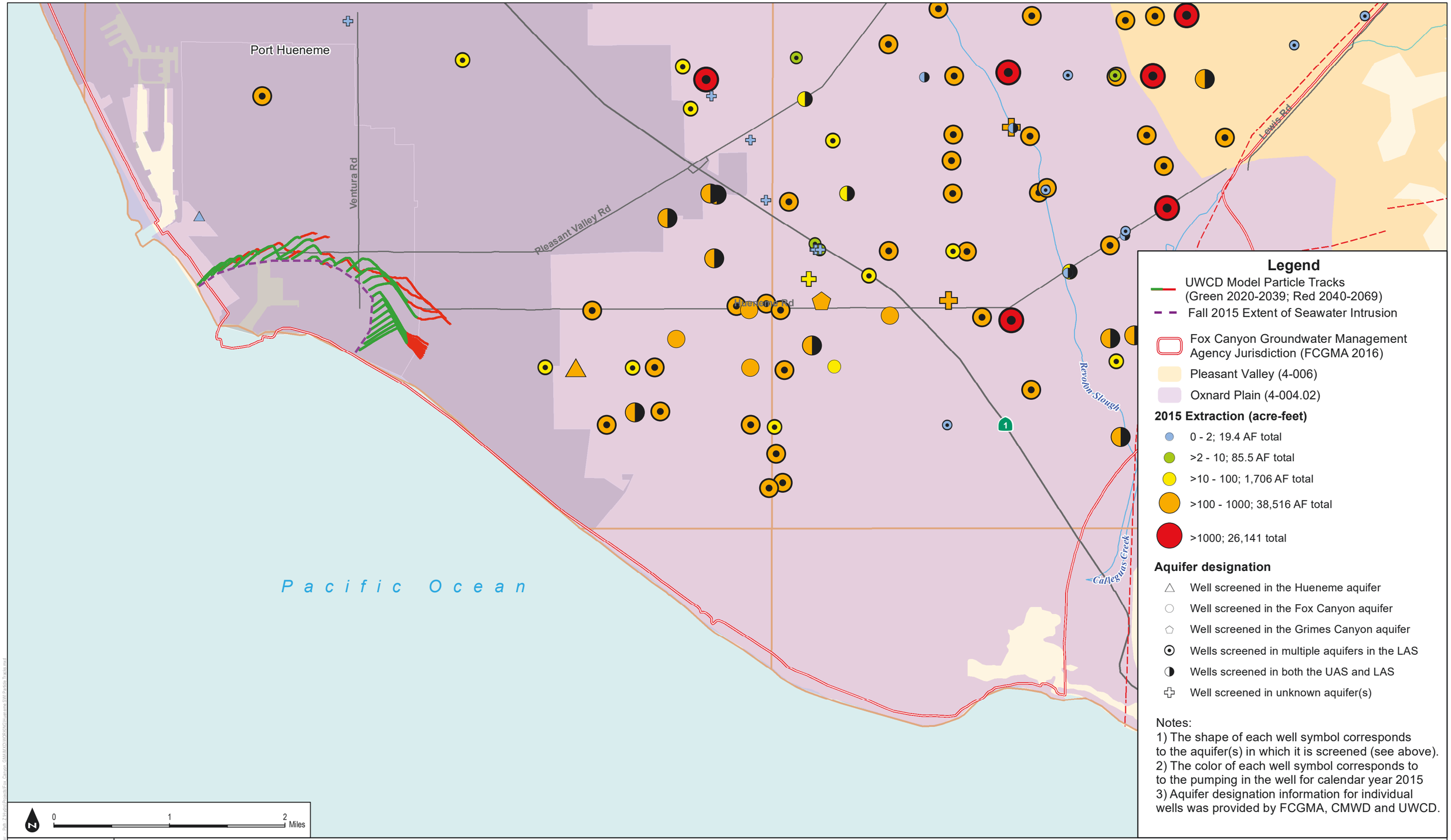

SOURCE: DWR; Ventura County; UWCD; CMWD
Climate Period 1930-1979; Climate Change Factor 2070

DUDEK

Figure 2-68c
UWCD Model Particle Tracks, Hueneme Aquifer, Reduction Without Projects Simulation 1 - 11,600 AFY Groundwater Production in the LAS

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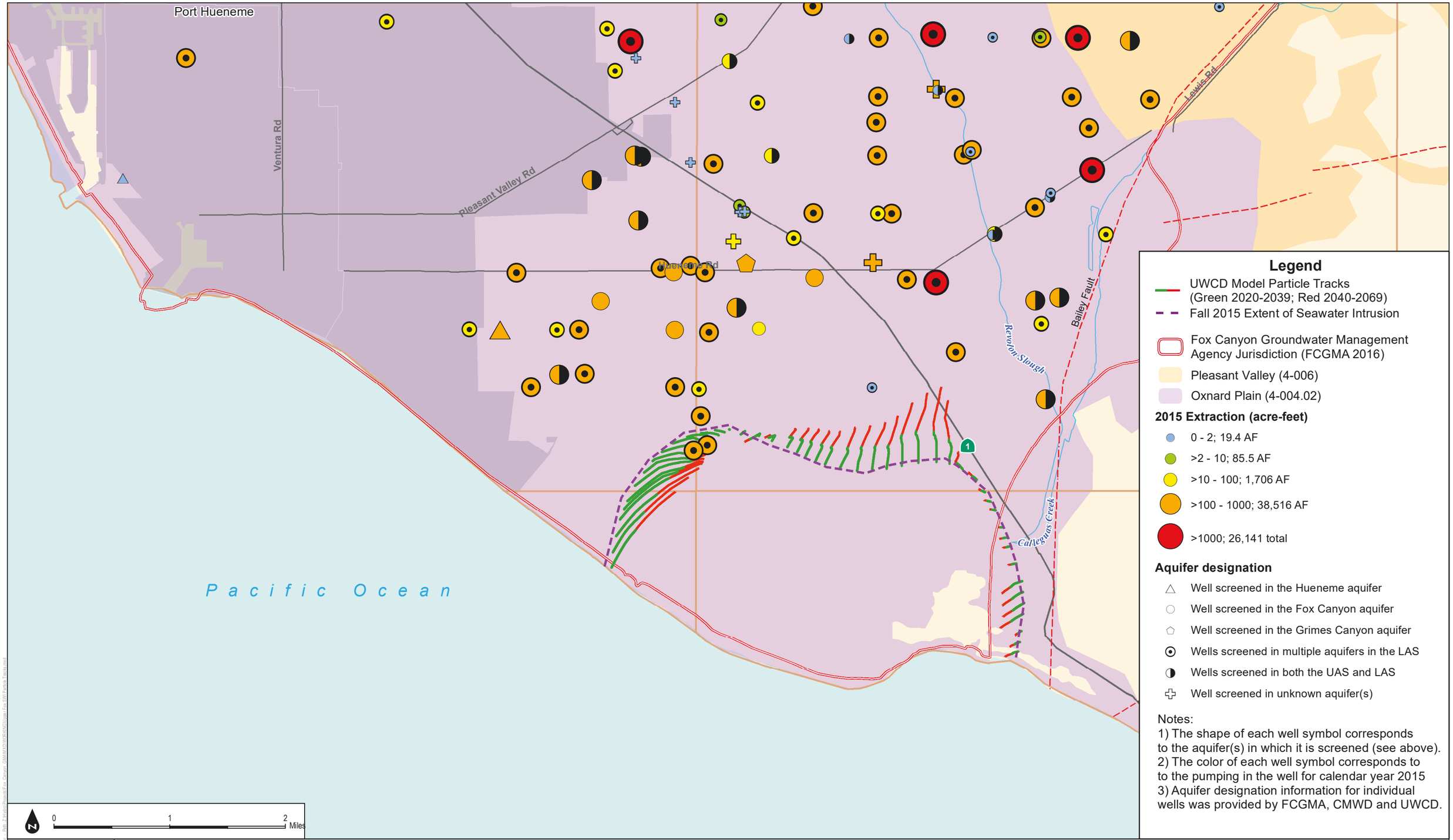

SOURCE: DWR; Ventura County; UWCD; CMWD
1930-1979 Climate Period; 2070 Climate Change Factor

DUDEK

Figure 2-68d

UWCD Model Particle Tracks, Upper Fox Canyon Aquifer, Reduction Without Projects Simulation 1 - 11,600 AFY Groundwater Production in the LAS

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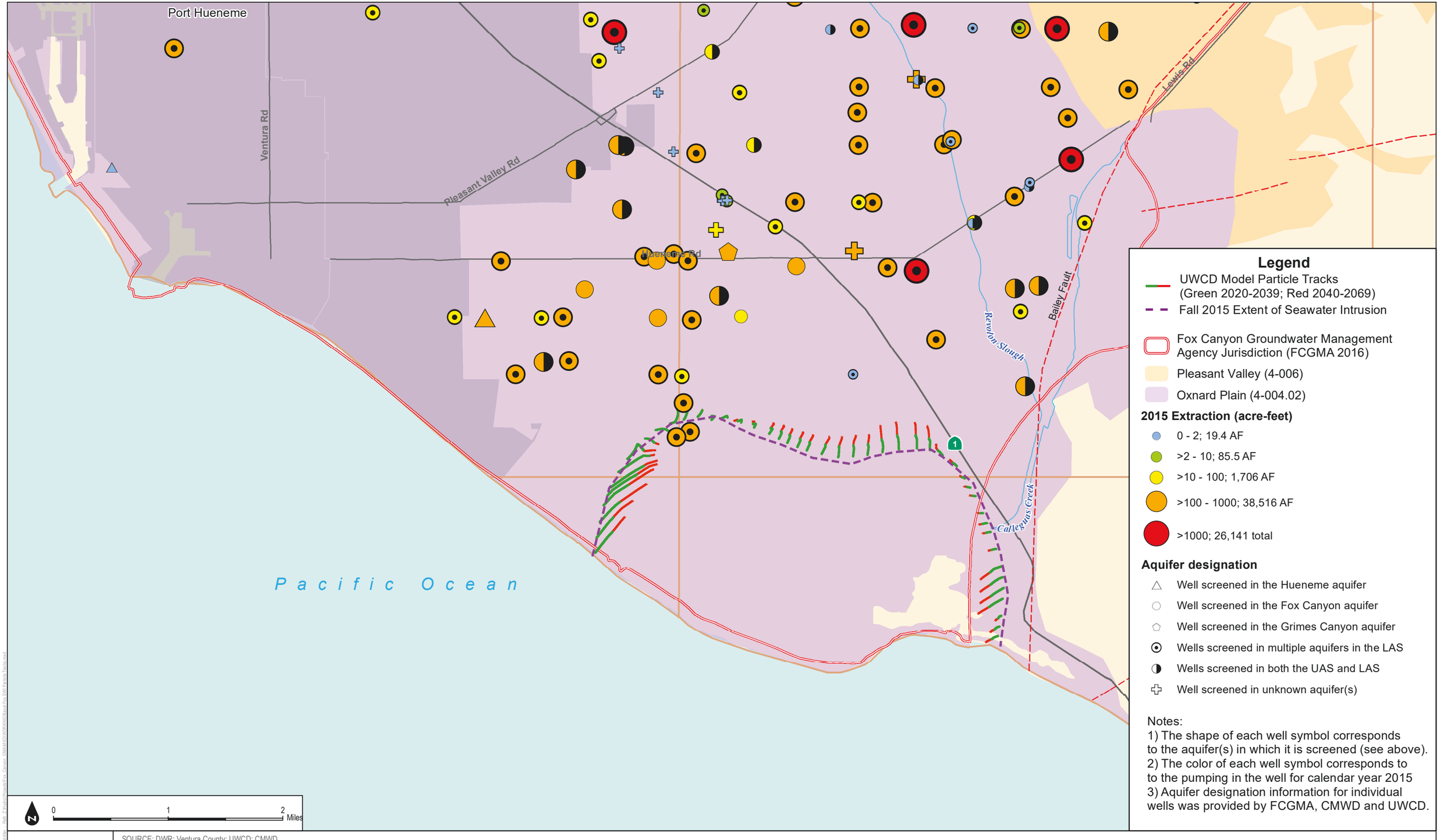

SOURCE: DWR; Ventura County; UWCD; CMWD
1930-1979 Climate Period; 2070 Climate Change Factor

DUDEK

Figure 2-68e

UWCD Model Particle Tracks, Basal Fox Canyon Aquifer, Reduction Without Projects Simulation 1 - 11,600 AFY Groundwater Production in the LAS

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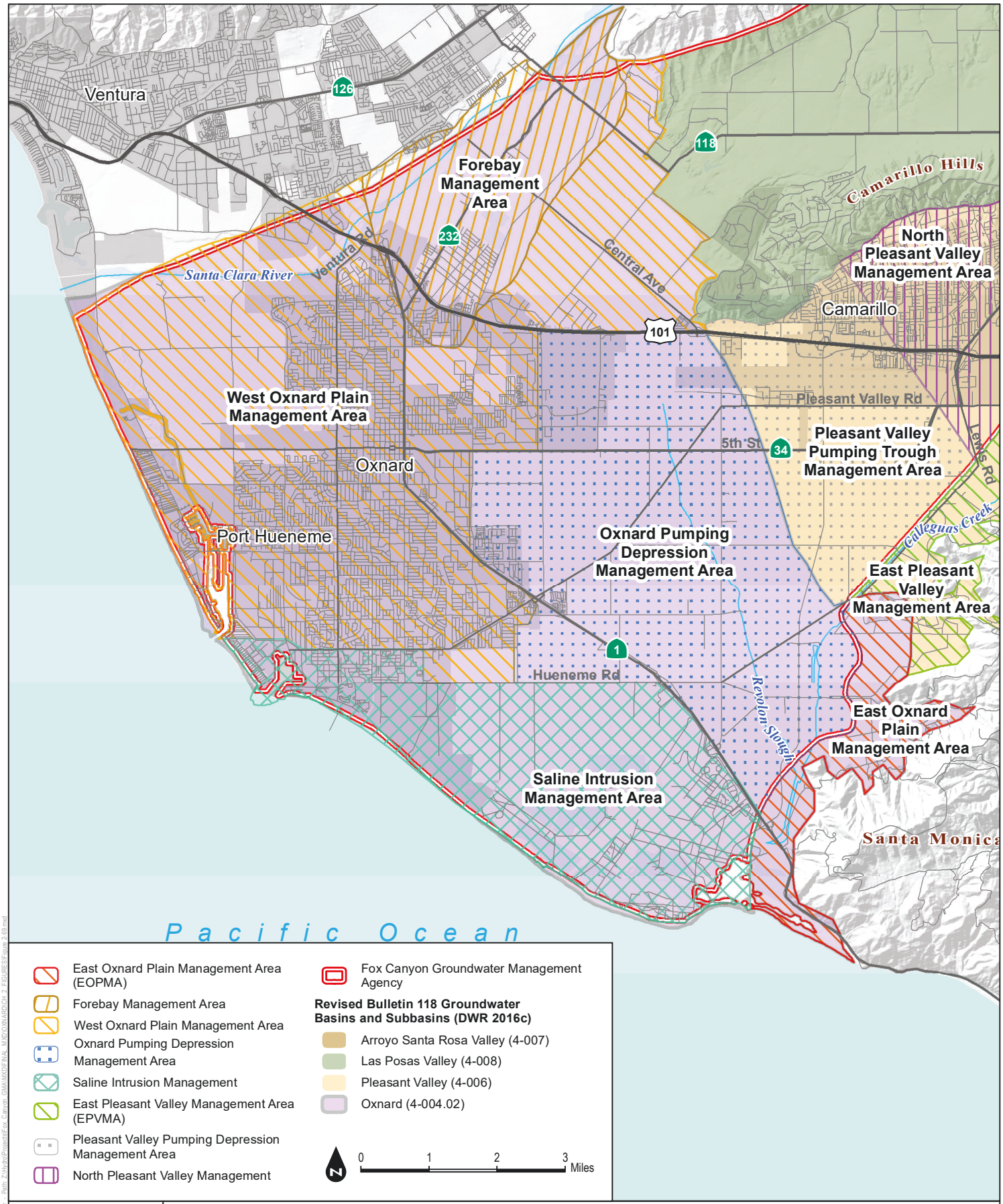

SOURCE: DWR; County of Ventura; FCGMA

FIGURE 2-69

Oxnard Subbasin Management Areas

Groundwater Sustainability Plan for the Oxnard Subbasin

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CHAPTER 3
SUSTAINABLE MANAGEMENT CRITERIA

3.1 INTRODUCTION TO SUSTAINABLE MANAGEMENT CRITERIA

In the Oxnard Subbasin, significant and unreasonable seawater intrusion is the primary undesirable result that occurs when groundwater production exceeds the sustainable yield. This undesirable result can occur even if groundwater production from the Subbasin as a whole is less than the freshwater recharge to the Subbasin, as seawater intrusion is closely related to groundwater production from coastal wells. Infrastructure projects and management actions undertaken in the Oxnard Subbasin have at times limited and even reversed the progress of seawater intrusion (see Section 2.3.3, Seawater Intrusion). However, groundwater elevations declined in all aquifers in the Subbasin in response to the statewide drought that began in 2011. These groundwater elevation declines exacerbated the impacts of seawater intrusion in the Subbasin.

On October 28, 2015, after several consecutive years of drought, the Fox Canyon Groundwater Management Agency (FCGMA) Board of Directors (Board) adopted planning goals for the Oxnard Subbasin, as well as the other basins within its jurisdiction. These goals are as follows:

- Control saline water impact front at its current position.
- Do not allow groundwater quality to further degrade without mitigation.
- No net subsidence due to groundwater withdrawal.
- Promote water levels that mitigate or minimize undesirable results (including pumping trough depressions, surface water connectivity, and chronic lowering of water levels).

These goals guide the definition of undesirable results, minimum thresholds, and measurable objectives in the subsequent sections.

Groundwater elevations are the primary metrics by which progress toward meeting the sustainability goal in the Oxnard Subbasin will be measured. Sustainable management of the Oxnard Subbasin does not necessarily mean, however, that springtime high groundwater levels in the Subbasin remain the same year after year. Rather, sustainability can be achieved over cycles of drought and recovery, so long as the impacts to the Subbasin that may occur during periods of drawdown are not significant or unreasonable. Thus, year over year, groundwater levels may decline during a drought, but sustainable management will result in groundwater levels—and, by extension, chloride concentrations and land surface elevations—returning to pre-drought levels in the wet years after a drought.

3.2 SUSTAINABILITY GOAL

The primary sustainability goal in the Oxnard Subbasin is to increase groundwater elevations inland of the Pacific coast in the aquifers that compose the Upper Aquifer System (UAS) and the Lower Aquifer System (LAS) to elevations that will prevent the long-term, or climatic cycle net (net), landward migration of the 2015 saline water impact front (see Section 3.3.3); prevent net seawater intrusion in the UAS; and prevent net seawater intrusion in the LAS.

The use of net landward migration, and net seawater intrusion in the sustainability goal reflects that climatic cycles influence groundwater elevations over multi-year periods and requires that assessment of seawater impacts to the Subbasin be tied to a time period over which net impacts are measured. This Groundwater Sustainability Plan (GSP) assesses net impacts to the Oxnard Subbasin over both a 50-year period beginning in 2020, and a 30-year period beginning in 2040. Undesirable results may occur in the Subbasin between 2020 and 2039, as progress is made toward sustainable management. By 2040, however, management of the Subbasin should achieve the sustainability goal. The 30-year period from 2040 through 2069 is referred to as the sustaining period in this GSP, as it is the period on which the evaluation of sustainability is based.

In order to achieve the sustainability goal, groundwater production will need to be reduced relative to historical groundwater production rates. At the same time, groundwater production inland from the coast may be allowed to increase as infrastructure is developed to convey inland production to agricultural users on the coast. During the first 5 years following GSP adoption, it is anticipated that the combined groundwater production from both the UAS and the LAS will begin to be reduced toward the estimated sustainable yield, accounting for the uncertainty assessed in the model water budget and sustainable yield predictions (Section 2.4, Water Budget).

Proposed reductions in groundwater production must take into account the potential economic disruption to the agricultural industry in the Subbasin, the interference with municipal water supply planning and rate setting, and the uncertainty in the estimated sustainable yield of the Subbasin. The estimated sustainable yield of the Subbasin is 42,000 acre-feet per year (AFY) with an uncertainty estimate of ±9,000 AFY (see Section 2.4.4, General Uncertainties in the Water Budget). The average 2015 groundwater production rate was 69,000 AFY. The difference between the upper estimate of the sustainable yield, 51,000 AFY, and the 2015 production rate is 18,000 AFY. If production is reduced linearly between 2020 and 2040, the estimated groundwater production reduction necessary throughout the geographic extent of the Oxnard Subbasin is approximately 900 AFY. However, the sustainability goal allows for operational flexibility, as groundwater production patterns are anticipated to change during the 20-year GSP implementation period from 2020 through 2039. Progress toward the sustainability goal will be evaluated throughout the 20-year implementation period.

The following sections describe the undesirable results that have occurred and may occur within the Subbasin, the minimum thresholds developed to avoid undesirable results, and the measurable objectives that account for the need to continue groundwater production during drought cycles and the associated interim milestones to help gauge progress toward sustainability over the next 20 years.

3.3 UNDESIRABLE RESULTS

Under the Sustainable Groundwater Management Act (SGMA), undesirable results occur when the effects caused by groundwater conditions occurring throughout the Subbasin cause significant and unreasonable impacts to any of the six sustainability indicators. These sustainability indicators are as follows:

- Chronic lowering of groundwater levels
- Reduction of groundwater storage
- Seawater intrusion
- Degraded water quality
- Land subsidence
- Depletions of interconnected surface water

The definition of what constitutes a significant and unreasonable impact for each sustainability indicator is determined by the Groundwater Sustainability Agency, which is FCGMA in the Oxnard Subbasin, using the processes and criteria set forth in the GSP. Each of the sustainability indicators is discussed in this section in the context of undesirable results.

3.3.1 Chronic Lowering of Groundwater Levels

Chronic lowering of groundwater levels resulting in a significant and unreasonable depletion of supply is an undesirable result applicable to the Oxnard Subbasin. Seawater intrusion occurs in the Subbasin as groundwater levels fall below threshold elevations that maintain sufficient hydrostatic pressure to keep seawater from moving landward. The threshold groundwater elevations differ between the aquifers of the UAS and the LAS, as well as with geographic location in the Subbasin. Groundwater elevation declines can also induce release of connate water brines, reduce the quantity of freshwater in storage, and cause land subsidence in the Subbasin.

The primary cause of groundwater conditions in the Subbasin that would lead to chronic lowering of groundwater levels is groundwater production in excess of natural and artificial recharge. Groundwater production from the Subbasin may result in significant and unreasonable lowering of groundwater levels if the groundwater levels were lowered to an elevation at which they allow net seawater intrusion in the UAS and LAS over climate cycles of drought and recovery. Historically, this condition has occurred within the Oxnard Subbasin.

In the past, groundwater levels in the UAS have declined during periods of drought and recovered during wet periods (Section 2.3.1, Groundwater Elevation Data). In fact, flowing artesian conditions were observed in UAS wells after multiple-year periods of above-average precipitation (UWCD 2016; Appendix C, UWCD Model Report, to this GSP). Groundwater levels in the LAS have also declined during drought and risen during wet periods, although the water levels in many wells in the LAS have remained below sea level since the 1980s (Section 2.3.1). One factor that contributed to the recovery of water levels following periods of drought was the amount of surface water that was diverted from the Santa Clara River and infiltrated through spreading basins to recharge the aquifers. Surface-water flows are available during wetter-than-average precipitation periods. These surface-water diversions and spreading are controlled by the United Water Conservation District (UWCD), which anticipates maintaining the historical volume of water diverted from the Santa Clara River over the next 50 years (UWCD 2018).

In addition to surface-water spreading, seawater intrusion into the aquifers of the Oxnard Subbasin has also sustained groundwater levels. Unlike surface-water spreading, seawater intrusion sustains groundwater levels at the expense of freshwater storage in the Subbasin (Section 2.3.3). Water levels in the aquifers of the LAS have remained below sea level even during drought recovery periods, thereby continuing to allow migration of seawater into the Subbasin near the Mugu and Hueneme Submarine Canyons (Section 2.3, Groundwater Conditions). Continued seawater intrusion has reduced the amount of freshwater in storage in the Subbasin.

Based on the sustainability goals for the Oxnard Subbasin, the criterion used to define undesirable results for chronic lowering of groundwater levels is landward migration of the 2015 saline water impact front during the sustaining period from 2040 through 2069. It is expected that there will be some landward migration of this front between 2020 and 2040 as the FCGMA Board and stakeholders in the Subbasin undertake the necessary projects and management actions toward achieving sustainability in 2040. The minimum thresholds metric against which chronic lowering of groundwater levels will be measured is groundwater levels that were selected to prevent net landward migration of the 2015 saline water impact front, and net seawater intrusion over the 30-year sustaining period from 2040 through 2069. These groundwater elevations are higher than previous historical low water levels, many of which were measured in the fall of 2015 (Table 3-1; Figures 3-1 through 3-5, Minimum Thresholds and Groundwater Elevation Contours).

In order to effectively manage the groundwater resources of the Oxnard Subbasin, the Subbasin has been divided into five management areas (see Section 2.5, Management Areas; Figure 2-69, Oxnard Subbasin Management Areas). These areas are defined by differences in their hydrogeologic properties, groundwater quality, or historical groundwater elevations. Groundwater elevations within each management area will be used to determine whether significant and unreasonable chronic lowering of groundwater levels is occurring. All of the management areas except the East Oxnard Plain Management Area (EOPMA) have wells in which water levels can be monitored by aquifer.

Until a monitoring well is installed in the EOPMA, the water level thresholds set for the wells closest to the EOPMA are presumed to be protective for the EOPMA, which has considerably less groundwater production than the adjoining management areas. This presumption will be revisited as groundwater elevation data are collected from the EOPMA.

Chronic lowering of groundwater levels in the Oxnard Subbasin has the potential to impact the beneficial uses and users of groundwater in the Subbasin by (1) exacerbating seawater intrusion in the Subbasin, (2) reducing the volume of freshwater in storage, (3) potentially causing land subsidence, (4) impacting areas of interconnected surface water and groundwater, and (5) causing groundwater levels to drop below current well screens.

3.3.2 Reduction of Groundwater Storage

Significant and unreasonable reduction of groundwater storage is an undesirable result that applies to the Oxnard Subbasin. Seawater intrusion occurs in the Subbasin as groundwater levels fall below threshold levels that maintain sufficient hydrostatic pressure to keep seawater from moving landward. The threshold groundwater levels differ between the UAS and the LAS, and differ with geographic location in the Subbasin.

The primary cause of groundwater conditions in the Subbasin that would lead to reduction in groundwater storage is groundwater production in excess of recharge over a cycle of drought and recovery. Groundwater production from the Subbasin may result in a significant and unreasonable reduction of groundwater in storage if the volume of water produced from the Subbasin exceeds the volume of freshwater recharging the Subbasin over cycles of drought and recovery. Changes in groundwater in storage can be tracked using groundwater elevations and would become significant and unreasonable if groundwater levels were lowered to an elevation below which they allow landward migration of the 2015 saline water impact front over cycles of drought and recovery, which would cause a long-term decline in groundwater storage.

Numerical groundwater model simulations indicate that there has been approximately 101,000 acre-feet (AF) of storage loss in the Oxnard Subbasin over the 31 years from 1985 to 2015 (Section 2.3.2, Estimated Change in Storage; Appendix C). The model results also indicate that between 1985 and 2015, approximately 380,000 AF of seawater intruded into the UAS and LAS under the Oxnard Subbasin. The replacement of freshwater with seawater is a reduction in freshwater storage and is an undesirable result that has already occurred within the Subbasin.

Based on the sustainability goals for the Oxnard Subbasin, the criterion used to define undesirable results for reduction in groundwater storage is landward migration of the 2015 saline water impact front after 2040. The minimum thresholds metric against which reduction of groundwater storage will be measured is water levels that were selected to prevent net landward migration of the 2015 saline water impact front, and net seawater intrusion after 2040. These groundwater elevations are higher than previous historical low water levels (Table 3-1).

Groundwater elevations within each management area of the Oxnard Subbasin will be used to determine whether significant and unreasonable reduction of groundwater in storage is occurring. All of the management areas except the EOPMA have wells in which water levels can be monitored by aquifer. Until a monitoring well is installed in the EOPMA, the water level thresholds set for the wells closest to the EOPMA are presumed to be protective for the EOPMA, which has considerably less groundwater production than the adjoining management areas. This presumption will be revisited as groundwater elevation data are collected from the EOPMA.

Reduction of groundwater storage in the Oxnard Subbasin has the potential to impact the beneficial uses and users of groundwater in the Subbasin by limiting the volume of groundwater available for agricultural, municipal, industrial, domestic, and environmental. These impacts will affect all users of groundwater in the Subbasin.

3.3.3 Seawater Intrusion

Significant and unreasonable seawater intrusion is an undesirable result that is present or likely to occur in the Oxnard Subbasin. Seawater intrusion is the primary sustainability indicator in the Oxnard Subbasin. Seawater intrusion occurs in the Subbasin as groundwater levels fall below threshold levels that maintain sufficient hydrostatic pressure to keep seawater from moving landward. The threshold groundwater levels differ between the UAS and the LAS, and differ with geographic location in the Subbasin.

The primary cause of groundwater conditions in the Subbasin that would lead to seawater intrusion is groundwater production. Currently, the area of the Subbasin impacted by concentrations of chloride greater than 500 milligrams per liter (mg/L) is generally west of Highway 1 and south of Hueneme Road. Sources of water high in chloride in the Oxnard Subbasin include modern seawater as well as non-marine brines and connate water in fine-grained sediments (see Section 2.3.3). Therefore, this area is referred to as the "saline water impact area," rather than the "seawater intrusion impact area," to reflect all the potential sources of chloride to the aquifers in this area. The saline water impact area was already impacted before 2015, when SGMA was implemented. As a result, the goal of this GSP is not to reverse historical impacts, but rather to limit seawater intrusion to the area that has already been impacted. Therefore, significant and unreasonable seawater intrusion is defined as seawater intrusion that results in a net landward migration of the 2015 saline water impact front beyond the already impacted area west of Highway 1 and south of Hueneme Road from 2040 through 2069.

Chloride concentrations in the Oxnard Subbasin indicate that seawater intrusion has occurred historically, and is currently occurring, in the vicinity of Point Hueneme and Point Mugu. However, seawater is not the only source of chloride to the groundwater of the Oxnard Subbasin (Section 2.3.3, Groundwater Conditions, and Section 2.3.4, Groundwater Quality). Chloride

concentrations exceeding 500 mg/L have been measured in the southeastern part of the Subbasin, where there is no direct connection between the inland freshwater aquifer and the Pacific Ocean. Stable isotope studies of the groundwater in these wells have shown that the chloride concentrations are likely not a result of seawater intrusion, but rather originated from release of connate water in the fine-grained lagoonal deposits in the Oxnard and Mugu Aquifers (Izbicki 1996). The connate water is released as groundwater head in the aquifer declines and the fine-grained deposits compress. Additionally, chloride concentrations in the UAS are also impacted by downward migration of brackish water from the semi-perched aquifer via improperly abandoned wells (Izbicki 1996). In the LAS, chloride concentrations above 500 mg/L result from seawater intrusion, as well as from upward migration of brines from the geologic formations that underlie and surround the Subbasin (Izbicki 1991).

The minimum thresholds metric against which seawater intrusion will be measured is water levels that were selected to prevent lateral seawater intrusion. These groundwater elevations are equal to, or higher than, previous historical low water levels (Table 3-1). Some of the minimum threshold groundwater elevations in the LAS are below sea level. These elevations were selected based on model results that indicate groundwater elevations could be this low and still limit seawater intrusion. They were also selected in concert with groundwater elevations in adjacent management areas, and are not expected to negatively impact the ability of the adjacent management areas to meet their sustainability goals.

The groundwater elevations selected in each of the management areas of the Oxnard Subbasin will be used to determine whether seawater intrusion is occurring in the Saline Intrusion Management Area and the West Oxnard Plain Management Area (WOPMA) of the Subbasin (Figure 2-69). Until a monitoring well is installed in the EOPMA, the water level thresholds set for the wells closest to the EOPMA in the WOPMA and the Oxnard Pumping Depression Management Area are presumed to be protective for the EOPMA, which has considerably less groundwater production than the adjoining management areas. This presumption will be revisited as groundwater elevation data are collected from the EOPMA.

Seawater intrusion in the Oxnard Subbasin has the potential to impact the beneficial uses and users of groundwater in the Subbasin by limiting the volume of non-brackish groundwater available for agricultural, municipal, industrial, and domestic use. These impacts will affect all users of groundwater in the Subbasin and continued seawater intrusion could result in changing land use as agricultural land is fallowed due to reduced groundwater supplies.

3.3.4 Degraded Water Quality

3.3.4.1 Chloride and TDS

Significant and unreasonable degraded water quality related to groundwater production is an undesirable result that has the potential to occur in the Oxnard Subbasin. Increases in chloride and total dissolved solids (TDS) have been observed in coastal areas of the Oxnard Subbasin including parts of the WOPMA and the Saline Intrusion Management Area. These increases are associated with seawater intrusion as well as connate water in fine-grained lenses, downward migration of brines from improperly abandoned wells, and upward migration of brines from deeper geologic formations (Izbicki 1991, 1996; UWCD 2016).

Degradation of groundwater quality from increased concentrations of chloride and TDS has the potential to impact the beneficial uses and users of groundwater in the Subbasin by (1) limiting the volume of groundwater available for agricultural, municipal, industrial, and domestic use or (2) requiring construction of treatment facilities to remove the constituents of concern.

The primary cause of groundwater conditions in the Subbasin that would lead to degradation of water quality from increased concentrations of TDS and chloride is groundwater production. If groundwater production from the Subbasin results in expansion of areas of the Subbasin impacted by chloride and TDS concentrations that limit agricultural and potable use, significant and unreasonable degradation of water quality may occur.

Based on the sustainability goals for the Oxnard Subbasin, the criterion used to define undesirable results for degraded water quality is the migration of the 2015 saline water impact front during the sustaining period from 2040 through 2069. The minimum thresholds metric against which degradation of water quality will be measured is groundwater levels that were selected to prevent net landward migration of the 2015 saline water impact front. The minimum thresholds metric against which seawater intrusion will be measured is groundwater levels that were selected to prevent net landward seawater migration. These groundwater elevations are equal to, or higher than, previous historical low water levels (Table 3-1).

Water quality will continue to be monitored at monitoring well locations identified by FCGMA and its partner agencies, as identified in Chapter 4, Monitoring Networks. As additional data are collected, the effectiveness of applying a water level proxy to groundwater quality degradation will continue to be assessed.

3.3.4.2 Nitrate

In the Oxnard Forebay area of the Oxnard Subbasin, nitrate concentrations above the water quality objectives (WQOs) and basin management objectives (BMOs) are routinely detected in

groundwater (UWCD 2008). These concentrations have resulted in significant and unreasonable impacts to beneficial uses and users of the Oxnard Subbasin, as not all municipal users of groundwater in this area have the ability to blend groundwater with nitrate exceeding the federal maximum contaminant level (MCL) with other water to sufficiently reduce the nitrate concentration for municipal use. Although nitrate concentrations in the Forebay have impacted municipal users of groundwater, the concentrations of nitrate in the Forebay are not caused by groundwater conditions occurring throughout the Subbasin. Rather, nitrate concentrations above WQOs and BMOs in the Forebay are likely a legacy of historical septic discharges and agricultural fertilizer application practices.[1]

Although nitrate concentrations decrease when water levels are high, the decreases are not a result of regional groundwater production patterns. Instead, the reduction in nitrate concentration results from dilution of nitrate in groundwater by lower nitrate concentration surface-water recharge from the Santa Clara River. Operationally, in years when surface-water diversions are lower than the overall demand, UWCD prioritizes surface-water recharge in areas where nitrate concentrations in the groundwater exceed the MCL over deliveries to areas with lower concentrations of nitrate in the groundwater. UWCD currently anticipates maintaining and potentially increasing surface-water recharge from the Santa Clara River in the future. Increases in surface-water recharge, combined with the cessation of septic discharges and modern agronomic fertilization practices, are anticipated to result in long-term declines in nitrate concentration in the Forebay.

Because nitrate concentrations are not impacted by local or regional groundwater production, and the currently impacted area is not anticipated to get larger in the future, the concentration of nitrate is not considered to be a SGMA sustainability indicator in the Subbasin. Because nitrate impacts are not a sustainability indicator, no minimum threshold concentration for nitrate is proposed at this time. Nitrate concentrations will continue to be monitored and the relationship between groundwater production and nitrate concentrations will be reevaluated during the 5-year evaluation.

3.3.5 Land Subsidence

The undesirable result associated with land subsidence in the Oxnard Subbasin is subsidence that substantially interferes with surface land uses. The FCGMA Board resolution discussed in Section 3.1, Introduction to Sustainable Management Criteria, calls for groundwater management that will not result in net subsidence due to groundwater withdrawal. Subsidence related to groundwater withdrawal can occur as groundwater elevations decline below previous historical low water levels, because the groundwater acts to reduce the effective stress, or pressure, on the sediments in the aquifers. As water levels decline, the pressure on the sediment matrix increases, and the pore structure of the sediment can collapse, resulting in subsidence. The minimum thresholds metric

[1] Ventura County extended sewer lines into this area in the years between 2000 and 2011 to address additional discharges of nitrate.

against which subsidence will be measured is water levels that were selected to prevent lateral seawater intrusion. These groundwater elevations are equal to, or higher than, previous historical low water levels, which will limit the potential for future land subsidence in the Subbasin resulting from groundwater withdrawal (Table 3-1).

Groundwater production is only one cause of subsidence in the Oxnard Subbasin. In addition to groundwater production, tectonic forces and oil and gas production can also result in subsidence in the Oxnard Subbasin (Section 2.3.5, Subsidence). Currently there are no monitoring stations that separate the effects of groundwater withdrawal from those of the other causes of subsidence.

Groundwater production from the Subbasin may result in significant and unreasonable land subsidence if the subsidence "substantially interferes with surface land uses" (California Water Code, Section 10721(x)(5)). Using this definition, historical records of land subsidence in the Subbasin do not indicate that land subsidence as a result of groundwater production has caused or is likely to cause undesirable results. Parts of the Oxnard Plain have experienced 2 to 3 feet of subsidence in the past, and future projections of subsidence indicate that areas within the Oxnard Plain may experience an additional 0.1 to 1 feet of subsidence by 2040 (Hanson et al. 2003; DWR 2014).

Land subsidence related to groundwater production has the potential to impact the beneficial uses and users of groundwater in the Oxnard Subbasin by interfering with surface land uses in a way that causes additional costs for releveling fields, replacing surface infrastructure, and otherwise interfering with surface land uses. Additional subsidence of 0.1 to 1 feet is not anticipated to substantially interfere with surface land uses in the Subbasin.

Even though substantial interference with land surface uses is not anticipated, actions to reduce groundwater production to a rate that avoids net seawater intrusion will mitigate future seawater intrusion as well as reducing the potential for additional subsidence in the Subbasin related to groundwater production.

3.3.6 Depletions of Interconnected Surface Water

The undesirable result associated with depletion of interconnected surface water in the Oxnard Subbasin is loss of groundwater-dependent ecosystem (GDE) habitat.

The primary cause of groundwater conditions in the Subbasin that would lead to depletion of interconnected surface water is groundwater production from the semi-perched aquifer. This unit is not currently considered a principal aquifer of the Oxnard Subbasin (Section 2.2.3, Principal Aquifers and Aquitards). Groundwater production from the semi-perched aquifer may result in depletion of interconnected surface water with significant and unreasonable adverse effects on beneficial uses of surface water if the groundwater levels were lowered to an elevation below which the vegetation in the existing GDEs could not access groundwater over a length of time

that negatively affected the health of the GDE. Historically, this condition has not occurred within the Oxnard Subbasin, because there has been very minor (<31 AFY) groundwater production from the semi-perched aquifer (Section 2.4.1.2, Imported Water Supplies).

Depletion of interconnected surface water in the Oxnard Subbasin is not currently occurring, as evidenced by lack of production, relatively stable groundwater elevations, and the need for tile drains in the semi-perched aquifer. Groundwater elevations will continue to be monitored in the semi-perched aquifer.

Depletion of interconnected surface water in the Oxnard Subbasin has the potential to impact the uses and users of groundwater in the Subbasin by lowering the groundwater table and negatively impacting the health of GDEs. If future projects involve the use of water from the semi-perched aquifer, depletion of interconnected surface water is possible, and significant and unreasonable impacts may occur. Reevaluation of the effects on existing and potential GDEs should be conducted in conjunction with the project approval process for any such future projects.

3.3.7 Defining Subbasin-Wide Undesirable Results

In order to better manage groundwater production and projects within the Oxnard Subbasin, the Subbasin has been divided into four management areas (Section 2.5, Management Areas). Groundwater production in each of the management areas occurs in both the UAS and LAS (Table 2-14, Oxnard Subbasin Groundwater Used). Although there are groundwater production wells screened in both the UAS and the LAS in the Oxnard Subbasin, there are a sufficient number of wells screened only in one of the two aquifer systems to be able to manage groundwater production in the Subbasin by aquifer system. In contrast, there are few production wells screened only within an individual aquifer in the Subbasin. Therefore, the discussion of Subbasin-wide undesirable results that follows has been separated by aquifer system, but not by individual aquifer.

Upper Aquifer System

Fifteen wells were selected as key wells in the UAS (Table 3-1).[2] Of these, three are in the Forebay Management Area, three are in the West Oxnard Plain Management Area, and nine are in the Saline Intrusion Management Area. None of the UAS key wells are located in the Oxnard Pumping Depression Management Area.

[2] Well 02N21W07L05 is screened in multiple aquifers, and has been assigned to the UAS for the purpose of defining undesirable results.

Undesirable results are defined in three ways for the UAS in the Oxnard Subbasin. The first is based on the total number of wells, independent of management area or aquifer. Under this definition, the UAS will be determined to be experiencing undesirable results if, in any single monitoring event, water levels in six of the 15 key wells are below their respective minimum thresholds.

The second definition of undesirable results for the UAS is based on the degree to which a single well exceeds a minimum threshold. Under this definition, the UAS would be determined to be experiencing an undesirable result if the groundwater elevation at any individual key well is below the historical low water level for that well.

The third definition of undesirable results for the UAS is based on the time over which a well may exceed the minimum threshold. Under this definition, the UAS would be determined to be experiencing an undesirable result if the water level in any individual key well was below the minimum threshold for either three consecutive monitoring events or three of five consecutive monitoring events. Monitoring events are scheduled to occur in the spring and fall of each year.

If conditions in the UAS meet any of the definitions of undesirable results listed above, the UAS would be considered to be experiencing undesirable results.

Lower Aquifer System

Nineteen wells were selected as key wells in the LAS (Table 3-1).[3] Of these, six are in the Forebay Management Area, five are in the West Oxnard Plain Management Area, six are in the Saline Intrusion Management Area, and two are in the Oxnard Pumping Depression Management Area.

Undesirable results are defined in three ways for the LAS in the Oxnard Subbasin. The first is based on the total number of wells, independent of management area or aquifer. Under this definition, the LAS will be determined to be experiencing undesirable results if, in any single monitoring event, water levels in 8 of the 19 key wells are below their respective minimum thresholds.

The second definition of undesirable results for the LAS is based on the degree to which a single well exceeds a minimum threshold. Under this definition, the LAS would be determined to be experiencing an undesirable result if the groundwater elevation at any individual key well is below the historical low water level for that well.

The third definition of undesirable results for the LAS is based on the time over which a well may exceed the minimum threshold. Under this definition, the LAS would be determined to be experiencing an undesirable result if the water level in any individual key well were below the minimum threshold for either three consecutive monitoring events or in three of five consecutive monitoring events. Monitoring events are scheduled to occur in the spring and fall of each year.

[3] Wells 02N21W07L03, 01N21W07J02, and 01N21W07L03 are screened in multiple aquifers and have been assigned to the LAS for the purpose of defining undesirable results.

If conditions in the LAS meet any of the definitions of undesirable results listed above, the LAS would be considered to be experiencing undesirable results.

3.4 MINIMUM THRESHOLDS

The following sections and discussion set forth the minimum thresholds for each of the six sustainability indicators. These thresholds discussed below are the proposed minimum groundwater elevations that would prevent undesirable results, defined as net landward migration of the 2015 saline water impact front, net seawater intrusion in the UAS, or net seawater intrusion in the LAS. When groundwater elevations drop below the proposed minimum threshold, the Subbasin may experience undesirable results (Section 3.3.7, Defining Subbasin-Wide Undesirable Results).

The minimum thresholds for chronic lowering of water levels, change in groundwater storage, seawater intrusion, groundwater quality, and land subsidence are based on the historical record of groundwater elevation in individual aquifers, the documented impacts of seawater intrusion, and the hydrogeologic conceptual model developed for the Oxnard Subbasin. All of these undesirable results are interrelated, and each is directly tied to seawater intrusion. Because groundwater elevations, change in storage, and groundwater quality are directly tied to seawater intrusion, the minimum threshold groundwater levels selected to mitigate the effects of seawater intrusion are also used for the other undesirable results as well (Table 3-1).

The minimum threshold groundwater levels selected to prevent seawater intrusion were based on a review of the historical groundwater elevation data and an analysis of the potential for seawater intrusion under multiple future groundwater production scenarios. Predicted groundwater levels were simulated over a 50-year period from 2020 to 2069 (Section 2.4.5, Projected Future Water Budget and Sustainable Yield). The future climate simulated in the model recreated the observed climate from 1930 to 1979, with adjustments to precipitation and streamflow based on climate change factors provided by the California Department of Water Resources (DWR). The historical period from 1930 to 1979 includes periods of drought and periods of above-average precipitation, but has the average precipitation of the entire climate record for the Oxnard Subbasin (Section 2.4.5). The 50-year future simulations were used to assess the rate of groundwater production that results in no net seawater intrusion in either the UAS or the LAS in the Oxnard Subbasin after 2040.

Two simulations were found to minimize net seawater intrusion after 2040 (Figures 2-67a through 2-67e, UWCD Model Particle Tracks for the Reduction With Projects Simulation, and Figures 2-68a through 2-68e, UWCD Model Particle Tracks for the Reduction Without Projects Simulation 1; Section 2.4). Groundwater production in the first simulation, referred to as the Reduction With Projects Scenario (Section 2.4.5.3), averaged approximately 40,000 AFY, with 27,000 AFY of production in the UAS, and 13,000 AFY in the LAS. This simulation incorporated projects, including temporary fallowing of approximately 500 AFY in the Oxnard Subbasin, and deliveries

of approximately 4,000 AFY of recycled water from the City of Oxnard's Groundwater Recovery Enhancement and Treatment (GREAT) Program for irrigation in the coastal area. Groundwater production in the second simulation, referred to as the Reduction Without Projects Scenario 1 (Section 2.4.5.4), averaged approximately 39,000 AFY, with 27,000 AFY of production in the UAS, and 12,000 AFY in the LAS (Section 2.4.5). In general, the simulated groundwater elevations in the model scenario with projects were close to those in the scenario without projects, with any observed difference between the two limited to less than approximately 10 feet (Figures 3-6 through 3-11, Key Well Hydrographs).

The minimum threshold groundwater elevations selected to protect against net seawater intrusion in the UAS and LAS are based on the lowest simulated groundwater elevation after 2040 for the two model simulations in which net seawater intrusion was minimized. To account for some of the uncertainty in the simulated future groundwater elevations, the lowest simulated value in either of the two simulations was used as a starting point for selecting the minimum thresholds. The lowest simulated value was then rounded down to the nearest 5-foot interval to further account for uncertainty in the future simulated groundwater elevations. The rounded groundwater elevation was then raised by 2 feet to account for predicted sea level rise by 2070. The minimum thresholds for each well are presented in Table 3-1 and Figures 3-6 through 3-11.

There are no proposed minimum thresholds in the EOPMA because there are no suitable monitoring wells in the EOPMA (Figure 2-69). The thresholds for the Saline Intrusion Management Area and Oxnard Pumping Depression Management Area, both of which border the EOPMA, are presumed to protect the EOPMA, which has considerably less groundwater production than the adjoining management areas (see Section 2.5). This presumption will be revisited as groundwater elevation data are collected from the EOPMA.

It is important to remember that there are several sources of uncertainty in the model predictions. These sources of uncertainty include, but are not limited to, the prediction of future climate, future diversions from the Santa Clara River, groundwater model assumptions and assigned values, and future groundwater production distribution in the Subbasin. The uncertainty in each of these factors is anticipated to decrease with time. As these factors are better understood, the minimum thresholds should be reassessed, and adjustments should be made, when warranted by the assessment.

3.4.1 Chronic Lowering of Groundwater Levels

The selected minimum thresholds for chronic lowering of groundwater levels are presented in Table 3-1. These minimum thresholds are water levels that were selected based on future groundwater model simulations that limit migration of the 2015 saline water impact front after 2040, limit net seawater intrusion into the UAS and LAS, and indicate that declines in groundwater elevations during periods of future drought will be offset by recoveries during future periods of above-average rainfall.

These minimum thresholds are anticipated to improve the beneficial uses of the Subbasin by limiting seawater intrusion and chronic lowering of groundwater levels. This allows for long-term use of groundwater supplies in the Subbasin without ongoing loss of storage that would cause economic harm to the users of groundwater in the Subbasin and impair the beneficial uses of groundwater in the Subbasin.

These minimum thresholds may impact groundwater users in the Subbasin by requiring both an overall reduction in groundwater production relative to historical levels, and potentially by requiring a redistribution of groundwater pumping within the Subbasin. A redistribution of groundwater production to shift groundwater production inland may require inland users to deepen existing wells or replace wells, and may require adjustment of the currently proposed minimum thresholds in the future. Furthermore, the minimum threshold groundwater elevations may result in a return to artesian conditions in wells screened in the UAS and LAS adjacent to the coast. In these areas, improperly abandoned wells can act as conduits for flow from the aquifer systems to land surface. Additional efforts may need to be undertaken by FCGMA and stakeholders in the Subbasin to prevent negative impacts from rising water levels and improperly abandoned wells.

The minimum thresholds for chronic lowering of groundwater levels are water levels that will be measured at the monitoring wells listed in Table 3-1. Groundwater levels in these wells, which are referred to as "key wells," will be reported to DWR in the annual reports that will follow the submittal of this GSP. Additionally, as funding becomes available, it is recommended that each of these monitoring wells be instrumented with a pressure transducer capable of recording hourly water levels. The groundwater elevation in each well will be compared to the minimum threshold assigned in Table 3-1 to determine whether water levels in individual wells are above the minimum thresholds.

3.4.2 Reduction of Groundwater Storage

The minimum thresholds for reduction in groundwater storage are water levels that were selected based on future groundwater model simulations that limit seawater intrusion in the Subbasin, and indicate that declines in groundwater elevations during periods of future drought will be offset by recoveries during future periods of above-average rainfall (Table 3-1). The minimum thresholds impacts to groundwater users for reduction of groundwater storage are the same as those for chronic lowering of groundwater levels. These minimum thresholds are anticipated to improve the beneficial uses of the Subbasin by allowing for long-term use of groundwater supplies in the Subbasin without replacing freshwater in the UAS and LAS with seawater. Such a replacement would lead to a loss of storage that would cause economic harm to the users of groundwater in the Subbasin and impair the beneficial uses of groundwater in the Subbasin.

The minimum thresholds for reduction of groundwater storage are water levels that will be measured at the key wells two times per year. Additionally, as funding becomes available, it is recommended that each key well be instrumented with a pressure transducer capable of recording hourly water levels. The groundwater elevation in each well will be compared to the minimum threshold assigned in Table 3-1 to determine whether water levels in individual wells are above the minimum thresholds.

3.4.3 Seawater Intrusion

Because the concentration of chloride is not necessarily the best indicator of modern seawater intrusion, the relationship between seawater intrusion and groundwater elevation was investigated using a numerical groundwater model (Appendix C). Groundwater levels in the Oxnard and Mugu Aquifers in coastal areas have historically fallen below sea level in response to increased production and drought cycles since the 1950s (Figure 2-9a, Groundwater Well Hydrographs in the Oxnard Aquifer – Oxnard Plain, and Figure 2-12, Groundwater Well Hydrographs in the Mugu Aquifer). The groundwater levels below sea level resulted in seasonal seawater intrusion during the fall irrigation season and during droughts in coastal wells in the vicinity of Point Hueneme and Point Mugu (Figure 2-35, Selected Historical Records of Water Elevation and Chloride Concentration).

Modeling by UWCD (2018; see Appendix C to this GSP) indicates that there was flux from the ocean into the Oxnard and Mugu Aquifers in the vicinity of the offshore Mugu and Hueneme Submarine Canyons when the coastal groundwater levels in the UAS fell below 5 to 10 feet above mean sea level. In 1990, FCGMA directed pumpers to decrease production in these aquifers to mitigate seawater intrusion. As a result, production in coastal areas shifted from the Oxnard and Mugu Aquifers to the deeper Hueneme Aquifer, the Fox Canyon Aquifer (FCA), and the Grimes Canyon Aquifer (the aquifers that compose the LAS). Water levels in the FCA and the Grimes Canyon Aquifer near the coast quickly fell below sea level and have remained there since the 1980s, even after periods of above-average precipitation (Figure 2-18, Groundwater Well Hydrographs in the Fox Canyon Aquifer, and Figure 2-21, Groundwater Well Hydrographs in the Grimes Canyon Aquifer). The UWCD model indicates continuous flux from the ocean into these aquifers since 1985 (Figure 2-34, Groundwater Flux along the Coast in the Lower Aquifer System).

Because the model indicates a strong relationship between groundwater elevation and seawater intrusion, the minimum thresholds for addressing seawater intrusion are water levels that were selected based on future groundwater model simulations that limited seawater intrusion in the UAS and LAS (Table 3-1). The model simulations suggest that if water levels fall below the minimum threshold elevations, the Subbasin is likely to experience net landward migration of the 2015 saline water impact front after 2040. These minimum thresholds are anticipated to improve the beneficial uses of the Subbasin by limiting seawater intrusion. This allows for long-term use of groundwater supplies in the Subbasin without ongoing loss of storage that would cause economic harm to the users of groundwater in the Subbasin and impair the beneficial uses of groundwater in the Subbasin.

Groundwater users in the Subbasin may be impacted by the minimum thresholds in several ways. First, an overall reduction in groundwater production relative to historical levels will be required to achieve the minimum thresholds. Such a reduction may impact the value of agricultural land, drive changes in crop types, result in temporary fallowing of agricultural acreage, and cause economic disruption to the regional economy. Second, a redistribution of groundwater pumping may be required to optimize water management in the Subbasin. If groundwater production is reduced at the coast and shifted inland, additional infrastructure may be needed to convey water from the inland areas to the coast, inland users may be required to deepen existing wells, and the currently proposed minimum thresholds may need to be lowered for inland areas in the future. Third, as the minimum thresholds are achieved in the coastal areas, additional economic impacts may occur as improperly abandoned wells may need to be properly sealed so they do not act as a conduit for flow from the underlying aquifers.

The minimum thresholds were selected for each aquifer system in the Oxnard Subbasin, primarily using wells screened in a single aquifer. These wells will be used to monitor groundwater elevations in each aquifer system in the Subbasin. Additionally, as funding becomes available, it is recommended that each key well be instrumented with a pressure transducer capable of recording hourly water levels. The groundwater elevation in each well will be compared to the minimum threshold assigned in Table 3-1 to determine whether water levels in individual wells are above the minimum thresholds.

3.4.4 Degraded Water Quality

Water quality impacts to the aquifer systems of the Oxnard Subbasin are limited to high concentrations of nitrate, chloride, and TDS. The sources and mechanisms controlling the concentration of these constituents differs throughout the Subbasin (Section 2.3). Nitrate concentrations in the Forebay exceed the federal MCL in some wells. However, these concentrations cannot be reduced by altering groundwater production in the Subbasin. For these concentrations, the recharge source water should be of the highest quality possible to maintain or improve future groundwater quality (Section 3.3.4, Degraded Water Quality). Although FCGMA cannot control the quality of the recharge water, the groundwater elevations minimum thresholds to prevent net migration of seawater after 2040 are higher than the historical low groundwater elevations at which nitrate concentrations were observed to exceed the federal MCL. These groundwater elevations will be used as the minimum thresholds to prevent further degradation of groundwater quality in the Forebay until such time that a separate concentration minimum threshold is found to be necessary.

In contrast to concentrations of nitrate in the Forebay, the concentration of chloride and TDS in coastal wells is influenced by groundwater production. Concentrations of chloride and TDS exceed federal, state, and local standards in some wells in the Subbasin (Section 2.3). Groundwater

production near the coast induces seawater intrusion, and lowered groundwater elevations induce compaction of fine-grained sediments that release connate brines into the aquifers. Because both of these processes are tied to groundwater elevations in the Subbasin, minimum thresholds for groundwater elevation, rather than concentration, were set to control the additional impacts from seawater and brine migration in the aquifers (Section 3.4.3, Seawater Intrusion). The minimum thresholds selected are the same as the water level thresholds selected to prevent net migration of the 2015 saline water impact front after 2040. These groundwater elevations are higher than historical low elevations, which will prevent further compaction of fine-grained sediments and brine release. They are also designed to prevent further degradation of water quality from direct seawater intrusion.

As discussed previously, the minimum thresholds are anticipated to improve the beneficial uses of the Subbasin by increasing the overall amount of freshwater storage in the Subbasin and limiting the further intrusion of seawater. The minimum thresholds impacts to groundwater users for degraded water quality are anticipated to be the same as those for seawater intrusion, which are described in Section 3.4.3.

The minimum thresholds for degraded water quality are water levels that will be measured at the monitoring wells listed in Table 3-1. Additionally, as funding becomes available, it is recommended that each key well be instrumented with a pressure transducer capable of recording hourly water levels. The groundwater elevation in each well will be compared to the minimum threshold assigned in Table 3-1 to determine whether water levels in individual wells are above the minimum thresholds.

3.4.5 Land Subsidence

The minimum thresholds for land subsidence are water levels that were selected based on future groundwater model simulations that limit seawater intrusion in the Subbasin, and indicate that declines in groundwater elevations during periods of future drought will be offset by recoveries during future periods of above-average rainfall (Table 3-1). As groundwater withdrawals will be reduced to avoid further seawater intrusion, groundwater elevations in the aquifer systems will rise, and the resulting minimum thresholds are higher than historical low water levels. Because groundwater elevations must be maintained above the minimum threshold in order to avoid undesirable results for seawater intrusion and loss of freshwater storage, water levels in the Subbasin will remain above historical low water levels after 2040. Therefore, water levels in the Subbasin will not induce inelastic subsidence in the Subbasin. If the distribution of pumping is altered to mitigate seawater intrusion by reducing pumping near the coast and increasing pumping in the Forebay, the potential subsidence risk may have to be revisited in inland areas. This risk evaluation should be tied to areas in which the minimum thresholds are lowered below previous historical low water levels.

As discussed previously, the minimum thresholds are anticipated to improve the beneficial uses of the Subbasin by increasing the overall amount of freshwater storage in the Subbasin and limiting the further intrusion of seawater. These minimum thresholds also will limit future subsidence because currently they are greater than the historical low groundwater elevation. The minimum thresholds impacts to groundwater users for land subsidence are anticipated to be the same as those for seawater intrusion, which are described in Section 3.4.3.

The minimum thresholds for subsidence are water levels that will be measured at the monitoring wells listed in Table 3-1. Additionally, as funding becomes available, it is recommended that each key well be instrumented with a pressure transducer capable of recording hourly water levels. The groundwater elevation in each well will be compared to the minimum threshold assigned in Table 3-1 to determine whether water levels in individual wells are above the minimum thresholds.

3.4.6 Depletions of Interconnected Surface Water

The minimum thresholds for depletions of interconnected surface water are water levels that were selected based on future groundwater model simulations that limit seawater intrusion in the Subbasin, and indicate that declines in groundwater elevations during periods of future drought will be offset by recoveries during future periods of above-average rainfall (Table 3-1). The areas of interconnected surface water and groundwater and associated GDEs described in Section 2.3.6, Groundwater–Surface Water Connections, and Section 2.3.7, Groundwater-Dependent Ecosystems, are connected to the semi-perched aquifer, from which there is little current groundwater production. Because the semi-perched aquifer is not considered a principal aquifer, specific minimum thresholds were not selected for this unit. Instead, results of the numerical groundwater model scenarios that prevent net landward migration of the 2015 saline water impact front after 2040 indicate that groundwater elevations in the semi-perched aquifer will be supported by groundwater elevations in the underlying Oxnard Aquifer. The Oxnard Aquifer is the uppermost aquifer of the UAS. The simulated minimum threshold water levels in the Oxnard Aquifer that prevent net migration of the 2015 saline water impact front after 2040 were found to result in higher water levels in the semi-perched aquifer. Therefore, the minimum thresholds for depletions of interconnected surface water are water levels in the Oxnard Aquifer that also prevent net migration of the 2015 saline water impact front after 2040. The minimum thresholds are equal to or higher than the lowest groundwater elevation measured at these wells. The selected groundwater elevations are anticipated to protect against depletion of interconnected surface water, because historical groundwater elevations in the semi-perched aquifer have maintained the documented and potential GDEs in the Subbasin (Section 2.3).

As discussed previously, the minimum thresholds are anticipated to improve the beneficial uses of the Subbasin by increasing the overall amount of freshwater storage in the Subbasin and limiting the further intrusion of seawater. The minimum thresholds set will maintain the existing beneficial

uses of the semi-perched aquifer by maintaining groundwater elevations equal to or higher than historical lows. The minimum thresholds impacts to groundwater users for interconnected groundwater and surface water are anticipated to be the same as those for seawater intrusion, which are described in Section 3.4.3.

Currently there is very little groundwater production from the semi-perched aquifer. If water levels in this aquifer rise as a result of reduced groundwater production in the underlying UAS, additional projects may investigate producing water from the semi-perched aquifer. Such projects will have to evaluate the potential impact to interconnected surface water and GDEs as part of the feasibility and permitting process. Additionally, if projects that produce groundwater from the semi-perched aquifer are implemented, the need for specific water level minimum thresholds in the semi-perched aquifer should be reevaluated.

The minimum thresholds for interconnected surface water are water levels that will be measured at the monitoring wells listed in Table 3-1. Additionally, as funding becomes available, it is recommended that each key well be instrumented with a pressure transducer capable of recording hourly water levels. The groundwater elevation in each well will be compared to the minimum threshold assigned in Table 3-1 to determine whether water levels in individual wells are above the minimum thresholds.

3.5 MEASURABLE OBJECTIVES

The measurable objectives are quantifiable goals for the maintenance or improvement of specified groundwater conditions that have been included in an adopted GSP to achieve the sustainability goal. For the Oxnard Subbasin, the measurable objective is the water level—measured at each of the key wells throughout the Subbasin—at which there is neither seawater flow into nor freshwater flow out of the UAS or LAS. If water levels in the Subbasin remained at the measurable objective in perpetuity, no groundwater would flow from the aquifer systems into the Pacific Ocean, and no ocean water would flow into the aquifer systems. This is the theoretical ideal water level for managing the aquifer systems of the Subbasin, because seawater intrusion would be prevented while maintaining the maximum freshwater use from the aquifer systems. However, because groundwater elevations in the Oxnard Subbasin respond to climatic cycles, actual groundwater levels in the Subbasin cannot be maintained at the measurable objective indefinitely. Therefore, to allow for operational flexibility while still preventing net migration of the 2015 saline water impact front after 2040, the measurable objectives were selected to work with the minimum thresholds in the Oxnard Subbasin.

To allow for operational flexibility during drought periods, water levels in the Subbasin are allowed to fall below the measurable objective, so long as they remain above the minimum threshold. As water levels fall below the measurable objective, seawater will flow toward the freshwater aquifer systems in the Subbasin, even if the water levels remain above the minimum threshold. The longer

groundwater elevations remain between the measurable objective and the minimum threshold the greater the volume of seawater that will migrate into the aquifer systems. In order to prevent net seawater intrusion over periods of drought and recovery, the periods during which seawater intrusion occurs must be offset by periods when the groundwater elevations are higher.

There are two components to balancing groundwater levels over climate cycles to prevent net migration of the 2015 saline water impact front after 2040. The first is not allowing groundwater levels to decline below an elevation at which net seawater intrusion will occur. This elevation is the minimum threshold. The second is ensuring that periods during which groundwater levels are above the minimum threshold but below the measurable objective are offset by equal periods during which groundwater levels are above the measurable objective. Therefore, the measurable objectives were selected based on the median groundwater elevation between 2040 and 2070, simulated for each well, in model simulations that prevented net landward migration of the 2015 saline water impact front after 2040.

The median groundwater elevation was rounded down to the nearest 5-foot interval to account for uncertainty in the model simulated future groundwater elevations. In order to account for future sea level rise, the rounded groundwater elevations were increased by 2 feet. The median simulated groundwater elevation (from 2040 to 2070) at each well after rounding and accounting for sea level rise is the measurable objective (Table 3-1). In order to prevent net seawater intrusion in the Subbasin after 2040, observed groundwater levels should be above the measurable objective 50% of the time. Ideally, the periods during which the water levels are above the measurable objectives will coincide with periods of above-average precipitation. If this occurs, additional reductions in groundwater production are not anticipated to be required to offset seawater intrusion. If, however, prolonged periods of drought limit the ability to recharge the groundwater aquifers in the Oxnard Subbasin, additional reductions in groundwater production may be required to offset seawater intrusion.

3.5.1 Chronic Lowering of Groundwater Levels

The measurable objective for the chronic lowering of groundwater levels is the groundwater level at which there is neither seawater flow into nor freshwater flow out of the UAS or LAS. This groundwater level is the same groundwater level that is used to protect against seawater intrusion in the Subbasin. The measurable objective groundwater level was selected for each of the key wells (Table 3-2). At each of these wells, the difference between the measurable objective and the minimum threshold is greater than 10 feet, which provides a margin of safety for operational flexibility in the Subbasin.

Groundwater elevations within each management area of the Oxnard Subbasin will be used to determine whether chronic lowering of groundwater levels is occurring. All of the management areas except the EOPMA have wells in which water levels can be monitored by aquifer. Until a

monitoring well is installed in the EOPMA, the measurable objectives set for the wells in the Saline Intrusion Management Area and Oxnard Pumping Depression Management Area, closest to the EOPMA, are presumed to also protect the EOPMA. The EOPMA has considerably less groundwater production than the WOPMA and does not have an independent suitable monitoring well for selecting a separate measurable objective. This presumption will be revisited as groundwater elevation data are collected from the EOPMA.

Interim Milestones for Chronic Lowering of Groundwater Levels

Interim milestones, which are target groundwater levels in 2025, 2030, and 2035 at key wells, will be used to assess progress toward sustainable groundwater management in the Oxnard Subbasin between 2020 and 2040. The interim milestones for chronic lowering of groundwater levels are the same as the interim milestones for seawater intrusion, because the interim milestones measure progress toward groundwater elevations in the Subbasin that prevent the net migration of the 2015 saline water impact front after 2040.

Two sets of interim milestones were determined for the key wells in the Subbasin (Table 3-2). The first set of interim milestones was calculated using linear interpolation between the fall 2015 low groundwater elevation and measurable objective (Figure 3-12, Interim Milestones for Dry and Average Conditions – Linear Interpolation). The second set was calculated using linear interpolation between the fall 2015 low groundwater elevation and the minimum threshold (Figure 3-12).

Two sets of interim milestones were calculated because the actual groundwater elevation in 2040 will depend both on groundwater production from the Subbasin and the climatic conditions between 2020 and 2040. Groundwater model simulations of future groundwater levels show that groundwater levels throughout the Subbasin vary by tens of feet at constant groundwater production rates over 5-year periods. This variability reflects the variability in annual precipitation, flow in the Santa Clara River, and groundwater recharge through the UWCD spreading grounds. Just as annual climate conditions vary from the calculated long-term historical mean conditions, so do 5-year average climate conditions (Figure 3-13, Distribution of 5-Year Average Climate Conditions in the Historical Record of Precipitation on the Oxnard Plain). Therefore, progress toward the measurable objective, which is the anticipated median groundwater level necessary to prevent net migration of the 2015 saline water impact front after 2040, must be evaluated in the context of the climate that occurred during the preceding 5 water years.

If, for example, the average precipitation from water years 2020 through 2024 (October 1, 2019, through September 30, 2024) equals the long-term historical average precipitation for the Oxnard Subbasin, then, as groundwater production is reduced, the groundwater level at each key well should reach the interim milestone for average climate conditions shown in Table 3-2. Under these conditions, groundwater levels in the Subbasin would be expected to reach the measurable

objective by 2040. If, however, the precipitation from water years 2020 through 2024 is less than 70% of the average long-term historical precipitation, as has occurred six times in the historical record (Figure 3-13), reductions in groundwater production anticipated as part of this GSP would not be sufficient for groundwater elevations to reach the interim milestone for average climate conditions. In order for the Subbasin to be sustainable in 2040 under ongoing dry climate conditions, the interim milestones should reflect progress toward the minimum threshold at each key well, rather than progress toward the measurable objective (Figure 3-13). Five-year climate conditions that fall between average and less than 70% of average would be expected to produce interim milestone groundwater elevations between those listed in Table 3-2.

Although specific interim milestones were not selected at each key well for above-average climate conditions, a similar analysis should be performed as part of the 5-year assessment process. For example, if the average precipitation from water years 2020 through 2024 exceeds 140% of the average long-term historical precipitation, as has occurred six times in the historical record (Figure 3-13), groundwater elevations in the fall of 2024 should be higher than the interim milestone groundwater elevation for average conditions listed in Table 3-2. Further, although Table 3-2 provides interim milestone groundwater elevations for the years 2030, 2035, and 2040, these interim milestones should be reassessed as part of the 5-year GSP evaluation process because of their climate dependence. The linear interpolation and resultant interim milestones should be updated based on the measured water level in the fall of 2024, 2029, and 2034 at each key well.

3.5.2 Reduction of Groundwater in Storage

The measurable objective for reduction of groundwater in storage is the groundwater level at which there is neither seawater flow into nor freshwater flow out of the UAS or LAS (Table 3-2). The measurable objective groundwater level was selected for each of the key wells based on the median predicted groundwater elevation between 2040 and 2070 from groundwater model simulations that minimized the migration of the 2015 saline water impact front after 2040. This groundwater level is the same groundwater level that is used to protect against seawater intrusion in the Subbasin. At each of the key wells, the difference between the measurable objective and the minimum threshold is greater than 10 feet, which provides a margin of safety for operational flexibility in the Subbasin.

All of the management areas except the EOPMA have wells in which water levels can be monitored by aquifer. Until a monitoring well is installed in the EOPMA, the measurable objectives set for the wells in the Saline Intrusion Management Area and Oxnard Pumping Depression Management Area, closest to the EOPMA, are presumed to also protect the EOPMA. The EOPMA has considerably less groundwater production than the WOPMA and does not have an independent suitable monitoring well for selecting a separate measurable objective. This presumption will be revisited as groundwater elevation data are collected from the EOPMA.

Interim Milestones for Reduction of Groundwater in Storage

Interim milestones for reduction of groundwater in storage are presented for two climate scenarios in Table 3-2. The two sets of interim milestones were calculated from a linear interpolation between the fall 2015 low groundwater elevation and either the measurable objective or the minimum threshold at each well. These interim milestones will be used to assess progress toward sustainable groundwater management in the Oxnard Subbasin between 2020 and 2040 as groundwater production from the Subbasin is reduced. The interim milestones for reduction of groundwater in storage are the same as the interim milestones for seawater intrusion.

3.5.3 Seawater Intrusion

The measurable objective for seawater intrusion is the groundwater level at which there is neither seawater flow into nor freshwater flow out of the UAS or LAS (Table 3-2). The measurable objective groundwater level was selected for each of the key wells based on the median predicted groundwater elevation between 2040 and 2070 from groundwater model simulations that minimized the migration of the 2015 saline water impact front after 2040. At each of the key wells, the difference between the measurable objective and the minimum threshold is greater than 10 feet, which provides a margin of safety for operational flexibility in the Subbasin.

All of the management areas except the EOPMA have wells in which water levels can be monitored by aquifer. Until a monitoring well is installed in the EOPMA, the measurable objectives set for the wells closest to the EOPMA in the Saline Intrusion Management Area and the Oxnard Pumping Depression Management Area are presumed to also protect the EOPMA. The EOPMA has considerably less groundwater production than the adjoining management areas and does not have an independent suitable monitoring well for selecting a separate measurable objective. This presumption will be revisited as groundwater elevation data are collected from the EOPMA.

Interim Milestones for Seawater Intrusion

Interim milestones for seawater intrusion are presented for two climate scenarios in Table 3-2. The two sets of interim milestones were calculated from a linear interpolation between the fall 2015 low groundwater elevation and either the measurable objective or the minimum threshold at each key well. These interim milestones will be used to assess progress toward sustainable groundwater management in the Oxnard Subbasin between 2020 and 2040 as groundwater production from the Subbasin is reduced.

3.5.4 Degraded Water Quality

The measurable objective for degraded water quality is the groundwater level at which there is neither seawater flow into nor freshwater flow out of the UAS or LAS (Table 3-2). The measurable

objective groundwater level was selected for each of the key wells based on the median predicted groundwater elevation between 2040 and 2070 from groundwater model simulations that minimized the migration of the 2015 saline water impact front after 2040. This groundwater level is the same groundwater level that is used to protect against seawater intrusion in the Subbasin. At each of the key wells, the difference between the measurable objective and the minimum threshold is greater than 10 feet, which provides a margin of safety for operational flexibility in the Subbasin.

Until a monitoring well is installed in the EOPMA, the measurable objectives set for the wells closest to the EOPMA in the Saline Intrusion Management Area and the Oxnard Pumping Depression Management Area are presumed to also protect the EOPMA. The EOPMA has considerably less groundwater production than the adjoining management areas and does not have an independent suitable monitoring well for selecting a separate measurable objective. This presumption will be revisited as groundwater elevation data are collected from the EOPMA.

Interim Milestones for Degraded Water Quality

Interim milestones for degraded water quality are presented for two climate scenarios in Table 3-2. The two sets of interim milestones were calculated from a linear interpolation between the fall 2015 low groundwater elevation and either the measurable objective or the minimum threshold at each key well. These interim milestones will be used to assess progress toward sustainable groundwater management in the Oxnard Subbasin between 2020 and 2040 as groundwater production from the Subbasin is reduced. The interim milestones for degraded water quality are the same as the interim milestones for seawater intrusion.

3.5.5 Land Subsidence

The measurable objective for land subsidence is the groundwater level at which there is neither seawater flow into nor freshwater flow out of the UAS or LAS (Table 3-2). This groundwater level is higher than the historical low water level in each key well. Therefore, it will protect against land subsidence related to groundwater withdrawal. The measurable objective groundwater level was selected for each of the key wells based on the median predicted groundwater elevation between 2040 and 2070 from groundwater model simulations that minimized the migration of the 2015 saline water impact front after 2040. This groundwater level is the same groundwater level that is used to protect against seawater intrusion in the Subbasin. At each of the key wells, the difference between the measurable objective and the minimum threshold is greater than 10 feet, which provides a margin of safety for operational flexibility in the Subbasin.

Until a monitoring well is installed in the EOPMA, the measurable objectives set for the wells closest to the EOPMA in the Saline Intrusion Management Area and the Oxnard Pumping Depression Management Area are presumed to also protect the EOPMA. The EOPMA has considerably less groundwater production than the adjoining management areas and does not have

an independent suitable monitoring well for selecting a separate measurable objective. This presumption will be revisited as groundwater elevation data are collected from the EOPMA.

Interim Milestones for Land Subsidence

Interim milestones for land subsidence are presented for two climate scenarios in Table 3-2. The two sets of interim milestones were calculated from a linear interpolation between the fall 2015 low groundwater elevation and either the measurable objective or the minimum threshold at each key well. These interim milestones will be used to assess progress toward sustainable groundwater management in the Oxnard Subbasin between 2020 and 2040 as groundwater production from the Subbasin is reduced. The interim milestones for land subsidence are the same as the interim milestones for seawater intrusion.

3.5.6 Depletions of Interconnected Surface Water

The measurable objective for depletions of interconnected surface water is the groundwater level at which there is neither seawater flow into nor freshwater flow out of the UAS or LAS (Table 3-2). This groundwater level is higher than the historical low water level in each key well. Therefore, it will protect against depletions of interconnected surface water related to groundwater withdrawal. The measurable objective groundwater level was selected for each of the key wells based on the median predicted groundwater elevation between 2040 and 2070 from groundwater model simulations that minimized the migration of the 2015 saline water impact front after 2040. This groundwater level is the same groundwater level that is used to protect against seawater intrusion in the Subbasin. At each of the key wells, the difference between the measurable objective and the minimum threshold is greater than 10 feet, which provides a margin of safety for operational flexibility in the Subbasin.

Currently there is very little groundwater production from the semi-perched aquifer. If water levels in this aquifer rise as a result of reduced groundwater production in the underlying UAS, additional projects may investigate producing water from the semi-perched aquifer. Such projects will have to evaluate the potential impact to interconnected surface water and GDEs as part of the feasibility and permitting process. Additionally, if projects that produce groundwater from the semi-perched aquifer are implemented, the need for specific water-level measurable objectives in the semi-perched aquifer should be reevaluated.

Until a monitoring well is installed in the EOPMA, the measurable objectives set for the wells closest to the EOPMA in the Oxnard Pumping Depression Management Area are presumed to also protect the EOPMA. The EOPMA has considerably less groundwater production than the Oxnard Pumping Depression Management Area and does not have an independent suitable monitoring well for selecting a separate measurable objective. This presumption will be revisited as groundwater elevation data are collected from the EOPMA.

Interim Milestones for Depletions of Interconnected Surface Water

Interim milestones for depletions of interconnected surface water are presented for two climate scenarios in Table 3-2. The two sets of interim milestones were calculated from a linear interpolation between the fall 2015 low groundwater elevation and either the measurable objective or the minimum threshold at each key well. These interim milestones will be used to assess progress toward sustainable groundwater management in the Oxnard Subbasin between 2020 and 2040 as groundwater production from the Subbasin is reduced. The interim milestones for interconnected surface water are the same as the interim milestones for seawater intrusion.

3.6 REFERENCES CITED

23 CCR (California Code of Regulations), Section 354.28(c)(5). Definition of the minimum threshold for land subsidence.

DWR (California Department of Water Resources). 2014. *Summary of Recent, Historical, and Estimated Potential for Future Land Subsidence in California*. Accessed February 2017. http://www.water.ca.gov/groundwater/docs/Summary_of_Recent_Historical_Potential_Subsidence_in_CA_Final_with_Appendix.pdf.

DWR. 2016. "Map of Basin Boundary Modifications." Bulletin 118 Basins (2016 Edits) [GIS layer]. https://gis.water.ca.gov/app/bbat/.

Hanson, R.T., P. Martin, and K. Koczot. 2003. *Simulation of Ground-Water/Surface-Water Flow in the Santa Clara-Calleguas Ground-Water Basin, Ventura County, California*. U.S. Geological Survey Water Resources Investigation Report 2002-4136.

Izbicki, J.A. 1991. "Chloride Sources in a California Coastal Aquifer." In *American Society of Civil Engineers Symposium on Groundwater in the Pacific Rim*, 71–77. Honolulu: American Society of Civil Engineers. Proceedings: July 22–26, 1991.

Izbicki, J.A. 1996. "Use of $\delta^{18}O$ and δD to Define Seawater Intrusion." In *North American Water Congress*, edited by C.T. Bathala. Anaheim, California: New York American Society of Civil Engineers. Proceedings: June 23–28, 1996.

UWCD (United Water Conservation District). 2008. *Nitrate Observations in the Oxnard Forebay and Vicinity, 1995–2006*. Prepared by D. Detmer. Santa Paula, California: UWCD. July 2008.

UWCD. 2016. *Saline Intrusion Update, Oxnard Plain and Pleasant Valley Basins.* United Water Conservation District Open-File Report 2016-04. October 2016.

UWCD. 2018. *United Water Conservation District Multiple Species Habitat Conservation Plan*. Administrative Draft. September 7, 2018. Accessed April 10, 2019. https://www.unitedwater.org/images/stories/Resource-Conservation/MSHCP%202018/UWCD%20Multiple%20Species%20Habitat%20Conservation%20Plan%202018-09-07.pdf.

Table 3-1
Minimum Threshold Groundwater Elevations by Well, Management Area, and Aquifer for Key Wells in the Oxnard Subbasin

State Well Number	Management Area	Aquifer	Perforations (ft bgs)	Top Perforations (ft msl)	Bottom Perforations (ft msl)	Historical Water Level Low (ft msl) and Date Measured		2015 Spring Water Level (ft msl) and Date Measured		GSP Undesirable Result	Proposed Minimum Threshold (ft msl)
01N21W32Q06S	Saline Intrusion Management Area	Oxnard	180–220	−172.7	−212.7	−25.8	11/22/1991	−12.7	March 2015	SWI, reduction in groundwater storage	2
01N22W20J08S	Saline Intrusion Management Area	Oxnard	155–195	−143.8	−183.8	−14.8	09/28/1991	−7.6	March 2015	SWI, reduction in groundwater storage	7
01N22W26J04S	Saline Intrusion Management Area	Oxnard	185–205	−170.2	−190.2	−28.3	10/26/1990	−14.3	March 2015	SWI, reduction in groundwater storage	2
01N22W27C03S	Saline Intrusion Management Area	Oxnard	175–195	−162.8	−182.8	−18.6	12/13/1990	−9.0	March 2015	SWI, reduction in groundwater storage	7
01N23W01C05S	West Oxnard Plain Management Area	Oxnard	120–145	−105.8	−130.8	−6.9	11/18/1991	1.2	March 2015	SWI, reduction in groundwater storage	7
02N22W36E06S	West Oxnard Plain Management Area	Oxnard	230–320	−211.7	−251.7	−25.0	10/28/2015	−15.3	March 2015	SWI, reduction in groundwater storage, chronic lowering of WL, subsidence	12
01N21W32Q05S	Saline Intrusion Management Area	Mugu	330–370	−322.7	−362.7	−107.4	11/30/2015	−60.7	March 2015	SWI, reduction in groundwater storage	2
01N21W32Q07S	Saline Intrusion Management Area	Mugu	275–285	−268.2	−278.2	−72.5	11/30/2015	−41.2	March 2015	SWI, reduction in groundwater storage	2
01N22W20J07S	Saline Intrusion Management Area	Mugu	310–350	−298.8	−338.8	−16.5	11/13/1991	−10.7	March 2015	SWI, reduction in groundwater storage	7
01N22W26J03S	Saline Intrusion Management Area	Mugu	524–620	−509.2	−605.2	−52.6	10/26/1990	−33.1	March 2015	SWI, reduction in groundwater storage	2
01N22W27C02S	Saline Intrusion Management Area	Mugu	275–295	−262.8	−282.8	−27.3	12/13/1990	−14.3	March 2015	SWI, reduction in groundwater storage	7
02N21W07L06S	Forebay Management Area	Mugu	135–155	11.9	−8.1	−12.2	12/03/2015	8.3	March 2015	SWI, reduction in groundwater storage, chronic lowering of WL, subsidence	25
02N22W23B07S	Forebay Management Area	Mugu	260–300	−150.2	−190.2	−40.8	12/15/1992	−20.7	March 2015	SWI, reduction in groundwater storage, chronic lowering of WL, subsidence	15
02N22W36E05S	West Oxnard Plain Management Area	Mugu	360–420	−288.4	−348.4	−21.0	11/04/2015	−13.6	February 2015	SWI, reduction in groundwater storage, chronic lowering of WL, subsidence	10
01N22W20J05S	Saline Intrusion Management Area	Hueneme	640–680	−628.8	−668.8	−29.9	11/30/2015	−19.9	March 2015	SWI, reduction in groundwater storage	2
01N23W01C03S	West Oxnard Plain Management Area	Hueneme	965–1,065	−950.8	−1,050.8	−39.7	01/07/1991	−23.2	March 2015	SWI, reduction in groundwater storage	7
01N23W01C04S	West Oxnard Plain Management Area	Hueneme	630–695	−615.8	−680.8	−34.9	01/07/1991	−20.0	March 2015	SWI, reduction in groundwater storage	7
02N22W23B04S	Forebay Management Area	Hueneme	1,110–1,150	−1,000.2	−1,040.2	−147.1	10/28/2014	−75.6	March 2015	SWI, reduction in groundwater storage, chronic lowering of WL, subsidence	−5
02N22W23B05S	Forebay Management Area	Hueneme	830–870	−720.2	−760.2	−121.0	10/12/1991	−65.5	March 2015	SWI, reduction in groundwater storage, chronic lowering of WL, subsidence	−5

Table 3-1
Minimum Threshold Groundwater Elevations by Well, Management Area, and Aquifer for Key Wells in the Oxnard Subbasin

State Well Number	Management Area	Aquifer	Perforations (ft bgs)	Top Perforations (ft msl)	Bottom Perforations (ft msl)	Historical Water Level Low (ft msl) and Date Measured		2015 Spring Water Level (ft msl) and Date Measured		GSP Undesirable Result	Proposed Minimum Threshold (ft msl)
02N22W23B06S	Forebay Management Area	Hueneme	460–500	−350.2	−390.2	−41.7	02/03/1993	−23.2	March 2015	SWI, reduction in groundwater storage, chronic lowering of WL, subsidence	15
02N22W36E03S	West Oxnard Plain Management Area	Hueneme	195–285	−123.1	−213.1	−51.8	12/03/2014	−30.5	June 2015	SWI, reduction in groundwater storage, chronic lowering of WL, subsidence	10
02N22W36E04S	West Oxnard Plain Management Area	Hueneme	130–170	−58.9	−98.9	−32.11	11/04/2015	−32.1	November 2015	SWI, reduction in groundwater storage, chronic lowering of WL, subsidence	10
01N21W32Q04S	Saline Intrusion Management Area	FCA	600–640	−592.7	−632.7	−116.9	11/30/2015	−66.3	March 2015	SWI, reduction in groundwater storage	−23
01N22W20J04S	Saline Intrusion Management Area	FCA	870–930	−858.8	−918.8	−40.7	11/30/2015	−28.1	March 2015	SWI, reduction in groundwater storage	2
01N22W26K03S	Saline Intrusion Management Area	FCA	470–580	−456.9	−566.9	−71.8	06/16/2015	−65.6	March 2015	SWI, reduction in groundwater storage	−18
01N23W01C02S	West Oxnard Plain Management Area	FCA	1,390–1,490	−1,375.8	−1,475.8	−50.4	01/07/1991	−29.3	March 2015	SWI, reduction in groundwater storage	7
02N21W07L04S	Forebay Management Area	FCA	500–540	−353.1	−393.1	−32.0	10/14/2015	3.9	March 2015	SWI, reduction in groundwater storage, chronic lowering of WL, subsidence	15
02N22W23B03S	Forebay Management Area	FCA	1,210–1,250	−1,100.2	−1,140.2	−128.7	02/28/1991	−77.0	March 2015	SWI, reduction in groundwater storage, chronic lowering of WL, subsidence	−5
01N21W32Q02S	Saline Intrusion Management Area	GCA	930–970	−922.7	−962.7	−115.2	11/30/2015	−64.7	March 2015	SWI, reduction in groundwater storage	−23
01N21W32Q03S	Saline Intrusion Management Area	GCA	800–840	−792.7	−832.7	−125.8	11/30/2015	−75.6	March 2015	SWI, reduction in groundwater storage	−23
01N21W07J02S	Oxnard Pumping Depression Management Area	Multiple	590–1,280	−555.4	−1,245.4	−145.4	10/21/2014	−96.2	March 2015	SWI, reduction in groundwater storage, chronic lowering of WL, subsidence	−40
01N21W21H02S	Oxnard Pumping Depression Management Area	Multiple	503–863	−484.3	−844.3	−149.4	10/20/2014	−101.1	March 2015	SWI, reduction in groundwater storage, chronic lowering of WL, subsidence	−70
02N21W07L03S	Forebay Management Area	Multiple	640–700	−493.1	−553.1	−24.6	10/15/2015	1.8	March 2015	SWI, reduction in groundwater storage, chronic lowering of WL, subsidence	15
02N21W07L05S	Forebay Management Area	Multiple	270–310	−1,23.1	−163.1	−7.4	12/30/2015	20.5	March 2015	SWI, reduction in groundwater storage, chronic lowering of WL, subsidence	25

Notes: FCA = Fox Canyon Aquifer; ft bgs = feet below ground surface; ft msl = feet mean sea level; GCA = Grimes Canyon Aquifer; GSP = Groundwater Sustainability Plan; SWI = seawater intrusion; WL = water level.
Interim milestones are proposed for wells with spring 2015 groundwater elevations that are lower than the minimum threshold groundwater elevation. Wells with spring 2015 groundwater elevations that are higher than the minimum threshold are currently in compliance with the goals of this GSP and do not require milestones to assess progress toward sustainability.

Table 3-2
Measurable Objectives and Interim Milestones

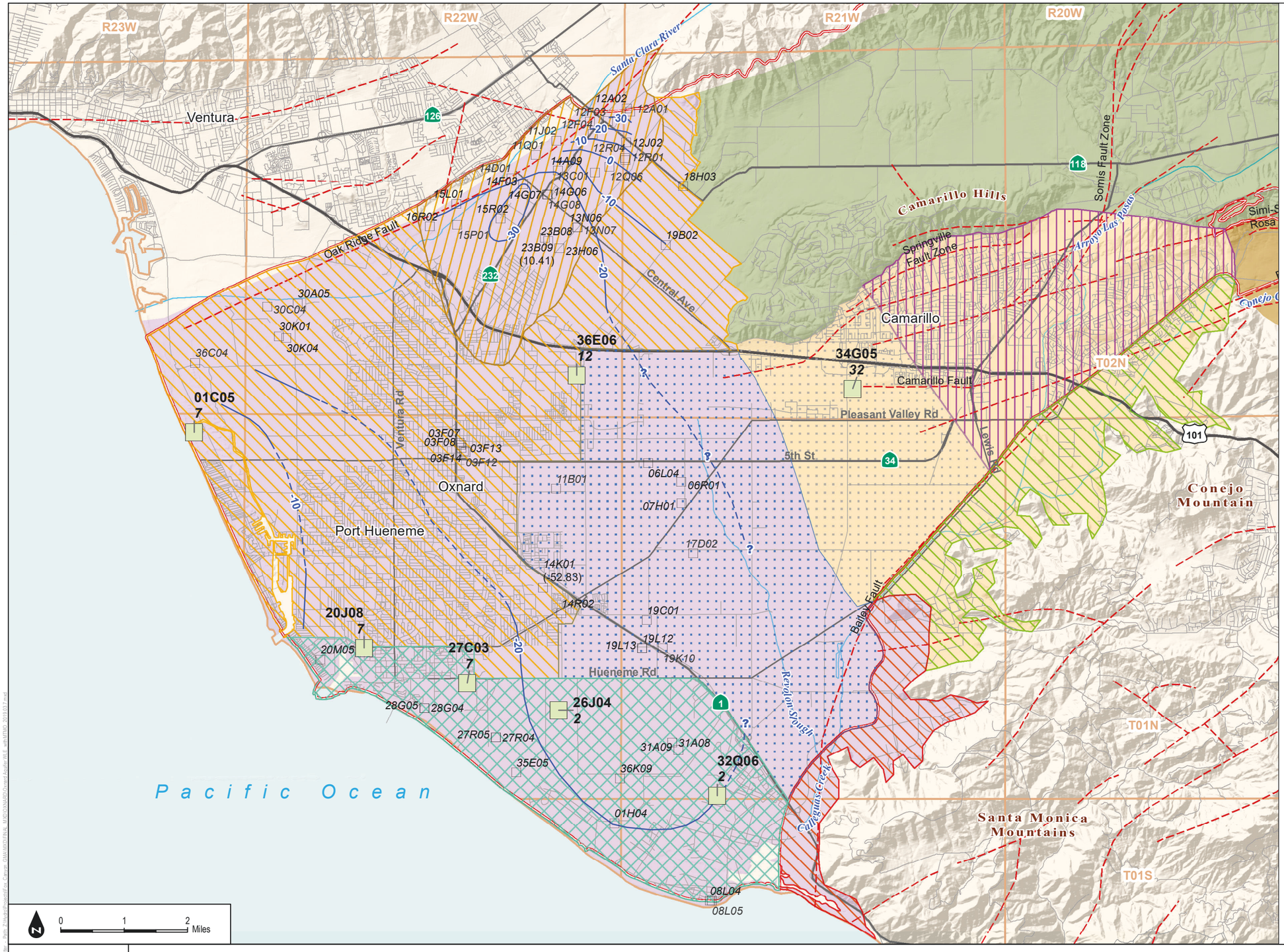
Well Number	Aquifer	Minimum Threshold (ft msl)	Measurable Objective (ft msl)	Fall 2015 Water Level Low (ft msl) and Date Measured		Interim Milestone Average Climate (ft msl)				Interim Milestone Dry Climate (ft msl)			
						2025	*2030*[a]	*2035*[a]	*2040*[a]	*2025*	*2030*[a]	*2035*[a]	*2040*[a]
01N21W32Q06S	Oxnard	2	17	−23.12	11/30/2015	−15	−5	6	17	−18	−11	−4	2
01N22W20J08S	Oxnard	7	17	-14.56	11/2/2015	−7	1	9	17	−10	−5	1	7
01N22W26J04S	Oxnard	2	17	−23.31	10/16/2015	−15	−5	6	17	−18	−11	−4	2
01N22W27C03S	Oxnard	7	17	−14.83	10/6/2015	−7	1	9	17	−10	−5	1	7
01N23W01C05S	Oxnard	7	17	−1.94	11/2/2015	4	8	12	17	2	4	6	7
02N22W36E06S	Oxnard	12	37	−25.03	10/28/2015	−10	6	22	37	−16	−7	2	12
01N21W32Q05S	Mugu	2	17	−107.36	11/2/2015	−78	−46	−14	17	−82	−54	−26	2
01N21W32Q07S	Mugu	2	17	−72.50	11/30/2015	−52	−29	−6	17	−56	−37	−18	2
01N22W20J07S	Mugu	7	17	−16.21	11/2/2015	−7	1	9	17	−10	−5	1	7
01N22W26J03S	Mugu	2	17	−44.39	10/16/2015	−30	−15	1	17	−33	−21	−9	2
01N22W27C02S	Mugu	7	17	−22.57	10/6/2015	−15	−5	6	17	−17	−9	−1	7
02N21W07L06S	Mugu	27	62	−12.21	12/3/2015	8	26	44	62	−1	8	17	27
02N22W23B07S	Mugu	17	47	−31.59	12/30/2015	−11	8	27	47	−18	−6	6	17
02N22W36E05S	Mugu	12	37	−21.01	11/4/2015	−6	8	22	37	−12	−4	4	12
01N22W20J05S	Hueneme	2	17	−29.87	11/30/2015	−18	−6	6	17	−22	−14	−6	2
01N23W01C03S	Hueneme	7	22	−32.26	11/30/2015	−17	−4	9	22	−21	−12	−3	7
01N23W01C04S	Hueneme	7	22	−28.36	11/4/2015	−17	−4	9	22	−21	−12	−3	7
02N22W23B04S	Hueneme	−3	17	−95.68	12/3/2015	−67	−39	−11	17	−72	−49	−26	−3
02N22W23B05S	Hueneme	−3	17	−83.59	12/3/2015	−60	−35	−10	16	−65	−45	−25	−4
02N22W23B06S	Hueneme	17	47	−37.35	12/3/2015	−15	6	27	47	−22	−9	4	17
02N22W36E03S	Hueneme	12	37	−51.77	12/3/2014	−28	−6	16	37	−35	−20	−5	11
02N22W36E04S	Hueneme	12	37	−32.12	11/4/2015	−13	4	21	37	−20	−10	1	12
01N21W32Q04S	FCA	−23	2	–116.94	11/30/2015	−86	−57	−28	2	−92	−69	−46	−23
01N22W20J04S	FCA	2	17	–40.72	11/30/2015	42	34	26	17	38	26	14	2
01N22W26K03S	FCA	−18	2	–71.84	6/16/2015	−52	−34	−16	2	−57	−44	−31	−18
01N23W01C02S	FCA	7	22	–37.63	11/30/2015	−25	−10	6	22	−28	−16	−4	7
02N21W07L04S	FCA	17	42	–32.02	10/14/2015	−12	6	24	42	−18	−6	6	17
02N22W23B03S	FCA	−3	17	–94.26	12/3/2015	−67	−39	−11	17	−72	−49	−26	−3
01N21W32Q02S	GCA	−23	2	–115.19	11/30/2015	−86	−57	−28	2	−92	−69	−46	−23

Table 3-2
Measurable Objectives and Interim Milestones

Well Number	Aquifer	Minimum Threshold (ft msl)	Measurable Objective (ft msl)	Fall 2015 Water Level Low (ft msl) and Date Measured		Interim Milestone Average Climate (ft msl)				Interim Milestone Dry Climate (ft msl)			
						2025	*2030[a]*	*2035[a]*	*2040[a]*	*2025*	*2030[a]*	*2035[a]*	*2040[a]*
01N21W32Q03S	GCA	−23	2	–125.76	11/30/2015	−93	−61	−29	2	−100	−75	−50	−24
01N21W07J02S	Multiple	−38	2	–140.02	10/25/2015	−105	−70	−35	1	−115	−90	−65	−39
01N21W21H02S	Multiple	−68	-8	–137.09	9/30/2015	−103	−71	−39	−7	−118	−101	−84	−67
02N21W07L03S	Multiple	17	37	–24.59	10/15/2015	−10	6	22	37	−15	−5	6	17
02N21W07L05S	Multiple	27	57	–7.41	12/30/2015	11	27	43	58	3	11	19	27

Notes: FCA = Fox Canyon Aquifer; ft msl = feet mean sea level; GCA = Grimes Canyon Aquifer.

[a] Interim milestones for 2030, 2035, and 2040 will depend on climate conditions and Subbasin water level recoveries between 2020 and 2025. These thresholds are proposed for the current GSP but will be reviewed and revised with each 5-year evaluation.



Legend

- Key Wells screened in the Oxnard Aquifer
- Wells screened in the Oxnard Aquifer
- Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.
- 15P01 / **15P01** — Abbreviated State Well Number (see notes)
- ***5*** — Minimum Threshold for Key Wells in Feet above mean sea level (AMSL)
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (County of Ventura 2016)
- Township (North-South) and Range (East-West)
- East Oxnard Plain Management Area (EOPMA)
- Forebay Management Area
- West Oxnard Plain Management Area (WOPMA)
- Oxnard Pumping Depression Management Area
- Saline Intrusion Management Area
- East Pleasant Valley Management Area (EPVMA)
- Pleasant Valley Pumping Depression Management Area
- North Pleasant Valley Management Area

Revised Bulletin 118 Groundwater Basins and Subbasins (DWR 2016c)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Notes:
1) Well labels consist of an abbreviated State Well Number (SWN). SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S. Geotracker wells do not have SWN IDs and so are not labeled.
2) All elevation values are in feet above mean sea level (ft AMSL).
3) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; County of Ventura; UWCD; CMWD

FIGURE 3-1

Minimum Thresholds and Groundwater Elevation Contours in the Oxnard Aquifer, October 2-29, 2015

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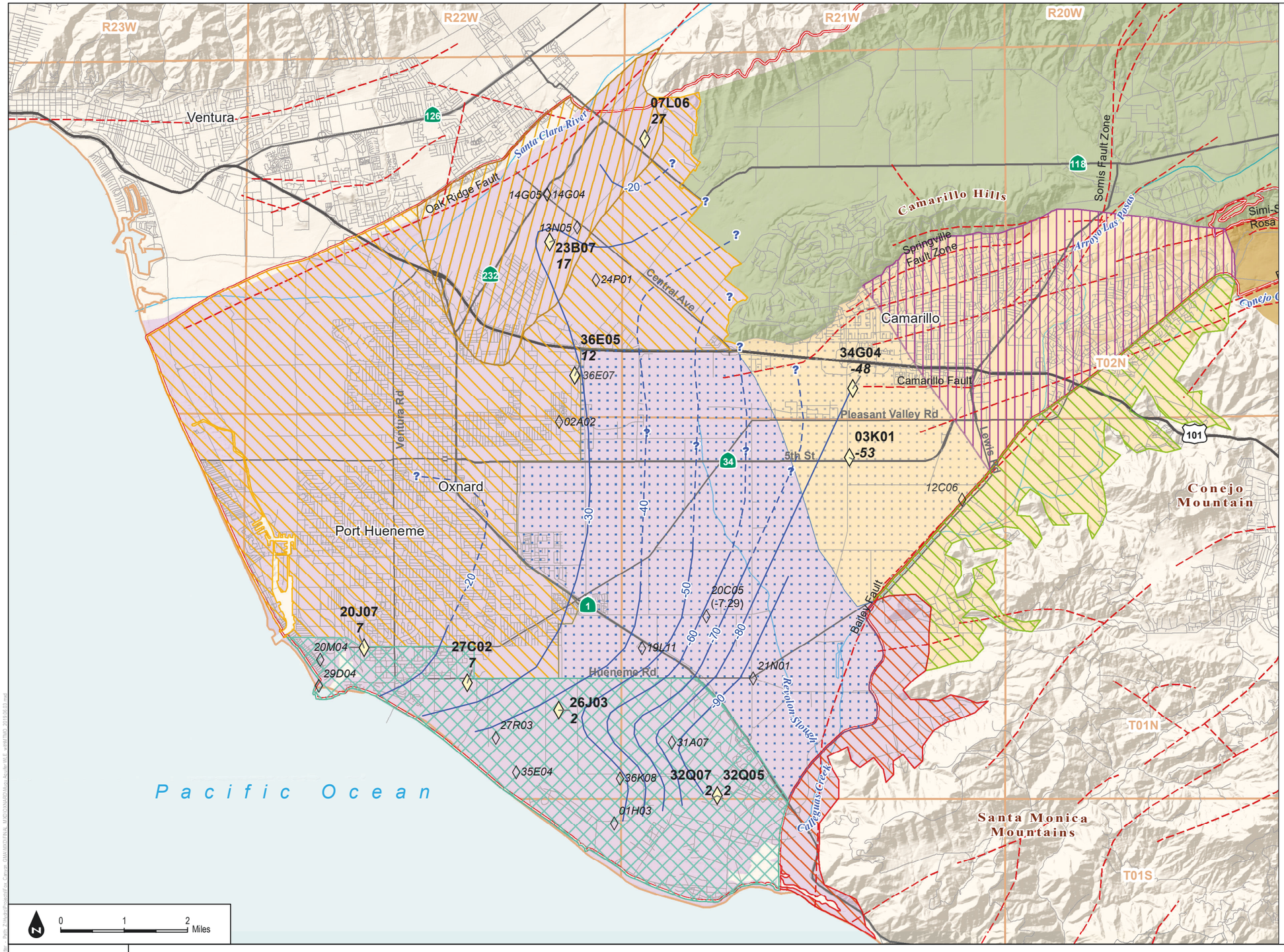

Legend

- Key Wells screened in the Mugu Aquifer
- Well screened in the Mugu Aquifer
- Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.
- *15P01* / **15P01** Abbreviated State Well Number (see notes)
- ***5*** Minimum Threshold for Key Wells in Feet above mean sea level (AMSL)
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (County of Ventura 2016)
- Township (North-South) and Range (East-West)
- East Oxnard Plain Management Area (EOPMA)
- Forebay Management Area
- West Oxnard Plain Management Area (WOPMA)
- Oxnard Pumping Depression Management Area
- Saline Intrusion Management Area
- East Pleasant Valley Management Area (EPVMA)
- Pleasant Valley Pumping Depression Management Area
- North Pleasant Valley Management Area

Revised Bulletin 118 Groundwater Basins and Subbasins (DWR 2016c)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Notes:
1) Well labels consist of an abbreviated State Well Number (SWN). SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S. Geotracker wells do not have SWN IDs and so are not labeled.
2) All elevation values are in feet above mean sea level (ft AMSL).
3) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; County of Ventura; UWCD; CMWD

FIGURE 3-2

Minimum Thresholds and Groundwater Elevation Contours in the Mugu Aquifer, October 2-29, 2015

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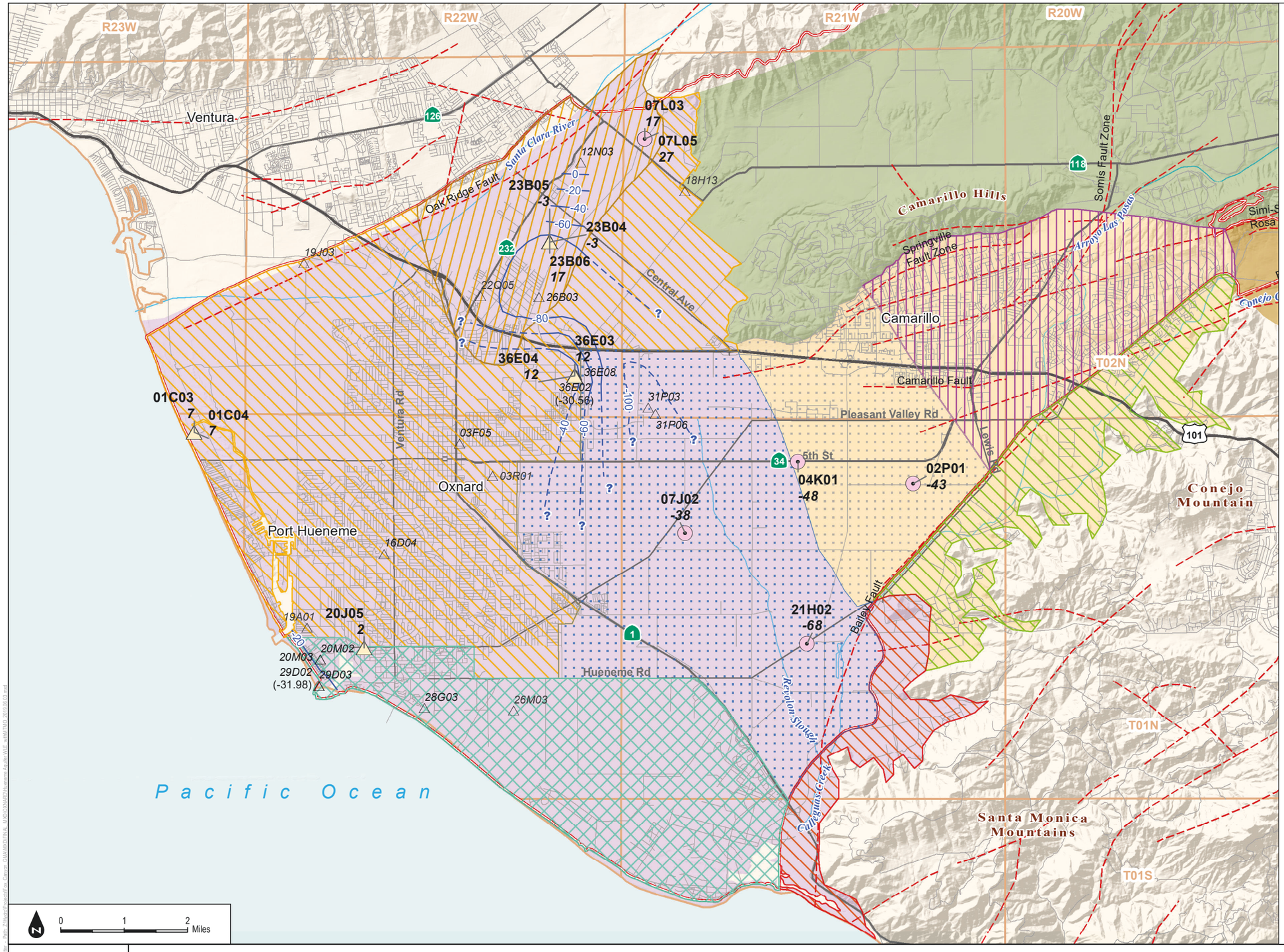

Legend

- Key Wells screened in the Hueneme Aquifer
- Key Wells screened in Multiple Aquifers
- Well screened in the Hueneme aquifer
- Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.
- 15P01 / **15P01** — Abbreviated State Well Number (see notes)
- ***5*** — Minimum Threshold for Key Wells in Feet above mean sea level (AMSL)
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (County of Ventura 2016)
- Township (North-South) and Range (East-West)
- East Oxnard Plain Management Area (EOPMA)
- Forebay Management Area
- West Oxnard Plain Management Area (WOPMA)
- Oxnard Pumping Depression Management Area
- Saline Intrusion Management Area
- East Pleasant Valley Management Area (EPVMA)
- Pleasant Valley Pumping Depression Management Area
- North Pleasant Valley Management Area

Revised Bulletin 118 Groundwater Basins and Subbasins (DWR 2016c)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Notes:
1) Well labels consist of an abbreviated State Well Number (SWN). SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S. Geotracker wells do not have SWN IDs and so are not labeled.
2) All elevation values are in feet above mean sea level (ft AMSL).
3) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; County of Ventura; UWCD; CMWD

FIGURE 3-3

Minimum Thresholds and Groundwater Elevation Contours in the Hueneme Aquifer, October 2-29, 2015

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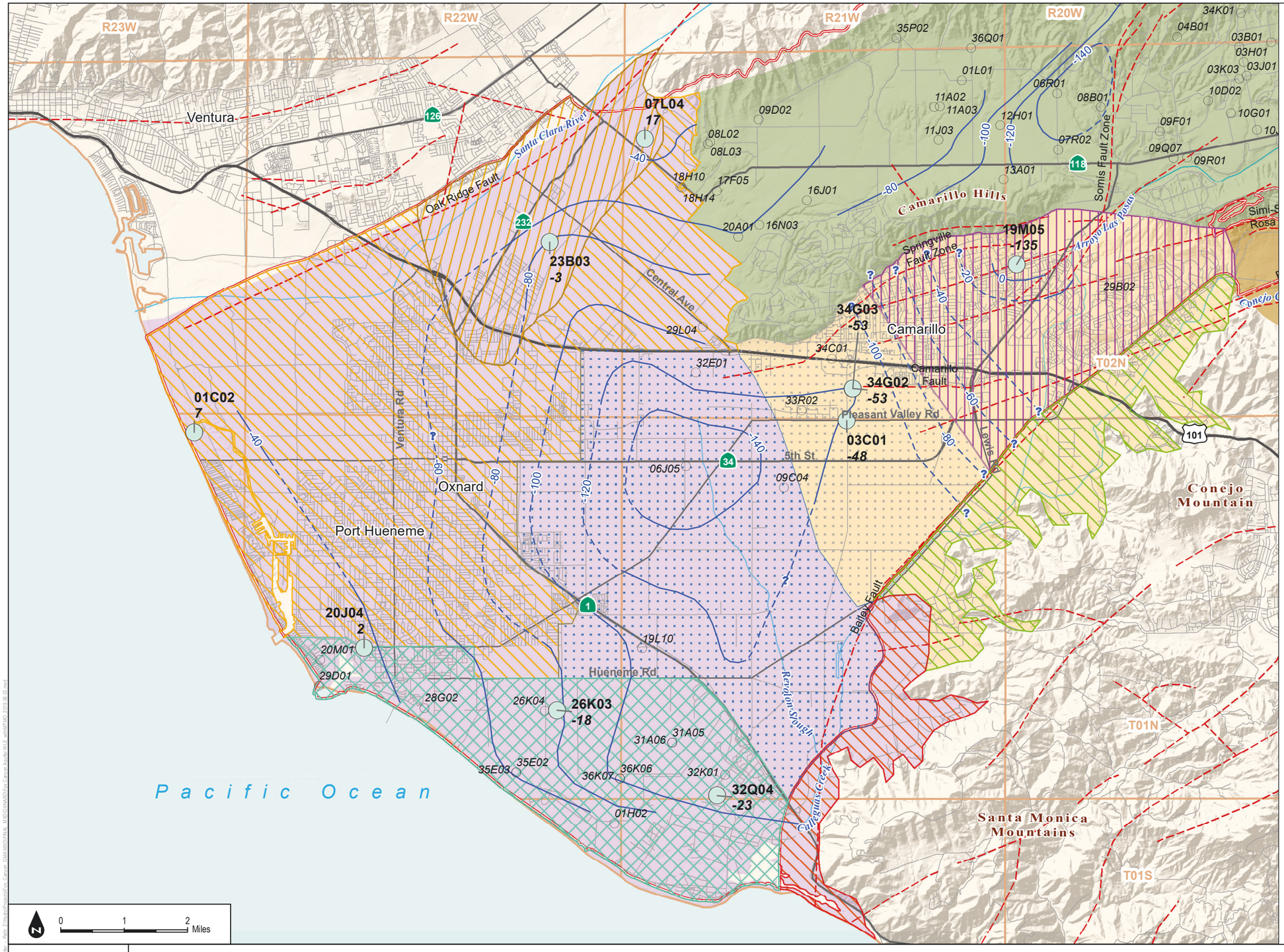

Legend

- Key Wells screened in the Fox Canyon Aquifer
- Well screened in the Fox Canyon aquifer
- Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.
- 15P01 / **15P01** — Abbreviated State Well Number (see notes)
- ***5*** — Minimum Threshold for Key Wells in Feet above mean sea level (AMSL)
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (County of Ventura 2016)
- Township (North-South) and Range (East-West)
- East Oxnard Plain Management Area (EOPMA)
- Forebay Management Area
- West Oxnard Plain Management Area (WOPMA)
- Oxnard Pumping Depression Management Area
- Saline Intrusion Management Area
- East Pleasant Valley Management Area (EPVMA)
- Pleasant Valley Pumping Depression Management Area
- North Pleasant Valley Management Area

Revised Bulletin 118 Groundwater Basins and Subbasins (DWR 2016c)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Notes:
1) Well labels consist of an abbreviated State Well Number (SWN). SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S. Geotracker wells do not have SWN IDs and so are not labeled.
2) All elevation values are in feet above mean sea level (ft AMSL).
3) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; County of Ventura; UWCD; CMWD

FIGURE 3-4

Minimum Thresholds and Groundwater Elevation Contours in the Fox Canyon Aquifer, October 2-29, 2015

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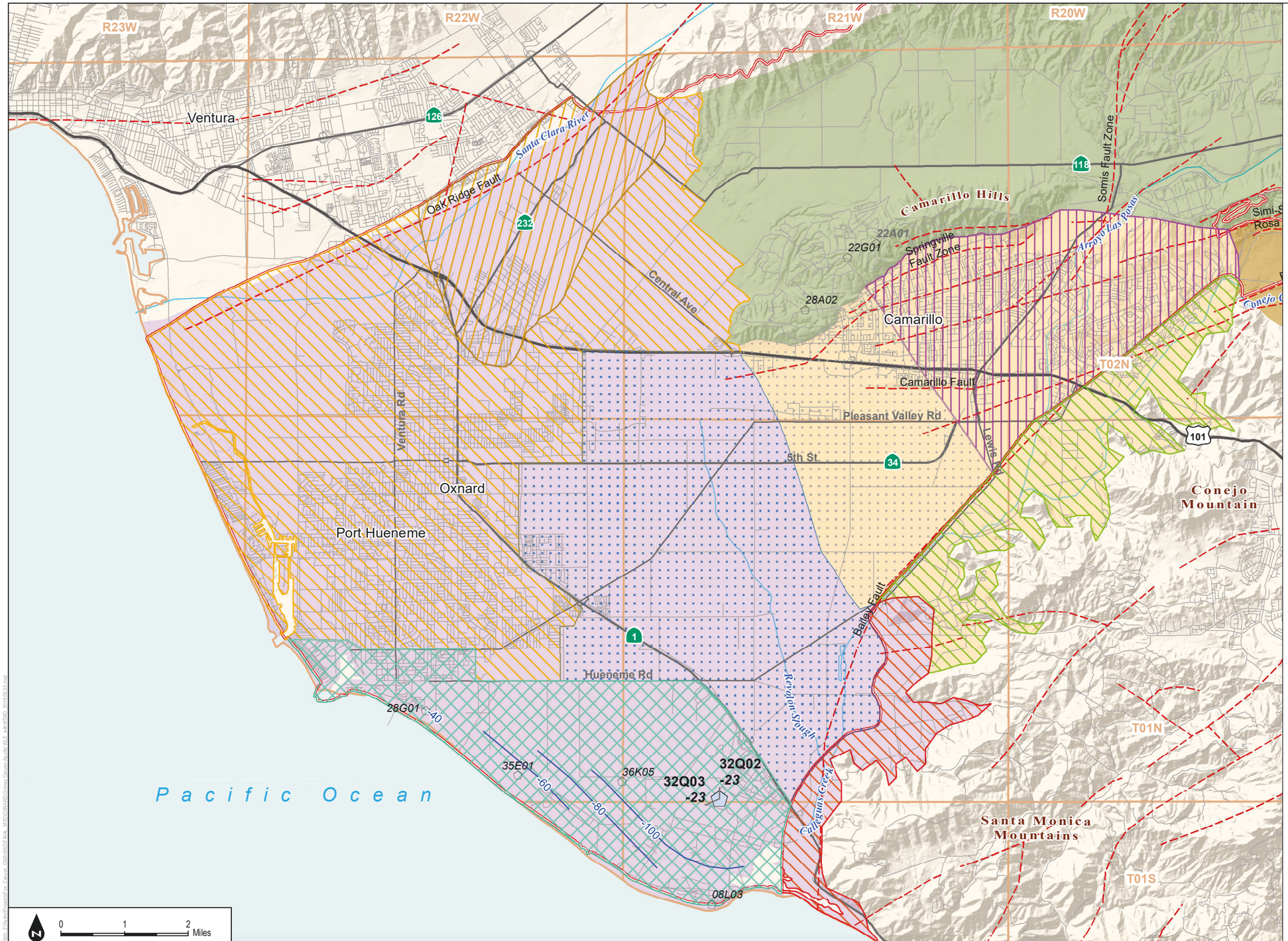

Legend

- Key Wells screened in the Grimes Canyon Aquifer
- Well screened in the Grimes Canyon aquifer
- Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.
- *15P01* / **15P01** — Abbreviated State Well Number (see notes)
- ***5*** — Minimum Threshold for Key Wells in Feet above mean sea level (AMSL)
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (County of Ventura 2016)
- Township (North-South) and Range (East-West)
- East Oxnard Plain Management Area (EOPMA)
- Forebay Management Area
- West Oxnard Plain Management Area (WOPMA)
- Oxnard Pumping Depression Management Area
- Saline Intrusion Management
- East Pleasant Valley Management Area (EPVMA)
- Pleasant Valley Pumping Depression Management Area
- North Pleasant Valley Management

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- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Notes:
1) Well labels consist of an abbreviated State Well Number (SWN). SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S. Geotracker wells do not have SWN IDs and so are not labeled.
2) All elevation values are in feet above mean sea level (ft AMSL).
3) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; County of Ventura; UWCD; CMWD

FIGURE 3-5

Minimum Thresholds and Groundwater Elevation Contours in the Grimes Canyon Aquifer, October 2-29, 2015

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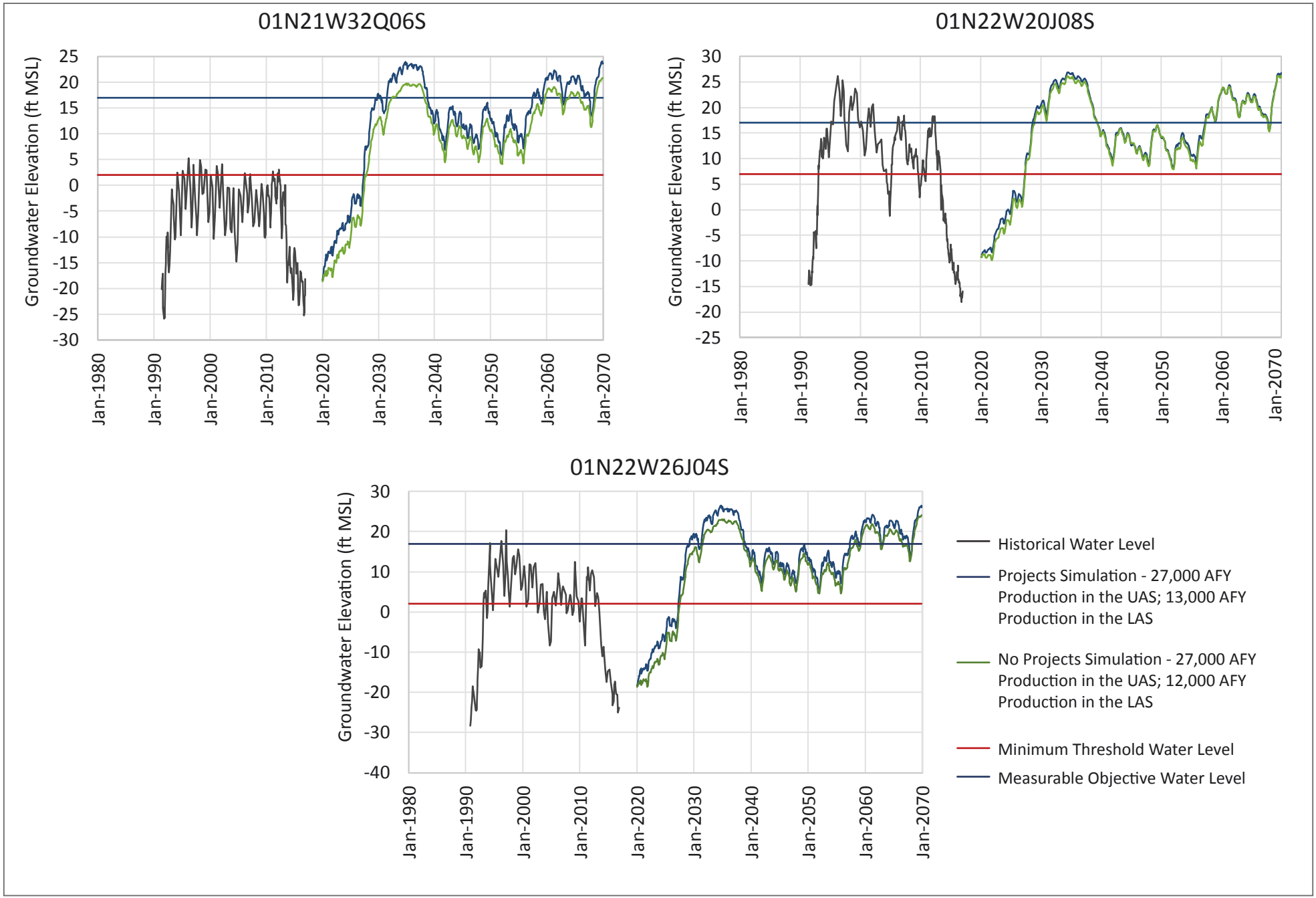

FIGURE 3-6a

Key Well Hydrographs for Wells Screened in the Oxnard Aquifer

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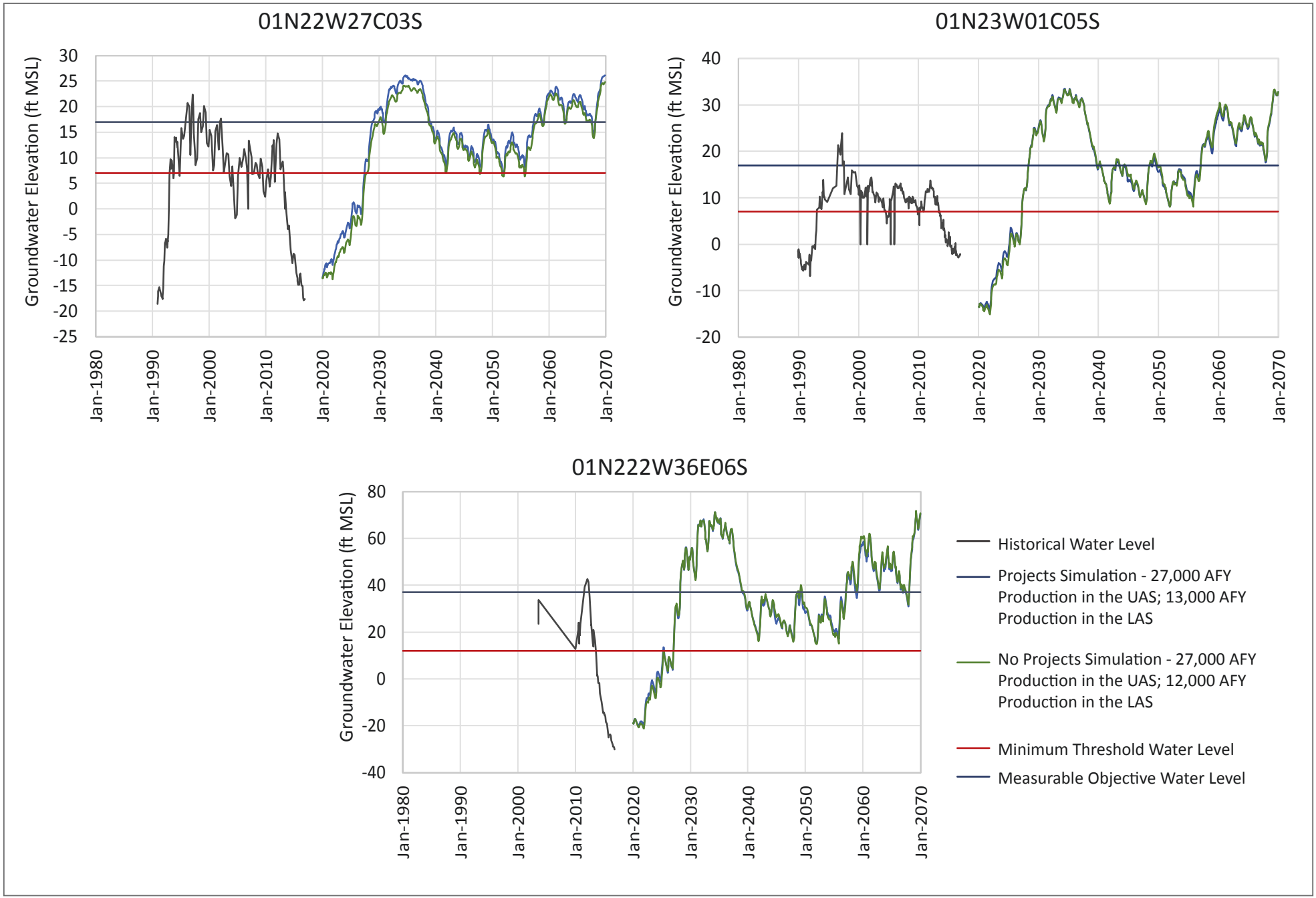

FIGURE 3-6b

Key Well Hydrographs for Wells Screened in the Oxnard Aquifer

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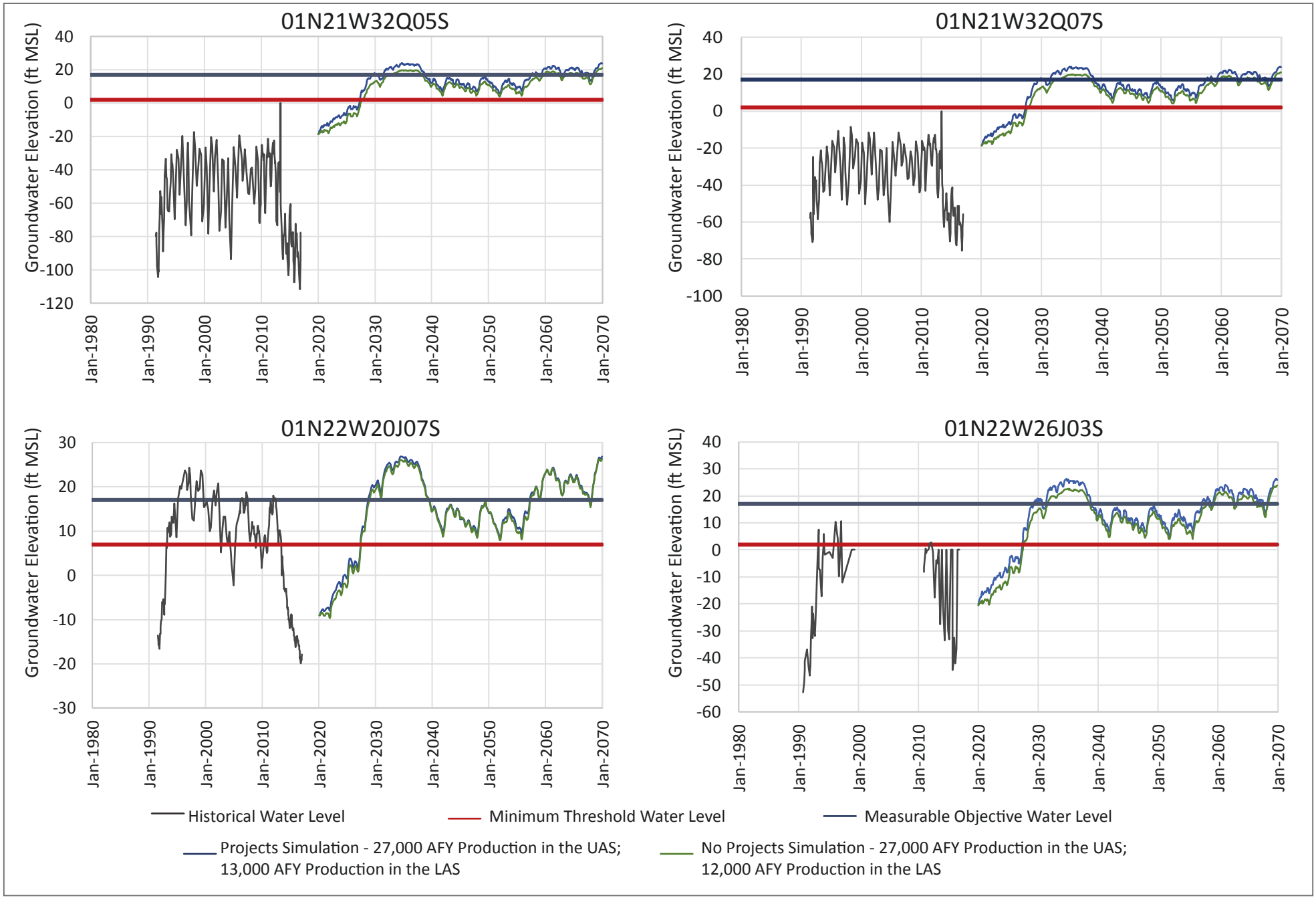

FIGURE 3-7a

Key Well Hydrographs for Wells Screened in the Mugu Aquifer

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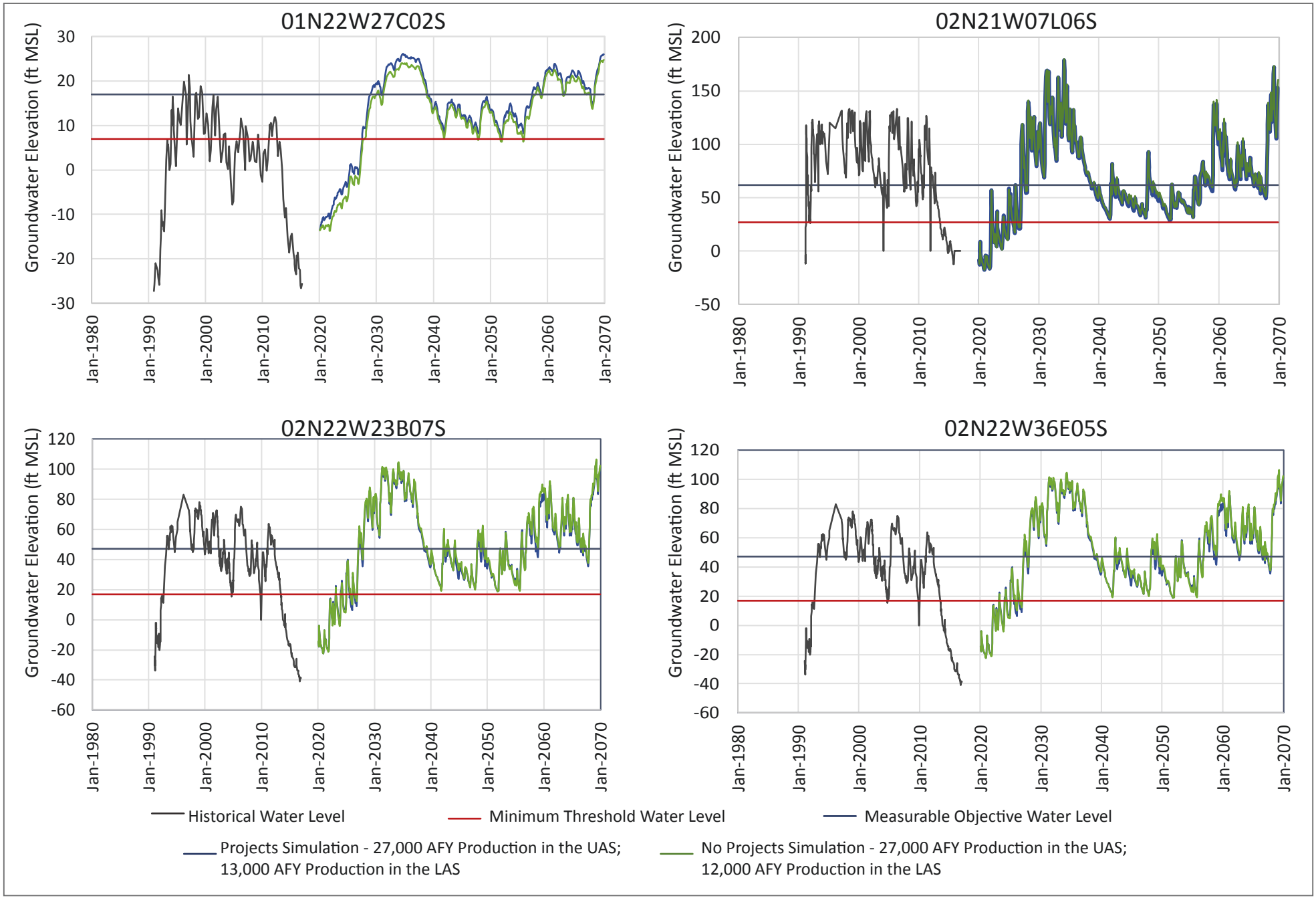

FIGURE 3-7b

Key Well Hydrographs for Wells Screened in the Mugu Aquifer

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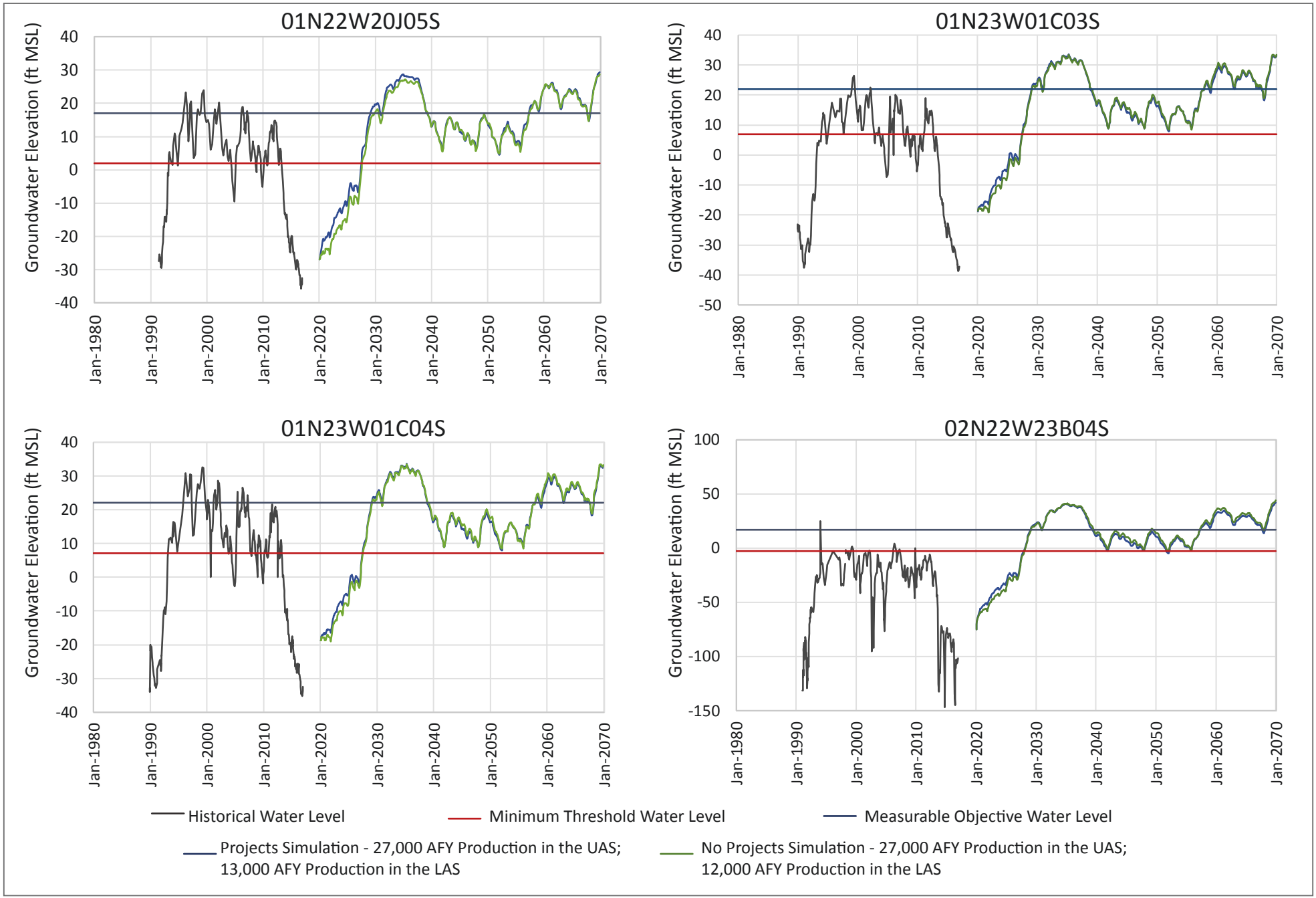

FIGURE 3-8a

Key Well Hydrographs for Wells Screened in the Hueneme Aquifer

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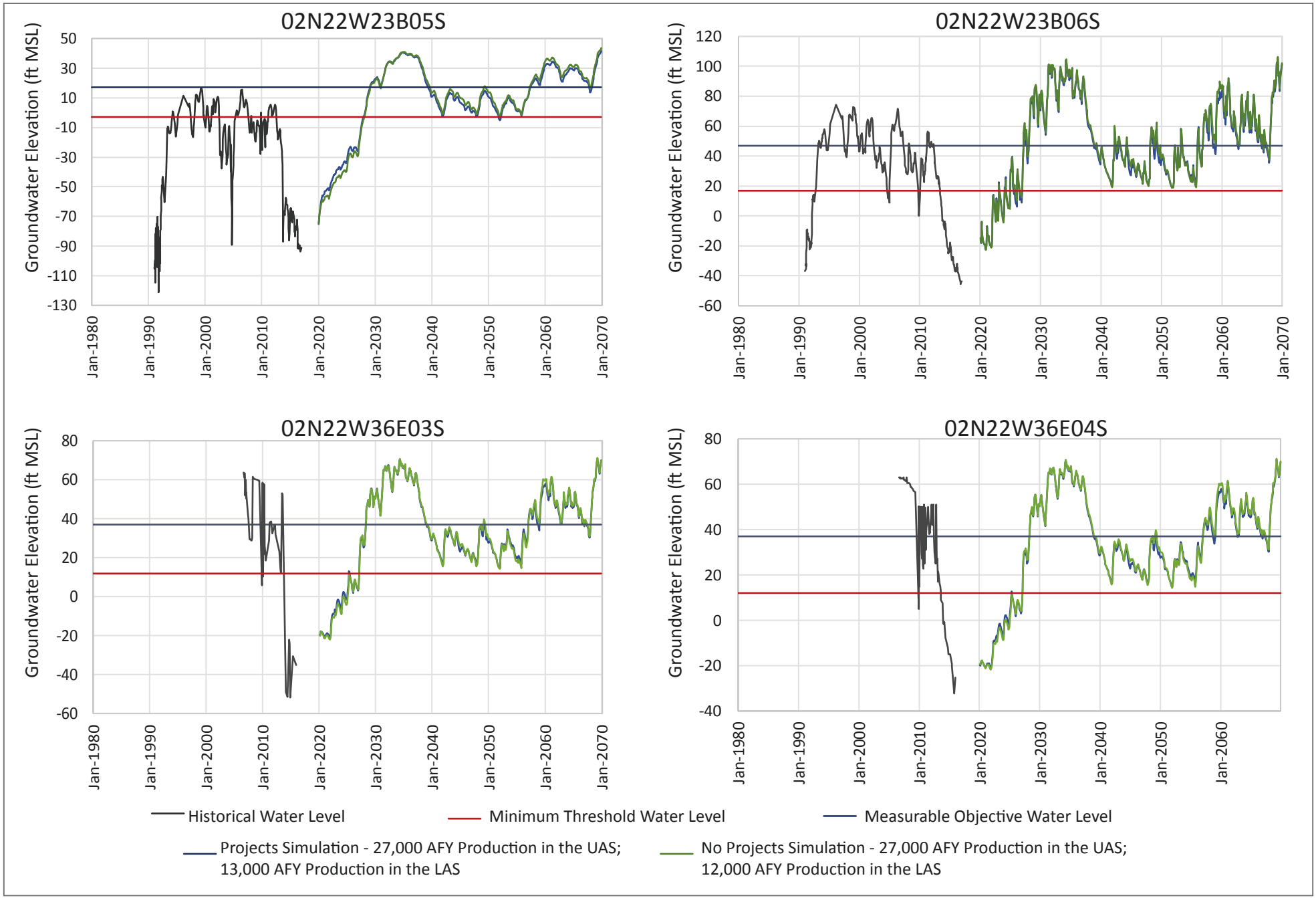

FIGURE 3-8b

Key Well Hydrographs for Wells Screened in the Hueneme Aquifer

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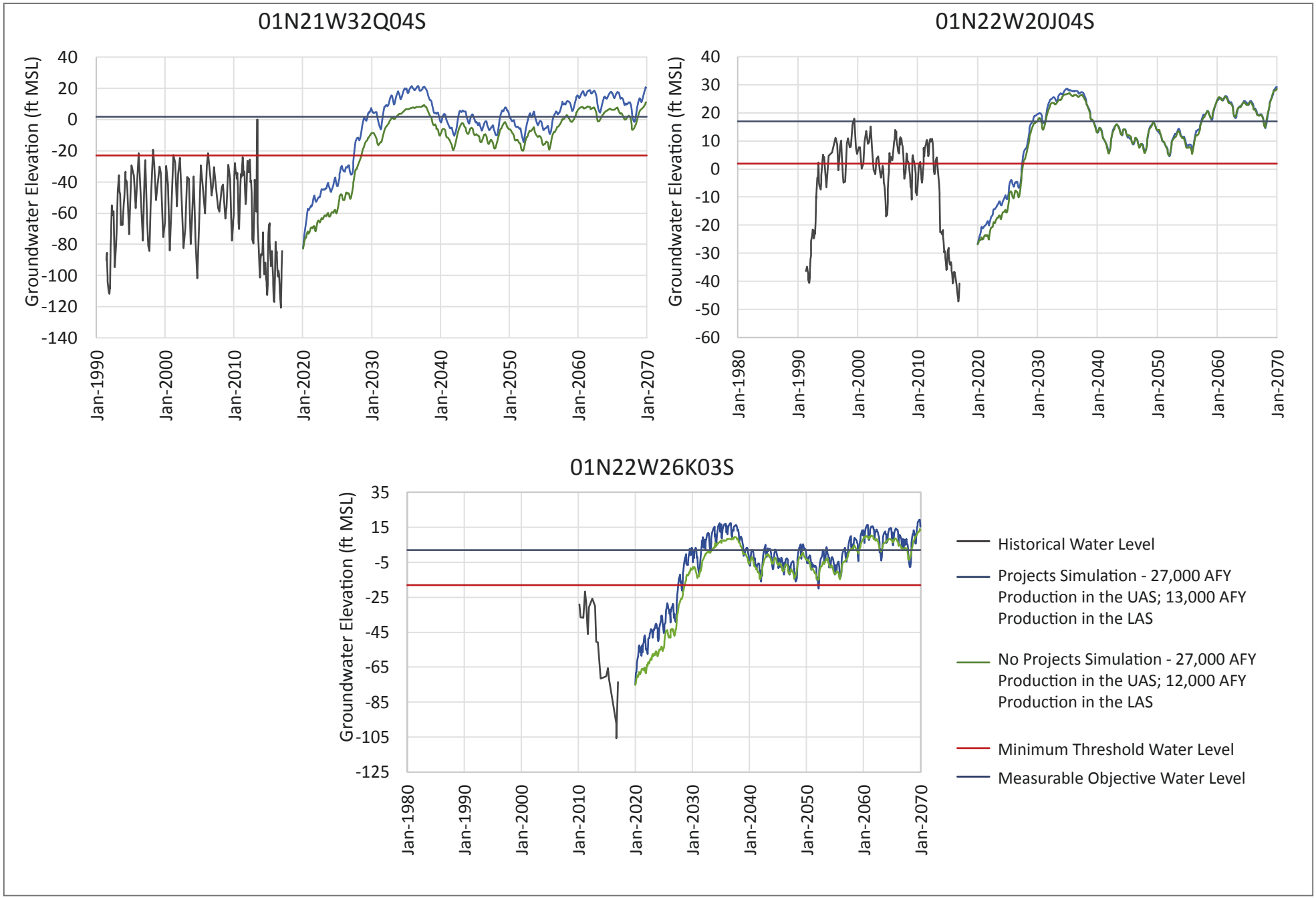

FIGURE 3-9a

Key Well Hydrographs for Wells Screened in the Fox Canyon Aquifer

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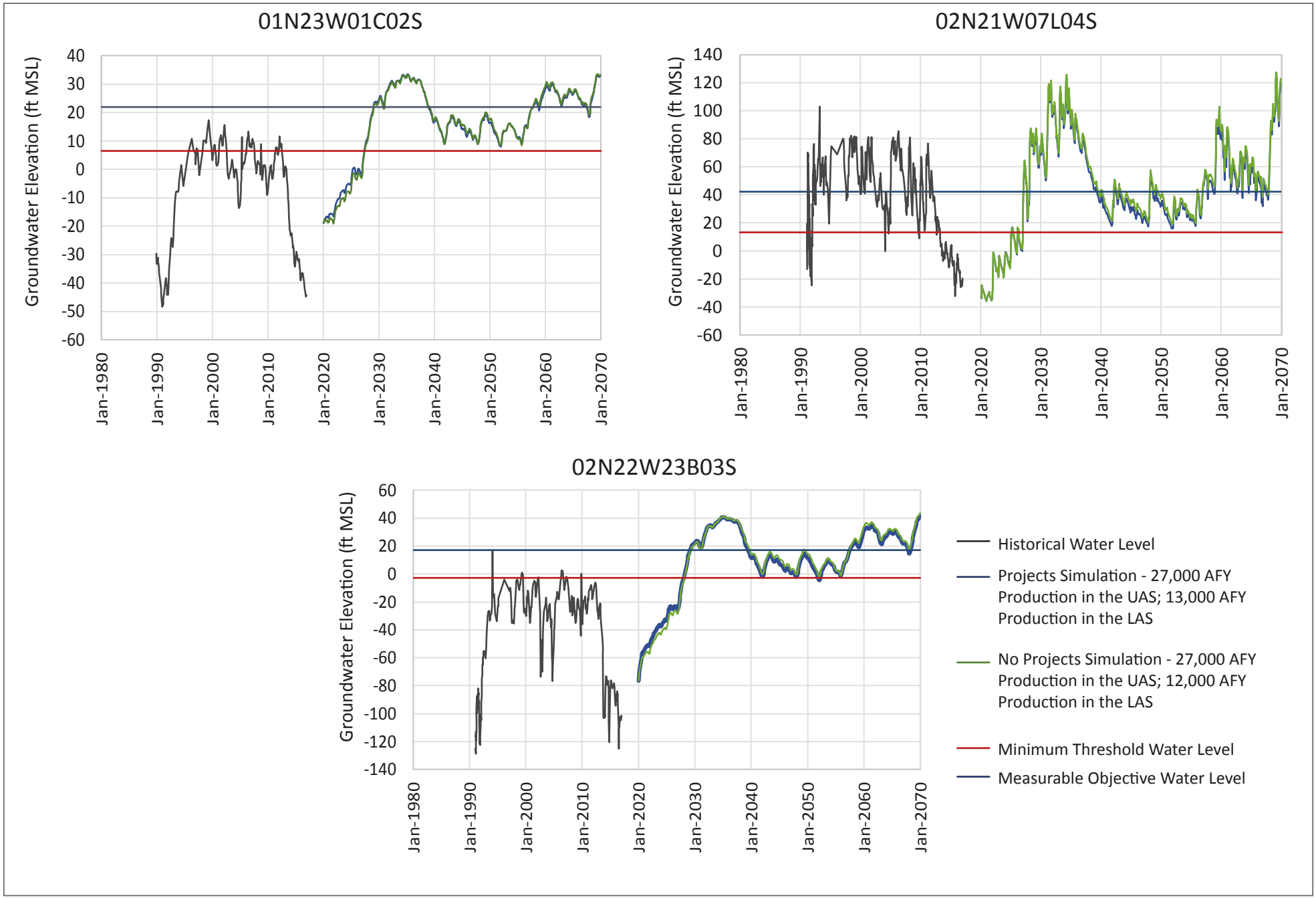

FIGURE 3-9b

Key Well Hydrographs for Wells Screened in the Fox Canyon Aquifer

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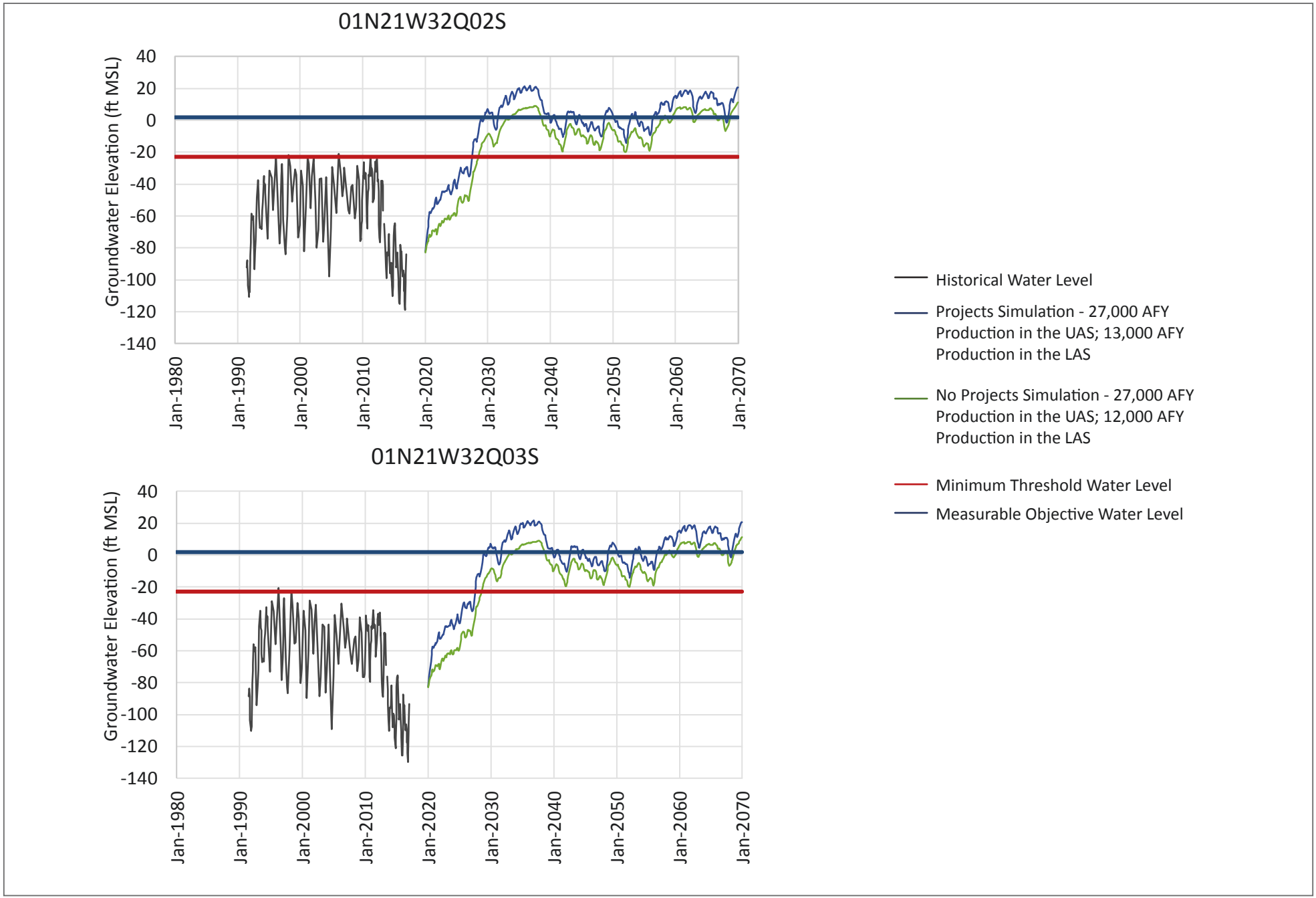

FIGURE 3-10

Key Well Hydrographs for Wells Screened in the Grimes Canyon Aquifer

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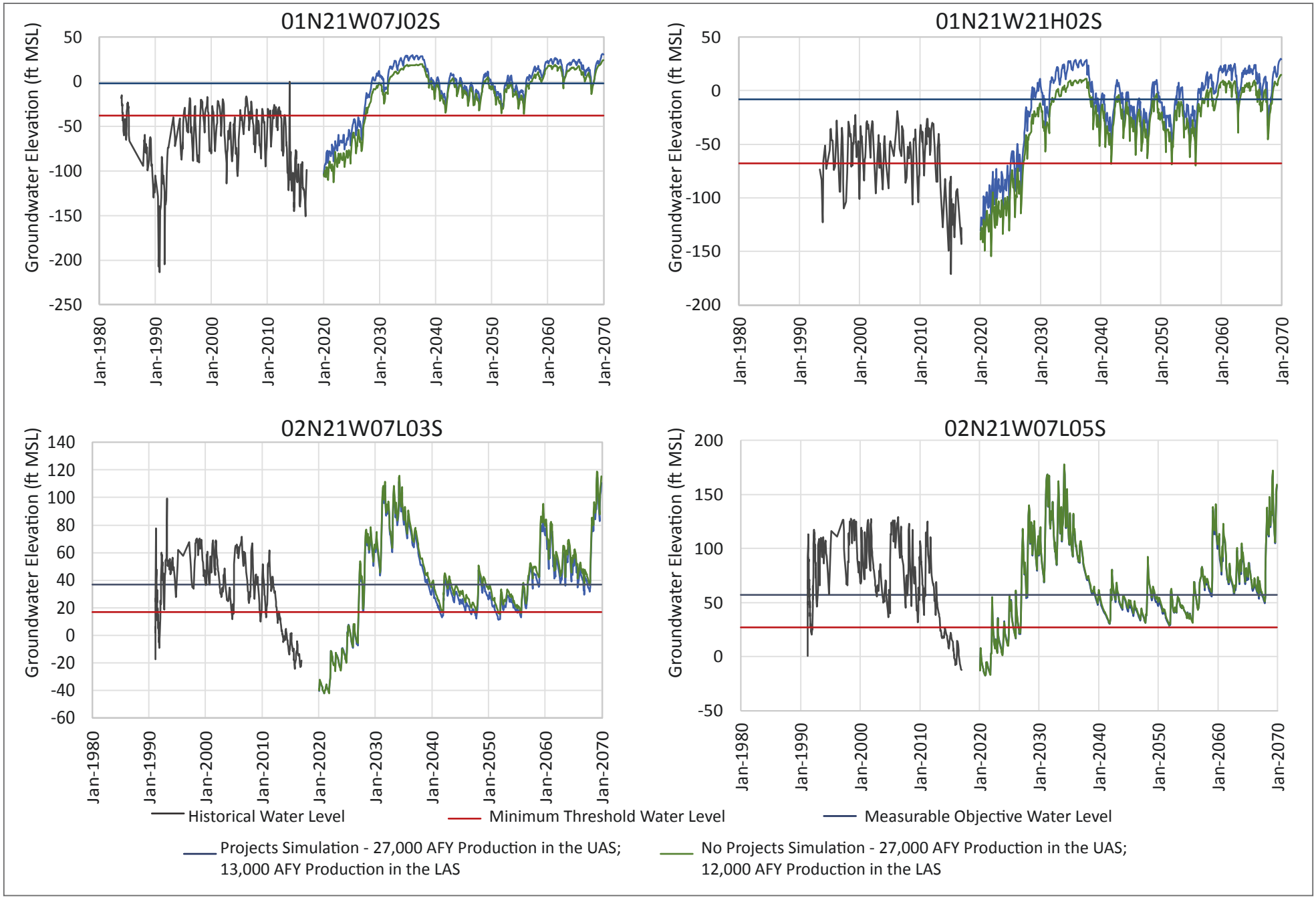

FIGURE 3-11

Key Well Hydrographs for Wells Screened in Multiple Aquifers

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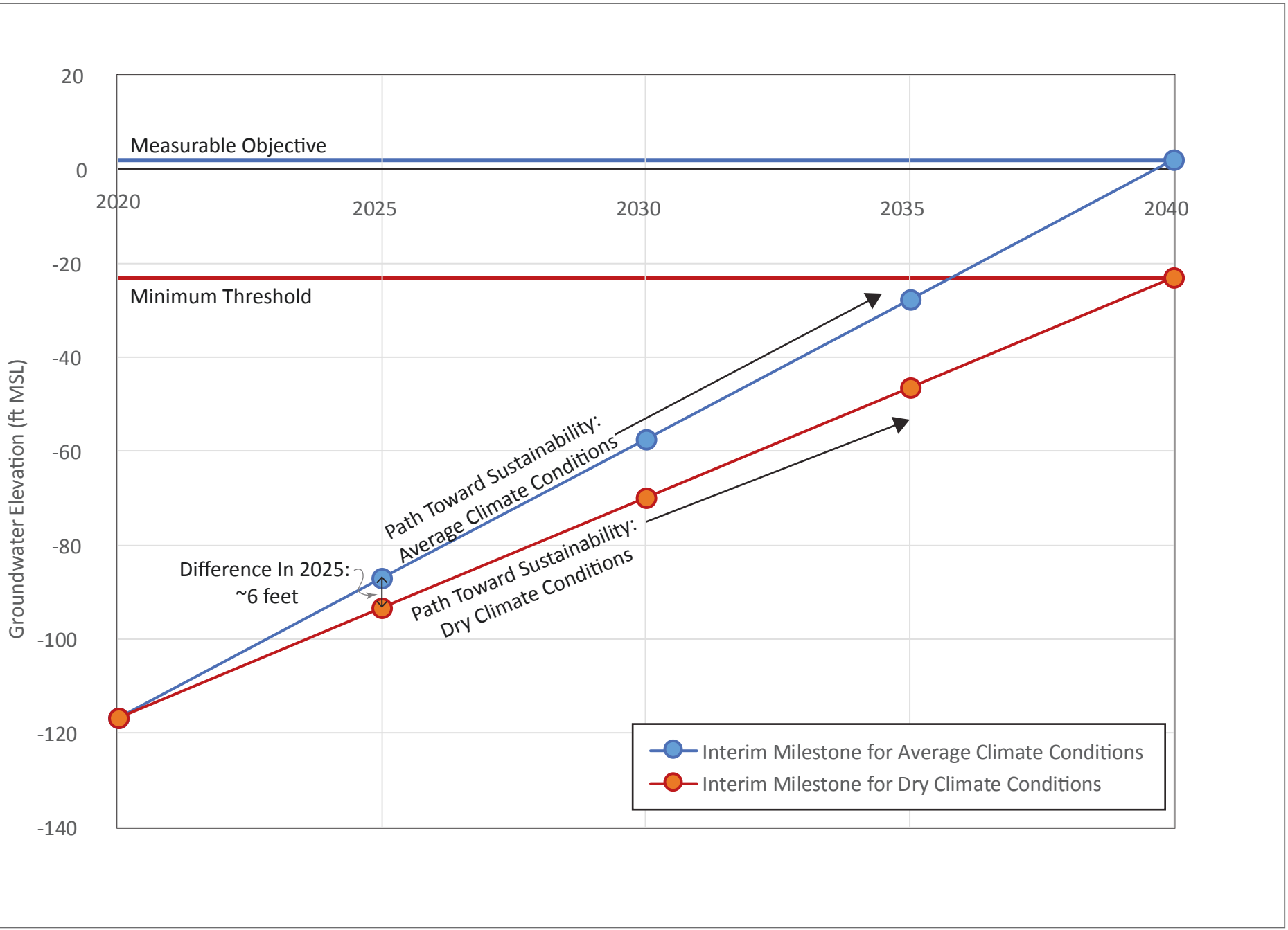

FIGURE 3-12

Interim Milestones for Dry and Average Conditions - Linear Interpolation

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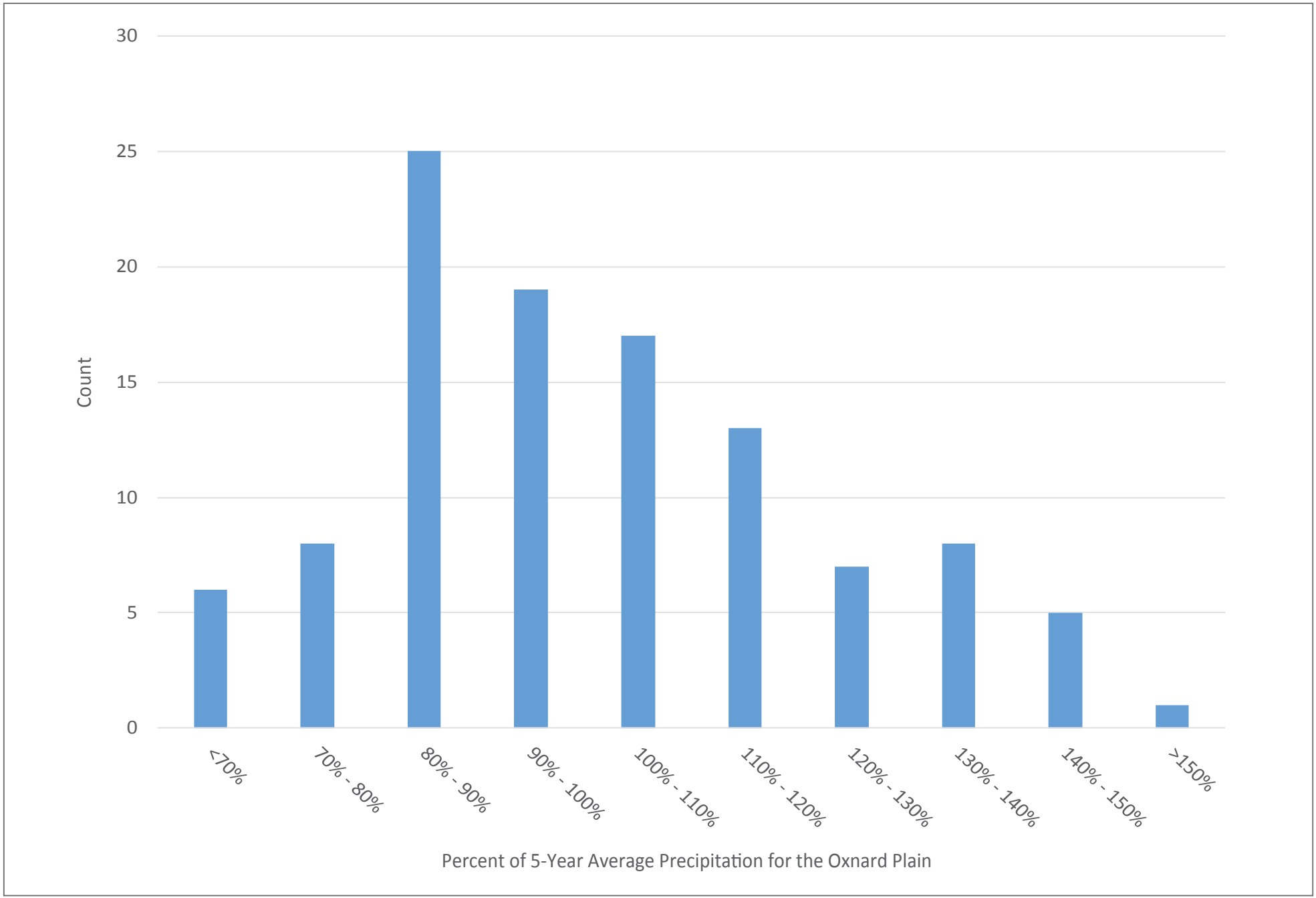

FIGURE 3-13

Distribution of 5-Year Average Climate Conditions in the Historical Record of Precipitation on the Oxnard Plain

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CHAPTER 4
MONITORING NETWORKS

4.1 MONITORING NETWORK OBJECTIVES

The overall objective of the monitoring network in the Oxnard Subbasin (Subbasin) is to track and monitor parameters that demonstrate progress toward meeting the sustainability goals. In order to accomplish this objective, the monitoring network in the Subbasin must be capable of the following:

- Monitoring changes in groundwater conditions (in six sustainability indicator categories)
- Monitoring progress toward minimum thresholds and measurable objectives
- Quantifying annual changes in water budget components

The existing network of groundwater wells includes both monitoring wells and production wells. This network is capable of delineating the groundwater conditions in the Subbasin and has been used for this purpose in the past. The current groundwater well network will be used to monitor groundwater conditions moving forward, in order to continue to assess long-term trends in groundwater elevation and groundwater quality in the Subbasin.

In the future, to the extent possible, additional dedicated monitoring wells will be incorporated into the existing monitoring network. These wells will provide information on groundwater conditions in geographic locations where data gaps have been identified, or where a dedicated monitoring well would better represent conditions in the aquifers than a production well currently used for monitoring.

4.2 DESCRIPTION OF EXISTING MONITORING NETWORK

The existing monitoring network for groundwater and related surface conditions in the Subbasin includes groundwater production wells, dedicated groundwater monitoring wells, stream gauges, and weather stations. The components of the monitoring network are discussed in Section 4.2.1, Groundwater Monitoring, and Section 4.2.2, Surface Conditions Monitoring, in the context of their ability to demonstrate short-term, seasonal, and long-term trends in groundwater and related surface conditions and of the ability of the network to provide representative conditions in the Subbasin. A discussion of how the monitoring network relates to each of the sustainability criteria follows this discussion in Section 4.3, Monitoring Network Relationship to Sustainability Indicators.

4.2.1 Groundwater Monitoring

Groundwater Elevation

Data collected from more than 150 wells in the Subbasin have been used to demonstrate historical groundwater elevation conditions in the Upper Aquifer System and Lower Aquifer System (Figures 4-1 through 4-6, Monitoring Wells Screened in the Oxnard Subbasin (by aquifer)). The groundwater well monitoring network contains wells that are located in every management area of the Subbasin except the East Oxnard Plain Management Area (EOPMA) and that are screened in every primary aquifer in the Subbasin. Although the network of groundwater wells includes agricultural, municipal and industrial, and domestic production wells, the majority of the wells used to determine groundwater elevations are designated as monitoring wells in the Ventura County Watershed Protection District (VCWPD) database of groundwater elevation and groundwater quality data collected in the Subbasin.

The United Water Conservation District (UWCD) collects groundwater elevation data from more than 100 monitoring and agricultural wells in the Subbasin. These wells are monitored either monthly or bimonthly (once every two months). Water levels are measured both manually and with pressure transducers, which record the pressure of water (or height of the water column) above the transducer in the well. Pressure transducers have been installed in 65 of these wells. These transducers record the height of the water column in the well every 4 hours, thereby providing high temporal resolution data on groundwater conditions in the aquifers. Data are downloaded from the transducers quarterly, in a rotating pattern. Transducer records are subject to quality control review before being added to UWCD databases and reported to VCWPD.

Manual groundwater elevation measurements are collected monthly or bimonthly from the UWCD network of groundwater wells. These data are used to assess seasonal and long-term trends in groundwater elevation in the Subbasin, where groundwater elevations were first measured in the 1930s. Seasonal and long-term groundwater elevation trends have been assessed based on the data collected from the existing network of groundwater monitoring wells, and are discussed in Section 2.3, Groundwater Conditions, of this Groundwater Sustainability Plan (GSP).

The spatial and temporal coverage of the existing groundwater monitoring network is sufficient to provide an understanding of representative conditions in the Upper Aquifer System and Lower Aquifer System throughout the Subbasin, and this network will be used to demonstrate progress toward the sustainability goals for the Subbasin. Although evaluation of the current network suggests that the network is sufficient to document groundwater conditions in the Subbasin, areas for future improvement of the network are identified in Section 4.6, Potential Monitoring Network Improvements.

Groundwater Quality

The majority of the wells in the groundwater elevation monitoring network in the Subbasin are also monitored for groundwater quality. UWCD conducts the majority of the water quality monitoring in the Subbasin. UWCD water quality monitoring is conducted in a rotating pattern such that each well is monitored at least once per year. Annual monitoring of groundwater quality is sufficient to demonstrate long-term trends in groundwater quality, because the physical processes that drive changes in groundwater quality operate on a longer timescale. Currently, groundwater elevations are the primary metric by which progress toward sustainability will be measured. However, groundwater quality data will continue to be collected and analyzed to assess whether groundwater elevation thresholds are sufficiently protective of groundwater conditions in the Subbasin. Recommendations for improvement of the groundwater quality monitoring network are identified in Section 4.6.

Groundwater Extraction

The Fox Canyon Groundwater Management Agency (FCGMA) has required reporting of groundwater extraction from the Subbasin since 1983. Historically, groundwater extraction data from wells within the FCGMA jurisdictional boundary have been self-reported by well owners semi-annually (Figure 2-5, Upper Aquifer System 2015 Extraction [acre-feet] in Oxnard and Pleasant Valley, and Figure 2-6, Lower Aquifer System 2015 Extraction [acre-feet] in Oxnard and Pleasant Valley). In 2018, FCGMA adopted an ordinance that required installation of advanced metering infrastructure (AMI) telemetry on wells that were equipped with flowmeters (FCGMA 2018). All agricultural wells were required to install AMI by December 31, 2018; municipal and industrial wells are required to install AMI by October 1, 2019; and all other metered wells are required to install AMI by October 1, 2020. Requiring AMI on all metered wells within FCGMA jurisdiction will provide for broader simultaneous reporting of groundwater extractions, improve FCGMA's ability to monitor and manage groundwater use, and facilitate implementation of this GSP.

4.2.2 Surface Conditions Monitoring

The primary surface conditions that impact groundwater conditions in the Oxnard Subbasin are surface water flows and precipitation. The monitoring networks for both surface conditions are discussed in this section.

Surface Water

Surface flows in the Subbasin are monitored by a network of gauges that are maintained by the VCWPD (Table 4-1). The network includes three types of gauges:

1. Recording Stream Gauges (also known as Daily and Peak Stations). These stream gauges record daily average flowrates as well as "peak" flowrates during rain events.

2. Peak Only (Event) Gauges. This type of stream gauge records only "peak" flowrates during rain events (the threshold over which a flowrate is considered to be part of a rain event is site-specific).
3. ALERT Peak Gauges. These stream gauges serve only as a flood warning system. These stations register high flows but are not used to measure numerical flow rates.

The recording stations at the Freeman Diversion Channel near Saticoy, Santa Clara River at Victoria Avenue, Beardsley Wash at Central Avenue, and the Revolon Slough at Pleasant Valley Road are recording gauges that provide the primary data on surface flows. These gauges collect daily data, while the other gauges in the basin only record flows during precipitation events.

In addition to the surface flow monitoring network in the Subbasin, UWCD monitors and reports diversions from the Santa Clara River. These diversions are used to deliver surface water to agricultural users in lieu of groundwater production and are used for recharge, via UWCD's spreading grounds, to the groundwater aquifers in the Subbasin.

Surface water flows have been recorded in the Subbasin since the 1930s (Figure 1-4, Average Daily Flows (ADF) and Monthly Minimum ADF in Oxnard Surface Waters). Daily flows on Calleguas Creek and in the Revolon Slough have been recorded since the 1970s. There are currently gauges on the major surface water bodies in the Subbasin (Figure 4-7, Active Surface Water Monitoring Network for the Oxnard Subbasin). The historical and existing spatial and temporal coverage from the surface water flow gauge network provides adequate coverage for the short-term, seasonal, and long-term surface flow conditions in the Subbasin. Although the current network is sufficient to document surface flow conditions in the Subbasin, areas for improvement are identified in Section 4.6.

Precipitation

Thirteen precipitation gauges currently monitor precipitation in the Subbasin (Table 4-2; Figure 4-8, Active Precipitation Monitoring Network for the Oxnard Subbasin). The precipitation gauges are maintained, and data are collected, by VCWPD and the National Weather Service.

Precipitation in the Subbasin has been recorded for more than a century (Figure 1-5, Oxnard Plain Annual Precipitation). Although the locations of individual precipitation gauges have changed through time, with some gauges being removed from service and others added, there is overlap between the records collected from the various gauges. Therefore, a continuous precipitation record can be constructed for the Subbasin to demonstrate long-term trends. More recent data, collected with greater frequency, can be used to demonstrate short-term and seasonal trends in precipitation.

In addition to providing adequate temporal coverage of the Subbasin, the current network of precipitation gauges includes sites in every management area of the Subbasin except the EOPMA. This is sufficient spatial coverage to document precipitation in the Subbasin and to connect the precipitation measurements to both streamflow and groundwater conditions. Additional precipitation monitoring locations are not currently recommended for characterizing surface conditions in the Oxnard Subbasin.

4.3 MONITORING NETWORK RELATIONSHIP TO SUSTAINABILITY INDICATORS

To document changes in groundwater conditions related to each of the six sustainability indicators, monitoring will be conducted using the existing network of groundwater wells (Figures 4-1 through 4-6). This network includes a greater number of wells than the list of key wells provided in Chapter 3, Sustainable Management Criteria, of this GSP (see Tables 4-3 and 4-4). Minimum thresholds and measurable objectives have been selected for the set of key wells but have not been selected for every well used to monitor groundwater conditions in the Subbasin. Conditions measured in the key wells will be used to document progress toward the sustainability goals. Groundwater conditions measured in the broader network of wells, which includes the key wells, will be used to document conditions in the Subbasin at a greater spatial coverage than is provided by the key wells. Recommendations and findings based on the key well data will be supported by the data collected by the broader well network.

4.3.1 Chronic Lowering of Groundwater Levels

To monitor conditions related to chronic lowering of groundwater levels, the groundwater monitoring network must be structured to accomplish the following:

- Track short-term, seasonal, and long-term trends in water elevation.
- Demonstrate groundwater elevations in mid-March and mid-October for each primary aquifer or aquifer system.
- Record groundwater elevations in key wells in which minimum thresholds and measurable objectives have been identified to track progress toward the sustainability goals for the Subbasin.

Spatial Coverage by Aquifer

The Subbasin monitoring well density for groundwater elevations varies by aquifer (Tables 4-3 and 4-4). Of the primary aquifers in the Subbasin identified in Chapter 2, Basin Setting, the Grimes Canyon Aquifer has the lowest density of active wells in which groundwater elevations can be measured. The density of wells in the Grimes Canyon Aquifer is approximately 1 well per 13 square

miles (the Oxnard Subbasin area is approximately 90 square miles). There is no definitive rule for the density of groundwater monitoring points needed in a basin; however, for comparison, the monitoring well density recommended by CASGEM Groundwater Elevation Monitoring Guidelines ranges from 1 to 10 wells per 100 square miles (DWR 2010). Additional California Department of Water Resources (DWR) guidelines recommend a well network with a density of 1 observation per 16 square miles (DWR 2010, 2016b). Therefore, the density of wells in the Grimes Canyon Aquifer meets the criteria for adequate coverage to accomplish the objectives of the monitoring well network for determining chronic lowering of groundwater levels.

In addition to the Grimes Canyon Aquifer, the density of wells in the other primary aquifers in the Subbasin is also greater than the recommended well density provided in the DWR and CASGEM guidelines. The density of active monitoring wells in the Fox Canyon Aquifer (FCA) and the Hueneme Aquifer is approximately 1 well per 4 square miles. The density of active monitoring wells in the Mugu Aquifer is approximately 1 well per 3 square miles, and the density of active monitoring wells in the Oxnard Aquifer is approximately 1 well per square mile.

Groundwater elevations are also monitored in the semi-perched aquifer, although the semi-perched aquifer is not a primary aquifer in the Subbasin. These elevations are measured to document interactions between the semi-perched aquifer and the surface water bodies in the Subbasin, as well as to document potential gradients between the semi-perched aquifer and the underlying Oxnard Aquifer. The density of monitoring wells in the semi-perched aquifer is approximately 1 well per 13 square miles. This density meets the DWR and CASGEM criteria for documenting groundwater elevations in the semi-perched aquifer.

Although the active network of wells used to document chronic lowering of groundwater levels in the Subbasin has sufficient spatial density on the Subbasin scale, in some aquifers, there are local areas in which coverage can be improved. Potential improvements in local coverage are discussed in Section 4.6.

Temporal Coverage by Aquifer

Groundwater elevation data will be collected from the network of groundwater wells to provide groundwater elevation conditions in the spring and fall of each year. Further discussion of the monitoring schedule is provided in Section 4.4, Monitoring Network Implementation.

4.3.2 Reduction of Groundwater Storage

To monitor conditions related to reduction of groundwater storage, the groundwater monitoring network must be structured to accomplish the following:

- Demonstrate groundwater elevations in mid-March and mid-October for each primary aquifer or aquifer system.
- Calculate year-over-year (mid-March to mid-March) change in storage by aquifer.
- Provide data from which lateral and vertical hydraulic gradients within and between aquifers can be calculated.
- Record groundwater elevations in key wells in which minimum thresholds and measurable objectives have been identified to track progress toward the sustainability goals for the Subbasin.

The requirements for documenting reduction in groundwater storage are similar to those for chronic lowering of groundwater levels (see Section 4.3.1), because these two sustainability indicators are interrelated. The primary difference between the two sets of requirements is the need to document potential gradients between aquifers. These gradients influence the movement of water between aquifers, which in turn influences storage in the aquifer.

Historically, the change in groundwater stored in freshwater aquifers in the Subbasin has been modeled by UWCD. After GSP adoption, modeled volumes of annual change in storage will be reported by aquifer and by year in annual reports. A standardized method to calculate the change in storage that relies solely on water elevations within each aquifer, rather than on a numerical model, may also be developed as a check on the model predictions.

The spatial and temporal density of groundwater elevation data necessary to document groundwater storage changes in the aquifers of the Subbasin is the same as that necessary to document groundwater elevation changes. The current network of wells is capable of documenting changes to both sustainability indicators. Specific recommendations for potential improvements to local coverage are discussed in Section 4.6.

4.3.3 Seawater Intrusion

To monitor conditions related to seawater intrusion, groundwater elevations will be measured, and water quality samples will be collected, in such a way as to accomplish the following:

- Track short-term, seasonal, and long-term trends in water elevation.
- Demonstrate groundwater elevations in mid-March and mid-October for each primary aquifer or aquifer system.

- Record groundwater elevations in key wells in which minimum thresholds and measurable objectives have been identified to track progress toward the sustainability goals for the Subbasin.

These goals are the same as those for chronic lowering of groundwater levels (see Section 4.3.1). Groundwater elevations are the metric by which seawater intrusion will be assessed (see Section 3.3.3).

Spatial Coverage by Aquifer

A network of nested monitoring wells was installed in the early 1990s by the U.S. Geological Survey for the Regional Aquifer System Analysis, which includes 16 wells in the Oxnard Subbasin (USGS 1996). Fourteen of these well sites are located within an approximately 28-square-mile area adjacent to the Pacific Ocean. Thus, the density of dedicated monitoring wells adjacent to the coast is approximately 1 well per 2 square miles. The current network of wells is capable of documenting groundwater elevations that could induce seawater intrusion. No additional coastal monitoring wells are proposed.

Water Quality Constituents

Groundwater samples will continue to be collected and analyzed for total dissolved solids (TDS) and chloride in order to assess trends in groundwater quality related to seawater intrusion. The network of existing wells is capable of providing an adequate assessment of groundwater quality trends for these constituents.

Temporal Resolution

Historically, groundwater quality samples have been collected with sufficient temporal resolution to identify seawater intrusion in the aquifers of the Subbasin (see Section 2.3.3, Seawater Intrusion, of this GSP). The temporal resolution of the data has varied through time and depends on the entity monitoring a given well. UWCD has collected annual groundwater samples from the network of monitoring wells along the Subbasin coastline since the late 1980s (UWCD 2016). These samples have documented long-term trends in chloride concentration for the coastal wells. Because the degradation of water quality associated with seawater intrusion is a process that occurs over a longer time than changes in groundwater elevation associated with groundwater production, annual groundwater quality sampling is adequate for documenting changes in chloride and TDS concentration associated with seawater intrusion.

4.3.4 Degraded Water Quality

To monitor conditions related to degraded water quality, water quality samples will be collected in such a way as to track long-term trends in water quality that may impact beneficial uses and users of groundwater in the Subbasin. Specifically, these water quality samples should be targeted to constituents of concern and areas of the Subbasin that have documented degradation, or the potential for degradation, in water quality related to groundwater production from the Subbasin.

Spatial Coverage by Aquifer

The network of wells currently used to monitor groundwater elevation conditions in each aquifer is sufficient to determine trends in groundwater quality as well. The primary areas of concern for groundwater quality degradation relating to groundwater elevations in the Subbasin are the Forebay Management Area, the Saline Intrusion Management Area, and the Oxnard Pumping Depression Management Area. Monitoring groundwater quality changes associated with seawater intrusion is discussed in Section 4.3.3. The spatial density of groundwater elevation monitoring wells is discussed in Section 4.3.1. The spatial coverage provided by the existing monitoring network is sufficient to document changes in groundwater quality.

Water Quality Constituents

Monitoring and annual reporting has occurred for constituents that are associated with a water quality threshold adopted by the FCGMA Board of Directors or by the Los Angeles Regional Water Quality Control Board. These constituents are TDS, chloride, nitrate, sulfate, and boron. The network of existing wells is capable of providing an adequate assessment of groundwater quality trends for these constituents.

Temporal Resolution

Degradation of groundwater quality occurs on a longer timescale than changes in groundwater elevation. Historically, UWCD has collected water quality samples on a quarterly basis and VCWPD has collected samples annually, although more frequent sampling can occur in some wells. These samples have provided information on trends in groundwater quality throughout the Subbasin. Samples from coastal wells have been used to document seawater intrusion, and samples from wells in the Oxnard Forebay have been used to document degradation of water quality related to increasing nitrate concentrations (see Section 2.3). The temporal resolution of the data collection is adequate to document trends in groundwater concentration for the constituents identified by the FCGMA Board of Directors and the Los Angeles Regional Water Quality Control Board.

4.3.5 Land Subsidence

To monitor conditions related to land subsidence, groundwater elevations will be measured to determine if water levels fall below historical lows. Groundwater elevations are being used as a proxy for land subsidence in the Subbasin. The minimum thresholds identified at the key wells are above the historical low groundwater elevation. Therefore, it is not anticipated that specific land subsidence monitoring will be required for the Subbasin. Instead, the network of groundwater monitoring wells discussed in Sections 4.2.1 and 4.3.1 will be used to determine if land subsidence related to groundwater production may occur.

4.3.6 Depletions of Interconnected Surface Water

To monitor conditions related to depletions of interconnected surface water, surface water flows and shallow groundwater will be measured in such a way as to accomplish the following:

- Track short-term, seasonal, and long-term trends in groundwater elevation in the semi-perched aquifer.
- Demonstrate groundwater elevations in mid-March and mid-October for the semi-perched aquifer.
- Record groundwater elevations in key wells in which minimum thresholds and measurable objectives have been identified to track progress toward the sustainability goals for the Subbasin.

Surface water flows in the Revolon Slough, Calleguas Creek, and the Santa Clara River downstream of, but not including, the Freeman Diversion are connected to water levels in the semi-perched aquifer, rather than the underlying confined aquifers of the Upper Aquifer System and Lower Aquifer System. In turn, the groundwater elevation in the semi-perched aquifer is effectively regulated by the height of the agricultural tile drains installed throughout the Oxnard Plain (UWCD 2016).

Although the active network of wells used to document groundwater conditions in the semi-perched aquifer has sufficient spatial density at the Subbasin scale, there are local areas in which coverage can be improved. Potential improvements in local coverage are discussed in Section 4.6.

4.4 MONITORING NETWORK IMPLEMENTATION

4.4.1 Groundwater Elevation Monitoring Schedule

To reduce uncertainty associated with hydraulic gradients, and to follow guidance documents produced by DWR (DWR 2016b), water level measurements used in the evaluation of seasonal high

and seasonal low groundwater conditions should be collected in a 2-week window in mid-March and mid-October (specifically, March 9–22 and October 9–22 of any given calendar year).

Short-term trends in groundwater elevation are currently, and will continue to be, monitored using transducers that are operated and maintained by UWCD. Data from these transducers are downloaded quarterly and stored in a central database.

Seasonal and long-term trends in groundwater elevation are monitored using the transducer data and manual measurements made by UWCD on a monthly or bimonthly basis, and manual measurements made by VCWPD on a quarterly basis. Additional manual water level measurements made by other partner agencies (e.g., the City of Oxnard or mutual water districts) are typically sent to VCWPD annually.

4.4.2 Groundwater Storage Monitoring Schedule

Groundwater storage is directly related to, and calculated from, groundwater elevations. Consequently, the schedule for monitoring groundwater storage is the same as that for monitoring groundwater elevations.

4.4.3 Seawater Intrusion Monitoring Schedule

Groundwater Elevation

Twice-yearly comprehensive evaluations (in mid-March and mid-October) of groundwater elevations in each aquifer will be used to assess progress toward minimum thresholds designed to avoid seawater intrusion.

Groundwater Quality

Annual groundwater quality samples for each coastal well will be used to monitor water quality trends related to seawater intrusion.

4.4.4 Water Quality Monitoring Schedule

UWCD conducts monthly or quarterly monitoring of groundwater quality in many wells throughout the Oxnard Subbasin. Wells with stable water quality are sampled annually or twice annually by UWCD. Groundwater quality monitoring should continue on the same schedule in order to document groundwater quality trends in the Subbasin. Annual reviews of the groundwater quality trends will be used to assess whether sampling frequency or the spatial density of samples needs to be adjusted.

4.4.5 Groundwater Extraction Monitoring Schedule

Monitoring of groundwater extraction rates will take place continuously, using flowmeters and telemetry equipment installed on individual wellheads, and monthly totals of pumped water will be transmitted to a central database maintained by FCGMA.

4.5 PROTOCOLS FOR DATA COLLECTION AND MONITORING

Protocols for collecting groundwater level measurements and water quality samples, as well as downloading transducers and logging the boreholes of newly drilled wells, are included in the Monitoring Protocols Best Management Practices (BMPs) produced by DWR (DWR 2016a). FCGMA plans to work with agency partners to ensure that future data collection is conducted according to relevant protocols in the BMP. Current practices used by VCWPD and UWCD are described in this section.

VCWPD Protocols

VCWPD technicians collect water levels using steel tapes. For a well that is too deep for the tape, an acoustical sounder or an air pressure gauge is used, and the measurement is stored in the database with a Questionable Measurement Code, indicating that alternate equipment was used.

VCWPD technicians collect water quality samples from production wells using the installed pump equipment. A three-volume purge, or a testing of groundwater parameters including pH, temperature, and electrical conductivity, is conducted to determine whether the water at the wellhead is representative of groundwater in the aquifer. Water quality samples are then sent to an analytical laboratory, where they are filtered and preserved.

UWCD Protocols

UWCD technicians collect water levels using a variety of equipment, including dual-wire and single-wire sounders and metal tapes. In the event that the well contains a pump, the technician manually tests the approximate temperature of the pump housing. If the pump housing is warm, the water level that is entered into the database is qualified with a Questionable Measurement Code, indicating recent pumping. UWCD also considers other indicators, such as wet conditions at wells and in nearby fields, to evaluate if water levels may not be static.

UWCD technicians collect water quality samples using the three-volume purge method, and follow U.S. Geological Survey guidelines for groundwater quality sampling. For shallow wells, a Grundfos Redi-Flo pump is used to purge and sample the groundwater. For deeper wells, a compressor is used to airlift the groundwater for purging and sampling. On rare occasions, a bailer is used to purge and sample.

4.6 POTENTIAL MONITORING NETWORK IMPROVEMENTS

The existing monitoring network in the Subbasin is sufficient to document groundwater conditions in the Subbasin, and can be used to document progress toward the sustainability goals for the Subbasin. Analysis of the monitoring network, however, also indicates that there are local areas in which data coverage and monitoring efforts can be improved in the future. Areas for improvement of the existing monitoring network and data infrastructure system, are described in the following sections.

4.6.1 Water Level Measurements: Spatial Data Gaps

Additional monitoring wells could be used to improve spatial coverage for groundwater elevation measurements in the West Oxnard Plain Management Area, the Oxnard Pumping Depression Management Area, and the EOPMA. Wells that are added to the network should be dedicated monitoring well clusters, with individual wells in the cluster screened in a single aquifer. The potential improvements to the monitoring network in each aquifer are shown on Figures 4-9 through 4-14 (Existing and Potential New Wells for Monitoring Groundwater Conditions, by aquifer).

The groundwater monitoring network in the Subbasin could be improved by adding monitoring wells in the Oxnard Pumping Depression Management Area (Figures 4-9 through 4-14). An additional well, or wells, in this area would provide aquifer-specific groundwater elevations in an area that does not have local wells screened solely in the Mugu Aquifer or the Hueneme Aquifer, and does not have a dedicated monitoring well screened in any of the primary aquifers. Groundwater elevation measurements in this well would help constrain groundwater gradients across the boundary between the Subbasin and the Pleasant Valley Basin. Additionally, a well in this management area could be used to assess groundwater conditions in the semi-perched aquifer adjacent to the Revolon Slough. FCGMA has applied for funding through a DWR Technical Support Services monitoring well funding grant to add a monitoring well in the Oxnard Pumping Depression Management Area.

In the West Oxnard Plain Management Area, the groundwater monitoring network could be improved by adding a monitoring well to the area north of Highway 101 and south of the Oxnard Forebay. Currently, there are no dedicated monitoring wells in this area (Figures 4-9 through 4-14). Adding a monitoring well in this area would provide for aquifer-specific water levels adjacent to the West Las Posas Management Area boundary. These groundwater levels could be used to constrain the gradient between the West Las Posas Management Area and the Subbasin.

The monitoring network in the West Oxnard Plain Management Area could also be improved by adding a monitoring well to the area north of 6th Street and west of Ventura Road. This area has dedicated monitoring wells in the Oxnard Aquifer, but does not have a dedicated monitoring well in the Mugu or Hueneme Aquifer or the FCA. A monitoring well in this area would help constrain groundwater gradients in the northwest part of the Oxnard Subbasin.

There are currently no monitoring wells in the EOPMA, which has minimal known groundwater production. Addition of a monitoring well in the vicinity of Calleguas Creek in the EOPMA would improve understanding of groundwater conditions in this management area. It would also provide data to help constrain the relationship between groundwater elevations in the EOPMA and groundwater conditions in the adjacent Oxnard Pumping Depression and Saline Intrusion Management Areas.

New wells will be constructed to applicable well installation standards set in California DWR Bulletins 74-81 and 74-90, or as updated (DWR 2016b). It is recommended that, where feasible, new wells be subjected to pumping tests to collect additional information about aquifer properties in the vicinity of new monitoring locations.

Proposed locations are approximate and subject to feasibility review (accounting for infrastructure, site acquisition, and site access, among other factors) after GSP submittal. The schedule for new well installation will be developed in conjunction with feasibility review.

4.6.2 Water Level Measurements: Temporal Data Gap

The DWR Monitoring Protocol BMP (DWR 2016a) states the following:

> Groundwater elevation data … should approximate conditions at a discrete period in time. Therefore, all groundwater levels in a basin should be collected within as short a time as possible, preferably within a 1 to 2 week period.

The DWR Monitoring Networks BMP (DWR 2016b) states the following:

> Groundwater levels will be collected during the middle of October and March for comparative reporting purposes.

Currently, groundwater elevation measurements are not scheduled according to these criteria. To minimize the effects of this type of temporal data gap in the future, it will be necessary to coordinate the collection of groundwater elevation data so it occurs within a 2-week window during the key reporting periods of mid-March and mid-October. The recommended collection windows are October 9 to 22 in the fall and March 9 to 22 in the spring (see Section 4.4).

Additionally, as funding becomes available, pressure transducers should be added to wells in the groundwater monitoring network. Pressure transducer records provide the high temporal resolution data that allows for a better understanding of water level dynamics in the wells related to groundwater production, groundwater management activities, and climatic influence.

4.6.3 Groundwater Quality Monitoring

To improve the existing groundwater quality monitoring in the Subbasin, the current analyte list could be expanded to include a full general minerals suite. Stiff or Piper diagrams could then be created to fully characterize the geochemical characteristics of the groundwater and track changes over time. UWCD currently gets a general mineral analysis at least annually for most monitoring wells in the Oxnard Subbasin.

4.6.4 Subsidence Monitoring

Currently, neither FCGMA nor its partner agencies in the region monitor land subsidence. The U.S. Geological Survey maintained one benchmark in the southern part of the Oxnard Plain between 1939 and 1978 (see Section 2.3.5, Subsidence, of this GSP), but it is not currently operational. Subsidence related to groundwater production is not anticipated to occur in the Subbasin in the future because the minimum threshold groundwater elevations are higher than the historical low groundwater elevations in the Subbasin. Preexisting GPS-based benchmarks could be used for monitoring land subsidence in the event that groundwater elevations drop below historical low levels for an extended period, and the potential for land subsidence to substantially interfere with surface land uses is determined (see Section 3.3.5, Land Subsidence). Additionally, historical InSAR and LIDAR records exist for the Oxnard Plain and could be used for comparison to future conditions if groundwater production causes water levels that are below the historical lows.

4.6.5 Shallow Groundwater Monitoring near Surface Water Bodies and GDEs

Currently, there are relatively few wells that can be used to monitor the shallow groundwater in the semi-perched aquifer that may be interconnected with surface water bodies and sustain GDEs or potential GDEs in the Subbasin. To improve the existing monitoring network and to assist with understanding the potential connectivity between shallow groundwater and potential GDEs, a dedicated shallow monitoring well within the boundaries of the potential GDE along the Revolon Slough and an additional dedicated shallow monitoring well in the vicinity of Lower Calleguas Creek could be added to the monitoring network, independent of an additional nested well cluster (Figure 2-52, Groundwater Dependent Ecosystems for the Oxnard Subbasin).

Additional shallow monitoring wells are not proposed for the coastal GDEs (Lower Santa Clara River, McGrath Lake, Ormond Beach, and Mugu Lagoon) described in Section 2.3.7, Groundwater-Dependent Ecosystems, of this GSP (see Figures 2-52 through 2-56). The coastal GDEs are sustained by groundwater in the semi-perched aquifer, which is rarely used for water supply in the Subbasin (FCGMA 2007). However, if future projects propose to produce water from the semi-perched aquifer, depletion of interconnected surface water is possible, and significant and unreasonable impacts may occur. Therefore, additional monitoring wells may be necessary and should be installed in conjunction with the planning for those projects.

4.6.6 Surface Water: Flows in Agricultural Drains in the Oxnard Plain

Discharge flows are currently unmeasured in the drainage system, frequently referred to as the "tile drains," that was installed throughout the Oxnard Plain in the 1950s (Isherwood and Pillsbury 1958). The tile drains were installed to support the development of land in the Oxnard Plain, which was formerly affected by high soil salinity levels, for agriculture (Isherwood and Pillsbury 1958). The drains are typically located 6 to 7 feet below ground surface, though the depth varies and is not well documented in most areas. Shallow groundwater entering the drains discharges to central drainage ditches, and from there flows into local surface waters, such as the Revolon Slough, or directly to the ocean, such as at Port Hueneme.

Metering flow in the tile drains would provide an important check on numerical groundwater results and would also provide valuable information about the water resource potential of the semi-perched aquifer. The tile drain system is extensive, and in much of the Oxnard Plain its current state of repair is currently unknown. A feasibility study is recommended to identify the best locations in the drainage system for installing flowmeters.

4.7 REFERENCES CITED

County of Ventura. 2016. Shapefile data of wells in Ventura County. *Ventura_County_Wells_08_17_2016.shp.* Attachment to an email from Jeff Dorrington. August 17, 2016.

DWR (California Department of Water Resources). 2010. *Department of Water Resources Groundwater Elevation Monitoring Guidelines.* December 2010. http://www.water.ca.gov/groundwater/casgem/pdfs/CASGEM%20DWR%20GW%20Guidelines%20Final%20121510.pdf

DWR. 2016a. *Best Management Practices for the Sustainable Management of Groundwater: Monitoring Protocols, Standards, and Sites*. December 2016.

DWR. 2016b. *Best Management Practices for the Sustainable Management of Groundwater: Monitoring Networks and Identification of Data Gaps*. December 2016.

DWR. 2016c. *Bulletin 118 Interim Update 2016: California's Groundwater—Working Toward Sustainability*. December 22, 2016. www.water.ca.gov/groundwater/bulletin118/index.cfm.

FCGMA (Fox Canyon Groundwater Management Agency). 2007. *2007 Update to the Fox Canyon Groundwater Management Agency Groundwater Management Plan*. Prepared by FCGMA, United Water Conservation District, and Calleguas Municipal Water District. May 2007.

FCGMA. 2016. Minutes of the Fox Canyon Groundwater Management Agency regular Board meeting held Wednesday, May 25, 2016. Accessed November 2017. http://www.fcgma.org/public-documents/board-of-directors-meetings.

FCGMA. 2018. Fox Canyon Groundwater Management Agency Advanced Metering Infrastructure (AMI) Ordinance. Adopted February 28 2018.

Isherwood, J.D., and A.F. Pillsbury. 1958. "Shallow Ground Water and Tile Drainage in the Oxnard Plain." *Eos* 39(6): 1101–1110.

USGS (U.S. Geological Survey). 1996. *Lithologic and Ground-Water Data for Monitoring Wells in the Santa Clara–Calleguas Ground-Water Basin, Ventura County, California, 1989–95*. USGS Open-File Report 96-120. Prepared by J.N. Densmore in cooperation with the United Water Conservation District. Sacramento: USGS.

UWCD (United Water Conservation District). 2016. *Saline Intrusion Update, Oxnard Plain and Pleasant Valley Basins*. United Water Conservation District Open-File Report 2016-04. October 2016.

VCWPD (Ventura County Watershed Protection District). 2016. [Ventura County Stream Gauge Locations – Figure 4-7.]

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Table 4-1
Network of Stations Monitoring Surface Flows in the Vicinity of the Oxnard Subbasin

Station Number	Station Name	Latitude	Longitude	Elevation (ft msl)	Station Type	USGS ID
A639	Freeman Diversion Weir ALERT	34.299111	−119.108417	187	ALERT Stream Gauge	—
724A	Santa Clara River at Freeman Diversion (ALERT)	34.299222	−119.108	—	ALERT Stream Gauge	—
793	J Street Drain at Lagoon (ALERT)	34.140944	−119.188028	15	ALERT Stream Gauge	—
778	Nyeland Acres Drain	34.225099	−119.126788	46	Peak Only (Event) Gauge	—
779	Rice Rd Drain at Wooley Rd	34.189448	−119.151126	24	Peak Only (Event) Gauge	—
781	Santa Clara Drain	34.242678	−119.113763	79	Peak Only (Event) Gauge	—
719	Freeman Diversion Channel near Saticoy	34.292778	−119.116389	—	Recording Stream Gauge	11113900
723	Santa Clara River at Victoria Ave	34.234917	−119.216611	62	Recording Stream Gauge	—
780	Beardsley Wash at Central Ave	34.2305	−119.112028	60	Recording Stream Gauge	—
776A	Revolon Slough at Pleasant Valley Rd	34.192592	−119.107875	20	Recording Stream Gauge	—

Notes: ft msl = feet above mean sea level; USGS = U.S. Geological Survey.
This table shows results from active gauges only (as of August 2016).

Table 4-2
Network of Stations Monitoring Precipitation in the Vicinity of the Oxnard Subbasin

Station Number	Station Name	Latitude	Longitude	Elevation (ft msl)	Station Type	USGS ID
273A	Oxnard NWS	34.207207	−119.137384	63	National Weather Service Site	—
403	Silverstrand Alert (Type B)	34.15271	−119.218965	18	Non-Standard Recorder	—
017C	Port Hueneme–Oxnard Sewer Plant	34.141684	−119.18665	10	Recording Precipitation Gauge	—
032A	Oxnard Civic Center	34.200087	−119.180278	53	Recording Precipitation Gauge	46569
168	Oxnard Airport	34.201647	−119.207685	34	Recording Precipitation Gauge	—

Table 4-2
Network of Stations Monitoring Precipitation in the Vicinity of the Oxnard Subbasin

Station Number	Station Name	Latitude	Longitude	Elevation (ft msl)	Station Type	USGS ID
175A	Saticoy–County Yard	34.281214	−119.141018	150	Recording Precipitation Gauge	—
177A	Camarillo–Pacific Sod	34.155471	−119.073003	20	Recording Precipitation Gauge	—
215A	Channel Is Harbor–Kiddie Beach	34.158944	−119.222338	15	Recording Precipitation Gauge	—
239	El Rio–UWCD Spreading Grounds	34.239405	−119.153009	105	Recording Precipitation Gauge	—
412	El Rio–Mesa School APCD	34.252361	−119.143056	131	Recording Precipitation Gauge	—
223A	Point Mugu–USN	34.112778	−119.119444	12	Standard Precipitation Midnight	—
215	Channel Islands Harbor	34.162042	−119.222717	5	Standard Precipitation	—
261	Saticoy–Recharge Facility	34.278889	−119.123056	145	Standard Precipitation	—

Notes: APCD = Air Pollution Control District; ft msl = feet above mean sea level; NWS = National Weather Service; USGS = U.S. Geological Survey; USN = U.S. Navy; UWCD = United Water Conservation District.
This table shows results from active gauges only.

Table 4-3
VCWPD Monitoring Schedule of Wells in the Oxnard Subbasin

State Well Number (SWN)	Main Use	Screened Aquifer	Screened Aquifer System	Manual Water Levels Monitored by VCWPD[a]	Water Quality Samples Collected by VCWPD[a]	Water Level Sampling Schedule after GSP Adoption	Water Quality Sampling Schedule after GSP Adoption
01N21W04D04S	Agricultural	Multiple	LAS	—	Yes		Annual
01N21W04N02S	Monitoring	Multiple	Unassigned	Yes	—		—
01N21W06L04S	Agricultural	Oxnard	UAS	Yes	—		—
01N21W07H01S	Agricultural	Oxnard	UAS	Yes			—
01N21W08R01S	Agricultural	Multiple	LAS	—	Yes		Annual
01N21W09C04S	Agricultural	FCA	LAS	Yes	—		—
01N21W16A04S	Agricultural	Multiple	LAS	Yes	—		—
01N21W16M01S	Agricultural	Multiple	Both	Yes	—		—

Table 4-3
VCWPD Monitoring Schedule of Wells in the Oxnard Subbasin

State Well Number (SWN)	Main Use	Screened Aquifer	Screened Aquifer System	Manual Water Levels Monitored by VCWPD[a]	Water Quality Samples Collected by VCWPD[a]	Water Level Sampling Schedule after GSP Adoption	Water Quality Sampling Schedule after GSP Adoption
01N21W16M03S	Agricultural	Multiple	LAS	—	Yes		Annual
01N21W16P03S	Agricultural	Multiple	LAS	Yes	—		—
01N21W17D02S	Agricultural	Oxnard	UAS	Yes	—		—
01N21W19J05S	Agricultural	Multiple	LAS	—	Yes		Annual
01N21W20K03S	Agricultural	Multiple	LAS	—	Yes		Annual
01N21W20N07S	Domestic	Multiple	UAS	Yes	—		—
01N21W21H02S	Agricultural	Multiple	LAS	—	Yes		Annual
01N21W21H03S	Agricultural	Unassigned	LAS	—	Yes		Annual
01N21W21K03S	Agricultural	Unassigned	Both	—	Yes		Annual
01N21W21N01S	Agricultural	Mugu	UAS	Yes	—		—
01N21W22C01S	Agricultural	Multiple	LAS	—	Yes		Annual
01N21W28D01S	Agricultural	Multiple	LAS	Yes	Yes		Annual
01N21W28G01S	Agricultural	Unassigned	UAS	—	Yes		Annual
01N21W28H03S	Agricultural	Unassigned	Both	—	Yes		Annual
01N21W29B03S	Agricultural	Multiple	UAS	Yes	Yes		Annual
01N21W32K01S	Municipal	FCA	LAS	Yes	—		—
01N22W03F05S	Municipal	Hueneme	LAS	—	Yes		Annual
01N22W03F07S	Municipal	Oxnard	UAS	—	Yes		Annual
01N22W06B01S	Domestic	Unassigned	UAS	—	Yes		Annual
01N22W12M01S	Agricultural	Unassigned	UAS	—	Yes		Annual
01N22W12N03S	Agricultural	Multiple	LAS	Yes	—		—
01N22W12R01S	Agricultural	Multiple	LAS	Yes	—		—
01N22W14K01S	Agricultural	Oxnard	UAS	Yes	—		—
01N22W16D04S	Municipal	Hueneme	LAS	—	Yes		Annual
01N22W19A01S	Municipal	Hueneme	LAS	—	Yes		Annual
01N22W21B03S	Municipal	Multiple	LAS	Yes	—		—
01N22W21B06S	Municipal	Multiple	LAS	—	Yes		Annual
01N22W23R02S	Agricultural	Unassigned	LAS	—	Yes		Annual
01N22W24B04S	Agricultural	Multiple	LAS	—	Yes		Annual
01N22W24C02S	Agricultural	Multiple	UAS	Yes	—		—
01N22W24C03S	Agricultural	Unassigned	Both	—	Yes		Annual
01N22W25K01S	Agricultural	Unassigned	UAS	—	Yes		Annual
01N22W25K02S	Agricultural	FCA	LAS	—	Yes		Annual

Table 4-3
VCWPD Monitoring Schedule of Wells in the Oxnard Subbasin

State Well Number (SWN)	Main Use	Screened Aquifer	Screened Aquifer System	Manual Water Levels Monitored by VCWPD[a]	Water Quality Samples Collected by VCWPD[a]	Water Level Sampling Schedule after GSP Adoption	Water Quality Sampling Schedule after GSP Adoption
01N22W26K03S	Agricultural	Multiple	LAS	Yes	—	Twice yearly	—
01N22W26M03S	Agricultural	Hueneme	LAS	Yes	Yes		Annual
01N22W26P02S	Agricultural	Unassigned	LAS	—	Yes		Annual
01N22W26Q01S	Agricultural	Unassigned	Both	—	Yes		Annual
01N22W36B02S	Agricultural	Multiple	LAS	Yes	—		—
02N21W07P04S	Agricultural	Multiple	LAS	Yes	Yes		Annual
02N21W19A01S	Domestic	Multiple	UAS	—	Yes		Annual
02N21W19A03S	Agricultural	Multiple	LAS	Yes	—		—
02N21W19B02S	Agricultural	Oxnard	UAS	Yes	—		—
02N21W20F02S	Domestic	Multiple	Unassigned	Yes	—		—
02N21W20M03S	Agricultural	Multiple	UAS	—	Yes		Annual
02N21W20M06S	Agricultural	Multiple	LAS	Yes	—		—
02N21W31P02S	Monitoring	Multiple	Unassigned	Yes	—		—
02N21W31P03S	Monitoring	Hueneme	LAS	Yes	—		—
02N22W23H03S	Agricultural	Unassigned	UAS	—	Yes		Annual
02N22W24P01S	Agricultural	Mugu	UAS	Yes	Yes		Annual
02N22W24P02S	Agricultural	Multiple	LAS	—	Yes		Annual
02N22W24R02S	Domestic	Unassigned	UAS	—	Yes		Annual
02N22W25A02S	Agricultural	Unassigned	UAS	—	Yes		Annual
02N22W25F01S	Industrial	Unassigned	UAS	—	Yes		Annual
02N22W26E01S	Municipal	Multiple	UAS	Yes	—		—
02N22W27M02S	Municipal	Unassigned	UAS	—	Yes		Annual
02N22W30F03S	Agricultural	Unassigned	LAS	—	Yes		Annual
02N22W30K01S	Agricultural	Oxnard	UAS	Yes	—		—
02N22W31A01S	Agricultural	Multiple	Unassigned	Yes	—		—
02N22W31D02S	Agricultural	Unassigned	UAS	—	Yes		Annual
02N22W32C04S	Agricultural	Multiple	UAS	—	Yes		Annual
02N22W32Q03S	Agricultural	Multiple	UAS	Yes	—	Twice yearly	—
02N22W36E02S	Municipal	Hueneme	LAS	—	Yes		Annual
02N22W36E03S	Municipal	Hueneme	UAS	—	Yes		Annual
02N22W36F01S	Domestic	Unassigned	Unassigned	—	Yes	Twice yearly	Annual
02N22W36F02S	Agricultural	Unassigned	UAS	—	Yes		Annual

Table 4-3
VCWPD Monitoring Schedule of Wells in the Oxnard Subbasin

State Well Number (SWN)	Main Use	Screened Aquifer	Screened Aquifer System	Manual Water Levels Monitored by VCWPD[a]	Water Quality Samples Collected by VCWPD[a]	Water Level Sampling Schedule after GSP Adoption	Water Quality Sampling Schedule after GSP Adoption
02N23W25G02S	Industrial	Multiple	Unassigned	Yes	Yes		Annual
02N23W25M01S	Agricultural	Unassigned	UAS	—	Yes		Annual
02N23W36C04S	Domestic	Oxnard	UAS	Yes	—		—

Notes: FCA = Fox Canyon Aquifer; GSP = Groundwater Sustainability Plan; LAS = Lower Aquifer System; UAS = Upper Aquifer System; VCWPD = Ventura County Watershed Protection District.

[a] As of October 2017.

Table 4-4
UWCD Monitoring Schedule of Wells in the Oxnard Subbasin

State Well Number (SWN)	Main Use	Screened Aquifer	Screened Aquifer System	Manual Water Levels Monitored Bimonthly[a]	Manual Water Levels Monitored Monthly[a]	Standard Transducer and Manual Water Level[a]	O&M Transducer and Manual Water Level[a]	Water Quality Samples Collected Monthly or Quarterly[a]	Water Level Sampling Schedule after GSP Adoption[a,b]	Water Quality Sampling Schedule after GSP Adoption[a]
01N21W04D04S	Agricultural	Multiple	LAS			Yes			Quarterly	
01N21W06J05S	Agricultural	FCA	LAS				Yes			
01N21W06R01S	Monitoring	Oxnard	UAS			Yes			Quarterly	
01N21W07J02S	Agricultural	Multiple	LAS				Yes		Twice yearly	
01N21W10G01S	Agricultural	Multiple	LAS			Yes			Quarterly	
01N21W12D01S	Agricultural	Multiple	UAS	Yes					Bimonthly	
01N21W15J04S	Agricultural	Multiple	LAS	Yes	Yes				Monthly	
01N21W17C02S	Agricultural	Unassigned	UAS			Yes			Quarterly	
01N21W17G03S	Agricultural	Multiple	LAS	Yes					Bimonthly	
01N21W18A04S	Agricultural	Unassigned	UAS	Yes	Yes				Bimonthly	
01N21W18L05S	Agricultural	Unassigned	LAS			Yes			Quarterly	
01N21W19C01S	Agricultural	Oxnard	UAS	Yes					Bimonthly	
01N21W19J05S	Agricultural	Multiple	LAS	Yes					Bimonthly	
01N21W19L10S	Monitoring	FCA	LAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N21W19L11S	Monitoring	Mugu	UAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N21W19L12S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N21W19L13S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N21W19L14S	Monitoring	Semi-Perched	Semi-Perched	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N21W20C05S	Agricultural	Mugu	UAS	Yes					Bimonthly	
01N21W20K03S	Agricultural	Multiple	LAS	Yes					Bimonthly	
01N21W21H02S	Agricultural	Multiple	LAS			Yes			Quarterly	
01N21W28D01S	Agricultural	Multiple	LAS			Yes			Quarterly	
01N21W28G04S	Agricultural	Multiple	LAS	Yes					Bimonthly	

Table 4-4
UWCD Monitoring Schedule of Wells in the Oxnard Subbasin

State Well Number (SWN)	Main Use	Screened Aquifer	Screened Aquifer System	Manual Water Levels Monitored Bimonthly[a]	Manual Water Levels Monitored Monthly[a]	Standard Transducer and Manual Water Level[a]	O&M Transducer and Manual Water Level[a]	Water Quality Samples Collected Monthly or Quarterly[a]	Water Level Sampling Schedule after GSP Adoption[a,b]	Water Quality Sampling Schedule after GSP Adoption[a]
01N21W31A05S	Monitoring	FCA	LAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N21W31A06S	Monitoring	FCA	LAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N21W31A07S	Monitoring	Mugu	UAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N21W31A08S	Monitoring	Oxnard	UAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N21W31A09S	Monitoring	Oxnard	UAS	Yes				Yes	Bimonthly	Quarterly
01N21W32Q02S	Monitoring	GCA	LAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N21W32Q03S	Monitoring	GCA	LAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N21W32Q04S	Monitoring	FCA	LAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N21W32Q05S	Monitoring	Mugu	UAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N21W32Q06S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N21W32Q07S	Monitoring	Mugu	UAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N22W01M03S	Agricultural	Multiple	LAS				Yes		Quarterly	
01N22W02A02S	Monitoring	Mugu	UAS	Yes	Yes	Yes			Monthly	
01N22W03F05S	Municipal	Hueneme	LAS			Yes			Quarterly	
01N22W03F09S	Monitoring	Unassigned	Unassigned	Yes	Yes			Yes	Monthly	Twice yearly
01N22W03F11S	Monitoring	Unassigned	Unassigned	Yes	Yes			Yes	Monthly	Twice yearly
01N22W03F13S	Municipal	Oxnard	UAS			Yes			Quarterly	
01N22W11C03S	Agricultural	Unassigned	Unassigned	Yes	Yes				Monthly	
01N22W13D03S	Agricultural	Multiple	LAS				Yes		Quarterly	
01N22W14R02S		Oxnard	UAS	Yes					Bimonthly	
01N22W16D04S	Municipal	Hueneme	LAS	Yes	Yes				Monthly	
01N22W17C03S	Municipal	Multiple	LAS			Yes			Quarterly	
01N22W18L02S	Municipal	Unassigned	LAS	Yes					Bimonthly	

Table 4-4
UWCD Monitoring Schedule of Wells in the Oxnard Subbasin

State Well Number (SWN)	Main Use	Screened Aquifer	Screened Aquifer System	Manual Water Levels Monitored Bimonthly[a]	Manual Water Levels Monitored Monthly[a]	Standard Transducer and Manual Water Level[a]	O&M Transducer and Manual Water Level[a]	Water Quality Samples Collected Monthly or Quarterly[a]	Water Level Sampling Schedule after GSP Adoption[a,b]	Water Quality Sampling Schedule after GSP Adoption[a]
01N22W19A01S	Municipal	Hueneme	LAS	Yes					Bimonthly	
01N22W20J04S	Monitoring	FCA	LAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N22W20J05S	Monitoring	Hueneme	LAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N22W20J06S	Monitoring	Mugu–Hueneme	LAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N22W20J07S	Monitoring	Mugu	UAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N22W20J08S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N22W20M01S	Monitoring	FCA	LAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N22W20M02S	Monitoring	Hueneme	LAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N22W20M03S	Monitoring	Hueneme	LAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N22W20M04S	Monitoring	Mugu	UAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N22W20M05S	Monitoring	Oxnard	UAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N22W20M06S	Monitoring	Semi-Perched	Semi-Perched	Yes		Yes		Yes	Bimonthly	Quarterly
01N22W21B03S	Municipal	Multiple	LAS	Yes					Bimonthly	
01N22W21B06S	Municipal	Multiple	LAS	Yes					Bimonthly	
01N22W24B04S	Agricultural	Multiple	LAS	Yes					Bimonthly	
01N22W24C02S	Agricultural	Multiple	UAS	Yes					Bimonthly	
01N22W24M03S	Agricultural	Unassigned	Both	Yes					Bimonthly	
01N22W26J03S	Monitoring	Mugu	UAS	Yes				Yes	Bimonthly	Quarterly
01N22W26J04S	Monitoring	Oxnard	UAS	Yes				Yes	Bimonthly	Quarterly
01N22W26J05S	Monitoring	Semi-Perched	Semi-Perched	Yes				Yes	Bimonthly	Quarterly
01N22W27C02S	Monitoring	Mugu	UAS	Yes				Yes	Bimonthly	Quarterly

Table 4-4
UWCD Monitoring Schedule of Wells in the Oxnard Subbasin

State Well Number (SWN)	Main Use	Screened Aquifer	Screened Aquifer System	Manual Water Levels Monitored Bimonthly[a]	Manual Water Levels Monitored Monthly[a]	Standard Transducer and Manual Water Level[a]	O&M Transducer and Manual Water Level[a]	Water Quality Samples Collected Monthly or Quarterly[a]	Water Level Sampling Schedule after GSP Adoption[a,b]	Water Quality Sampling Schedule after GSP Adoption[a]
01N22W27C03S	Monitoring	Oxnard	UAS	Yes				Yes	Bimonthly	Quarterly
01N22W27C04S	Monitoring	Semi-Perched	Semi-Perched	Yes				Yes	Bimonthly	Quarterly
01N22W27R03S	Monitoring	Mugu	UAS	Yes				Yes	Bimonthly	Quarterly
01N22W27R04S	Monitoring	Oxnard	UAS	Yes				Yes	Bimonthly	Quarterly
01N22W27R05S	Monitoring	Oxnard	UAS	Yes				Yes	Bimonthly	Quarterly
01N22W28G01S	Monitoring	GCA	LAS	Yes	Yes			Yes	Monthly	Quarterly
01N22W28G02S	Monitoring	FCA	LAS	Yes	Yes			Yes	Monthly	Quarterly
01N22W28G03S	Monitoring	Hueneme	LAS	Yes	Yes			Yes	Monthly	Quarterly
01N22W28G04S	Monitoring	Oxnard	UAS	Yes	Yes			Yes	Monthly	Quarterly
01N22W28G05S	Monitoring	Oxnard	UAS	Yes	Yes			Yes	Monthly	Quarterly
01N22W29D01S	Monitoring	FCA	LAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N22W29D02S	Monitoring	Hueneme	LAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N22W29D03S	Monitoring	Hueneme	LAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N22W29D04S	Monitoring	Mugu	UAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N22W35E01S	Monitoring	GCA	LAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N22W35E02S	Monitoring	FCA	LAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N22W35E03S	Monitoring	FCA	LAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N22W35E04S	Monitoring	Mugu	UAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N22W35E05S	Monitoring	Oxnard	UAS	Yes		Yes		Yes	Bimonthly	Quarterly
01N22W36K05S	Monitoring	GCA	LAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N22W36K06S	Monitoring	FCA	LAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N22W36K07S	Monitoring	FCA	LAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N22W36K08S	Monitoring	Mugu	UAS	Yes	Yes	Yes		Yes	Monthly	Quarterly

Table 4-4
UWCD Monitoring Schedule of Wells in the Oxnard Subbasin

State Well Number (SWN)	Main Use	Screened Aquifer	Screened Aquifer System	Manual Water Levels Monitored Bimonthly[a]	Manual Water Levels Monitored Monthly[a]	Standard Transducer and Manual Water Level[a]	O&M Transducer and Manual Water Level[a]	Water Quality Samples Collected Monthly or Quarterly[a]	Water Level Sampling Schedule after GSP Adoption[a,b]	Water Quality Sampling Schedule after GSP Adoption[a]
01N22W36K09S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N23W01C02S	Monitoring	FCA	LAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N23W01C03S	Monitoring	Hueneme	LAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N23W01C04S	Monitoring	Hueneme	LAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01N23W01C05S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Quarterly
01S21W08L03S	Monitoring	GCA	LAS	Yes		Yes		Yes	Bimonthly	Quarterly
01S21W08L04S	Monitoring	Oxnard	UAS	Yes		Yes		Yes	Bimonthly	Quarterly
01S22W01H01S	Monitoring	Multiple	LAS					Yes		Quarterly
01S22W01H02S	Monitoring	FCA	LAS					Yes		Quarterly
01S22W01H03S	Monitoring	Mugu	UAS					Yes		Quarterly
01S22W01H04S	Monitoring	Oxnard	UAS					Yes		Quarterly
02N21W06P01S	Agricultural	Multiple	Unassigned	Yes					Bimonthly	
02N21W07F01S	Agricultural	Multiple	UAS	Yes					Bimonthly	
02N21W07L03S	Monitoring	Multiple	Unassigned	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N21W07L04S	Monitoring	FCA	LAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N21W07L05S	Monitoring	Multiple	Unassigned	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N21W07L06S	Monitoring	Mugu	UAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N21W07L07S	Municipal	Multiple	UAS				Yes		Bimonthly	
02N21W07M04S	Municipal	Multiple	UAS				Yes		Bimonthly	Twice yearly
02N21W07N02S	Agricultural	Multiple	LAS	Yes					Bimonthly	
02N21W07P03S	Agricultural	Multiple	LAS	Yes					Bimonthly	
02N21W07P04S	Agricultural	Multiple	LAS	Yes					Bimonthly	
02N21W07Q01S	Agricultural	Multiple	LAS			Yes				

Table 4-4
UWCD Monitoring Schedule of Wells in the Oxnard Subbasin

State Well Number (SWN)	Main Use	Screened Aquifer	Screened Aquifer System	Manual Water Levels Monitored Bimonthly[a]	Manual Water Levels Monitored Monthly[a]	Standard Transducer and Manual Water Level[a]	O&M Transducer and Manual Water Level[a]	Water Quality Samples Collected Monthly or Quarterly[a]	Water Level Sampling Schedule after GSP Adoption[a,b]	Water Quality Sampling Schedule after GSP Adoption[a]
02N21W07R01S	Monitoring	Multiple	LAS	Yes					Bimonthly	
02N21W08D01S	Monitoring	Multiple	Unassigned	Yes					Bimonthly	
02N21W16J03S	Agricultural	Multiple	LAS	Yes					Bimonthly	
02N21W17F05S	Agricultural	FCA	LAS	Yes					Bimonthly	
02N21W18B01S	Agricultural	Multiple	UAS	Yes				Yes	Bimonthly	Twice yearly
02N21W19P01S	Agricultural	Multiple	LAS	Yes	Yes				Bimonthly	
02N21W20A02S	Agricultural	Unassigned	Unassigned	Yes					Bimonthly	
02N21W22G01S	Municipal	GCA	LAS	Yes					Bimonthly	
02N21W28A02S	Municipal	GCA	LAS	Yes					Bimonthly	
02N21W29L04S	Agricultural	Multiple	LAS	Yes	Yes				Monthly	
02N21W29M02S	Agricultural	Unassigned	Unassigned	Yes	Yes				Monthly	
02N21W30A01S	Agricultural	Unassigned	LAS	Yes	Yes				Monthly	
02N21W31P06S	Agricultural	Hueneme	LAS	Yes					Bimonthly	
02N21W32E01S	Agricultural	Multiple	LAS				Yes		Quarterly	
02N21W34G02S	Monitoring	FCA	LAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N21W34G03S	Monitoring	FCA	LAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N21W34G04S	Monitoring	Hueneme	LAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N21W34G05S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N21W34G06S	Monitoring	Unassigned	Unassigned	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W01P02S		Oxnard	UAS			Yes		Yes	Quarterly	
02N22W01R02S	Monitoring	Multiple	Unassigned			Yes		Yes	Quarterly	Twice yearly
02N22W02R05S	Agriculture	Multiple	Both	Yes					Bimonthly	
02N22W11G01S		Oxnard	UAS			Yes		Yes	Quarterly	

Table 4-4
UWCD Monitoring Schedule of Wells in the Oxnard Subbasin

State Well Number (SWN)	Main Use	Screened Aquifer	Screened Aquifer System	Manual Water Levels Monitored Bimonthly[a]	Manual Water Levels Monitored Monthly[a]	Standard Transducer and Manual Water Level[a]	O&M Transducer and Manual Water Level[a]	Water Quality Samples Collected Monthly or Quarterly[a]	Water Level Sampling Schedule after GSP Adoption[a,b]	Water Quality Sampling Schedule after GSP Adoption[a]
02N22W11J01S	Monitoring	Multiple	Unassigned	Yes		Yes		Yes	Bimonthly	Twice yearly
02N22W11J02S	Monitoring	Oxnard	UAS			Yes		Yes	Quarterly	Twice yearly
02N22W11Q01S	Monitoring	Oxnard	UAS	Yes		Yes		Yes	Bimonthly	Twice yearly
02N22W12A01S	Monitoring	Oxnard	UAS	Yes		Yes			Bimonthly	
02N22W12A02S	Agricultural	Oxnard	UAS	Yes					Bimonthly	
02N22W12B08S	Agricultural	Multiple	UAS	Yes		Yes			Bimonthly	
02N22W12E04S	Industrial	Multiple	Both			Yes			Quarterly	
02N22W12F03S	Monitoring	Oxnard	UAS			Yes		Yes	Quarterly	Twice yearly
02N22W12F04S	Monitoring	Oxnard	UAS			Yes		Yes	Quarterly	Twice yearly
02N22W12G03S	Industrial	Oxnard	UAS	Yes					Bimonthly	
02N22W12H01S	Municipal	Multiple	UAS				Yes		Quarterly	
02N22W12J02S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W12J04S	Municipal	Multiple	UAS				Yes		Quarterly	
02N22W12K05S	Industrial	Unassigned	UAS			Yes			Quarterly	
02N22W12N03S	Agricultural	Hueneme	LAS	Yes					Bimonthly	
02N22W12Q06S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W12R03S	Agricultural	Multiple	Both	Yes					Bimonthly	
02N22W12R04S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W12R05S	Agricultural	Unassigned	Both	Yes					Bimonthly	
02N22W13C01S	Monitoring	Oxnard	UAS			Yes		Yes	Quarterly	Twice yearly
02N22W13N02S	Municipal	Multiple	LAS				Yes		Quarterly	
02N22W13N05S	Monitoring	Mugu	UAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W13N06S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly

Table 4-4
UWCD Monitoring Schedule of Wells in the Oxnard Subbasin

State Well Number (SWN)	Main Use	Screened Aquifer	Screened Aquifer System	Manual Water Levels Monitored Bimonthly[a]	Manual Water Levels Monitored Monthly[a]	Standard Transducer and Manual Water Level[a]	O&M Transducer and Manual Water Level[a]	Water Quality Samples Collected Monthly or Quarterly[a]	Water Level Sampling Schedule after GSP Adoption[a,b]	Water Quality Sampling Schedule after GSP Adoption[a]
02N22W13N07S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W14A09S	Monitoring	Oxnard	UAS	Yes		Yes		Yes	Bimonthly	Twice yearly
02N22W14B01S	Agricultural	Multiple	LAS	Yes	Yes				Monthly	
02N22W14D01S	Monitoring	Oxnard	UAS			Yes		Yes	Quarterly	Twice yearly
02N22W14F03S	Monitoring	Oxnard	UAS	Yes		Yes		Yes	Bimonthly	Twice yearly
02N22W14G04S	Monitoring	Mugu	UAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W14G05S	Monitoring	Mugu	UAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W14G06S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W14G07S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W14G08S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W14P02S	Municipal	Multiple	UAS				Yes		Quarterly	
02N22W14P03S	Municipal	Multiple	UAS	Yes				Yes	Bimonthly	
02N22W15L01S	Monitoring	Oxnard	UAS			Yes		Yes	Quarterly	Twice yearly
02N22W15P01S	Monitoring	Oxnard	UAS			Yes		Yes	Quarterly	Twice yearly
02N22W15R02S	Monitoring	Oxnard	UAS			Yes		Yes	Quarterly	Twice yearly
02N22W16R02S	Monitoring	Oxnard	UAS			Yes		Yes	Quarterly	Twice yearly
02N22W22Q05S	Municipal	Multiple	LAS	Yes	Yes				Monthly	
02N22W22R02S	Municipal	Multiple	Unassigned	Yes	Yes				Monthly	
02N22W23B02S	Municipal	Multiple	UAS				Yes		Quarterly	
02N22W23B03S	Monitoring	FCA	LAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W23B04S	Monitoring	Hueneme	LAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W23B05S	Monitoring	Hueneme	LAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W23B06S	Monitoring	Hueneme	LAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly

Table 4-4
UWCD Monitoring Schedule of Wells in the Oxnard Subbasin

State Well Number (SWN)	Main Use	Screened Aquifer	Screened Aquifer System	Manual Water Levels Monitored Bimonthly[a]	Manual Water Levels Monitored Monthly[a]	Standard Transducer and Manual Water Level[a]	O&M Transducer and Manual Water Level[a]	Water Quality Samples Collected Monthly or Quarterly[a]	Water Level Sampling Schedule after GSP Adoption[a,b]	Water Quality Sampling Schedule after GSP Adoption[a]
02N22W23B07S	Monitoring	Mugu	UAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W23B08S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W23B09S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W23C02S	Municipal	Multiple	UAS				Yes		Quarterly	
02N22W23C05S	Agricultural	Multiple	UAS			Yes	Yes		Quarterly	
02N22W23C06S	Municipal	Unassigned	UAS				Yes		Quarterly	
02N22W23D06S	Agricultural	Multiple	UAS	Yes					Bimonthly	
02N22W23G03S	Municipal	Multiple	UAS				Yes		Quarterly	
02N22W23G04S	Municipal	Multiple	UAS				Yes		Quarterly	
02N22W23H04S	Municipal	Multiple	LAS				Yes		Quarterly	
02N22W23H06S	Monitoring	Oxnard	UAS	Yes	Yes	Yes		Yes	Monthly	Twice yearly
02N22W23K05S	Municipal	Multiple	UAS				Yes		Quarterly	
02N22W24A01S	Agricultural	Multiple	UAS	Yes				Yes	Bimonthly	Twice yearly
02N22W24P02S	Agricultural	Multiple	LAS	Yes					Bimonthly	
02N22W25J01S	Municipal	Multiple	LAS	Yes					Bimonthly	
02N22W25L03S	Municipal	Multiple	UAS			Yes			Quarterly	
02N22W26B03S	Municipal	Hueneme	LAS				Yes		Quarterly	
02N22W26E01S	Municipal	Multiple	UAS					Yes		Twice yearly
02N22W26H02S	Agricultural	Multiple	LAS	Yes					Bimonthly	
02N22W27A02S	Municipal	Unassigned	Unassigned					Yes		Twice yearly
02N22W27A03S	Municipal	Unassigned	Unassigned					Yes		Twice yearly
02N22W27K01S	Municipal	Unassigned	UAS					Yes		Twice yearly
02N22W27L01S	Municipal	Unassigned	UAS					Yes		Twice yearly

Table 4-4
UWCD Monitoring Schedule of Wells in the Oxnard Subbasin

State Well Number (SWN)	Main Use	Screened Aquifer	Screened Aquifer System	Manual Water Levels Monitored Bimonthly[a]	Manual Water Levels Monitored Monthly[a]	Standard Transducer and Manual Water Level[a]	O&M Transducer and Manual Water Level[a]	Water Quality Samples Collected Monthly or Quarterly[a]	Water Level Sampling Schedule after GSP Adoption[a,b]	Water Quality Sampling Schedule after GSP Adoption[a]
02N22W27M02S	Municipal	Unassigned	UAS					Yes		Twice yearly
02N22W28H02S	Domestic	Unassigned	UAS					Yes		Twice yearly
02N22W30K01S	Agricultural	Oxnard	UAS	Yes					Bimonthly	
02N22W31A01S	Agricultural	Multiple	Unassigned			Yes			Quarterly	
02N22W32C04S	Agricultural	Multiple	UAS	Yes					Bimonthly	
02N22W36E04S	Monitoring	Hueneme	LAS						Twice yearly	
02N22W36E05S	Monitoring	Mugu	UAS						Twice yearly	
02N22W36E06S	Monitoring	Oxnard	UAS			Yes			Twice yearly	
02N22W36E07S	Monitoring	Mugu	UAS			Yes			Twice yearly	
02N22W36E08S	Monitoring	Hueneme	LAS			Yes			Twice yearly	
02N22W36M02S	Monitoring	Unassigned	Unassigned	Yes						

Notes: FCA = Fox Canyon Aquifer; GCA = Grimes Canyon Aquifer; GSP = Groundwater Sustainability Plan; LAS = Lower Aquifer System; O&M = operations and maintenance; UAS = Upper Aquifer System; UWCD = United Water Conservation District.

[a] As of October 2017.

[b] Although sometimes used to mean twice a month (i.e., semimonthly), *bimonthly* as used here means once every 2 months.

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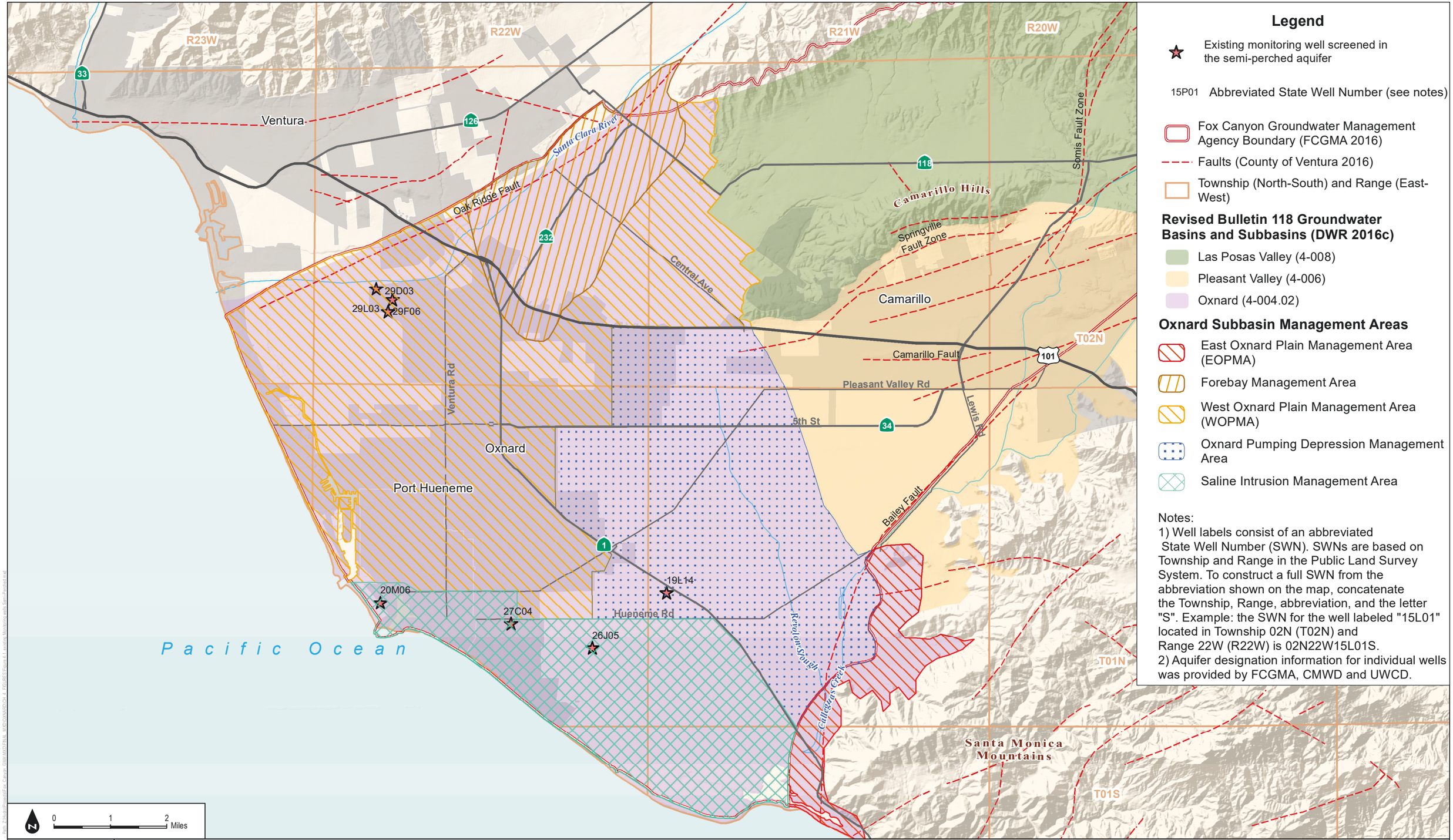

Legend

- Existing monitoring well screened in the semi-perched aquifer
- 15P01 Abbreviated State Well Number (see notes)
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (County of Ventura 2016)
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasins (DWR 2016c)

- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Oxnard Subbasin Management Areas

- East Oxnard Plain Management Area (EOPMA)
- Forebay Management Area
- West Oxnard Plain Management Area (WOPMA)
- Oxnard Pumping Depression Management Area
- Saline Intrusion Management Area

Notes:
1) Well labels consist of an abbreviated State Well Number (SWN). SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
2) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; County of Ventura; UWCD; CMWD

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FIGURE 4-1

Monitoring Wells Screened in the Semi-Perched Aquifer in the Oxnard Subbasin

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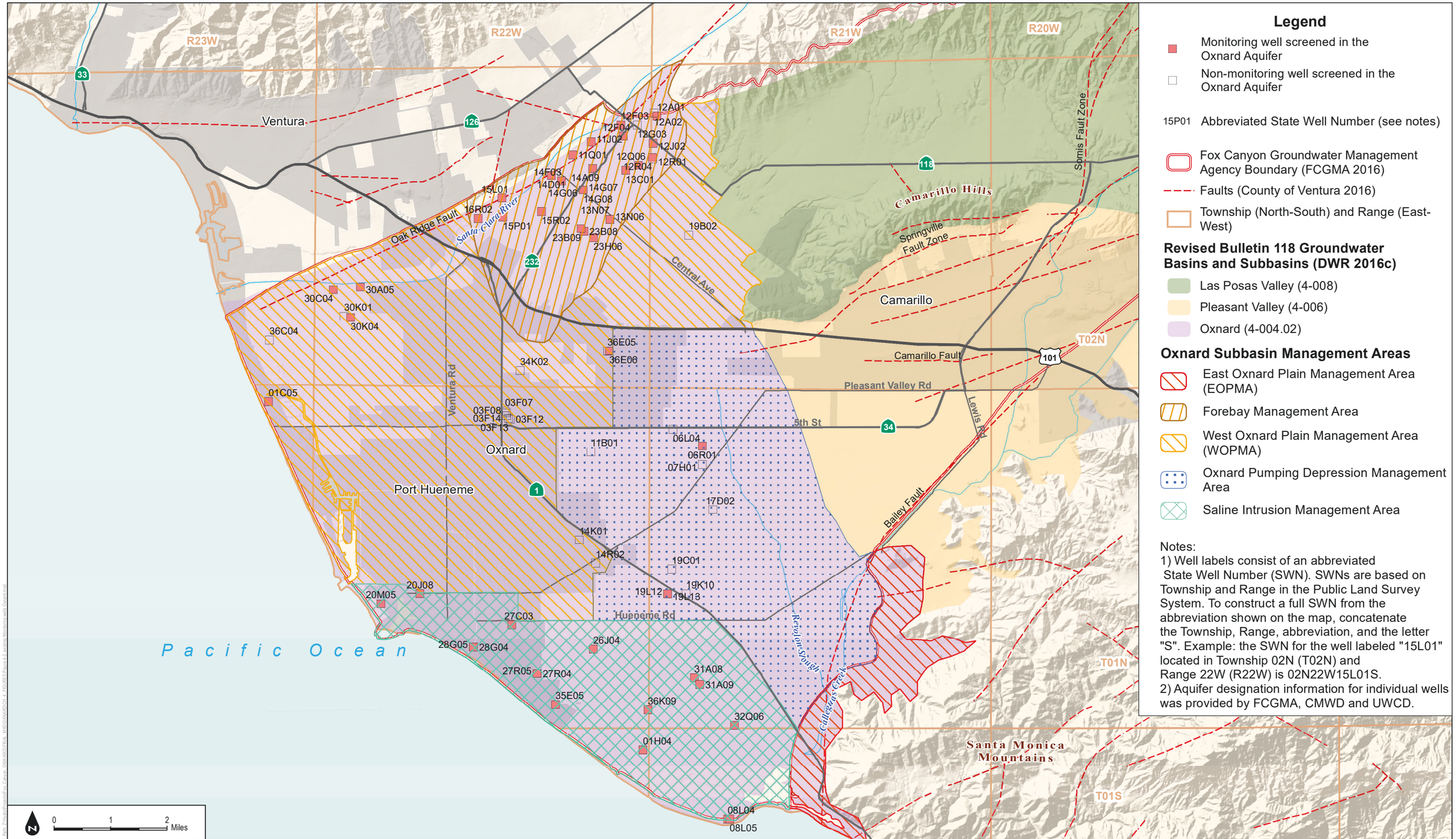

Legend

- Monitoring well screened in the Oxnard Aquifer
- Non-monitoring well screened in the Oxnard Aquifer
- 15P01 Abbreviated State Well Number (see notes)
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (County of Ventura 2016)
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasins (DWR 2016c)

- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Oxnard Subbasin Management Areas

- East Oxnard Plain Management Area (EOPMA)
- Forebay Management Area
- West Oxnard Plain Management Area (WOPMA)
- Oxnard Pumping Depression Management Area
- Saline Intrusion Management Area

Notes:
1) Well labels consist of an abbreviated State Well Number (SWN). SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
2) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; County of Ventura; UWCD; CMWD

FIGURE 4-2

Monitoring Wells Screened in the Oxnard Aquifer in the Oxnard Subbasin

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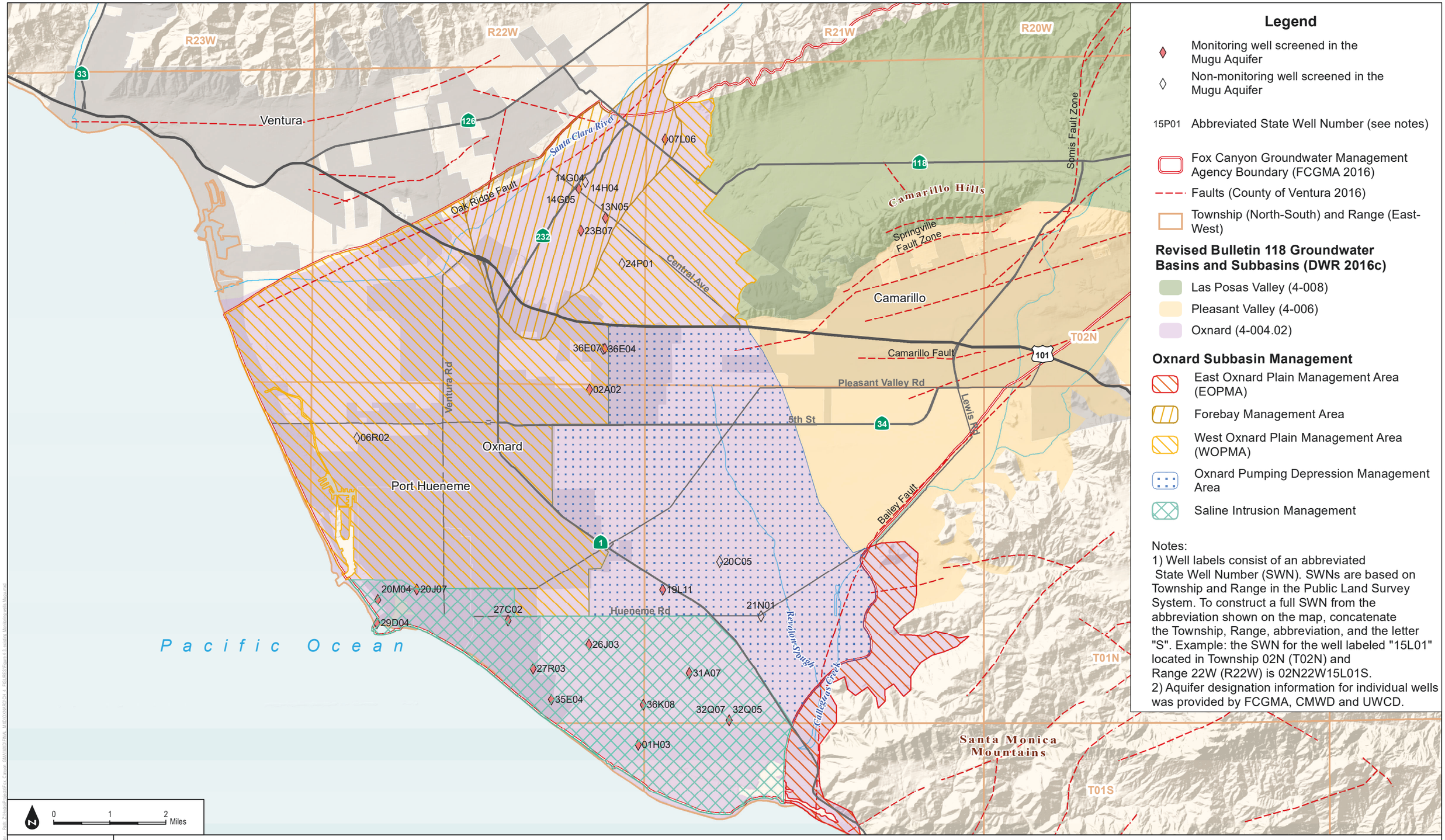

Legend

- Monitoring well screened in the Mugu Aquifer
- Non-monitoring well screened in the Mugu Aquifer
- 15P01 Abbreviated State Well Number (see notes)
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (County of Ventura 2016)
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasins (DWR 2016c)

- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Oxnard Subbasin Management

- East Oxnard Plain Management Area (EOPMA)
- Forebay Management Area
- West Oxnard Plain Management Area (WOPMA)
- Oxnard Pumping Depression Management Area
- Saline Intrusion Management

Notes:
1) Well labels consist of an abbreviated State Well Number (SWN). SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
2) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; County of Ventura; UWCD; CMWD

FIGURE 4-3

Monitoring Wells Screened in the Mugu Aquifer in the Oxnard Subbasin

DUDEK

Groundwater Sustainability Plan for the Oxnard Subbasin

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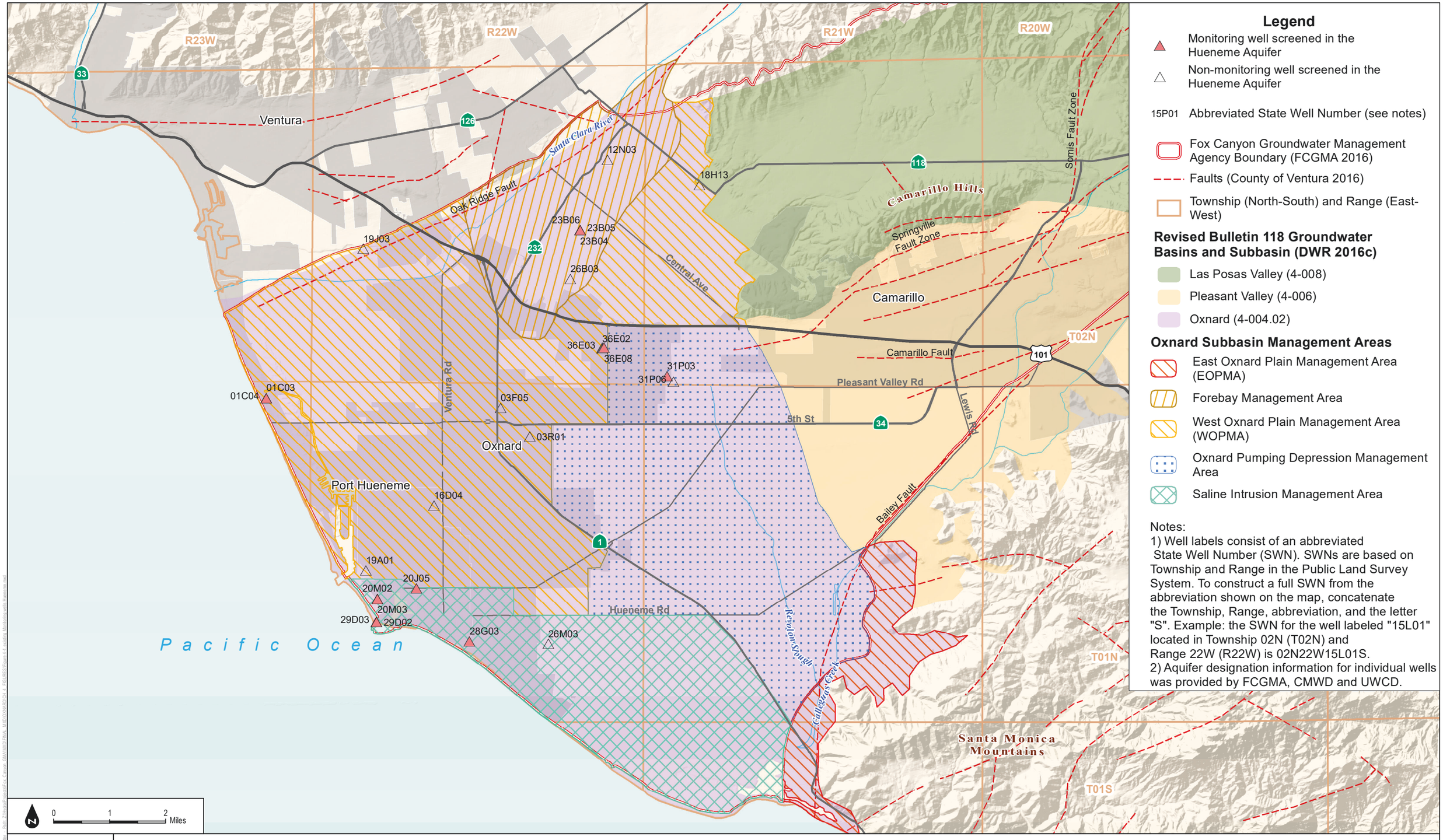

Legend

- Monitoring well screened in the Hueneme Aquifer
- Non-monitoring well screened in the Hueneme Aquifer
- 15P01 Abbreviated State Well Number (see notes)
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (County of Ventura 2016)
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2016c)

- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Oxnard Subbasin Management Areas

- East Oxnard Plain Management Area (EOPMA)
- Forebay Management Area
- West Oxnard Plain Management Area (WOPMA)
- Oxnard Pumping Depression Management Area
- Saline Intrusion Management Area

Notes:
1) Well labels consist of an abbreviated State Well Number (SWN). SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
2) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; County of Ventura; UWCD; CMWD

FIGURE 4-4
Monitoring Wells Screened in the Hueneme Aquifer in the Oxnard Subbasin

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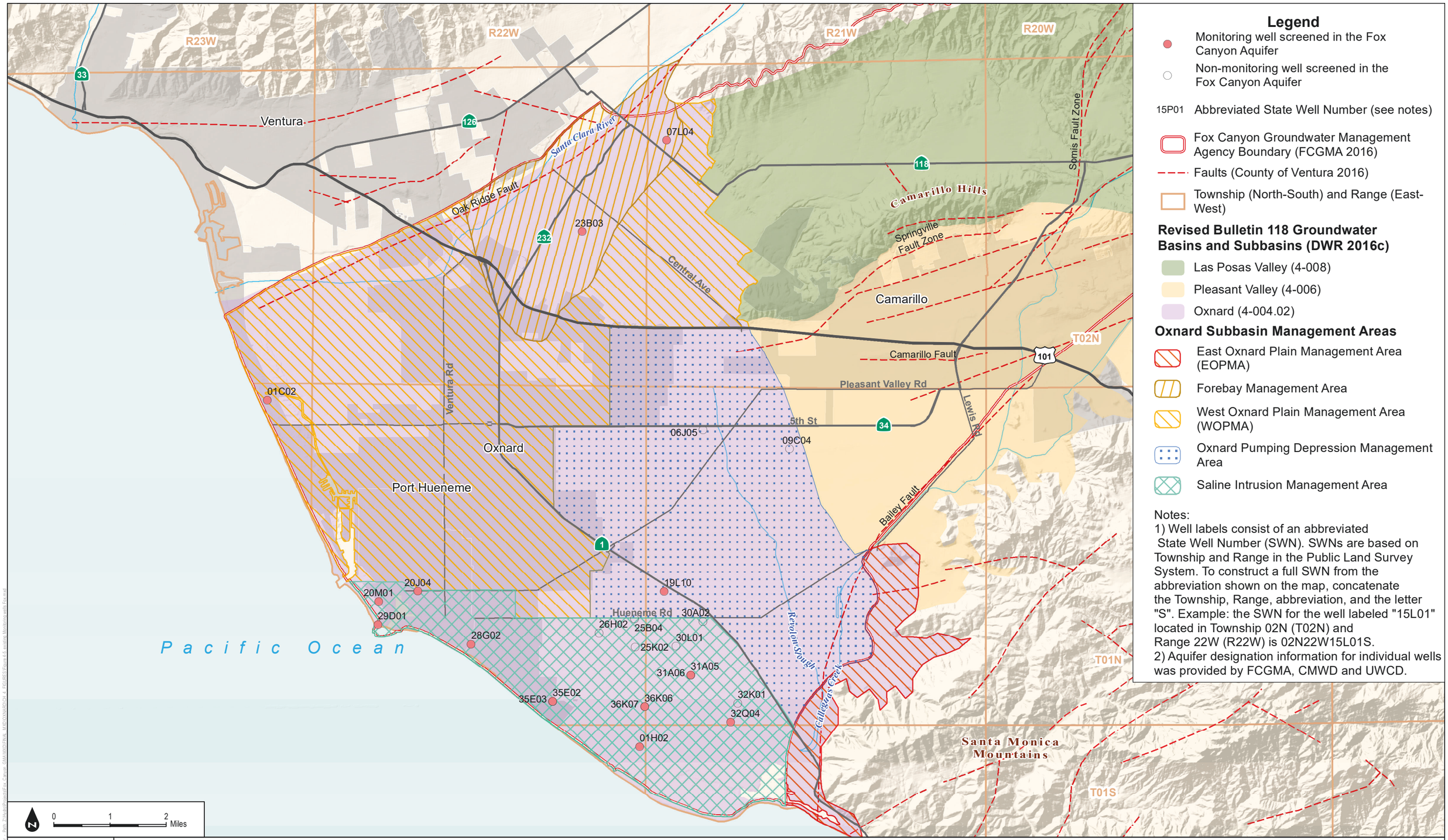

Legend

- Monitoring well screened in the Fox Canyon Aquifer
- Non-monitoring well screened in the Fox Canyon Aquifer
- 15P01 Abbreviated State Well Number (see notes)
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (County of Ventura 2016)
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasins (DWR 2016c)

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- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Oxnard Subbasin Management Areas

- East Oxnard Plain Management Area (EOPMA)
- Forebay Management Area
- West Oxnard Plain Management Area (WOPMA)
- Oxnard Pumping Depression Management Area
- Saline Intrusion Management Area

Notes:
1) Well labels consist of an abbreviated State Well Number (SWN). SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
2) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; County of Ventura; UWCD; CMWD

FIGURE 4-5

Monitoring Wells Screened in the Fox Canyon Aquifer in the Oxnard Subbasin

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Groundwater Sustainability Plan for the Oxnard Subbasin

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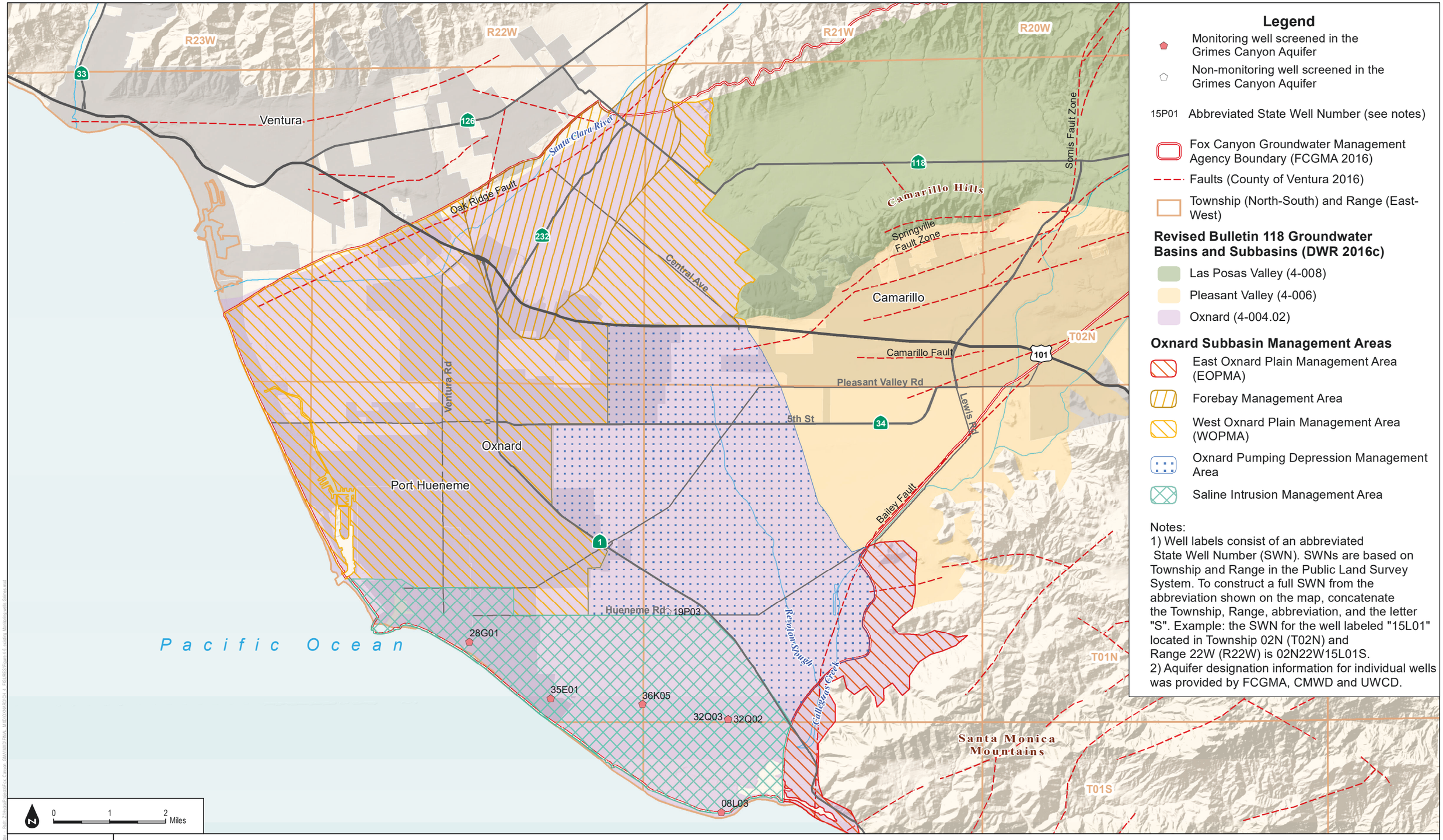

Legend

- Monitoring well screened in the Grimes Canyon Aquifer
- Non-monitoring well screened in the Grimes Canyon Aquifer
- 15P01 Abbreviated State Well Number (see notes)
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (County of Ventura 2016)
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasins (DWR 2016c)

- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Oxnard Subbasin Management Areas

- East Oxnard Plain Management Area (EOPMA)
- Forebay Management Area
- West Oxnard Plain Management Area (WOPMA)
- Oxnard Pumping Depression Management Area
- Saline Intrusion Management Area

Notes:
1) Well labels consist of an abbreviated State Well Number (SWN). SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
2) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; County of Ventura; UWCD; CMWD

DUDEK

FIGURE 4-6

Monitoring Wells Screened in the Grimes Canyon Aquifer in the Oxnard Subbasin

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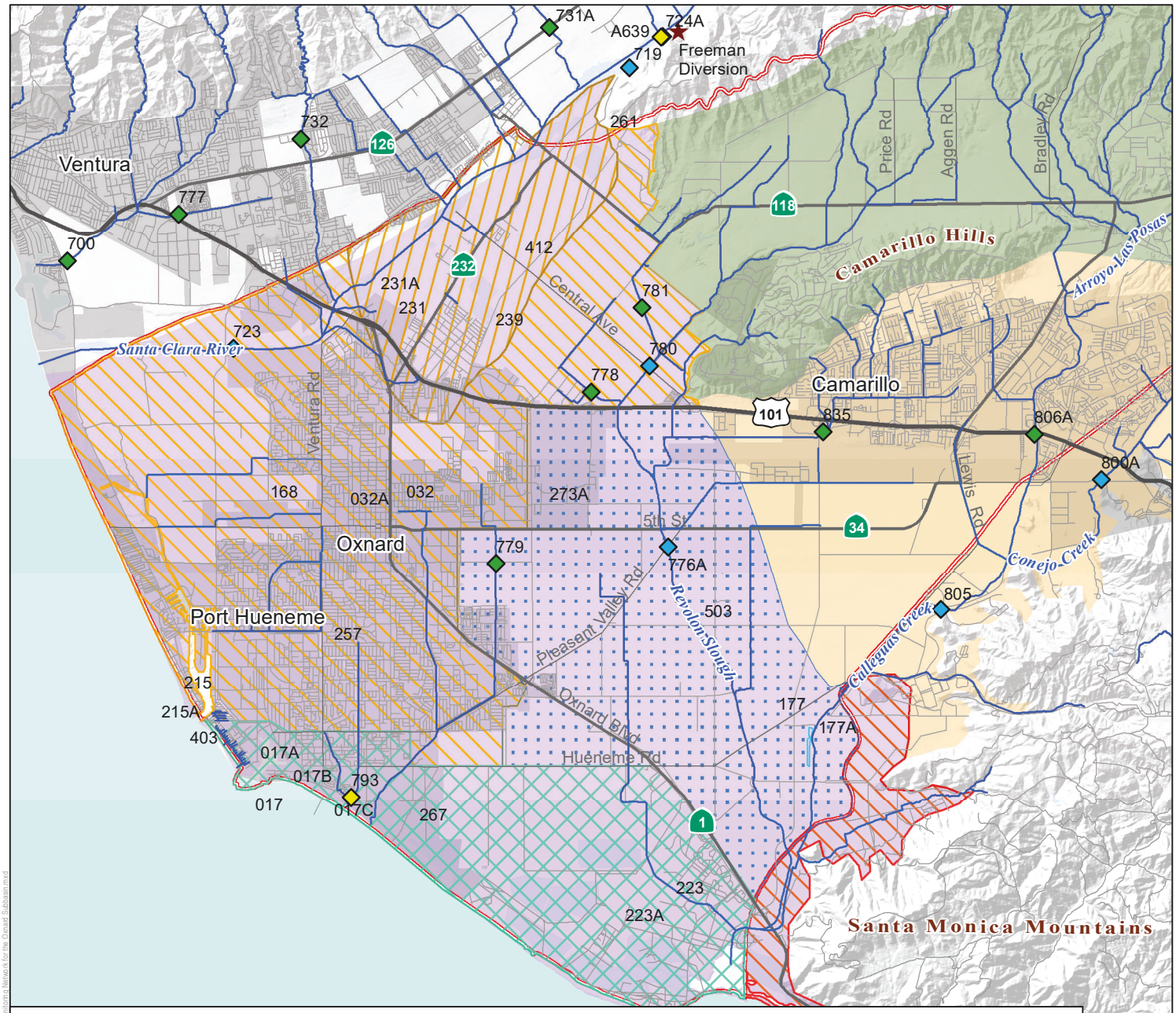

Ventura County Gauge Locations (VCWPD 2016; labeled by station number)

- Recording Stream Gauge
- Peak Only (Event) Site
- ALERT Stream Gauge
- Ventura County Rivers, Streams and Channels (VCWPD 2016)
- Freeman Diversion

Oxnard Subbasin Management Areas

- East Oxnard Plain Management Area (EOPMA)
- Forebay Management Area
- West Oxnard Plain Management Area (WOPMA)
- Oxnard Pumping Depression Management Area
- Saline Intrusion Management
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)

Revised Bulletin 118 Groundwater Basins and Subbasins (DWR 2016c)

- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

N

0 0.5 1 2 3 Miles

SOURCE: DWR; County of Ventura; VCWPD

FIGURE 4-7

Active Surface Water Monitoring Network for the Oxnard Subbasin

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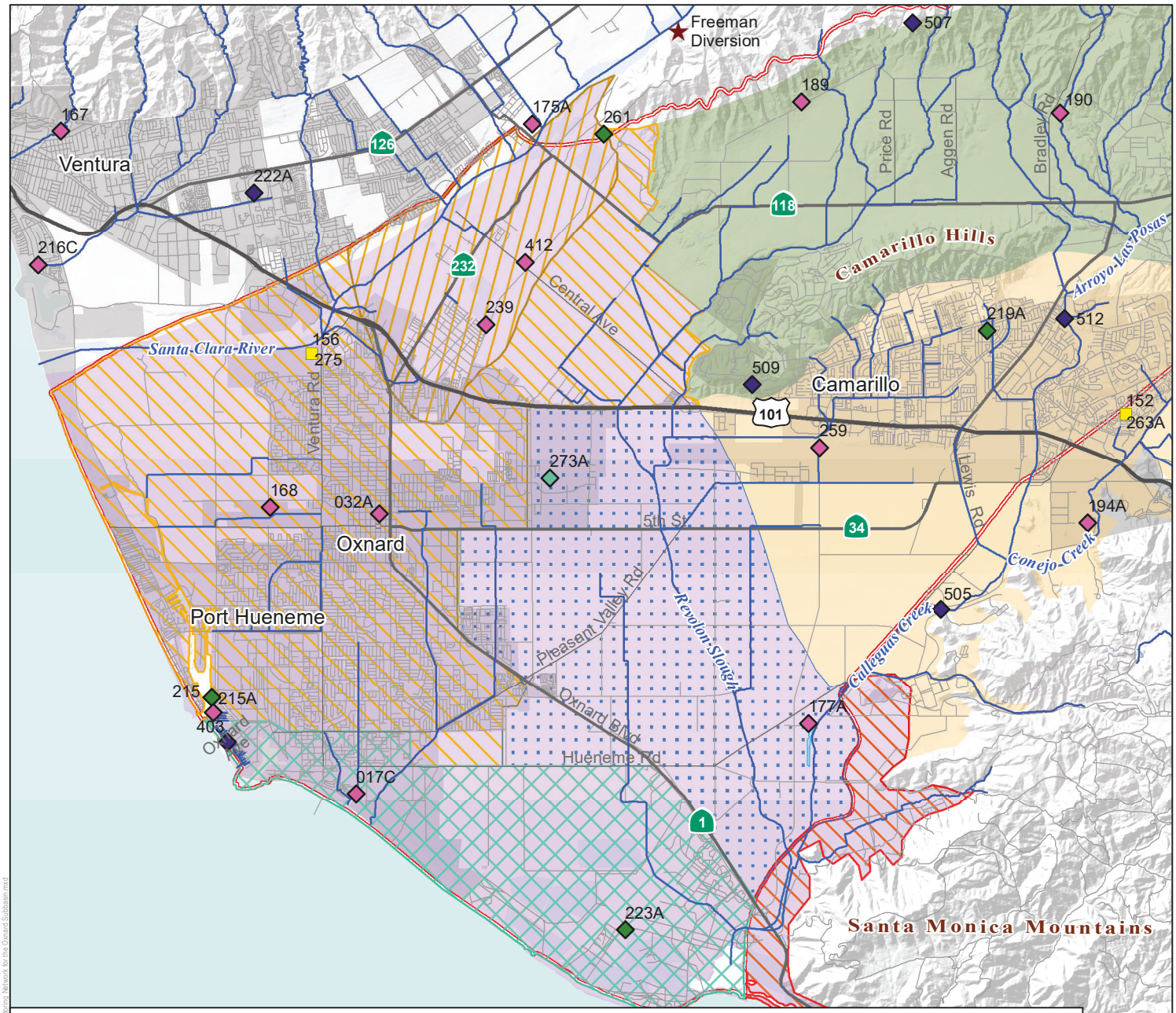

Ventura County Gauge Locations (VCWPD 2016; labeled by station number)

- Recording Precipitation Gauge
- Standard Precipitation
- Storage Precipitation
- Non-Standard Recorder
- ALERT Precipitation Gauge
- Storage Precip & ALERT
- National Weather Service Site
- Ventura County Rivers, Streams and Channels (VCWPD 2016)
- Freeman Diversion
- CIMIS Stations

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)

Oxnard Subbasin Management Areas

- East Oxnard Plain Management Area (EOPMA)
- Forebay Management Area
- West Oxnard Plain Management Area (WOPMA)
- Oxnard Pumping Depression Management Area
- Saline Intrusion Management Area

Revised Bulletin 118 Groundwater Basins and Subbasins (DWR 2016c)

- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

N

0 0.5 1 2 3 Miles

DUDEK

SOURCE: DWR; County of Ventura; VCWPD

FIGURE 4-8

Active Precipitation Monitoring Network for the Oxnard Subbasin

Groundwater Sustainability Plan for the Oxnard Subbasin

Date: 6/3/2019 Last saved by cdiffee Path: Z:\Hydro\Projects\Fox Canyon GMA\MXD\FINAL MXD\OXNARD\CH 4 FIGURES\Figure 4-8 Active Precipitation Monitoring Network for the Oxnard Subbasin.mxd

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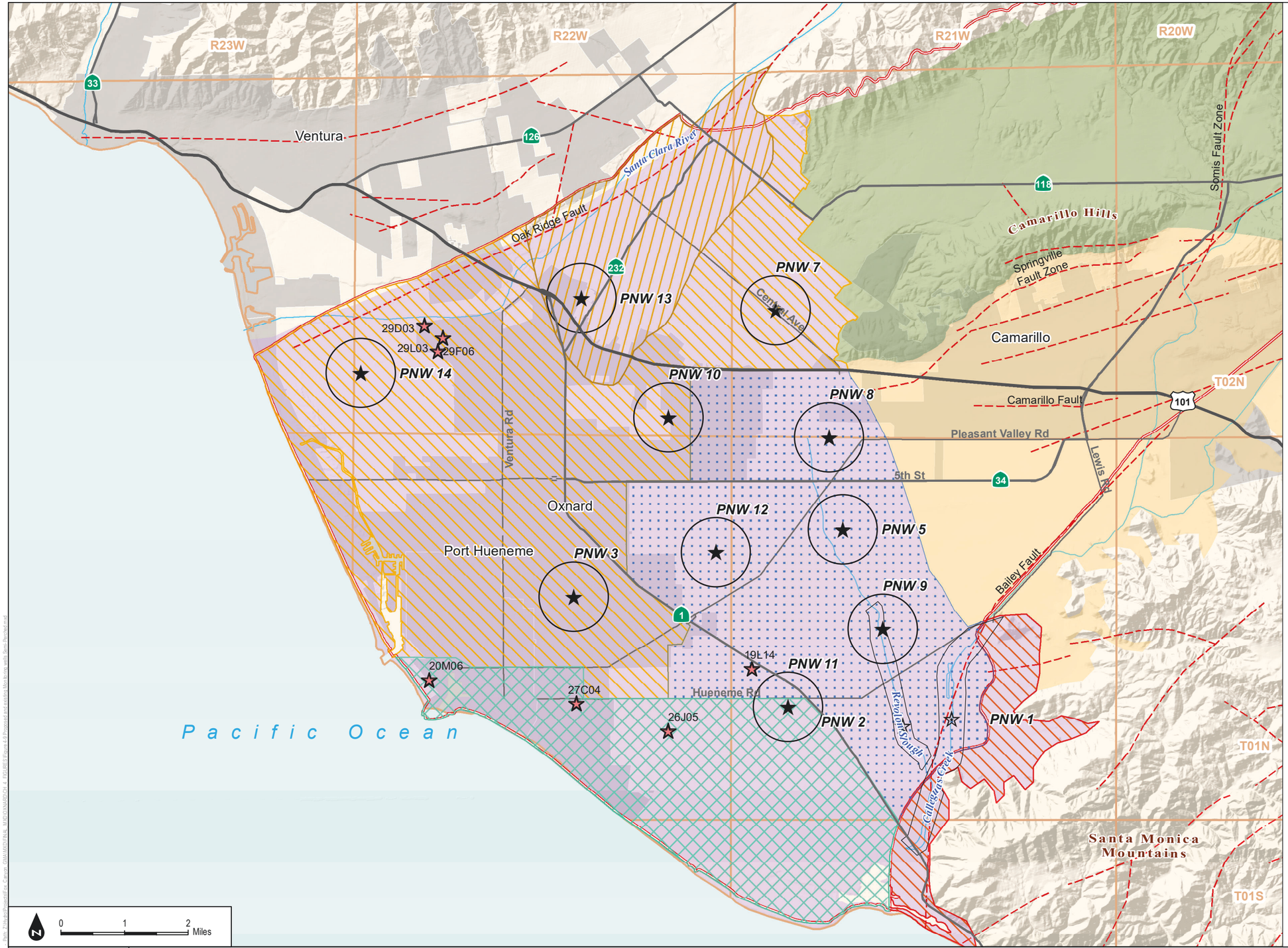

Legend

Potential well screened in the semi-perched aquifer (nested cluster)

Potential well screened in the semi-perched aquifer (GDE Monitoring)

Existing monitoring well screened in the semi-perched aquifer

15P01 Abbreviated State Well Number (see notes)

PNW 1 Potential New Well and location number

Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)

Faults (County of Ventura 2016)

Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasins (DWR 2016c)

Las Posas Valley (4-008)

Pleasant Valley (4-006)

Oxnard (4-004.02)

Oxnard Subbasin Management Areas

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West Oxnard Plain Management Area (WOPMA)

Oxnard Pumping Depression Management Area

Saline Intrusion Management Area

Notes:
1) Well labels consist of an abbreviated State Well Number (SWN). SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
2) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

DUDEK

SOURCE: DWR; County of Ventura; UWCD; CMWD

FIGURE 4-9

Existing and Potential New Wells For Monitoring Groundwater Conditions in the Semi-Perched Aquifer

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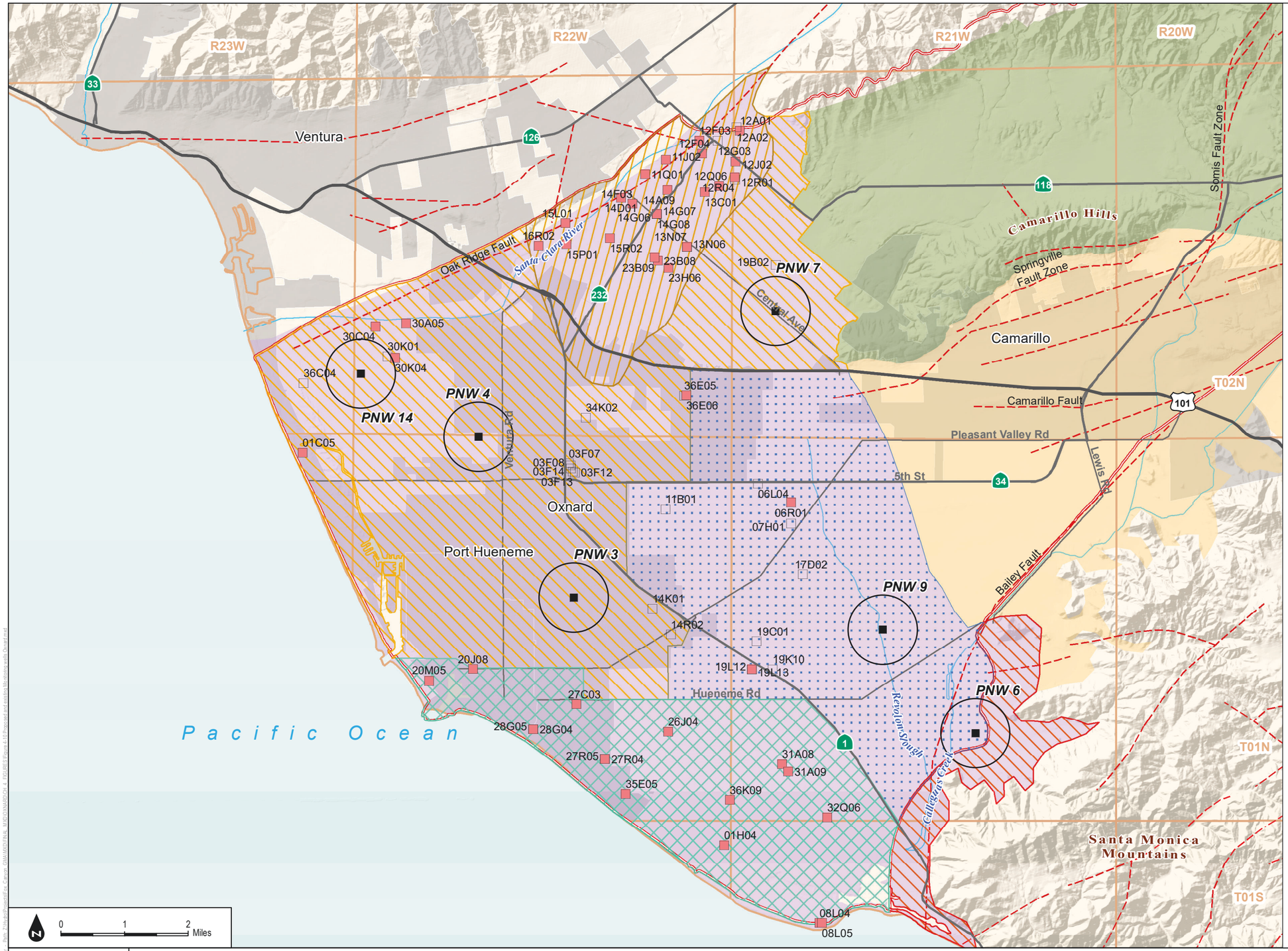

Legend

Installation target for potential new well screened in the Oxnard Aquifer

Monitoring well screened in the Oxnard Aquifer

Non-monitoring well screened in the Oxnard Aquifer

15P01 Abbreviated State Well Number (see notes)

PNW 1 Potential New Well and location number

Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)

Faults (County of Ventura 2016)

Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasins (DWR 2016c)

Las Posas Valley (4-008)

Pleasant Valley (4-006)

Oxnard (4-004.02)

Oxnard Subbasin Management Areas

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West Oxnard Plain Management Area (WOPMA)

Oxnard Pumping Depression Management Area

Saline Intrusion Management Area

Notes:
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2) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

DUDEK

SOURCE: DWR; County of Ventura; UWCD; CMWD

FIGURE 4-10

Existing and Potential New Wells For Monitoring Groundwater Conditions in the Oxnard Aquifer

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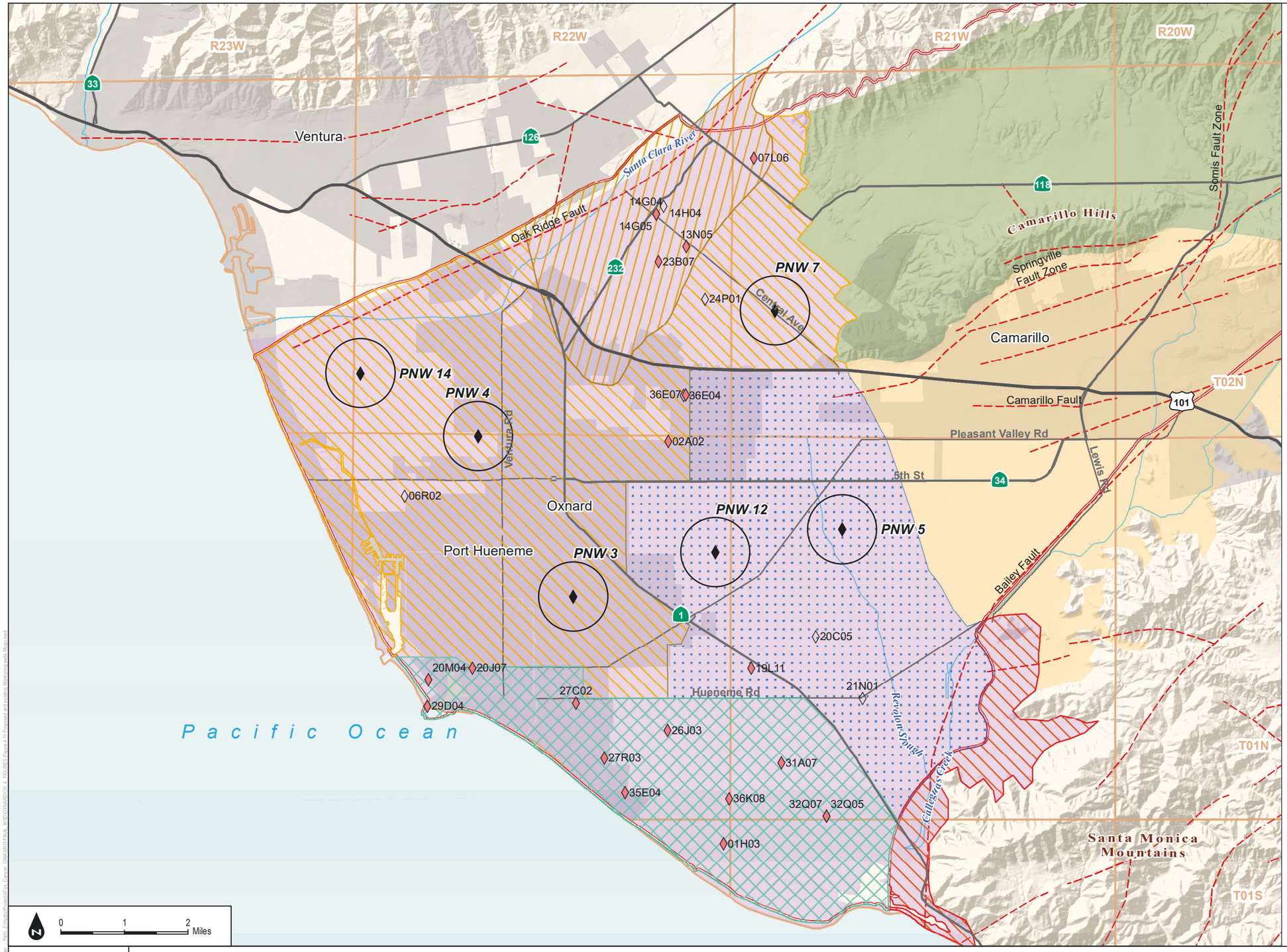

Legend

Installation target for potential well screened in the Mugu Aquifer

Monitoring well screened in the Mugu Aquifer

Non-monitoring well screened in the Mugu Aquifer

15P01 Abbreviated State Well Number (see notes)

PNW 1 Potential New Well and location number

Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)

Faults (County of Ventura 2016)

Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasins (DWR 2016c)

- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Oxnard Subbasin Management Areas

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- Forebay Management Area
- West Oxnard Plain Management Area (WOPMA)
- Oxnard Pumping Depression Management Area
- Saline Intrusion Management Area

Notes:
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2) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; County of Ventura; UWCD; CMWD

FIGURE 4-11

Existing and Potential New Wells For Monitoring Groundwater Conditions in the Mugu Aquifer

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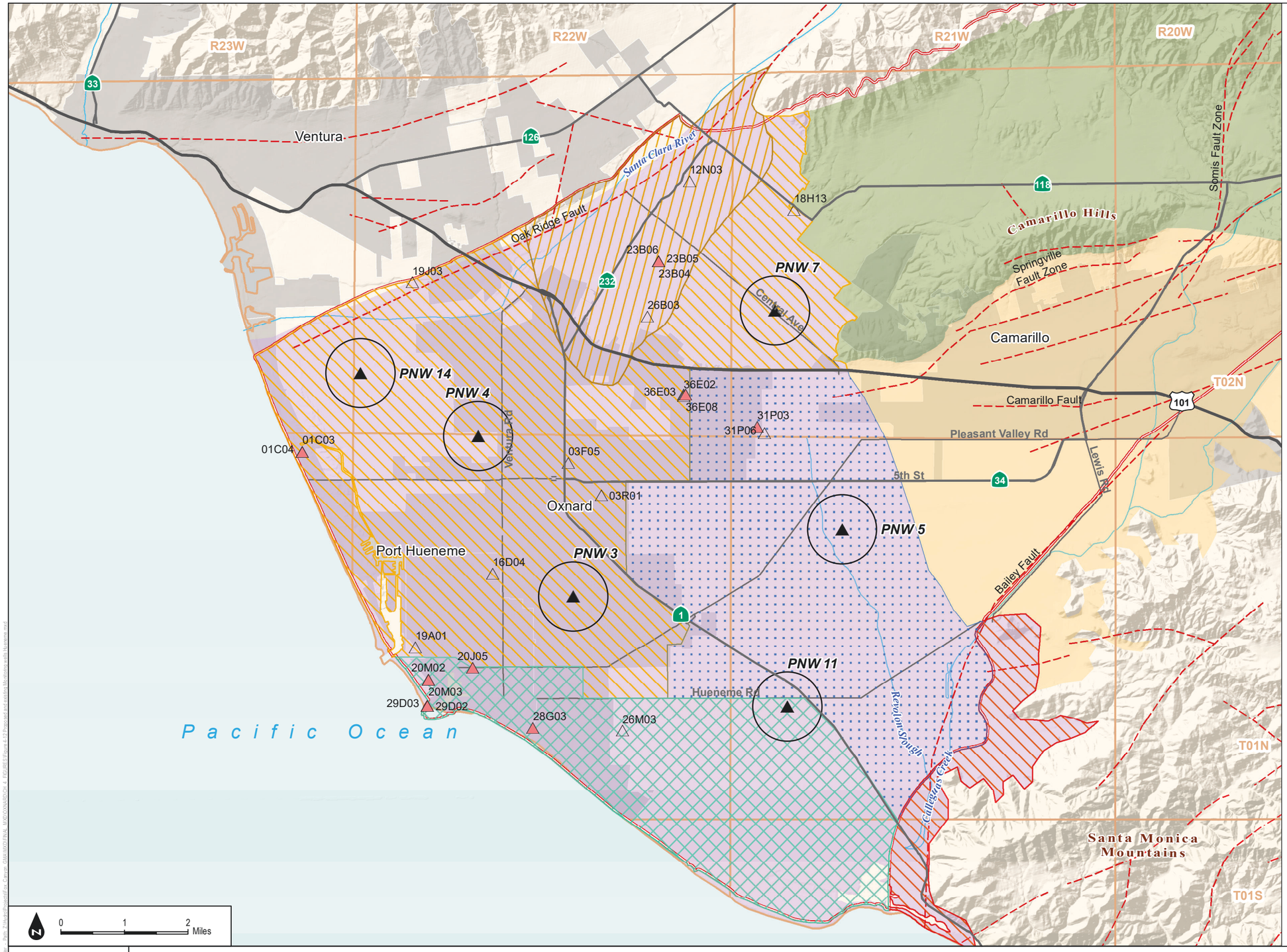

Legend

Installation target for potential well screened in the Hueneme Aquifer

Monitoring well screened in the Hueneme Aquifer

Non-monitoring well screened in the Hueneme Aquifer

15P01 Abbreviated State Well Number (see notes)

PNW 1 Potential New Well and location number

Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)

Faults (County of Ventura 2016)

Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasins (DWR 2016c)

Las Posas Valley (4-008)

Pleasant Valley (4-006)

Oxnard (4-004.02)

Oxnard Subbasin Management Areas

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West Oxnard Plain Management Area (WOPMA)

Oxnard Pumping Depression Management Area

Saline Intrusion Management Area

Notes:
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2) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; County of Ventura; UWCD; CMWD

DUDEK

FIGURE 4-12

Existing and Potential New Wells For Monitoring Groundwater Conditions in the Hueneme Aquifer

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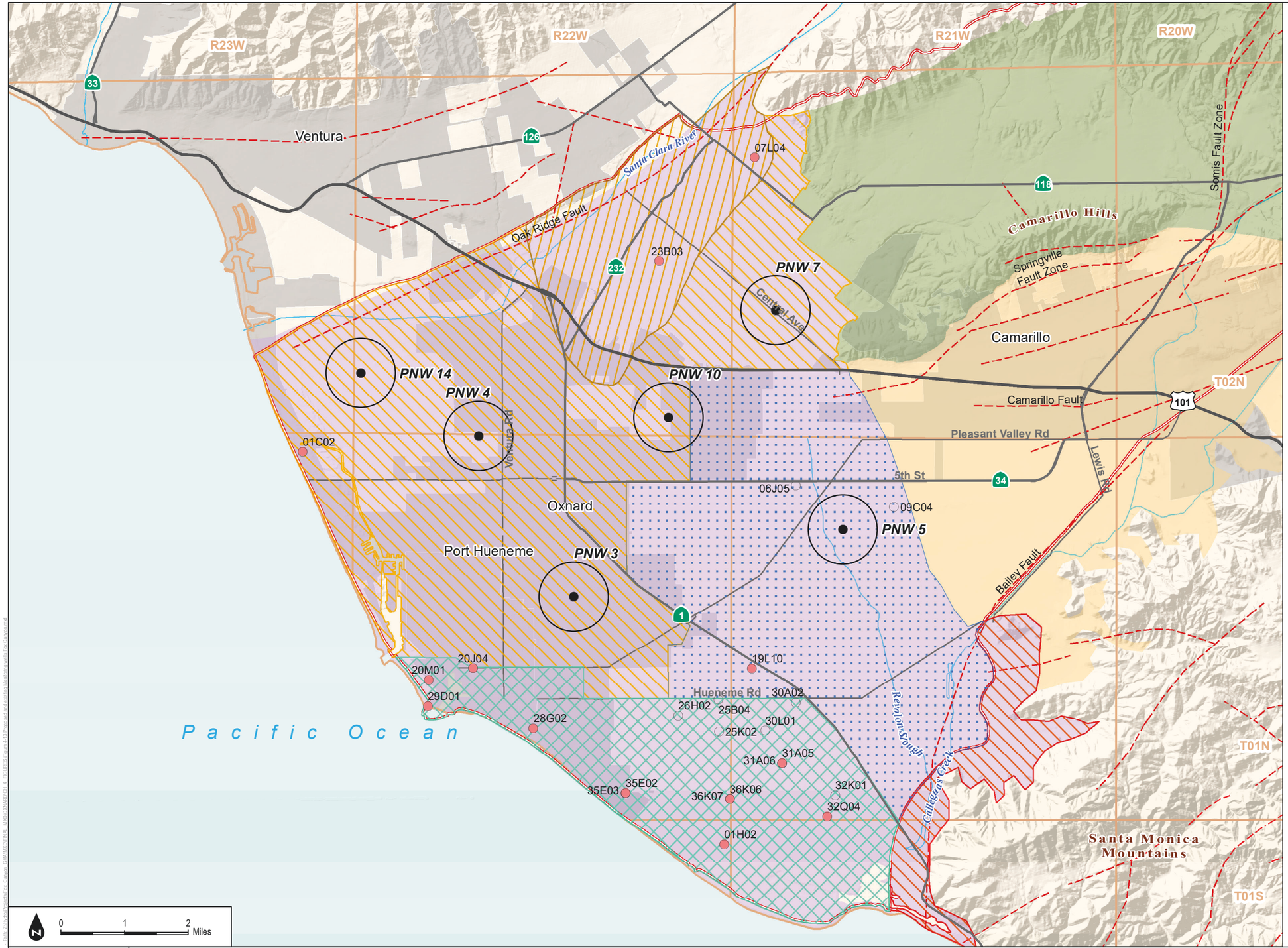

Legend

Installation target for potential well screened in the Fox Canyon Aquifer

Monitoring well screened in the Fox Canyon Aquifer

Non-monitoring well screened in the Fox Canyon Aquifer

15P01 Abbreviated State Well Number (see notes)

PNW 1 Potential New Well and location number

Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)

Faults (County of Ventura 2016)

Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasins (DWR 2016c)

Las Posas Valley (4-008)

Pleasant Valley (4-006)

Oxnard (4-004.02)

Oxnard Subbasin Management Areas

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West Oxnard Plain Management Area (WOPMA)

Oxnard Pumping Depression Management Area

Saline Intrusion Management Area

Notes:
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2) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; County of Ventura; UWCD; CMWD

FIGURE 4-13

Existing and Potential New Wells For Monitoring Groundwater Conditions in the Fox Canyon Aquifer

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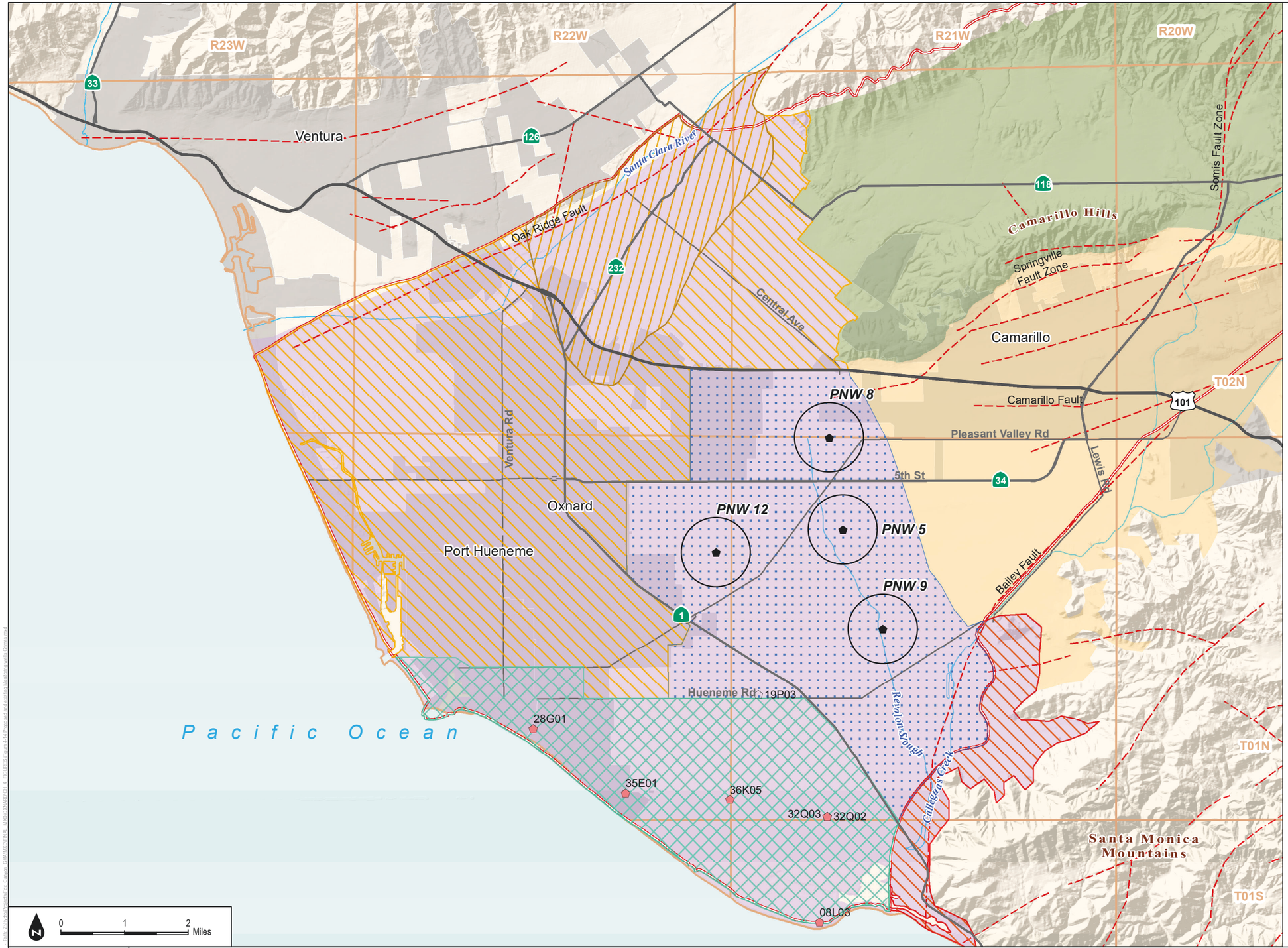

Legend

Potential installation target for proposed well screened in the Grimes Canyon Aquifer

Monitoring well screened in the Grimes Canyon Aquifer

Non-monitoring well screened in the Grimes Canyon Aquifer

15P01 Abbreviated State Well Number (see notes)

PNW 1 Potential New Well and location number

Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)

Faults (County of Ventura 2016)

Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasins (DWR 2016c)

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West Oxnard Plain Management Area (WOPMA)

Oxnard Pumping Depression Management Area

Saline Intrusion Management Area

Notes:
1) Well labels consist of an abbreviated State Well Number (SWN). SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S.
2) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; County of Ventura; UWCD; CMWD

FIGURE 4-14

Existing and Potential New Wells For Monitoring Groundwater Conditions in the Grimes Canyon Aquifer

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CHAPTER 5
PROJECTS AND MANAGEMENT ACTIONS

5.1 INTRODUCTION TO PROJECTS AND MANAGEMENT ACTIONS

Projects and management actions have been developed to meet the sustainability goal, measurable objectives, and undesirable results identified for the Oxnard Subbasin (Subbasin) in Chapter 3, Sustainability Management Criteria, of this Groundwater Sustainability Plan (GSP). Seawater intrusion in the aquifers of the Upper Aquifer System (UAS) and Lower Aquifer System (LAS) has been identified as the undesirable result that will impact beneficial uses of groundwater in the Subbasin.

To address potential impacts to beneficial uses and users of groundwater in the Subbasin resulting from groundwater production in excess of the current sustainable yield, several projects were developed for the Subbasin. The projects listed below were suggested by stakeholders, selected for inclusion in the GSP through a process by the Operations Committee of the Fox Canyon Groundwater Management Agency (FCGMA) Board of Directors (Board), and approved for inclusion in the GSP by the FCGMA Board. The criteria for including a project in the GSP included the following:

- Sufficient project information is available for evaluation and modeling.
- Project increases sustainable yield, or reduces groundwater demand.
- Project implementation is planned within 20 years.
- Project meets GSP Emergency Regulations Section 354.44 criteria.
- There is an agency proponent for the project.
- Funding for the project is identified.

In the Oxnard Subbasin, five projects were determined by the Operations Committee to meet the above criteria. These five projects were incorporated into the future model scenarios to the extent possible (see Section 2.4.5, Projected Future Water Budget and Sustainable Yield). The inclusion of these projects does not constitute a commitment by the FCGMA Board to construct or fund the projects, but rather signals that these projects were sufficiently detailed to be included in groundwater modeling efforts that examined the quantitative impacts of the projects on groundwater elevations and the sustainable yield of the Subbasin. As currently envisioned, the projects in this GSP would be implemented by the project proponent or sponsoring agency. However, FCGMA may opt to implement projects in the future as necessary to achieve sustainability in the Subbasin. Additionally, all projects undertaken in the Subbasin will need to be approved and permitted by all relevant regulatory agencies. These agencies may include, but are not limited to, the Regional Water Quality Control Board and the State Water Resources Control Board.

In addition to the projects discussed in this chapter, the FCGMA Board has the authority to implement management actions to ensure that the Subbasin does not experience undesirable results. The primary management action that can be implemented by the FCGMA Board is restrictions on groundwater production. This authority was granted to the FCGMA Board in the enabling legislation that formed the FCGMA, and this action has been undertaken in the past to eliminate overdraft.

As discussed in Chapter 2, Basin Setting, groundwater modeling was used to evaluate projected water budget conditions and potential impacts to beneficial uses and users of groundwater in the basin. Without the type of projects described below, substantially greater reductions in groundwater production will be needed to meet the sustainability goal for the basin, which would lead to significant economic disruption and prevent groundwater in the basin from being put to beneficial use to the fullest extent possible. It is anticipated, and recommended, that FCGMA will evaluate, model, and conduct feasibility studies of other projects for achieving sustainable groundwater management for the 5-year update to this GSP to optimize basin management and minimize extraction restrictions.

5.2 PROJECT NO. 1 – GREAT PROGRAM ADVANCED WATER PURIFICATION FACILITY

5.2.1 Description of Project No. 1

The Groundwater Recovery Enhancement and Treatment (GREAT) Program's Advanced Water Purification Facility (AWPF) is part of the City of Oxnard's GREAT Program, which focuses on using existing water resources more efficiently. The AWPF provides the City of Oxnard with a source of reclaimed water that can be used for landscape irrigation, agricultural, industrial process water, and groundwater recharge. The AWPF is designed to initially treat approximately 8 to 9 million gallons per day (mgd) of secondary effluent from the Oxnard Wastewater Treatment Plant and produce 6.25 mgd of product water for reclaimed water uses. This is equivalent to 7,000 acre-feet per year (AFY) of product water that can be delivered through existing infrastructure. The AWPF is currently producing up to 4,600 AFY. Advanced purified water was first delivered to agricultural operators in 2016. The portion of the project that is being considered for inclusion in GSP is the additional water that is being purchased by FCGMA to reduce groundwater extractions for which no Recycled Water Pumping Allocation is issued.

5.2.2 Relationship of Project No. 1 to Sustainability Criteria

GREAT Program AWPF Project water was included in future groundwater modeling scenarios to examine the impact that the project may have on the sustainability criteria. This project was incorporated in the modeling along with the expansion of the GREAT Program AWPF (see Section 5.3, Project No. 2 – GREAT Program Advanced Water Purification Facility Expansion Project)

and the temporary fallowing of agricultural land (see Section 5.6, Project No. 5 – Temporary Agricultural Land Fallowing Project). Therefore, the relationship between the impact of this project alone and the sustainability indicators has not been quantified. Rather, the potential effect of this project in the context of all three of these projects is presented in this discussion.

Relationship to Minimum Thresholds

The minimum thresholds for both the UAS and the LAS in the Oxnard Subbasin are higher than the historical low water levels and the spring 2015 water levels (see Chapter 3). In the UAS, the minimum thresholds are approximately 41 feet higher than historical low water levels and 25 feet higher than spring 2015 water levels. In the LAS, the minimum thresholds are approximately 70 feet higher than historical low water levels, and 38 feet higher than spring 2015 water levels.

The numerical groundwater model simulation of the Future Baseline With Projects scenario, which incorporates potential future projects including the GREAT Program AWPF Project, results in higher groundwater elevations than the Future Baseline scenario, which does not incorporate projects (see Section 2.4). Incorporation of the projects resulted in groundwater elevations at the end of the 50-year model simulation that were, on average, approximately 2 feet higher in the UAS and approximately 8 feet higher in the LAS. This suggests that the projects will assist with water level recovery in the Subbasin, a necessary first step to avoid exceedance of the minimum thresholds. Although implementation of the projects increases water levels in the Subbasin, these projects alone did not provide sufficient recycled water or redistribution of groundwater production to avoid exceedance of the minimum thresholds.

As modeled, the GREAT Program AWPF Project supplied approximately 4,600 AFY of recycled water to farmers in the vicinity of Hueneme Road (Chapter 2). This accounts for approximately half of the water delivered in the Future Baseline With Projects scenario. Because groundwater elevations were higher in the Future Baseline With Projects scenario than they were in the Future Baseline scenario, and because the GREAT Program AWPF Project supplied approximately half of the project water modeled this project is anticipated to result in measurably higher groundwater elevations in the Oxnard Subbasin. Therefore, the GREAT Program AWPF Project is anticipated to benefit the Subbasin and assist with raising groundwater elevations above the minimum thresholds in the future.

Relationship to Measurable Objectives

The relationship of the GREAT Program AWPF Project to the measurable objectives is similar to the relationship with the minimum thresholds. By measurably increasing water levels in the Subbasin, the GREAT Program AWPF Project water will help the Oxnard Subbasin meet the measurable objective water levels defined in Chapter 3.

5.2.3 Expected Benefits of Project No. 1

The AWPF product water that will be put to use in the Oxnard Subbasin is secondary wastewater effluent that is currently discharged to the Pacific Ocean. Therefore, this project provides a new source of water for use in the Subbasin. This additional water is expected to benefit the Oxnard Subbasin by providing water that would otherwise be pumped from the Subbasin to farmers in the vicinity of Hueneme Road, an area that is currently threatened by the inland migration of the saline water impact front (see Section 2.3, Groundwater Conditions).

5.2.4 Timetable for Implementation of Project No. 1

Phase 1 of the GREAT Program AWPF Project has already been permitted and constructed, and the AWPF Project is currently operating in the Subbasin. Under the current program, AWPF water is being delivered to farmers. The City of Oxnard receives a Recycled Water Pumping Allocation for delivered water used by farmers in lieu of groundwater production. Implementation of the project relative to the GSP will depend on the timetable necessary to deliver the GREAT Program AWPF water to farmers for in-lieu groundwater production for which no allocation or credits are provided to the City of Oxnard. Therefore, if the GREAT Program AWPF Project is incorporated into management of the Oxnard Subbasin for the purpose of increasing groundwater elevations to meet the sustainability criteria, the time for implementing the GREAT Program AWPF Project will depend on acquiring the necessary agreements between FCGMA and the City of Oxnard. This is anticipated to require less than 1 year.

5.2.5 Metrics for Evaluation of Project No. 1

Evaluation of the GREAT Program AWPF Project will be based on the quantity of water delivered to farmers in the vicinity of Hueneme Road and the associated reduction in groundwater production from this area. Groundwater producers in the Oxnard Subbasin have been required to report groundwater production to FCGMA since 1983. The GREAT Program AWPF water delivered to farmers will also have to be reported to FCGMA if this project is implemented as part of the GSP.

5.2.6 Economic Factors and Funding Sources for Project No. 1

The capital to construct the GREAT Program AWPF Project facilities has already been funded by City of Oxnard bonds and federal grant money (FCGMA 2018). Ongoing operations and maintenance are anticipated to equal approximately $300 per acre-foot (AF) of water generated by the project (FCGMA 2018). Funding for operations and maintenance has not been identified; however, as proposed, funding may come from a replenishment fee implemented by the FCGMA Board.

Any action taken by the FCGMA Board, acting as the Groundwater Sustainability Agency for the portion of the Oxnard Subbasin in its jurisdiction, to impose or increase a fee shall be taken by ordinance or resolution. Should the FCGMA Board decide to fund a project through imposition of a replenishment fee, FCGMA will hold at least one public meeting, at which oral or written presentations may be made. Notice of the meeting will include an explanation of the fee to be considered and the notice shall be published pursuant to Section 6066 of the Government Code.[1] At least 20 days prior to the meeting, the Groundwater Sustainability Agency will make the data on which the proposed fee is based available to the public.

5.3 PROJECT NO. 2 – GREAT PROGRAM ADVANCED WATER PURIFICATION FACILITY EXPANSION PROJECT

5.3.1 Description of Project No. 2

The GREAT Program's AWPF is part of the City of Oxnard's GREAT Program, which focuses on using existing water resources more efficiently. The purpose of the GREAT Program AWPF Expansion Project is to increase the production of high-quality recycled water within the City of Oxnard, the Oxnard Subbasin, and the Pleasant Valley Basin. This project will provide additional reclaimed water for Subbasin recharge. The AWPF Expansion Project is predicated on the availability of secondary effluent from the Oxnard Wastewater Treatment Plant or other available and appropriate source water. The main project components include purchase and installation of additional microfiltration, reverse osmosis, and ultraviolet/advanced oxidation equipment. Additionally, the project will require construction of influent flow equalization facilities. The AWPF Expansion Project could occur in phases, which would be dictated by the availability of source water, recycled water uses and needs, and project funding.

5.3.2 Relationship of Project No. 2 to Sustainability Criteria

GREAT Program AWPF Expansion Project water was included in future groundwater modeling scenarios to examine the impact that the project will have on the sustainability criteria. This project was incorporated in the modeling along with the GREAT Program AWPF Project (see Section 5.2, Project No. 1 – GREAT Program Advanced Water Purification Facility) and the temporary fallowing of agricultural land (see Section 5.6). Therefore, the relationship between the impact of this project alone and the sustainability indicators has not been quantified. Rather, the potential effect of this project in the context of all of three of these projects is presented in this discussion.

[1] Publication of notice pursuant to Section 6066 of the Government Code: "shall be once a week for two successive weeks. Two publications in a newspaper, published once a week or oftener, with at least five days intervening between the respective publication dates not counting such publication dates are sufficient."

Relationship to Minimum Thresholds

The numerical groundwater model simulation of the Future Baseline With Projects scenario, which incorporates potential future projects including the GREAT Program AWPF Expansion Project, results in higher groundwater elevations than the Future Baseline scenario, which does not incorporate projects (see Section 2.4, Water Budget). Incorporation of the projects resulted in groundwater elevations at the end of the 50-year model simulation that were, on average, approximately 2 feet higher in the UAS and approximately 8 feet higher in the LAS. This suggests that the projects will assist with water level recovery in the Subbasin, a necessary first step to avoid exceedance of the minimum thresholds. Although implementation of the projects increases water levels in the basin, these projects alone did not provide sufficient recycled water or redistribution of groundwater production to meet the minimum thresholds.

The AWPF Expansion Project water accounts for approximately half of the water delivered in the Future Baseline With Projects scenario. Because groundwater elevations were higher in the Future Baseline With Projects scenario compared to the Future Baseline scenario, and because the AWPF Expansion Project supplied approximately half of the project water modeled, the AWPF Expansion Project is anticipated to result in measurably higher groundwater elevations in the Oxnard Subbasin. Therefore, this project is anticipated to benefit the Subbasin and assist with raising groundwater elevations above the minimum thresholds in the future.

As modeled, the GREAT Program AWPF Expansion Project supplied approximately 4,500 AFY of recycled water to the United Water Conservation District (UWCD) Saticoy Spreading Grounds (see Section 2.4.5). This would be a recharge, rather than an in-lieu, program. However, the exact use of the AWPF Expansion Project water is not currently specified. It can be used for groundwater recharge, but it can also be used as part of an in-lieu program or for indirect potable reuse.

Relationship to Measurable Objectives

The relationship of the GREAT Program AWPF Expansion Project to the measurable objectives is similar to the relationship with the minimum thresholds. By measurably increasing water levels, the GREAT Program AWPF Expansion Project will help the Oxnard Subbasin meet the measurable objective water levels defined in Chapter 3.

5.3.3 Expected Benefits of Project No. 2

The AWPF Expansion Project product water that will be put to use in the Oxnard Subbasin is secondary wastewater effluent that is currently discharged to the Pacific Ocean. Therefore, this project provides a new source of water for use in the Subbasin. This additional water is expected to benefit the Oxnard Subbasin by providing additional recharge via the Saticoy Spreading Grounds (see Section 2.3).

5.3.4 Timetable for Implementation of Project No. 2

The City of Oxnard has already constructed and already operates the GREAT Program AWPF. As discussed in Section 5.3.1, Description of Project No. 2, the AWPF Expansion Project will require purchase and installation of additional equipment, as well as construction of influent flow equalization facilities. The expansion can occur in phases; therefore, the timetable for implementing the project is not fixed at this time. The implementation timetable for expansion of the AWPF is not dependent on permits or completion of California Environmental Quality Act (CEQA) documentation, which has already been obtained. The City of Oxnard estimates that the construction timetable for implementation of the AWPF Expansion Project is approximately 1 year.

The timetable for incorporating the GREAT Program AWPF Expansion Project water into sustainable management programs will also depend on how the water will be used. If, for example, the water will be conveyed to the Saticoy Spreading Grounds, the necessary infrastructure to convey the water will need to be constructed, in addition to construction of the expanded facility. Depending on the permitting required and construction time frames, it is anticipated that the timetable for incorporation of the AWPF Expansion Project water in sustainable management programs may take an additional 1 to 5 years beyond what was estimated by the City of Oxnard for construction of the expanded AWPF alone.

5.3.5 Metrics for Evaluation of Project No. 2

Evaluation of the GREAT Program AWPF Expansion Project will be based on the quantity of water delivered by the project. This water will be metered and the quantity of water delivered will be reported to FCGMA annually.

5.3.6 Economic Factors and Funding Sources for Project No. 2

Expansion of the AWPF can occur in phases, and the degree to which the AWPF is expanded will depend on the quantity of water available and the demand for the water produced. Therefore, the exact cost of expanding the GREAT Program AWPF is not currently known. Under one potential expansion scenario, the facility upgrades are anticipated to cost approximately $16,600,000 (FCGMA 2018). Under this scenario, the water produced by the facility would cost approximately $1,900 per AF. Operations and maintenance costs for the expanded AWPF would be approximately $440 per AF. Funding sources have not yet been identified for this project, although a portion of the project may be funded by replenishment fees implemented by the FCGMA Board. Any action taken by the FCGMA Board to impose or increase a fee shall be taken by ordinance or resolution, and notice shall be provided of any meeting at which imposition of the ordinance or resolution will be discussed (see Section 5.2.6, Economic Factors and Funding Sources for Project No. 1).

5.4 PROJECT NO. 3 – RIVERPARK–SATICOY GRRP RECYCLED WATER PROJECT

5.4.1 Description of Project No. 3

The RiverPark–Saticoy Groundwater Replenishment and Reuse Project (GRRP) Recycled Water Project will convey water produced by the GREAT Program AWPF Expansion Project (see Section 5.3) to the Saticoy Groundwater Recharge Facility and El Rio Groundwater Recharge Facility operated by UWCD (FCGMA 2018). In 2016, the City of Oxnard completed the northernmost portion of its 9.5-mile north–south Recycled Water Backbone Pipeline, which terminates at the RiverPark development adjacent to the Santa Clara River, north of Highway 101. This pipeline does not currently reach UWCD's groundwater recharge facilities. Under the GRRP Recycled Water Project, the Recycled Water Backbone Pipeline will be extended by 3 miles to convey water from the AWPF Expansion Project to UWCD groundwater recharge facilities. The 3-mile pipeline extension is called the RiverPark–Saticoy Pipeline. Up to 4,800 AFY of water will be conveyed to the UWCD recharge facilities via the Recycled Water Backbone and RiverPark–Saticoy Pipelines. It should be noted that this project does not provide water in addition to Project No. 2; rather, it provides the infrastructure to deliver the GREAT AWPF expansion water to the Saticoy Spreading Grounds.

5.4.2 Relationship of Project No. 3 to Sustainability Criteria

The RiverPark–Saticoy GRRP Recycled Water Project, using the AWPF Expansion Project product water to recharge groundwater in the Oxnard Forebay, was included in future groundwater modeling scenarios to examine the impact that the project will have on the sustainability criteria. The RiverPark–Saticoy GRRP Recycled Water Project is the same as the GREAT Program AWPF Expansion Project, as incorporated into the numerical groundwater model simulations, because the RiverPark–Saticoy GRRP Recycled Water Project simply provides the infrastructure to convey the water. It does not provide additional water to the Subbasin beyond what was modeled for the GREAT Program AWPF project. As discussed in Section 5.2.2, Relationship of Project No. 1 to Sustainability Criteria, and Section 5.3.2, Relationship of Project No. 2 to Sustainability Criteria, the relationship between the impact of this project alone and the sustainability indicators has not been quantified. Rather, the potential effect of this project in the context of all three of these projects is presented in this discussion.

Relationship to Minimum Thresholds

As modeled, the RiverPark–Saticoy GRRP Recycled Water Project provided the infrastructure to supply approximately 4,500 AFY of recycled water to the UWCD Saticoy Spreading Grounds (see Section 2.4.5). This would be a recharge, rather than an in-lieu, program. The numerical groundwater model simulation of the Future Baseline With Projects scenario, which incorporates

potential future projects including the RiverPark–Saticoy GRRP Recycled Water Project, results in higher groundwater elevations than the Future Baseline scenario, which does not incorporate projects (see Section 2.4). This suggests that the projects will assist with water level recovery in the Subbasin, a necessary first step to avoid exceedance of the minimum thresholds. Although implementation of the projects increases water levels in the basin, these projects alone did not provide sufficient recycled water or redistribution of groundwater production to avoid the exceedance of the minimum thresholds.

The AWPF Expansion Project water, delivered via the RiverPark–Saticoy GRRP Recycled Water Project, accounts for approximately half of the water delivered in the Future Baseline With Projects scenario. Because groundwater elevations were higher in the Future Baseline With Projects scenario than they were in the Future Baseline scenario, and because the RiverPark–Saticoy GRRP Recycled Water Project supplied approximately half of the project water modeled, the RiverPark–Saticoy GRRP Recycled Water Project is anticipated to result in measurably higher groundwater elevations in the Oxnard Subbasin. Therefore, the RiverPark–Saticoy GRRP Recycled Water Project is anticipated to benefit the Subbasin and assist with raising groundwater elevations above the minimum thresholds in the future.

Relationship to Measurable Objectives

The relationship of the RiverPark–Saticoy GRRP Recycled Water Project to the measurable objectives is similar to the relationship with the minimum thresholds. By measurably increasing water levels, the RiverPark–Saticoy GRRP Recycled Water Project will help the Oxnard Subbasin meet the measurable objective water levels defined in Chapter 3.

5.4.3 Expected Benefits of Project No. 3

The RiverPark–Saticoy GRRP Recycled Water Project is expected to benefit the Oxnard Subbasin by providing the infrastructure to take secondary treated wastewater from the Oxnard Water Treatment Plant and using it for groundwater recharge (FCGMA 2018). Currently, this water is being discharged to the Pacific Ocean. The RiverPark–Saticoy Pipeline and the GRRP will help ensure that excess flows from the AWPF will be used for groundwater recharge. In addition, the product water from the AWPF Expansion Project is of higher quality than groundwater in the Oxnard Forebay. Therefore, by using this water to recharge groundwater in the Forebay, implementation of the GRRP Recycled Water Project is expected to improve groundwater quality in the Forebay (FCGMA 2018).

5.4.4 Timetable for Implementation of Project No. 3

UWCD estimates that the RiverPark–Saticoy GRRP Recycled Water Project could be implemented in 18 to 24 months. The project is already in the preliminary design phase and a draft

initial study/mitigated negative declaration has been prepared. The required project permits (a groundwater replenishment reuse permit and a California Department of Transportation (Caltrans) permit) are anticipated to take 12 to 18 months to obtain, and the likelihood of obtaining these permits is anticipated to be high (FCGMA 2018).

5.4.5 Metrics for Evaluation of Project No. 3

The metric for evaluation of the RiverPark–Saticoy GRRP Recycled Water Project will be the quantity of water delivered to UWCD's groundwater recharge facilities. UWCD will meter the deliveries and will report these to FCGMA for incorporation in the annual and periodic GSP evaluation process.

5.4.6 Economic Factors and Funding Sources for Project No. 3

Funding sources for the RiverPark–Saticoy GRRP Recycled Water Project is proposed to come from either UWCD Zone B or FCGMA funds (FCGMA 2018). UWCD proposes funding assistance from FCGMA for the capital cost of the project, which is estimated to be $6.4 million, with an annual operations and maintenance cost of approximately $5 million to $7.5 million. The resulting water cost would be approximately $1,000 to $1,500 per AF. These operating costs are anticipated to be provided by a pump charge administered by FCGMA. The timeline necessary to secure funding for the project is anticipated to be the same as the construction timeline.

Any action taken by the FCGMA Board to impose or increase a fee shall be taken by ordinance or resolution, and notice shall be provided of any meeting at which imposition of the ordinance or resolution will be discussed (see Section 5.2.6).

5.5 PROJECT NO. 4 – FREEMAN EXPANSION PROJECT

5.5.1 Description of Project No. 4

UWCD currently operates the Freeman Diversion on the Santa Clara River, which diverts surface water flows from the river into recharge facilities for the purpose of providing additional recharge to the Oxnard Subbasin, and for direct delivery to growers via UWCD pipelines. Through time, more restrictive environmental regulatory requirements have lessened the amount of Santa Clara River surface water available to be diverted at the Freeman Diversion. The Freeman Expansion Project proposes constructing facilities capable of diverting surface water at higher flow rates and with higher sediment loads than the currently diverted flows (FCGMA 2018). Using the higher flows, which are less conducive to fish migration, has been encouraged by both regulatory agencies and non-governmental organizations (FCGMA 2018).

The Freeman Expansion Project would expand the recharge facilities, using two former gravel mines located adjacent to UWCD's Noble Basin recharge facility that have not previously been used for groundwater recharge, and would increase the capacity of UWCD's diversion system (FCGMA 2018). The project would also include modification and expansion of existing fish screens, modifications to the existing desilting basin, and construction of a high-capacity conveyance to the former Ferro aggregate mining pit. Although the exact capacity of the project is not currently known, UWCD anticipates that at full project build-out, the expanded facility could provide an additional 7,400 AF of diversions relative to the current diversion capacity (FCGMA 2018).

5.5.2 Relationship of Project No. 4 to Sustainability Criteria

Historically UWCD has diverted over 62,000 AFY from the Freeman Diversion (see Table 2-8). The Freeman Expansion Project would provide up to an additional 7,400 AF. Although expansion of UWCD's diversion capabilities at the Freeman Diversion was not explicitly modeled in the GSP future projects scenarios, historical groundwater elevations are strongly and positively correlated with the quantity of surface water diverted by UWCD. Therefore, increased surface water diversions that will be delivered directly to agricultural users, thereby offsetting groundwater production, or that will be recharged via UWCD's recharge facilities will help increase water levels in the Subbasin.

Relationship to Minimum Thresholds

Groundwater elevations in the Oxnard Subbasin are currently below the minimum thresholds proposed in Chapter 3 of this GSP. Increased recharge of surface water that currently flows to the Pacific Ocean will help water levels recover to elevations above the proposed minimum thresholds. The magnitude of the groundwater level rise will depend on the quantity of additional recharge available via the expanded diversion facilities.

Relationship to Measurable Objectives

The relationship of the Freeman Expansion Project to the measurable objectives is the same as the relationship with the minimum thresholds. By increasing water levels in the Subbasin, the Freeman Diversion Project will help the Oxnard Subbasin meet the measurable objective water levels defined in Chapter 3.

5.5.3 Expected Benefits of Project No. 4

The Freeman Expansion Project will provide an additional source of water to the Oxnard Subbasin by diverting high flows, which are not as suitable for fish migration, from the Santa Clara River and using those flows to provide additional groundwater recharge. The surface water flows in the Santa Clara River are lower in total dissolved solids and nitrate concentration compared to the

groundwater in the Oxnard Forebay. Therefore, this project will reduce the concentrations of these constituents in the groundwater. Additionally, replenishing the groundwater will reduce pump lift, and therefore energy consumption, for municipal and agricultural pumpers (FCGMA 2018).

5.5.4 Timetable for Implementation of Project No. 4

The timetable for implementation of the Freeman Expansion Project is estimated to be between 2 and 10 years (FCGMA 2018). The required modifications to the conveyance system needed to deliver turbid water have been analyzed, and this project was included in the UWCD Habitat Conservation Plan (FCGMA 2018). However, the project has not yet undergone environmental review, engineering design, or permitting.

5.5.5 Metrics for Evaluation of Project No. 4

The metric for evaluation of the Freeman Expansion Project would be the quantity of surface water diverted at flow rates that are higher than the current maximum flow rate that can be diverted. UWCD meters diversions from the Santa Clara River and would report these to FCGMA.

5.5.6 Economic Factors and Funding Sources for Project No. 4

Improvements to the conveyance system, fish screens, and desilting basin inlet are estimated to cost $31 million (FCGMA 2018). The annual operations and maintenance cost is estimated to be $700,000. The combined capital and operations and maintenance cost of the water is estimated to be approximately $4,300 AFY. Funding sources for the project are anticipated to include grant money, UWCD rate payers, and replenishment fees from FCGMA.

Any action taken by the FCGMA Board to impose or increase a fee shall be taken by ordinance or resolution, and notice shall be provided of any meeting at which imposition of the ordinance or resolution will be discussed (see Section 5.2.6).

5.6 PROJECT NO. 5 – TEMPORARY AGRICULTURAL LAND FALLOWING PROJECT

5.6.1 Description of Project No. 5

The Temporary Agricultural Land Fallowing Project would use replenishment fees to lease and temporarily fallow agricultural land (FCGMA 2018). This would result in decreased groundwater production on the parcels or ranches that are fallowed, and an overall reduction in groundwater demand in the Subbasin. Parcels or ranches in areas susceptible to seawater intrusion would be targeted with this project (FCGMA 2018).

5.6.2 Relationship of Project No. 5 to Sustainability Criteria

Temporary fallowing of agricultural land was included in future groundwater modeling scenarios to examine the impact that the project will have on the sustainability criteria (see Section 2.4.5). As discussed in Sections 5.2.2 and 5.3.2, the relationship between the impact of this project alone and the sustainability indicators has not been quantified. Rather, the potential effect of this project in the context of all three of these projects is presented in this discussion.

Relationship to Minimum Thresholds

As modeled, the Temporary Agricultural Land Fallowing Project reduced production from the Subbasin by approximately 500 AFY (see Section 2.4.5). The numerical groundwater model simulation of the Future Baseline With Projects scenario, which incorporates potential future projects including the Temporary Agricultural Land Fallowing Project, results in higher groundwater elevations than the Future Baseline scenario, which does not incorporate projects (see Section 2.4). This suggests that the projects will assist with water level recovery in the Subbasin, a necessary first step to meet the minimum threshold. Although implementation of the projects increases water levels in the basin, these projects alone did not provide sufficient supplemental water or redistribution of groundwater production to meet the minimum thresholds. Additionally, the Temporary Agricultural Land Fallowing Project accounted for approximately 7% of the total volume of water delivered or saved by all of the projects in the Oxnard Subbasin that were incorporated into the future groundwater model scenarios. The effect of this project on groundwater elevations is likely smaller than that of other projects incorporated into the future model scenarios. However, the value of this project is more directly connected with the location of the land that would be fallowed. If the project can target areas that are prone to seawater intrusion, the impact of this project will be greater than would be indicated by a comparison of the volume of water supplied.

Relationship to Measurable Objectives

The relationship of the Temporary Agricultural Land Fallowing Project to the measurable objectives is similar to the relationship with the minimum thresholds. By increasing water levels and fallowing agricultural land prone to seawater intrusion, the Temporary Agricultural Land Fallowing Project will help the Oxnard Subbasin meet the measurable objective water levels defined in Chapter 3.

5.6.3 Expected Benefits of Project No. 5

Temporary fallowing is a quick way to reduce demand with no capital costs or infrastructure needed. Because it is inexpensive, it is envisioned that temporary fallowing could be implemented early, while other long-term solutions are investigated and implemented. The Temporary

Agricultural Land Fallowing Project will benefit the Oxnard Subbasin by mitigating seawater intrusion in the Subbasin. This project would complement a water market that is currently being developed for the Subbasin by providing an alternative method for landowners to monetize pumping allocations (FCGMA 2018).

5.6.4 Timetable for Implementation of Project No. 5

The project is currently in the planning phase but does not require construction of new facilities and is unlikely to require permitting. CEQA compliance has not yet been initiated but the project proponents anticipate that a negative declaration or a mitigated negative declaration may be sufficient (FCGMA 2018). The project could be implemented when FCGMA is able to collect replenishment fees, and willing lessors are found to participate.

5.6.5 Metrics for Evaluation of Project No. 5

The metric for evaluation of the Temporary Agricultural Land Fallowing Program will be the volume of groundwater that is not produced from wells that supply the fallowed acreage. FCGMA has required groundwater production reporting since 1983. Groundwater production rates from before the project is implemented will be compared to groundwater production rates when the parcel or ranch has been fallowed. If the project is implemented, the historical production rates and associated base period for calculating those rates will be determined.

5.6.6 Economic Factors and Funding Sources for Project No. 5

The funding source for this project is anticipated to be replenishment fees collected by FCGMA. The cost of water under this project is estimated to be $1,200 to $1,800 per acre-foot. Any action taken by the FCGMA Board to impose or increase a fee shall be taken by ordinance or resolution, and notice shall be provided of any meeting at which imposition of the ordinance or resolution will be discussed (see Section 5.2.6)

5.7 MANAGEMENT ACTION NO. 1 – REDUCTION IN GROUNDWATER PRODUCTION

5.7.1 Description of Management Action No. 1

The primary management action proposed under this GSP is a Reduction in Groundwater Production from the Oxnard Subbasin. FCGMA has had the authority to monitor and regulate groundwater production in the Oxnard Subbasin since 1983. The FCGMA Board has used its authority to reduce groundwater production from the Subbasin in the past, and will continue to exert its authority over groundwater production as the Groundwater Sustainability Agency for the Subbasin.

The estimated long-term rate of groundwater production in the UAS that will prevent net seawater intrusion after 2040 is approximately 32,000 AFY ± 4,100 to 6,000 AFY (see Section 2.4.5). The estimated long-term rate of groundwater production in the LAS that will prevent net seawater intrusion after 2040 is approximately 7,000 AFY ± 2,300 to 3,600 AFY (see Section 2.4.5). Reductions in groundwater production were modeled as a linear decrease from the 2015–2017 production rates. The exact reductions that will be implemented in the Subbasin over the next 5 years will be determined by the FCGMA Board based on the data collected and analyzed for this GSP. These reductions will be evaluated based on the potential paths to reaching sustainability discussed in Chapter 3.

5.7.2 Relationship of Management Action No. 1 to Sustainability Criteria

Reducing groundwater production in the Oxnard Subbasin has a measurable impact on groundwater elevations. Groundwater elevations, in turn, control seawater intrusion. Seawater intrusion occurs in the Subbasin when groundwater elevations fall below threshold elevations that maintain sufficient hydrostatic pressure to keep seawater from moving landward. The relationship between seawater intrusion and groundwater elevation is impacted by groundwater production throughout the Subbasin, but is strongest in wells adjacent to the coast.

The effect of Reduction in Groundwater Production on groundwater level elevations was simulated using a numerical groundwater model (see Section 2.4.5). The results of the model and the relationship between Reduction in Groundwater Production and the sustainability criteria is discussed below.

Relationship to Minimum Thresholds

In the absence of additional projects, purchase of imported water, and shifting groundwater production locations, Reduction in Groundwater Production in the Subbasin is a critical component of achieving sustainability. When groundwater production was reduced from the 2015–2017 average production rates, simulated future groundwater elevations in the Subbasin recovered to elevations that remained above the minimum threshold after 2040 (see Section 2.4.5). The long-term production rate necessary to maintain groundwater elevations above the minimum threshold depended on several factors, including the simulated future climate, the quantity of surface water available to recharge the Subbasin, and the number of projects undertaken. Therefore, the numerical groundwater simulation results suggest a range of potential reductions in groundwater production that will maintain groundwater elevations above the minimum thresholds. This range is anticipated to change as additional data are collected and additional projects are implemented over the next 5 years. Therefore, any reductions implemented by the FCGMA Board over the initial 5-year period after the GSP is adopted will be evaluated and may be changed as warranted by future conditions in the Subbasin.

Relationship to Measurable Objectives

The relationship between Reduction in Groundwater Production and the measurable objectives is similar to the relationship between Reduction in Groundwater Production and the minimum thresholds. Numerical groundwater model simulations suggest a range of potential groundwater production rates that would result in groundwater elevations that are higher than the measurable objective half of the time and lower than the measurable objective half of the time (see Section 3.5, Measurable Objectives). As discussed previously, this range is anticipated to change as additional data are collected and additional projects are implemented over the next 5 years. Therefore, any reductions implemented by the FCGMA Board over the initial 5-year period after the GSP is adopted will be evaluated and may be changed as warranted by future conditions in the Subbasin.

5.7.3 Expected Benefits of Management Action No. 1

The primary benefit related to Reduction in Groundwater Production is recovery of groundwater elevations that have historically allowed for seawater intrusion in the Oxnard Subbasin. Reduction in Groundwater Production can be used to close any differential between groundwater elevations that can be obtained through implementation of projects and the groundwater elevations necessary to prevent future net seawater intrusion in the UAS and the LAS.

5.7.4 Timetable for Implementation of Management Action No. 1

The FCGMA Board already has the authority to reduce groundwater production in the Subbasin. Therefore, reductions can be implemented within months of GSP adoption, once the proposed reductions have gone through the FCGMA Board approval process.

5.7.5 Metrics for Evaluation of Management Action No. 1

The metric for evaluation of Reduction in Groundwater Production will be groundwater elevations in the UAS and the LAS. As groundwater elevations recover, additional projects are developed, and basin management is optimized, groundwater production rates will continue to be evaluated and adjusted accordingly.

5.7.6 Economic Factors and Funding Sources for Management Action No. 1

Program administration, investigations, inspections, compliance assistance, and enforcement of the Reduction in Groundwater Production management action will rely on funding from pumping fees imposed by FCGMA. Economic factors that will affect Reduction in Groundwater Production include impacts to the users of groundwater in the Subbasin. Potential economic impacts to stakeholders will be considered in the decision process for selecting future groundwater production rates and reductions necessary to meet the sustainability goal for the Subbasin.

5.7.7 Management Action No. 1 Uncertainty

Groundwater production from the Oxnard Subbasin has resulted in historical seawater intrusion, and groundwater model simulations indicate that sustainable groundwater production rates will need to be lower than historical rates to prevent net seawater intrusion in each aquifer system after 2040. Nevertheless, uncertainty remains regarding the exact reductions in groundwater production required to achieve the sustainability goals for the Subbasin. Uncertainty in the hydrogeologic conceptual model and the numerical groundwater model is discussed in Chapter 2 of this GSP. Uncertainty in the minimum thresholds and measurable objectives is discussed in Chapter 3. Chapters 2 and 3 also discuss uncertainty associated with the future location of groundwater production and impacts of projects that will optimize management of the Subbasin.

Because of the existing uncertainty associated with future conditions in the Subbasin, a plan for exact reductions and groundwater elevation triggers for those reductions has not been developed as part of this GSP. Instead, FCGMA will work to develop this plan over next 20 years, as the level of uncertainty is reduced. FCGMA recognizes that a specific long-term plan that incorporates stakeholder feedback and the need for flexibility in groundwater management will have to be adopted by 2040 to provide users of groundwater in the Subbasin with the tools necessary to plan for sustainable groundwater production into the future.

5.8 MANAGEMENT ACTION NO. 2 – WATER MARKET PILOT PROGRAM

A Water Market Pilot Program is currently being conducted by the FCGMA as a means of increasing operational management of groundwater in the Subbasin. The pilot program will run through July 2019 and may be extended to October 2019 (FCGMA 2019). The program is open to agricultural operators in the Oxnard Subbasin who are authorized by FCGMA to participate. Participants are able to submit anonymous bids and offers to an electronic trading desk that matches potential buyers and sellers. Matching takes place at 4:00 p.m. on Friday each week of the pilot program (FCGMA 2019). Transfer of extraction allocation will be reported to FCGMA by the Exchange Administrator.

Trades are limited by both geography and quantity. Transfers that result in a net increase in the total market allocation for participants in the Saline Water Intrusion Management Area or Pumping Depression Management Areas are not allowed. Additionally, participants with a well located in the Saline Water Intrusion Management Area may receive a transfer of market allocation only from another participant with a well in the Saline Water Intrusion Management Area. The same is true for participants in the Pumping Depression Management Areas.

Analysis of the Water Market Pilot Program will be conducted and its suitability for incorporation as a management action for the Subbasin will be determined after the pilot program is completed in July 2019.

5.9 REFERENCES CITED

FCGMA. 2018. "Full Agenda Package: Special Board Meeting of August 29, 2018." Meeting agenda, minutes, and preliminary project descriptions for GSPs currently in progress. August 29, 2018 Accessed May 10, 2019. https://ventura.granicus.com/MetaViewer.php?view_id=45&clip_id=5067&meta_id=661400.

FCGMA. 2019. "Rules and Regulations Phase 2 (Extended Water Market Pilot Program)." Accessed May 15, 2019. http://www.fcgma.org/images/WMPilot-RulesRegs-Phase2ext.pdf.

Ventura River Valley Groundwater Basin, Lower Ventura River Subbasin

- Groundwater Basin Number: 4-3.02
- County: Ventura
- Surface Area: 5,300 acres (8.3 square miles)

Basin Boundaries and Hydrology

The Lower Ventura River Subbasin is bounded on the north by the Upper Ventura River Subbasin, on the south by the Pacific Ocean and Mound Subbasin of the Santa Clara River Valley Groundwater Basin, and elsewhere by near impervious rocks of the Santa Ynez Mountains (DPW 1933; Panaro 2000). The valley is drained by Canada Larga and the Ventura River. Average annual precipitation ranges from 14 to 16 inches.

Hydrogeologic Information

Water Bearing Formations

Groundwater is found in alluvium of Holocene and Pleistocene age and the San Pedro Formation of Pleistocene age. Groundwater in the basin is unconfined (Panaro 2000). The estimated average specific yield of the basin is 8 percent (CSWRB 1953).

Alluvial Deposits. The alluvium of Holocene and Pleistocene age consists of sand, gravel, and clay. The deposits range from 60 to 100 feet thick beneath the floor of the Ventura River Valley (CSWRB 1953).

San Pedro Formation. The San Pedro Formation consists of gravel, sand, silt, and clay, which near the river mouth is at least partially hydraulically isolated from the Holocene alluvium by relatively impervious material (CSWRB 1953).

Recharge Areas

The basin is recharged by percolation of Ventura River water, precipitation to the valley floor, and irrigation return flow and by subsurface inflow from the Upper Ventura River Subbasin (Panaro 2000).

Groundwater Level Trends

Groundwater moves southward following the course of the Ventura River to the Pacific Ocean. During 1948 through 1956, groundwater levels in one well fluctuated about 25 feet and experienced flowing conditions in 1950 and 1954 (Panaro 2002).

Groundwater Storage

Groundwater Storage Capacity. The total storage capacity is estimated at 264,000 af (Panaro 2000; VCPWA 2002).

Groundwater in Storage. Unknown.

Groundwater Budget (Type A)

Estimates of recharge include underflow of 1,100 af/yr and irrigation return of less than 100 af/yr (Panaro 2000). Extractions are estimated to be less than 400 af/yr (Panaro 2000).

Groundwater Quality

Characterization. Groundwater in the basin is sodium bicarbonate in character. Water from 2 public supply wells has an average TDS content of 772 mg/L in the basin with a range from 760 to 784 mg/L. However, TDS content can range from 1,100 to 3,000 mg/L during extended dry spells (VCPWA 1996).

Impairments. Hydrogen sulfide gas has been reported in the water, particularly during periods when water levels are lowest (DWR 1959). Oil has also been found in the water (DWR 1959). High sulfate and nitrate minerals are common along the shallow alluvium drainage courses where most remaining water wells are found (VCPWA 1996).

Well Characteristics

	Well yields (gal/min)	
Municipal/Irrigation	Range:	Average: 20 gal/min (Panaro 2000)
	Total depths (ft)	
Domestic	Range:	Average:
Municipal/Irrigation	Range:	Average:

Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency
Department of Health Services and cooperators	Title 22 water quality	2

Basin Management

Groundwater management:

Water agencies

Public	Ventura County Public Works Agency
Private	Southern California Water Company

References Cited

California Department of Public Works, Division of Water Resources (DPW). 1933. *Ventura County Investigation.* Bulletin 46.

California Department of Water Resources (DWR). 1959. *Water Quality and Water Quality Problems, Ventura County.* Bulletin 75. Two Volumes. 195 p.

California State Water Resources Board (CSWRB). 1953. *Ventura County Investigation.* Bulletin 12. Two Volumes.

Panaro, D. 2000. Fox Canyon Groundwater Management Agency: Written Communication to R.R. Davis (DWR), March 21, 2000.

_____. 2002. Fox Canyon Groundwater Management Agency: Written Communication to T. M. Ross (DWR), July 2, 2002.

Southern California Water Company (SCWC). 2001. *Water Quality Report*. http://www.aswater.com/2kWQRpts/Ojai.PDF (March 2002).

Ventura County Public Works Agency (VCPWA). 1996. *Ventura County Groundwater Quality Assessment Report.* 57 p.

_____. 2002. "Ventura County Groundwater Basins." http://www.ventura.org/vcpwa/wre/wrd/pages/BASINS.htm (March 2002).

Additional References

California Department of Water Resources (DWR). 1975. *California's Ground Water.* Bulletin 118. 135 p.

Leason F. P. & Associates. 1959. *Upper Ventura River Valley and Ojai Valley Sewerage Study.* Pasadena, Calif.: The Associates.

Turner, J. M. 1971. *Ventura County Water Resources management Study, Geohydrology of the Ventura River System.* Ventura County Department of Public Works, Flood Control District: unnumbered Report.

Richardson, H. E., and others. 1968. *Ventura River Project Extensions, Feasibility Study, Ground-Water Geology and Resources Appendix*. United States Bureau of Reclamation (USBR): unnumbered Report.

Errata

Changes made to the basin description will be noted here.

California's Groundwater Update 2020 (Bulletin 118)

2 Followers

California's Groundwater Update 2020 (CalGW) is California's foremost technical publication on groundwater in the state of California. CalGW, formally known as Bulletin 118, is legislatively mandated by Water Code 12924 to be updated every 5 years by the California Department of Water Resources.

This dataset includes the full publication of CalGW - Update 2020, a link to the new California's Groundwater Live (https://sgma.water.ca.gov/CalGWLive/) platform and all supporting data used in the creation of the report which was finalized on November 16, 2021. CalGW - Update 2020 consists of an Executive Summary (Highlights) and seven chapters commonly referred to as the Statewide Report. Due to the large file sizes, the Update has been broken into multiple pdf documents for the ease of downloading these large files.

For more information on California's Groundwater (Bulletin 118) including historical publications please visit California's Groundwater (Bulletin 118) Open Data Page (https://data.cnra.ca.gov/dataset/california-s-groundwater-bulletin-118-archive).

Dataset (/dataset/calgw_update2020) Topics (/dataset/groups/calgw_update2020)
Activity Stream (/dataset/activity/calgw_update2020)
Showcases (/dataset/showcases/calgw_update2020)

Data and Resources

How to Use California's Groundwater - Update 2020 (/dataset/calgw_update2020/resource/1cc883c1-9127-460b-8658-7f128dbb01cd)
A one-page guide on how to use California's Groundwater - Update 2020.

California's Groundwater Update 2020 - Full Report (/dataset/calgw_update2020/resource/d2b45d3c-52c0-45ba-b92a-fb3c90c1d4be)
The Full Report of CalGW 2020 is the complete Update 2020 document including the Highlights and...

California's Groundwater Update 2020 - Highlights (/dataset/calgw_update2020/resource/88dbb333-90c3-48f2-a247-7a4f84fce56d)
California's Groundwater Update 2020 - Highlights includes an overview of material presented in...

Agua Subterránea de California 2020 (Highlights in Spanish) (/dataset/calgw_update2020/resource/30788eba-8a43-468b-b6d9-3bd21a6af2bf)
Agua Subterránea de California 2020 – Puntos Sobresalientes presenta un resumen de alto nivel del...

California's Groundwater Update 2020 - Statewide Report (Chapters 1- 7) (/dataset/calgw_update2020/resource/35d5a953-9e93-4704-a78d-76329c0c82da)
The Statewide Report of CalGW 2020 includes all 7 chapters of Update 2020.

California's Groundwater Update 2020 - Chapter 1-6 (/dataset/calgw_update2020/resource/bd2afb6f-cade-447e-9e04-f48574c9cc38)
Chapters 1 through 6 is the Statewide portion of CalGW 2020. This portion of the report contains...

California's Groundwater Update 2020 - Chapter 7 (/dataset/calgw_update2020/resource/1187b743-44bb-44b7-aa45-2538e6a1f984)
Chapter 7 contains the Hydrologic Region's Groundwater At a Glance portion of CalGW 2020.

California's Groundwater Live (/dataset/calgw_update2020/resource/d2003e87-1c99-47bf-b23c-a5eb1ccf338a)
In conjunction with the release of the latest version of California’s Groundwater (Bulletin 118)...

Appendix A: Findings and Recommendations (/dataset/calgw_update2020/resource/33700788-fd32-416f-93ee-cad92c31352f)
Appendix A (Findings and Recommendations) of California's Groundwater - Update 2020. This...

Appendix B: Glossary (/dataset/calgw_update2020/resource/84e2f12d-43e8-4c12-8ad7-a14c4f9c5652)
Appendix B (Glossary) of California's Groundwater - Update 2020.

Appendix C: Methods and Assumptions (/dataset/calgw_update2020/resource/a1015683-7bc5-440b-8100-b58e51a21335)
Appendix C (Methods and Assumptions) of California's Groundwater - Update 2020.

Appendix D: Citations, Reference Materials and Links (/dataset/calgw_update2020/resource/cc9995a9-3f98-4e8d-9a61-edfd0989d189)
Appendix D (Citations, Reference Materials and Links) of California's Groundwater - Update 2020.

Appendix E: Groundwater - Understanding and Managing this Vital Resource (/dataset/calgw_update2020/resource/1a04ec16-4473-4f31-be10-ba46aac752d2)
Appendix E (Understanding and Managing this Vital Resource) is an online story map explaining the...

Appendix F: Hydrologic Region Basin Maps with Basin Tables (/dataset/calgw_update2020/resource/551ee7be-0cba-4dbf-ab96-c7cd7d2eef34)
Appendix F (Hydrologic Region Basin Maps with Basin Tables) of California's Groundwater - Update...

Appendix G: Water Use Data (Part 1:California Water Plan Data) (/dataset/calgw_update2020/resource/79d9eb2f-49c1-46c1-970f-87ee7e3af6c8)

Appendix G (Water Use Data: Part 1) of California's Groundwater - Update 2020. This dataset...

Appendix G: Water Use Data (Part 2: Basin and Non-Basin Agricultural ... (/dataset/calgw_update2020/resource/80faa2a6-acb2-40ab-8e36-51b61acaac8e)

Appendix G (Water Use Data: Part 2) of California's Groundwater - Update 2020. This dataset is a...

Appendix G: Water Use Data (Part 3: Basin and Non-Basin Urban Water Use) (/dataset/calgw_update2020/resource/3cb0cba0-8468-428c-abc1-66b17570d6bc)

Appendix G (Water Use Data: Part 3) of California's Groundwater - Update 2020. This dataset is a...

Appendix H: Hydrologic Region, Basin and County Data (Part 1: ... (/dataset/calgw_update2020/resource/408972f0-8073-4fc5-9085-86b49e025109)

Appendix H (Hydrologic Region, Basin and County Data) of California's Groundwater - Update 2020:...

Appendix H: Hydrologic Region, Basin and County Data (Part 2: Basin) (/dataset/calgw_update2020/resource/0da00650-6f3a-4155-9021-c59cf3f1cf28)

Appendix H (Hydrologic Region, Basin and County Data) of California's Groundwater - Update 2020:...

Appendix H: Hydrologic Region, Basin and County Data (Part 3: County ... (/dataset/calgw_update2020/resource/4828bc1c-1116-4aac-8ec7-f5310b7b9d14)

Appendix H (Hydrologic Region, Basin and County Data) of California's Groundwater - Update 2020:...

CalGW Update 2020 - Well Completion Reports (1977–2018) (/dataset/calgw_update2020/resource/4b40a413-4fd8-4914-afc1-d962dc76d126)

This dataset includes all well completion reports submitted to the Department of Water Resources...

CalGW Update 2020 - Production Well Information (1977-2018) (/dataset/calgw_update2020/resource/4cee2c97-2a5f-433d-b52c-99cbf31d57cf)

This zipped file includes 3 excel files and 2 ArcGIS shapefiles....

CalGW Update 2020 - GW Level Monitoring Wells (2015-2018) (/dataset/calgw_update2020/resource/116e052b-2d75-4b26-8df3-ae224a721560)

The CalGW Update 2020 — GW Level Monitoring Wells (2015–2018) dataset was compiled from...

CalGW Update 2020 - GW Quality Monitoring Stations (GAMA) (/dataset/calgw_update2020/resource/256d8116-7fc9-4023-af8e-23d3f7f274d7)

The CalGW Update 2020 — GW Quality Monitoring Stations dataset is based on data accessed in the...

CalGW Update 2020 - Land Subsidence at CGPS Stations (/dataset/calgw_update2020/resource/14a78772-234f-43d8-9d43-23fcb07d0080)

The CalGW Update 2020 — Land Subsidence Continuous Global Positioning System (CGPS) Stations...

CalGW Update 2020 - Stream Gages in California (/dataset/calgw_update2020/resource/1750363e-0a6f-4130-aab8-4df449509ef4)

The CalGW Update 2020 — Stream Gages in California dataset is based on the following publicly...

CalGW Update 2020 - Mann-Kendall GW Level Trends (1998-2018) (/dataset/calgw_update2020/resource/ed76914e-e8e2-4731-aecc-6417e90ff9b1)

This zipped dataset includes an excel file and an ArcGIS shapefile for the Mann-Kendall...

CalGW Update 2020 - GW Level Change (2010-2018) (/dataset/calgw_update2020/resource/3297a01a-fcba-48fb-a521-61281b746a0c)
The CalGW Update 2020 - GW Level Change (2010-2018) dataset includes an excel spreadsheet and...

CalGW Update 2020 - GW Level Change (2015-2018) (/dataset/calgw_update2020/resource/d50ed600-13ea-44f7-9aed-5d52101c4547)
The CalGW Update 2020 - GW Level Change (2015-2018) dataset includes an excel spreadsheet and...

CalGW Update 2020 - GW Quality Constituents Detected (2009-2018) (/dataset/calgw_update2020/resource/483b54ad-3e66-4802-9112-63e2a3d20b16)
CalGW Update 2020 - GW Quality Constituents Detected (2009-2018) dataset assesses statewide...

CalGW Update 2020 - Land Subsidence Vertical Displacement Points (/dataset/calgw_update2020/resource/16f91ae3-1f33-4d01-8e10-09a7481d9a72)
The CalGW Update 2020 - Land Subsidence Vertical Displacement Points dataset summarizes the...

CalGW Update 2020 - Land Subsidence Vertical Displacement Polygon (/dataset/calgw_update2020/resource/d57fdf28-6d2c-412e-9650-01667da10f70)
The CalGW Update 2020 - Land Subsidence Vertical Displacement Polygon dataset is a shapefile...

CalGW Update 2020 - Land Subsidence InSAR Coverage (/dataset/calgw_update2020/resource/02c93bed-aa15-4d3e-8164-11d9181395c6)
The CalGW Update 2020 - Land Subsidence InSAR Coverage dataset summarizes the square miles and...

CalGW Update 2020 - GW Change in Storage (2006-2018) (/dataset/calgw_update2020/resource/2adcedc8-7c3c-4aac-bcce-2a1fd1814ec5)
The CalGW Update 2020 - GW Change in Storage (2006-2018) is a zip file containing 1 shapefile and...

CalGW Update 2020 - GW Quality Conditions (2009-2018) (/dataset/calgw_update2020/resource/8cb47540-e175-4525-aa82-d06a093347ab)
The CalGW Update 2020 - GW Quality Conditions (2009-2018) dataset assesses statewide groundwater...

CalGW Update 2020 - Depth to Groundwater (Spring 2018) (/dataset/calgw_update2020/resource/4115c765-a723-4832-abe7-4abc2ffecdee)
The CalGW Update 2020 – Depth to Groundwater (Spring 2018) dataset includes two shapefiles and...

CalGW Update 2020 - Groundwater Elevation (Spring 2018) (/dataset/calgw_update2020/resource/16993bac-1b0e-4281-86b3-8d04b2132f89)
The CalGW Update 2020 – Groundwater Elevation (Spring 2018) dataset includes a shapefile and a...

Tags

Bulletin 118 (/dataset?tags=Bulletin+118) CalGW (/dataset?tags=CalGW)
DWR (/dataset?tags=DWR)
Department of Water... (/dataset?tags=Department+of+Water+Resources)
SGMA (/dataset?tags=SGMA)

Sustainable Groundw... (/dataset?tags=Sustainable+Groundwater+Management)
groundwater (/dataset?tags=groundwater) water (/dataset?tags=water)

Additional Info

CONTACT NAME	Sustainable Groundwater Management Office
CONTACT EMAIL	sgmps@water.ca.gov
PUBLIC ACCESS LEVEL	Public
SPATIAL COVERAGE	
LAST UPDATED	December 28, 2021, 10:59 AM (UTC-08:00)
LICENSE	License not specified

Organization

(/organization/dwr)

California Department of Water Resources

DWR manages California's water resources, systems, and infrastructure, including the State Water Project (SWP), in a responsible, sustainable way. read more (/organization/about/dwr)

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CALIFORNIA DEPARTMENT OF WATER RESOURCES
SUSTAINABLE GROUNDWATER MANAGEMENT OFFICE
901 P Street, Room 313-B | Sacramento, CA 95814 | P.O. Box 942836 | Sacramento, CA 94236-0001

November 18, 2021

Kimball Loeb, Plan Manager
Fox Canyon Groundwater Management Agency
800 South Victoria Avenue
Ventura, CA 93009
kim.loeb@ventura.org

RE: Oxnard Subbasin – 2020 Groundwater Sustainability Plan

Dear Kimball Loeb,

The Department of Water Resources (Department) has evaluated the groundwater sustainability plan (GSP) submitted for the Oxnard Subbasin and has determined the GSP is approved. The approval is based on recommendations from the Staff Report, included as an exhibit to the attached Statement of Findings, which describes that the Oxnard Subbasin GSP satisfies the objectives of the Sustainable Groundwater Management Act (SGMA) and substantially complies with the GSP Regulations. The Staff Report also proposes recommended corrective actions that the Department believes will enhance the GSP and facilitate future evaluation by the Department. The Department strongly encourages the recommended corrective actions be given due consideration and suggests incorporating all resulting changes to the GSP in future updates.

Recognizing SGMA sets a long-term horizon for groundwater sustainability agencies (GSAs) to achieve their basin's sustainability goals, monitoring progress is fundamental for successful implementation. GSAs are required to evaluate their GSPs at least every five years and whenever the Plan is amended, and to provide a written assessment to the Department. Accordingly, the Department will evaluate approved GSPs and issue an assessment at least every five years. The Department will initiate the first five-year review of the Oxnard Subbasin GSP no later than January 13, 2025.

Please contact Sustainable Groundwater Management Office staff by emailing sgmps@water.ca.gov if you have any questions about the Department's assessment or implementation of your GSP.

Thank You,

_____

Paul Gosselin
Deputy Director for Sustainable Groundwater Management

Attachment:

1. Statement of Findings Regarding the Approval of the Oxnard Subbasin Groundwater Sustainability Plan

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STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

STATEMENT OF FINDINGS REGARDING THE APPROVAL OF THE OXNARD SUBBASIN GROUNDWATER SUSTAINABILITY PLAN

The Department of Water Resources (Department) is required to evaluate whether a submitted groundwater sustainability plan (GSP or Plan) conforms to specific requirements of the Sustainable Groundwater Management Act (SGMA or Act), is likely to achieve the sustainability goal for the basin covered by the Plan, and whether the Plan adversely affects the ability of an adjacent basin to implement their GSP or impedes achievement of sustainability goals in an adjacent basin. (Water Code § 10733.) The Department is directed to issue an assessment of the Plan within two years of its submission. (Water Code § 10733.4.) This Statement of Findings explains the Department's decision regarding the Plan submitted by the Oxnard Subbasin (Subbasin No. 4-004.02).

Department management has reviewed the Department Staff Report, entitled Sustainable Groundwater Management Program Groundwater Sustainability Plan Assessment Staff Report, attached as Exhibit A, recommending approval of the GSP. Based on its review of the Staff Report, Department management is satisfied that staff have conducted a thorough evaluation and assessment of the Plan and concurs with staff's recommendation and all the recommended corrective actions. The Department thus approves the Plan based on the Staff Report and the findings contained herein.

A. The Plan satisfies the required conditions as outlined in § 355.4(a) of the GSP Regulations (23 CCR § 350 et seq.):

    1. The Plan was submitted to the Department on January 13, 2020, and thus within the statutory deadline of January 31, 2020. (Water Code § 10720.7(a)(1); 23 CCR § 355.4(a)(1).)

    2. The Plan is complete, meaning it includes the information required by the Act and the GSP Regulations sufficient to warrant a thorough evaluation by the Department. (23 CCR § 355.4(a)(2).)

    3. The Plan covers the entire Subbasin. (23 CCR § 355.4(a)(3).)

B. The Plan conforms with Water Code §§ 10727.2 and 10727.4 in the Act and substantially complies with the GSP Regulations. It is likely to achieve the sustainability goal for the Subbasin. In making this determination, the Department considered the following:

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1. The Plan's goal to improve groundwater levels to prevent seawater intrusion and its associated impacts related to groundwater storage, groundwater quality, and subsidence beyond 2015 conditions is reasonable and consistent with SGMA and the GSP Regulations. The Plan relies on credible information and science to sufficiently detail the hydrogeologic conceptual model, groundwater conditions, and water budget for the Subbasin, which provides a reasonable assessment of overdraft and serves as the sufficient basis for defining and assessing reasonable sustainable management criteria and projects and management actions.

2. The Plan identifies data gaps exist and describes reasonable measures to eliminate those data gaps. The Department recommends the agencies investigate further the hydraulic connectivity between the surface water bodies, semi-perched aquifer, and principal aquifers to reduce the uncertainty regarding the impacts groundwater extraction has on surface water and beneficial uses and users of surface water. Notwithstanding this recommendation, the Department finds that, at this time, the GSP contains a sufficient understanding of the groundwater conditions in the Subbasin and that implementation of the Plan during the collection and evaluation of additional information is not likely to cause serious or irreparable harm.

3. The projects and management actions designed to eliminate overdraft by increasing surface water supplies and decreasing groundwater production demand, if implemented in a reasonable and timely manner, will likely achieve the sustainability goal defined for the Subbasin.

4. The Plan provides a detailed explanation of how the varied interests of groundwater uses and users in the Subbasin were considered in developing the sustainable management criteria and how those interests would be impacted by the chosen minimum thresholds.

5. The Oxnard Subbasin GSP will not adversely impact the ability of the adjacent basins to be operated sustainably and will not impede the adjacent basins' ability to achieve their respective sustainability goals. Fox Canyon Groundwater Management Agency (Agency) took a regional approach to determine the combined sustainable yield of the Subbasin and adjacent Pleasant Valley Basin and Las Posas Subbasin, and then determined the sustainable yield for each groundwater subbasin. The minimum thresholds for each respective groundwater sustainability plan were established with consideration for the sustainability goals of the

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adjacent basins and to operate each groundwater basin within its sustainable yield.

6. The Agency, along with other local agencies have implemented numerous projects and management actions to address groundwater conditions in the Subbasin. The Agency's legal authority and history of managing groundwater provides a reasonable level of confidence that the Agency, Camrosa Water District-Oxnard Subbasin GSA, and County of Ventura GSA (collectively, the GSAs) have the legal authority and financial resources necessary to implement the Plan.

7. Through review of the Plan and public comments, the Department determines that the GSAs adequately responded to comments that raised credible technical or policy issues with the Plan, sufficient to warrant approval of the Plan at this time. The Department also notes that the recommended corrective actions included in the Staff Report are important to addressing certain technical or policy issues that were raised and, if not addressed before future, subsequent plan evaluations, may preclude approval of the Plan in those future evaluations.

C. In addition to the grounds listed above, DWR also finds that:

1. The Plan's compliance with the requirements of SGMA and substantial compliance with the GSP Regulations is congruent with the state policy regarding the human right to water (Water Code § 106.3). The Department developed its GSP Regulations consistent with and intending to further the policy through implementation of SGMA and the Regulations, primarily by achieving sustainable groundwater management in a basin. By ensuring substantial compliance with the GSP Regulations, the Department has considered the state policy regarding the human right to water. (23 CCR § 350.4(g).)

2. The Plan defines the undesirable result associated with depletion of interconnected surface water in the Oxnard Subbasin as a loss of groundwater dependent ecosystem (GDE) habitat. According to the Plan, because historical groundwater elevations have maintained the GDE in the past, the goal of maintaining groundwater levels at or above historical lows is, expected to protect against the undesirable result of depletion of interconnected surface water. The Department determines that in attempting to avoid the further loss of GDE habitat beyond any historic losses, the GSAs considered public trust resources in development of the Plan.

3. The California Environmental Quality Act (CEQA) does not apply to the Department's evaluation and assessment of the Plan.

Based on the above, the GSP submitted by the Agency for the Oxnard Subbasin is approved as being found to satisfy the requirements of SGMA and to be in substantial compliance with the GSP Regulations. Recommended corrective actions identified in the Staff Report will assist the Department's review of the Plan's implementation for consistency with SGMA and are thus recommended to be addressed in the GSP by the time of the Department's five-year review, which is set to begin on January 13, 2025, as required by Water Code § 10733.8.

Signed:

_____

Karla Nemeth, Director

Date: November 18, 2021

Exhibit A: Groundwater Sustainability Plan Assessment Staff Report – Oxnard Subbasin

State of California
Department of Water Resources
Sustainable Groundwater Management Program
Groundwater Sustainability Plan Assessment Staff Report

Groundwater Basin Name:	Oxnard Subbasin (Subbasin No. 4-004.02)
Submitting Agency:	Fox Canyon Groundwater Management Agency, Camrosa Water District, County of Ventura
Recommendation:	Approve
Date:	November 18, 2021

The Fox Canyon Groundwater Management Agency (FCGMA or Agency) Groundwater Sustainability Agency (GSA), Camrosa Water District-Oxnard Subbasin GSA, and County of Ventura GSA (collectively, the GSAs) submitted the Oxnard Subbasin (Subbasin) Groundwater Sustainability Plan (GSP or Plan) to the Department of Water Resources (Department) for evaluation and assessment as required by the Sustainable Groundwater Management Act (SGMA).[1] The GSP covers the entire Subbasin for the implementation of SGMA.

After evaluation and assessment, Department staff find the Oxnard Subbasin GSP includes the required components of a GSP, demonstrates a thorough understanding of the Subbasin based on the best available science and information, sets reasonable sustainable management criteria to prevent undesirable results as defined in the Plan, and proposes a set of projects and management actions that will likely achieve the sustainability goal defined for the Subbasin, as required by SGMA and the GSP Regulations.[2] Department staff will continue to monitor and evaluate the Subbasin's progress toward achieving the sustainability goal through annual reporting and future periodic GSP evaluation. Based on the current evaluation of the Plan, Department staff recommend approval of the Plan with recommended corrective actions described herein.[3] This assessment includes five sections:

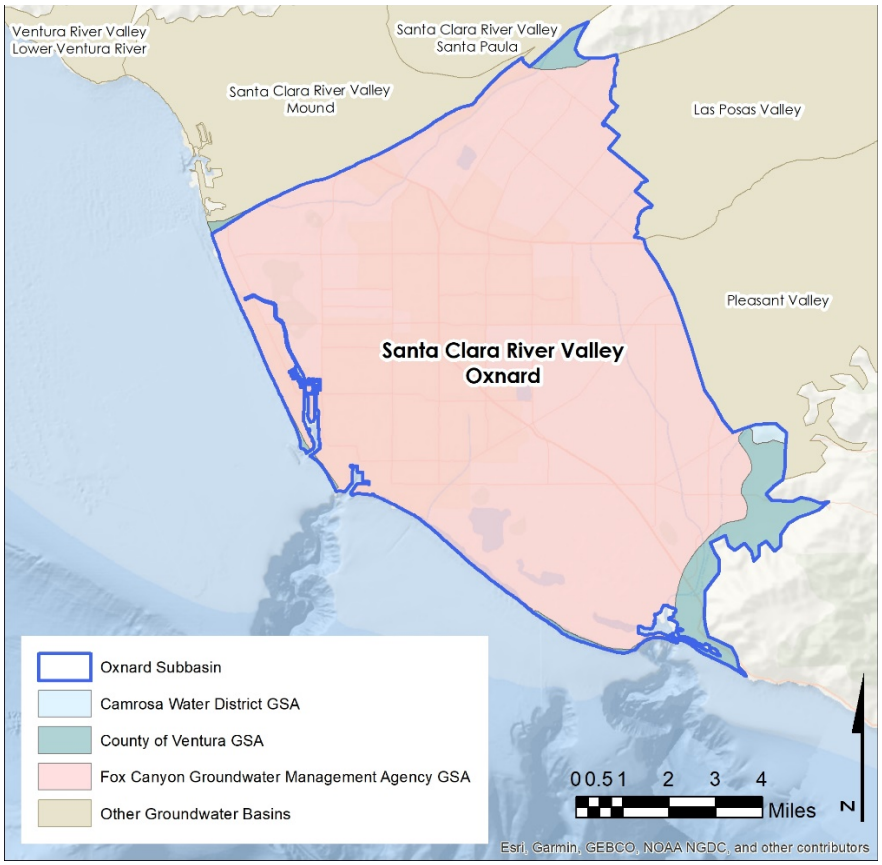
[1] Water Code § 10720 *et seq*.
[2] 23 CCR § 350 *et seq*.
[3] The Department recognizes that litigation, including a comprehensive adjudication of the Basin under Code of Civil Procedure section 830 et seq., has been filed. The filing of litigation does not alter or affect the Department's mandate to issue its assessment of the Agency's groundwater sustainability plan (GSP or Plan) for the basin within two years of its submission. (Water Code §10733.4(d).) The Department's assessment consists of a technical review of the submitted Plan, as required by SGMA and the GSP Regulations, and the filing of the adjudication or other litigation did not in any way influence or affect the Department's evaluation of the Plan. The Department expresses no opinion on the claims of the parties in the pending litigation involving the GSP or the groundwater basin. The role of a GSP in the adjudication process is addressed in Chapter 12 of SGMA (Water Code § 10737 et seq.).

- **Section 1 – Summary:** Provides an overview of the basin setting, GSP contents, and overview of the Department's assessment and recommendations.
- **Section 2 – Evaluation Criteria:** Describes the legislative requirements and the Department's evaluation criteria.
- **Section 3 – Required Conditions:** Describes the submission requirements, plan completeness, and basin coverage required for a GSP to be evaluated by the Department.
- **Section 4 – Plan Evaluation:** Provides a detailed assessment of the contents included in the GSP organized by each subarticle outlined in the GSP Regulations.
- **Section 5 – Staff Recommendation:** Includes the staff recommendation for the Plan and any recommended or required corrective actions, as applicable.

1 SUMMARY

A single GSP covering the entire Oxnard Subbasin was submitted to the Department by three GSAs on January 13, 2020. FCGMA is the lead GSA covering the majority of the Subbasin; a smaller portion of the Subbasin is covered by Camrosa Water District GSA, with remaining outlying areas covered by County of Ventura GSA.

The Oxnard Subbasin is a coastal groundwater basin located in Ventura County and is part of the Santa Clara River Valley Groundwater Basin (4-004) within the South Coast Hydrologic Region. The Subbasin is bounded by the Santa Monica Mountains to the southeast and by the Pacific Ocean to the west and southwest. Additionally, the Subbasin is bounded to the north by the Santa Paula Subbasin (4-004.04) and the Mound Subbasin (4-004.03)—both are part of Santa Clara River Valley Groundwater Basin—, and to the east by the Las Posas Valley Basin (4-008) and the Pleasant Valley Basin (4-006). The Santa Paula Subbasin is an adjudicated subbasin managed by the United Water Conservation District which is a court-appointed watermaster. The Oxnard Subbasin and the Pleasant Valley Basin are designated as critically overdrafted groundwater basins and were, therefore, required to be covered by GSPs submitted in 2020. The Las Posas Basin and the Mound Subbasin are designated as high-priority groundwater basins required to be covered by GSPs submitted in 2022. In 2020, the GSAs submitted GSPs covering the Oxnard Subbasin and the Pleasant Valley Basin, as well as a GSP covering the Las Posas Basin two years ahead of the statutory deadline of 2022. A vicinity map showing the Oxnard Subbasin, adjacent groundwater basins, and GSA boundaries is provided as Figure 1.



Water supply in the Subbasin comes from four sources: surface water, groundwater, recycled/reclaimed water, and imported water. The agricultural sector is the largest user of groundwater and accounts for 60 percent of the annual groundwater use. According to the GSP, the Subbasin's main land uses are agriculture and urban uses, each covering 47 percent of land area. The remaining land use is categorized as open space or water.

According to the GSP, seawater intrusion has been observed since the 1930s, and continues to be an issue due to ongoing conditions of groundwater overdraft. The current extent of seawater intrusion appears to reach as much as three miles inland. The Agency also recognizes seawater intrusion is one of the sources of water quality problems in the Subbasin that has resulted in higher concentrations of total dissolved solids (TDS) and chloride in the coastal area.

FCGMA has been implementing groundwater management actions since it was formed by the California Legislature in 1982. As examples, the Agency has instituted ordinances and programs that require groundwater extraction reporting and extraction fees, implemented a groundwater storage credit program, and approved a resolution through which recycled water discharged to Conejo Creek is delivered in lieu of groundwater pumping. Furthermore, local agencies such as United Water Conservation District

(UWCD), the City of Oxnard, and Calleguas Municipal Water District (CMWD) have implemented water supply projects that contributed new water sources in the Subbasin for municipal use, industrial use, agricultural use, and groundwater recharge to offset groundwater production, limit the decline in storage, and alleviate seawater intrusion. The GSP states that a history of interagency collaboration has resulted in the implementation of various conjunctive use programs which contributed to the groundwater elevation recovery in the 1990s. The Agency intends to implement the GSP alongside existing and planned conjunctive use programs in the Subbasin.

The GSP describes many existing surface water and groundwater monitoring programs in the Subbasin administered by other agencies such as the United States Geological Survey (USGS), Ventura County Watershed Protection District, UWCD, and CMWD. Groundwater quality in the Subbasin is monitored by multiple state and local agencies for various programs. The data provided by these monitoring programs and other investigations conducted in the Subbasin since the 1930s have been used to understand the groundwater conditions and develop sustainable management criteria for the GSP. FCGMA intends to continue to rely on groundwater elevation data collected by the Ventura County Watershed Protection District to assess the groundwater conditions for GSP annual reports and the 5-year GSP evaluations.

The sustainability goal for the Subbasin is to "increase groundwater elevations inland of the Pacific coast, to prevent landward migration of the 2015 saline water impact front,[5] and to prevent net seawater intrusion in the Upper Aquifer System and the Lower Aquifer System." As stated in the GSP, seawater intrusion is the primary sustainability indicator in the Oxnard Subbasin and sustainable management criteria were established based on information gathered over several decades from the monitoring programs investigations described above and with input from beneficial users of groundwater in the Subbasin. The GSPs of the neighboring Pleasant Valley Basin and Las Posas Basin were also developed by FCGMA, demonstrating a regional approach.

The GSP will use groundwater levels as a proxy to manage all applicable sustainability indicators and establishes sustainable management criteria that aim to either significantly improve groundwater conditions or not worsen them. For instance, minimum thresholds for seawater intrusion aim to limit net landward migration of the 2015 saline water impact front beyond the already impacted area while the measurable objectives aim to halt seawater flow into and freshwater flow out of the Upper Aquifer System or the Lower Aquifer System. Similarly, the expansion of areas impacted by degraded water quality that limit beneficial uses of groundwater is defined as an undesirable result. To manage depletions of interconnected surface water, the GSP establishes management criteria for the Oxnard aquifer which underlies and, as the GSAs claim, supports groundwater

[5] The GSP uses a term "2015 saline water impact front" to describe the 2015 extent of the seawater intrusion in the Oxnard Subbasin. The area of the Subbasin impacted by chloride concentrations greater than 500 milligrams per liter in 2015 is referred to as the saline water impact area. The Agency's reasoning to use the term saline water impact front rather than seawater intrusion is to reflect all potential sources of chloride to the aquifer, which are not limited to seawater.

elevations in the shallowest aquifer. The shallowest aquifer, locally referred to as the semi-perched aquifer, supports groundwater dependent ecosystems (GDEs) but is not considered a principal aquifer due to low groundwater production in the basin. The GSP proposes to continue monitoring the semi-perched aquifer to evaluate the depletion of interconnected surface water. The GSP recognizes significant and unreasonable lowering of groundwater levels and reduction of groundwater storage has occurred historically or is currently occurring in the Subbasin and defines the groundwater condition related to significant and unreasonable seawater intrusion.

To meet the sustainability goal of the Subbasin, the GSP proposes to implement a series of projects and management actions. Four proposed projects are related to the expansion of current water supply and groundwater recharge, and one project relates to temporary agricultural land fallowing. The GSP identifies two management areas that are vulnerable to seawater intrusion and chronic decline of groundwater levels. Management actions proposed to protect these vulnerable areas include reducing groundwater production and limiting the transfer of pumping allocations; FCGMA has the legislative authority to restrict groundwater production and conducted a pilot program for limiting transfer pumping allocations in 2019. The GSP acknowledges that the current revenue generated from pumpers of the Subbasin through extraction and sustainability fees would not be enough to fund the projects and management actions and, therefore, the Agency intends to increase the sustainability fee and impose a replenishment fee.

After reviewing the GSP, Department staff conclude that the best available science and information were relied on to analyze and describe the GSP elements, including the hydrogeologic conceptual model (HCM), groundwater conditions, and water budgets. The GSP has effectively identified where the data gaps exist. For example, one of the data gaps identified is the limited understanding of the extent and location of hydraulic connectivity between surface water bodies and the semi-perched and principal aquifers. Department staff believe that the GSA's further investigation of the hydraulic connectivity between surface water bodies and groundwater will improve the understanding of the impact(s) of groundwater production on the related sustainability indicators.

Department staff believe the GSP's goal to improve groundwater levels to prevent seawater intrusion and its associated impacts related to groundwater storage, groundwater quality, and subsidence beyond 2015 conditions are reasonable and consistent with SGMA and the GSP Regulations. The GSP proposes mitigating overdraft by implementing various projects and management actions, including reducing groundwater production and augmenting water supplies. As stated earlier, the Agency's primary management action is to implement pumping reductions, for which it has legislative authority.

The GSP's projects and management actions are an integral component for achieving the sustainability goal for the Subbasin; therefore, Department staff will monitor the progress and performance of these actions through annual reporting and five-year GSP updates (at a minimum). While the Plan does not include specific implementation details

regarding projects and management actions, Department staff find the overall approach described in the GSP to mitigate overdraft is reasonable, and if the proposed projects and management actions are implemented in a reasonable and timely manner, the GSP is likely to achieve the sustainability goal of the Subbasin.

For the reasons outlined above, Department staff recommend approval of the Oxnard Subbasin GSP. The GSP identifies several data gaps (e.g., HCM, interconnected surface water, and monitoring networks), which Department staff agree should be addressed. Department staff have also identified additional recommended corrective actions that should be considered by the GSAs for the first periodic evaluation of its GSP (see Section 5). Addressing these recommended corrective actions will be critical for the GSAs to demonstrate, on an ongoing basis, that implementation of the GSP is progressing toward achieving the sustainability goal.

2 EVALUATION CRITERIA

The GSAs submitted a single GSP to the Department to evaluate whether the Plan conforms to SGMA's requirements[6] and is likely to achieve the sustainability goal for the Oxnard Subbasin.[7] To achieve the sustainability goal for the Subbasin, the GSP must demonstrate that implementation of the Plan will lead to sustainable groundwater management, which means the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results.[8] Undesirable results are defined quantitatively by the GSA(s).[9] The Department is also required to evaluate whether the GSP will adversely affect the ability of an adjacent basin to implement its GSP or achieve its sustainability goal.[10]

For the GSP to be evaluated by the Department, it must first be determined that the Plan was submitted by the statutory deadline,[11] and that it is complete and covers the entire Subbasin.[12] If these conditions are satisfied, the Department evaluates the Plan to determine whether it complies with SGMA and substantially complies with the GSP Regulations.[13] "Substantial compliance means that the supporting information is sufficiently detailed and the analyses sufficiently thorough and reasonable, in the judgment of the Department, to evaluate the Plan, and the Department determines that any discrepancy would not materially affect the ability of the Agency to achieve the sustainability goal for the basin, or the ability of the Department to evaluate the likelihood of the Plan to attain that goal."[14]

When evaluating whether the Plan is likely to achieve the sustainability goal for the Subbasin, Department staff reviewed the information provided and relied upon in the GSP for sufficiency, credibility, and consistency with scientific and engineering professional standards of practice.[15] The Department's review considers whether there is a reasonable relationship between the information provided and the assumptions and conclusions made by the GSAs, including whether the interests of the beneficial uses and users of groundwater in the Subbasin have been considered; whether sustainable management criteria and projects and management actions described in the Plan are commensurate with the level of understanding of the basin setting; and whether those projects and management actions are feasible and likely to prevent undesirable results.[16]

[6] Water Code §§ 10727.2, 10727.4.
[7] Water Code § 10733(a).
[8] Water Code § 10721(v).
[9] 23 CCR § 354.26 *et seq*.
[10] Water Code § 10733(c).
[11] 23 CCR § 355.4(a)(1).
[12] 23 CCR §§ 355.4(a)(2), 355.4(a)(3).
[13] 23 CCR § 350 *et seq*.
[14] 23 CCR § 355.4(b).
[15] 23 CCR § 351(h).
[16] 23 CCR § 355.4(b)(1), (3), (4) and (5).

The Department also considers whether the GSA(s) has the legal authority and financial resources necessary to implement the Plan.[17]

To the extent overdraft is present in a basin, the Department evaluates whether the Plan provides a reasonable assessment of the overdraft and includes reasonable means to mitigate the overdraft.[18] The Department also considers whether the Plan provides reasonable measures and schedules to eliminate identified data gaps.[19] Lastly, the Department's review considers the comments submitted on the Plan and evaluates whether the GSA(s) adequately responded to the comments that raise credible technical or policy issues with the Plan.[20]

The Department is required to evaluate the Plan within two years of its submittal date and issue a written assessment of the Plan.[21] The assessment is required to include a determination of the Plan's status.[22] The GSP Regulations provide three options for determining the status of a Plan: Approved,[23] Incomplete,[24] or Inadequate.[25]

Even when review indicates that the GSP satisfies the requirements of SGMA and is in substantial compliance with the GSP Regulations, the Department may recommend corrective actions.[26] Recommended corrective actions are intended to facilitate progress in achieving the sustainability goal within the basin and the Department's future evaluations, and to allow the Department to better evaluate whether the Plan adversely affects adjacent basins. While the issues addressed by the recommended corrective actions do not, at this time, preclude approval of the Plan, the Department recommends that the issues be addressed to ensure the Plan's implementation continues to be consistent with SGMA and the Department is able to assess progress in achieving the sustainability goal within the basin.[27] Unless otherwise noted, the Department proposes that recommended corrective actions be addressed by the submission date for the first five-year assessment.[28]

The staff assessment of the GSP involves the review of information presented by the GSA(s), including models and assumptions, and an evaluation of that information based on scientific reasonableness. The assessment does not require Department staff to recalculate or reevaluate technical information provided in the Plan or to perform its own geologic or engineering analysis of that information. The staff recommendation to approve a Plan does not signify that Department staff, were they to exercise the professional

[17] 23 CCR § 355.4(b)(9).
[18] 23 CCR § 355.4(b)(6).
[19] 23 CCR § 355.4(b)(2).
[20] 23 CCR § 355.4(b)(10).
[21] Water Code § 10733.4(d), 23 CCR § 355.2(e).
[22] Water Code § 10733.4(d), 23 CCR § 355.2(e).
[23] 23 CCR § 355.2(e)(1).
[24] 23 CCR § 355.2(e)(2).
[25] 23 CCR § 355.2(e)(3).
[26] Water Code § 10733.4(d).
[27] Water Code § 10733.8
[28] 23 CCR § 356.4 *et seq*.

judgment required to develop a GSP for the basin, would make the same assumptions and interpretations as those contained in the Plan, but simply that Department staff have determined that the assumptions and interpretations relied upon by the submitting GSA(s) are supported by adequate, credible evidence, and are scientifically reasonable.

Lastly, the Department's review and approval of the Plan is a continual process. Both SGMA and the GSP Regulations provide the Department with the ongoing authority and duty to review the implementation of the Plan.[29] Also, GSAs have an ongoing duty to reassess their plans, provide reports to the Department, and, when necessary, update or amend their plans.[30] The passage of time or new information may make what is reasonable and feasible at the time of this review to not be so in the future. The emphasis of the Department's periodic reviews will be to assess the progress toward achieving the sustainability goal for the basin and whether Plan implementation adversely affects the ability of adjacent basins to achieve their sustainability goals.

[29] Water Code § 10733.8, 23 CCR § 355.6 *et seq*.
[30] Water Code §§ 10728 *et seq*, 10728.2.

3 REQUIRED CONDITIONS

A GSP, to be evaluated by the Department, must be submitted within the applicable statutory deadline. The GSP must also be complete and must, either on its own or in coordination with other GSPs, cover the entire basin. If corrective actions have been identified by the Department, in the context of an Incomplete assessment, the GSAs must also have sufficiently addressed those corrective actions within the period of time provided.

3.1 SUBMISSION DEADLINE

SGMA required basins categorized as high- or medium-priority as of January 1, 2017 and that were subject to critical conditions of overdraft to submit a GSP no later than January 31, 2020.[31]

The GSAs submitted their GSP on January 13, 2020, in compliance with the statutory deadline.

3.2 COMPLETENESS

GSP Regulations specify that the Department shall evaluate a GSP if that GSP is complete and includes the information required by SGMA and the GSP Regulations.[32]

The GSAs submitted an adopted GSP for the entire Subbasin. Department staff found the GSP to be complete and include the required information, sufficient to warrant an evaluation by the Department. The Department posted the GSP to its website on January 31, 2020.

3.3 BASIN COVERAGE

A GSP, either on its own or in coordination with other GSPs, must cover the entire basin.[33] A GSP that intends to cover the entire basin may be presumed to do so if the basin is fully contained within the jurisdictional boundaries of the submitting GSA(s).

The GSP intends to manage the entire Subbasin and the jurisdictional boundaries of the submitting GSA(s) cover the entire Oxnard Subbasin.[34] However, the GSP acknowledges that it uses the Subbasin boundary defined by the 2016 version of the Department's Bulletin 118 instead of the 2018 version to maintain consistency with the GSP's groundwater model. The GSP discusses the differences between the two boundary versions and concluded that the 2018 administrative modification to the Subbasin boundary had a limited impact on the water budget, from a sustainable management

[31] Water Code § 10720.7(a)(1).
[32] 23 CCR § 355.4(a)(2).
[33] Water Code § 10727(b), 23 CCR § 355.4(a)(3).
[34] Oxnard Subbasin GSP, Figure 1-2, p. 103.

perspective, because the change in Subbasin areas did not include or exclude representative monitoring sites or production wells and does not affect the groundwater model conditions and parameters.[35] Department staff generally agree with the GSP's statement that the boundary modification was primarily administrative and results in negligible changes to the water budget. Staff acknowledge that much of the groundwater model and the GSP were developed prior to the Department adopting the modified boundary and, therefore, find the Agency's approach to use the 2016 boundary to be reasonable and not likely to affect the Agency's ability to implement the GSP across the entire Subbasin.

[35] Oxnard Subbasin GSP, Section 1.3.1, p. 38-39.

4 PLAN EVALUATION

As stated in Section 355.4 of the GSP Regulations, a basin "shall be sustainably managed within 20 years of the applicable statutory deadline consistent with the objectives of the Act." The Department staff's evaluation of the likelihood of the GSP to attain the sustainability goal for the Subbasin is provided below.

4.1 ADMINISTRATIVE INFORMATION

The GSP Regulations require each GSP to include administrative information identifying the submitting agency, describing the plan area, and demonstrating the legal authority and ability of the submitting agency to develop and implement a plan for that area.[36]

4.1.1 Evaluation Summary

The detailed administrative information included in the GSP substantially complies with the requirements outlined in the GSP Regulations. The GSP adequately describes the Subbasin coverage by the three GSAs and the legal authority of the GSAs to manage groundwater within the Subbasin. The GSP provides detailed information on the various water resources management programs, monitoring programs, conjunctive-use programs, regulatory programs, urban water management plans, general plans, and additional plan elements that are relevant to sustainable groundwater management. The GSP also provides detailed information on FCGMA's past and current groundwater management activities in the Subbasin. Based on the information provided, Department staff conclude that the Agency's past and ongoing collaboration with local agencies to implement various water resources management programs demonstrate that the FCGMA, along with Camrosa Water District GSA and County of Ventura GSA, will likely continue to manage groundwater in the Subbasin to meet the requirements of SGMA.

The GSP sufficiently describes the geographic areas covered by the GSP, including the types of land use based on 2015 data, sources of water, and existing water resources management programs. The beneficial uses and users of groundwater in the Subbasin are adequately described, as well as how interested parties were consulted regarding the status and development of the GSP.[37] The GSP was developed through participation of other agencies and beneficial users and was revised and finalized based on the feedback received from the interested parties.

4.1.2 Agency Information

Three GSAs worked together to complete a single GSP for the Subbasin (Oxnard GSP). FCGMA is the lead GSA, which covers the majority (94.1 percent) of the Subbasin's geographical area. SGMA specifically permitted FCGMA to become the exclusive GSA

[36] 23 CCR § 354.2 *et seq*.
[37] Oxnard Subbasin GSP, Section 1.8, p. 73-77.

within its statutory boundary.[38] Formed as a special district in 1982 to manage groundwater, FCGMA has been collaboratively managing groundwater in the Subbasin for over three decades. The groundwater management activities include oversight of various water resources management programs such as groundwater storage and injection credits programs, extraction limitations, extraction surcharges, the prohibition of groundwater exports, and municipal, industrial, and agriculture allocation programs.[39] Camrosa Water District (CWD) GSA and County of Ventura - Oxnard Outlying Areas GSA cover areas of the Subbasin outside the jurisdiction of FCGMA.

The GSP describes the Agency's funding plans and the three types of costs associated with GSP implementation, consisting of basic operation costs, implementation costs, and project costs.[40] The GSP states that the Agency collects a groundwater extraction fee to fund its basic operations and collects a sustainability fee, which is expected to generate additional revenue to cover the implementation costs and a portion of the project costs. The GSP estimates that it will cost $21,265,000 per year to cover the project and water supply costs for the first five years of implementation. Because the Agency developed the GSPs for the adjacent Pleasant Valley and Las Posas basins, the GSP provides the Agency's estimated implementation cost for all three groundwater basins. Collectively, the implementation cost for all three basins is estimated to be $79,302,272 for the period of 2020 through 2040. Given FCGMA's legal authority and history of groundwater management, the Department staff are reasonably confident that the Agency has the means to generate financial resources to implement the GSP.

4.1.3 Description of Plan Area

The GSP shows that the three main types of land use in the Subbasin are agriculture (47 percent), urban (47 percent), and open space or water (6 percent).[41] The cities of Oxnard and Port Hueneme overlie the Subbasin. The cities of Ventura and Camarillo lie primarily outside the Subbasin; however, the cities' outer edges are crossed by the Subbasin boundary. Naval Base Ventura County is federal land, which occupies 10 percent of the Subbasin's area.

The beneficial users of groundwater are agricultural, municipal, industrial, and environmental users. The GSP states that approximately 60 percent of the groundwater is used by the agricultural sector, and the remaining 40 percent is used by other sectors. The GSP identifies GDEs as the primary environmental user of groundwater in the Subbasin.

The Oxnard Subbasin has a complex network of water supply, water management, and delivery projects, including diversions of Santa Clara River and Conejo Creek; importing

[38] Water Code § 10723(c)(1)(D).
[39] Oxnard Subbasin GSP, Section 1.4, p. 46-49, Table 1-11, p. 92-95.
[40] Oxnard Subbasin GSP, Section 1.2.6, p. 33-36, Section 5, 538-551.
[41] Oxnard Subbasin GSP, Table 1.8, p. 88.

water from the State Water Project and Metropolitan Water District; and various recycled and reclaimed water treatment programs.

The main sources of water in the Subbasin are surface water, groundwater, recycled/reclaimed water, and imported water. Diverted surface water from the Santa Clara River and Conejo Creek is used for managed aquifer recharge in spreading basins and for non-potable applications. Recycled water produced by the Advance Water Purification Facility is used for agriculture, whereas recycled water produced by the Hill Canyon Wastewater Treatment Plant is discharged into Conejo Creek and diverted for use in lieu of groundwater pumping.

Many of the existing monitoring programs, including groundwater level and groundwater quality monitoring, surface water quality monitoring, stormwater quality monitoring, precipitation monitoring, and streamflow monitoring, are administered by other agencies.[42] Few of the existing monitoring programs are overseen by FCGMA, who collect and analyze data for annual groundwater extraction and analyze water quality data to track the progress toward meeting Basin Management Objectives. The GSP states that these monitoring programs are anticipated to continue, and the data from these programs will continue to be used to assess groundwater conditions in the Subbasin. The GSP lists several existing groundwater management programs that operate in the Subbasin.[43] Programs include groundwater recharge projects, recycled water programs, a surface water diversion project, allocation programs, water conservation programs, groundwater storage and injection credit programs, prohibition of groundwater export, extraction limitation and surcharge programs, extraction fee and reporting programs, water credit transfer program, salinity management program and imported water program.

The GSP describes how the four existing urban water management plans (UWMP) may affect sustainable groundwater management within the Subbasin and how the GSP may impact the assumptions of these UWMPs.[44] The GSP also provides descriptions of existing conjunctive use programs and additional plan elements.[45] The GSP states that the three UWMP discussed as the additional plan elements do not interface with SGMA or affect the Subbasin's sustainability because the implementation agencies do not directly pump groundwater from the Subbasin. The GSP further states that Naval Base Ventura County groundwater use currently represents approximately 1 percent of groundwater pumped in the Oxnard Subbasin and Pleasant Valley Basin and may voluntarily agree to an allocation under the GSP less than its full federal reserved water rights.

The GSP discusses three general plans that are applicable in the Oxnard Subbasin.[46] The Agency is planning to coordinate with Ventura County on the next update of the

[42] Oxnard Subbasin GSP, Table 1-10 and Table 1-11, p. 91-95.
[43] Oxnard Subbasin GSP, Table 1-11, p. 92-95.
[44] Oxnard Subbasin GSP, Section 1.6.2, p. 57-65.
[45] Oxnard Subbasin GSP, Section 1.5, p. 49-52, Section 1.6.3, p. 65-69.
[46] Oxnard Subbasin GSP, Sections 1.6.1, p. 53-57.

general plan to ensure that the GSP and the general plan update are mutually consistent.[47] The GSP also states that the City of Oxnard's General Plan does not contain water supply assumptions, which would conflict with the sustainable management criteria or the projects and management actions proposed in Oxnard GSP. However, the City of Oxnard submitted a comment to the Department claiming that the GSP's statement is inaccurate because there are fundamental inconsistencies between the City's 2030 General Plan and the GSP. The City further states that water demand in the City could increase by 50 percent due to population growth, so the GSP's management action to reduce groundwater pumping by 40 percent is inconsistent with the City's growth assumptions, long-term strategy for groundwater management, water supply assumption, and the land use plan. Department staff encourage FCGMA to work with the City of Oxnard to rectify the difference in policies that could potentially impact SGMA implementation in the Subbasin.

4.1.4 Notice and Communication

The GSP describes notification and communication efforts made by the Agency during Plan development and includes a Public Outreach and Engagement Plan.[48] Parties who would be potentially affected by the use of groundwater use in the Subbasin are listed in the Plan as 1. Surface water suppliers, 2. Municipal well operators and water purveyors, 3. Agricultural, Domestic, and Environmental users, 4. Local land-use planning agencies, 5. The Federal government, and 6. Disadvantaged Communities (DACs).[49]

Based on the Agency governance structure provided in the GSP, most of these interested parties, along with agricultural groups, have direct representation through membership on the FCGMA Board. The GSP states that although environmental users, the U.S. Navy, and DACs do not have representation on the Agency board, they had various opportunities to participate in the GSP development process. For example, environmental user interests were represented through the appointment of an environmental representative on the Technical Advisory Group (TAG). Additionally, representatives from the DACs and the U.S. Navy participated in the Agency's public meetings and are on the list of interested parties who receive electronic newsletters regarding the status and development of the Oxnard GSP. The GSP also states that, in addition to the U.S. Navy's participation during public meetings, the Agency coordinated with the U.S. Navy during GSP development.

The Agency conducted over 100 public meetings and five public workshops to discuss the GSP between March 2015 and November 2019,[50] including a special TAG meeting to discuss potential GDEs.[51] During the TAG meeting, comments were accepted from the

[47] Oxnard Subbasin GSP, Sections 1.6.1, p. 54.
[48] Oxnard Subbasin GSP, Appendix B, p. 890-916.
[49] Oxnard Subbasin GSP, Section 1.8.2, p. 73-76.
[50] Oxnard Subbasin GSP, Table 1-12, p. 97-100.
[51] Oxnard Subbasin GSP, Section 1.8.2, p. 75.

public regarding potential impacts to surface water bodies. Additional means of outreach include a survey for input on sustainability indicators, a public call for project ideas for incorporation in the GSP, circulating electronic newsletters, and regularly posting updates on the Agency website. During GSP implementation, the Agency intends to use the same tools of communication that were used during GSP development. The opportunities and efforts regarding outreach, collaboration, and communication with interested parties are provided in the GSP.[52]

During GSP development, FCGMA received several written comment letters.[53] The GSP describes that, in consideration of some of these comments, the Agency completed an independent peer review of the numerical groundwater models, completed additional analysis for the water quality approach, and extended the timeline for completion of the GSP.[54]

Given the GSP's description of the Agency's robust engagement efforts with other agencies and interested parties throughout the GSP development process and its proposed commitment to continue with the same engagement mechanisms during GSP implementation, Department staff are satisfied that the GSP substantially complies with the requirements pertaining to Notice and Communication.[55]

4.2 Basin Setting

GSP Regulations require information about the physical setting and characteristics of the basin and current conditions of the basin, including a hydrogeologic conceptual model; a description of historical and current groundwater conditions; and a water budget accounting for total annual volume of groundwater and surface water entering and leaving the basin, including historical, current, and projected water budget conditions.[56]

4.2.1 Evaluation Summary

The description of the basin setting in the GSP substantially complies with the requirements outlined in the GSP Regulations. The GSP describes in sufficient detail the hydrogeologic conceptual model, groundwater conditions, and water budget for the Subbasin, which appear to be based on the best information and science available at the time the GSP was prepared. The GSP identifies data gaps in the basin setting and describes actions that could be taken to fill data gaps. Department staff find the descriptions of groundwater levels, groundwater in storage, seawater intrusion, and water quality sufficiently demonstrate that the Agency understands the groundwater conditions in the Subbasin.

[52] Oxnard Subbasin GSP, Appendix B, p. 890-916.
[53] Oxnard Subbasin GSP, Appendix A-5, p. 587-889.
[54] Oxnard Subbasin GSP, Section 1.8.4, p. 76.
[55] 23 CCR § 354.10.
[56] 23 CCR § 354.12 *et seq.*

The GSP includes historical, current, and projected water budget estimates for the Subbasin which were developed using a numerical model. The Agency used the water budgets to determine the historical and projected sustainable yield and overdraft. Department staff believe that the water budget components provided in the GSP were developed using the best available tools and information available at the time the GSP was prepared and substantially comply with the GSP Regulations. Overall, the GSP's description of the Subbasin's physical characteristics and current conditions is sufficient to serve as the basis for defining and assessing reasonable sustainable management criteria and projects and management actions.

4.2.2 Hydrogeologic Conceptual Model

The GSP identifies six aquifers in the Subbasin. Five of these aquifers are considered primary or principal aquifers in the GSP and are grouped into the Upper Aquifer System and the Lower Aquifer System. The Upper Aquifer System includes the Oxnard and Mugu aquifers and the Lower Aquifer System contains the Hueneme, Fox Canyon, and Grimes Canyon aquifers.[57] The GSP states that, in most of the Subbasin, a hydraulic connection exists between the Mugu aquifer in the Upper Aquifer System and the Hueneme aquifer in the Lower Aquifer System; the hydraulic connection between the Mugu and Hueneme aquifers is absent in the southwestern portion of the Subbasin, where seawater intrusion has affected the Mugu aquifer.[58] The GSP states that both of the aquifer systems in the Subbasin extend offshore and are believed to have direct hydraulic connection with the Pacific Ocean.

The GSP explains that the uppermost aquifer, referred to as the semi-perched aquifer, is excluded from the Upper Aquifer System and is not considered a primary aquifer because of limited groundwater production.[59] A clay layer separates the semi-perched aquifer from the underlying Oxnard aquifer.[60] The GSP states that the clay layer functions as an aquitard, restricting the flow of groundwater between the aquifers; however, water can still migrate vertically under conditions of differential head and through improperly abandoned wells.[61] The GSP states that both the semi-perched aquifer and the clay layer are absent in the Forebay area of the Subbasin, which makes the Forebay area the most desirable for groundwater recharge, but also the most vulnerable for contaminants to migrate into the principal aquifers.[62]

The Santa Clara River runs through the Subbasin and provides groundwater recharge to the Upper Aquifer System and the semi-perched aquifer. The Santa Clara River also delivers State Water Project water for managed aquifer recharge in spreading grounds

[57] Oxnard Subbasin GSP, Section 2.2, p. 118.
[58] Oxnard Subbasin GSP, Section 2.2.3, p. 126.
[59] Oxnard Subbasin GSP, Section 2.2.3, p. 122.
[60] Oxnard Subbasin GSP, Section 2.2.3, p. 123.
[61] Oxnard Subbasin GSP, Section 2.2.3, p. 123.
[62] Oxnard Subbasin GSP, Section 2.2, p. 118, Section 2.5, p. 192, Section 2.3.4.3, p. 153, Section 3.3.4.2, p. 414-415.

and irrigation for agricultural users.[63] Calleguas Creek also provides groundwater recharge to the semi-perched aquifer, but does not directly recharge the Upper Aquifer System due to a lack of hydraulic connectivity.[64] The GSP identifies potential recharge areas mainly located near or along the Santa Clara River and in sandy sediments along the northern coastal areas of the Subbasin.[65]

The Agency's understanding of the geographic, geologic, and structural settings along with other physical attributes (such as lateral and vertical boundaries) of the Subbasin, its aquifers, and aquitards are represented graphically and through written descriptions in the GSP. The GSP includes various maps such as surficial geology, cross-sections, rivers and drainages, impaired surface water bodies, water conveyance and treatment infrastructure, recharge basins, and stream gauges to thoroughly describe the hydrogeologic conceptual model and the supporting information as required by the GSP Regulations.

The GSP does identify data gaps in the hydrogeologic conceptual models as uncertainties associated with aquifer-specific data, the distinct sources of high TDS concentrations in the Lower Aquifer System, the relative impact of groundwater pumping in specific areas on seawater intrusion, and the interaction between the semi-perched aquifer and GDEs. The Plan states that these uncertainties are due to a lack of wells screened solely in a single aquifer and limited temporal and spatial distribution of the available monitoring wells.[66] Despite the uncertainties caused by limited data availability, in certain circumstances, Department staff find the Agency had credible data spanning several decades to rely on and uses the best available information to provide a sufficient understanding of the physical characteristics of the Subbasin, including the geologic and hydrogeologic conditions.

4.2.3 Groundwater Conditions

Hydrographs provided in the GSP for the five principal aquifers show groundwater level trends from the 1980s to 2015 with additional groundwater elevation data for the Oxnard aquifer dating as far back as the 1930s.[67] The hydrographs from all principal aquifers show a pattern of decline and recovery in groundwater elevation until the 1990s, followed by a significant recovery in the early 1990s that resulted in artesian conditions observed in wells screened in the western portions of the Oxnard aquifer.[68] The GSP states that the recovery in groundwater elevation was likely due to a combination of several wet years during the 1990s, the effects of management actions, and the construction of water conservation facilities in the 1980s and 1990s.

[63] Oxnard Subbasin GSP, Section 2.4.1.1, p. 165.
[64] Oxnard Subbasin GSP, Section 2.4.1.1, p. 166.
[65] Oxnard Subbasin GSP, Section 2.3.8, p. 162, Figure 2-57, p. 349.
[66] Oxnard Subbasin GSP, Section 2.2.4, p. 128, Section 2.3.1.1, p. 130, Section 4.6.1, p. 485.
[67] Oxnard Subbasin GSP, Figure 2-9A – Figure 2-21, p. 241-267.
[68] Oxnard Subbasin GSP, Section 2.3, p. 132-141, Section 2.3, p. 139.

The hydrographs also show that the groundwater levels were relatively stable from 1990 to 2010 then experienced a significant decline after 2010. Between 2011 and 2015, groundwater elevations declined by up to 100 feet in some areas. Though the historical trends suggest groundwater levels in the Subbasin tend to decline during periods of drought and recover, groundwater elevations have not yet recovered from the drought beginning in 2011.[69] Some of the hydrographs show that the groundwater elevations have continued to decline after 2015. The Forebay area appears to be highly impacted by the recent drought, as the water level declines in the Oxnard and Mugu aquifers have been the most pronounced. Another area greatly affected by droughts appears to be the coastal Grimes Canyon aquifer, where groundwater elevations have remained below mean sea level since the 1990s.[70]

In addition to the hydrographs, groundwater elevation contour maps for principal aquifers are provided for 2015 fall and spring groundwater conditions. The GSP states that the groundwater elevations in all of the principal aquifers were higher than those in the underlying aquifers, resulting in a downward vertical gradient, with an exception in the Port Hueneme area where groundwater elevations in the Grimes Canyon aquifer are higher than those in the overlying Fox Canyon aquifer. The GSP does not explain the reason for this difference in vertical gradient in Port Hueneme. However, the GSP states that the vertical gradients along the coast are generally lower than they are inland.[71]

The UWCD used a numerical groundwater flow model to estimate the change in groundwater storage from 1986 to 2015 for the Subbasin.[72] The GSP states that the cumulative change in storage (i.e., the Upper Aquifer System and Lower Aquifer System were replenished by seawater) over this period was a net loss of approximately 101,400 acre-feet (i.e., an average decrease of 3,400 acre-feet per year).[73] The GSP states that the annual change in storage ranges from a maximum decrease of approximately 48,700 acre-feet during 1987 and a maximum increase of approximately 81,000 acre-feet during 2005.[74]

Without seawater intrusion (i.e., if the Upper Aquifer System and Lower Aquifer System were not replenished by seawater), the cumulative change in freshwater storage between 1986 and 2015 for the Subbasin was a loss of approximately 380,200 acre-feet (i.e., an average decrease of approximately 12,700 acre-feet per year).[75] The annual change of freshwater in storage ranges from a maximum increase of approximately 74,700 acre-feet in 2005 to a maximum decrease of approximately 73,500 acre-feet in 1990.[76] During

[69] Oxnard Subbasin GSP, Section 2.3.1.2, p. 134.
[70] Oxnard Subbasin GSP, Section 2.3.1.5, p. 141; Figure 2-21, p. 267.
[71] Oxnard Subbasin GSP, Section 2.3.1.1, p. 131.
[72] Oxnard Subbasin GSP, Appendix C, p. 918-1271.
[73] Oxnard Subbasin GSP, Section 2.3.2, p. 142, Figure 2-22, p. 269.
[74] Oxnard Subbasin GSP, Section 2.3.2, p. 142.
[75] Oxnard Subbasin GSP, Section 2.3.2, p. 143.
[76] Oxnard Subbasin GSP, Section 2.3.2, p. 143.

the model period, there was approximately 9,400 acre-feet per year of seawater intrusion into the principal aquifers of the Oxnard Subbasin.[77] The UWCD groundwater model estimates suggest that between 1985 and 2015, approximately 1,800 acre-feet per year of groundwater flowed to the Pacific Ocean from the semi-perched aquifer, which is not considered a principal aquifer.[78]

According to the GSP, seawater intrusion in the Subbasin was first observed in the 1930s and the impacted area continued to expand through the 1970s. Seawater intrusion into the Subbasin preferentially occurs near Port Hueneme and Point Mugu due to the direct contact and hydraulic connection of onshore freshwater aquifer units with deeply incised submarine canyons.[79] In Port Hueneme, which has groundwater elevations below sea level, the saline water impact front reached as much as three miles inland by the early 1980s. The GSP states that in the late 1970s and early 1980s, the area of the Upper Aquifer System affected by seawater intrusion was reduced due to the management actions by the Agency along with above-average rainfall. The historical progression of seawater intrusion from 1985 to 2015 in Upper Aquifer System and Lower Aquifer System are graphically presented in the GSP[80], which shows that seawater intrusion was mitigated in the Upper Aquifer System during the 1990s when a surface water diversion project was completed.[81] During this time, seawater intrusion began to affect the Lower Aquifer System. Between 2000 and 2012, there was no significant change in the extent of seawater intrusion. However, beginning in 2013, seawater intrusion has increased in both aquifer systems.[82]

The GSP uses the phrase “saline water impact area” to describe the area of the Subbasin impacted by chloride concentrations greater than 500 milligrams per liter and the phrase “saline water impact front” to describe the landward extent of the saline water impact area.[83] The Agency uses the phrase “saline water impact area”, rather than “seawater intrusion impact area”, to include other potential sources of chloride in the aquifer. The other contributors of salinity are identified as non-marine high-salinity connate water released during compaction of aquitards and older geologic formations beneath the freshwater aquifers, and vertical groundwater movement between major aquifers due to mergence between aquifers, and wells screened across multiple aquifers.[84] The areal extent of chloride concentration in all six aquifers and the current extent of saline water intrusion in the Upper Aquifer System and the Lower Aquifer System are shown on a

[77] Oxnard Subbasin GSP, Section 2.3.3.2, p. 145.
[78] Oxnard Subbasin GSP, Section 2.3.3.2, p. 145.
[79] Oxnard Subbasin GSP, Executive Summary, p. 19.
[80] Oxnard Subbasin GSP, Figure 2-33 - 2-34, p. 291-293.
[81] Oxnard Subbasin GSP, Section 2.3.3.3, p. 146.
[82] Oxnard Subbasin GSP, Figure 2-33 - 2-34, p. 291-293.
[83] Oxnard Subbasin GSP, Executive Summary, p. 17.
[84] Oxnard Subbasin GSP, Section 2.3.3.1, p. 144.

series of maps and a cross-section.[85] The GSP states that the chloride concentrations in wells near the coast are close to those of seawater and that the current area of seawater intrusion is smaller than the area of high chloride concentrations shown in maps because seawater intrusion is only one of the three reasons for the elevated salinity in the Subbasin.

The GSP identifies the primary reasons for degraded water quality as contaminated groundwater from the semi-perched aquifer, seawater intrusion, connate water from fine-grained lagoonal deposits, brines migrating via faults or upwelling from older geologic formations, mineral dissolution in groundwater, historical septic discharges, and agricultural fertilizer application practices.[86] The Agency has been conducting water quality monitoring and reporting to the Los Angeles Regional Water Quality Control Board (LARWQCB). The GSP discusses the elevated concentration of key constituents of concern for water quality and provides concentration maps that show elevated concentrations of TDS, sulfate, and boron are present throughout the basin, with a higher concentration of chloride near the coast and a higher concentration of nitrate near the Forebay area.[87]

The GSP states that during 2011 to 2015, TDS and chloride concentrations in the Lower Aquifer System were higher in the southern part of the Subbasin compared to the northern part. The primary areas of concern for groundwater quality degradation in the Subbasin are identified as the Forebay Management Area, the Saline Intrusion Management Area, and the Oxnard Pumping Depression Management Area.[88] The GSP also discusses groundwater quality impacts from other operations in the Subbasin, such as petroleum extraction and contaminated sites. However, the GSP concludes that the impact on groundwater quality from these sites is either not identified by beneficial users or the impacts are mitigated due to the presence of a confining layer. Furthermore, the Agency reviewed active contamination cases in GeoTracker and EnviroStor databases and concluded that existing groundwater contamination in the semi-perched aquifer do not pose a substantial threat to beneficial use of groundwater in the Upper Aquifer System and Lower Aquifer System.[89]

The GSP identifies three possible causes of land subsidence as groundwater pumping, petroleum reservoir compaction, and tectonic activity, but acknowledges groundwater pumping as the major cause of land subsidence in the Oxnard Subbasin. The GSP states that land subsidence in the Subbasin has been documented since the 1930s but provides limited information on the current extent and rate of subsidence. The GSP provides historical data from 1939 to 1992 measured at two USGS monitoring sites[90] which indicate that 1.6 feet of subsidence occurred from 1939 to 1960 and between 1960 and

[85] Oxnard Subbasin GSP, Figure 2-28 - 2-32, p. 277-289.
[86] Oxnard Subbasin GSP, Section 2.3.4, p. 150-154.
[87] Oxnard Subbasin GSP, Figure 2-36 - 2-46, p. 297-327.
[88] Oxnard Subbasin GSP, Section 2.3.4, p. 149-156.
[89] Oxnard Subbasin GSP, Section 2.3.4.7, p. 156.
[90] Oxnard Subbasin GSP, Section 2.3.5, p. 157.

1978 subsidence ranged from 0.3 to 1 foot. The most recent subsidence data provided in the GSP is from a study by Farr et al. (2017) that analyzed interferometric synthetic aperture radar (InSAR) data.[91] The study showed that up to one inch of subsidence occurred throughout the Subbasin between May 2015 and August 2016 and up to two inches of subsidence occurred in isolated areas.[92] Department staff find the GSP's discussion of the rate of historical subsidence, based on observed data, to be reasonable.

Using information from a 2003 USGS modeling study, the GSP predicts that areas within the Oxnard Plain may experience an additional 0.1 to 1 feet of subsidence by 2040, depending on whether future water levels decline below previous low levels and remain there for a considerable amount of time. Based on this assumption, the Agency plans to limit future subsidence by maintaining water levels above historical low levels.[93]

The GSP states that all surface water bodies in the Subbasin may have a connection to the semi-perched aquifer. These surface water bodies include the Santa Clara River, Calleguas Creek, Revolon Slough, Mugu Lagoon, Ormond Beach, and McGrath Lake. The GSP states that the connection between these surface water bodies and underlying groundwater is not fully understood due to limited groundwater elevation data for the semi-perched aquifer and the absence of monitoring sites near surface water bodies.[94] Nevertheless, as described in the hydrogeological conceptual model, a previous investigation found that water can migrate vertically between the Semi-perched Aquifer and the underlying Oxnard Aquifer.[95] Furthermore, Appendix C of the GSP includes a numerical modelling study which provides an estimate of groundwater-surface water connections for a few surface water systems. The numerical model simulates leakage from major surface water bodies using data from stream gauges and estimated aquifer properties. The model shows that the Santa Clara River exhibited recharge to the semi-perched aquifer for 19 out of 31 years [96] and recharged the Upper Aquifer System for 27 out of 31 years [97]; Calleguas Creek exhibited recharge to the semi-perched aquifer in all modeled years. Determining the location of interconnected surface water with groundwater, including the semi-perched aquifer with the Upper Aquifer System, will be necessary to understand and manage the depletion of interconnected surface water in the Subbasin. (see Recommended Corrective Action 1).[98]

The GSP identifies six surface water bodies within the Subbasin as GDEs and potential GDEs. The GDEs include the Lower Santa Clara River, McGrath Lake, Ormond Beach, and Mugu Lagoon, whereas the potential GDEs include Revolon Slough and Lower

[91] Oxnard Subbasin GSP, Section 2.3.5, p. 158.
[92] Farr et al., 2017, p. 24.
[93] Oxnard Subbasin GSP, Section 2.3.5, p. 157.
[94] Oxnard Subbasin, Section 2.3.6, p. 158.
[95] Oxnard Subbasin, Section 2.2.3, p. 123.
[96] Oxnard Subbasin GSP, Table 2-7a, p. 207-208.
[97] Oxnard Subbasin GSP, Table 2-7b, p. 208-209.
[98] 23 CCR § 354.16(f), 355.4 (b)(1) and (3).

Calleguas Creek. Revolon Slough and Lower Calleguas Creek are identified as potential GDEs due to a lack of groundwater level data to confirm whether riparian vegetation are supported by groundwater.[99] The location and the extent of GDEs are shown in maps based on data made available by the Department and other sources.[100] The GSP provides detailed descriptions of the types of ecosystems, the habitat supported by the ecosystems, and the connection of the ecosystem to the underlying semi-perched aquifer. The GSP states that additional data need to be collected within the boundaries of two potential GDEs to understand their connection to the underlying aquifer.

4.2.4 Water Budgets

The GSP used the Ventura Regional Groundwater Flow Model to develop the water budgets for the Subbasin. The Regional Groundwater Flow Model is based on USGS's numerical groundwater flow model (MODFLOW) and was created by UWCD for the Oxnard Subbasin, Mound Basin, the western part of the Las Posas Valley Basin, and Pleasant Valley Basin.[101] The GSP states that the UWCD model was revised, peer reviewed, and finalized in June 2018 for the Oxnard Subbasin GSP[102] and was used to estimate historical, current, and projected water budgets and the sustainable yield.

The GSP provides detailed descriptions of the sources of inflows, outflows, and the use of imported water and recycled water in the Subbasin. The GSP defines the period of 1985 to 2015 as the historical water budget, with the year 2015 as the current water budget.[103] The GSP includes a historical water budget for the semi-perched aquifer, the Upper Aquifer System, and the Lower Aquifer System. It also provides estimates of annual inflows, outflows, and change in storage.[104] Additional data pertaining to the water budget components, such as summary of water deliveries, detailed accounting of recharge by source type, and groundwater use by beneficial uses for each aquifer system are provided in the GSP as required by the GSP Regulations.

The GSP quantified overdraft in the Subbasin using the water year during which water supply conditions approximated average conditions. This calculation method excluded wet, dry, and critically dry water years. The GSP estimates that the overdraft in the Subbasin was about 2,300 acre-feet per year. Based on historical water supply conditions, the GSP evaluates the availability and reliability of water supply deliveries and states that most of the surface water supply sources are reliable and are not significantly affected by the water year type, other than the diversions from the Santa Clara River, which vary widely depending on climate conditions.

The GSP discusses the current water budget for calendar year 2015 and states that the Subbasin had greater outflows than inflows, resulting in a storage loss of 38,703 acre-

[99] Oxnard Subbasin GSP, Section 2.3.7, p. 159-162, Figure 2-52, p. 339.
[100] Oxnard Subbasin GSP, Figure 2-52 - 2-56, p. 339-347.
[101] Oxnard Subbasin GSP, Appendix C, p. 918-1271.
[102] Oxnard Subbasin GSP, Appendix E, p. 1664-1740.
[103] Oxnard Subbasin GSP, Section 2.4.3.2, p. 173-174.
[104] Oxnard Subbasin GSP, Table 2-7a - 2-7c, p. 207-210.

feet.[105] This change in groundwater storage includes seawater intrusion, meaning the groundwater storage decline would have been larger if seawater had not infiltrated the aquifers in the Subbasin. The GSP states that the net seawater intrusion in 2015 was approximately 19,200 acre-feet and affected the Upper Aquifer System and the Lower Aquifer System, whereas the semi-perched aquifer experienced net outflow of water to the Pacific Ocean and was not affected by seawater intrusion.

The Agency developed eight model scenarios to assess the projected water budget and future sustainable yield.[106] The scenarios incorporated existing projects, variable amounts of reduced groundwater production, various climate and precipitation projections, both the 2030 and 2070 climate-change factors, and covered a 50-year time frame, from 2020 to 2069. The GSP states that none of the modeled scenarios successfully eliminated seawater intrusion[107] and, therefore, none of the direct model scenarios were used to determine the sustainable yield of the Oxnard Subbasin. Instead, the findings from six model scenarios were plotted graphically and a statistical method of linear regression was used to calculate the future sustainable yield that would result in zero seawater intrusion.[108] This groundwater production volume with no seawater intrusion is provided in the GSP as the future sustainable yield. The future sustainable yield of the Upper Aquifer System is estimated to be 32,000 acre-feet per year, and the Lower Aquifer System is estimated to be 7,000 acre-feet per year.[109] Therefore, the combined future sustainable yield of Upper Aquifer System and Lower Aquifer System would be 39,000 acre-feet per year, which is equal to the modeled historical sustainable yield of the Subbasin.[110] The future sustainable yield, which is equivalent to the future groundwater production rate of 39,000 acre-feet per year, is substantially lower than the groundwater production in 2015, which was 80,814 acre-feet.[111]

Department staff note that the approach the Agency used to estimate sustainable yield was the subject of several comments. The comments in general questioned the statistical method used and how modeling outputs were utilized. Department staff reviewed the approach and determined that, while novel, the approach to estimate sustainable yield appears to be reasonable. The model relied on is peer-reviewed and is reasonably well-calibrated, and the statistical method utilized is consistent with scientific standards of practice. While other methods could have been employed to estimate sustainable yield, Department staff do not believe that, at this time, the Agency erred in its approach.

Overall, Department staff believe the rationale and information utilized to develop the water budgets is sufficiently thorough and substantially complies with the GSP Regulations. The components of the water budgets, the accounting of the inflows and

[105] Oxnard Subbasin GSP, Section 2.4.3.3, p. 174.
[106] Oxnard Subbasin GSP, Section 2.4.5, p. 177-190.
[107] Oxnard Subbasin GSP, Section 2.4.5.9, p. 190.
[108] Oxnard Subbasin GSP, Section 2.4.5.9, p. 190-191, Appendix E, Figures 4 and 5, p. 1711-1712.
[109] Oxnard Subbasin GSP, Section 2.4, p. 191.
[110] Oxnard Subbasin GSP, Section 2.4, p. 176.
[111] Oxnard Subbasin GSP, Section 2.4.2.1, p. 171.

outflows to the Subbasin, and availability of water supply for the future are sufficiently detailed and substantially comply with the GSP Regulations. The estimated overdraft, sustainable yield, and change in storage appear to be reasonable and based on the best available information and science. The GSP adequately discusses uncertainties in the water budget and the impact of population growth and future land use on the projected water budget.

4.2.5 Management Areas

The Agency divided the Oxnard Subbasin into five management areas. It appears to Staff that these management areas were created primarily for purposes of implementing the GSP's proposed projects and management actions. The Subbasin is divided into the Forebay, West Oxnard Plain, Oxnard Pumping Depression, Saline Intrusion, and East Oxnard Plain Management Areas.[112] The GSP states that these areas are separated by hydrogeologic properties, groundwater quality, or historical groundwater elevations (see Table 1). Based on information in the Plan, Staff believe that the Agency does not intend to use these management areas to establish differing minimum thresholds or measurable objectives.

Table 1: Summary of Oxnard Subbasin management areas as described in the Oxnard Subbasin GSP

Name	Description
Forebay Management Area	An unconfined part of the Subbasin and a key recharge area where most of the spreading grounds are located.
West Oxnard Plain Management Area	Jurisdictional area that includes the FCGMA and the City of Oxnard.
Oxnard Pumping Depression Management Area	Established based on the low groundwater elevations historically recorded in both the Upper Aquifer System and the Lower Aquifer System in the area.
Saline Intrusion Management Area	Part of the Subbasin where saline intrusion has historically occurred and has impacted wells in both the Upper Aquifer System and Lower Aquifer System.
East Oxnard Plain Management Area	Established based on differences in groundwater elevation and chloride concentration across the Bailey Fault, which acts as a barrier to groundwater flow.

4.3 SUSTAINABLE MANAGEMENT CRITERIA

GSP Regulations require each Plan to include a sustainability goal for the basin and to characterize and establish undesirable results, minimum thresholds, and measurable objectives for each applicable sustainability indicator, as appropriate.[113]

4.3.1 Evaluation Summary

Department staff find the sustainable management criteria included in the GSP were developed using sufficient and credible information and science, and substantially comply

[112] Oxnard Subbasin GSP, Section 2.5, p. 191-192.
[113] 23 CCR § 354.22 *et seq*.

in form and presentation with the requirements outlined in the GSP Regulations. Significant and unreasonable conditions, as defined in the GSP, are based on historical conditions in the Subbasin and their avoidance represents a reasonable approach to achieving the sustainability goal for the Subbasin. The GSP establishes minimum thresholds and measurable objectives that, over time, aim to substantially maintain or improve groundwater conditions in comparison to those present in 2015. Groundwater elevations that achieve the sustainability goal for seawater intrusion were, in turn, used as a proxy for other sustainability indicators. Department staff find this approach is reasonably likely to limit further seawater intrusion and degradation of groundwater quality, avoid land subsidence that substantially interferes with surface land uses, and not worsen impacts to interconnected surface water from current conditions.

While Department staff find, at this time, that the GSP's approach and rationale for establishing sustainable management criteria to be reasonable, further work will be necessary to support the approach and appropriately define the scope of the GSP's evaluation of water quality, subsidence and depletions of interconnected surface water, and potential undesirable results. Department staff strongly encourage the GSAs to address any recommended corrective actions no later than the first five-year update.

4.3.2 Sustainability Goal

The sustainability goal for the Subbasin is to increase groundwater elevations inland of the Pacific coast in order to prevent landward migration of the 2015 saline water impact front and to prevent net seawater intrusion in the Upper Aquifer System and the Lower Aquifer System.[114] The GSP includes multiple projects and management actions that, if implemented, will allow the Subbasin to operate within its sustainable yield and achieve its sustainability goal. The primary management action that will be implemented to achieve the sustainability goal is reducing groundwater production from both the Upper Aquifer System and the Lower Aquifer System,[115] which is anticipated to begin during the first five years following GSP adoption.[116] Department staff find that the GSP sets reasonable sustainability goals and adequately describes the measures to be implemented to achieve sustainable management of groundwater within 20 years and substantially complies with the GSP Regulations.

4.3.3 Sustainability Indicators

GSP Regulations specify that an agency define conditions that constitute sustainable groundwater management for a basin, including the characterization of undesirable results and the establishment of minimum thresholds and measurable objectives for each applicable sustainability indicator.[117]

Sustainability indicators are defined as any of the effects caused by groundwater conditions occurring throughout the basin that, when significant and unreasonable, cause

[114] Oxnard Subbasin GSP, Section 3.2, p. 408.
[115] Oxnard Subbasin GSP, Section 5.1, p. 536.
[116] Oxnard Subbasin GSP, Section 3.2, p. 408.
[117] 23 CCR § 354.22 *et seq*.

undesirable results.[118] Sustainability indicators thus correspond with the six undesirable results – chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon, significant and unreasonable reduction of groundwater storage, significant and unreasonable seawater intrusion, significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies, land subsidence that substantially interferes with surface land uses, and depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water[119] – but refer to groundwater conditions that are not, in and of themselves, significant and unreasonable. Rather, sustainability indicators refer to the effects caused by changing groundwater conditions that are monitored, and for which criteria in the form of minimum thresholds are established by the agency to define when the effect becomes significant and unreasonable, producing an undesirable result.

The following subsections thus consolidate three facets of sustainable management criteria: undesirable results, minimum thresholds, and measurable objectives. Information, as presented in the GSP, pertaining to the processes and criteria relied upon to define undesirable results applicable to the basin, as quantified through the establishment of minimum thresholds, are addressed for each sustainability indicator. However, a submitting agency is not required to establish criteria for undesirable results that the agency can demonstrate are not present and are not likely to occur in a basin.[120]

4.3.3.1 Chronic Lowering of Groundwater Levels

The GSP states that the chronic lowering of groundwater levels resulting in a significant and unreasonable depletion of supply is an undesirable result applicable to the Oxnard Subbasin and acknowledges that groundwater production in excess of natural and artificial recharge is the primary cause of the chronic lowering of groundwater levels.[121] Significant and unreasonable lowering of levels may result in net seawater intrusion in the Upper Aquifer System and Lower Aquifer System over climate cycles of drought and recovery.[122] The GSP explains the criterion used to define when and where undesirable results occur is landward migration of the 2015 saline water impact front during the period from 2040 through 2069; and the quantitative criteria is:[123]

1. A number of key wells with water levels below their respective minimum thresholds. The Agency selected fifteen key wells in the Upper Aquifer System and nineteen key wells in the Lower Aquifer System for monitoring and to define undesirable results. In the Upper Aquifer System, undesirable results will occur if water levels in six of the 15 key wells are below their respective minimum thresholds in any single monitoring event. Similarly, the Lower Aquifer System will

[118] 23 CCR § 351(ah).
[119] Water Code § 10721(x).
[120] 23 CCR § 354.26(d).
[121] Oxnard Subbasin GSP, Section 3.3.1 p. 409.
[122] Oxnard Subbasin GSP, Section 3.3.1 p. 409.
[123] Oxnard Subbasin GSP, Section 3.3.7, p. 417-419.

experience undesirable results if water levels in eight of the 19 key wells are below their respective minimum thresholds in any single monitoring event.

2. Water levels going below the historical low at the respective key monitoring wells. Under this definition, an undesirable result would occur if the groundwater elevation at any individual key well is below the historical low water level for that well.

3. A period of time during which groundwater level exceeds the minimum threshold in any key well. Under this definition, an undesirable result would occur if the water level in any key well was below the respective minimum threshold for either three consecutive monitoring events or three of five consecutive monitoring events.

The Agency established minimum thresholds for groundwater levels based on historical groundwater elevation data and future groundwater model scenarios with potential for seawater intrusion. Specifically, the selected minimum thresholds were based on the lowest simulated groundwater elevation between 2040 and 2069, in which net seawater intrusion was minimal. To account for some of the uncertainty in the projected groundwater elevations, the lowest simulated value was rounded down to the nearest 5-foot interval and then raised by two feet to account for predicted sea level rise by 2070. The GSP states that the established minimum thresholds are water levels that would limit net seawater intrusion into the Upper Aquifer System and Lower Aquifer System, limit migration of the 2015 saline water impact front after 2040[124], and indicate that declines in levels during periods of drought will be offset by increases in levels during periods of above-average rainfall. [125] According to the second criterion above, groundwater elevations are higher than previous historical low water levels.

The GSP establishes measurable objectives for each key well as water levels at which there is neither seawater flow into nor freshwater flow out of the Upper Aquifer System or Lower Aquifer System.[126] According to the GSP, there is at least 10 feet between the measurable objective and the minimum threshold water level, which the Agency considers a margin of safety for operational flexibility.

The GSP describes two sets of interim milestones that represent two paths to achieve the sustainability goal for the Subbasin within 20 years of implementation. With the first path, water levels will reach the measurable objectives under average climatic conditions, and with the second path, water levels will reach minimum thresholds under dry conditions.[127] The GSP states that the interim milestones should be reassessed during future GSP updates in conjunction with measured groundwater levels at each key well.[128]

[124] Department staff's understanding of "after 2040" is January 1st, 2041. See Oxnard Subbasin GSP, p. 28 footnote 2 and definition of sustainability goal on p. 408.
[125] Oxnard Subbasin GSP, Section 3.3.1, p. 410, Section 3.4.1, p. 420.
[126] Oxnard Subbasin GSP, Section 3.5.1, p. 427.
[127] Oxnard Subbasin GSP, Table 3-2, p. 437-438, Figure 3-12, p. 469.
[128] Oxnard Subbasin GSP, Section 3.5.1, p. 429.

The GSP states that the minimum thresholds are anticipated to improve conditions for beneficial uses of the Subbasin by limiting seawater intrusion and chronic lowering of groundwater levels.[129] While it seems reasonable to anticipate improvements at the minimum thresholds, the GSP does not provide specific information on how the minimum thresholds may affect the interests of beneficial uses and users of groundwater in the Subbasin. In particular, the Department understands that there are domestic wells in the Subbasin, and the Plan does not provide an assessment of how the minimum thresholds affect domestic wells. Department staff encourage the Plan provide more specific information detailing potential effects of minimum thresholds on beneficial users and uses of groundwater, on land uses, and on property interests in the Subbasin. Nonetheless, established minimum thresholds represent levels above historical lows,[130] which represents an approach that is consistent with SGMA and the GSP Regulations.

Department staff find the sustainable management criteria defined for chronic lowering of groundwater levels is commensurate with the level of understanding of the basin setting and establishes reasonable criteria to achieve the sustainability goal of the Subbasin. Based on the thresholds established by the Agency, the groundwater level will show the first sign of recovery by 2025 when the groundwater level in every key well is anticipated to be above 2015 groundwater levels; groundwater levels will progressively improve until 2040.[131] Establishing sustainable management criteria that aims to prevent advancement of the 2015 saline water impact front is a reasonable approach that will help avoid a significant and unreasonable depletion of groundwater supply in the Subbasin.

4.3.3.2 Reduction of Groundwater Storage

The Plan states that the significant and unreasonable reduction of groundwater storage is an undesirable result that applies to Oxnard Subbasin.[132] The Plan acknowledges that the primary cause of reduction in groundwater storage is groundwater production in excess of recharge. The Plan states that significant and unreasonable reduction of groundwater storage may result if the volume of water produced from the Subbasin exceeds the volume of freshwater recharging the Subbasin over cycles of drought and recovery, and this undesirable result that has already occurred in the Subbasin.[133]

The Plan's definition for an undesirable result associated with "reduction in groundwater storage is landward migration of the 2015 saline water impact front after 2040."[134] The minimum thresholds established are the same water levels that limit seawater intrusion in the Subbasin, and indicate that declines in groundwater elevation during periods of drought will be offset by recovery during periods of above-average rainfall.[135] The

[129] Oxnard Subbasin GSP, Section 3.4, p. 421.
[130] Oxnard Subbasin GSP, Section 3.3.1, p. 410.
[131] Oxnard Subbasin GSP, Table 3-2, p. 437-438.
[132] Oxnard Subbasin GSP, Section 3.3.2, p. 411.
[133] Oxnard Subbasin GSP, Section 3.3.2, p. 411.
[134] Oxnard Subbasin GSP, Section 3.3.2, p. 411.
[135] Oxnard Subbasin GSP, Section 3.4.2, p. 421.

established elevations are higher than previous historical low water levels. The measurable objective for seawater intrusion is defined as the groundwater level at which there is neither seawater flow into, nor freshwater flow out of, the Upper Aquifer System and Lower Aquifer System; the measurable objective for each key well is based on the simulated median groundwater elevation between 2040 and 2070 that minimizes the migration of the 2015 saline water impact front after 2040.[136]

The Plan states that undesirable results related to a reduction of groundwater storage have already occurred in the Subbasin.[137] These undesirable results have the potential to impact the beneficial uses and users of groundwater by limiting the volume of groundwater available for agriculture, municipal, industrial, domestic, and environmental uses.

Department staff find the sustainable management criteria defined for reduction of groundwater in storage, in particular connecting the reduction in storage to seawater intrusion, is commensurate with the level of understanding of the basin setting and establishes reasonable criteria for this particular sustainability indicator. Preventing a reduction in groundwater storage in the Subbasin from getting worse than those conditions experienced in 2015 is a reasonable approach that will help avoid a significant and unreasonable depletion of supply in the Subbasin. The Plan states that selected management criteria are anticipated to improve the beneficial uses of the Subbasin by allowing for long-term use of groundwater supplies in the Subbasin without replacing freshwater in the Upper Aquifer System and Lower Aquifer System with seawater. The anticipated improvement appears to be reasonable. However, under the dry condition scenario (i.e., projected water levels at the minimum thresholds) landward migration of seawater, while minimized, is still expected until 2040. If this is the case, analysis should be provided to describe how continued seawater intrusion may affect the interests of beneficial uses and users of groundwater in the Subbasin (see Recommended Corrective Action 2).

4.3.3.3 Seawater Intrusion

The Plan defines significant and unreasonable seawater intrusion as a net landward migration of the 2015 saline water impact front beyond the already-impacted area from 2040 through 2069.[138] This saline water impact area is characterized by concentrations of chloride greater than 500 milligrams per liter, is generally located west of Highway 1 and south of Hueneme Road, and is sourced by modern seawater as well as non-marine brines and connate water in fine-grained sediments.[139] The Agency plans to limit

[136] Oxnard Subbasin GSP, Section 1.1, Footnote 2, p. 28, Section 3.5.2, p. 429.
[137] Oxnard Subbasin GSP, Section 3.3.2, p. 411.
[138] Oxnard Subbasin GSP, Section 3.3.3, p. 412.
[139] Oxnard Subbasin GSP, Section 3.3.3, p. 412.

seawater intrusion to the area that has already been impacted but does not intend to reverse or improve the historically impacted area.[140]

According to the GSP, modeling by UCWD indicates a strong relationship between groundwater elevation and seawater intrusion and, therefore, the minimum thresholds for seawater intrusion are based on groundwater levels that limit seawater intrusion in the Upper Aquifer System and Lower Aquifer System.[141] The measurable objective for seawater intrusion is defined as the groundwater level at which there is neither seawater flow into nor freshwater flow out of the Upper Aquifer System and Lower Aquifer System; the measurable objective for each key well is based on the simulated median groundwater elevation between 2040 and 2070 that minimizes the migration of the 2015 saline water impact front after 2040.[142] The GSP states that model simulations suggest that if groundwater levels fall below the minimum threshold elevations, the Subbasin is likely to experience net landward migration of seawater intrusion after 2040.[143] The minimum thresholds are anticipated to improve the beneficial uses of the Subbasin by limiting seawater intrusion.[144]

Department staff conclude that the sustainable management criteria defined in the GSP for seawater intrusion are commensurate with the understanding of seawater intrusion in the Subbasin and will be reasonably protective of the beneficial uses and users of groundwater in the Subbasin, and if progress toward the minimum threshold or measurable objective is achieved, will have a positive impact on groundwater users. Furthermore, preventing further long-term seawater intrusion will be beneficial to users in the Subbasin who may reside in areas at risk from further intrusion.

However, Department staff understands that until groundwater levels are at the minimum thresholds there is a potential for further seawater intrusion. Under the dry conditions scenario presented in the Plan, reaching the minimum thresholds may not happen until 2040. Department staff thus recommend the Agency provide additional information on the potential impacts of seawater intrusion on the beneficial uses and users, including domestic users, that are inland of the 2015 saline water impact area if landward migration of the front continues (see Recommended Corrective Action 2).

4.3.3.4 Degraded Water Quality

The GSP states that significant and unreasonable degraded water quality related to groundwater production is an undesirable result that has the potential to occur in the Subbasin and that the main constituents of concern for SGMA purposes are TDS and chloride.[145] Significant and unreasonable degradation of water quality may occur if there

[140] Oxnard Subbasin GSP, Section 3.3.3, p. 412.
[141] Oxnard Subbasin GSP, Section 3.4.3, p. 422.
[142] Oxnard Subbasin GSP, Section 1.1, Footnote 2, p. 28, Section 3.5.3 p. 430.
[143] Oxnard Subbasin GSP, Section 3.4.3, p. 422.
[144] Oxnard Subbasin GSP, Section 3.4.3, p. 422.
[145] Oxnard Subbasin GSP, Section 3.3.4.1, p. 414.

is an expansion of the areas currently impacted by elevated concentrations of chloride and TDS that limit agricultural and potable use of groundwater.

The GSP states that the sustainable management criteria for chronic lowering of groundwater levels are used as a proxy for water quality, rather than concentrations of chloride and TDS, because the elevated concentrations of chloride and TDS are associated with groundwater production resulting in seawater intrusion and release of connate brines into aquifers. The GSP explains minimum thresholds established are water levels that prevent net migration of the 2015 saline water impact front after 2040.[146] The measurable objective is defined as the groundwater level at which there is neither seawater flow into nor freshwater flow out of the Upper Aquifer System and Lower Aquifer System; the measurable objective for each key well is based on the simulated median groundwater elevation between 2040 and 2070 that minimizes the migration of the 2015 saline water impact front after 2040.[147]

Department staff conclude that the GSP's approach of using groundwater levels as a proxy for its water quality sustainable management criteria for chloride and TDS specifically, is generally reasonable and consistent with the GSP Regulations. However, as recognized in the GSP, the effectiveness of applying a water level proxy to groundwater quality degradation needs to be assessed through continued monitoring.[148] It is not established at this time how groundwater levels will ensure that groundwater use subject to the GSAs jurisdiction does not significantly and unreasonably exacerbate existing degraded water quality conditions. While the Department is unaware of information demonstrating that groundwater production is impacting water quality in the Subbasin, Department staff recommend the GSAs assess water quality monitoring data and coordinate with the appropriate water quality regulatory programs and agencies to better understand how the established groundwater level thresholds are protective of groundwater quality, and not just limited to saline water, and to provide supporting data and information to ensure that groundwater quality is not exacerbated by groundwater use in the Subbasin (see Recommended Corrective Action 4).

In addition, the GSP identifies groundwater from the semi-perched aquifer as one of the primary reasons for degraded water quality[149] and acknowledges that water can migrate vertically from the semi-perched aquifer to the underlying Oxnard aquifer.[150] The GSP lacks adequate assessment and characterization of the potential for migration of degraded water to impair water supplies that may lead to undesirable results.[151] Therefore, Department staff recommend the Agency investigate the potential for

[146] Oxnard Subbasin GSP, Section 3.4.4, p. 424.
[147] Oxnard Subbasin GSP, Section 3.5.4 p. 430-431.
[148] Oxnard Subbasin GSP, Section 3.3.4.1, p. 414.
[149] Oxnard Subbasin GSP, Section 2.3.4.2, p. 151.
[150] Oxnard Subbasin GSP, Section 2.2.3, p. 123.
[151] 23 CCR § 354.28(c)(4).

groundwater pumping to result in migration of impaired water (see Recommended Corrective Action 1).

Lastly, the Plan acknowledges that elevated nitrate concentrations in the Forebay area have resulted in significant and unreasonable impacts to beneficial uses and users of the Subbasin.[152] Notably, nitrate concentrations in UWCD shallow supply wells tend to increase during periods of drought.[153] Nitrate concentrations above water quality objectives and basin management objectives are routinely detected in the Subbasin and likely caused by historical septic discharges and agricultural fertilizer application practices.[154] However, the GSP states that nitrate concentrations are not negatively impacted by their groundwater production, not anticipated to expand geographically, and, therefore, are not considered a SGMA sustainability indicator.[155] No minimum threshold is established for nitrate because the Agency believes nitrate concentrations are not negatively impacted by their groundwater production; will be diluted by maintaining and potentially increasing surface-water recharge from the Santa Clara River; and will decline in the long term due to modern agronomic fertilization practices and cessation of septic discharges. The GSP states that groundwater levels will be used as a proxy to prevent further degradation of groundwater quality in the Forebay area until a separate minimum threshold concentration for nitrate is found to be necessary.[156] At this time, Department staff find the GSP's approach to nitrate to be reasonable and encourage the GSAs to continue monitoring and assessing the relationship between groundwater production and nitrate concentrations.

4.3.3.5 Land Subsidence

The GSP defines the undesirable result associated with land subsidence as subsidence that substantially interferes with surface land uses.[157] Although the GSP does not explicitly describe whether land subsidence has impacted beneficial uses and users, the Agency recognizes the potential for land subsidence to impact infrastructure and states that subsidence associated with groundwater production has not caused and is not likely to cause undesirable results.[158] Furthermore, the GSP states that the projected 0.1 to 1 feet of subsidence that is anticipated to occur by 2040 will not substantially interfere with surface land uses in the Subbasin.

The GSP discusses historical land subsidence studies and subsidence rates, then hypothesizes that maintaining groundwater levels above historical lows will avoid subsidence related to groundwater production. Thus, the Agency intends to use groundwater levels as a proxy to monitor and avoid undesirable results related to subsidence. Although Department staff find the approach to be reasonable, staff also

[152] Oxnard Subbasin GSP, Section 3.3.4.2, p. 414-415.
[153] Oxnard Subbasin GSP, Section 1.6.2, p. 62.
[154] Oxnard Subbasin GSP, Section 3.3.4.2, p. 414-415.
[155] Oxnard Subbasin GSP, Section 3.3.4.2, p. 415.
[156] Oxnard Subbasin GSP, Section 3.4.4, p. 423.
[157] Oxnard Subbasin GSP, Section 3.3.5, p. 415.
[158] Oxnard Subbasin GSP, Section 3.3.5, p. 416.

recommend the Agency incorporate periodic monitoring (e.g., for each five-year update) for land subsidence that can provide the Agency with quantitative data regarding the performance of the proxy (see Recommended Corrective Action 3).

4.3.3.6 Depletions of Interconnected Surface Water

The Plan defines the undesirable result associated with depletion of interconnected surface water in the Oxnard Subbasin as a loss of GDE habitat. The Plan recognizes four GDEs and two potential GDEs and states that the health of GDEs depends on conditions of the semi-perched aquifer. Based on the stable groundwater elevation and low rate of groundwater production from the semi-perched aquifer, the Plan states that the loss of GDEs is not occurring and has not occurred in the past; thus, the Subbasin is not experiencing undesirable results for this sustainability indicator.[159] The Plan acknowledges data gaps regarding the confirmation of the potential GDEs and their hydraulic connection with the semi-perched aquifer.

The Plan explains that the minimum thresholds for depletion of interconnected surface water are water levels that limit seawater intrusion in the Subbasin and indicate that declines in groundwater elevations during periods of future drought will be offset by recoveries during future periods of above-average rainfall.[160] The Plan states that minimum thresholds are not established for the semi-perched aquifer because this unit is not considered a principal aquifer. Instead, the Plan explains that the simulated minimum thresholds established for the underlying Oxnard aquifer, which would prevent landward migration of the 2015 saline water impact front, were also found to result in higher water levels in the semi-perched aquifer.[161] The Plan states that historical groundwater levels in the semi-perched aquifer have supported GDEs and that the minimum thresholds for the Oxnard aquifer would result in higher groundwater elevations in the semi-perched aquifer, which would be protective of GDEs.[162]

Determining the connection between the surface water bodies and the underlying aquifers, including the semi-perched aquifer and the principal aquifers, will be necessary to understand and manage the depletion of interconnected surface water in the Subbasin. Department staff recommend the GSAs improve their understanding of interconnected surface water systems and the potential GDEs that may rely on those systems (see Recommended Corrective Action 1).

Department staff believe that if the proxy of using the minimum threshold established for groundwater levels for the Oxnard aquifer results in higher groundwater elevations in the semi-perched aquifer, this approach is reasonable to avoid the loss of GDEs, given that historical groundwater levels have supported GDEs prior to GSP implementation. However, Department staff believe that there is uncertainty regarding the future

[159] Oxnard Subbasin GSP, Section 3.3.6, p. 416-417.
[160] Oxnard Subbasin GSP, Section 3.4.6, p. 425.
[161] Oxnard Subbasin GSP, Section 3.4.6, p. 425.
[162] Oxnard Subbasin GSP, Section 3.4.6, p. 425.

groundwater condition in the semi-perched aquifer. Because the groundwater level in the semi-perched aquifer has been maintained largely by agricultural return flow,[163] the intended groundwater pumping reduction and agricultural land fallowing[164] could potentially reduce agricultural return flow and affect the future groundwater level conditions in the semi-perched aquifer. Therefore, Department staff believe that the Agency should have a robust monitoring network capable of evaluating whether the use of groundwater levels in the underlying Oxnard aquifer as a proxy for depletion of interconnected surface water is performing as intended and avoiding undesirable results associated with GDEs and the depletion of interconnected surface waters (see Recommended Corrective Action 1).

4.4 MONITORING NETWORKS

GSP Regulations require that a monitoring network be developed for each basin including monitoring objectives, monitoring protocols, and data reporting requirements. The network shall promote the collection of data of sufficient quality, frequency, and distribution to characterize groundwater and related surface water conditions in the basin and evaluate changing conditions.[165]

4.4.1 Evaluation Summary

The monitoring network for the Subbasin was developed to track and monitor parameters that demonstrate progress toward meeting the sustainability goals. In addition to existing groundwater level monitoring programs, the Agency developed a monitoring network which monitors groundwater levels in the Subbasin. Although there are no monitoring networks newly developed for the other five sustainability indicators, the Agency plans to use groundwater level data as a proxy to assess groundwater conditions related to other sustainability indicators.

Although the GSP's monitoring network substantially complies with GSP regulations, the Plan identifies data gaps in each aquifer and in a management area. Department staff concur that there are critical data gaps that should be addressed early in GSP implementation. Failure to do so may make it difficult to demonstrate that implementation of the Plan is achieving the sustainability goal of the Subbasin, which may influence subsequent plan assessments by the Department.

4.4.2 Monitoring Networks

The Agency maintains long-term groundwater and surface water data for groundwater management purposes and to understand Subbasin conditions and responses to climate and land use. Groundwater elevation and surface flow monitoring started in the 1930s, with groundwater extraction data being collected since 1983. Precipitation data has been recorded for more than a century in the Subbasin.

[163] Oxnard Subbasin GSP, Section 2.2.3, p. 123, Section 2.4.1.9, p. 170, Section 2.4.2.2, p. 171,
[164] Oxnard Subbasin GSP, Section 5.6 – Section 5.7, p. 546-551
[165] 23 CCR § 354.32 *et seq*.

The existing groundwater level monitoring network consists of 150 wells that are measured monthly to quarterly; 34 of those wells are selected for representative monitoring. Groundwater level data is being collected by the Ventura County Watershed Protection District and UWCD, which are partner agencies. Because these agencies follow different data collection protocols, the Agency plans to work with these agencies to ensure that future data collection is conducted according to protocol that is consistent with best management practices.[166] The Agency plans to collect groundwater elevation data from the 34 representative wells within a 2-week window in the spring and fall of each year. In addition to manual measurements, the Agency plans to monitor short-term and long-term trends in groundwater elevation using transducers.

The GSP states that the groundwater level monitoring network is structured to provide groundwater elevation data for each primary aquifer and the lateral and vertical gradient within and between the aquifers. The numerical model will be used to calculate the annual change in storage using the collected groundwater level data and will be reported for each aquifer in annual reports.

The Agency has worked with Department's Technical Support Services program to close data gaps by constructing six new monitoring wells in the Oxnard Subbasin. The Agency's rationale for monitoring site selection appears to include wells from all major aquifers and management areas to have temporal and spatial coverage, and the Agency believes that the monitoring network is robust enough to detect Subbasin-wide undesirable results in a timely manner. Because there are no representative monitoring wells located in the East Oxnard Plain Management Area (EOPMA),the Agency intends to use the wells located in the adjacent Oxnard Pumping Depression Management Area to monitor the groundwater conditions in the EOPMA until a monitoring well is installed in the EOPMA.[167] The Agency assumes that the measurable objectives set for the wells located in the Oxnard Pumping Depression Management Area will also protect the EOPMA because of the proximity of the monitoring wells to the EOPMA. Department staff believe that Agency's approach of using key wells located in the adjacent management area for EOPMA is scientifically reasonable and Agency's plan to add a monitoring well in future for an accurate understanding of EOPMA groundwater condition is pragmatic.

The GSP includes over 900 groundwater quality hydrographs which show historical and current water quality data. Some of these hydrographs include water quality data going back to the 1930s. The hydrographs compare the five water quality constituents with Basin Plan Water Quality Objectives or Maximum Contaminant Levels (MCL).[168] The GSP does not include a summary of the historical water quality conditions apart from information provided in hydrographs, but discusses 2011 to 2015 groundwater quality conditions related to the five constituents of concern. The water quality constituents that are currently being monitored in the Subbasin are TDS, chloride, nitrate, sulfate, and

[166] Oxnard Subbasin GSP, Section 4.5, p. 484.
[167] Oxnard Subbasin GSP, Section 3.3.1, p. 410-411.
[168] Oxnard Subbasin GSP, Appendix G, p. 1803-2718.

boron. These water quality constituents are associated with the water quality thresholds either adopted by the Agency or mandated by the LARWQCB. The groundwater quality sampling frequency ranges from quarterly to annually, with data being analyzed to document trends of the constituents identified by FCGMA and the LARWQCB. The Agency chooses not to use the water quality monitoring data for the degraded water quality sustainability indicator; instead, the Agency uses groundwater elevation data as the proxy. The Plan states that the groundwater quality data will continue to be collected and analyzed to assess whether groundwater elevation thresholds are sufficiently protective of groundwater conditions in the Subbasin.[169]

Although the existing water quality monitoring program in the Oxnard Subbasin includes the monitoring of chloride concentration, the Agency chose not to use chloride concentration data to monitor seawater intrusion. Instead, the Agency plans to use groundwater elevation data to monitor and assess seawater intrusion in the Subbasin. The Plan states that their network of 16 dedicated monitoring wells located adjacent to the coast is capable of documenting groundwater elevations that could induce seawater intrusion. The Agency plans to monitor the water quality trends related to seawater intrusion by monitoring each coastal well on an annual basis.

The Agency does not have a monitoring program to directly monitor land subsidence in the Subbasin, stating that it does not anticipate subsidence related to groundwater production to occur because the minimum threshold for groundwater elevations are higher than the historical low groundwater elevations in the Subbasin. The Agency plans to use groundwater elevation data as a proxy for monitoring land subsidence in the Subbasin and states that pre-existing GPS-based benchmarks could be used to monitor land subsidence if the water level falls below historical low levels for an extended period and the potential for land subsidence to substantially interfere with surface land uses is determined.[170] As stated above, Department staff recommend the Agency incorporate periodic monitoring for subsidence, directly, to verify that its assumptions about the proxy are correct (see Recommended Corrective Action 3)

The GSP states that groundwater elevations are monitored in the semi-perched aquifer to document interactions between the semi-perched aquifer and the surface water bodies in the Subbasin, as well as to document potential gradients between the semi-perched aquifer and the underlying Oxnard aquifer.[171] However, the Agency's monitoring network does not include any representative key wells for the semi-perched aquifer; thus, sustainable management criteria are not established for any wells screened solely in the semi-perched aquifer. Although the GSP states that the semi-perched aquifer is not a primary aquifer and is not a significant contributor to groundwater production, the GSP recognizes that impaired groundwater from the semi-perched aquifer[172] could migrate

[169] Oxnard Subbasin GSP, Section 3.3.4.1 - 3.3.4.2, p. 414-415.
[170] Oxnard Subbasin GSP, Section 4.6.4, p. 487.
[171] Oxnard Subbasin GSP, Section 4.3.1, p. 478.
[172] Oxnard Subbasin GSP, Section 2.3.4.7, p. 155.

vertically and impact the underlying Oxnard aquifer.[173] Staff recommend that the GSAs provide additional information to demonstrate that the network can effectively characterize conditions in the semi-perched aquifer and in the vicinity of GDEs (see Recommended Corrective Action 1).

4.5 PROJECTS AND MANAGEMENT ACTIONS

GSP Regulations require a description of the projects and management actions the submitting agency has determined will achieve the sustainability goal for the basin, including projects and management actions to respond to changing conditions in the basin.[174]

4.5.1 Evaluation Summary

The Agency has already been managing groundwater in the Subbasin by implementing various management actions to address the undesirable results described in the GSP. In addition to the currently operational Advanced Water Purification Facility project, the GSP proposes projects that, if implemented, will likely allow the Subbasin to be operated within its sustainable yield by decreasing reliance on groundwater within the Subbasin.

Furthermore, Department staff find that the management actions, which focus largely on reducing groundwater production, directly relate to the sustainable management criteria and present a generally feasible approach to achieving the sustainability goal of the Subbasin and are generally consistent with the requirements of the GSP Regulations. However, the GSP lacks specific details regarding the pumping reduction plan, the projects and management actions that will be implemented, expected timelines of projects and management actions, and when the Agency expects to see benefits from implemented projects and management actions. Department staff understand that many of these details will be developed during the next several years. Since meeting the sustainability goal for the Subbasin is largely dependent on implementation of the projects and in particular the management actions, failure to implement these projects and management actions, or material modifications, may affect the Department's conclusions regarding the adequacy of the GSP or its implementation in future evaluations.

4.5.2 Projects

To meet the sustainability goal of the Subbasin, the Plan provides details for five projects:[175]

1. Complete construction of the Advanced Water Purification Facility (AWPF)
    - Provide City of Oxnard with up to 6.25 million gallons per day for reclaimed water uses

[173] Oxnard Subbasin GSP, Section 2.2.3, p. 122-123, Section 2.3.4.7, p. 156.
[174] 23 CCR § 354.44 *et seq*.
[175] Oxnard Subbasin GSP, Section 5.2, p. 536-548.

2. Expand the capacity of the AWPF to provide additional reclaimed water for recharge
3. River Park-Saticoy Groundwater Replenishment and Reuse Project Recycled Water Project
    - Extend three miles of pipeline to convey water from the AWPF Expansion Project to two groundwater recharge facilities operated by UWCD
4. Freeman Expansion Project
    - Construct facilities capable of diverting Santa Clara River water at higher flow rates and with higher sediment loads
5. Temporary agricultural land fallowing project
    - Use replenishment fees collected by the Agency to lease and temporarily fallow agricultural land in specific areas more susceptible to seawater intrusion

All five projects include a description, the relationship to sustainability criteria, expected benefits, metrics for evaluation, and funding sources. The Plan states that Phase 1 of Project 1 (constructing the AWPF) has already been permitted and constructed and began delivering reclaimed water to agricultural operators in 2016. The AWPF is currently producing up to 4,600 acre-feet of reclaimed water per year

The Agency provided timelines for project implementation to be within 10 years,[176] but the GSP explicitly states that inclusion of these projects in the GSP does not mean the Agency is making a commitment to fund or construct these projects; rather, these projects met various feasibility criteria and were analyzed to understand their impacts on groundwater elevation and the sustainable yield of the Subbasin.[177] The GSP further states that these projects were included because they have quantifiable information for evaluation and modelling rather than because of the project feasibility.[178]

The Agency used the numerical model to simulate scenarios with projects to determine the relationship between projects and groundwater elevations in the Subbasin. The model simulations indicate that groundwater elevations were slightly higher with the proposed projects than without projects[179] and show that the proposed projects are reasonable to address the undesirable results related to seawater intrusion occurring in the Subbasin.[180]

The GSP identifies some uncertainties with respect to the successful implementation of the projects. The operational uncertainties described in the GSP are:

[176] Oxnard Subbasin GSP, Section 5.2, p. 538-548.
[177] Oxnard Subbasin GSP, Section 5.1, p. 535.
[178] Oxnard Subbasin GSP, Section 5.1, p. 535.
[179] Oxnard Subbasin GSP, Section 2.4, p. 177-190; Figure 3-6 - 3-11, p. 449-467.
[180] Oxnard Subbasin GSP, Figure 2-63, p. 361, Appendix E, Figure 4 and Figure 5, p. 1711-1712.

- the source of additional secondary effluent for the expansion of the AWPF project
- the availability of high flow in the Santa Clara River for diversion of additional surface water flow
- the availability of the lessors to participate in the temporary agricultural land fallowing project
- the funding sources for the proposed projects have been identified in the Plan as the replenishment fee and grant fund, but the reliability of these funding sources have not been discussed.

Furthermore, a comment letter received by the Department discusses the disagreement between the agencies regarding implementation of projects 1, 2 and 3, and the letter challenged the Agency's authority to implement the projects identified in the GSP. Department staff recommend FCGMA rectifies the differences between the agencies and arrive at an agreement so that the projects can be implemented in the desired schedule.

Despite the uncertainties discussed above, Department staff find that, at this time, the GSP provides a reasonable discussion of how the projects are related to the basin sustainability and provides a general implementation timeline. The projects are developed by the GSAs to help ensure that the Subbasin will be operated within its sustainable yield and are expected to mitigate the overdraft condition. Therefore, Department staff believe that the projects included in the GSP demonstrate a feasible approach to meet the Subbasin's sustainability goals and appears to help in improving groundwater conditions in the Subbasin.

4.5.3 Management Actions

The GSP describes two management actions, which include reducing groundwater production and a water market pilot program. The GSP discusses the relationship between the management actions and sustainability criteria, expected benefits, metrics for evaluation, and funding sources. The GSP states that reducing groundwater production is the primary management action[181] that can be implemented by the Agency and is a critical component of achieving sustainability.[182] The Agency intended to implement these management actions within five years of GSP adoption, upon approval by the FCGMA board.

In regard to the proposed water market pilot program, the program will allow for transfer of extraction allocations, but excludes transfers in the Saline Water Intrusion Management Area and Pumping Depression Management Area if the transfer results in a net increase in the total market allocation for participants. The participants in these management areas may receive a transfer of market allocation only from another participant in the same

[181] Oxnard Subbasin GSP, Executive Summary, p. 25.
[182] Oxnard Subbasin GSP, Section 5.7.2, p. 549.

management area. In placing these parameters on its market allocation transfers, the Agency aims to avoid undesirable impacts related to seawater intrusion.

The GSP provides an overview of how and when the management actions will be implemented, but also identifies that allocations need to be determined and approved by the GSAs. Department staff believe that both the management actions included in the Plan can reasonably mitigate overdraft and, if implemented, appear likely to help the GSAs achieve sustainability in the Subbasin. Department staff's understanding is that the ability of the GSP to achieve the sustainability goal for the Subbasin is largely dependent on successful implementation of a management action to reduce groundwater pumping. As such, the Department will closely monitor the Agency's progress in developing and implementing such a management action.

4.6 Consideration of Adjacent Basins/Subbasins

SGMA requires the Department to "…evaluate whether a groundwater sustainability plan adversely affects the ability of an adjacent basin to implement their groundwater sustainability plan or impedes achievement of sustainability goals in an adjacent basin."[183] Furthermore, the GSP Regulations state that minimum thresholds defined in each GSP should be designed to avoid causing undesirable results in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals.[184]

The Oxnard Subbasin has four adjacent basins/subbasins: Pleasant Valley, Las Posas, Mound, and Santa Paula. The Oxnard Subbasin is in hydraulic communication, in varying degrees, with all of those adjacent basins and subbasins. FCGMA is the lead GSA and exclusive GSA for developing and implementing the respective groundwater sustainability plans in the Oxnard Subbasin, Pleasant Valley Basin, and Las Posas Basin. FCGMA took a regional approach to determine the combined sustainable yield of all three basins and then determined the sustainable yield for each groundwater basin. The sustainable management criteria for each respective groundwater sustainability plan were established with consideration for the sustainability goals of the adjacent basins and to operate each groundwater basin within their sustainable yield.

The GSP of Mound Subbasin is being developed by the Mound Basin GSA, which is a joint powers authority comprised of three local public agencies. Department staff recommend that the Agency continue to collaborate and communicate with the Mound Basin GSA to ensure that the basins in the region do not prevent each other from achieving sustainability.

The Santa Paula Subbasin is an adjudicated basin currently managed by UWCD per the physical solution embodied within the Court Judgment. Department staff recommend that

[183] Water Code § 10733(c).
[184] 23 CCR § 354.28(b)(3).

the GSAs work with UWCD to corroborate that the implementation of Oxnard GSP does not adversely affect the UWCD's management of the Santa Paula.

Department staff understand that the established sustainability management criteria and strategy to reach sustainability in the Oxnard Subbasin is primarily related to improving groundwater levels in the principal aquifers and avoiding seawater intrusion. Based on this strategy, on the Agency's history of actively collaborating with local agencies, other information provided in the Plan, and because the Agency took a regional approach in developing the respective groundwater sustainability plans and provided reasonable consideration to adjacent basins and their sustainability metrics, Department staff determined that the Oxnard Subbasin GSP will not adversely impact the ability of the adjacent basins to be operated sustainably and will not impede the adjacent basins' ability to achieve their respective sustainability goals.

5 STAFF RECOMMENDATION

Department staff's recommendation is to approve the GSP with the recommended corrective actions listed below. The Oxnard Subbasin GSP conforms with Water Code Sections 10727.2 and 10727.4 of SGMA and substantially complies with the GSP Regulations. Implementation of the GSP will likely achieve the sustainability goal for the Oxnard Subbasin. The GSAs have identified several areas for improvement of the GSP and Department staff concur that those items are important and should be addressed as soon as possible. Department staff have also identified additional recommended corrective actions that should be considered by the GSAs for the first five-year assessment of its GSP. Addressing these recommended corrective actions will be important to demonstrate that implementation of the GSP is likely to achieve the sustainability goal. The recommended corrective actions include:

RECOMMENDED CORRECTIVE ACTION 1

Investigate the hydraulic connectivity between the surface water bodies, semi-perched aquifer, and principal aquifers to improve the understanding of potential migration of impaired water, the reliance of two potential GDEs on the semi-perched aquifer, and depletion of interconnected surface water bodies. Also, identify specific locations of gaining and losing reaches of surface water bodies and quantify the depletion of interconnected surface water. Describe schedule and steps that will be taken to fill data gaps identified in the GSP related to shallow groundwater monitoring near surface water bodies and GDEs.

RECOMMENDED CORRECTIVE ACTION 2

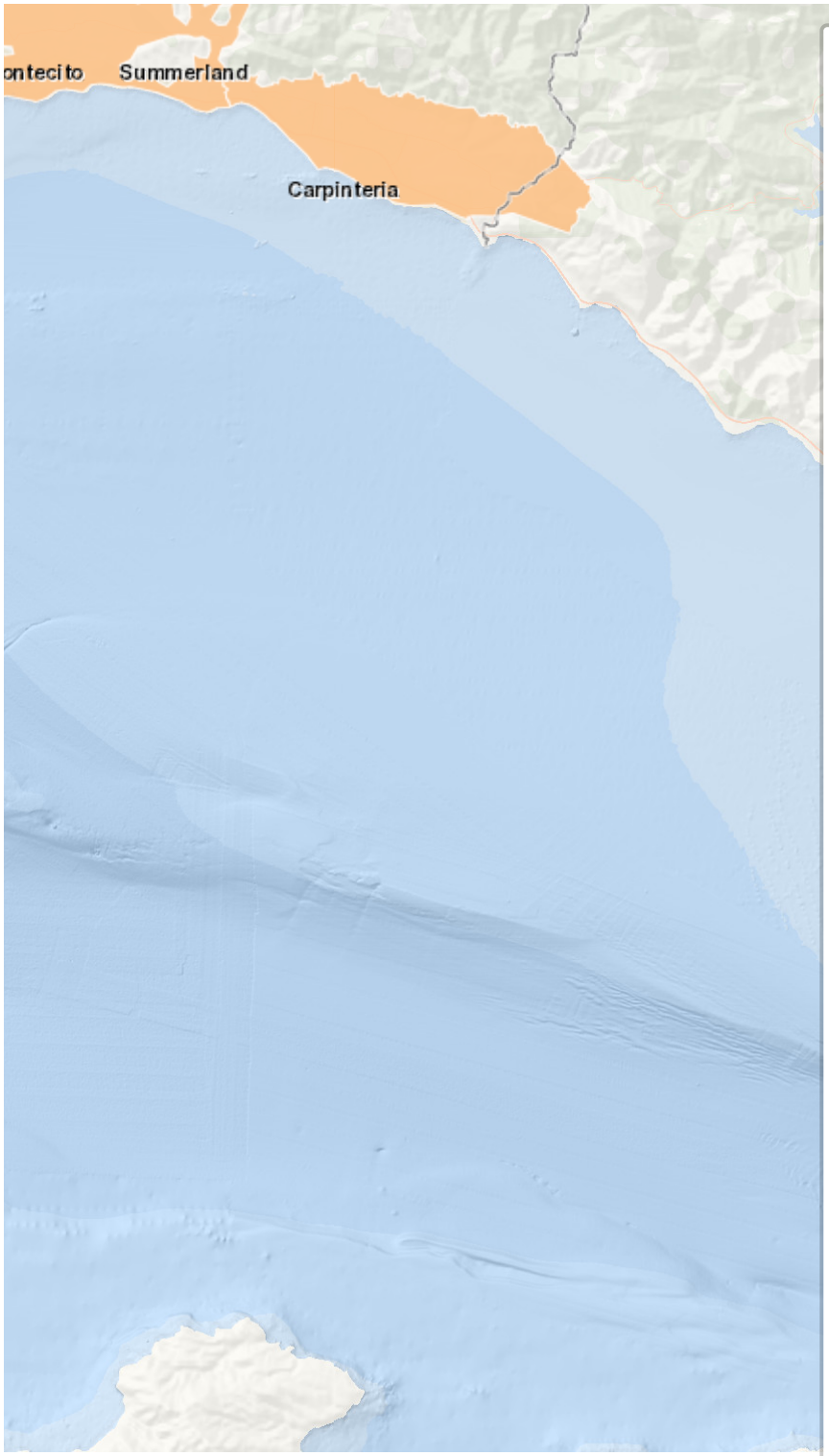
Under the dry climatic condition scenario, the groundwater levels will only reach minimum thresholds by 2040, which will limit seawater intrusion but not necessarily avoid the condition. Discuss the impact of further seawater intrusion and associated loss of storage on beneficial uses and users under the dry climatic condition scenario and the potential impacts to uses and users inland of the 2015 saline water impact area if landward migration of the saline water impact front continues.

RECOMMENDED CORRECTIVE ACTION 3

Incorporate periodic subsidence monitoring into the GSP's monitoring plan that can be used to quantify whether land subsidence is occurring and whether the groundwater level proxy is avoiding undesirable results associated with land subsidence. As an option, the Department provides statewide InSAR data that can be used for monitoring land subsidence.

RECOMMENDED CORRECTIVE ACTION 4

Elaborate how the Agency is planning to verify that the groundwater level thresholds are adequate to assess the groundwater quality conditions in the Subbasin. Discuss how the groundwater quality data from the existing monitoring network will be used for sustainable management of the Subbasin. Coordinate with the appropriate groundwater users, as identified in the GSP, and the appropriate water quality agencies in the Subbasin to evaluate how the Agency's current groundwater management strategy is affecting the groundwater quality in the Subbasin.



Basin Priority Details

VENTURA RIVER VALLEY - LOWER VENTURA RIVER (4-003.02)

Phase 1 (FINAL)

Very Low 0 Priority Points

Component 1 - Population	
Population (2010)	15,911
Pop / mi^2	1,935
C1 Priority Points	**3**

Component 2 - Population Growth	
Population (2030)	16,744
Pop Growth	5%
C2 Priority Points	**1**

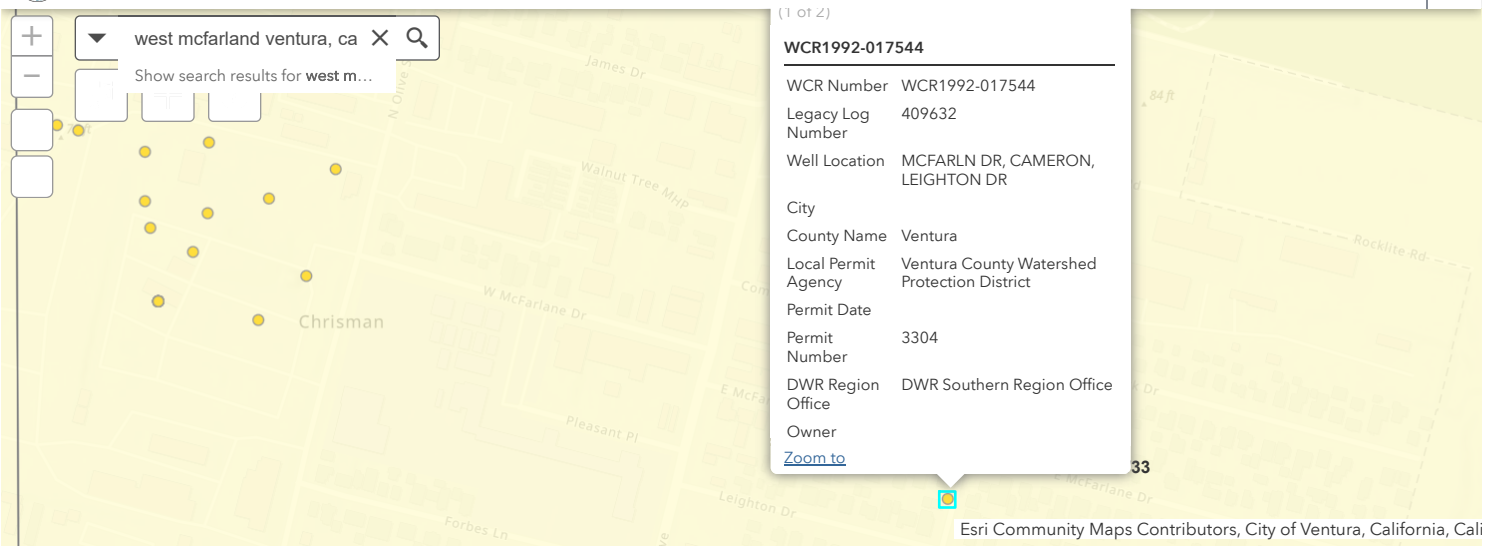
Component 3 - Public Supply Wells	
Public Supply Wells	0
PSW / mi^2	0
C3 Priority Points	**0**

Component 4 - Total Wells	
Total Wells	17
Wells / mi^2	2.06
C4 Priority Points	**2**

Component 5 - Irrigated

Well Completion Report Map Application

Well Completion Report PDFs for Amador County are temporarily not available.



300ft

-119.298 34.298 Degrees

Well Completion Reports

Options | Filter by map extent | Zoom to | Clear selection | Refresh

WCR Number	Legacy Log Number	Owner Assigned Well Number	Well Location	City	County Name	Local Permit Agency	Permit Date	Permit Number	Region Office	Record Type
WCR2017-005910	e0337509	BMW-4	1689 Olive ST	Ventura	Ventura	Ventura County Water Resources	11/10/2016	GWP-08070	DWR Southern Region Office	WellCompletior

25 features 0 selected

How's My Waterway?

Informing the conversation about your waters.

Waterbody Report

Ventura River Reach 1 and 2 (Estuary to Weldon Canyon)

Assessment Unit ID: CAR4021001119990203084656

Waterbody Condition: Impaired (Issues Identified)

Existing Plans for Restoration: No

303(d) Listed: Yes

Year Reported: 2022

Organization Name (ID): California (CA_SWRCB)

What type of water is this?

Stream/creek/river (4.45 Miles)

Where is this water located?

Information Not Available

Assessment Information from 2022

State or Tribal Nation specific designated uses:

Information on Water Quality Standards

Expand All

Cold Freshwater Habitat	Good
Municipal and Domestic Supply	Good
Non-Contact Water Recreation	Impaired

Warm Freshwater Habitat	Impaired	>
Water Contact Recreation	Good	>

Probable sources contributing to impairment from 2022:

Clear Filters

Source	Parameter	Confirmed
Filter...	Filter...	Filter...
Source Unknown	Algae	No
Source Unknown	Benthic Macroinvertebrates Bioassessments	No

Clear Filters

Assessment Documents

No documents are available

Plans to Restore Water Quality

What plans are in place to protect or restore water quality?

Links below open in a new browser tab.

Plan	Impairments	Type	Date
Ventura River and Its Tributaries Total Maximum Daily Load for Algae, Eutrophic Conditions, and Nutrients	Algae, Dissolved Oxygen, Eutrophication, Flow Alteration(s), Nitrogen, Nutrients, Organic Enrichment/low Dissolved Oxygen, Pumping, Trash, Water Diversion	TMDL	2013-06-28

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Drinking Water Regulations and Contaminants

On this page:

- National primary drinking water regulations (NPDWRs)
- List of drinking water contaminants and their maximum contaminant levels (MCLs)
- National secondary drinking water regulations (NSDWRs)
- List of secondary drinking water regulations
- Unregulated drinking water contaminants

National Primary Drinking Water Regulations (NPDWRs)

NPDWR (National Primary Drinking Water Regulations)s (or primary standards) are legally enforceable standards that apply to public water systems.

Additional Resource

- NPDWR Alphabetical List (PDF)(6 pp, 924 K, About PDF <https://epa.gov/home/pdf-files>) EPA 816-F-09-004, May 2009

Primary standards protect public health by limiting the levels of contaminants in drinking water.

- Regulation Timeline: Contaminants Regulated Under the Safe Drinking Water Act <https://epa.gov/node/119195/>
- Read more information about NPDWRs in the Code of Federal Regulations <https://epa.gov/dwregdev/how-epa-regulates-drinking-water-contaminants-documents>

List of Primary Drinking Water Contaminants and their Maximum Contaminant Levels (MCLs)

- Table of Regulated Drinking Water Contaminants <https://epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations>

National Secondary Drinking Water Regulations (NSDWRs)

NSDWRs (or secondary standards) are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. EPA recommends secondary standards to water systems but does not require systems to comply with the standard. However, states may choose to adopt them as enforceable standards.

While secondary standards are not federally enforceable, EPA requires a special notice for exceedance of the fluoride secondary standard of 2.0 mg/L. Community water systems that exceed the fluoride secondary standard of 2 mg/L, but do not exceed the primary standard of 4.0 mg/L for fluoride, must provide public notice to persons served no later than 12 months from the day the water system learns of the exceedance (40 CFR 141.208).

List of National Secondary Drinking Water Regulations

Contaminant	Secondary Standard
Aluminum	0.05 to 0.2 mg/L
Chloride	250 mg/L
Color	15 (color units)
Copper	1.0 mg/L
Corrosivity	noncorrosive
Fluoride	2.0 mg/L
Foaming Agents	0.5 mg/L

Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor	3 threshold odor number
pH	6.5-8.5
Silver	0.10 mg/L
Sulfate	250 mg/L
Total Dissolved Solids	500 mg/L
Zinc	5 mg/L

Unregulated Drinking Water Contaminants

This list of contaminants which, at the time of publication, are not subject to any proposed or promulgated national primary drinking water regulation (NPDWRs), are known or anticipated to occur in public water systems, and may require regulations under the Safe Drinking Water Act (SDWA).

For more information visit the Drinking Water Contaminant Candidate List (CCL) and Regulatory Determination Website <https://epa.gov/node/50301/>.

Contact Us <https://epa.gov/sdwa/forms/contact-us-about-safe-drinking-water-act> to ask a question, provide feedback, or report a problem.

LAST UPDATED ON FEBRUARY 14, 2023

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U.S. Department of Homeland Security
1111 Broadway,
Suite1200
Oakland, CA. 94607-4052

FEMA

August 31, 2007

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Jeff Pratt
Ventura County Department of Public Works
800 South Victoria Avenue
Ventura, CA 93009
(805) 654-2040

Dear Mr. Pratt:

This letter is in regard to the levees that are accredited on the effective Flood Insurance Rate Map (FIRM) and in the effective Flood Insurance Study (FIS) report for the Ventura County Watershed Protection District. These levees are identified on an enclosure to this letter. The U.S. Department of Homeland Security, Federal Emergency Management Agency (FEMA), is in the process of producing a countywide FIS report and Digital Flood Insurance Rate Map (DFIRM) for Ventura County, California. This effort is being undertaken as part of FEMA's Flood Map Modernization Program.

Flood hazard information presented on the effective FIRM and in the FIS report is based, in some areas, on flood protection provided by the levees identified on the enclosure. Based on the information available and on the mapping standards of the National Flood Insurance Program (NFIP) at the time that the FIS was performed, FEMA accredited the levees with providing protection from the flood that has a 1-percent-chance of being equaled or exceeded in any given year. The 1-percent-annual-chance flood also is referred to as the base flood.

For FEMA to continue to accredit the identified levees with providing protection from the base flood, the levees must meet the criteria of the Code of Federal Regulations, Title 44, Section 65.10 (44 CFR 65.10), titled "Mapping of Areas Protected by Levee Systems" (copy enclosed). In accordance with 44 CFR 65.10(a), it is the responsibility of the community or other party seeking recognition of a levee system, to provide the data defined and outlined within the regulation. Specifically, the design and construction data provided must be certified by a registered professional engineer or by a Federal agency with responsibility for levee design.

FEMA understands that it may take time to acquire and/or assemble the documentation necessary to fully comply with 44 CFR 65.10. Therefore, FEMA has incorporated a process into the schedule of Flood Map Modernization that, if needed, will provide the Ventura County Watershed Protection District with additional time to submit all the necessary documentation. Initiation of this process can take place only if the levee owner and a representative of each impacted community sign and return the enclosed agreement to the FEMA Region IX office within 90 days of the date of this letter (before November 30, 2007).

In addition, the following must be provided:

- A copy of the adopted operation and maintenance plan for the levee; and
- Records of levee maintenance and operation, as well as tests of the mechanized interior drainage systems, if applicable.

Completion and submittal of the agreement, as well as the operation and maintenance plan and records, will serve as an official request that FEMA label the levee as a Provisionally Accredited Levee (PAL) on the DFIRM and will serve as agreement that, to the best of your knowledge, the levee meets the criteria of 44 CFR 65.10. It is the responsibility of the levee owner to submit the data required by 44 CFR 65.10 before FEMA can accredit the levee as providing protection from the base flood. The completed package must be submitted to the FEMA Region IX office before November 30, 2007 for the levee to receive the PAL designation. Please note that a levee that has maintenance deficiencies is not eligible for PAL consideration.

By endorsing the enclosed agreement, you state that all the necessary documentation will be provided within 2-years to comply with 44 CFR 65.10; that is before September 1, 2009. If you are unable to submit all the documentation necessary to meet the criteria of 44 CFR 65.10 before this date, FEMA will initiate a map revision to redesignate certain areas on the landward side of the levee as floodprone.

Levees will be labeled as PALs during the 24-month period to convey to map users that levee certification verification is underway. FEMA recommends that the levee owner and the impacted communities implement outreach efforts to inform affected property owners that an assessment of the levee is underway. FEMA also encourages the purchase of flood insurance, even though coverage is not federally required for the areas landward of the accredited levee.

If the documentation necessary to fully comply with 44 CFR 65.10, including an existing operation and maintenance plan and record of on-site inspection, is readily available, please submit the data to this office. Upon receipt of your submittal, FEMA will review the data and determine whether the levee will continue to be accredited with providing protection from the base flood.

If the only grounds for the levee in question not currently meeting the 44 CFR 65.10 criteria or PAL requirements are **maintenance issues**, then the FEMA Region IX office must be contacted by letter to bring attention to the matter before the end of this 90-day period to submit the enclosed PAL agreement. If you notify FEMA that the levee has known maintenance deficiencies, then a 1-year correction period can be provided to remedy these deficiencies. This 1-year correction period would begin on November 30, 2007, if you notify FEMA within 90 days of the date of this letter. During the 1-year correction period, FEMA will move forward with the current flood hazard mapping project as if the areas landward of the levee is to be located in a Special Flood Hazard Area (SFHA); the mapped area subject to inundation by the base flood. However, FEMA will delay issuance of the Letter of Final Determination (LFD) and effective DFIRM until the 1-year correction period has elapsed.

For FEMA to remove the SFHA landward of the levee, the following requirements must be met within the 1-year correction period:

- All the criteria contained in 44 CFR 65.10 submitted to FEMA, <u>or</u>
- Submittal of the entire PAL application, including the following documentation:
  - An agreement signed by the community and/or levee owner stating that the PAL

designation is warranted because the levee meets the requirements of 44 CFR 65.10;
- o A copy of the adopted operation and maintenance plan for the levee; and
- o Records of levee maintenance and operation, as well as tests of the mechanized interior drainage systems, if applicable.

Once the 1-year correction period has expired, FEMA will assess any submitted data and determine whether any mapping revisions are necessary. If no data have been submitted within the 1-year correction period, or if the submitted data are determined inadequate, FEMA will issue the LFD and effective DFIRM to show the areas landward of a maintenance deficient levee as located in a SFHA. However, if all of the criteria of 44 CFR 65.10 or the entire PAL application is submitted before the 1-year correction period has elapsed, then FEMA will show the levee on the newly effective DFIRM as accredited or provisionally accredited, as applicable.

If you have additional questions regarding the specific submittal requirements, please contact Raymond T. Lenaburg, Senior Engineer, of my staff, either by telephone at (510) 627-7181 or by facsimile at (510) 627-7147 or by facsimile at (510) 627-7147. We look forward to working with you and community officials to address this important matter. If there is anything we can do to facilitate the submittal process, please let us know.

Sincerely,

For: Sally Ziolkowski, Director
Mitigation Division
FEMA Region IX

Enclosures:
- Title 44 of the Code of Federal Regulations (CFR), Section 65.10 (44 CFR 65.10)
- Requirements of 44 CFR Section 65.10: Mapping of Areas Protected by Levee Systems
- Letter of Agreement and Request for Provisionally Accredited Levee (PAL) Designation and Agreement to Provide Adequate Compliance With the Code of Federal Regulations, Title 44, Section 65.10 (44 CFR 65.10)
- Levee Status Map
- Levee Status Table

Copies Furnished

Senator Feinstein State Office

Senator Boxer State Office

Representative Gallegly District Office

Ricardo Pineda, CA DWR
NFIP State Coordinator

Colonel Thomas H. Magness, USACE, LA District
Commander

Mr. Gerard Kapuscik, Special Projects Project Manager
Ventura County Watershed Protection District

Letter of Agreement and Request for Provisionally Accredited Levee (PAL) Designation and Agreement to Provide Adequate Compliance with the Code of Federal Regulations, Title 44, Section 65.10 (44 CFR 65.10)

PAL Agreement Form

We, the undersigned, have received a letter from FEMA dated August 31, 2007 with an enclosed *"Levee Status Table"* and two enclosed documents titled *"Title 44 of the Code of Federal Regulations (CFR), Section 65.10 (44 CFR 65.10)"* and *"Requirements of 44 CFR Section 65.10: Mapping of Areas Protected by Levee Systems."* We understand that FEMA is in the process of providing an updated Flood Insurance Rate Map for Ventura County, California and that the flood hazards around levee(s) identified on the *Map* and *Levee Status Table* with ID numbers ____, ____, ____, will be remapped to reflect that these levees have been designated a PAL. This/these levee(s) or levee system(s) is/are also known as _____ _____.

To the best of our knowledge, the levee(s) identified above meet the criteria of 44 CFR 65.10 and has/have been maintained in accordance with an adopted operation and maintenance plan. For Scenario A (non-USACE Program) levees, this must be evidenced by an attached Operation and Maintenance Plan and records of levee maintenance and operation, as well as Test Records of Mechanized Interior Drainage System. We hereby submit to FEMA within 90 days (before November 30, 2007) our agreement to provide FEMA with all the necessary information to show that the levee(s) identified above comply with 44 CFR 65.10. We understand that this documentation will be provided before September 1, 2009. Providing the information described in 44 CFR 65.10 will allow FEMA to move forward with the flood mapping for Ventura County, California. We fully understand that if complete documentation of compliance with 44 CFR 65.10 is not provided within the designated timeframe of 24 months, FEMA will initiate a revision to the Flood Insurance Rate Map for Ventura County, California to redesignate the area as floodprone.

Levee Owner Representative (signature): _____ Date: _____

Levee Owner Representative (print name): _____

Community CEO (signature): _____ Date: _____

Community CEO (print name): _____

Other, if applicable (signature): _____ Date: _____

Other, if applicable (print name): _____

Required Attachments for Scenario A (non-USACE Program) Levees only:

- Operation and Maintenance Plan and Records
- Test Records of Mechanized Interior Drainage System

Instructions for Completing this Form:

- On this PAL Agreement Form, fill-in the levee ID numbers and levee(s) name/description for which the Provisionally Accredited Levee (PAL) designation is requested. A separate PAL Agreement Form is recommended for each unique levee owner/levee system. Make copies of this blank form to request PAL designation for multiple levee systems, as necessary.
- This document is available on-line (in a PDF format that can be filled-in electronically) via the link named "Generic PAL Agreement Form for Region IX" at http://rmc.mapmodteam.com/rmc9/Fact_Sheets.htm

City of Camarillo

Levee Object ID	VCWPD Levee ID	Type	USACE Constructed Levee	Community	Levee Status	Flood Source	Effective FIRM Panel	Organization	Congressional District Representative	Comment
14	CON-1	Levee	No	Ventura County, City of Camarillo	May be PAL A eligible	Conejo Creek	0650200003B, 0650200006B	Ventura County Watershed Protection District	Representative Gallegly	
110	CHD-1	Levee	No	Ventura County, City of Camarillo	May be PAL A eligible	Camarillo Hills Drain	0604130905B, 0650200004B	Ventura County Watershed Protection District	Representative Gallegly	
119	CC-3	Levee	No	City of Camarillo	May be PAL A eligible	Calleguas Creek	0650200005B	Ventura County Watershed Protection District	Representative Gallegly	
120	CC-2	Levee	No	City of Camarillo	May be PAL A eligible	Calleguas Creek	0650200002B, 0650200005B	Ventura County Watershed Protection District	Representative Gallegly	

City of Fillmore

Levee Object ID	VCWPD Levee ID	Type	USACE Constructed Levee	Community	Levee Status	Flood Source	Effective FIRM Panel	Organization	Congressional District Representative	Comment
46	SC-1	Levee	Yes	Ventura County, City of Fillmore	May be PAL A eligible	Sespe Creek	0604150001D, 0604130620B, 0604130615B	Ventura County Watershed Protection District	Representative Gallegly	MAPIX is currently performing levee failure analysis for this levee.
81	N/A	Levee-like	No	Ventura County, City of Fillmore	May be PAL A eligible	Pole Creek	0604150001D, 0604130620B	Ventura County Watershed Protection District	Representative Gallegly	MAPIX is currently performing levee failure analysis for this levee.
82	N/A	Levee-like	No	Ventura County, City of Fillmore	May be PAL A eligible	Pole Creek	0604150001D, 0604130620B	Ventura County Watershed Protection District	Representative Gallegly	MAPIX is currently performing levee failure analysis for this levee.
106	SCR-4	Levee	No	City of Fillmore	May be PAL A eligible	Santa Clara River	0601500011D	City of Fillmore	Representative Gallegly	
114	SCR-5	Levee	No	City of Fillmore	May be PAL A eligible	Santa Clara River	0604130620B, 0601500011D	City of Fillmore	Representative Gallegly	

City of Moorpark

Levee Object ID	VCWPD Levee ID	Type	USACE Constructed Levee	Community	Levee Status	Flood Source	Effective FIRM Panel	Organization	Congressional District Representative	Comment
35	N/A	Levee-like	No	City of Moorpark	May be PAL A eligible	Calleguas Creek	0607120005A	Ventura County Watershed Protection District	Representative Gallegly	
39	N/A	Levee-like	No	Ventura County, City of Moorpark	May be PAL A eligible	South Grimes Canyon Wash	604130795B, 0607120005A	Ventura County Watershed Protection District	Representative Gallegly	
122	AS-2	Levee	No	City of Moorpark	May be PAL A eligible	Calleguas Creek	0607120005A	Ventura County Watershed Protection District	Representative Gallegly	
123	AS-2	Levee	No	City of Moorpark	May be PAL A eligible	Calleguas Creek	0607120005A	Ventura County Watershed Protection District	Representative Gallegly	
124	AS-3	Levee	No	City of Moorpark	May be PAL A eligible	Calleguas Creek	0607120005A	Ventura County Watershed Protection District	Representative Gallegly	
125	AS-3	Levee	No	City of Moorpark	May be PAL A eligible	Calleguas Creek	0607120005A	Ventura County Watershed Protection District	Representative Gallegly	
126	AS-4	Levee	No	City of Moorpark	May be PAL A eligible	Calleguas Creek	0607120005A	City of Moorepark	Representative Gallegly	

City of Oxnard

Levee Object ID	VCWPD Levee ID	Type	USACE Constructed Levee	Community	Levee Status	Flood Source	Effective FIRM Panel	Organization	Congressional District Representative	Comment
76	N/A	Levee-like	No	Ventura County, City of Oxnard	May be PAL A eligible	Victoria Avenue Drain	0604130880B, 0604170005C	Ventura County Watershed Protection District	Representative Capps	MAPIX is currently performing levee failure analysis for this levee.
77	N/A	Levee-like	No	Ventura County, City of Oxnard	May be PAL A eligible	Victoria Avenue Drain	0604130880B, 0604170005C	Ventura County Watershed Protection District	Representative Capps	MAPIX is currently performing levee failure analysis for this levee.
78	ERD-1	Levee	No	City of Oxnard	May be PAL A eligible	El Rio Drain	0604130885B, 0604130880B	Ventura County Watershed Protection District	Representative Capps	MAPIX is currently performing levee failure analysis for this levee.
86	SCR-3	Levee	No	City of Oxnard	May be PAL A eligible	Santa Clara River	0604130885B, 0604130880B	Ventura County Watershed Protection District	Representative Capps	MAPIX is currently performing levee failure analysis for this levee.
87	SCR-3, SCR-6	Levee	No	Ventura County, City of Oxnard	May be PAL A eligible	Santa Clara River	0604130880B	Ventura County Watershed Protection District	Representative Capps	MAPIX is currently performing levee failure analysis for this levee.

City of San Buenaventura

Levee Object ID	VCWPD Levee ID	Type	USACE Constructed Levee	Community	Levee Status	Flood Source	Effective FIRM Panel	Organization	Congressional District Representative	Comment
53	VR-1	Levee	Yes	Ventura County, City of San Buenaventura	May be PAL A or PAL B eligible	Ventura River	0604130720B, 0604190005B	Ventura County Watershed Protection District	Representative Gallegly	
102	VR-2	Levee	No	Ventura County, City of San Buenaventura	May be PAL A eligible	Ventura River	0604130545C, 0604130710B	Ventura County Watershed Protection District	Representative Gallegly	
104	SCR-2	Levee	No	City of San Buenaventura	May be PAL A eligible	Santa Clara River	0604130745B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	

City of Santa Paula

Levee Object ID	VCWPD Levee ID	Type	USACE Constructed Levee	Community	Levee Status	Flood Source	Effective FIRM Panel	Organization	Congressional District Representative	Comment
105	SPC-1	Levee	Yes	Ventura County, City of Santa Paula	May be PAL B eligible	Santa Paula Creek	0604130760C, 060420003D	USACE	Representative Gallegly	

City of Simi Valley

Levee Object ID	VCWPD Levee ID	Type	USACE Constructed Levee	Community	Levee Status	Flood Source	Effective FIRM Panel	Organization	Congressional District Representative	Comment
74	N/A	Levee-like	No	City of Simi Valley	May be PAL A eligible	Arroyo Simi	0604210001A	Ventura County Watershed Protection District	Representative Gallegly	
107	AS-7	Levee	No	City of Simi Valley	May be PAL A eligible	Arroyo Simi	0604210009B	Ventura County Watershed Protection District	Representative Gallegly	
108	AS-6	Levee	No	City of Simi Valley	May be PAL A eligible	Arroyo Simi	0604210002B, 0604210004B	Ventura County Watershed Protection District	Representative Gallegly	

112	AS-7	Levee	No	City of Simi Valley	May be PAL A eligible	Arroyo Simi	0604210009B	Ventura County Watershed Protection District	Representative Gallegly	

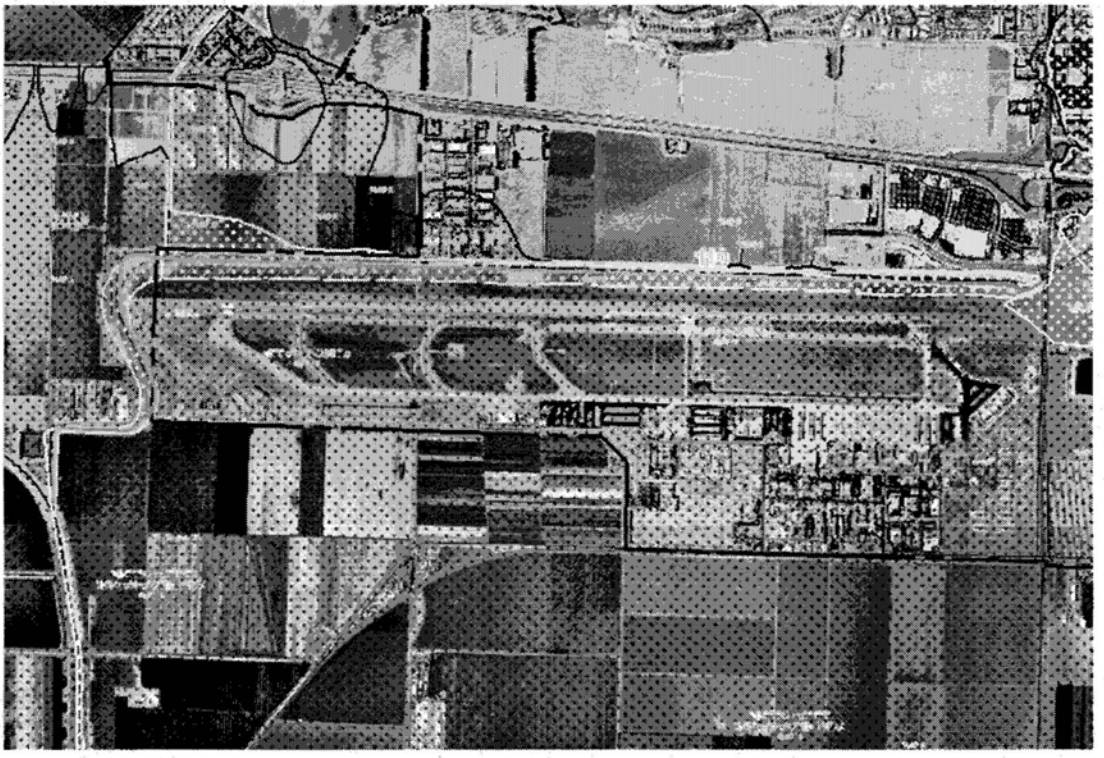
Ventura County

Levee Object ID	VCWPD Levee ID	Type	USACE Constructed Levee	Community	Levee Status	Flood Source	Effective FIRM Panel	Organization	Congressional District Representative	Comment
1	N/A	Levee-like	No	Ventura County	May be PAL A eligible	Todd Barranca	0604130570B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	
11	N/A	Levee-like	No	Ventura County	May be PAL A eligible	Hidden Valley Wash	0604130945B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	
12	N/A	Levee-like	No	Ventura County	May be PAL A eligible	Lake Sherwood	0604130945B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	
14	CON-1	Levee	No	Ventura County, City of Camarillo	May be PAL A eligible	Conejo Creek	0650200003B, 0650200006B	Ventura County Watershed Protection District	Representative Gallegly	
15	N/A	Levee-like	No	Ventura County	May be PAL A eligible	Beardsley Wash	0604130905B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	
16	N/A	Levee-like	No	Ventura County	May be PAL A eligible	Nyeland Drain/Nyeland Drain Tributary	0604170010C, 0604130885B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	City of Oxnard protected by this structure; structure is not located in this community
18	SCR-1	Levee	Yes	Ventura County	May be PAL A eligible	Santa Clara River	0604310885B, 0604130765B, 0604130745B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	MAPIX is currently performing levee failure analysis for this levee.
24	N/A	Levee-like	No	Ventura County	May be PAL A eligible	Happy Camp Canyon	0604130825B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	
27	N/A	Levee-like	No	Ventura County	May be PAL A eligible	Pacific Ocean	0604130685C	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	
28	N/A	Levee-like	No	Ventura County	May be PAL A eligible	Tapo Canyon Creek	0604130665B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	
29	N/A	Levee-like	No	Ventura County	May be PAL A eligible	Santa Clara River	0604130665B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	
30	N/A	Levee-like	No	Ventura County	May be PAL A eligible	Holser Canyon Creek	0604130650B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	
37	N/A	Levee-like	No	Ventura County	May be PAL A eligible	Pacific Ocean	0604130705B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	
38	N/A	Levee-like	No	Ventura County	May be PAL A eligible	South Grimes Canyon Wash	604130795B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	
39	N/A	Levee-like	No	Ventura County, City of Moorpark	May be PAL A eligible	South Grimes Canyon Wash	604130795B, 0607120005A	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	
40	N/A	Levee-like	No	Ventura County	May be PAL A eligible	Calleguas Creek	0604130790B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	
46	SC-1	Levee	Yes	Ventura County, City of Fillmore	May be PAL A or PAL B eligible	Sespe Creek	0604150001D, 0604130620B, 0604130615B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	MAPIX is currently performing levee failure analysis for this levee.
52	N/A	Levee-like	No	Ventura County	May be PAL A eligible	Ellsworth Barranca	0604130750B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	
53	VR-1	Levee	Yes	Ventura County, City of San Buenaventura	May be PAL A or PAL B eligible	Ventura River	0604130720B, 0604190005B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	

67	N/A	Levee-like	No	Ventura County	May be PAL A eligible	San Antonio Creek	0604130545B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	
76	N/A	Levee-like	No	Ventura County, City of Oxnard	May be PAL A eligible	Patterson Drain	0604130880B, 0604170005C	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	MAPIX is currently performing levee failure analysis for this levee.
77	N/A	Levee-like	No	Ventura County, City of Oxnard	May be PAL A eligible	Patterson Drain	0604130880B, 0604170005C	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	MAPIX is currently performing levee failure analysis for this levee.
79	GCW-1	Levee	No	Ventura County	May be PAL A eligible	Grimes Canyon Wash	0604130620B, 0604130785B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	MAPIX is currently performing levee failure analysis for this levee.
80	GCW-1	Levee	No	Ventura County	May be PAL A eligible	Grimes Canyon Wash	0604130620B, 0604130785B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	MAPIX is currently performing levee failure analysis for this levee.
81	N/A	Levee-like	No	Ventura County, City of Fillmore	May be PAL A eligible	Pole Creek	0604150001D, 0604130620B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	MAPIX is currently performing levee failure analysis for this levee.
82	N/A	Levee-like	No	Ventura County, City of Fillmore	May be PAL A eligible	Pole Creek	0604150001D, 0604130620B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	MAPIX is currently performing levee failure analysis for this levee.
83	N/A	Levee-like	No	Ventura County	May be PAL A eligible	Basalo Ditch	0604130620B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	MAPIX is currently performing levee failure analysis for this levee.
84	N/A	Levee-like	No	Ventura County	May be PAL A eligible	Basalo Ditch	0604130620B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	MAPIX is currently performing levee failure analysis for this levee.
85	N/A	Levee-like	No	Ventura County	May be PAL A eligible	Piru Creek	0604130645B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	MAPIX is currently performing levee failure analysis for this levee.
87	N/A	Levee-like	No	Ventura County, City of Oxnard	May be PAL A eligible	Santa Clara River	0604130880B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	MAPIX is currently performing levee failure analysis for this levee.
88	N/A	Levee-like	No	Ventura County	May be PAL A eligible	Santa Clara River	0604130765B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	MAPIX is currently performing levee failure analysis for this levee.
91	N/A	Levee-like	No	Ventura County	May be PAL A eligible	Pacific Ocean	0604130515C	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	MAPIX is currently performing levee failure analysis for this levee.
94	N/A	Levee-like	No	Ventura County	May be PAL A eligible	Hopper Canyon	0604130640B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	MAPIX is currently performing levee failure analysis for this levee.
95	N/A	Levee-like	No	Ventura County	May be PAL A eligible	Hopper Canyon	0604130640B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	MAPIX is currently performing levee failure analysis for this levee.
96	N/A	Levee-like	No	Ventura County	May be PAL A eligible	Hopper Canyon	0604130640B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	MAPIX is currently performing levee failure analysis for this levee.
97	N/A	Levee-like	No	Ventura County	May be PAL A eligible	Hopper Canyon	0604130640B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	MAPIX is currently performing levee failure analysis for this levee.
98	N/A	Levee-like	No	Ventura County	May be PAL A eligible	Gabbert Canyon	0604130795B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	Canal embankment
100	N/A	Levee-like	No	Ventura County	May be PAL A eligible	Santa Clara River	0604130880B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	
101	SC-1	Levee	Yes	Ventura County	May be PAL A eligible	Sespe Creek	0604130620B, 0604130615B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	MAPIX is currently performing levee failure analysis for this levee. City of Filmore protected by this structure; structure is not located in this community.
102	VR-2	Levee	No	Ventura County, City of San Buenaventura	May be PAL A eligible	Ventura River	0604130545C, 0604130710B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	

103	VR-3	Levee	No	Ventura County	May be PAL A eligible	Ventura River	604130545C	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	
105	SPC-1	Levee	Yes	Ventura County, City of Santa Paula	May be PAL B eligible	Santa Paula Creek	0604130760C, 060420003D	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	
109	ASR-2	Levee	No	Ventura County	May be PAL A eligible	Arroyo Santa Rosa	06042103935C	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	
110	CHD-1	Levee	No	Ventura County, City of Camarillo	May be PAL A eligible	Camarillo Hills Drain	0604130905B, 0650200004B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	
111	SCR-7	Levee	No	Ventura County	May be PAL A eligible	Santa Clara River	0604130615B, 0604130780B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	
113	SPC-1	Levee	Yes	Ventura County	May be PAL B eligible	Santa Paula Creek	0604130760C, 060420003D	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	
115	RS-1	Levee	No	Ventura County	May be PAL A eligible	Revolon Channel	0604130905B, 0604130915B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	
116	RS-1	Levee	No	Ventura County	May be PAL A eligible	Revolon Channel	0604130905B, 0604130915B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	
117	RS-1	Levee	No	Ventura County	May be PAL A eligible	Revolon Channel	0604130905B, 0604130915B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	
118	RS-1	Levee	No	Ventura County	May be PAL A eligible	Revolon Channel	0604130905B, 0604130915B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	
121	CC-1	Levee	No	Ventura County	May be PAL A eligible	Calleguas Creek	0604130915B, 0604131080B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	
127	CC-1	Levee	No	Ventura County	May be PAL A eligible	Calleguas Creek	0604130915B, 0604130920B, 0604131080B	Ventura County Watershed Protection District	Representative Gallegly, Representative Capps	

City of Camarillo Levee Status Map



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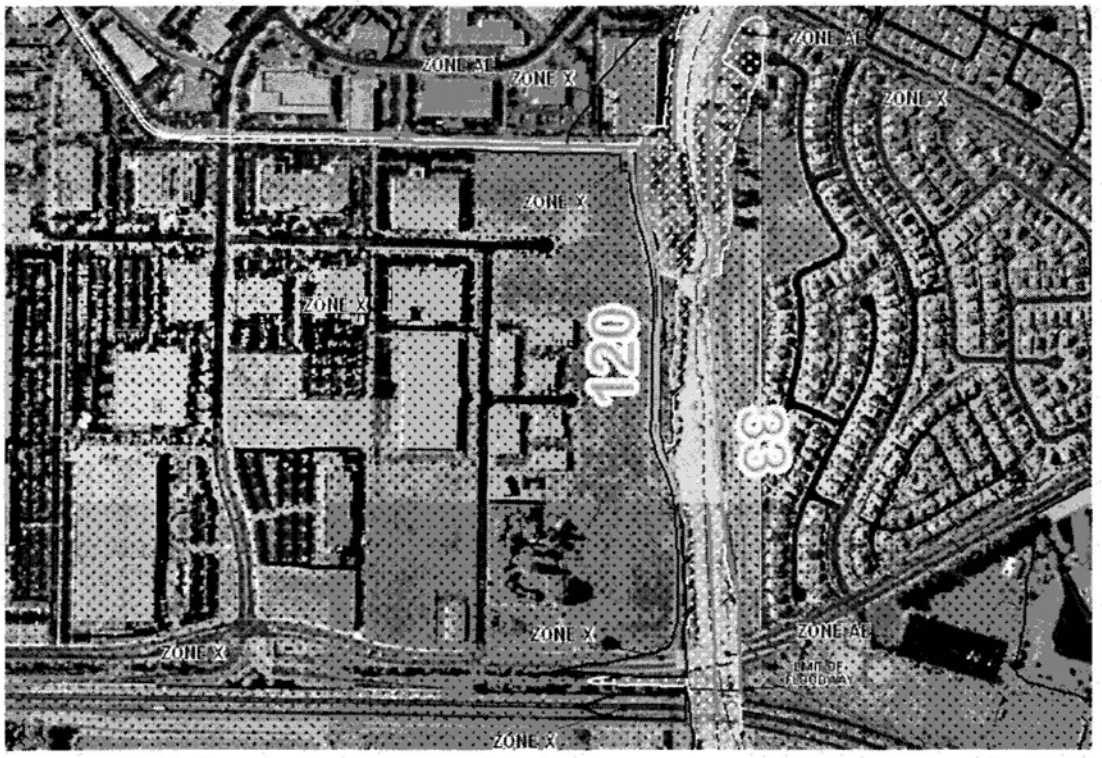
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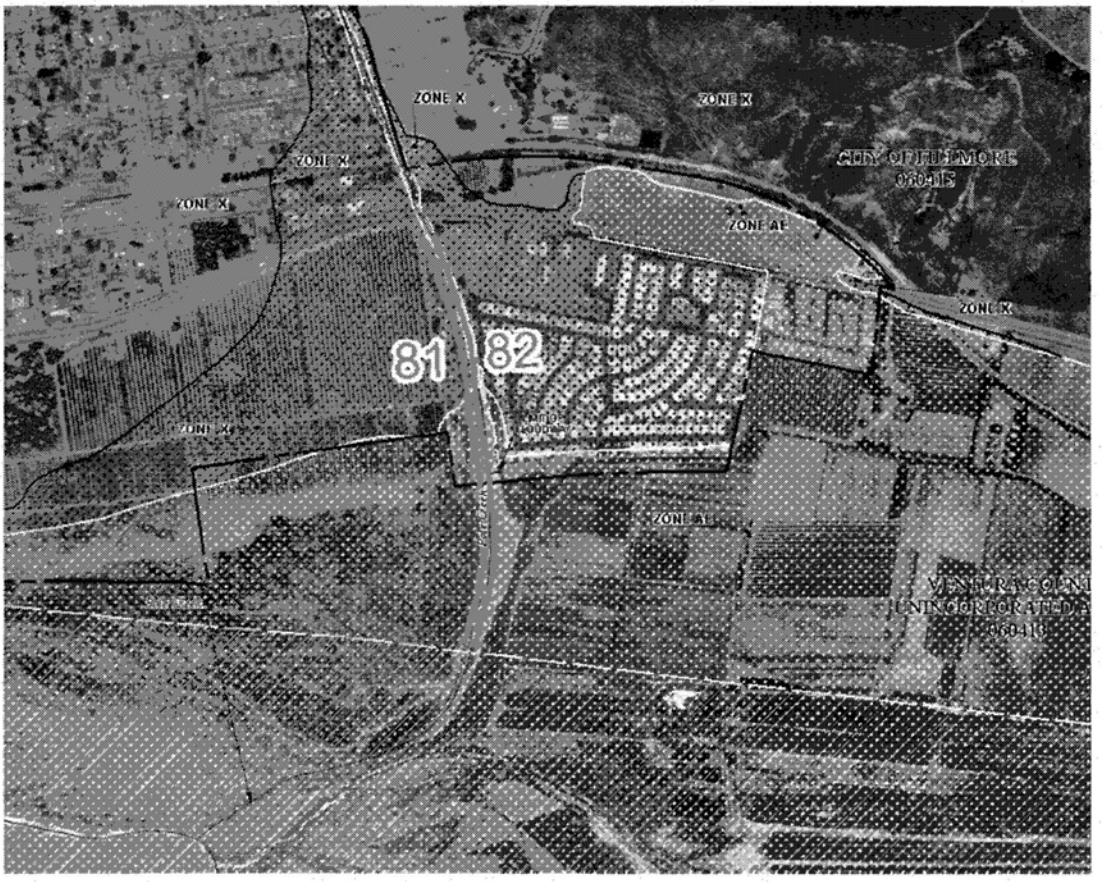
City of Fillmore Levee Status Map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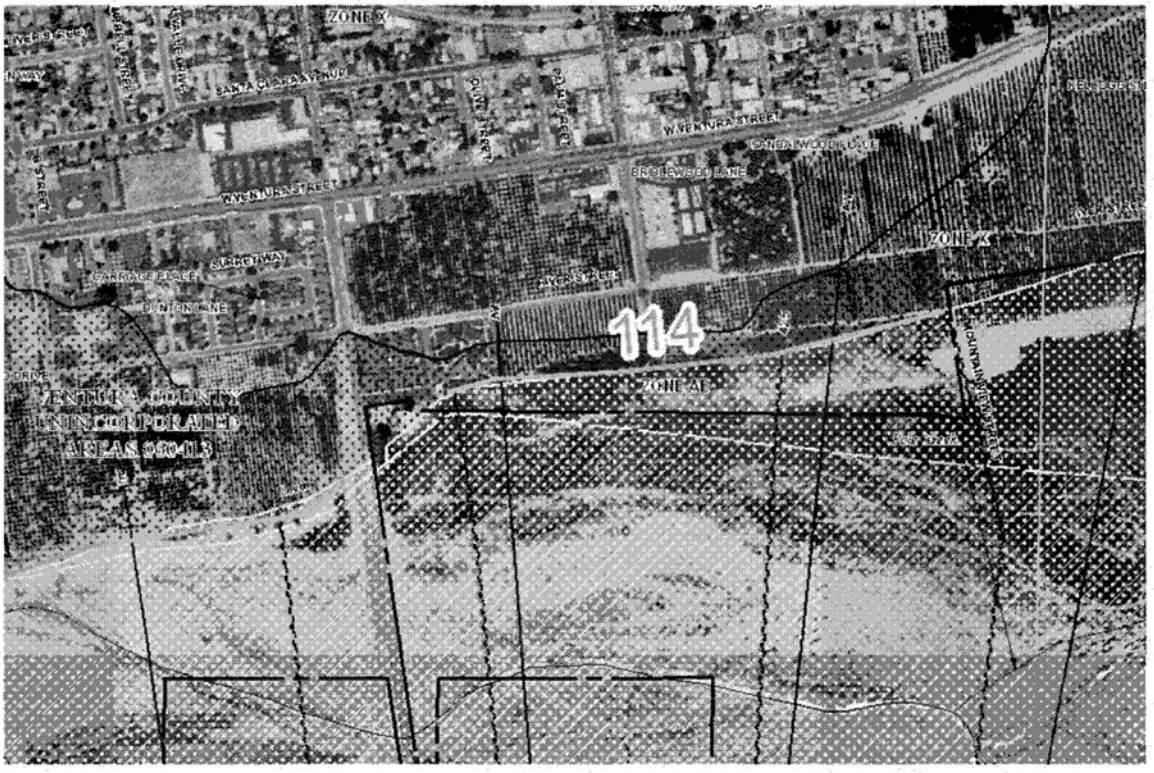
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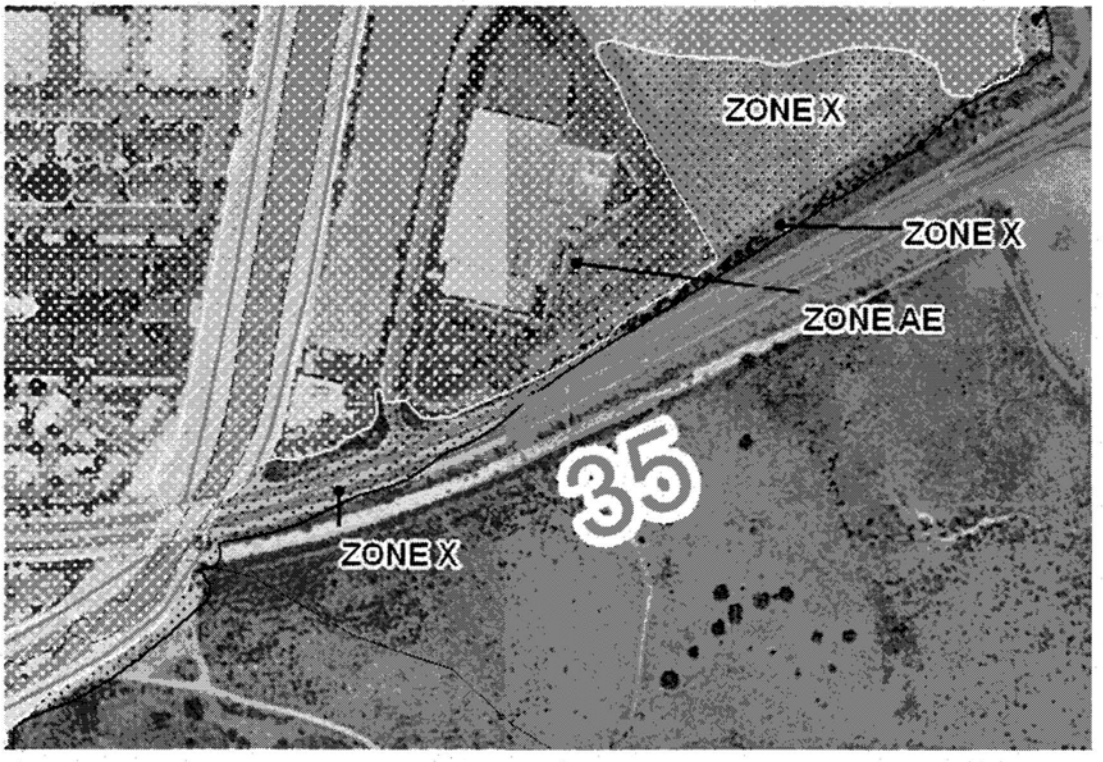
City of Moorpark Levee Status Map



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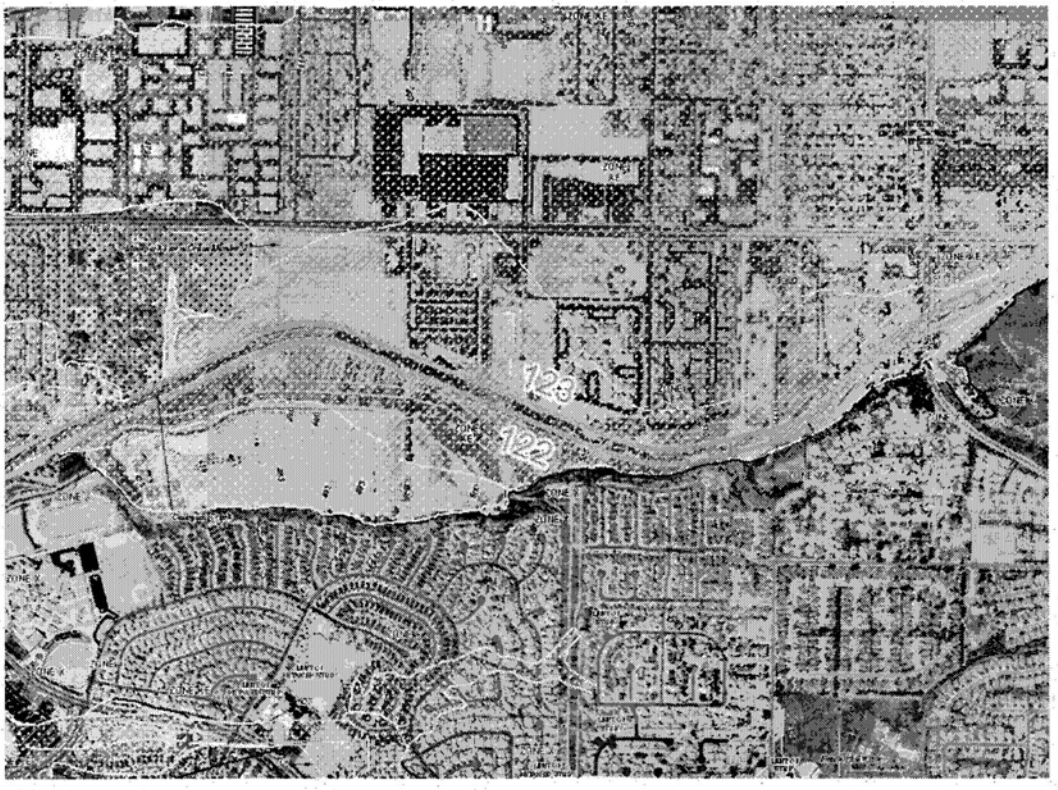
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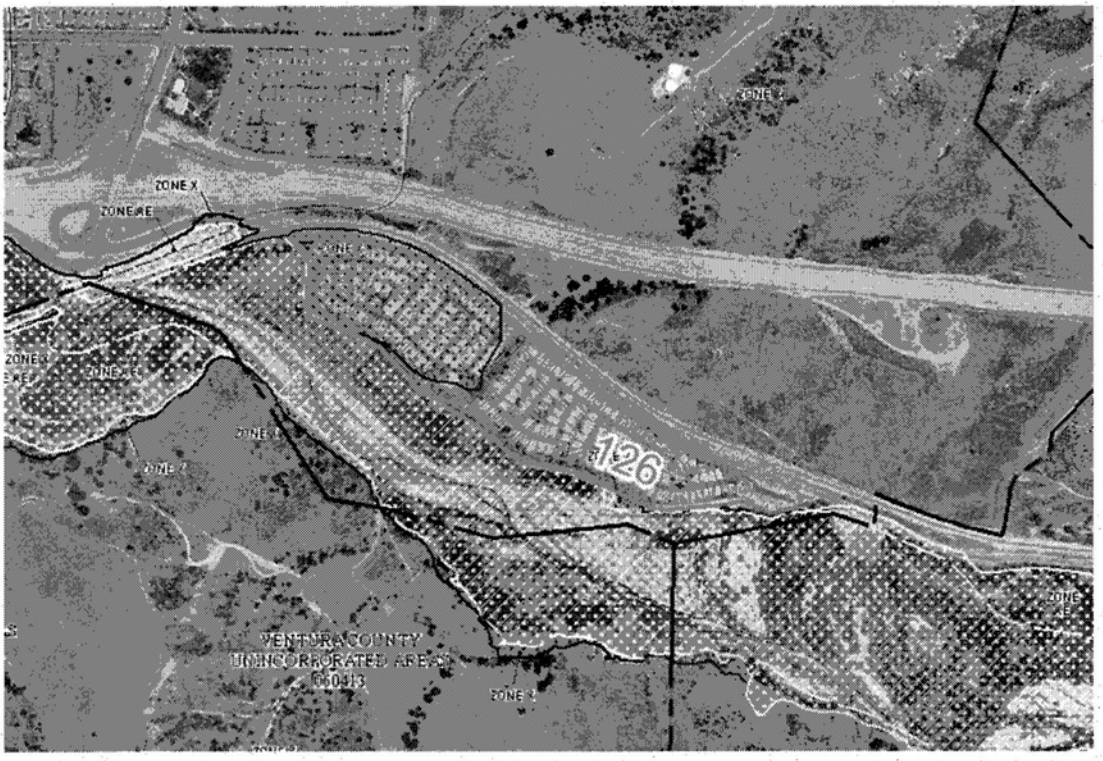
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UNINCORPORATED AREAS
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City of Oxnard Levee Status Map

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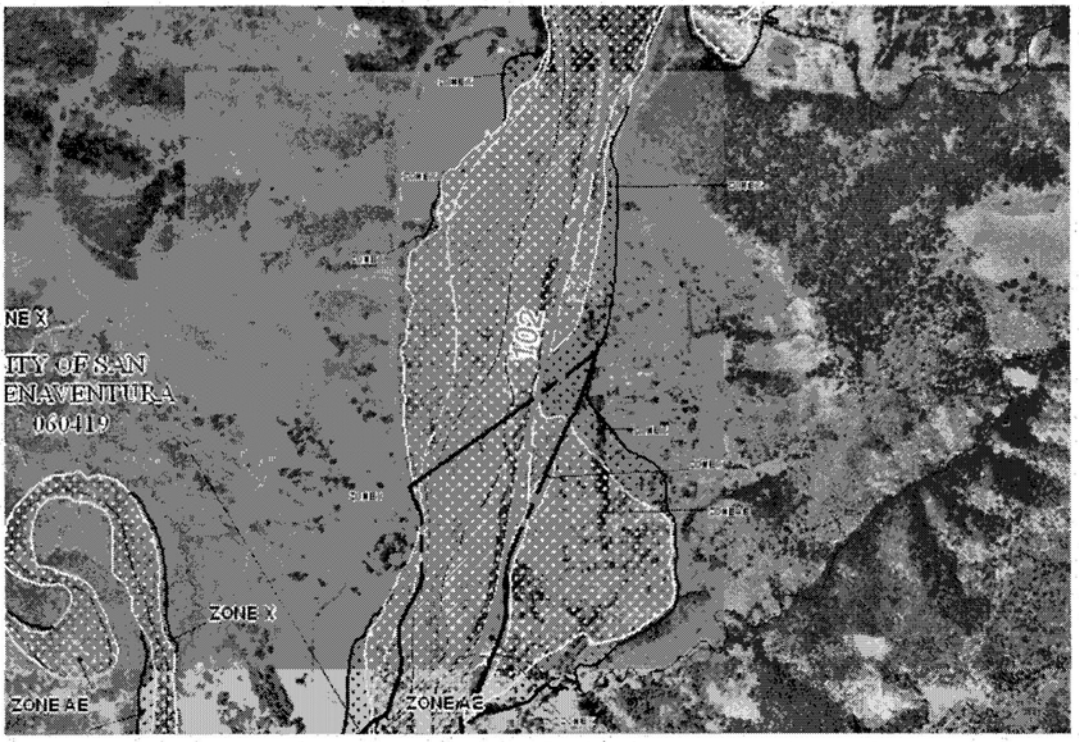
City of San Buenaventura Levee Status Map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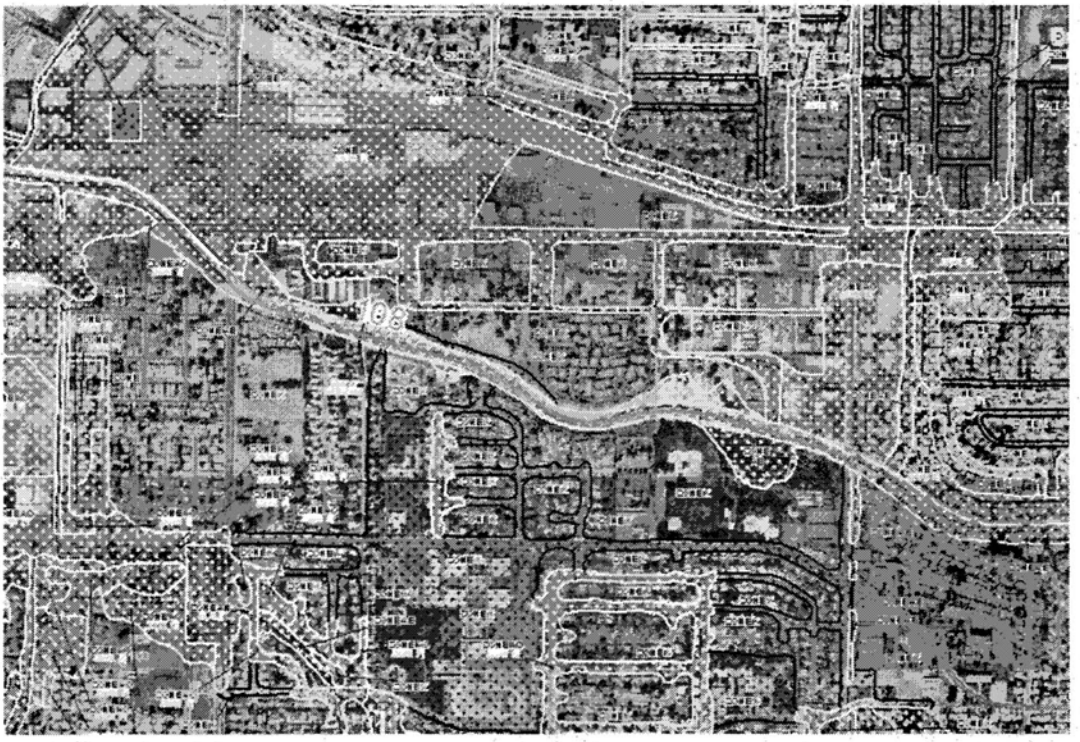
City of Santa Paula Levee Status Map

City of Simi Valley Levee Status Map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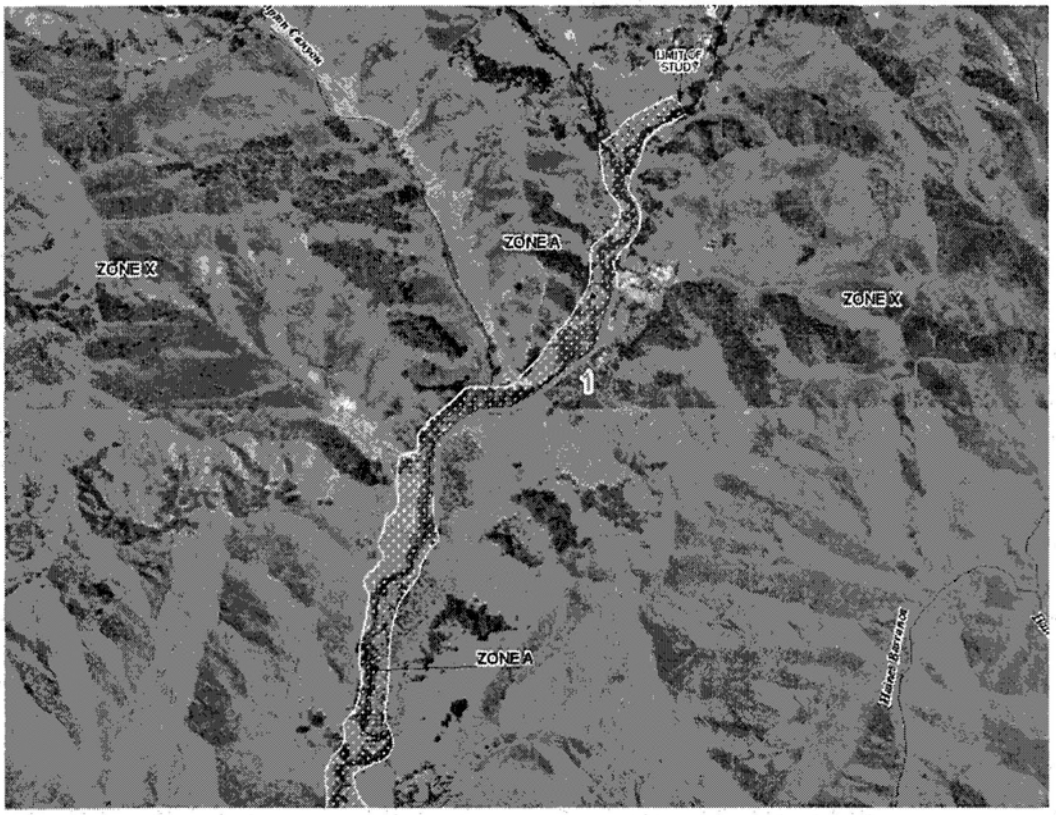
Ventura County Unincorporated Areas Levee Status Map



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VENTURA COUNTY
UNINCORPORATED AREA
CITY OF CAMARILLO
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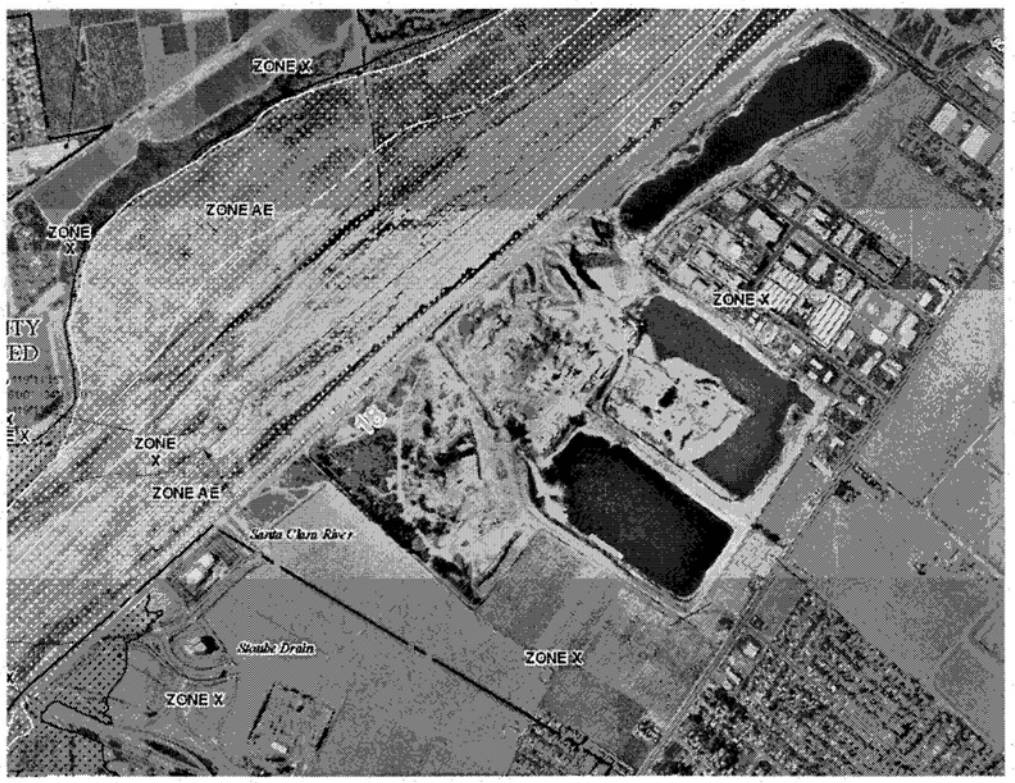
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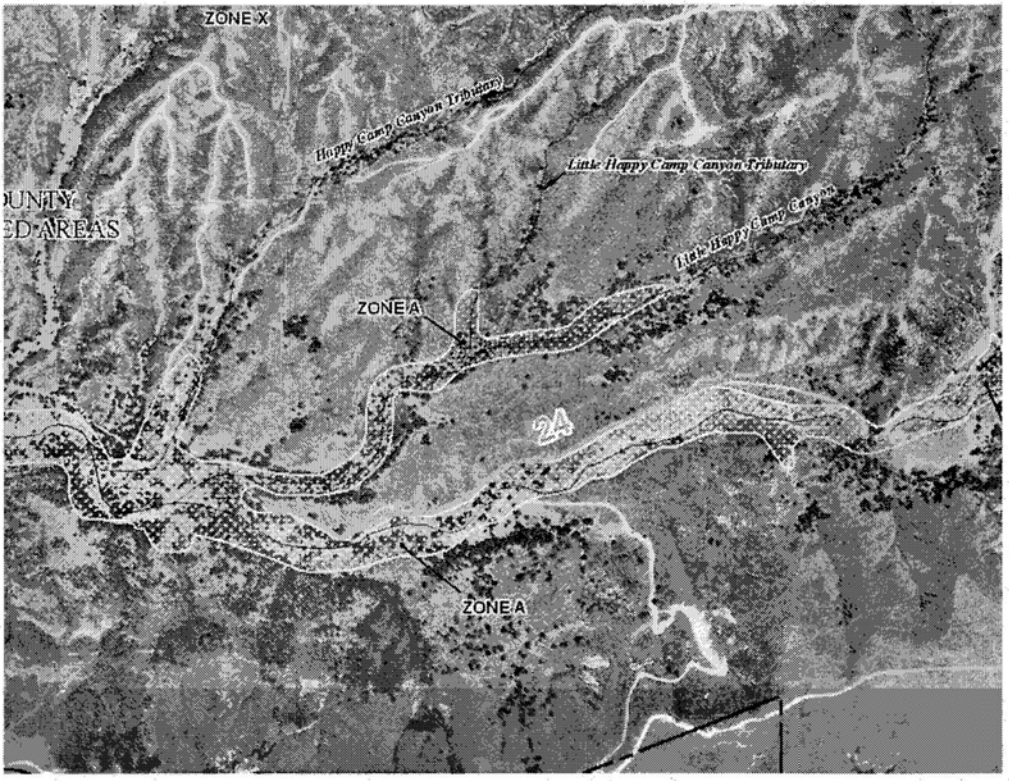
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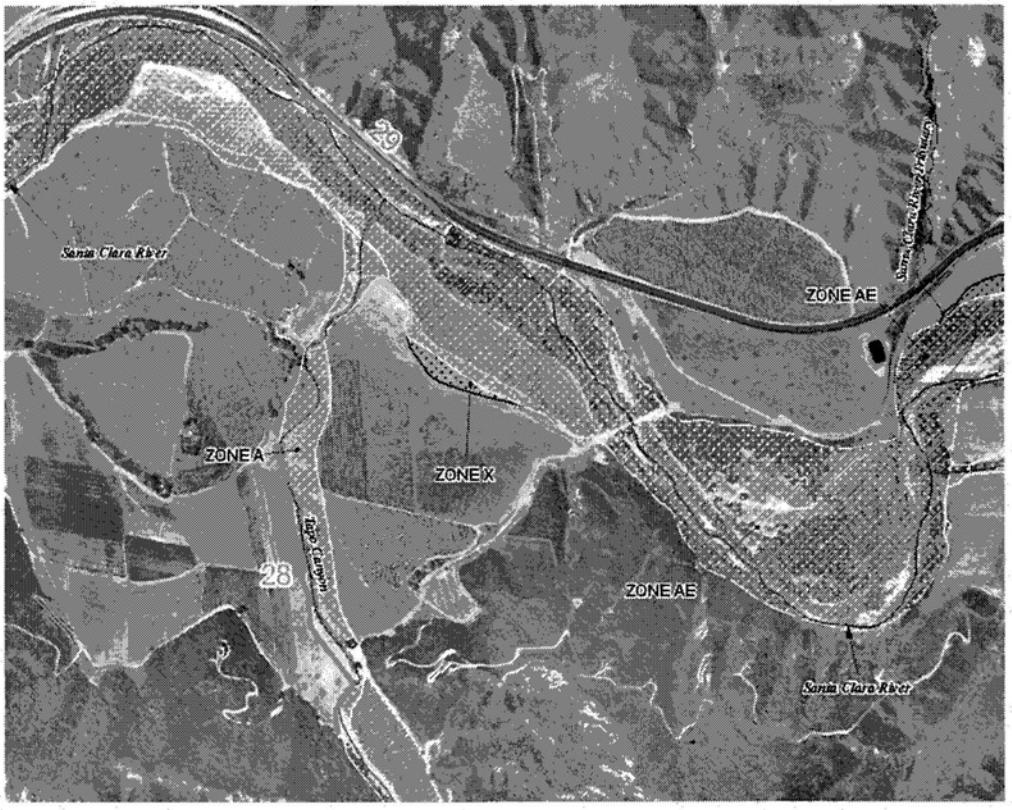
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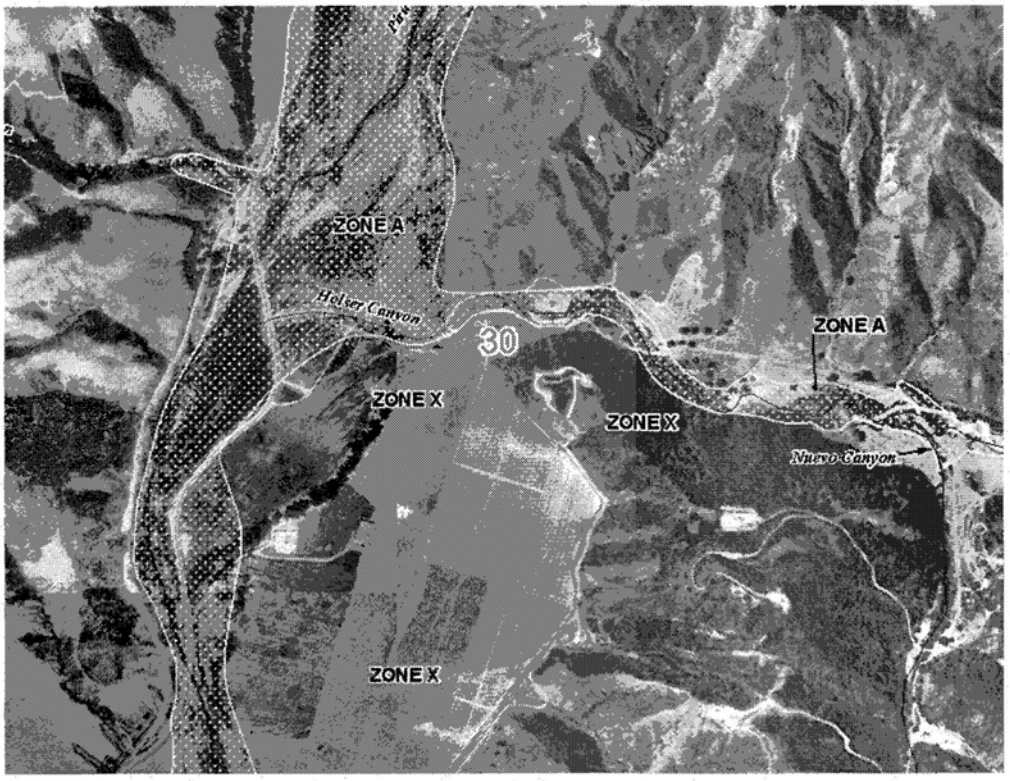
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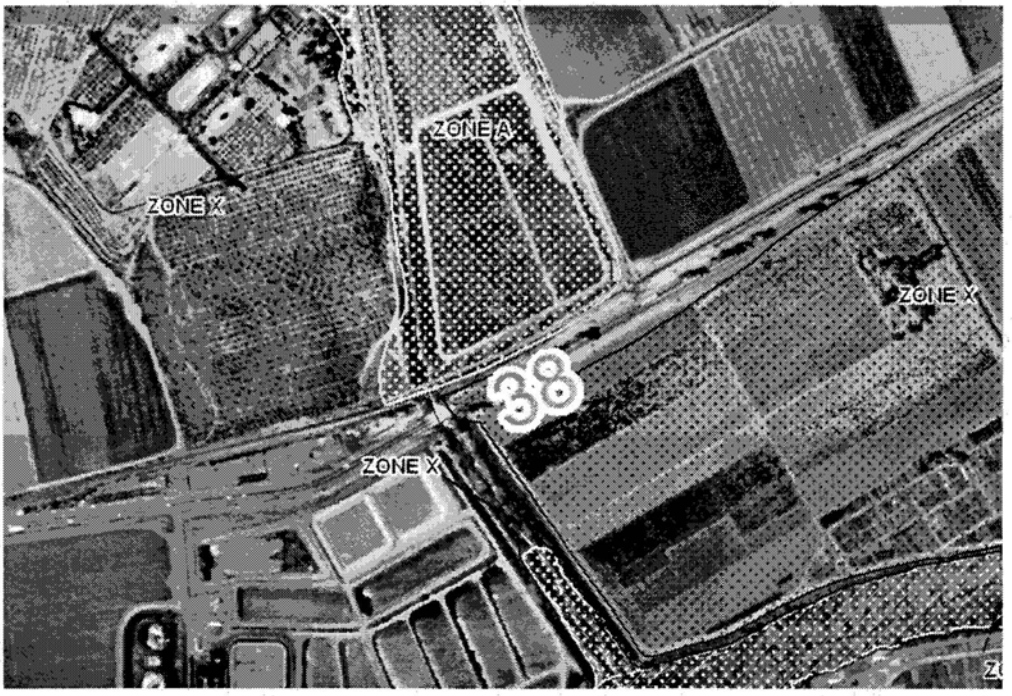
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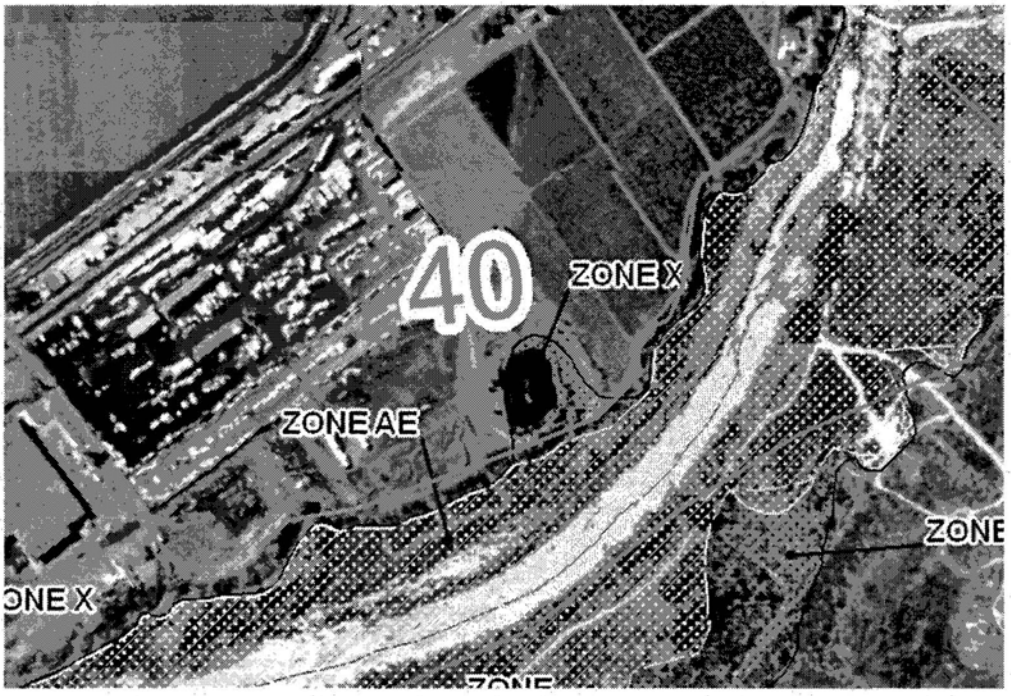
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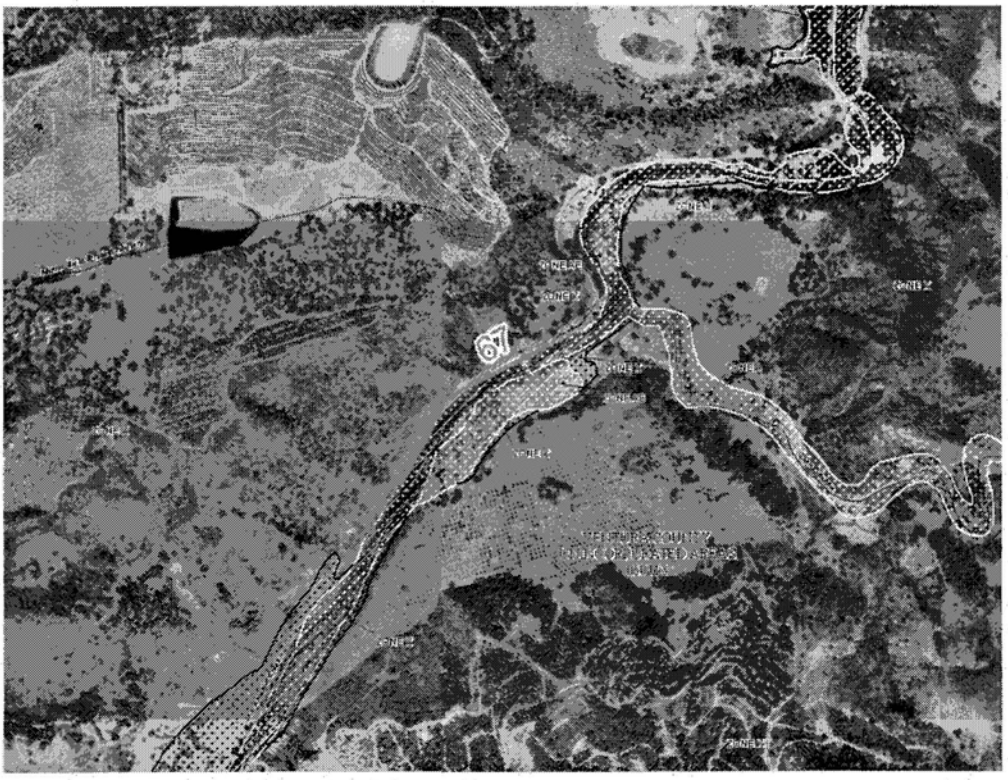
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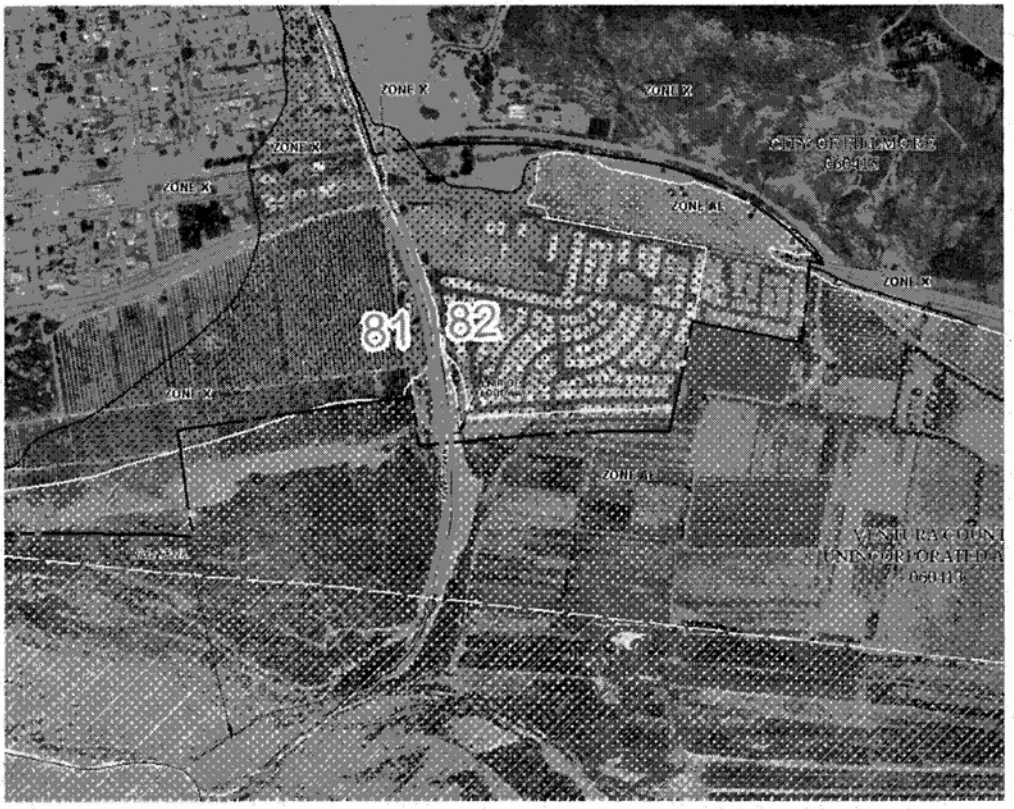
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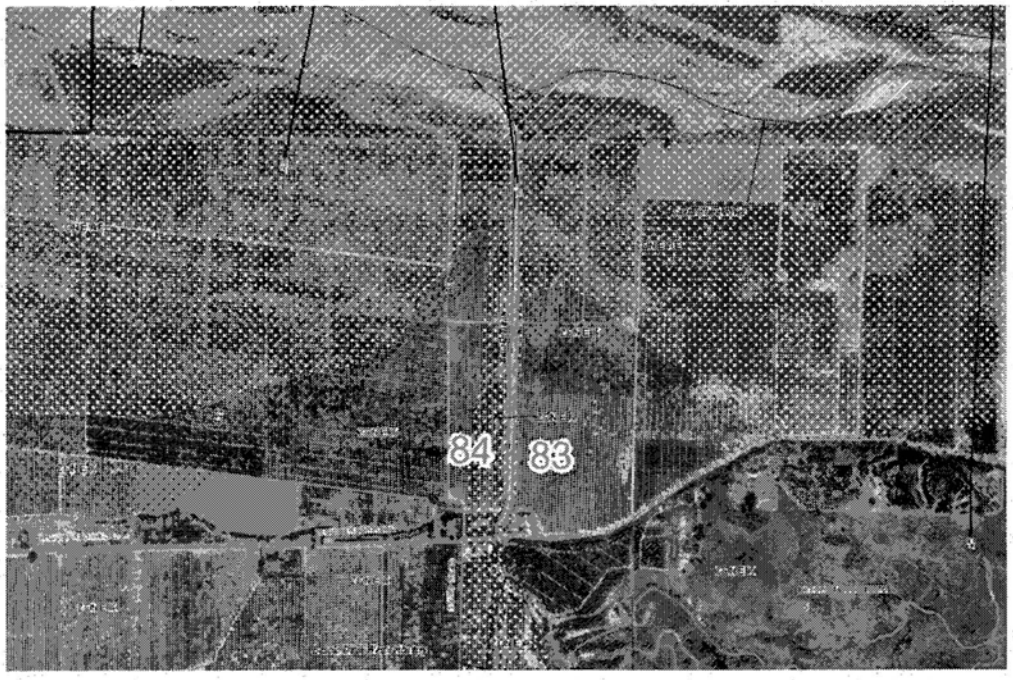
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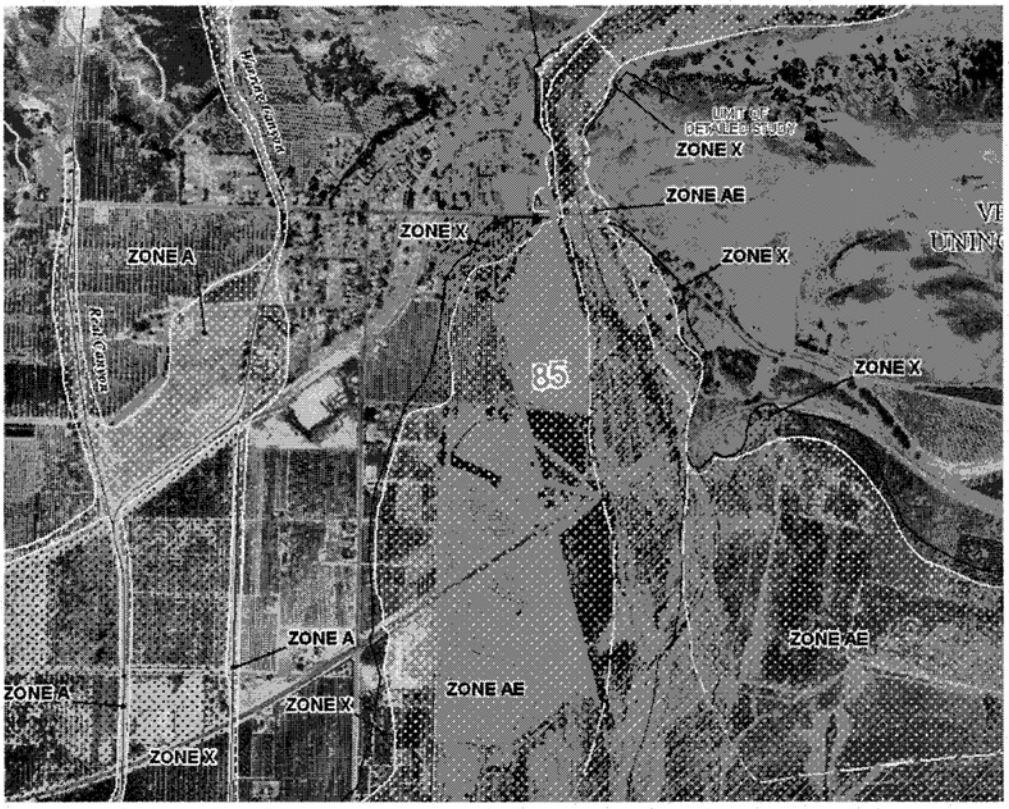
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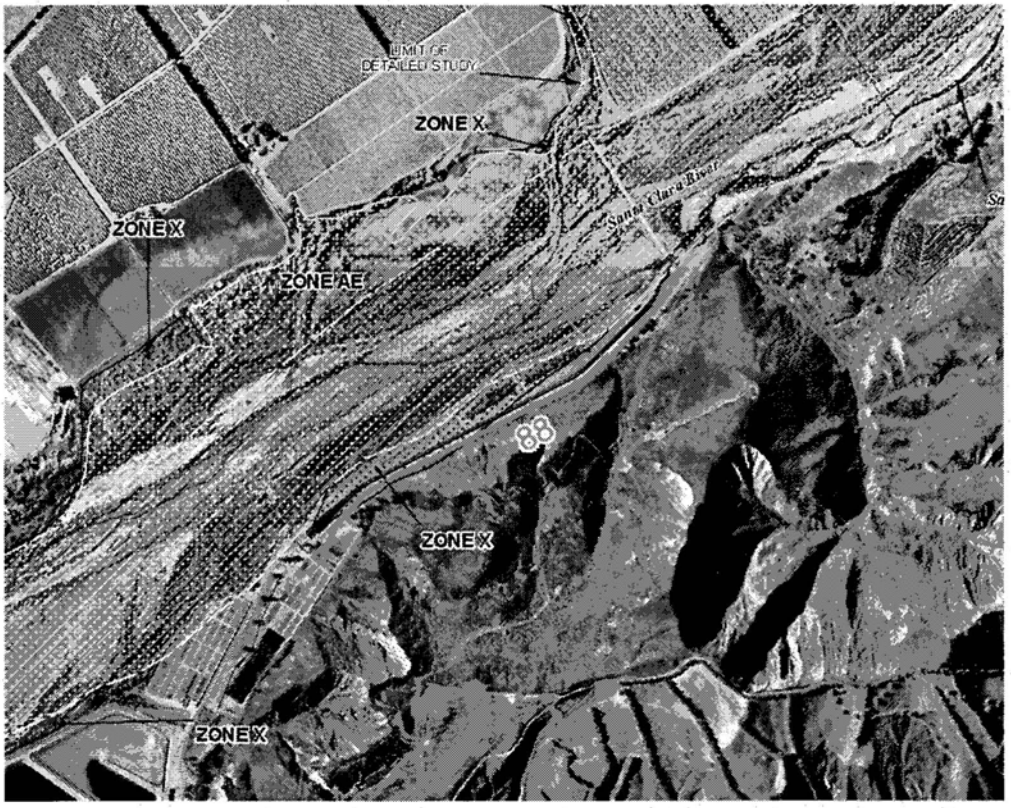
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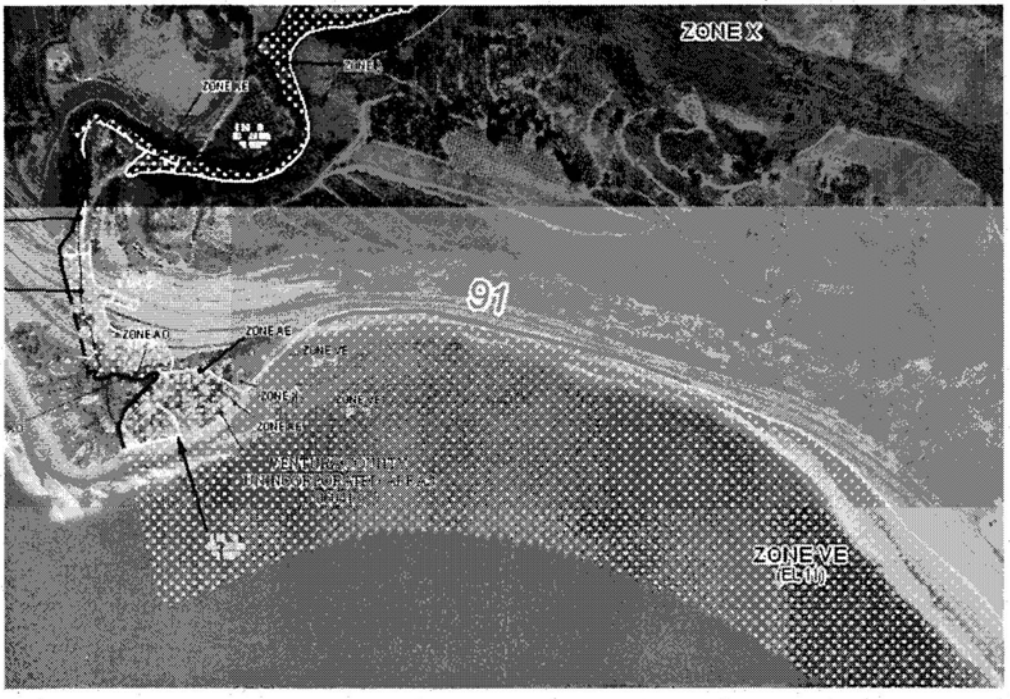
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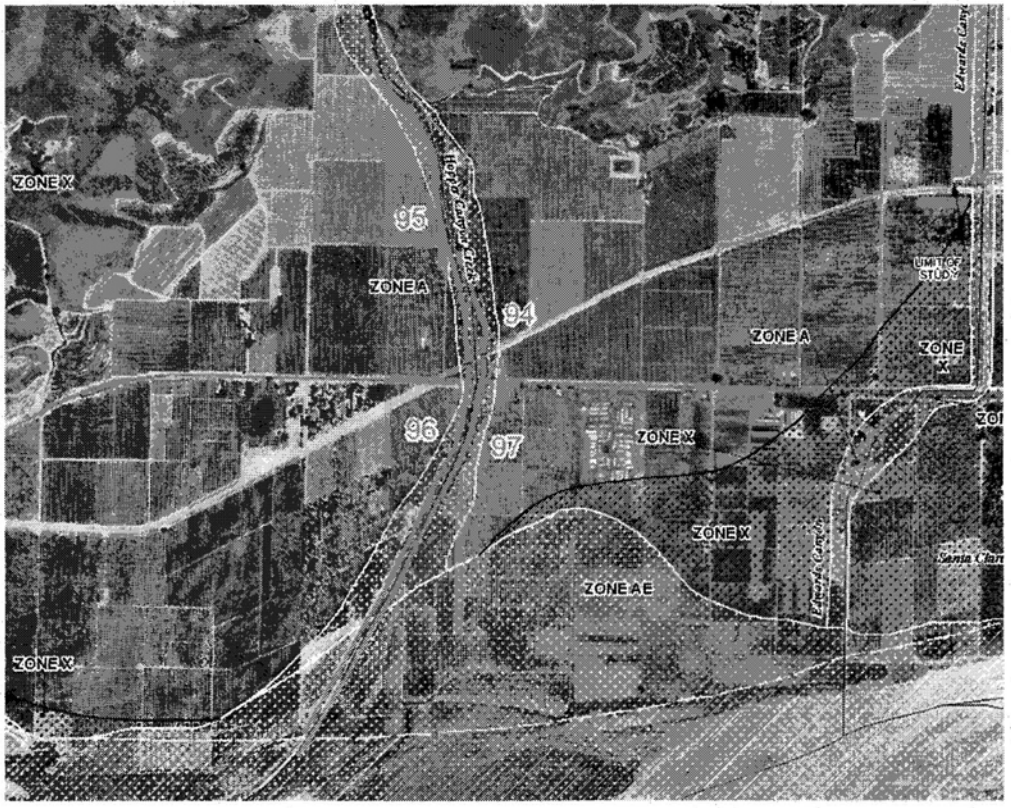
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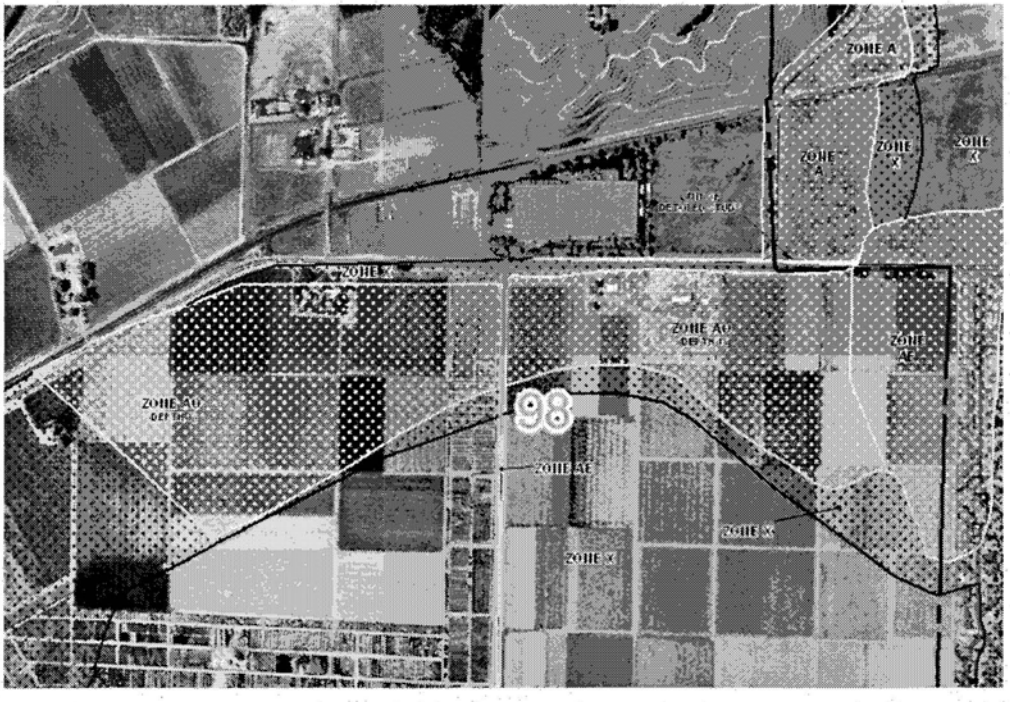
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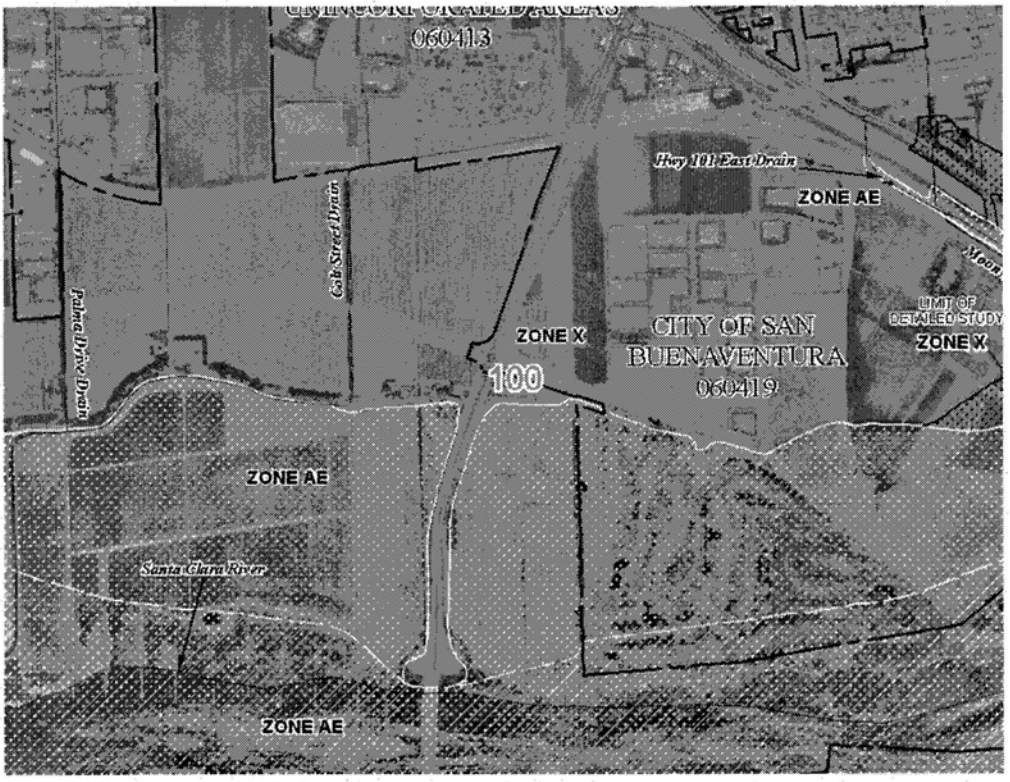
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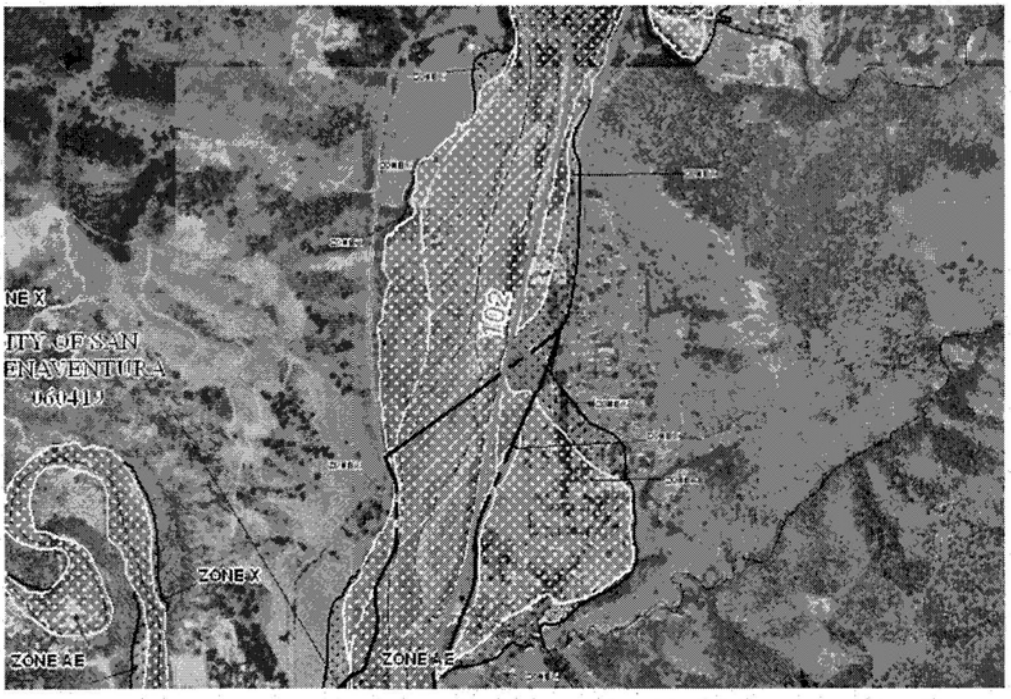
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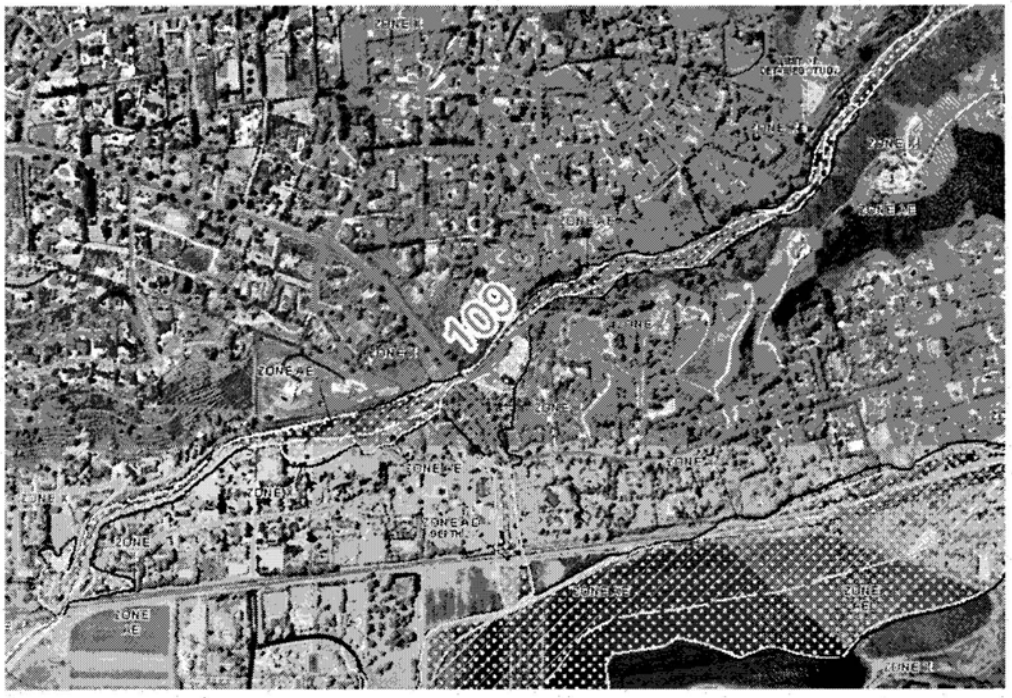
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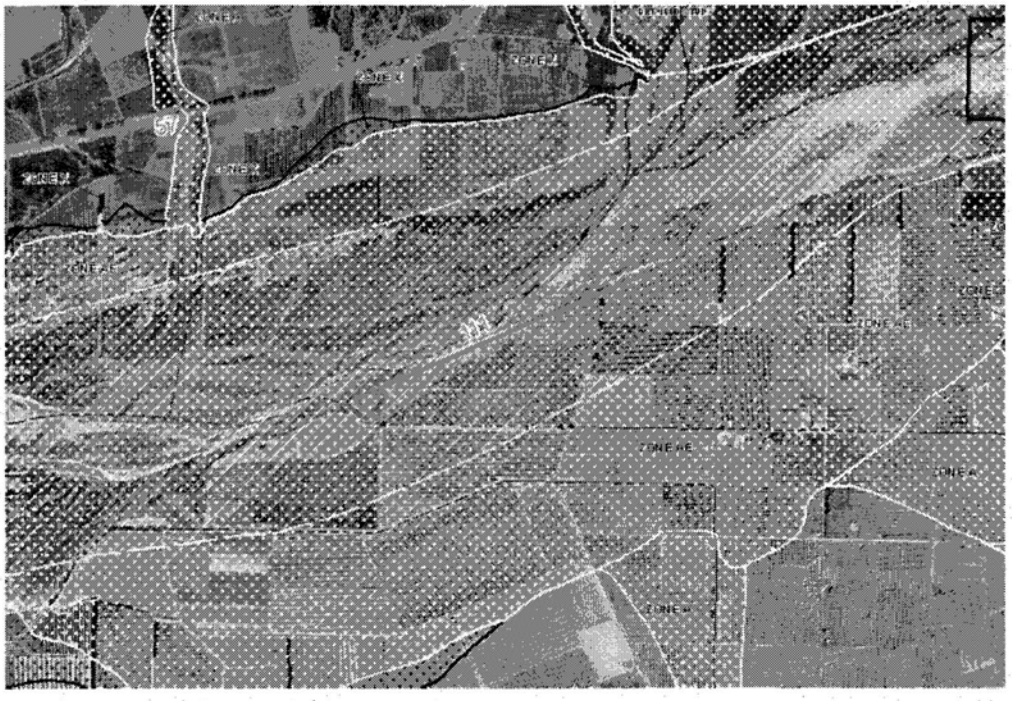
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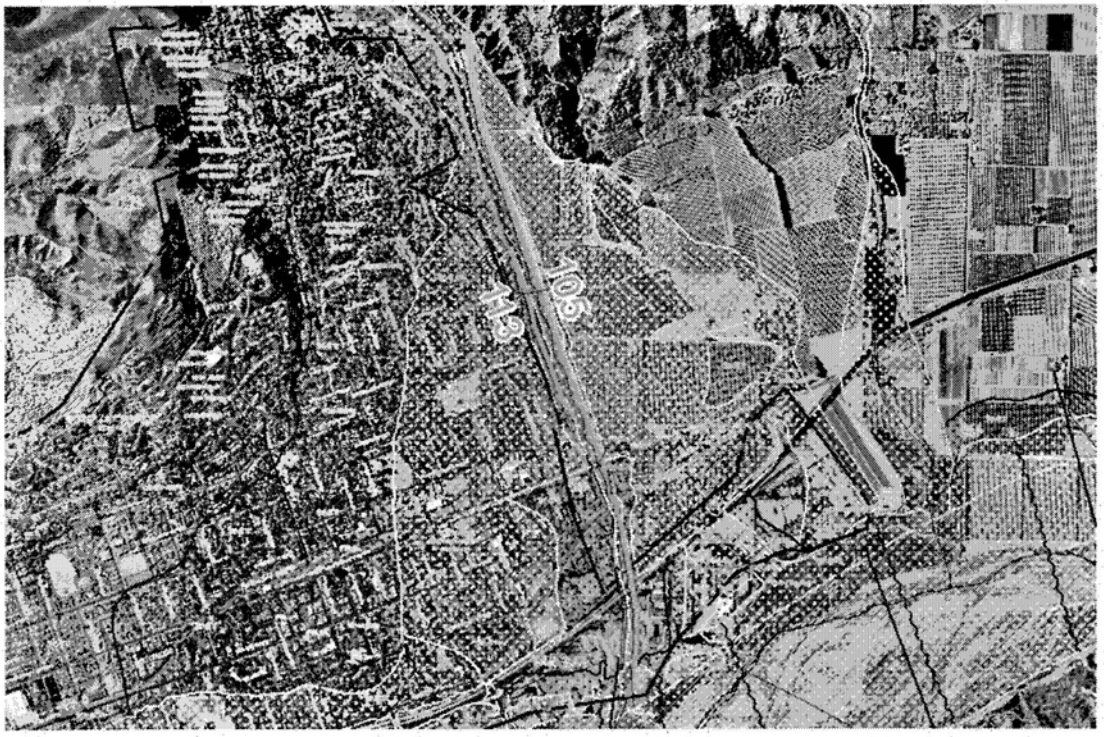

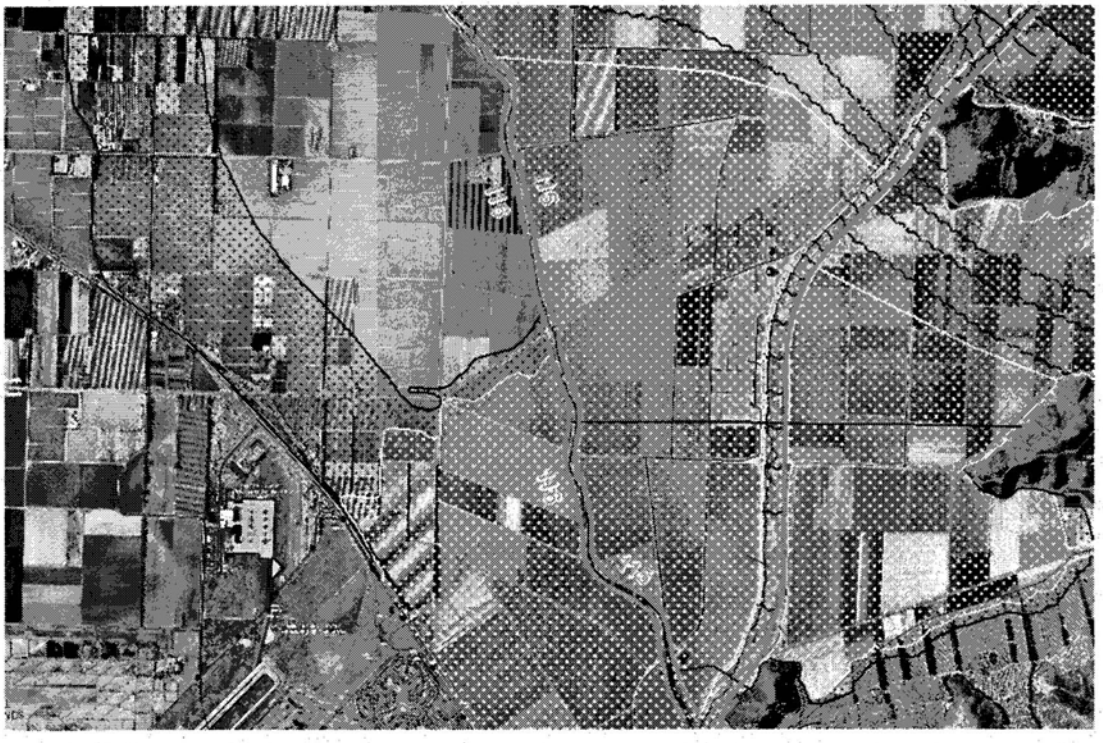

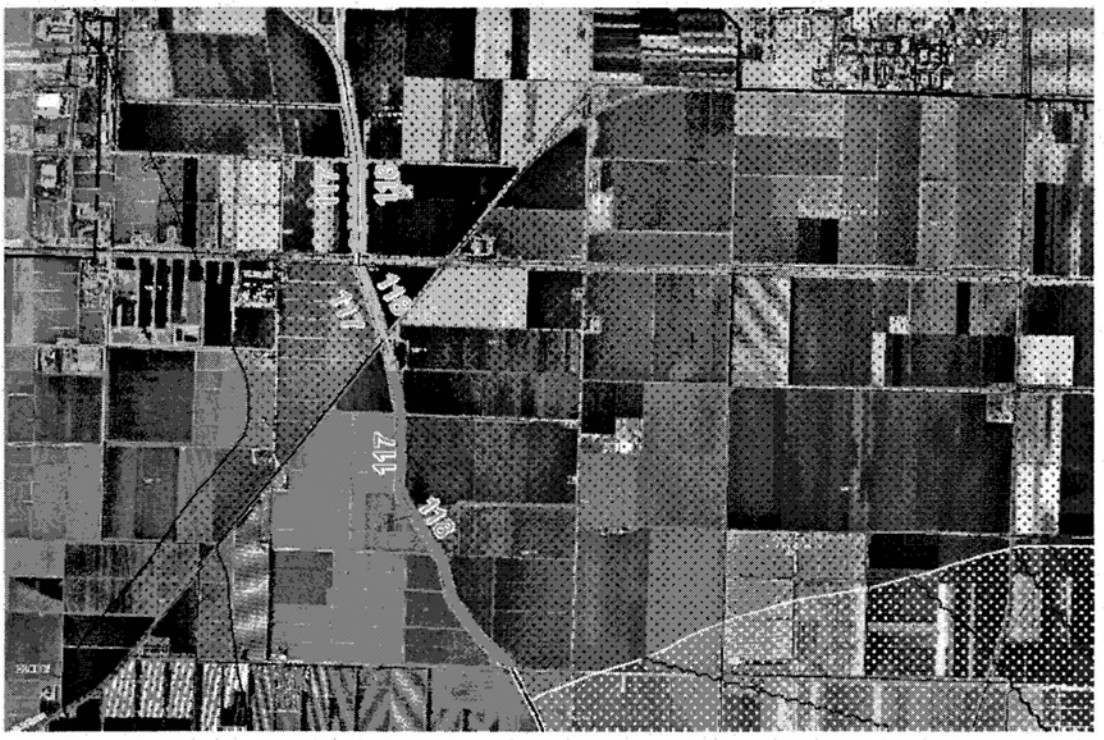
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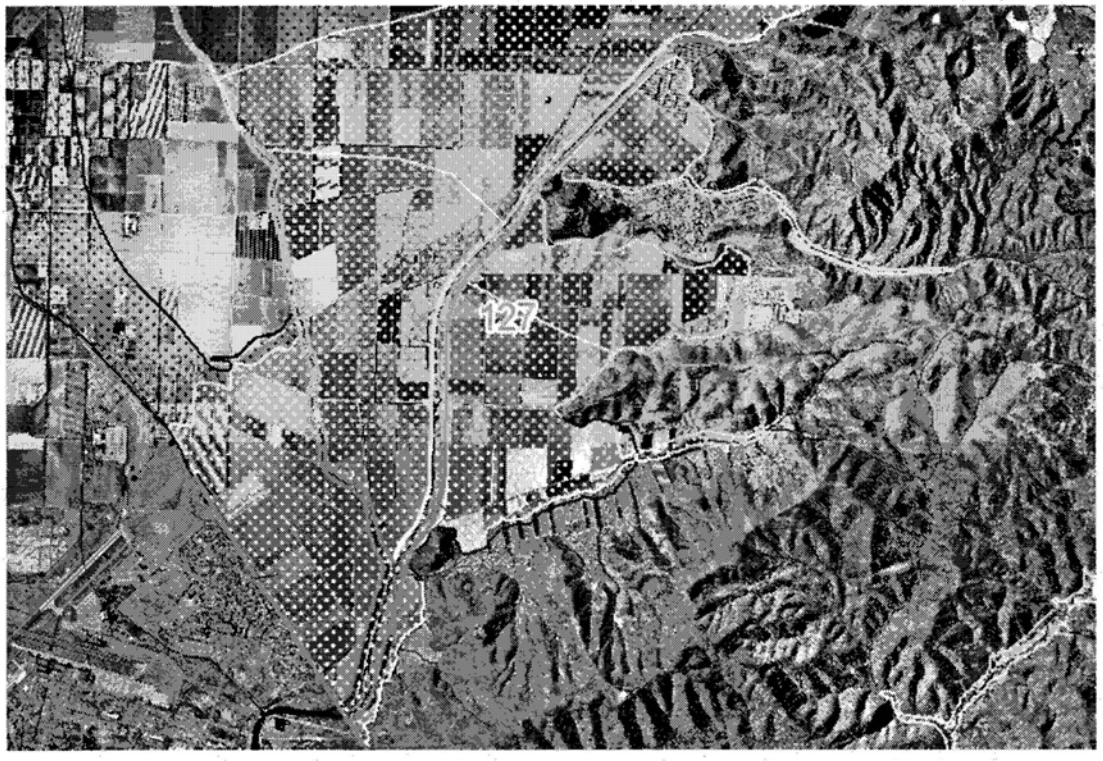
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Guidance for Flood Risk Analysis and Mapping

Levees

December 2020

FEMA

Requirements for the Federal Emergency Management Agency (FEMA) Risk Mapping, Assessment, and Planning (Risk MAP) Program are specified separately by statute, regulation, or FEMA policy (primarily the Standards for Flood Risk Analysis and Mapping). This document provides guidance to support the requirements and recommends approaches for effective and efficient implementation. The guidance, context, and other information in this document is not required unless it is codified separately in the aforementioned statute, regulation, or policy. Alternate approaches that comply with all requirements are acceptable.

For more information, please visit the FEMA Guidelines and Standards for Flood Risk Analysis and Mapping webpage (www.fema.gov/flood-maps/guidance-partners/guidelines-standards). Copies of the Standards for Flood Risk Analysis and Mapping policy, related guidance, technical references, and other information about the guidelines and standards development process are all available here. You can also search directly by document title at www.fema.gov/multimedia-library.

Table of Revisions

The following summary of changes details revisions to this document subsequent to its most recent version in November 2019.

Affected Section or Subsection	Date	Description
Section 1.2.4, 1.2.5	December 2020	Corrected minor alignment of wording.
Section 1.3.1	December 2020	Added more details to describe the National Levee Safety Program.
Section 4.1.10.2	December 2020	Updated web links.
Section 4.2 and subsections	December 2020	Updated to reflect FEMA and USACE data sharing processes.
Section 4.4, 6.12, and 6.19	December 2020	Minor wording revisions to address revised standards and introduction of evaluation lines for 2-D based floodways.
Section 5.5.2	December 2020	Corrected expiring PAL guidance to align with new standard.
Section 6.19	December 2020	Updated Zone D information and minor alignment of wording.
Section 6.21.1	December 2020	Added text for inclusion into the FIS when Freeboard Deficient approach is used and when Zone D is used.

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1.0 Levees Overview

This consolidated guidance document was prepared for FEMA, as part of the Risk MAP program, to promote sound and consistent implementation of levee-related National Flood Insurance Program (NFIP) regulations and mapping program standards that apply to levees.

This guidance document is intended to provide current information on the mapping of levees and associated flood hazards. This document captures current standards and practices and, therefore, does not address all topics related to the identification of flood hazards and risks associated with levees.

Federal, State, and local officials have often considered levee systems an effective structural approach for reducing average annual flood losses. However, it is an approach that needs to be considered cautiously. Carefully engineered and well-maintained levees should divert floodflows as intended in their design and keep the areas landward of the levees dry if their structural integrity is not compromised, all elements of the system are functional, and the floodwaters do not overtop the structure. However, a primary drawback is that levees could lead to increased development of areas landward of the levees over time and thereby increase the exposure to catastrophic failures during extreme events (A Levee Policy for the National Flood Insurance Program, National Academy Press, 1982).

When it comes to working with communities on levee-related mapping projects or issues, FEMA shares a mission with its State agency partners, the U.S. Army Corps of Engineers (USACE), and other Federal agencies. That mission entails helping levee owners, flood control districts, community officials, floodplain managers, the media, and other stakeholders understand and properly communicate the risks associated with living and working landward of levees. Living with levees is a shared responsibility and local community officials should remain engaged in flood risk management activities. It is important for all stakeholders to know the risk; their role in helping to reduce that risk; and what specific actions they can take, including the purchase of flood insurance to further reduce the financial risk associated with living and working in levee-impacted areas. For more information, visit the Living with Levees portion of the FEMA website (https://www.fema.gov/flood-maps/living-levees).

The primary audiences for this guidance document are communities, regional entities, Tribal entities, and State agencies, including those participating in the Cooperating Technical Partners program (CTPs), FEMA Project Teams that are formed to carry out projects in support of the FEMA Regional Offices, and FEMA Regional Office and Headquarters staff. The FEMA Project Teams often include representatives of the FEMA Risk MAP providers. This guidance document is also intended for communities and local stakeholders involved in levee accreditation and the implementation of FEMA non-accredited levee analysis and mapping procedures.

The levee guidance in this document emphasizes the Risk MAP program vision of collaborating with local, regional, State, and Tribal entities throughout a watershed to deliver quality data that increases public awareness and leads to mitigation actions that reduce flood risk to life and property. To achieve this vision, FEMA transformed its historic documents for flood hazard

identification and mapping efforts into a more integrated process of identifying, assessing, communicating, planning, and mitigating flood-related risks aligned with the Risk MAP vision[1].

To accomplish this process, the appropriate analyses, mapping, and communication of risk of levee systems is necessary throughout the Risk MAP project lifecycle. FEMA has prepared this consolidated guidance in keeping with that responsibility.

1.1 Prior Guidance Documents

The consolidation of work that guided users through decades of levee-related procedures implemented during flood hazard mapping projects were incorporated into this guidance document. This is intended to promote sound and consistent implementation of policies, regulations, and standards for levee risk evaluation. This guidance enhances compliance with the Code of Federal Regulations; incorporates portions of Analysis and Mapping Procedures for Non-Accredited Levee Systems New Approach, (July 2013); and FEMA standards to facilitate implementation during flood hazard mapping projects. This guidance document has been prepared to expand on, and supersede, guidance provided in FEMA Operating Guidance (OG) 12-13; Procedure Memorandum (PM) Nos. 34, 43, 45, 51, 52, 53, and 63; and Appendix H of Guidelines and Specifications for Flood Hazard Mapping Partners. More details for each superseded guidance document are provided in each chapter of this document.

This guidance document does not supersede the following existing FEMA guidance documents:

- Analysis and Mapping Procedures for Non-Accredited Levee Systems New Approach.
- Guidance Document No. 29, Guidance for Flood Risk Analysis and Mapping: Levee Seclusion.
- Guidance Document No. 34, Guidance for Flood Risk Analysis and Mapping: Zone A99 and Zone AR Determinations.
- Guidance Document No. 72, Guidance for Flood Risk Analysis and Mapping: Levee-Specific Non-Regulatory Flood Risk Datasets.

These and additional mapping guidance and best practices can be accessed through the FEMA Guidelines and Standards for Flood Risk Analysis and Mapping webpage.

1.2 Flood Hazard Mapping and Levees

FEMA does not design, build, inspect, operate, maintain, or certify levees. However, as administrator of the NFIP, FEMA is responsible for accurately identifying flood hazards and communicating those hazards and risks to affected stakeholders.

Conditions in a community or watershed change over time; therefore, the need to update flood hazard information reflected on Flood Insurance Rate Maps (FIRMs) is assessed periodically to better reflect the current flood risk to people and property. FEMA updates FIRMs nationwide through the Risk MAP program. FEMA shows levee systems on the FIRM as being accredited,

[1] For more information on the Risk MAP program, see https://www.fema.gov/risk-mapping-assessment-and-planning-risk-map.

provisionally accredited, non-accredited, or in the process of being restored or constructed. FEMA designates the areas landward of the levees as Zone A, Zone AE, Zone AR, Zone A99, Zone D, Zone X (shaded), or Zone X depending on the status of the levee systems and the type of study performed. With new or updated FIRMs, community officials will have information to help them advise where and how to build more safely, and the public will understand their risk, allowing more informed decisions about reducing the risk to families, homes, and businesses.

Levees add complexity to an ongoing flood hazard study. To address the complexities that levees introduce, a FEMA Project Team should consider the presence of levees and appropriate mapping procedures as early in the study process as possible. Early consideration will help ensure that appropriate data collection and coordination occur. Subsections 1.2.1 through 1.2 5 briefly introduce the possible mapping options for levees.

1.2.1 Accredited Levee System

An accredited levee system is a system that FEMA has determined meets requirements of the NFIP regulations as cited in the Code of Federal Regulations (CFR) at Title 44, Chapter 1, Section 65.10 (44 CFR 65.10) and that FEMA has recognized on a FIRM as reducing the flood hazards posed by a base (1-percent-annual-chance) flood. This determination is based on a submittal, by or on behalf of a community, which includes 44 CFR 65.10–compliant design data and documentation, certified by a registered Professional Engineer (P.E.), and operations and maintenance documentation under the appropriate jurisdiction. FEMA strongly encourages flood insurance for all insurable structures in floodplains, including those in areas landward of levees.

FEMA accreditation of a levee system does not guarantee that the levee will provide flood hazard reduction to properties from flooding; therefore, FEMA has included a note on related FIRM panels that overtopping, or failure of an accredited levee system is possible. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. Chapter 4 of this document provides detailed information on the mapping of accredited levee systems.

1.2.2 Provisionally Accredited Levee System

When the area impacted by an accredited levee system shown on an effective FIRM is in the process of being remapped, FEMA may ask the levee owner or community to provide data and documentation demonstrating the levee system still meets the requirements set forth in 44 CFR 65.10. To assist levee owners and communities, FEMA established the Provisionally Accredited Levee (PAL) designation as an option for mapping the area while providing levee owners or communities more time to gather the required data and documentation. The levee owner signs and submits an agreement to FEMA indicating the data and documentation required for compliance with 44 CFR 65.10 will be provided within 24 months of the 91st day following the date of the initial FEMA notification letter. FEMA places a note on the impacted FIRM panel(s) landward of the levee system to indicate FEMA has provisionally accredited the levee system and the designation of any existing Zone X (shaded) areas of flood hazard reduction due to levees is provisional. Chapter 5 of this document provides detailed information on the mapping of PALs.

1.2.3 Non-Accredited Levee System

Non-accredited levee systems are levee systems that do not meet the NFIP regulatory requirements of 44 CFR 65.10 and that are not shown on a FIRM as reducing the base flood hazard. FEMA recognizes that non-accredited levee systems do impact flood risk; for that reason, FEMA has developed analysis and mapping procedures for non-accredited levees that provide a suite of approaches for analyzing flood hazards landward of levee systems. Chapter 6 of this document provides detailed information on the mapping of non-accredited levee systems.

1.2.4 Levees Undergoing Restoration (Zone AR) and Undergoing Construction (Zone A99)

The NFIP regulations contain two provisions that help ameliorate the flood insurance impact on property owners during the restoration of non-accredited levee systems or construction of new levee systems. These are based on provisions of the National Flood Insurance Act of 1968, as amended, as cited in the United States Code (U.S.C.) at 42 U.S.C. 4014 (e) and 42 U.S.C. 4014(f). These provisions are intended to provide reduced flood insurance premium rates for insurable structures landward of levee system projects designed and intended for eventual accreditation. Under these provisions, a levee system undergoing construction, or restoration, but that cannot currently meet 44 CFR 65.10 requirements, is recognized by FEMA as providing some (less than the base flood) level of hazard reduction.

FEMA issues Flood Protection Restoration determinations, regulated through 44 CFR 65.14, in areas where a project is sufficiently underway to restore a levee system to meet 44 CFR 65.10 accreditation requirements. FEMA maps the areas landward of the levee system that is being restored as Zone AR on the FIRM and may present Base Flood Elevations (BFEs) representing the current hazard as if the levee system was not in place. The Zone AR determination may provide property owners with reduced flood insurance premium rates lower than rates in other mapped Special Flood Hazard Areas (SFHAs).

FEMA issues adequate progress determinations, regulated through 44 CFR 61.12, in areas where FEMA determines that a community has made adequate progress on a levee system construction or reconstruction project designed for flood hazard reduction. FEMA maps the areas landward of the levee system as SFHAs designated Zone A99 on the FIRM. The Zone A99 determination also provides flood insurance premium rates and floodplain management requirements that are generally less than those required in other SFHAs. The Zone A99 designation is used in place of a shaded Zone X accredited levee system recognized as reducing the flood hazards from a base designation for the landward area of the levee system. The horizontal extent of the Zone A99 would match the boundary extent of the potential area of reduced flood hazard that in the future would be adjusted to a shaded Zone X accredited levee system recognized as reducing the flood hazards from a base flood designation.

Detailed information on Flood Protection Restoration and Adequate Progress determinations is provided in FEMA Guidance Document No. 34, Guidance for Flood Risk Analysis and Mapping: Zone A99 and Zone AR Determinations. Guidance Document No. 34 is accessible through the FEMA Guidelines and Standards for Flood Risk Analysis and Mapping webpage.

1.2.5 Levee Seclusion Mapping

In March 2011, FEMA committed to updating the way flood hazards for non-accredited levee systems were analyzed and mapped. As a result, some in-progress FIRM updates that included levee systems were delayed or otherwise impacted while FEMA developed the analysis and mapping approach for non-accredited levees. FEMA developed the levee seclusion mapping approach as a project management solution to allow the release of the FIRM updates for those portions of the community outside of the levee-impacted area. Through the levee seclusion mapping approach, FEMA maintains the flood hazard information as depicted on the current effective FIRM (the FIRM in effect before the in-progress update) with map notes explaining that the flood hazard information in these areas will be updated after FEMA applies an updated levee analysis and mapping approach. Levee seclusion was not intended to be a long-term mapping approach and was not anticipated to be implemented on any mapping projects initiated after July 2013. Justification to use Seclusion mapping on the FIRM panel must be coordinated with and approved by the FEMA Region and FEMA Headquarters. Detailed information on seclusion is provided in FEMA Guidance Document No. 29, Guidance for Flood Risk Analysis and Mapping: Levee Seclusion, which is accessible through the FEMA Guidelines and Standards for Flood Risk Analysis and Mapping webpage.

1.3 Summary of Recent Legislation and Recommendations

This section summarizes some recent legislation and recommendations related to managing and assessing levee systems.

1.3.1 Water Resources Development Act of 2007

Title IX of the Water Resources Development Act (WRDA) 2007, the National Levee Safety Act of 2007, as amended and codified in 33 USC Chapter 46, includes activities in support of establishing a National Levee Safety Program to be led by USACE in cooperation with FEMA. USACE and FEMA have been working within existing appropriations to develop some of the technical and communication building blocks necessary for an effective National Levee Safety Program. USACE and FEMA remain fully committed to working within available appropriations to continue to make progress on achieving the overall objectives of the National Levee Safety Program. The National Levee Safety Act requires: 1) establishment of the Committee on Levee Safety as an all non-federal advisory body; 2) a database with an inventory of the Nation's levees; 3) a one-time review of all levees in the National Levee Database (NLD); 4) carrying out a levee safety initiative that establishes technical guidelines, creates and supports state/regional/tribal levee safety programs, provides technical assistance broadly and funding for specific items and improves public awareness of levee-related issues; and, 5) specified reports. Recommendations leading up to this legislation can be found on the USACE website (www.usace.army.mil/National-Levee-Safety/).

1.3.2 Flood Protection Structure Accreditation Task Force

The USACE and FEMA formed the Flood Protection Structure Accreditation Task Force (Task Force) in accordance with Section 100226 of Public Law (P.L.) 112-141. The primary charge of the Task Force was to align agency processes, so information collected for either program can be used interchangeably and to align the information and data collected by USACE, so it is sufficient to satisfy NFIP accreditation requirements. The Task Force resulted in a list of recommendations

and a formal memorandum of understanding signed by USACE and FEMA committing to establishing a coordinated approach for levee activities that is aligned with policies and goals of both agencies to promote life safety, flood risk reduction, risk communication, and sound national investments. The final Task Force report and memorandum of understanding can be found at https://www.usace.army.mil/Missions/Civil-Works/Levee-Safety-Program/Task-Force/.

1.3.3 National Academy of Science Recommendations

The National Research Council (NRC) document titled A Levee Policy for the National Flood Insurance Program, published in 1982, made recommendations to FEMA for a comprehensive levee policy for use in administering floodplain management, insurance, and hazard mapping aspects of the NFIP. The document addressed five areas that NRC deemed critical to a levee policy: (1) Minimum design standards; (2) Inspection and evaluation to be conducted by FEMA to assure conformance with minimum design standards at the time a levee is recognized in the program; (3) Requirements FEMA should place on communities with recognized levees; (4) Estimation of risk in areas landward of levees for use in setting insurance rates; and (5) Floodplain mapping of levee-impacted areas to portray SFHAs, degree of flood risk, and evacuation routes.

The National Academy of Sciences (NAS) document titled Levees and the National Flood Insurance Program, Improving Policies and Practices, published in 2013, examines the way levees are addressed in the NFIP and provides advice as to what actions might be taken to improve program efficiency and effectiveness. The NAS document includes 11 recommendations and 10 conclusions to improve the policies and practices related to levees and the NFIP. Additional information on the NAS document is accessible through the NAS website at https://nas-sites.org/levees/. While FEMA is making progress toward achieving some of the goals and objectives, this guidance document does not address the modern risk-informed analysis recommended in the NAS document.

1.4 Levee-Related Communication and Community Engagement

To appropriately analyze and map the flood hazards in levee-impacted areas, FEMA will coordinate with communities during the Discovery Phase of a Flood Risk project, and throughout the project lifecycle as necessary, to understand the location and impacts of levee systems. The current, effective FIRMs may inadvertently represent levee systems as providing flood hazard reduction or other impacts to the conveyance of floodwaters, and as such, may indicate a lesser flood hazard and corresponding risk than what may actually exist in these areas. Because communities and property owners may not be fully aware of the risk associated with levee systems, coordination with local stakeholders is essential to identify, analyze, and map the flood hazards associated with levee systems and to provide relevant information and tools to help them understand their flood risk and mitigation opportunities in these areas.

FEMA developed the Risk Communications and Risk MAP Playbook, also known as the Community Engagement and Risk Communication (CERC) Playbook, to focus on the value of outreach and community engagement in ensuring the successful delivery of the Risk MAP program goals and demonstrating how communication can facilitate an understanding of the value of mitigation and the importance of resilience. The Playbook provides guidance to FEMA, FEMA Risk MAP providers (primarily, the Production and Technical Services [PTS] and CERC providers), and CTPs on developing approaches that will ultimately motivate communities toward

mitigation action throughout the Risk MAP lifecycle, including those communities impacted by levees.

Section 5 of the Playbook, "Risk Communication for Communities with Levees", provides guidance on FEMA's role regarding levees, how that role intersects with the roles of other agencies; and how to effectively communicate flood risk with respect to levees. The levee section of the Playbook includes information on the following topics:

- Levee Systems: Who Does What?
- What Is Risk Communication in Relation to Levees?
- Why and How Does FEMA Map Flood Hazards for Levee-Impacted Areas?
- Risk Messaging for Levees
- Developing your Community Engagement Plan
- Building Resiliency

Project Team members should refer to the CERC Playbook for additional information about stakeholder engagement and links to examples, tools, and templates. The CERC Playbook can be accessed through the password-protected Risk Management Directorate SharePoint Portal or by contacting the FEMA Project Officer.

This guidance document focuses on mapping guidance and therefore does not cover risk communication in detail, although these are important portions of the flood hazard mapping project lifecycle.

1.5 Chapter Overviews

Primary topics covered by this guidance document include the collection and management of levee data; procedures for addressing accreditation, PALs, and non-accredited levees; addressing the topic of evaluating and mapping flood hazards landward of non-levee features; and coordination with USACE and other Federal agencies. Additional summary information for each chapter is provided in Subsections 1.5.1 through 1.5.8

1.5.1 Chapter 2, Glossary of Levee Terms

The glossary in Chapter 2 contains levee terminology to be used throughout this guidance document.

1.5.2 Chapter 3, Levee Data Inventory

Chapter 3 provides an overview and brief history of FEMA historic levee inventory systems. The chapter introduces FEMA's overall mission with early identification of levees, levee data tracking, inventory, mapping, and coordination/cooperation with USACE in the direction toward a unified national levee database. Chapter 3 provides guidance for populating and maintaining the FEMA accreditation status tracking system, the NLD, and National Flood Hazard Layer (NFHL).

1.5.3 Chapter 4, Accredited Levee Systems

Chapter 4 provides focused guidance on levee accreditation, leveraging the requirements in 44 CFR 65.10 and the transformation of PM 45, Revisions to Accredited Levee and Provisionally Accredited Levee Notation, issued on May 12, 2008; and PM 63, Guidance for Reviewing Levee Accreditation Submittals, issued on September 2, 2010. In addition to the transformed guidance, Chapter 4 includes clarifications and best practices that have been collected since the implementation of PMs 45 and 63.

1.5.4 Chapter 5, Provisionally Accredited Levees

Chapter 5 provides guidance to Project Team members (FEMA, FEMA Risk MAP providers, CTPs, and CTP subcontractors) on implementing the PAL process. This chapter is a transformation and revision of PM 43, Guidelines for Identifying Provisionally Accredited Levees, issued on September 25, 2006; PM 45, Revisions to Accredited Levee and Provisionally Accredited Levee Notation, issued on May 12, 2008; and PM 53, Guidelines for Notification and Mapping of Expiring Provisionally Accredited Levee Designations, issued on April 24, 2009.

1.5.5 Chapter 6, Non-Accredited Levees

Chapter 6 provides guidance to FEMA Regional Office staff, FEMA Risk MAP providers, CTPs, and CTP subcontractors involved in performing flood hazard mapping projects where non-accredited levee systems have been identified. This chapter follows the levee analysis and mapping procedures described in OG 12-13, Non-Accredited Levee Analysis and Mapping Guidance, dated September 2013.

1.5.6 Chapter 7, Non-Levee Features

Chapter 7 recommends actions that would help ensure adequate identification, analysis, and mapping of potential flood hazards around non-levee features. This chapter is a transformation and revision of PM 51, Guidance for Mapping of Non-Levee Embankments Previously Identified as Accredited, issued on February 27, 2009.

1.5.7 Chapter 8, FEMA and Other Federal Agency Coordination

Chapter 8 provides guidance to FEMA Regional Office staff, Risk MAP providers, and CTPs performing flood hazard mapping projects where other Federal agencies may have a role. These potential roles could include policy development, actual mapping actions, and accreditation efforts involving levees. In addition, mitigation and outreach activities may involve other Federal agencies.

2.0 Glossary

Key levee terms used throughout this guidance document. are defined in Table 1.

Table 1: Levee Terms

Levee Term	Description
Accredited Levee System	A levee system shown on a FIRM that is recognized as reducing the flood hazards posed by a base flood. This determination is based on the submittal of data and documentation as required by 44 CFR 65.10. The area landward of an accredited levee system is shown as Zone X (shaded) on the FIRM except for areas of residual flooding, such as ponding areas, which are shown as SFHA.
Berms	Horizontal strips or shelves of material built contiguous to the base of either side of levee embankments for the purpose of providing risk reduction from underseepage or erosion or increasing the stability of the slopes of the earthen embankment.
Certification	As stated in 44 CFR 65.2(b), certification of analyses is a statement that the analyses have been performed correctly and in accordance with sound engineering practices. Certification of structural works is a statement that works are designed in accordance with sound engineering practices to provide risk reduction from the base flood. Certification of "as built" conditions is a statement that the structure(s) has been built according to the plans being certified is in place and is fully functioning. Certification documentation is the responsibility of the local project sponsor.
Closure Devices	Any movable and essentially watertight barriers, used during flood periods to close openings in levee systems, securing but not increasing the levee systems' design level of risk reduction. Must be structural parts of the system during operation and designed according to sound engineering practice.
Erosion	The wearing away of land masses through gradual natural processes or catastrophic events.
Flood Risk	The risk of flooding in a leveed area that remains at any point in time after accounting for the flood risk reduction contributed by the levee system. Risk is a measure of the probability and severity of undesirable consequences. Flood risk is comprised of three parts: (1) the likelihood of occurrence of an event (e.g., flood, earthquake, etc.), (2) the likelihood associated with the performance of the levee system (e.g., levee breach, closure malfunction, overtopping, etc.), and (3) the magnitude of the consequences resulting from inundation of the levee impacted

Levee Term	Description
	area during that event (e.g., life loss, economic damages, environmental damages, etc.).
Floodwall	A designed structural wall constructed adjacent to shorelines for the purpose of reducing flooding of property on the landward side of the wall. Floodwalls are normally constructed in lieu of or to supplement levees where the land required for levee construction is too expensive or not available.
Freeboard	A factor of safety usually expressed in feet above a flood level for purposes of floodplain management. ”Freeboard’’ tends to compensate for the many unknown factors that could contribute to flood heights greater than the height calculated for a selected size flood and floodway conditions, such as wave action, bridge openings, and the hydrological effect of urbanization of the watershed. At times, overbuild to account for long-term settlement and incrementing the height to ensure maintenance access during flood events is referred to as freeboard as well. For levees and purposes of the NFIP, this is the vertical distance between the top of a levee and the water level that can be expected during the base flood.
Freeboard Deficient Procedure	Non-accredited levee analysis and mapping procedure that is applicable if the freeboard standard is not met, but the top of levee is above the base flood. A Freeboard Deficient levee reach must meet the structural requirements of 44 CFR 65.10 and have documented operation, maintenance, and emergency preparedness plans. Freeboard Deficient Levee reaches differ from an accredited levee system because they are part of a levee system that as a whole cannot meet accreditation requirements and because they cannot meet the regulatory freeboard standard.
Gravity outlets	Culverts, conduits, or other similar conveyance openings through embankments or floodwalls that permit discharge of interior floodwaters by gravity when the outlets are above exterior water levels. Gravity outlets are equipped with gates to prevent flows from entering the levee impacted area during time of high exterior stages.
Hazard	An event or physical condition that has the potential to cause fatalities, injuries, property damage, infrastructure damage, agricultural loss, damage to the environment, interruption of business, and other types of loss or harm.
Hydraulic Analysis	An engineering analysis of a flooding source carried out to determine how flood waters will move within the system in response to differing discharge quantities.

Levee Term	Description
Hydraulic Independence	Two levees or levee reaches are considered hydraulically independent when their level of flood hazard reduction functions independently from the other; their corresponding levee impacted areas are not identical; and if one breaches or overtops, the structural integrity of the other levee/levee reach is not adversely impacted.
Hydraulically Insignificant	For mapping purposes, a structure is considered hydraulically insignificant if, during a 1-percent–annual-chance flood event, the peak water-surface elevations landward of the structure may be the same regardless of whether the structure was in place.
Inspection	A visual assessment of physical features of a levee system to determine the general condition and operability of the levee. This may include operation and mechanical features such as pumps or gates.
Interior Drainage	Natural or modified removal of runoff within an area landward of a levee.
Interior Drainage Systems	Systems associated with levee systems that usually include storage areas, gravity outlets, pumping stations, or a combination thereof to control interior drainage.
Levee	Per 44 CFR 59.1, a manmade structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water to reduce flood hazards posed by temporary flooding.
Leveed Area	A spatial feature in the National Levee Database defined by the lands from which floodwater is excluded by the levee system.
Levee Breach	A rupture, break, or gap in a levee system that causes flooding in the area landward of the levee system and may be due to overtopping or levee feature failure.
Levee Feature	A structure that is critical to the functioning of a levee system, including: (A) an embankment section; (B) a floodwall section; (C) a closure structure; (D) a pumping station; (E) an interior drainage work; and (F) a flood damage reduction channel.
Levee Impacted Area (*for base flood*)	The area landward of a levee system that would be inundated by the corresponding base flood if the flood hazard reduction effect of the levee system is not considered. Often, this area will be identified by applying the Natural Valley Procedure for the levee system.

Levee Term	Description
Levee Owner	A federal or state agency, a water management or flood control district, a local community, a levee district, a nonpublic organization, or an individual considered the proprietor of a levee. The levee owner is responsible for administering the operations, maintenance, and emergency preparedness plans for the levee system. Often referred to as levee sponsor.
Levee Reach	A levee reach is a portion of a levee system (usually a length of a levee) that may be considered for analysis purposes to have approximately uniform representative properties. A levee reach is a unique component having properties different than other reaches of the levee system and may be used to evaluate the performance of a portion of the levee system. No minimum or maximum length is associated with a reach. Any continuous section of a levee to which a single analysis and mapping procedure may be considered as a reach.
Levee Segment	A discrete portion of a levee system that is operated and maintained by a single entity. A levee segment can be comprised of a single levee reach or multiple reaches. A levee segment may comprise one or more levee feature.
Levee System	A flood hazard-reduction system that consists of one or more levee segments/reaches and other features, such as floodwalls and pump stations, which are interconnected and necessary to ensure exclusion of the design flood from the associated hydraulically independent levee impacted area, and which are constructed and operated in accordance with sound engineering practices.
Line of Flood Hazard Reduction	The centerline of the levee segments/reaches which exclude floodwaters from the base flood event from the levee impacted area.
Local Levee Partnership Team (LLPT)	A workgroup that is facilitated by FEMA when a levee system will be analyzed by levee analysis and mapping procedures for non-accredited levees. The primary function of this group is to share information/data and identify options based on stakeholder roles and knowledge.

Levee Term	Description
National Levee Database (NLD)	The NLD, developed by the USACE in cooperation with FEMA, is a dynamic, searchable inventory of information for all levee systems in the nation. The database contains information to facilitate and link activities, such as flood risk communication, levee system evaluation for the NFIP, levee system inspections, floodplain management, and risk assessments. The NLD continues to be a dynamic database with ongoing efforts to add levee data from federal agencies, states and tribes.
Natural Valley Procedure	Non-accredited levee procedure that can be applied to all non-accredited levee reaches. The Natural Valley Procedure is used in two ways: first landward of the entire levee system to determine the outer limits of any levee impacted Zone D areas, and second as a potential procedure applied to individual levee reaches to determine the SFHA on the landward side of the levee reach. Several factors are considered when determining whether to use the Natural Valley Procedure to determine the SFHA: • The levee reach does not significantly obstruct the flow of water; Data necessary for more complex methods is not and will not be available in the near term; or • The community (or tribal entity, when appropriate) provides feedback that it is the acceptable procedure to use. For riverine levee systems, the Natural Valley Procedure reflects the levee geometry in the hydraulic model but allows water to flow on either side of the levee. For coastal levee systems, the Natural Valley Procedure reflects the levee geometry, and consideration is given as to how the levee system impacts wave propagation.
Non-Accredited Levee System	A levee system that does not meet the requirements in the NFIP regulations at Title 44, Chapter 1, Section 65.10 of the Code of Federal Regulations (44 CFR 65.10), Mapping of Areas Protected by Levee Systems, and is not shown on a FIRM as reducing the base flood hazards.
Non-levee Feature	A physical feature that is not designed, constructed, operated, or maintained as a flood control structure, but may inadvertently confine flow during some flood events.

Levee Term	Description
Non-levee Reach	A form of manmade high ground which a levee system or segment/reach ties into, whose existence and performance is necessary for excluding floodwaters from the levee impacted area.
Overtopping	A condition that occurs when water levels, including any wave or run-up factors, exceed the top elevation of a levee system and flow into areas landward of the levee system. Levee system may be damaged and/or compromised.
Overtopping Procedure	Non-accredited levee procedure is applicable when the base flood is above the levee crest for a reach, and the community or levee owner has provided appropriate technical justification that the base flood event will not cause a levee breach. In addition to the structural standards established in 44 CFR 65.10, it is expected that more detailed structural analysis will be required to justify that the levee system can sustain the base flood. As with a Sound Reach and Freeboard Deficient levee reach, an operations and maintenance plan and documentation of inspection are required.
Piping	The result of water seepage that progressively erodes and washes away soil particles, leaving large voids in the soil. Removal of soil through sand boils by piping or internal erosion damages levees, their foundations, or both, which may result in settlement and has the potential to cause catastrophic failures of levees.
Ponding	The result of runoff or flows collecting in a depression that may have no outlet, subterranean outlets, rim outlets, or manmade outlets such as culverts or pumping stations. Impoundments landward of manmade obstructions are included in this type of shallow flooding as long as they are not backwater from a defined channel or do not exceed 3.0 feet in depth.
Provisionally Accredited Levee (PAL)	A designation for a levee system that FEMA has previously accredited with reducing the flood hazards associated with a base flood on an effective FIRM, and for which FEMA is awaiting data and/or documentation that will demonstrate the levee system's compliance with the NFIP regulatory criteria of 44 CFR 65.10.
Pumping Stations	Pumps located at or near the levee system to discharge interior drainage over or through the levees or floodwalls (or through pressure lines) when free outflow through gravity outlets is prevented by high exterior stages.

Levee Term	Description
Rehabilitation	The term rehabilitation means the repair, replacement, reconstruction, or reconfiguration of a levee system, including a setback levee.
Residual Risk (or Flood risk)	The flood risk (probability of capacity exceedance or failure and the associated consequences) that remains after the flood risk management measure is implemented.
Ring Levees	Levees that completely encircle or “ring” an area subject to inundation from all directions.
Risk Assessment	A systematic, evidence-based approach for quantifying and describing the nature, likelihood, and magnitude of risk.
Setback Levees	Levees that are built landward of existing levees, usually because the existing levees have suffered distress or are in some way being endangered, as by river migration.
Shallow Flooding	Flat areas where a lack of channels prevents water from draining away easily. Shallow flood types fall into three categories: sheet flow, ponding, and urban drainage. For the purposes of the NFIP, shallow flooding is distinguishable from riverine or coastal flooding because it generally occurs in an area where there is no channel or identifiable flow path.
Sound Reach Procedure	A reach that has been designed, constructed, and maintained to withstand the flood hazards posed by a base flood, in accordance with the standards in 44 CFR 65.10 of the NFIP regulations, but is part of a system that cannot be accredited.
Structural-Based Inundation Procedure	Non-accredited levee analysis and mapping procedure applicable to some levee systems having reaches with either structural deficiencies that are known or structural integrity that is unknown (a common occurrence for older levee systems). For these levee reaches, FEMA will rely on modeling of breaches along the levee reach. It is not possible to predict the exact location of a levee breach. This procedure, therefore, does not predict the probability of failure at any breach location, nor does it provide a specific determination or evaluation of the overall levee system performance or require a determination of the likely failure mechanism. The procedure instead results in the development of a levee reach-specific SFHA that might occur as a result of potential breaches along a particular levee reach during the base flood. To determine this SFHA, possible locations of system breaches, geometry, and failure duration will be considered.

Levee Term	Description
Zone A99	As defined in 44 CFR 61.12, areas subject to inundation by the base flood event, but which will ultimately be accredited upon completion of an under-construction levee system. These are areas of special flood hazard where enough progress has been made on the construction of a levee system, such as dikes, dams, and levees, to consider it complete for insurance rating purposes. Zone A99 may only be used when the levee system has reached specified statutory progress toward completion. No BFEs or depths are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.
Zone AR	As defined in 44 CFR 61.12, areas that result from the new non-accredited status of a previously accredited levee system that is determined to be in the process of being restored to provide base flood risk reduction. Mandatory flood insurance purchase requirements and floodplain management standards apply.
Zone D	An area of possible, but undetermined flood hazard. When analyzing and mapping areas landward of non-accredited levee systems, a Zone D may represent areas landward of a non-accredited levee, within the natural valley footprint, that are not depicted as SFHA resulting from freeboard deficient, sound reach, overtopping, and/or structural-based inundation procedures. The Zone D designation is used for non-accredited systems instead of the Zone X (shaded) designation because the flood hazard potential is more uncertain and possibly greater.

3.0 Levee Data Inventory

The construction of flood hazard-reduction structures, such as levees and floodwalls, has had a significant effect on flood-prone areas throughout the United States. These structures are of particular importance in identifying flood hazards and risks to lives and property. As such, FEMA and USACE share a common interest in managing and administering levee information and data throughout the Nation. This chapter provides background on previous FEMA levee inventory systems; introduces FEMA's overall mission with regard to identification of levees, levee data tracking, inventory, mapping, and coordination/cooperation with USACE on the development of a unified national levee database; and provides guidance for populating and maintaining the FEMA accreditation status tracking system, NLD, and NFHL database.

3.1 Background

With the enactment of WRDA in 2007, the U.S. Congress directed USACE to develop a national database for levee data and information. USACE developed the database model for the NLD to meet that long-term goal. FEMA initially used a simplified subset of the NLD database schema to compile a midterm levee inventory database for internal use. The two agencies synchronized the two databases to track information specific to their respective agencies with the goal to merge the two into one authoritative database. USACE focused on levees as part of their agency Levee

Safety Program while FEMA's interest was to inventory all levees to identify those affecting flood hazard mapping efforts as part of the NFIP.

The FEMA midterm levee inventory database contained data gathered for many levees that were designed to provide flood hazard reduction from the base flood. This standard is the minimum level of flood hazard reduction that is recognized by the NFIP. However, the database also frequently included data for levees that did not meet this minimum NFIP criterion for accreditation, as well as agricultural levees and levees of small and potentially less significant nature.

Beginning in 2012, FEMA and USACE formed a team of levee Subject Matter Experts (SMEs) to collaboratively merge the FEMA inventory into the NLD. The FEMA/USACE team completed the effort to integrate the two databases in May 2016.

3.2 National Levee Database

USACE and FEMA envision the NLD to be the main repository for comprehensive information about all levees and floodwalls in the United States. The NLD is a dynamic database, with USACE and FEMA staff continuously updating its content and adding levee data from other Federal agencies, States agencies, and communities. The NLD contains various levels of information for levees within the USACE Levee Safety Program and non-USACE Program levees, with information from FEMA and other organizations.

The NLD includes attributes of levees and floodwalls relevant to design, construction, operations, maintenance, repair, inspections, and performance. The NLD will facilitate linking levee safety activities, such as flood risk communication, levee system evaluations for the NFIP, levee system inspections, floodplain management, and risk assessments. Most of the information in the NLD is publicly available. Only information deemed sensitive from a security standpoint is not publicly available. For information on accessing the non-public NLD, interested parties should consult with FEMA Project Officer, other FEMA Regional Office staff, or the designated mapping partner responsible for supporting the Region with levee inventory and tracking.

3.3 Identification and Mapping of Levees in Flood Hazard Studies and Map Revisions

An important step in identifying and mapping areas impacted by levee systems is to first consult with FEMA Regional Office staff that are not part of the FEMA Project Team, as well as the local community Floodplain Administrator (FPA) and the State. When the Project Team identifies a potential flood-control structure, the assigned team member should evaluate the structure to determine whether it can be considered a levee and is subject to the procedures described in this guidance document. FEMA will only consider a structure to be a levee when it can be demonstrated that the structure was designed and has been operated and maintained as a levee. FEMA verifies whether a structure meets this definition of a levee by coordinating with community officials and levee owners, and by reviewing available levee data and documentation.

The FEMA Region and other Project Team members will be able to use the available accreditation status tracking systems to provide details about levee systems, special situations, or any additional analysis or outreach that may be necessary. The local FPA may have knowledge of any newly constructed flood-control projects that may not yet be inventoried by FEMA or USACE. The local FPA also may be able to provide updates to the data FEMA and USACE have already

inventoried. Items that the Project Team should consider when determining whether the flood hazard mapping project will impact any levees include, but are not limited to, those listed below (in no particular order of priority).

- Levee features in the S_Levee feature class of the NFHL
- Levee symbology on the effective FIRM
- Levee features USACE NLD database
- Local data for new flood control projects recently completed that may not already be inventoried by FEMA or USACE
- Effective FEMA accreditation status of all existing levees in the project footprint
- Any existing, pending, or missing 44 CFR 65.10 certification data and documentation
- Non-accredited levees that may require new/updated levee analysis and mapping procedures for non-accredited levees
- Topographic data, such as Light Detection and Ranging (LiDAR)-generated data and U.S. Geological Survey (USGS) quadrangles, that may show potential flood-control structures

If discrepancies exist between the NFHL and the NLD, the assigned Project Team member should coordinate with the FEMA regional levee data leads, USACE District, and the local FPA to determine the best available data.

The FEMA-led Project Team or mapping partner should complete the research and identification of levees early on during the project. Early identification of levees allows the Project Team or mapping partner time to reach out to the community, or to another party seeking recognition of levee, to collect information and discuss options, responsibilities, and expectations regarding mapping of the levee system(s) and the levee-impacted area(s) on the FIRM.

The Project Team or mapping partner is to examine the current effective FIRM, as well as the existing effective S_Levee feature class in the NFHL database and compare it to the NLD to resolve any discrepancies. The Project Team or mapping partner can download the current effective NFHL data from the FEMA Flood Map Service Center (MSC) for counties that have been converted to a digital FIRM format. For levees that were not previously mapped on the FIRM, or inventoried in the NLD, the assigned Project Team member or mapping partner must input a new entry in S_Levee, with relevant information collected and recorded, as described in Section 3.6 of this document.

The assigned Project Team member or mapping partner should next examine the levee features in the NLD that are located within the project footprint, making note of any spatial misalignments and additional/missing features between the NFHL and the NLD. The assigned Project Team member or mapping partner is to verify and correct these discrepancies in the production data through the use of best available orthoimagery, topographic data, and online web mapping data (such as Google Earth) and through engagement with local community officials. The assigned team member or partner is to report the updated levee mapping to FEMA as described in Section 3.6 of this document. The Project Team or mapping partner is to verify any changes to the USACE Program Levee alignments with the responsible USACE District first.

When levees are identified, FEMA is to inform the community of the data requirements for FEMA to recognize on the FIRM a levee with reducing the base flood hazard. In accordance with 44 CFR 65.10(a), it is the responsibility of the community or other party seeking recognition of a levee system at the time of a flood hazard study or restudy to provide the data outlined in 44 CFR 65.10. (See Chapter 4 – Levee Accreditation of this document.)

FEMA will update the FIRMs to depict the hazard associated with the levee based on the data and documentation provided (if any) by the community, levee owner, or certifying engineer. In addition, FEMA will notify the community or party seeking recognition of the data collection period to provide information regarding the hazards associated with the levee system.

The specific data requirements and the length of the collection time period depend on the level of intended flood hazard reduction and the mapping path forward. The data and timelines are discussed in Chapter 4 – Accredited Levee Systems, Chapter 5 – Provisionally Accredited Levee Systems, and Chapter 6 – Non-Accredited Levee Systems. At any point, a levee owner may choose to submit a map revision following the MT-2 process regarding the submittal of data and documentation and updates to the flood hazards on the FIRMs.

3.4 FEMA Regulatory Levee Data

Once the Project Team or mapping partner has identified and researched all flood-control structures in the project areas, as discussed in Section 3.3, the team or partner uses the S_Levee table in the FIRM database to store the spatial features, and whether they have been demonstrated to meet NFIP requirements in 44 CFR 65.10. The Project Team or mapping partner will symbolize all flood control features inventoried in the S_Levee table on the FIRM panel as outlined in Flood Insurance Rate Map (FIRM) Panel Technical Reference: Format for Flood Insurance Rate Maps and noted as accredited or non-accredited.

The accreditation status of any levee in the NFHL and on the FIRM panel is only as current as the date of the effective study. At this time, FEMA does not define a set time period in which a certification of data for a levee remains valid for accreditation. The certifying engineer may provide a timeframe for which the certification of data for a levee is valid. When a map action is initiated to revise a current effective FIRM panel containing a levee, the assigned Project Team member or mapping partner will need to revisit the certification and subsequent accreditation status of that levee. Further discussion regarding the continued accreditation of levees is provided in Chapter 4 of this document.

Inside the FIRM database, the assigned Project Team member or mapping partner must include the levee System ID from the NLD in the S_Levee table. For more information on populating the NLD System ID in the S_Levee table, the team members or partner should refer to Technical Reference: Flood Insurance Rate Map (FIRM) Database. It is critical that this NLD System ID is correctly attributed in the S_Levee table to maintain the linkage to the detailed levee records maintained in the FEMA accreditation status tracking systems and the NLD. The Project Team or mapping partner should always depict accredited levee systems on the FIRM with a “Zone X – Area with Reduced Flood Risk Due to Levee” flood hazard zone on the landward side of the levee. In addition, the Project Team or mapping partner should show all accredited levees, PALs, and non-accredited levees (all other levees shown on the FIRM with a levee symbol) in Table 9 of the current, effective Flood Insurance Study (FIS) Report(s). The team or partner shall ensure that

the information in Table 9 matches the data populated in the S_Levee table. For more information on including levee information in the FIS Report, Project Team members or partners should refer to the current version of Flood Insurance Study (FIS) Report Technical Reference: Preparing FIS Reports.

The Technical References cited above are accessible from the FEMA Technical References webpage (https://www.fema.gov/media-library/assets/documents/34519).

If discrepancies exist between the FIRM database and the NLD, the assigned Project Team member must correct the discrepancies as part of the current map action so that the FIRM database, and subsequent NFHL, represent the most accurate levee alignment and inventory. Reporting requirements for the updated levee mapping are described in Section 3.6 of this document.

3.5 Tracking Levee Accreditation Status

Tracking specific levee information is critical to meeting FEMA program goals. As part of the NLD and subsequent tracking systems, FEMA maintains information about all levee systems such as:

- Current accreditation status on the effective FIRM
- Long-term levee project planning and prioritization
- Levee-related FIRM mapping issues
- 44 CFR 65.10 certification records
- Levee-related risk assessments
- Ongoing levee studies
- Local ownership, media, and political information

The NLD can be accessed and edited by designated USACE staff, FEMA staff, and FEMA Regional levee SMEs who help to maintain the database while keeping it synched with NFHL databases.

3.6 Reporting Levee System Updates

The FEMA mapping partner or Project Team member producing the updated FIRM is expected to have detailed knowledge of whether the map update includes any updates to levee system reach alignments or changes to levee accreditation status. The process of researching levees for flood studies and map revisions was described in Section 3.3 of this document.

When new levee features are added to the inventory or existing levee data is modified, the mapping partner or Project Member must incorporate the updates into the FIRM database and then into the NFHL database. The mapping partner and Project Team is to ensure that all updates are coordinated with the FEMA Region and designated levee SMEs to incorporate appropriate updates into the NLD, and FEMA tracking systems.

Specific questions related to levee data updates exist in the Key Decision Point (KDP) questionnaires. Accurate and complete answers to these levee questions are very important. The

KDP levee information provided will give the FEMA Region staff and their designated Levee Project Monitors visibility on any updates that need to take place in the national levee data inventory and tracking systems. More detailed information on the KDP process and copies of the questionnaires are provided in FEMA Guidance Document No. 35, Guidance for Flood Risk Analysis and Mapping: Key Decision Point (KDP) Process Guidance Document, which is accessible from the FEMA Guidelines and Standards for Flood Risk Analysis and Mapping webpage.

If levee map revisions are requested through the MT-2 Letter of Map Revision (LOMR) process, the appropriate FEMA Regional Levee Project Monitor must review the submittal so that the appropriate updates to the levee attributes and alignments can be entered in the NLD.

3.7 Levee Data Storage Standards

To depict the hazard associated with levee systems on the FIRM, FEMA collects certified data pertaining to the requirements under 44 CFR 65.10 for levee accreditation and certain scenarios pertaining to the analysis and mapping procedures for non-accredited levees. The details of the data requirements and processes are laid out in Chapter 4--Accredited Levee Systems and Chapter 6--Non-Accredited Levee Systems) of this document. Once the FEMA Levee Project Monitor or designee considers the submitted certified data, the data needs to be consistently captured and documented for search ability throughout all FEMA Regions. The methods differ depending on whether the submitted certified data for an area is associated with a FEMA-funded mapping project, an area associated with a LOMR case, or unfunded area.

3.7.1 Levee Data Storage and Documentation for the MIP

Levee accreditation data and documentation provided to mapping partners from the Region or its supporting staff, in conjunction with a PAL or analysis and mapping procedures for non-accredited levees process, needs to be captured under a funded mapping project to update the levee-related flood hazard on the FIRM. These projects can be funded solely to update the levee hazard or can be done in conjunction with a larger study effort for the flooding source, county, or watershed.

On the FEMA Mapping Information Platform (MIP), a levee purchase option is available for funded projects to capture pertinent levee information. This purchase includes several tasks available for levees, including Levee Data Capture, Analysis and Mapping Procedure for Non-Accredited Levees Data Capture, and associated QA/QC and Validation Tasks. The main tasks can be defined as follows:

- **Levee Data Capture Task**: Under this task, the assigned Project Team member or partner captures levee data certification submittals, levee analysis and mapping approach packages for non-accredited levees (i.e., Sound Reach Procedure, Freeboard Deficient Procedure Overtopping Procedure, Structural-Based Inundation Procedure, Natural Valley Procedure), new PAL offers, and Natural Valley Concurrence letters (if the full levee deficiency based analysis workflow was not applied). For FEMA-funded mapping projects, this task is intended for non-engineering modeling data only because models are to be stored separately in the Hydraulics Data Capture and/or Hydrology Data Capture Tasks in the MIP.

- **Levee Analysis and Mapping Procedures Data Capture Task**: Under this task, the assigned Project Team member or partner captures data useful to evaluate the appropriate levee analysis and mapping approach discovered during the process of Identification and Plan Preparation concluding with a full analysis and mapping procedure plan for the non-accredited levee or Natural Valley Concurrence. The team member or partner also may document the Natural Valley Concurrence under the Levee Data Capture task if the full levee analysis and mapping procedures were not funded.

All levee-related data pertaining to the mapping of the hazard and risk associated with the levee system on the FIRM should be captured under the Levee Data Capture Task. The Levee Data Capture task can be utilized to capture submitted levee data that includes levee accreditation data or data pertaining to the analysis and mapping procedure scenarios of a non-accredited levee that can be retrievable under the case number.

More detailed information on levee-related data storage is provided in, but may not be limited to, the FEMA guidance documents and technical references listed below.

- MIP User Guidance
- Guidance Document No. 12, Guidance for Flood Risk Analysis and Mapping: National Flood Hazard Layer (NFHL)
- Guidance Document No.46, Guidance for Flood Risk Analysis and Mapping: Data Capture - General
- Guidance Document No. 51, Guidance for Flood Risk Analysis and Mapping: Data Capture – Workflow Details
- Guidance Document No. 56, Guidance for Flood Risk Analysis and Mapping: Mapping Information Platform (MIP)
- Data Capture Technical Reference
- Flood Insurance Rate Map (FIRM) Panel Technical Reference: Format for Flood Insurance Rate Maps
- Flood Insurance Study (FIS) Report Technical Reference: Preparing FIS Reports
- Domain Tables Technical Reference: FEMA Spatial Databases

The MIP User Guidance is accessible from the User Guides and Documentation page on the MSC Web Portal. Guidance Document Nos. 12, 46, 51, and 56 are accessible from the previously referenced FEMA Guidelines and Standards for Flood Risk Analysis and Mapping webpage. The Technical References are available from the previously referenced FEMA Technical References webpage.

4.0 Accredited Levee Systems

FEMA analyzes and maps the flood hazards associated with levee systems based on the information provided by other Federal agencies, levee owners, and/or communities. Accredited levee systems are depicted as reducing the base flood hazard on a Flood Insurance Rate Maps (FIRM) if FEMA has been provided with documentation and certified data that meets the

requirements of 44 CFR 65.10, including an adopted operation, maintenance and emergency preparedness plan provided by the community or other qualified entity seeking accreditation. This information can be submitted to FEMA at any time including through the Flood Risk Project study process, PAL process, or through the MT-2 process.

Accreditation can only be considered for an entire levee system which meets the full requirements of 44 CFR 65.10. As noted in Chapter 2 of this guidance, a levee system is defined as

> A flood hazard-reduction system that consists of one or more levee segments/reaches and other features such as floodwalls and pump stations, which are interconnected and necessary to ensure exclusion of the design flood from the associated hydraulically independent levee impacted area, and which are constructed and operated in accordance with sound engineering practices.

Because the levee system must be considered hydraulically independent, failure of any portion of the system will only adversely impact the system itself and not any surrounding areas or levee systems. See Figure 1.

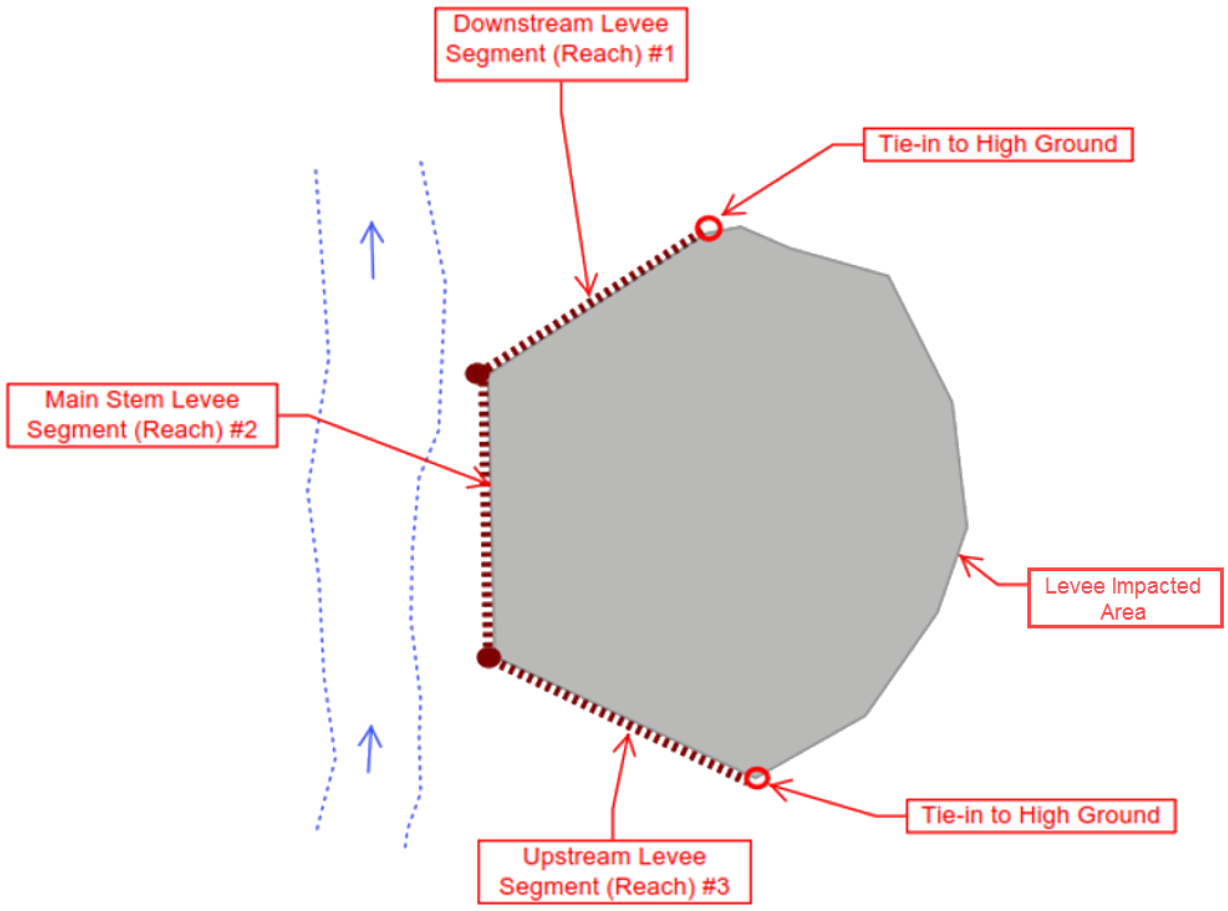

Figure 1: Example Levee System A

Levee System A is a typical example of a main stem levee with both upstream and downstream levees extending to high ground. The levee impacted area is shown in gray shading and represents the area which would be inundated during the base flood if the levee system fails to provide flood hazard reduction for the base flood. For an accredited levee system, the levee impacted area would be shown as Zone X (shaded) and labeled with the "Area with Reduced Flood Risk due to Levee" note on the Flood Insurance Rate Map.

For a levee system to be considered eligible for accreditation, the structure must first be identified as a levee system and meet the following minimum criteria:

- Meets the definitions of a levee and levee system, as defined in 44 CFR 59.1
- Has an identifiable owner
- Is operated, maintained, and inspected as a levee
- Is hydraulically independent from other levee systems or flood control structures
- Meets full requirements of 44 CFR 65.10

Unless designed as a ring levee, a levee system's requirements should also include that the levee system tie into natural high ground at either end of the system. High ground will be considered as topography that has not been revised due to manmade influences and should conform to the existing topography including no side slopes or heights outside of the typical terrain in the area. High ground should be sufficient to provide a stable foundation for the levee system to meet the structural requirements of 44 CFR 65.10 at both upstream and downstream tie-ins. For certain situations, it may not be feasible for the downstream end of a levee to tie into high ground. There may also be certain levee conditions, such as levees in urban or coastal areas where they do not tie-in to natural high ground. These situations will need to be coordinated and approved by the FEMA Regional Office and in coordination with FEMA Headquarters. Accreditation may still be considered for certain situations as described in Section 4.2 of this chapter.

4.1 44 CFR 65.10 Requirements

Regarding the NFIP, FEMA will only recognize the flood hazard and risk mapping efforts of those levee systems that meet and continue to meet the requirements of 44 CFR 65.10. Technical data submitted to meet 44 CFR 65.10(b) requirements must be certified by a registered PE. Additionally, the accreditation package must be certified by a P.E. in its entirety to ensure that all 44 CFR 65.10 elements, topographic information, as well as the hydrology and hydraulics (H&H), as updated as warranted, are consistent with the information that is basis of accrediting the levee on the FIRM. For accreditation, a levee system must meet all the requirements listed below. It should be noted that FEMA's analysis and mapping procedures for non-accredited levee systems (see Chapter 6--Non-accredited Levee Systems), necessitate that most requirements of 44 CFR 65.10 be met.

4.1.1 Freeboard

The purpose of freeboard is to acknowledge and consider the uncertainties associated with the H&H analysis and to minimize damages and threat to life and property. The freeboard requirements vary if the levee system lies within a riverine area or a coastal area. The appropriate

requirements will be determined by the modeling method used for analysis. Coastal modeling should only be considered if the available fetch of the waterbody is 0.5 miles or greater.

4.1.2 Riverine Freeboard

The riverine freeboard requirements are stated in 44 CFR 65.10(b)(1)(i) and states the following:

> *Riverine levees must provide a minimum freeboard of three feet above the water-surface level of the base flood. An additional one foot above the minimum is required within 100 feet in either side of structures (such as bridges) riverward of the levee or wherever the flow is constricted. An additional one-half foot above the minimum at the upstream end of the levee, tapering to not less than the minimum at the downstream end of the levee, is also required.*

The freeboard shall be based on the difference between the top of levee elevation to the elevation and the BFE at the riverside of the levee. A current top of levee survey or certified as-built plans should accompany any documentation regarding the freeboard requirement for a levee system. Older data may be accepted if accompanied with a statement from the certifying engineer that the older survey data still reflects current top levee conditions for the levee.

The levee shall tie into high ground at both the upstream and downstream end and maintain the required minimum freeboard at the tie into high ground. There may be cases in which high ground itself may not have the required freeboard at the tie-in location. If the tie into high ground cannot meet the minimum freeboard requirements within the vicinity of the levee, the levee can still be considered for meeting freeboard if the high ground lies above the BFE at the tie-in location of the levee. In some geographic areas, levee systems are designed to end in the absence of high ground at the downstream end. In these cases, the levee system may still be considered for accreditation as described in Subsection 4.2.1 of this guidance.

The levee freeboard should be determined based on the effective hydrologic and hydraulic models. New hydrology or hydraulics may be introduced for evaluation of freeboard as part of a FEMA initiated study, LOMR or Conditional Letter of Map Revision (CLOMR) to be evaluated by FEMA prior to consideration for accreditation. If during collection of data for accreditation it is determined that the effective BFEs are incorrect (too low), it is incumbent on the P.E. to provide updated information to FEMA through the MT-2 process such that the levee can be determined to reduce risk against the current base flood.

The tapering requirement for the additional 0.5-foot freeboard requirement at upstream end of levee system will be determined perpendicular to the flow of the base flood event and to help prevent overtopping at the structure. All aspects of levees, including mainline and tributary levees, are subject to an additional 0.5 feet of freeboard if they are perpendicular to flow at upstream end of levee. See Figure 2.

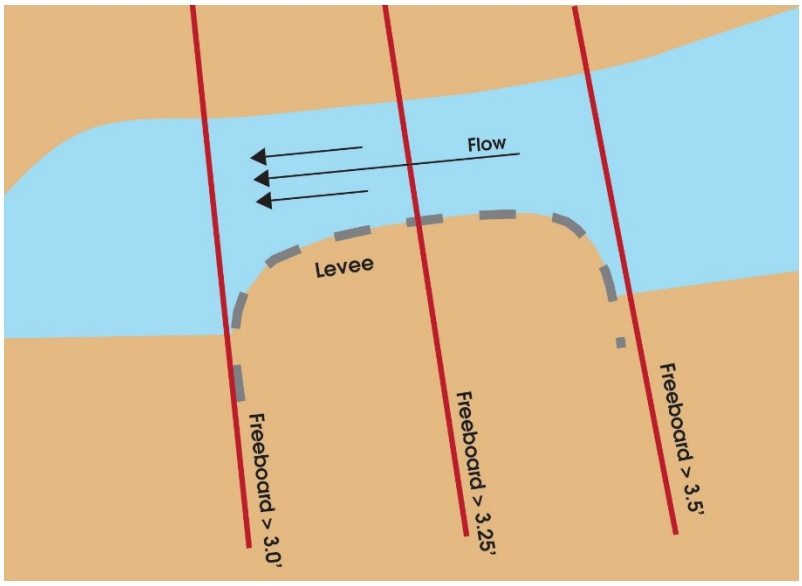

Figure 2: Freeboard Determination

There may be some circumstances in which the upstream end and downstream end of the levee are indistinguishable and the freeboard tapering requirement may not apply. This may include levees along stillwater bodies or large rivers where velocities are slow and there is no change in water-surface elevation along the length of the levee system. A waiver may be granted from FEMA for exclusion of the freeboard tapering requirement if the certifying engineer can provide data that justifies the waiver request.

The additional 1.0 foot of freeboard around structures is needed for any areas that constrict the natural flow of the river, such as bridges or culverts perpendicular to the flow. The 100 feet on either side of the structure shall be considered from the furthest upstream and downstream point of the structure that influences the flow, not the center of the structure. See Figure 3.

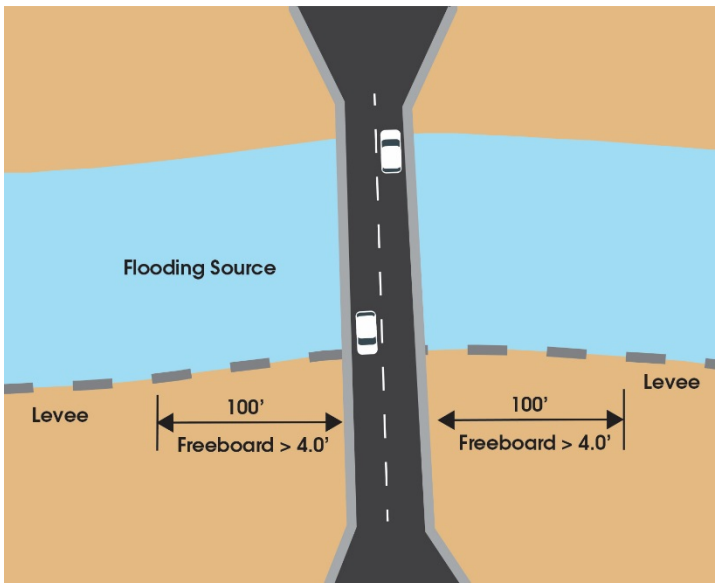

Figure 3: Freeboard Near Structures

If a structure is located at the upstream end of a levee system, the required freeboard shall be 4.0 feet (not a cumulative 4.5 feet) as the variability in flow at the upstream end of the levee and around structures has redundant uncertainties. In certain instance, it may be advantageous for the levee to have an additional half foot where debris or ice flow may incur additional flood risk or where overtopping at the structure needs to be avoided.

The additional freeboard requirement around structures may be waived if the certifying engineer can demonstrate that the structure does not influence the flow pattern of the base flood or the overtopping would not result in structure failure at that location. Possible considerations may include demonstrating the low chord of a bridge is above the base flood plus minimum freeboard requirement as well as the related embankments outside the floodplain. Debris and ice accumulation would need to be addressed before the exception is granted. In certain situations, FEMA may request additional analyses.

Freeboard must also take into account the impacts of settlement and subsidence for completeness of this section as described under 44 CFR 65.10(b)(5).

4.1.2.1 Riverine Freeboard Exceptions

Exceptions of the freeboard requirement for levees in a riverine area are stated in 44 CFR 65.10(b)(1)(ii), which states the following:

> *Occasionally, exceptions to the minimum riverine freeboard requirement described in paragraph (b)(1)(i) of this section, may be approved. Appropriate engineering analyses demonstrating adequate protection with a lesser freeboard must be submitted to support a request for such an exception. The material presented must evaluate the uncertainty in the estimate base flood elevation profile and include, but not necessarily be limited to an assessment of the statistical confidence limits of the 100-year discharge; changes in the stage-discharge relationships; and the sources, potential, and magnitude of debris, sediment, and ice accumulation. It must be also shown that the levee will remain structurally stable during the base flood when such loading considerations are imposed. Under no circumstances will freeboard of less than two feet be accepted.*

Based on the requirements laid forth in 44 CFR 65.10(b)(1)(ii), the levee must demonstrate it can meet the following items of the freeboard exception process:

- Assessment of the statistical confidence limits of the 1-percent-annual-chance discharge
- Assessment of the changes in stage discharge relationships
- Assessment of the sources, potential, and magnitude of debris, sediment, and ice accumulation
- Stability analysis indicating levee will remain structurally stable during the base flood when additional loading considerations required by the uncertainty analysis are imposed

Statistical Confidence Limits of the 1-percent-annual-chance Discharge

A statistical analysis should be performed demonstrating the conditional non-exceedance probability is 95 percent or greater for the base flood.

FEMA will accept an analysis of the upper 5-percent confidence limits of the base flood discharge or 0.2-percent-annual-chance event, whichever is greater. Additional analyses may be accepted pending FEMA concurrence.

Changes in Stage Discharge Relationships

An evaluation should be performed on the uncertainty due to changes to the stage-discharge relationship of the water body. This would include physical conditions that may change the relationship between the stage and discharge rating curve over time. It is suggested the certifying engineer utilize the appropriate USACE guidelines to demonstrate this requirement.

Sources, Potential, and Magnitude of Debris, Sediment, and Ice Accumulation

An analysis should be done demonstrating that any debris, sediment, and ice accumulation would have a negligible impact on the required freeboard.

Stability Analysis at Most Critical Section

A stability analysis should be done that conforms to the requirements laid out under 44 CFR 65.10(b)(4) demonstrating the levee will remain structurally stable with the reduced freeboard.

4.1.3 Coastal Freeboard

The coastal freeboard requirements are stated in 44 CFR 65.10(b)(1)(iii), which states the following:

> *For coastal levees, the freeboard must be established at one foot above the height of the one percent wave or the maximum wave runup (whichever is greater) associated with the 100-year stillwater surge elevation at the site.*

To show that a levee system provides base flood hazard reduction in a coastal area, the top of the levee must be equal or greater than the highest value of the following:

1. Two (2) feet above the base flood total stillwater storm surge elevation including wave setup;
2. One (1) foot above the base flood wave crest elevation; or
3. One (1) foot above the maximum base flood wave runup elevation.

The stillwater surge elevation shall be considered the water level in the absence of waves but with all other processes present. This includes the stillwater elevation of the base flood event plus a wave setup component. The wave setup is defined as the increase in mean water level above the stillwater level due to momentum transfer to the water column by waves that are breaking or otherwise dissipating their energy. Wave setup may be included in the FIS provided stillwater elevations if coupled 2D wave and surge modeling has been performed for the coastal study. If coupled 2D wave and surge modeling has not been performed wave setup may be calculated and added to the stillwater separately. Care should be taken to ensure the proper values are being used to evaluate coastal levee freeboard.

Wave runup is the vertical extent of the wave uprush on a beach or structure due to the breaking waves as shown in Figure 4.

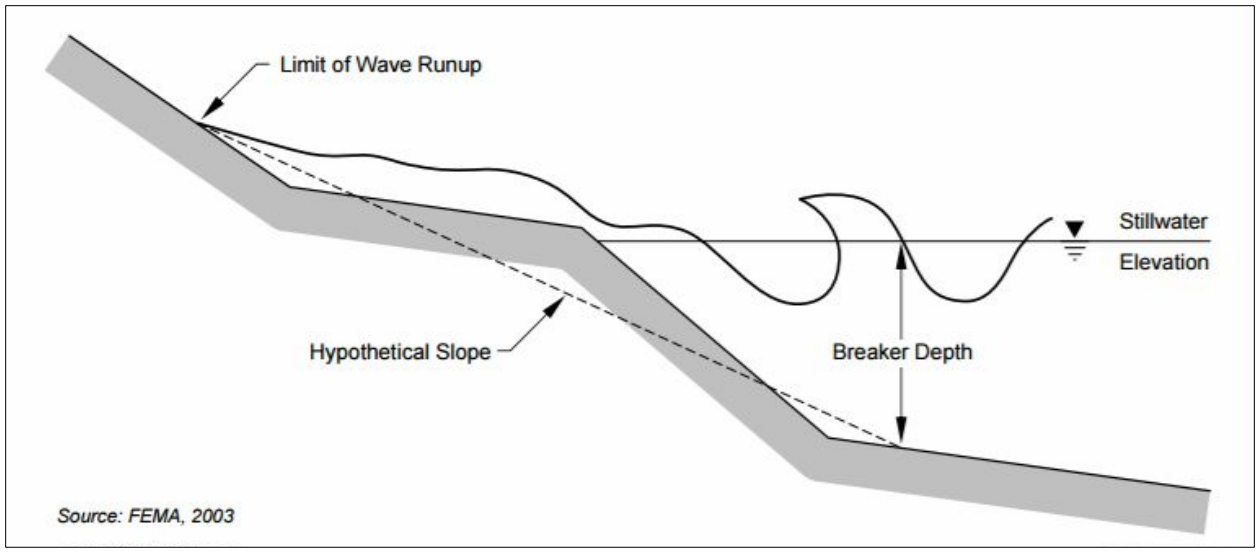

Figure 4: Wave Runup

Commonly used methods can include TAW, DIM, ACES, and CSHORE to calculate the wave runup. As stated, 44 CFR §65.10(b)(1)(iii) requires the maximum wave runup elevation. The maximum wave runup is the statistical highest wave runup attained by a group of irregular waves. The most frequently modeled wave runup heights are the mean (R_{mean} and the runup exceeded by 2 percent of the wave runup values attained by a group of irregular waves ($R_{2\%}$ Depending on the output of the method employed, one of the following conversion factors will need to be applied to calculate the maximum wave runup value required for freeboard determination:

1. $R_{max} = R_{mean} * 2.87$
2. $R_{max} = R_{2\%} * 2.87/2.23 = R_{2\%} * 1.29$

The freeboard shall be evaluated using the 1-percent total stillwater, the BFE on the FIRM, or the maximum wave runup elevation and the effective coastal model. As the 1 percent total stillwater and the maximum wave runup elevations may not be directly stated on the FIRM or in the FIS Report, these values must be derived utilizing the effective coastal modeling data. New wave runup analysis may be needed at the levee location if not including in the effective coastal study or the coastal levee is recently constructed. New coastal modeling may be introduced for evaluation of freeboard, but any new or updated models must be submitted as part of a LOMR or CLOMR to be evaluated by FEMA prior to incorporation. If the proposed model output is more conservative (BFE, velocities, duration, etc.) than the effective, the model results may be used without a LOMR or CLOMR review, pending FEMA concurrence.

4.1.3.1 Coastal Freeboard Exceptions

Exceptions to the freeboard requirement for levees in a coastal area are stated in 44 CFR 65.10(b)(1)(iv), which states the following:

> *Occasionally, exceptions to the minimum coastal levee freeboard requirement described in paragraph (b)(1)(iii) of this section, may be approved. Appropriate engineering analyses demonstrating adequate protection with a lesser freeboard must be submitted to support*

a request for such an exception. The material presented must evaluate the uncertainty in the estimated base flood loading conditions. Particular emphasis must be placed on the effects of wave attack and overtopping on the stability of the levee. Under no circumstances, however, will a freeboard of less than two feet above the 100-year stillwater surge elevation be accepted.

An analysis must be provided that evaluates the uncertainty in the base flood loading and demonstrates the stability of the levee will not be compromised with the acceptance of a lesser freeboard. Any Freeboard exceptions would need to be concurred upon by both the FEMA Region and headquarters.

4.1.4 Closures

The closures requirements are stated in 44 CFR 65.10(b)(2), which states the following: "All openings must be provided with closure devices that are structural parts of the system during operation and design according to sound engineering practice*."*

A closure shall be considered for any opening within the levee system elevated at or below the minimum freeboard elevation that pertains to a hydraulic connection between the riverside and landside of the levee system. Closures can include road openings and utility penetrations. All considered closures must have a documented and properly designed closure device and procedure in the levee system operation and maintenance manual that meets the requirements laid out for Operation Plans and Criteria under 44 CFR 65.10(c). Closures that require manual intervention, such as road openings, gate structures and manual operation for closures on pipe penetrations, must have a warning system in place that allows adequate time to respond.

Temporary closures which are not a structural part of the levee may be used as a closure device for any areas where the closure invert is above the BFE. Examples of temporary closures include sandbags, manufactured closures, and earthen closures. Temporary closures cannot be used for meeting freeboard requirements if the minimum invert elevation of the closure is below the base flood elevation.

4.1.5 Embankment Protection

The embankment protection requirements are stated in 44 CFR 65.10(b)(3), which states the following:

Engineering analyses must be submitted that demonstrate that no appreciable erosion of the levee embankment can be expected during the base flood, as a result of either currents or waves, and that anticipated erosion will not result in failure of the levee embankment or foundation directly or indirectly through the reduction of the seepage path and subsequent instability. The factors to be addressed in such analyses include but are not limited to: expected flow velocities (especially in constricted areas); expected wind and wave action; ice loading; impact of debris; slope protection techniques; duration of flooding at various stages and velocities; embankment and foundation materials; levee alignment, bends, and transitions; and levee side slopes.

Existing embankment protection must be identified along the entire levee system. It must be demonstrated that during the conditions associated with the base flood event that the duration of

the event and erosion will not compromise the stability of the levee. Flow velocities and duration of flooding used for evaluation, at a minimum, must coincide with effective hydraulic model associated with the BFE listed on the FIRM.

For coastal levees, wave runup should be addressed each time VE zones are mapped in the area or a fetch of 0.5 mile or greater is presented along the waterbody. Appropriate analyses should be presented documenting the wave impacts along the levee. If the fetch is less than 0.5 mile or circumstances are present that minimize the impacts of waves along the levee, the certifying engineer should submit a statement and documentation justifying this position.

Ice loading should be addressed when the certifying engineer believes it pertains. The certifying engineer should include a statement and justification if ice loading does not apply to the levee system.

If a previous analysis regarding the adequacy of the embankment protection is still applicable to current conditions, it may be used in lieu of providing a new analysis. A registered P.E. would need to provide the previous data and documentation and certify that it still applies to current conditions.

4.1.6 Embankment and Foundation Stability

The embankment and foundation stability requirements are stated in 44 CFR 65.10(b)(4), which states the following:

> *Engineering analyses that evaluate levee embankment stability must be submitted. The analyses provided shall evaluate expected seepage during loading conditions associated with the base flood and shall demonstrate that seepage into or through the levee foundation and embankment will not jeopardize embankment and foundation stability. An alternative analysis demonstrating that the levee is designed and constructed for stability against loading conditions for Case IV as defined by US Army Corps of Engineers (COE) manual, "Design and Construction of Levees" (EM 1110-2-1913, Chapter 6, Section II) may be used. The factors that shall be addressed in the analyses include: Depth of flooding, duration of flooding, embankment geometry and length of seepage path at critical locations, embankment and foundation materials, embankment compaction, penetrations, other design factors affecting seepage (such as drainage layers), and other design factors affecting embankment and foundation stability (such as berms).*

To meet the requirements shown above, the certifying engineer should include a seepage and stability analysis. An example method is outlined in USACE EM 1110-2-1913. This should include an examination of component material characteristics of the foundation and levee embankment, compaction design, seepage at critical locations (including at the levee tie-in locations), and penetrations. It is recommended that data including information on soil borings and laboratory results be included in the documentation for this requirement. Additionally, the impact of any structure, including but not limited to bridges and roads crossing the levee must be addressed.

If a previous seepage and stability analysis was done for the levee system, it may be used if the certifying engineer states that the findings and data are still representative of current conditions

for the levee system. A recent soil boring may be required to demonstrate the current composition of the levee is representative of the original analysis.

4.1.7 Settlement

The settlement requirements are stated in 44 CFR 65.10(b)(5), which states the following:

> *Engineering analyses must be submitted that assess the potential and magnitude of future losses of freeboard as a result of levee settlement and demonstrate that freeboard will be maintained within the minimum standards set forth in paragraph (b)(1) of this section. This analysis must address embankment loads, compressibility of embankment soils, compressibility of foundation soils, age of the levee system, and construction compaction methods. In addition, detailed settlement analysis using procedures such as those described in the COE manual, "Soil Mechanics Design – Settlement Analysis" (EM 1100-2-1904) must be submitted.*

An analysis or calculation utilizing the composition of the levee to determine current and future settlement is required for areas subject to both coastal and riverine flooding to demonstrate the current and future impacts of settlement on the freeboard. This analysis may leverage existing data if still applicable regarding calculations and composition of the levee. The analysis must address any future loss of freeboard associated with settlement over time, including subsidence impacts.

The settlement requirement is to determine the impacts on freeboard over time due to the natural settling of a levee. If a levee is not newly constructed, has not been improved and the certifying engineer can demonstrate that the minimum freeboard will be maintained when all current and future settlement is considered, a statement from the certifying engineer may suffice instead of a settlement analysis. If a levee cannot meet these requirements, a settlement analysis is still required.

4.1.8 Interior Drainage

The interior drainage requirements are stated in 44 CFR 65.10(b)(6), which states the following:

> *An analysis must be submitted that identifies the source(s) of such flooding, the extent of the flooded area, and, if the average depth is greater than one foot, the water-surface elevation(s) of the base flood. This analysis must be based on the joint probability of interior and exterior flooding and the capacity of facilities (such as drainage lines and pumps) for evacuating interior floodwaters.*

Interior drainage represents all runoff, seepage inflow, coastal overwash, and collection associated with the flooding sources tributary to the landside or interior drainage area of the levee system. An analysis must identify and demonstrate the modes and potential runoff paths from the interior drainage area. This will involve an analysis of runoff, seepage inflow, streams, coastal overwash, pump stations, detention/retention ponds, storm sewers, and other stormwater management facilities based on the judgement of the certifying engineer. The certifying engineer should evaluate and certify all data associated with the flooding sources within the interior drainage area related to handling the anticipated runoff and seepage landward of the levee and identify any ponding areas or streams. Any areas with an average depth greater than one foot

must be identified with the relevant BFE. A work map should be provided indicating the inundation areas of the analysis.

The interior drainage analysis should be done utilizing a FEMA approved hydrologic and hydraulic model. A list of these acceptable models can be found at www.fema.gov/numerical-models-meeting-minimum-requirements-national-flood-insurance-program. Any analyses done with a model that has not been accepted by FEMA will not be considered as valid under this requirement and results cannot be mapped.

The analysis should include a joint probability analysis of events on the interior and exterior of the levee, with the most conservative combination used for final analysis. In lieu of a joint probability analysis, the engineer may evaluate several scenarios rather than identify a probability-based based flood event, the most conservative combination should be used for final analysis. Comparable methodology is also available in appropriate USACE guidelines.

If a flooding source on the landside of the levee is instrumental to the interior drainage analysis but not previously identified on the FIRM, an analysis of the flooding source should be done by the certifying engineer and submitted as part of the interior drainage analysis. The analysis should meet relevant FEMA Guidance and Standards (G&S) but the associated inundation areas on the workmap provided by the certifying engineer do not need to meet FEMA G&S for mapping. However, FEMA must convert inundation areas into flood hazard areas on the FIRM, as appropriate, in accordance with FEMA G&S and in coordination with the impacted community.

If a previous analysis of interior drainage was performed and is still applicable to current hydrologic and hydraulic conditions, it may be used in lieu of providing a new analysis. A registered P.E. must certify the previous data and documentation represent current interior drainage conditions and associated flood hazards.

4.1.9 Other Design Criteria

Other design criteria are stated in 44 CFR 65.10(b)(7), which states the following:

> *In unique situations, such as those where the levee system has relatively high vulnerability, FEMA may require that other design criteria and analyses be submitted to show that the levees provide adequate protection. In such situations, sound engineering practice will be the standard on which FEMA will base its determinations. FEMA will also provide rationale for requiring this additional information.*

FEMA reserves the right to request additional information pertaining to the purpose, design, or construction, of the levee systems under unique situations that are not covered under 44 CFR 65.10(b)(1) through (6). These situations may include levees with a higher landward risk, levee systems that cannot tie into high ground and require additional analyses demonstrating that they meet and continue to meet design requirements and the structural integrity would not be compromised when exposed to the base flood event, or unique characteristics that cannot be adequately evaluated under traditional methods. FEMA will coordinate with the levee owner in writing with notification and justification for additional design requirements prior to final accreditation submission and provide adequate time for preparation of additional material.

4.1.10 Plans for Maintenance, Operation, and Emergency Preparedness

A levee submittal must include detailed plans that describe the operation, maintenance, and emergency preparedness activities to be implemented. These plans must be officially adopted and be under the jurisdiction of Federal or State agencies, an agency created by Federal or State law, or an NFIP participating community. An officially adopted plan is a plan that is signed by the Chief Executive Officer (CEO) or highest elected official of the community or the appropriate head of the agency or entity that is accepting the ultimate responsibility for all the tasks and actions listed in those plans. All plans must be prepared for the specific levee system for which accreditation is being evaluated. Generic plans that include addendums covering specific requirements may be accepted, with FEMA concurrence.

4.1.10.1 Operation Plans

The criteria for operation plans are described in 44 CFR 65.10(c), which states the following:

> *All closure devices or mechanical systems for internal drainage, whether manual or automatic, must be operated in accordance with an officially adopted operation manual, a copy of which must be provided to FEMA by the operator when levee or drainage system recognition is being sought or when the manual for a previously recognized system is revised in any manner. All operations must be under the jurisdiction of a Federal or State agency, an agency created by Federal or State law, or an agency of a community participating in the NFIP.*
>
> *(1) Closures. Operation plans for closures must include the following:*
>
> *(i) Documentation of the flood warning system, under the jurisdiction of Federal, State, or community officials, that will be used to trigger emergency operation activities and demonstration that sufficient flood warning time exists for the completed operation of all closure structures, including necessary sealing, before floodwaters reach the base of the closure.*
>
> *(ii) A formal plan of operation including specific actions and assignments of responsibility by individual name or title.*
>
> *(iii) Provisions for periodic operation, at not less than one-year intervals, of the closure structure for testing and training purposes.*
>
> *(2) Interior drainage systems. Interior drainage systems associated with levee systems usually include storage areas, gravity outlets, pumping stations, or a combination thereof. These drainage systems will be recognized by FEMA on NFIP maps for flood protection purposes only if the following minimum criteria are included in the operation plan:*
>
> *(i) Documentation of the flood warning system, under the jurisdiction of Federal, State, or community officials, that will be used to trigger emergency operation activities and demonstration that sufficient flood warning time exists to permit activation of mechanized portions of the drainage system.*

(ii) A formal plan of operation including specific actions and assignments of responsibility by individual name or title.

(iii) Provision for manual backup for the activation of automatic systems.

(iv) Provisions for periodic inspection of interior drainage systems and periodic operation of any mechanized portions for testing and training purposes. No more than one year shall elapse between either the inspections or the operations.

(3) Other operation plans and criteria. FEMA may require other operating plans and criteria to ensure that adequate protection is provided in specific situations. In such cases, sound emergency management practice will be the standard upon which FEMA determinations will be based.

All items outlined in the operation plan must reflect current conditions of the levee system and must align with the certified activities covered in 44 CFR 65.10(b)(1) through (7). All discrepancies between existing conditions or operations must be resolved prior to the levee being accepted for accreditation.

If flood fighting activities are listed in an operation plan, it must be ensured that these activities are not necessary in order to meet the requirements of 44 CFR 65.10.

If sandbags or other nonstructural measures are to be used as closure devices, the operation plan must include the details for the storage, hauling, and placement of the required materials and equipment.

Portable pumps may be accepted as modes of alleviating flood risk associated with interior drainage if details of application, flood triggers and implementation are clearly laid out in the operation plan. Portable pumps should also be shown to be readily available and onsite.

4.1.10.2 Emergency Preparedness Plans

FEMA Standard (SID) 444 requires that the submittal for levee accreditation include a current emergency preparedness plan that must, at a minimum, be adopted by the community, include the area impacted by the levee system, and procedures for emergency operations and public evacuation, meeting the requirements of 44 CFR 65.10(c)(3). Although this plan may be included in the adopted operation plan, it may also be submitted as a separate document. The size and required detail of the submitted documentation is scalable and should be appropriate for the levee system. Many communities may already be familiar with similar planning efforts and may have the relevant information available in other forms. Provided the information is appropriate to meet these requirements, the document is not required to have the title “emergency preparedness plan”. Refer to the following documents for more information on preparing these plans and sample content and format for the plans:

- U.S. Department of Homeland Security, Emergency Preparedness Guidelines for Levees, A Guide for Owners and Operators, dated January 2018, website: https://www.fema.gov/sites/default/files/2020-08/fema_emergency-preparedness-guidelines-for-levees_2018.pdf.

The Silver Jackets, Emergency Action Plan, Guidebook, Version 4.0, dated November 2019, website: https://www.mvp.usace.army.mil/Portals/57/docs/Operations%20Center/EAP_Combined_4_20Nov19w_cover.pdf?ver=2020-08-27-141125-400.

- USACE EC 1110-2-6075, Inundation Maps and Emergency Action Plans and Incident Management for Dams and Levee Systems. Website is a follows and search by EC number:

  https://www.publications.usace.army.mil/.

- FEMA, "CPG 101, Developing and Maintaining Emergency Operations Plans, Version 2", dated November 2010, website:

- https://www.fema.gov/sites/default/files/2020-07/developing-maintaining-emergency-operations-plans.pdf.

- FEMA, "Federal Guidelines for Emergency Action Planning for Dams", dated July 2013, website: https://www.fema.gov/sites/default/files/2020-08/fema_dam-safety_emergency-action-planning_P-64.pdf.

4.1.10.3 Maintenance Plans

The criteria for operation plans are described in 44 CFR 65.10(d), which states the following:

> *Levee systems must be maintained in accordance with an officially adopted maintenance plan, and a copy of this plan must be provided to FEMA by the owner of the levee system when recognition is being sought or when the plan for a previously recognized system is revised in any manner. All maintenance activities must be under the jurisdiction of a Federal or State agency, an agency created by Federal or State law, or an agency of a community participating in the NFIP that must assume ultimate responsibility for maintenance. This plan must document the formal procedure that ensures that the stability, height, and overall integrity of the levee and its associated structures and systems are maintained. At a minimum, maintenance plans shall specify the maintenance activities to be performed, the frequency of their performance, and the person by name or title responsible for their performance.*

The maintenance activities and the frequency of their performance to maintain the levee's compliance with requirements of 44 CFR 65.10 and well documented. At a minimum, plans must address provisions for inspection of the levee and maintenance of all mechanical systems, such as closure devices, pumps, valves, and relief wells.

4.1.11 Certification Requirements

The criteria for certification of data are described in 44 CFR 65.10(e) which states the following:

> *Data submitted to support that a given levee system complies with the structural requirements set forth in paragraphs (b)(1) through (b)(7) of this section must be certified by a registered professional engineer. Also, certified as-built plans of the levee must submitted. Certifications are subject to the definition given at §65.2 of this subchapter. In lieu of these structural requirements, a Federal agency with responsibility for levee design*

may certify that the levee has been adequately designed and constructed to provide protection against the base flood.

Certified as-built plans submitted must cover the entire levee system that is being considered for accreditation. The as-built plans should match levee features certified in design requirements under 44 CFR 65.10(b)(1) through (7). A new levee survey may be required if certified as-built plans are missing, or do not cover the entire length of the levee. The new survey must include all the necessary information for the review, including but not limited to topographic information, location and dimensions of all structures, pipes and utilities crossing the levee, and all the facilities that are part of the interior drainage system. If certified as-built plans are not available, the certifying engineer may also submit more recent plans conveying similar information if certified that they represent current conditions of the levee system.

In lieu of the structural requirements cited in 44 CFR 65.10(b)(1) through (7) a Federal agency with responsibility for levee design may certify that the levee has been adequately designed and constructed. Further details on this topic is shown under Subsection 4.2.2 (Other Federal Agency Accreditation Submittals).

4.1.11.1 Permits and Other State and Local Requirements

The submittal must adequately address all applicable Federal, State, and local laws regulations and requirements, including, but not limited to, Federal, State, and local floodplain management laws, environmental laws, and permit requirements. This requirement is the responsibility of the NFIP community. This can be verified through communication with the requester. A record of these communications must be kept in the FEMA project file for future reference.

4.2 Additional Levee Accreditation Considerations

Situations may arise during the evaluation of a levee system for accreditation that may warrant further discussion or evaluation of the specific situations. Some of the more common situations that may warrant additional considerations may include the following:

- Levees systems designed to end in the absence of high ground at the downstream end
- Considerations for review of accreditation packages from other Federal agencies
- Guidance for addressing continued accreditation of a levee system after it initially met the requirements of 44 CFR 65.10

4.2.1 Levee System Tie-In Considerations

Typically, levee systems are designed and constructed to tie into high ground at the upstream and downstream portions of the levee system, unless they are designed as ring levees. In some geographic areas, levee systems are designed to end in the absence of high ground at the downstream end. If certain criteria are still met, these levees may be eligible for accreditation. Variations of these types of levee systems are described as follows:

- The most common scenario occurs when the downstream end of a levee system meets the 44 CFR 65.10 freeboard requirements, but it does not tie into high ground at this downstream end.

- A variation occurs when the downstream end of a levee system meets the freeboard requirements but ties into a non-accredited levee (see Chapter 6) or a non-levee reach (see Chapter 7), which is part of the entire levee system. In this case, the certifying engineer must provide certified data and documentation that meets requirements of 44 CFR 65.10 to demonstrate base flood hazard reduction in the leveed impacted area.

If a levee system designed to end in the absence of high ground at the downstream end meets the requirements of 44 CFR 65.10, the "levee impacted area" defined by a natural valley analysis would be shown on a FIRM as Zone X (shaded) overlaid with the appropriate SFHAs, as determined by interior drainage analyses and/or backwater flooding that comes around the downstream end of the levee system.

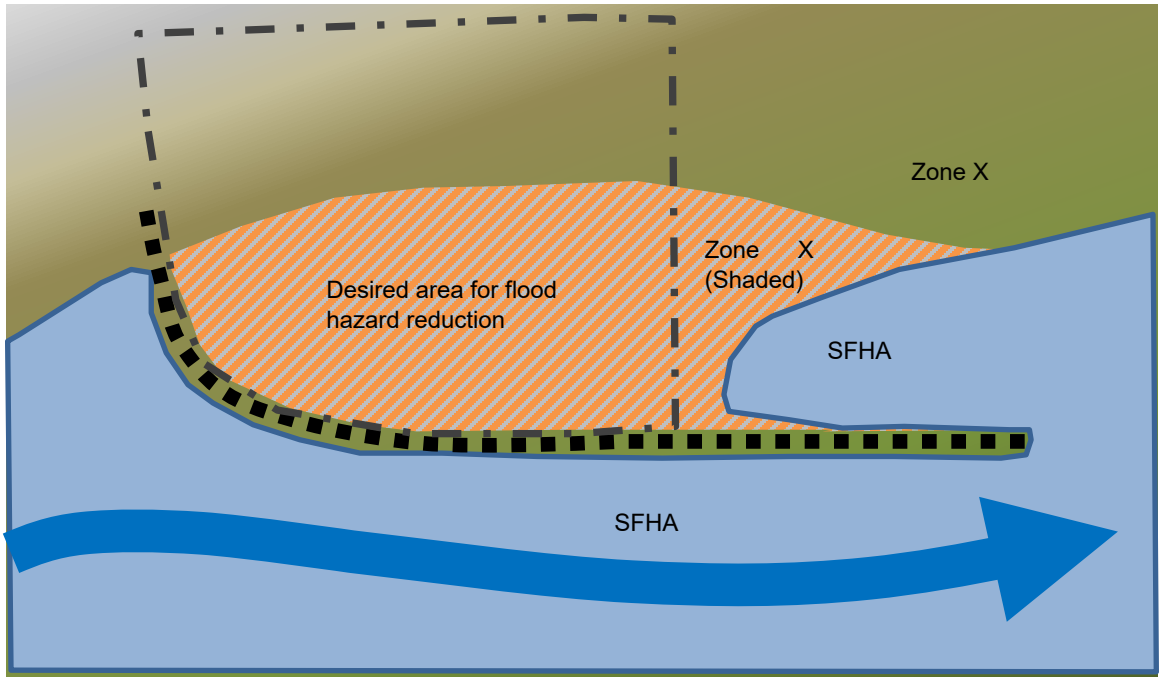

Figure 5: Levee System Designed to End in the Absence of High Ground

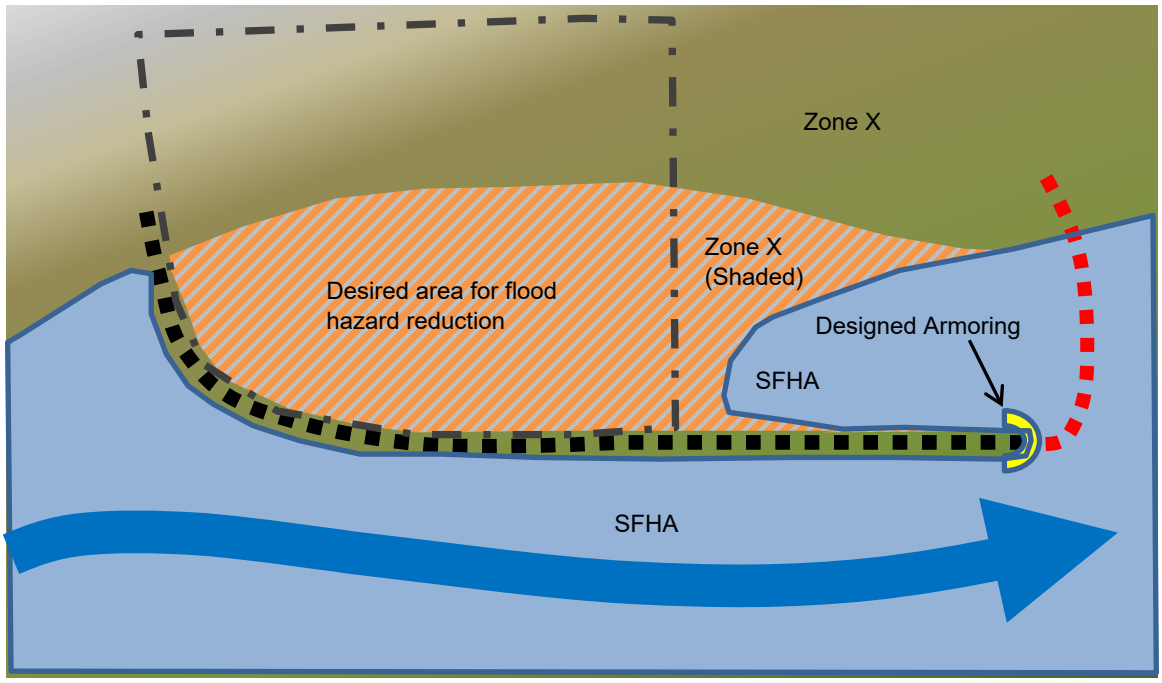

Figure 6: Levee System Tying into Non-Levee Reach

If a levee system designed to end in the absence of high ground at the downstream end does not meet the requirements of 44 CFR 65.10, but can be analyzed and mapped in accordance with the analysis and mapping procedures for non-accredited levees (See Chapter 6), the resulting flood hazard would be mapped as Zone D with the appropriate SFHA overlaid.

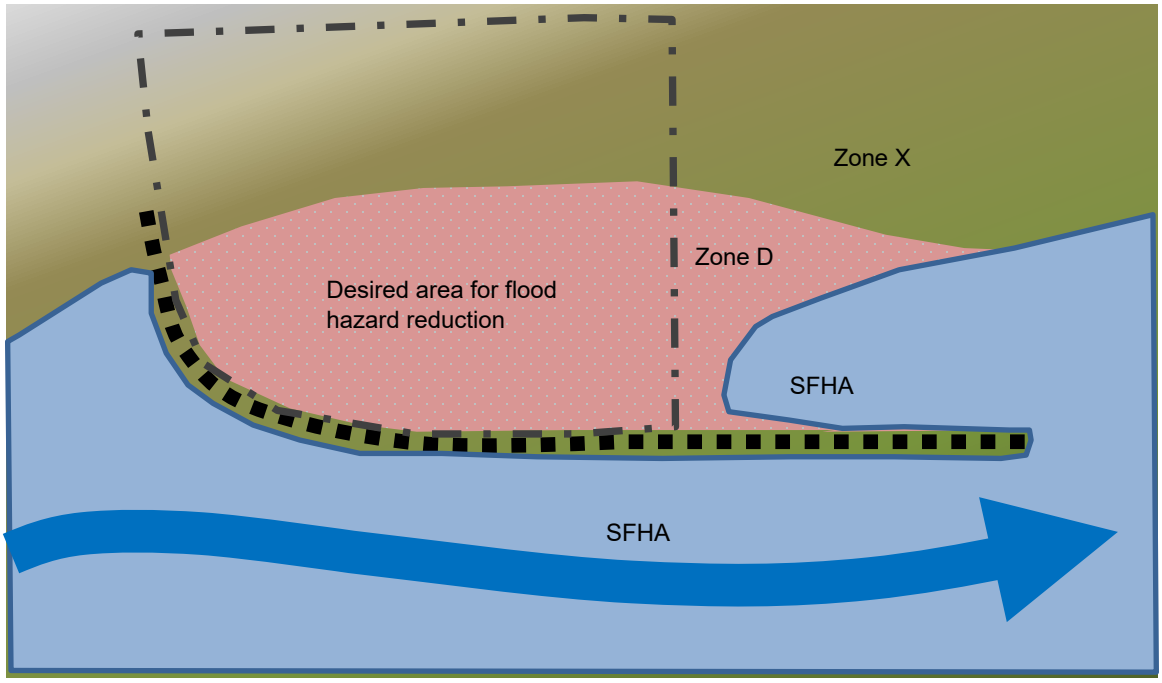

Figure 7: Non-Accredited Levee System

Before a levee system designed to end in the absence of high ground at the downstream end can be considered for accreditation or under the analysis and mapping procedures for non-accredited levees, the following three criteria must be met:

1. The levee system, including the downstream end, meets the full requirements defined in 44 CFR 65.10, except freeboard unless pursuing accreditation. But it will not be required to tie-in to high ground, which is required by 44 CFR 65.10.
2. The levee system be designed and constructed using sound engineering practices, and that the data certification specifically state that the downstream end of the levee system and the landward side exposed to any flooding conditions/loading be able to continue to meet design requirements and not "unravel" or result in the failure of the upstream levee reaches.
3. Any potential flooding that would come around the back, landward side of the downstream end of the levee be analyzed and mapped and shown on the FIRM as a SFHA.

For cases where the levee system ties into another levee or non-levee reach that has not been demonstrated to meet the requirements of 44 CFR 65.10, the certifying engineer must meet all the criteria above, as well as consider the situation where the other structure fails at the tie-in point and is analyzed with breach, overtopping, and/or natural valley analyses. The potential flooding from breaching, overtopping, or natural valley analyses on the non-accredited structure would be shown as SFHA, if this flooding creates backwater that impacts the landward side of the accredited levee system.

4.2.2 Use of Other Federal Agency Information in Support of Accreditation Submittals

There may be instances when other Federal agencies provide information to FEMA in support of a community's request for levee accreditation. The federal agency certification requirements are cited at 44 CFR 65.10(e), which states the following:

> *In lieu of these structural requirements, a Federal agency with responsibility for levee design may certify that the levee has been adequately designed and constructed to provide protection against the base flood event.*

The structural requirements are considered those listed in 44 CFR 65.10(b)(1) through (7) which are required to be certified by a registered P.E. However, if the accreditation submittal is provided by a Federal agency with responsibility for levee design, that agency may provide a recommendation for accreditation of the levee system, and FEMA may require additional supporting data and documentation, as appropriate.

In these cases, FEMA will perform a completeness check of the submitted data and documentation and may require a statement from the submitting Federal agency regarding recommendations for accreditation involving elements that do not directly align to the requirements for 44 CFR 65.10. Formally adopted operation, maintenance and emergency preparedness plans, and the most recent levee inspections are required to be submitted to FEMA for the entire levee system before FEMA will depict the levee system as accredited on a FIRM.

FEMA will review the formally adopted operation, maintenance and emergency preparedness plans to ensure that the requirements of 44 CFR 65.10(c) and (d) are met. In addition, the

community or entity seeking accreditation will be required to provide interior drainage analyses and resulting inundation maps to meet the requirements of 44 CFR 65.10(b)(6) if that information was not provided by the Federal agency.

More information on coordination with other Federal agencies as well as a list of potential agencies involved in levee design and construction can be found in Chapter 8 of this document.

4.2.2.1 Use of USACE Information in Support of Accreditation Submittals

USACE and FEMA have a long history of exchanging information related to the identification of flood hazard areas behind levees for NFIP purposes, including hydrologic and hydraulic modeling as well as detailed information regarding a specific levee system's current condition. USACE has historically provided data to FEMA in support of levee accreditation through various means including through the flood risk study, MT-2, and PAL processes, in accordance with the requirements of 44 CFR 65.10(e). USACE also provided data to FEMA in accordance with EC 1110-2-6067, USACE Process for National Flood Insurance Program (NFIP) Levee System Evaluation, which expired on August 31, 2012, and which superseded prior USACE technical letters and all other USACE policy memoranda related to evaluating levee systems with respect to FEMA accreditation under the NFIP. These evaluations provided direct findings for most of the requirements of 44 CFR 65.10. It should be noted that USACE is transitioning away from utilizing this deterministic methodology and towards a risk-informed approach for assessing levee systems with respect to accreditation for the NFIP. Refer to USACE guidance, Engineering and Construction Bulletin (ECB), No. 2019-11, Transition Guidance for Levee System Evaluations for the National Flood Insurance Program (NFIP), for USACE's current guidance on this matter: https://www.wbdg.org/ffc/dod/engineering-and-construction-bulletins-ecb.

As referenced in Section 1.3.2, Flood Protection Structure Accreditation Task Force, USACE and FEMA have an agreement in place that specifies how information collected and assessed by USACE through their agency Levee Safety Program (Program) activities [levee inspection, screening level risk assessment, Semi-Quantitative Risk Assessment (SQRA), and Quantitative Risk Assessment (QRA)] can be used to inform accreditation for NFIP purposes. The intent is to create a working partnership between FEMA, USACE, levee sponsors and communities to reduce perceived redundancies, streamline the exchange of best available information, and ensure that levee sponsors and communities receive one consistent message and are not pointed back-and-forth between the two Federal agencies. Because the coordination process between FEMA and USACE continues to evolve and improve, as mandated in multiple legislative requirements, both agencies must effectively collaborate to implement activities involving USACE Program levees. The following paragraphs describe how information from USACE levee inspections, screening level risk assessments, SQRAs, and QRAs are related to accreditation.

Levee inspections are the most frequent and familiar activity USACE performs on a levee system. Each time a USACE district conducts a levee inspection, it will identify when a levee segment meets or does not meet a specified subset of requirements in 44 CFR 65.10 as identified in the inspection checklist by providing a positive or negative finding. A positive finding is a conclusion by USACE that there is sufficient information to determine that specific criteria of 44 CFR 65.10 have been met. A negative finding is a conclusion by USACE there is sufficient information to determine that specific criteria of 44 CFR 65.10 have not been met. FEMA does not need to request additional information or documentation related to specific 44 CFR 65.10 criteria in which

USACE has provided a positive or negative finding via an inspection, unless there is additional information indicating that this finding requires verification. Other information obtained from the inspections, such as identification of serious deficiencies, may also inform a NFIP levee accreditation decision. Therefore, it is important to consider the full inspection results and not just the limited identified 44 CFR 65.10 criteria. Inspections are performed on a levee segment basis and caution should be taken to ensure that inspection results are considered collectively, in addition to the results for all the levee segments for the levee system, when using inspection information to inform a levee accreditation decision. It will also be important to consider the most recent USACE risk assessment result for a levee system. At a minimum, the USACE district will notify FEMA directly when the inspection results in a negative finding for any of the criteria. It should be noted that USACE intends to no longer assign an overall inspection rating (Acceptable, Minimally Acceptable, and Unacceptable) to levees and will begin to transition away from such ratings. FEMA will consider USACE Program levee system inspection results (and corresponding risk assessment results as necessary) and will determine if additional coordination is needed with the community and the levee sponsor for NFIP mapping purposes.

USACE screening level risk assessments are a simplified, semi-quantitative risk assessment that relies on existing data, historical performance, engineering judgment, and consequence estimation to quickly characterize the relative risks posed by levees in terms of annual exceedance probability and potential risk to life and property. All levee screenings are performed using the web-based USACE Levee Screening Tool (LST). Levee screenings are performed on each levee segment, but results are rolled up to the levee system level. Screenings provide limited information, which can inform NFIP levee accreditation decisions but do not satisfy all the requirements of 44 CFR 65.10. Each time a USACE district conducts a levee screening, it will identify when a levee segment meets or does not meet a specified subset of requirements in 44 CFR Section 65.10 as identified in the LST by providing a positive, negative, or inconclusive finding. A positive finding will be given when it is determined that based on the screening information the specified criteria of 44 CFR 65.10 has been met. Positive findings are limited to specific criteria of 44 CFR 65.10 and are insufficient to make a complete levee accreditation recommendation. Levee sponsors and communities may use positive findings to meet certain criteria of 44 CFR 65.10, but will be responsible to provide to FEMA the remaining requirements for 44 CFR 65.10 in order for FEMA to accredit the levee system on a NFIP map. A negative finding will be given when it is determined that, based on the screening information, specific criteria of 44 CFR 65.10 has not been met. Negative findings are limited to specific criteria of 44 CFR 65.10. At a minimum, the USACE district will notify FEMA directly when a screening results in a negative finding for any of the 44 CFR 65.10 criteria. An inconclusive finding will be given when it is determined that, based on the screening information, there is insufficient information to determine whether or not that specific criteria of 44 CFR 65.10 has been met.

When using screening information to inform a levee accreditation decision, caution should be taken to ensure that screenings and the corresponding inspection results are used, presented, and considered collectively, along with the results for all the levee segments for the system. FEMA will consider the USACE Program levee screening results (and corresponding inspection results) and determine if additional coordination is needed with the community and the levee sponsor for NFIP mapping purposes.

Once a levee system undergoes a full USACE semi-quantitative or quantitative risk assessment (SQRA or QRA), the NFIP findings associated with a levee screening are no longer considered valid and cannot be used to fulfill any part of 44 CFR 65.10 requirements.

When USACE performs a SQRA or QRA, it will include a recommendation related to accreditation for the NFIP based on a probabilistic determination of levee performance, if a recommendation can be made. If the results of a SQRA or QRA have a sufficient level of assurance, USACE will either recommend or not recommend that the levee system be accredited for NFIP purposes. A levee system recommendation to accredit will only be provided when all segments of the levee system, including any non-project segments (considered by FEMA as non-levee reaches; see Chapter 7 of this document), have been explicitly evaluated in the risk assessment. SQRAs may result in an accreditation recommendation, or, depending on the level of detail and degree of uncertainty, may provide an inconclusive recommendation related to accreditation for the NFIP. QRAs will have sufficient detail to make a levee accreditation recommendation each time. USACE will provide results and background information regarding QRAs and SQRAs to the FEMA Regional office in addition to a recommendation related to accreditation.

It should be noted that both the SQRA and QRA may be based on hydrologic and hydraulic modeling developed by USACE that is different from the modeling used to develop FEMA's regulatory BFEs and flood hazard mapping on the effective FIRM. As part of the SQRA and QRA, USACE evaluates the levee system performance for several flood elevations ranging from the toe to the top of the levee. When reviewing a levee accreditation recommendation provided by USACE, FEMA will compare the effective BFE (and proposed BFE, if available) to the range of flood elevations evaluated by USACE to ensure that the effective BFE (and proposed BFE, if available) falls within this range. If it does not, FEMA will need to determine if the BFE and supporting modeling in this area should be updated based on consultation with USACE. Note that USACE modeling may require additional analyses and refinements to meet FEMA's regulatory requirements, guidance, and standards for flood hazard mapping for the NFIP.

It should also be noted that USACE does not evaluate freeboard as part of a NFIP accreditation recommendation associated with SQRAs or QRAs. Thus, it is possible that the freeboard provided above the regulatory BFE may be less than the minimum freeboard requirement of 44 CFR 65.10(b)(1), and accreditation of this levee system may still be possible when based on a recommendation by USACE and supported by a SQRA or QRA. However, it is not anticipated that a recommendation for accreditation will be made when a regulatory BFE exceeds the height of the levee system since that fact would preclude FEMA from accrediting the levee system. In any case where the minimum freeboard requirement of 44 CFR 65.10(b)(1) is not met in comparison with the regulatory BFE, the FEMA Regional Office should consult with FEMA Headquarters.

Although USACE may recommend accreditation of a levee system based on a SQRA or QRA in accordance with 44 CFR 65.10(e), additional information may be required to meet the remaining requirements of 44 CFR 65.10. If USACE does not own or maintain the levee system, then the levee sponsor and/or community may be responsible for providing additional information to FEMA. These items may include, but are not limited to, interior drainage analyses, emergency preparedness plans, as-built plans, and operation and maintenance plans. FEMA will review the information provided by USACE and will determine if additional coordination is needed with the

community and the levee sponsor to obtain additional information required for NFIP mapping purposes. If a community or other entity seeks accreditation of their levee system, FEMA and USACE will work together to engage the community and levee sponsor to explain what, if any, information provided by USACE meets the requirements of 44 CFR 65.10, and what additional information the community or levee sponsor will need to provide to FEMA to meet the remaining requirements of 44 CFR 65.10.

USACE districts will coordinate with the appropriate FEMA Regions before the start of each SQRA or QRA to determine the appropriate level of engagement with FEMA. As soon as the FEMA Regional Office staff is made aware of a planned or ongoing USACE QRA or SQRA, FEMA Headquarters must be notified and engaged throughout the process to ensure documentation of lessons learned and consistent implementation of best practices. USACE will coordinate with FEMA throughout the risk assessment process, providing visibility on the data and hydrologic and hydraulic modeling being used for the risk assessment. This engagement allows FEMA to determine if potential changes to the effective base flood elevations are warranted, if and how USACE modeling may be used to update the FIRM when appropriate, and whether interior drainage is addressed in the risk assessment. It is highly recommended that USACE and FEMA jointly coordinate with the levee sponsor and community as soon as the QRA and SQRA results become available. This joint coordination will allow FEMA to communicate impacts to regulatory products and any additional items that may be the responsibility of the levee sponsor and/or community to provide to FEMA in order to meet all requirements of 44 CFR 65.10.

Ultimately, communities or parties seeking accreditation, or recognition of a levee system as reducing the base flood hazard on FIRMs, must provide data and documentation to FEMA in accordance with 44 CFR 65.10. In cases when information collected or developed by USACE through their Levee Safety Program will inform some of the requirements for levee accreditation, the communities or parties seeking accreditation may still have to provide information to fulfill the remaining requirements. It is imperative the FEMA and USACE work together to engage the levee sponsor and community to ensure that they receive one consistent message about what data is available and what is required to most appropriately analyze and map the flood hazards and to understand the flood risk in the levee-impacted area.

4.2.3 Continued Accreditation

Accreditation of a levee system requires the levee owner to demonstrate that the levee system meets, and continues to meet, the requirements of 44 CFR 65.10. Therefore, accreditation is not a one-time activity, and over time, factors may change that require FEMA to reassess accreditation status. These factors can include the expiration of the certification of data by a certifying engineer, endorsement of accreditation by a Federal agency, changes to the hydrologic or hydraulic conditions of the flooding source that necessitates a restudy, and documented deficiencies or lack of maintenance.

4.2.4 Expiration of Data Certification or Endorsement

A certifying engineer or federal agency may choose to place an expiration date on the use of the data and documentation for accreditation of a levee system. This expiration date will be tracked by FEMA in the NLD. Once the certification of this data and documentation or accreditation recommendation by a Federal agency has expired, FEMA will no longer consider the levee

system as meeting the requirements of 44 CFR 65.10. FEMA will initiate engagement with the levee owner and impacted community regarding the need to submit certified data and documentation demonstrating the levee system continues to meet the requirements of 44 CFR 65.10 to remain accredited. If this certified data and documentation cannot be provided in a timely manner, FEMA may initiate the analysis and mapping procedures for non-accredited levees (see Chapter 6) to update the flood hazard information impacted by the levee system. At no time shall a levee system with an expired certification of data be remapped as accredited without updated documentation and a certification of data by a registered P.E. or endorsement from an authorized Federal agency.

As referenced in Section 4.2.2.1, refer to USACE's transition guidance regarding expired levee system accreditation recommendations.

4.2.5 Updated Modeling along an Accredited Levee

During any update to the FIRM, the flood hazards associated with levee systems should be re-evaluated for all levee systems located along newly studied or restudied flooding sources. If the new or updated study impacts a levee system accredited in accordance with 44 CFR 65.10, the levee owner will be asked to provide data and documentation demonstrating the levee continues to meet the requirements of 44 CFR 65.10 based on the updated hydraulic loadings.

If the hydraulic loading and flood hazard information (BFE, velocities, duration, etc.) from the updated study is less than those used in the previous accreditation documentation for the requirements of 44 CFR 65.10(b), the levee may retain its accreditation status pending submission of the documents meeting the requirements of 44 CFR 65.10(c) and (d), and confirmation from the levee owner that the levee has not been structurally modified since the prior certification of data. In cases where a levee system or levee appurtenance has undergone structural modifications since the previous certification of data, submittal of data and documentation meeting the requirements of 44 CFR 65.10(b) and (e) may also be required.

If the hydraulic loading and flood hazard (BFE, velocities, duration, etc.) from the updated study is greater than those used in the previous accreditation documentation for the design requirements under 44 CFR 65.10(b), the levee owner must submit updated certified data and documentation based on the updated loading and flood hazard information demonstrating the levee system continues to meet the minimum requirements of 44 CFR 65.10. Understanding that the analysis and data collection may require additional time, Regions should take this into consideration when planning project schedules.

In some instances, an updated mapping project may include a levee system that was accredited through the LOMR process. The above requirements for updated certification of data and documentation would also apply to levees accredited through the LOMR process, granted the information provided in support of the LOMR reflects the current conditions of the levee system.

If the new or updated study impacts a levee system that has not been accredited in accordance with 44 CFR 65.10, FEMA will proceed with implementing the analysis and mapping procedures for non-accredited levees, as appropriate.

4.2.6 Noted Structural or Maintenance Deficiencies

FEMA reserves the right to re-evaluate the accreditation status of a levee system if structural or maintenance deficiencies are noted that may cause concern over the validity of the current flood hazard noted on the FIRM. This re-evaluation of the levee status on the FIRMs may be triggered based on inspection reports of State or Federal agencies or performance of the levee system in the context of a base flood event or less. If deficiencies are noted that impact requirements of 44 CFR 65.10, FEMA will coordinate with the levee owner as outlined under Chapter 6 of this document for resolution and additional data collection, as needed. If resolution is not accepted in a timely manner, FEMA will proceed with action to update the flood hazard on impacted FIRM(s) appropriately.

4.3 Levee Accreditation Reviews

This section outlines the process FEMA will follow when reviewing levee accreditation submittals. This process shall be the same for all types of submittals, including those for new and existing levee systems that have not yet been evaluated and identified during the Discovery phase, PALs, Letters of Map Change (LOMCs), Physical Map Revisions (PMRs), and accredited levee systems impacted by updated hydraulic modeling along the water body. The review process in this section applies to hydraulically independent levee systems defined in Chapter 2 of this document.

FEMA does not require communities or levee owners to accredit their levee systems, however, in accordance with NFIP regulations, communities or other parties seeking recognition of a levee system on NFIP maps may provide data and documentation demonstrating compliance with regulations cited in the 44 CFR 65.10. Once compliance with 44 CFR 65.10 is determined by FEMA, the hydraulically independent levee system will be accredited on NFIP maps, reflecting the appropriate NFIP SFHA and risk premium rate zones for levee-impacted areas. Accreditation by itself is not a guarantee or warranty of performance of levee systems during a flooding event. It is a determination that the levee system meets the minimum design, operation, and maintenance standards set forth in 44 CFR 65.10, to be shown on the NFIP map as providing flood hazard reduction from the base flood event.

The preferred format for the submittal materials is an electronic PDF with each volume clearly labeled with state, county, community, levee names and document chapter. The backup data in its native electronic format is recommended. However, FEMA may request data in PDF format in cases when data are generated using proprietary software that is not commonly used.

4.3.1 FEMA Completeness Check

The review of the levee accreditation submittal is a completeness check. It is neither a technical review nor an evaluation of design, it also is not performed to determine how a levee will perform during a flood event. The incoming data supporting 44 CFR 65.10 requirements must be certified by a registered P.E., and licensed by their respective states, or by a federal agency with responsibility for levee design. The completeness check is performed to ensure that all data demonstrating compliance with 44 CFR 65.10 is submitted, so FEMA can delineate the appropriate NFIP SFHA and risk premium rate zones on NFIP maps. However, if FEMA is presented with conflicting data, a more in-depth review can be performed. This additional and more in-depth review would require approval and consultation with FEMA Region and/or HQ, as appropriate. Although FEMA performs a completeness check for 44 CFR 65.10 compliance,

submittals must include backup data and supporting information for all calculations demonstrating the certified conclusions for each requirement. Certified summary reports without all backup data are not acceptable.

To make the levee accreditation process efficient, the reviewer may stop the review at any point if basic data requirements are not met. The examples of submittals lacking basic data includes, but not limited to, submittals with no backup data, lack of certification signatures, and submittals with data not organized intelligibly.

If the reviewer decides to stop the review, a data request should be compiled and sent to the requester noting the extent of what has already been reviewed and that additional data requests might be forthcoming once the review is restarted.

FEMA suggests that the data is submitted in the FEMA recommended data organization noted in the document titled FEMA Suggested Tabbed Submission for 44 CFR 65.10 Accreditation Material. This document allows for a cover page for each certification requirement contained in 44 CFR 65.10(b)(1) through (b6). Completeness check of the accreditation materials submitted in a format other than that presented in this document may be significantly delayed or the review may stop moving forward were the basic data appear to be missing due to poor data organization.

4.3.1.1 44 CFR 65.10 Accreditation Requirements Reviews

This portion of the completeness check is performed to verify whether the submittal has complete data to meet the minimum requirements of 44 CFR 65.10.

4.3.1.2 Freeboard Check

The data submitted must contain a profile that shows adequate freeboard exists. The reviewer shall verify the freeboard evaluation profile uses appropriate BFEs from the source consistent with sources recommended in Subsection 4.1.1 compared to the top of levee elevation. The reviewer shall request additional data in cases where the submitted data is not detailed enough to reasonably evaluate the freeboard of the levee under request for accreditation, and the submittal does not provide information about the upstream and downstream tie-ins. The evaluation criteria of upstream and downstream tie-ins shall be consistent with the requirements detailed in Subsection 4.1.2 or Subsection 4.2.1 of this document. The reviewer shall also verify freeboard information shows the levee meets all the requirements of 44 CFR 65.10(b)(1)(i), described in Section 4.1.2 of this document.

In cases where levee does not meet the minimum freeboard requirements, the reviewer shall check whether the submittal provides data supporting the levee meeting the requirements of 44 CFR 65.10(b)(1)(ii). Information on requirements for freeboard exceptions is in Subsection 4.1.2 of this document. In cases where a freeboard exception is requested, the reviewer shall verify that the levee evaluations of the other 44 CFR 65.10 criteria are evaluated using the loading conditions estimated for the freeboard exception requirements.

In case of the levees in coastal areas the reviewer shall check if the data submitted demonstrates the levee meets all the requirements of 44 CFR 65.10(b)(1)(iii), as described in Subsection 4.1.3 of this document. Occasionally, exceptions to the minimum freeboard for the levees in coastal areas are allowed. In these circumstances, the reviewer shall check the data to verify whether the

submitted data meets the requirements of 44 CFR 65.10(b)(1)(iv), described in Subsection 4.1.3 of this document and coordinate with the FEMA Regional Office and FEMA Headquarters.

4.3.1.3 Closures Check

The data submitted shall meet all the requirements outlined in Subsection 4.1.4 of this document. Closures include all levee openings and low points noted in Subsection 4.1.4 of this document. The reviewer shall check the data to verify the submittal, includes information on the numbers of closures, closure location, invert elevations, pictures, and type of closure. The reviewer shall verify consistency in the closure data between submitted reports, as-built plans, operation and maintenance plans, and emergency preparedness plans, when applicable.

The reviewer shall also verify that operations and maintenance requirements of the closures are fully met for the completeness of the closure requirements. Also, all closures must be addressed in the submitted inspection reports.

4.3.1.4 Embankment Protection Check

The data submitted shall include technical documentation regarding the existing embankment protection. The reviewer shall check the submittal documentation to verify whether the data include an analysis addressing existing protection of the levee embankment and levee foundation from erosion. The analyses shall consider all but not limited to, the factors mentioned in the Subsection 4.1.5 that might impact the erosive forces acting on the levee embankment and foundation. In cases where some of the factors are not accounted for (such as wave action, ice loading, etc.), the reviewer shall seek a written justification for the omission from the certifying engineer. Analysis must at minimum use loadings associated with the effective base flood event.

The reviewer shall check the submittal to verify the type of current embankment protection for the entire levee system, references to accepted documents to demonstrate current protection is adequate against the erosive forces acting on the levee embankment and foundation during the base flood, and backup data supporting the analysis is provided.

USACE has developed reference materials for embankment protection evaluations that may be used as technical reference. Other Federal agencies, such as the U.S. Bureau of Reclamation (USBR), may have technical references that may be leveraged. It is up to the certifying engineer to identify and use the methodology that is most appropriate for the levee being evaluated, other evaluation approaches deemed applicable by the certifying engineer may also be considered if warranted and approved.

4.3.1.5 Embankment and Foundation Stability Check

The data submitted shall include technical documentation addressing the embankment and foundation stability of the levee. The reviewer shall check the submitted documentation to verify whether the submitted data includes a seepage and stability analyses demonstrating the levee and foundation stability during the base flood or less frequent events. In cases where flood control structures are flood walls the reviewer shall also check the analyses demonstrating adequate strength and stability of flood walls are also provided. The analyses shall at the minimum consider the stability conditions mentioned in the Subsection 4.1.6 that might impact the stability of the flood control structures and their foundation.

The reviewer shall check the submittal to verify the submittal identifies the location of evaluated flood control structure section, and that justification is provided for its selection. The reviewer shall also check submittal to verify it includes the backup data supporting the analysis.

The reviewer shall also review the submitted documentation to verify loading conditions used in the analysis are consistent with the base flood used to evaluate other requirements of 44 CFR 65.10.

USACE has developed reference material for levee and foundation stability evaluations that may be used as technical reference. It is up to the certifying engineer to identify and use the methodology that is most appropriate for the levee being evaluated, other methodologies to evaluate levee and foundation stability deemed applicable by the certifying engineer may also be considered if warranted and approved.

4.3.1.6 Settlement Check

The data submitted shall include technical documentation that assesses the potential settlement of the levee and reduced freeboard over time. The reviewer shall check the submitted data to verify it includes settlement analysis, information on the current top of levee elevations, and subsidence evaluation, where applicable. The reviewer shall check that the submitted documentation has information to demonstrate that freeboard will be maintained within the minimum standards for the entire levee system after settlement and applicable subsidence are considered. The minimum freeboard applied for evaluation shall correspond to the requirements established in Subsection 4.1.7.

The reviewer shall check the submittal report to verify the analysis considers all, but not limited to, the factors mentioned in Subsection 4.1.7, that might impact the settlement and future freeboard of the levee. In cases where some of the factors are not considered, the reviewer shall request written justification from certifying engineer for omission. The reviewer shall check the submitted data to verify the backup data supporting the analysis is included.

USACE has developed reference material for settlement evaluations that may be used as technical reference. Other Federal agencies, such as USBR, may have technical references that may be leveraged. It is up to the certifying engineer to identify and use the methodology that is most appropriate for the levee being evaluated. Other approaches to evaluate a levee's settlement and estimating future loss of freeboard deemed applicable by the certifying engineer may also be considered if warranted and approved.

4.3.1.7 Interior Drainage Check

The reviewer shall verify the submittal includes a hydrologic and hydraulic analysis of the flooding sources on the landside of the levee, identifies the source(s) and extent of flooding due to the flooding sources on the landside, includes a topographic work map showing the extent of any flooded area, and in cases where the average depth of flooding is greater than one-foot, the water-surface elevation of the base flood. New BFEs and/or SFHAs resulting from the interior drainage analysis are subject to the appeal process set forth in 44 CFR Part 67.

The reviewer shall verify the analyses submitted are performed based on the joint probability of interior and exterior flooding, and the capacity and operation of the facilities to evacuate interior

floodwaters in the analysis is consistent to the operation and maintenance plans submitted for the levee system.

USACE has developed reference material for joint probability analysis that is commonly used as technical reference for interior drainage analysis. However, analyses performed using other relevant agency or local jurisdiction publications on joint probability are also accepted. The reviewer shall verify the methodology used for interior drainage analysis comply with the methods discussed in Subsection 4.1.8.

The reviewer shall perform a thorough H&H review for all flooding sources identified within the impacted drainage area. The review of the interior drainage analysis shall involve evaluation of the submitted data to check the methodology used complies with the requirements of 44 CFR 65.10 detailed in Subsection 4.1.8 of this document, as well as meets current FEMA G&S for H&H analyses. The reviewer shall check the data submitted to verify the digital versions of the models used as well as any background calculations or references are included.

4.3.1.8 Other Design Criteria Check

In unique situations FEMA may require that additional design criteria and analysis be submitted. The reviewer shall coordinate with FEMA to verify such additional design criteria is applicable for the levee under evaluation. When additional design criteria are applicable, the reviewer shall verify the analysis and design addressing the additional design criteria requested by FEMA and the backup data is provided.

4.3.1.9 Operation Plans and Criteria Check

The reviewer shall verify that the submittal includes an officially adopted operation plan that includes information on interior drainage systems, if any, and all closure structures or devices. The reviewer shall check the submitted package includes official adoption documentations the plan meets all the requirements of 44 CFR 65.10(c) as described in Subsection 4.1.10, and it corresponds with the other sections of the submittal and backup data.

4.3.1.10 Emergency Preparedness Plan Check

The levee accreditation submittal shall also include an emergency preparedness plan. The plan must comply with all the emergency preparedness plan requirements discussed in Subsection 4.1.10. Some of the commonly used emergency preparedness plan guideline documents are also provided in this subsection.

The reviewer shall verify the submittal include an officially adopted emergency preparedness plan and it meets the minimum requirements discussed in Subsection 4.1.10. In cases where emergency preparedness plan is a part of the levee's operation plan a separate official adoption document is not necessary.

4.3.1.11 Maintenance Plans Check

The reviewer shall verify the submittal includes an officially adopted maintenance plan, verify the plan documents the formal procedure that addresses all the requirements of 44 CFR 65.10(d) as described in Subsection 4.1.10, and the plan corresponds to other sections of the submittal and backup data.

The reviewer shall also verify that both the operation and maintenance plans are prepared for the specific levee for which accreditation is requested. In cases where generic O&M plans, non-specific to the levee system, i.e., plans that cover an entire county or State is used, they are only used as reference and the submitted operation and maintenance plan also include operational and maintenance procedure specific to the levee requested for accreditation.

4.3.1.12 Certification Requirements Check

The reviewer shall verify the data submitted, associated with the requirements of 44 CFR 65.10(b)(1) through (7), are certified by a registered PE, licensed by the appropriate State. If the data are submitted by a Federal agency with responsibility for levee design, the reviewer shall confirm that documentation consistent with Subsection 4.2.2 is provided.

The reviewer shall also check the submitted data to verify a certified copy of as-built plans are submitted and they correspond with other submitted data.

When as-built plans from levee's original construction drawings are used, the as-builts generally are updated adding notes and updates at the locations where the leveraged data does not correctly represent the current condition. It is the certifying engineer's responsibility to ensure the submitted data are still valid. The reviewer shall verify the submittal package in its entirety is certified by a PE.

Once the completeness check is finished and all required components have been submitted and deemed complete, FEMA will accredit the corresponding levee on the affected NFIP map(s). If any component is found to be missing or erroneous and the requester cannot provide missing data to show compliance with 44 CFR 65.10, FEMA will not accredit the levee and reserves the right to suspend or deny the request.

4.3.1.13 Other Checks

This portion of the checks are performed to verify the submitted data complies with other regulatory and FEMA standards.

4.3.1.14 Regulations

The reviewer shall verify the requester has confirmed that the all the applicable permits related to the levee have been obtained. The permits include but, are not limited to the regulations mentioned in Subsection 4.1.11. The verification is generally through communication with the requester. A record of these communications shall be kept in a file. In cases where the requestor provides the information, the data submitted shall be organized and kept in a file.

4.3.1.15 New Hydrologic and Hydraulic Analyses

If new hydrologic and/or hydraulic analyses are submitted as part of a levee certification package, the submittal must follow the process outlined in Subsection 4.4.1.

4.3.1.16 Inspection Reports

The reviewer shall verify the documentation, including tests and inspection reports that are required by regulation under 44 CFR 65.10(c)(1)(iii) and 65.10(c)(2)(iv), are provided.

All other applicable inspection reports from either USACE or other sources must be considered as part of the review to ensure that any issues related to 44 CFR 65.10 have been addressed. The reviewer shall verify these documents are provided in the submittal.

4.3.1.17 Levee System Cross Reference Check and Certified Reach Documentation

The reviewer shall verify that all components in 44 CFR 65.10 use the same flooding elevations and conditions, and that the entire levee system (if a system consists of different reaches) is considered in the submittal. In cases where the levee system provides flood hazard reduction from multiple flooding sources, the reviewer shall verify the certified analyses use flood elevations from the appropriate flooding source(s).

A certifying engineer may submit certified data and documentation for a levee reach that may not meet all components in 44 CFR 65.10 under the analysis and mapping procedure for non-accredited levee systems (see Chapter 6). In these instances, the submittal may not include data for the entire levee system. In these cases, the submitted package shall clearly identify the reach for which the data is applicable. The package shall also include all the necessary data to demonstrate the section under evaluation meets the definition of a levee reach. The reviewer shall perform the completeness check of the data, document the applicable procedure consistent with the analysis and mapping procedure for non-accredited levees, and clearly identify the levee reach for which the data is submitted. The reviewer shall inform FEMA and the requester that the data does not meet requirements for the full accreditation of the levee system.

4.3.2 Data Storage and Delivery

Once the accreditation package has been considered complete by FEMA or its designee, the applicable correspondence, complete accreditation package, and all applicable models will be provided to the mapping partner responsible for updating the FIRM with revised flood hazard information. Data will be captured under the applicable funded project and MIP case number as described in the Guidance Document No. 51, Data Capture – Workflow Details, and the Data Capture Technical Reference.

Complete levee accreditation packages that do not have a funded mapping project or accreditation data submitted through the MT-2 process will be captured and stored as laid out under Section 3.6 of this document.

4.4 Accredited Levee Mapping and Notes

4.4.1 New Hydrologic and Hydraulic Analysis

If a new hydrologic and/or hydraulic analysis for the exterior flooding source is submitted as part of a levee accreditation package, the package must be reviewed to determine that it meets FEMA criteria before it can be used to revise the effective BFEs. If the new hydrologic and/or hydraulic analysis indicates the base flood hazards are less conservative than the effective flood hazards, this review must occur and the effective BFEs must be updated before the levee can be accredited. However, if the new hydrologic and/or hydraulic analysis indicate the base flood hazards are more conservative than the effective flood hazards, the levee system may be accredited without revising the BFEs; FEMA will determine if a future revision based on the new analysis is warranted.

4.4.2 "With Levee" and Natural Valley Analyses

If a new hydrologic and/or hydraulic analysis is performed in an area with a levee, then both "with levee" and "natural valley" analyses must be performed. For accredited levees, the "with levee" analysis contains all of the 1-percent-annual-chance discharge riverward of the levee. The "natural valley" procedure assumes the levee does not impede floodflows. Because the "natural valley" analysis allows for additional conveyance and/or storage of floodwaters on the landward side of the levee, it typically results in lower BFEs than the "with levee" analysis.

If levees have been built on both sides of the flooding source, the "with levee" analysis assumes that the base flood discharge is contained between the two levees. However, a separate "natural valley" analysis is required for each levee. The "natural valley" analysis for the right levee should assume the left levee is in place and the "natural valley" analysis for the left levee should assume that the right levee is in place. This approach should also be used for analyzing the 0.2-percent-annual-chance flood or lesser events if requested.

Both the "with levee" and "natural valley" analyses should include all of the effective FIS flood frequency profiles and those flood frequency profiles required by current FEMA guidance to be analyzed for the project.

4.4.3 Flood Profiles

For accredited levees, the results of the "with levee" hydraulic analysis will be used to generate the Flood Profiles for the FIS Report. It is not necessary to generate Flood Profiles for the "natural valley" analysis unless specifically requested by the community and approved by FEMA.

4.4.4 BFE and SFHA Mapping

For accredited levees, the results of the "with levee" hydraulic analysis are used to map the BFEs riverward of the levee. The area landward of the levee centerline will be mapped using water-surface elevations from the "natural valley" hydraulic analysis and will be mapped on the best available topography landward of the levee. The BFEs will be mapped landward of the levee as Zone X (shaded) to show the area with a reduced base flood hazard. The 0.2-percent-annual-chance flood will also be mapped landward of the levee as Zone X (shaded). These two areas of Zone X (shaded) will be differentiated by using the appropriate symbology and notes as described in the FIRM Panel Technical Reference. Any areas of residual risk and interior drainage flooding that fall within this area will be mapped as an SFHA, the area subject to inundation from the base flood.

4.4.5 Floodway Analysis and Mapping Methods

NFIP regulations and Standards SID 69 and 70 state:

> Floodway surcharge values must be less than or equal to 1.0 foot. If the state (or other jurisdiction) has established more stringent regulations, these regulations take precedence over the NFIP regulatory standard. Further reduction of maximum allowable surcharge limits can be used if required or requested and approved by the communities impacted… [and] If a stream forms the boundary between two or more states and/or tribes, either the 1.0-foot maximum allowable rise criterion or existing floodway agreements between the parties shall be used.

Coordination with communities may be necessary in establishing the floodway extents implementing the floodway analysis methodology described below. The community coordination process shall be in accordance to Section 2 of FEMA Guidance Document No. 79, Floodway Analysis and Mapping, accessible through the FEMA Flood Risk Analysis and Mapping webpage.

Accredited levee systems are assumed to be hydraulically significant levees, and floodways for areas impacted by accredited levee systems should be computed using the same procedures outlined in Chapter 6 of this document for hydraulically significant levees. Please refer to Section 6.19 of this document for a description of these methods.

4.4.6 Multiple Levee Scenarios

When multiple levee systems may reduce flood hazards for the same area, each system must be individually analyzed, and the higher BFEs from the "natural valley" analyses shall be used on the FIRM for the levee-impacted area. If an area is impacted by both an accredited levee and non-accredited levee systems, the area shall be mapped in accordance with the appropriate procedure for both the accredited and non-accredited levee systems. Refer to the Chapter 6 of this document for information about mapping non-accredited levees.

In some cases, where one or more levee systems are located within the levee-impacted area of a larger levee system (exterior levee system), such as interior drainage levees (interior levee system). In these cases, it may be possible that both levee systems are accredited (see Figure 8) and the natural valley floodplain for the interior levee will fall within the natural valley floodplain for the exterior levee. For mapping purposes, gutterlines should be used to separate the Zone X (shaded) areas impacted by the interior levees from the Zone X (shaded) area impacted by only the exterior levee system.

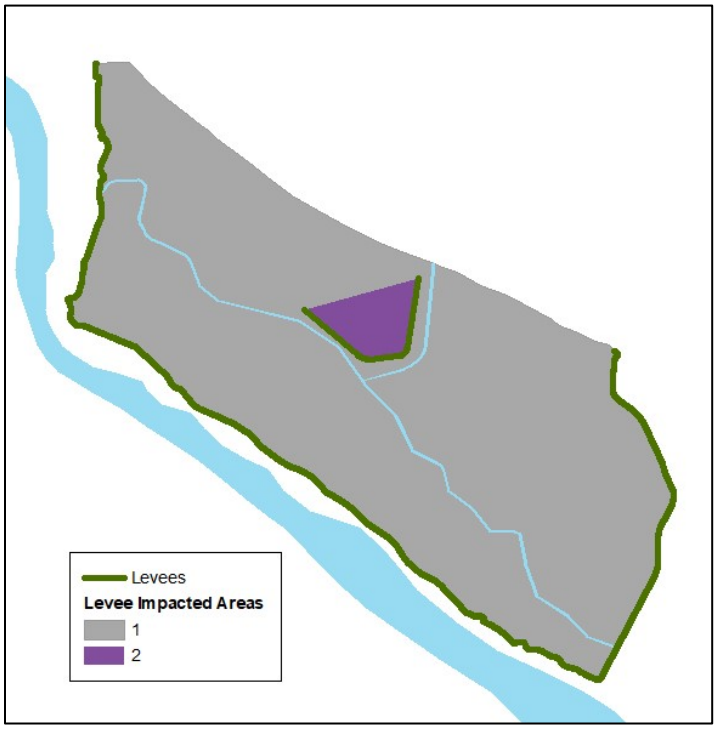

Figure 8: Multiple-Levee Scenario

In many cases, the interior levee system is designed to provide flood hazard reductions from an interior flooding source that may have an identified SFHA with a lower flood hazard than the exterior levee system. Three basic scenarios are possible:

1. If the exterior levee system is accredited (levee-impacted area 1 in Figure 8), the accreditation of any interior levee systems (levee-impacted area 2 in Figure 8) shall be based on the characteristics of the interior flooding sources to be shown with a reduced flood hazard.
2. If the exterior levee system is non-accredited (levee-impacted area 1 in Figure 8), the accreditation of any interior levee system (levee-impacted area 2 in Figure 8) shall be based on the characteristics of both the interior flooding sources and the exterior flooding sources to be shown with a reduced flood hazard.
3. If the interior levee system does not meet the accreditation requirements in either case, it shall be mapped using the procedures for non-accredited levee systems.

When no SFHA has been identified from any flooding source or interior drainage system associated with an interior levee, then an analysis of flood hazards shall be performed per Section 6.10 of this document to determine if a flood hazard exists.

4.4.7 Accredited Levee Notes to Users

When an accredited levee is shown on a FIRM panel, the Notes to Users section of the panel should include an accredited levee note as described in the FIRM Panel Technical Reference. This note should also be included in the Notes to Users section of the FIS Report.

4.4.8 Accredited Levees in the FIS Report

All accredited levees should be referenced in the FIS Report as explained in the FIS Report Technical Reference. This consists of including all levees in Table 9 of the FIS Report and referencing them on the Floodway Data Table as appropriate.

5.0 Provisionally Accredited Levee Systems

5.1 Provisional Levee Accreditation Overview

Levee owners and other levee stakeholders are responsible for providing 44 CFR 65.10-compliant design, operation, and maintenance documentation for FEMA to issue FIRMs recognizing the base flood hazard reduction capability of levee systems, also referred to as accreditation. In 2005, FEMA issued guidelines to clarify roles and responsibilities for levee flood hazard identification during a Flood Risk Project. FEMA further recognized that levee-impacted communities or other levee stakeholders may not have all documentation readily available to meet the requirements of 44 CFR 65.10, which could delay a Flood Risk Project. In 2007, FEMA issued guidelines establishing the PAL designation. The PAL designation provides communities and levee owners a specified timeframe to gather and submit 44 CFR 65.10-compliant data and documentation while allowing FEMA to move forward with preliminary and effective FIRMs while minimizing impact to the map production schedule.

A levee system is not eligible for a PAL designation if it is not shown as providing flood hazard reduction on the effective FIRM or on an attachment to a LOMR. A PAL designation can only be offered once for any given levee system.

This chapter provides guidance on determining if a levee system is eligible for a PAL designation and, if so, the process to offer the PAL, associated communication, and mapping. The determination of PAL eligibility requires coordination with Federal, State, and local levee stakeholders to support the decision-making process. Table 2 highlights the eligibility requirements that a levee system must meet to be considered for a PAL designation and provides the appropriate PAL category for the offer to the levee owner. If the levee system cannot meet any of the eligibility requirements listed in Table 2, then the levee system is not eligible for a PAL designation.

Table 2: Summary of Minimum PAL Requirements

Non-USACE or USACE Program Levee System	PAL Category	Levee System Shown as Providing Base Flood Hazard Reduction on Effective FIRM	PAL Not Previously Offered for Levee System
Non-USACE Program Levee System	A	X	X
USACE Program Levee System	B	X	X

5.2 PAL Eligibility Requirements

When levee systems are identified during a Flood Risk Project, a PAL designation may be considered in certain circumstances. Upon completing the levee system identification process, as specified in Section 3.3 of this document, within the project area, a Project Team member will perform an assessment of PAL eligibility. For a PAL eligibility determination, the levee systems identified should first be separated into three categories:

1. Levee systems not identified on the effective FIRM
2. Levee systems identified on the effective FIRM, but not shown as providing base flood hazard reduction
3. Levee systems identified on the effective FIRM and are shown as providing base flood hazard reduction

Only levee systems identified on the effective FIRM and shown as providing base flood hazard reduction can be considered for a PAL designation. If the levee system is shown as providing base flood hazard reduction on the effective FIRM, the Project Team must determine whether a PAL designation has been previously offered for the levee system. FEMA will only offer a PAL designation once to any given levee system. If a PAL designation was previously offered for the levee system, then the levee system is not PAL eligible.

To determine if a levee system is “PAL eligible”, FEMA must first establish, through coordination with USACE, whether the levee system is a USACE Program levee system or a non-USACE Program levee system.

For this document, USACE Program levee systems typically have recent inspection and risk assessment data, and are described in the following categories:

- Levee systems built by USACE that were authorized for construction by the U.S. Congress or by USACE continuing authorities (e.g., Section 205). These levee systems may contain levee projects constructed by non-Federal entities or other Federal agencies and incorporated into the USACE Program levee system by specific congressional action. In either case, these levee systems may be:
    - Owned or partially owned by USACE
    - Operated and maintained by USACE
    - Operated and maintained by a local sponsor (also referred to levee sponsor, public sponsor, or non-federal sponsor)
    - A combination of the above
- Non-Federal projects that are Active in the USACE Rehabilitation Program (pursuant to PL 84-99).

For non-federal projects that are Inactive in the USACE Rehabilitation Program, but were previously Active, USACE may still have data available to share with FEMA. As USACE continues to collect and expand information for all levees in the Nation in the NLD, it is best practice to look for information in the NLD and coordinate with USACE.

For this document, levee systems that do not meet the above criteria for a USACE Program levee system will be considered a non-USACE Program levee system, and this includes non-federal projects made Inactive in the USACE Rehabilitation Program.

Additionally, levee system symbology on the effective FIRM is important when determining PAL eligibility. If levee system symbology is not shown on the effective FIRM, the Project Team will consider the presence of a levee and the purpose of the structure. If levee symbology is not identified on an effective FIRM, but the structure implies base flood hazard reduction and has been verified to meet the definition of a levee system, a PAL designation may be considered.

Consideration of offering a PAL designation for a USACE Program levee system or a non-USACE Program levee system can follow different procedures and require different documentation, and as a result, have different PAL categories. The PAL categories are A: non-USACE Program levee system and B: USACE Program levee system. Table 2 shows that both categories of levee systems must meet the same general PAL eligibility requirements. Figure 9 (on page 61 of this document) provides a workflow process for assessment of PAL eligibility.

5.3 Considerations for Offering PAL to PAL Eligible Levee Systems

Even when a levee system is eligible for PAL Category A or B, FEMA may find that offering a PAL designation is not the best course of action. Therefore, additional considerations should be assessed before a PAL designation is offered.

If a levee system is determined to be PAL eligible per Section 5.2, the next step is for the Project Team to consider if:

- The levee system crest is at least 2 feet above the effective BFE.

- Operation and maintenance requirements of 44 CFR 65.10(c) and 44 CFR 65.10(d) have been met.

O&M plans under the jurisdiction of a federal or state agency, an agency created by federal or state law, or agency of a community participating in the NFIP is a regulatory requirement of 44 CFR 65.10(c) and 44 CFR 65.10(d). It is also information all communities are required to provide as part of a qualifying levee system for a PAL designation. FEMA will evaluate, before offering a PAL designation, whether an O&M plan under one of the jurisdictions cited above is available for the levee system. If the levee system does not have an O&M plan per 44 CFR 65.10(c) and 44 CFR 65.10(d), FEMA may not offer a PAL designation for the levee system.

Considerations and coordination with levee system stakeholders vary somewhat between non-USACE Program levee systems and USACE Program levee systems when deciding to offer a PAL designation and are described in detail in Subsections 5.3.1 and 5.3.2 and illustrated in the decision tree in Figure 9 on page 61 of this document.

5.3.1 PAL Category A – Considerations for Offering PAL for Non-USACE Program Levee Systems

The Project Team will assess the following considerations for offering a PAL designation when a levee system is determined to be eligible for PAL Category A:

- Where the levee system crest elevation and BFE are available, the Project Team should compare them to determine if the levee system crest elevation is at least 2 feet above the effective BFE. At no point along the levee system should the crest elevation be less than 2 feet above the effective BFE.
- Does information exist that indicates the levee system does not meet the design criteria of 65.10(b)?
- The levee owner must demonstrate that the levee system meets the operation and maintenance requirements of 44 CFR 65.10(c) and 44 CFR 65.10(d). The levee owner must be able to provide records of levee system maintenance and operation, as well as tests of mechanized interior drainage systems, if applicable.

Even for a non-USACE Program levee system, FEMA should first coordinate with USACE to determine if they have any data related to the levee system. The assessment to offer a PAL designation for non-USACE Program levee systems should then be performed in coordination with the local levee owner or the entity responsible for the levee system operation and maintenance.

It may be more difficult to obtain levee system crest elevation data for non-USACE Program levee systems. FEMA will need to work with the levee owner(s) to determine best available levee system crest elevation information and BFE information. FEMA will estimate the BFE(s). New or more up to date modeling may result in BFEs that are different than what is provided in the effective study. New or more recent BFEs may be used only if increases are demonstrated above the effective BFEs information. Water-surface elevation decreases in new or updated locations may not be used in place of the effective information.

FEMA recognizes that non-USACE Program levee systems may not have levee inspections and/or levee risk assessments like a USACE Program levee system may have. At a minimum, the levee owner must be able to provide records of levee system operation and maintenance, as well as tests of mechanized interior drainage systems, if applicable. If no operation and maintenance records exist, FEMA will not offer a PAL designation for the levee system.

5.3.2 PAL Category B – Considerations for Offering PAL to USACE Program Levee Systems

This subsection provides considerations that the Project Team should be assess before FEMA will offer a PAL designation to USACE Program levee systems determined to be eligible for PAL Category B. In addition, this subsection identifies the suggested coordination with USACE when assessing whether a PAL should be offered. FEMA and USACE will initially coordinate PAL assessment and then should jointly engage the local levee system sponsor and impacted communities after it has been agreed that the levee system is PAL eligible. Coordination with USACE will include requesting data and documentation concerning USACE Program levee systems to facilitate the assessment for offering a PAL designation.

The Project Team should assess the following considerations for offering a PAL designation when a levee system is determined to be eligible for PAL Category B:

- No readily available information indicates that the levee system does not have base flood risk reduction capability.
- Where the levee system crest elevation and BFE are available, the Project Team should compare them to determine if the levee system crest elevation is at least 2 feet above BFE. At no point along the levee system, can the crest elevation be less than 2 feet above BFE.
- Does information exist that indicates the levee system does not meet the design criteria of 44 CFR 65.10(b)?
- The levee owner must demonstrate that the levee system meets the operation and maintenance requirements of 44 CFR 65.10(c) and 44 CFR 65.10(d).
- For USACE Program levee systems, levee inspections and risk assessments provide valuable information to help determine if the above-mentioned criteria may be met for the levee system.

In some cases, new or more up to date modeling may result in BFEs that are different than what is provided in the effective study. New or more recent BFEs may be used only if increases are demonstrated above the effective BFEs information. Water-surface elevation decreases in new or updated locations may not be used in place of the effective information.

For non-Federal levee systems that have been placed on Inactive status in the USACE Rehabilitation Program, the FEMA Regional Office will obtain a copy of the USACE notification letter to the levee owner informing the owner that the levee system status has been changed from Active to Inactive. They will also coordinate with the appropriate USACE District office to determine whether the levee owner should be offered a PAL designation for the levee system.

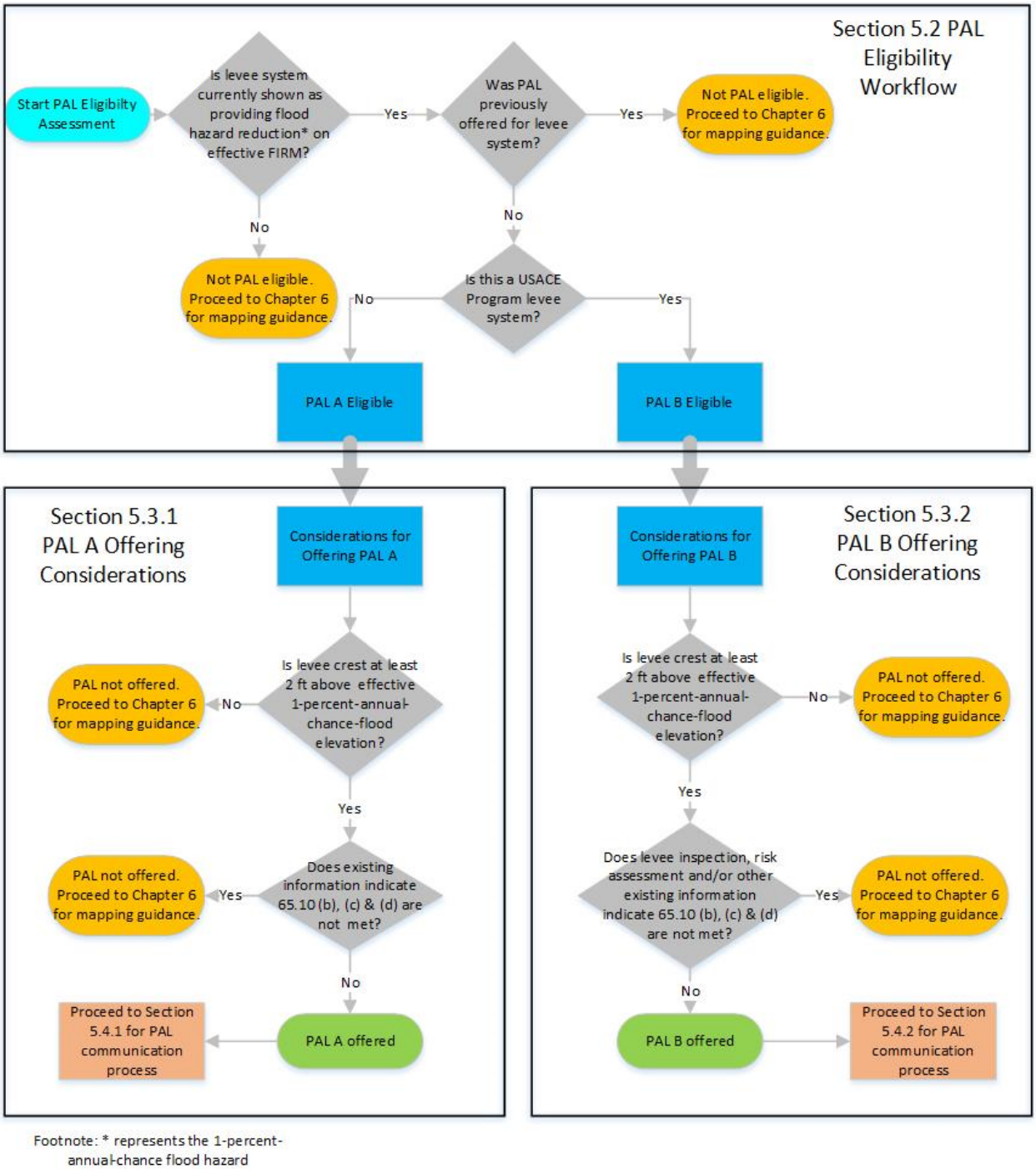

Figure 9: PAL Determination Decisions Tree

5.4 PAL Communication and Coordination Processes

This section discusses the communication and coordination processes followed by FEMA, Project Team members, levee owners, and USACE once a levee system has been identified as being eligible for a PAL designation per the criteria outlined in Sections 5.2 and 5.3 of this document. This section also discusses the required PAL submission and 44 CFR 65.10-required data and

documentation submission from the levee owner to FEMA. Levee systems not eligible for a PAL designation should be evaluated through analysis and mapping procedures for non-accredited levee systems and associated engagement. See Chapter 6 of this document for more information regarding non-accredited levee systems.

5.4.1 PAL Category A

The Project Team will prepare an initial notification letter for the FEMA Regional Office to send to the appropriate levee owner(s) to identify the levee system(s) that meet the criteria in Subsection 5.3.1 of this document and are, therefore, PAL eligible. The FEMA letter will describe the PAL category and the requirements and supporting documentation to enter a PAL agreement with FEMA.

The following attachments will accompany the initial notification letter sent to the levee owner(s) of non-USACE Program levee systems:

- A description of the requirements to meet 44 CFR 65.10
- An agreement to accept the PAL designation (agreement for Category A), for the levee owner(s) to sign and return to FEMA before the 91st day following the date of the initial notification letter. FEMA will send a similar agreement to levee-impacted community(ies).

Once the FEMA Regional Office sends the initial notification letter for Category A, the levee owner will have 90 days to return the PAL submission. The PAL submission requirements are as follows:

- An agreement signed by the levee owner(s) stating that the mapping of the PAL on a FIRM (PAL designation) is warranted because the levee system can be demonstrated to meet the requirements of 44 CFR 65.10, and that data demonstrating such will be provided to FEMA within 24 months. A similar, signed agreement must be provided by any levee impacted community(ies).
- A copy of the adopted operation and maintenance plan for the levee system.
- Records of levee system maintenance and operation, as well as tests of the mechanized interior drainage systems, if applicable.

Any levee owner that signs a PAL agreement must submit 44 CFR 65.10-compliant data and documentation within 24 months of the 91st day following the date of the initial notification letter. Levee owners may provide 44 CFR 65.10-compliant data to FEMA at any point within this 24-month timeframe and are encouraged to do so as soon as possible. In addition, the levee owner(s) must submit a progress report to FEMA 12 months after signing the PAL agreement to document progress toward obtaining 44 CFR 65.10-compliant data and documentation.

5.4.2 PAL Category B

The Project Team will prepare an initial notification letter for the FEMA Regional Office to send to the appropriate levee owner(s) to identify the levee system(s) that meet the criteria in Subsection 5.3.2 of this document and are, therefore, PAL eligible. A copy of this letter will be sent to the appropriate USACE District office for awareness. The FEMA letter will describe the PAL

category and the requirements and supporting documentation to enter a PAL agreement with FEMA.

The following attachments will accompany the initial notification letter sent to the levee owner(s) of USACE Program levee systems:

- A description of the requirements to meet 44 CFR 65.10, Mapping of Areas Protected by Levee Systems.
- An agreement to accept the PAL (agreement for Category B), for the levee owner(s) to sign and send back to FEMA before the 91st day following the date of the initial notification letter. FEMA will send a similar agreement to levee impacted community(ies).

When the levee system is fully or partially owned by USACE, FEMA will coordinate with the USACE District office and other levee owner(s), if any, to determine if the levee owner(s) intend to sign a PAL agreement.

Once the FEMA Regional Office sends the initial notification letter for Category B, the levee owner will have 90 days to return the PAL submission. The PAL submission requirements are as follows:

- An agreement signed by the levee owner(s) stating that the PAL designation is warranted because the levee system can be demonstrated to meet the requirements of 44 CFR 65.10, and that data demonstrating such will be provided to FEMA within 24 months. A similar, signed agreement must be provided by any levee impacted community.

Any levee owner that signs a PAL agreement must submit 44 CFR 65.10-compliant data and documentation within 24 months of the 91st day following the date of the initial notification letter. Levee owners may provide 44 CFR 65.10-compliant data to FEMA at any point within this 24-month timeframe and are encouraged to do so as soon as possible. In addition, the levee owner(s) must submit a progress report to FEMA 12 months after signing the PAL agreement to document progress toward obtaining 44 CFR 65.10-compliant data and documentation.

5.4.3 Timing of Initial Notification Letter

To minimize the risk of the PAL designation expiring prior to the effective date of the FIRM panel impacted by the PAL note, ideally the initial notification letter from FEMA should be timed such that the signed PAL agreements from levee owners and impacted communities are received before FEMA issues the Preliminary FIRM as indicated in Figure 10.
For example, an initial notification letter could be provided after KDP 2. This would allow the 90-day PAL offer period (beginning the date of the initial notification letter and ending 90 days later) to expire before the conclusion of the Quality Review 3 (QR3) review and the result of the PAL offer could be reflected on the Preliminary FIRM. Coordination with the QR3 reviewer may be necessary to allow the PAL note to be shown on the FIRM before the expiration of the PAL offer period and the QR3 review should not be deemed complete before to the 91st day past the date of the initial notification letter. This timing for the QR3 review to overlap the PAL offer period reduces, but does not eliminate, the risk of the 24-month PAL period expiring before the effective date of the FIRM.

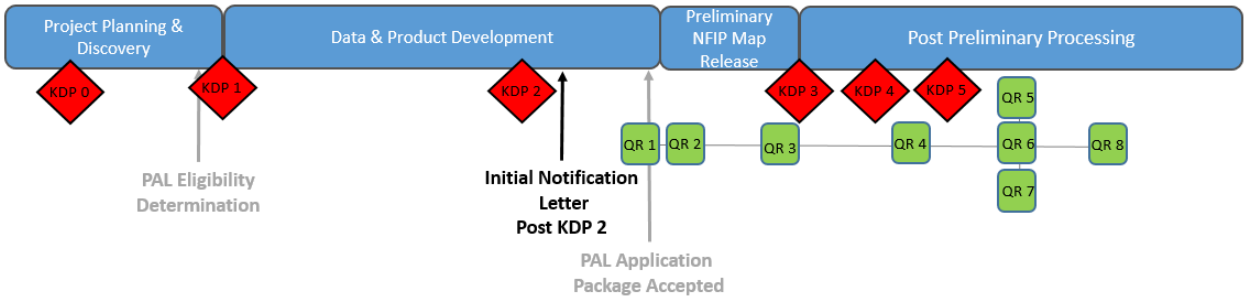

Figure 10: Initial Notification Letter within Risk MAP Project Timeline

5.4.4 Communication Guidance for PAL Submission Accepted by FEMA

This subsection provides guidance for communication to levee owners when FEMA accepts a PAL submission.

During the 24-month period that the PAL agreement is active (24-month PAL period), the FEMA Project Officer or designee will notify the levee owners and other stakeholders of the ongoing 24-month PAL period during which the levee owner must submit 44 CFR 65.10-compliant data and documentation to FEMA. This notification will be accomplished by sending a series of letters during the 24-month PAL period as follows:

- 30 days after initiation of the PAL agreement
- 10 months after initiation of the PAL agreement
- 16 months after initiation of the PAL agreement
- 90 days before the PAL period expiration date
- 30 days before the PAL period expiration date

Additionally, a progress report reminder letter will be sent to the levee owner to remind the owner that a progress report is due to FEMA 12 months after the start of the 24-month PAL period to document progress toward compliance with the PAL agreement.

The FEMA Project Officer or designee will send the letters to each levee owner signatory of the PAL Agreement, and will send copies of the letters to the following (at a minimum):

- CEOs of all impacted communities
- FPAs of all impacted communities
- State NFIP Coordinator(s)
- State levee safety officials, where appropriate
- District offices of U.S. Senators and U.S. Representatives
- USACE District offices, if the levee system is a USACE Program levee system

It is important that appropriate District offices of U.S. Senators and U.S. Representatives are aware of this communication effort throughout the 24-month PAL period, especially in advance of

the PAL period expiration date. Therefore, in addition to sending copies of the letters, FEMA Regional Offices shall notify their Regional Legislative Affairs Division who may coordinate additional outreach efforts, as appropriate.

The FEMA Project Officer may choose standard U.S. mail or certified mail to send the letters to the levee owners and impacted communities. Use of a tracking number and mail service website (such as USPS.com) is recommended for delivery tracking to confirm delivery of the letter. The FEMA Project Officer or designated Project Team member will file return receipts, fax reports, or phone logs documenting the follow up telephone calls in the case file for each affected community. The FEMA Project Officer or designated Project Team member will also include copies of the letters with other technical and administrative support data in the Technical Support Data Notebook (TSDN) for the project upon the expiration of the PAL period.

Additionally, the FEMA Project Officer should consider conducting an in-person PAL outreach meeting with the levee owner and other stakeholders to discuss:

- Status of the levee system
- Data collection process in support of submitting 44 CFR 65.10-compliant data and documentation to FEMA for contents only review and approval prior to the expiration date of the PAL period
- Analysis and mapping procedures for non-accredited levee systems, if applicable

The recommended timing of this meeting is near the time that the levee owner is to provide the 12-month progress report to FEMA.

The FEMA Project Officer or designated Project Team member will distribute and track the letters to each levee owner signatory of the PAL agreement and other federal, state, and local stakeholders.

5.4.5 Communicaton Guidance for PAL Submission Not Accepted by FEMA

Conditions may arise where FEMA has determined a levee system to be PAL eligible and offered a PAL designation, but then decides not to proceed with PAL designation for the levee system. If any of the following conditions occur, FEMA may decide not to accept the PAL submission:

- The signed PAL agreement is not returned to FEMA before the 91st day following the date of the initial notification letter.
- The PAL submission is determined to be deficient, such as:
    - A copy of the adopted operation and maintenance plan for the levee system is deficient or not provided.
    - For non-USACE Program levee systems, records of levee system maintenance and operation, as well as tests of the mechanized interior drainage systems, if applicable, are deficient or not provided.

5.4.6 Rescinding the PAL Designation

If any of the following conditions arise during the 24-month PAL period, FEMA may take immediate action to rescind the PAL designation and revise the FIRM for the area landward of the levee system:

- FEMA determines that the data and documentation required for compliance with 44 CFR 65.10 is deficient within 24 months of the 91st day following the date of the initial notification letter.
- The 12-month progress report is not provided to FEMA, and the FEMA Regional Office believes the PAL agreement should be rescinded.

If the FEMA Project Officer, based on the above criteria, concludes that a PAL designation should be rescinded before the expiration of the 24-month PAL period, the FEMA Project Officer will send a notification letter to the levee owner. The FEMA letter will clearly state the reason for rescinding the PAL designation and identify the levee system as non-accredited. See Chapter 6 of this document for more information regarding non-accredited levee systems.

5.4.7 Data and Documentation Submission for PAL Levee Systems in Support of 44 CFR 65.10

If a levee owner can provide 44 CFR 65.10-compliant data and documentation for a levee system to FEMA before the expiration date of the PAL, the levee system will be accredited and mapped accordingly, either within a current mapping project, or through a LOMR or PMR. The timing of the submission will impact FEMA's decision on the appropriate mapping process. Completeness regarding 44 CFR 65.10 requirements is discussed in Chapter 4.3.

FEMA will not grant extensions to the 24-month PAL period. However, accreditation opportunities for levee system are still available after the expiration date of the PAL agreement and before the Letter of Final Determination (LFD) for the update map showing the levee system not having base flood hazard reduction capability, if applicable.

If a levee owner can provide 44 CFR 65.10-compliant data and documentation and the submission is deemed complete by FEMA after the expiration date of the PAL agreement but before the effective date of the updated FIRM, FEMA will revise the FIRM and process it following the accreditation guidance provided in Chapter 4 of this document. This process does not provide an extension to the PAL period and may cause FEMA to spend funds to revise the FIRM to reflect the hazard of the non-accredited levee system, only to receive the submission and change direction to accreditation during the in-progress mapping project. However, this process provides consistency nationwide in initiating map revisions in a timely manner following the expiration of a PAL period.

If a levee owner provides the FEMA Regional Office with the 44 CFR 65.10 data and documentation submission and the data is deemed non-compliant by FEMA, the levee owner may submit additional data and documentation to substantiate compliance with 44 CFR 65.10. However, this data must be deemed compliant prior to the LFD date for the updated FIRM. If additional data and documentation submitted up to the day before the LFD date still do not meet the requirements of 44 CFR 65.10, FEMA may delay the FIRM. If issues with the data and documentation cannot be resolved, the flood hazard associated with the levee system should be

addressed through analysis and mapping procedures for non-accredited levee systems. See Chapter 6 of this document for more information regarding analysis and mapping procedures for non-accredited levee systems.

After the date of the LFD for the updated FIRM, a levee owner may provide 44 CFR 65.10-compliant data and documentation submission to FEMA for a completeness check through the LOMR or PMR process.

5.5 PAL Mapping and Notes

5.5.1 Mapping Project with PAL Designations

5.5.1.1 Cartographic Specifications for PALs

For levee systems with PAL designations, the levee-impacted area can still be mapped as Zone X (shaded) area with reduced flood hazard due to levee. The PAL designation associated with the Zone X (shaded) area with reduced flood hazard due to levee will be indicated on the FIRM panel with a PAL note. See FIRM Panel Technical Reference for more information regarding the depiction of flood hazard features and notes.

5.5.1.2 Notes to Users

For levee systems with PAL designations, the Notes to Users section of the FIRM directs map users to additional information about provisionally accredited levee systems. This note shall be on all FIRM panels that contain PALs. See FIRM Panel Technical Reference for more information regarding the FIRM Levee Notes to Users for PALs.

The Notes to Users example in FIRM Panel Technical Reference includes blanks in the note for the Project Team member to populate with the end date of the PAL period for the levee system associated with the flood zone.

See Subsection 5.4.1.6 and FIRM Database Technical Reference for more information regarding the S_Levee Table.

5.5.1.3 FIRM Panel Index

The Project Team does not need to revise the FIRM Panel Index due to a PAL designation. The Project Team does not need to revise and update the FIS Report to identify and include the levee systems that have a PAL designation. The Levees table in the FIS Report should show all accredited, provisionally accredited, and non-accredited levee systems. See FIS Report Technical Reference for more information regarding the Levees table of the FIS Report.

5.5.1.4 FIRM Database

The FEMA FIRM Database stores the digital GIS data used in the map production process, as well as tabular information inside the FIS Report.

The S_Levee table, part of the FIRM Database, contains information about levee systems shown on the FIRMs, including levee systems with PAL designations. For levee systems with PAL designations, the S_Levee table contains a field to be populated with the end date of the PAL period for the levee systems associated with the flood zone. The end date of the PAL period for

the levee system is 24 months from the start date of the PAL period. If the date is not known, the assigned Project Team member can obtain this date through consultation with FEMA Project Officer or other Regional Office staff. For more information regarding the S_Levee table, see FIRM Database Technical Reference.

5.5.1.5 Flood Risk Products

The L_Levee_Scenario table describes scenarios modeled for levee systems in the Flood Risk Database. The table contains a field to be populated by the Project Team member with levee system accreditation status, which includes the option of PALs. See Flood Risk Database Technical Reference for more information regarding the L_Levee_Scenario table. For a list of acceptable values for levee accreditation status, see the D_Levee_Accreditation domain in Domain Tables Technical Reference.

5.5.2 Mapping Project with Expired PAL Designation

For mapping projects that contain levee systems with expired PAL designations, the Project Team should address the flood hazard associated with the levee system following the analysis and mapping procedures for non-accredited levee systems summarized in Chapter 6 of this document; however, depicting levee systems with expired PAL notes on Preliminary or effective FIRMs may be appropriate in limited situations. It is a standard that the justification to use an expired PAL agreement date on the FIRM panel must be approved by the FEMA Region and FEMA Headquarters.

If approval is obtained from FEMA Region and FEMA Headquarters to include an expired PAL note on an effective FIRM, the Project Team should follow the guidance in Subsection 5.5.1 of this document.

6.0 Non-Accredited Levee Systems

This chapter provides guidance to FEMA Regional Office staff, FEMA Risk MAP providers, CTPs, and CTP providers involved in performing Flood Risk Projects where non-accredited levee systems have been identified. The FEMA, provider, and CTP staff involved in these "non-accredited levee projects" are hereinafter referred to as "Project Teams". An overview of the process described in this chapter is shown in Figure 11 on page 72.

6.1 Non-Accredited Levee Systems Defined

Non-accredited levee systems are systems that do not meet the NFIP regulatory requirements of 44 CFR 65.10 as described in Chapter 4 of this document and that are not shown on a FIRM as reducing the base flood hazard. This process for non-accredited levee systems will not be applied to non-levee features (discussed in Chapter 7 of this document), levee systems that are not hydraulically significant, or coastal structures[2] that reduce the flood hazard to areas below sea level. For mapping purposes, a structure is considered hydraulically insignificant if, during a base flood event, the peak water-surface elevations landward of the structure may be the same regardless of whether the structure was in place.

[2] For coastal structures, such as seawalls, revetments, and bulkheads, the USACE Coastal Engineering Research Center (CERC) prepared Technical Report CERC-89-15, Criteria for Evaluating Coastal Flood Protection Structures, in December 1989.

The technical procedures described in this document may be used for non-accredited levee systems that are not hydraulically significant, but the process as a whole does not apply.

6.2 Other Considerations

Subsections 6.2.1 through 6.2.5 provide information regarding the submission of data through the LOMR process, coastal considerations, expiring PAL system designations, projects involving multiple levee systems, and projects involving levee systems that are in the process of being restored.

6.2.1 Submission of Data through the Letter of Map Revision Process

Mapping of non-accredited levee systems may be completed following the MT-2 process for LOMRs provided that the requester follows the guidance for analysis and mapping procedures for non-accredited levee systems as outlined in this document. Before submitting the LOMR request, the community FPA or designee establish a Local Levee Partnership Team (LLPT) with participation of stakeholders, including FEMA, based on the complexity and scope of the levee system under evaluation. The organizer of the LLPT must document the options discussed by the LLPT members and FEMA decisions regarding the appropriate analysis and mapping procedures to be used. So that all stakeholders are included in the map revision process, the organizer or designee will make copies of these documents available directly or through a publicly accessible website. Upon completion of a Levee Analysis and Mapping Plan, discussed in Section 6.7 of this document, the requester can submit a request for a LOMR.

6.2.2 Coastal Considerations

Flood Risk Projects involving non-accredited levee systems in coastal areas may have a longer timeline for completion than a “typical” levee-related Flood Risk Project in a riverine or lacustrine setting.

The Project Team also may need to assess and discuss the transition zones between coastal and riverine levees. Additional information regarding coastal considerations is provided in the discussion of each of the technical procedures in Subsections 6.11 through 6.15 of this document.

6.2.3 Expiring Provisionally Accredited Levee Designations

Because extensive coordination may have been performed as part of the PAL process (see Chapter 5), the Project Team may not need to carry out some outreach and data collection for levee systems where PAL designations are expiring. Where outreach and data collection activities are necessary, the Project Team is to perform these tasks in conjunction with the remaining parts of the PAL process. For example, the Stakeholder Coordination and Data Collection Meeting (discussed in Section 6.4) may be combined with the PAL Meeting (discussed in Subsection 5.4.4) to discuss whether the PAL status or designation is expiring, along with potential options to address the levee. The FEMA Project Officer will make this determination through coordination with other Project Team members at the appropriate time to incorporate the FEMA levee analysis and mapping procedures for non-accredited levees into the project timeline.

6.2.4 Projects Involving Multiple Levee Systems

If levee systems have been constructed on both sides of a flooding source, or if multiple levee systems overlap, the Project Team will analyze the extents of the natural valley area and reach-specific flood hazards for each system independently, assuming the other system remains in place.

6.2.5 Levee Restoration and Adequate Progress

Situations may occur where FEMA determines, through coordination with community officials, levee owners, and/or OFAs), that a restoration (Zone AR, 44 CFR 65.14) or adequate progress (Zone A99, 44 CFR 61.12) project for the levee is underway. In these instances, levee reaches are not used. Rather, the regulatory requirements provided in 44 CFR 61.12 for new construction projects that have made adequate progress toward completion or the regulatory requirements provided in 44 CFR 65.14 for de-accredited levee systems that are being restored to provide base flood event design, or greater, would apply. Section 100230 of the Biggert-Waters Flood Insurance Reform Act of 2012 (Public Law 112-141) provides additional guidance on reconstruction or improvement of flood hazard reduction systems. Additional guidance is provided in Guidance Document No. 34, Guidance for Flood Risk Analysis and Mapping: Zone A99 and Zone AR Determinations, which is accessible from the FEMA Guidelines and Standards for Flood Risk Analysis and Mapping webpage

6.3 Levee Analysis and Mapping Procedure

Under the FEMA levee analysis and mapping approach followed before FEMA issued guidance in July 2013, FEMA analyzed and mapped a levee system that did not meet the NFIP requirements of 44 CFR 65.10 as if it had no effect on flooding on the landward side of the levee system during the base flood. This was known as the “without levee” approach.

The FEMA document titled Analysis and Mapping Procedures for Non-Accredited Levee Systems, issued in July 2013, provides additional information on the process used by FEMA to analyze and map areas on the landward side of non-accredited levee systems that are shown on FIRMs. The document, which is accessible from the FEMA website (https://www.fema.gov/media-library-data/20130726-1922-25045-4455/20130703_approachdocument_508.pdf), provides:

- A synopsis of FEMA’s historic analysis in the vicinity of levee systems
- An overview of the development process and teams responsible for procedure development
- Response to the public comments received and incorporated
- An understanding of analyses and mapping approaches

The technical aspects of Analysis and Mapping Procedures for Non-Accredited Levee Systems have been incorporated into this document.

Given recent technological advances in data collection and H&H modeling, FEMA can implement a more refined approach to mapping flood hazards in areas landward of levee systems. The current levee analysis and mapping procedures were developed to analyze and map areas on the landward side of non-accredited levee systems that are shown on FIRMs. The current levee

analysis and mapping procedures better meet the needs of the public and provide results that are more refined.

The current FEMA levee analysis and mapping procedures for non-accredited levee systems provide for a repeatable and flexible approach that:

- Complies with all existing statutory and regulatory requirements governing the NFIP, most notably the requirements of 44 CFR 65.10
- Leverages local input, knowledge, and data through proactive stakeholder engagement
- Aligns available resources for engineering analysis and mapping commensurate with the level of hazard in the areas landward of levee systems
- Recognizes the uncertainty associated with levee systems
- Allows analysis of levee reaches
- Considers, from an engineering perspective, the unique characteristics of each levee system

Figure 11 illustrates the current FEMA levee analysis and mapping procedures for non-accredited levee systems. Guidance on the identification of the levees is detailed in Section 3.3 of this document. Following confirmation that a structure is a levee; the Project Team conducts an initial accreditation evaluation to determine if the levee system is accredited or can be provisionally accredited. If neither, then the Project Team analyzes the levee system following the levee analysis and mapping procedures illustrated in Figure 11.

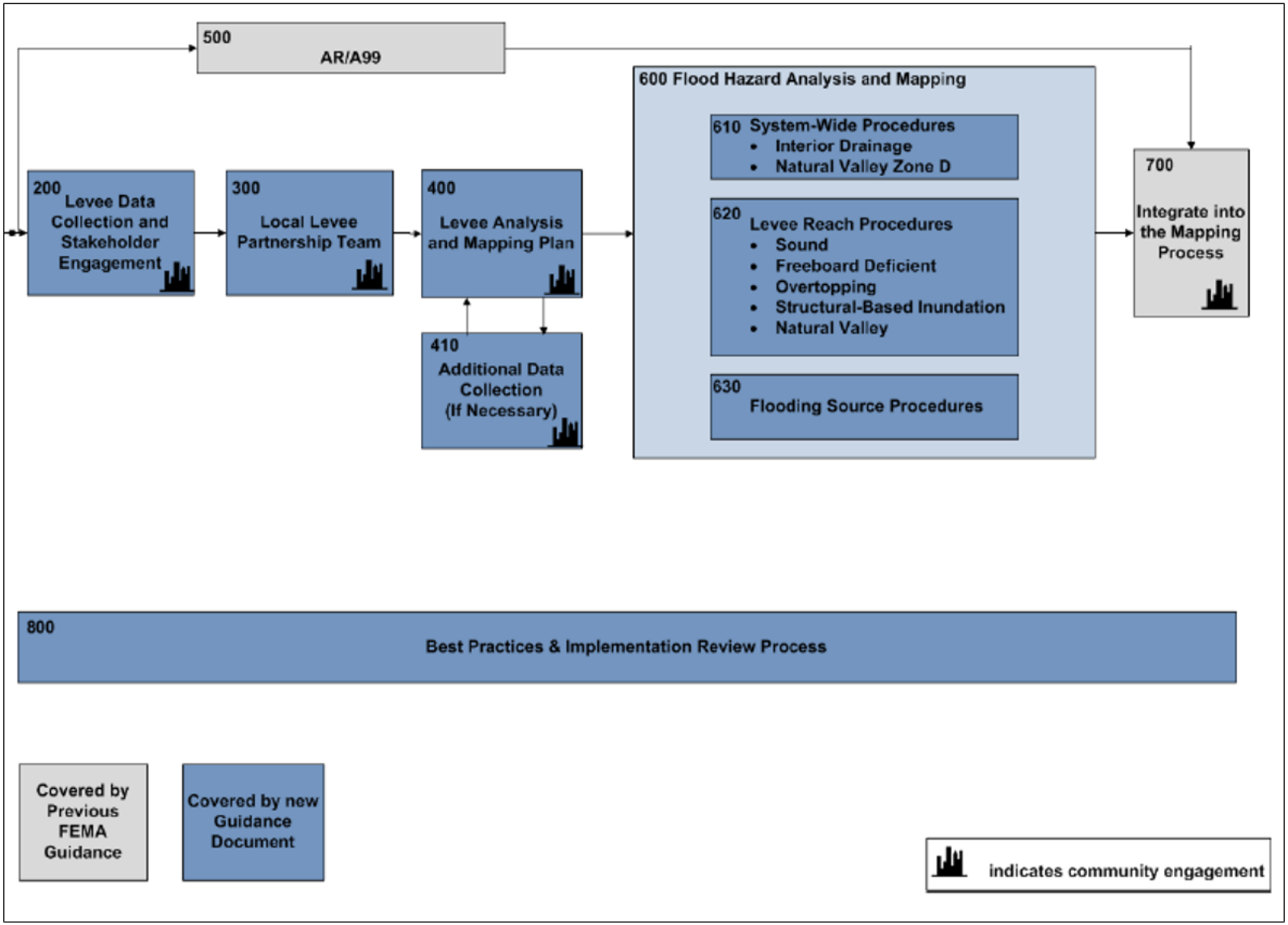

Figure 11: FEMA Levee Analysis and Mapping Procedure

6.4 Levee Data Collection and Stakeholder Engagement (Figure 11, Element 200)

The FEMA analysis and mapping procedures for non-accredited levees include an interactive coordination process with key stakeholders, including State and community officials, officials of participating Tribes, and levee owner(s). The primary goals of the levee data collection and stakeholder engagement phase are:

1. Improve stakeholder understanding of the levee analysis and mapping process.
2. Help the Project Team obtain a comprehensive understanding of data available and the levee system(s) in project areas so that informed decisions may be made by FEMA regarding the procedures to be used to model and map flood hazards for non-accredited levee systems.

FEMA has developed email and letter templates that the Project Team may use when inviting community stakeholders to meet with the LLPT. Project Team members may obtain copies of Region-specific templates through the FEMA Project Officer.

FEMA Regional Office staff are to plan, and budget for, stakeholder coordination, data collection, and establishment of an LLPT for all Flood Risk Projects involving non-accredited levee systems. Each step is discussed in this document. If little or no data are available, or if the Natural Valley Procedure discussed in Subsection 6.10.1 of this document is preferred by the affected communities and that preference is documented, the scope may be limited. This stakeholder coordination step should typically occur during the Discovery process for the watershed/project area that is the focus of the Flood Risk Project.

The Project Team will perform the initial levee stakeholder coordination and data collection steps for all non-accredited levee systems. In some instances, the results of these data collection efforts may indicate that the data and documentation already collected are adequate and are sufficient to make a decision on potential analysis and mapping procedures. Where applicable, such a decision will be made by the FEMA Project Officer with input from the LLPT. The primary function of the LLPT will be to provide feedback, additional data, and options on levee reach selection for the system. Additional information on the LLPT is provided in Section 6.5 of this document. Thereafter, FEMA, through coordination with community officials, Tribal officials, levee owner(s), and local project sponsor(s), will proceed with modeling the levee system and mapping the flood hazards in areas landward of the levee system. (See Figure 11, Elements 500 and 600.)

The levee data collection and stakeholder engagement process are shown in Figure 12 and discussed in more detail in Subsections 6.4.1 through 6.4.4.

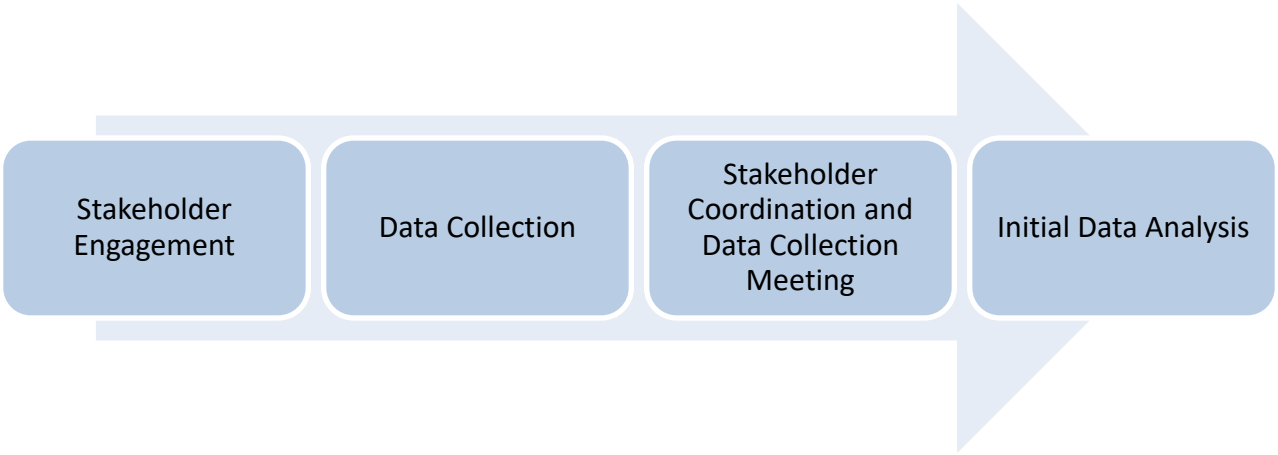

Figure 12: Levee Data Collection and Stakeholder Engagement Process

6.4.1 Stakeholder Engagement

The FEMA Project Officer or designee will engage levee-impacted communities, levee owners/operators, and levee sponsors during the stakeholder engagement process. The purpose of this initial engagement is twofold:

1. Discuss the levee analysis and mapping process.
2. Collect initial community- and levee system-related information and data to help streamline and facilitate future meetings. This upfront coordination may take the form of conference calls, Web-enabled meetings, or other means that facilitates two-way communication.

For a Flood Risk Project involving a non-accredited levee system, the Project Team will need to engage with a different array of community, county, regional, and State officials and other stakeholders than may be engaged for a Flood Risk Project that does not involve such systems. The stakeholders to be engaged include, but are not limited to, the following:

- Community, County, and State emergency management officials
- Levee owners/operators
- Officials from communities upstream of, downstream of, and across the flooding source from the levee system
- State or regional groups with a vested interest in water resources, such as levee boards, conservation districts, and watershed/river basin commissions
- Dam safety officials
- Members of Tribal communities, as defined through consultation and coordination with Tribal officials
- GIS managers and specialists, community and regional planners, and county land use departments

- Representatives of district offices of OFAs with responsibility for levee systems in the project area, including USACE District offices
- Economic development and commerce representatives
- Members of the local engineering community

This upfront coordination may take the form of conference calls, Web-based meetings, or other means of two-way communication. The types of levee stakeholders engaged in a levee-related project may vary by State or Region but may include local community and Tribal officials and agencies, local economic development organizations or environmental groups, members of the local engineering community, State, and regional representatives, USACE, and OFAs.

6.4.2 Data Collection

The Project Team will obtain available supporting data and documentation for the levee system elements from levee system owners; levee system operators; State agencies; local agencies; private individuals or corporations; FEMA data repository and online services; and USACE, including the NLD; and OFAs. The Project Team may perform some of this data collection before an initial meeting with levee stakeholders. This data collection effort before the meeting will help FEMA facilitate and encourage substantive discussion during the meeting. In addition, the Project Team will obtain available supporting documentation regarding historical performance of the levee system, considering both successful performance and unsuccessful performance issues.

Collecting data and information early in the process will help the Project Team facilitate and encourage substantive discussion during meetings with stakeholders. Data collection efforts may vary based on the uniqueness of the levee system. FEMA will not fund any efforts related to certifying data for levee accreditation or making determinations of the levee's structural conditions. Levee owners may choose to perform additional data collection activities but must do so at their own expense. The Project Team will work with various stakeholders as appropriate to obtain supporting data and documentation. The Project Team will make the data and documentation available to those who request it.

Depending on the complexity of the levee system, data and documentation collected may include (if available and applicable), but are not be limited to, the following:

- Design reports/memorandums
- Construction documentation reports/memorandums, specifications, or plans
- Post-construction plans and specifications (e.g., bridges, roads, utility construction that occurred since levee construction)
- Survey data
- Geotechnical reports
- Structural analyses
- Interior drainage analyses
- O&M plans

- Inspection reports
- Historical news articles or data regarding levee breaches and flood fighting efforts and levee distress
- USACE NLD data, Levee Screening, or Risk Assessment Reports
- Flood records and streamflow data
- Current orthophotography and topographic data
- Related data from the FEMA MIP, the FEMA Engineering Library, and other FEMA archives/databases
- Building footprint/parcel data
- Master drainage plans and/or flood modeling
- PAL or accreditation review documentation

Project Team members are to use the NLD as a first resource, if available. The data and information collected will help FEMA and the levee stakeholders develop an approach for modeling and mapping the flood hazard in areas landward of non-accredited levee systems.

Typically, the FEMA Project Officer will make the initial contact with district offices of OFAs to obtain data and information regarding levees. The Project Officer will determine the appropriateness of followup contacts with OFAs by other Project Team members. Data and information collection efforts may also vary based on the potential uniqueness of each area landward of a levee system. The FEMA Project Officer and other Project Team members will work with various stakeholders in these areas to obtain the best available supporting data, information, and documentation. Levee owners may choose to perform additional data and information collection activities but must do so at their own expense.

The Project Team is to develop and maintain a distribution list for disseminating information to all stakeholders involved in the process and maintain this list throughout the lifecycle of the project

If, during the data collection effort, information and documentation is provided substantiating that the levee system may be accredited, FEMA will reconsider the accreditation determination following the guidance discussed in Chapter 4 of this document.

6.4.3 Stakeholder Coordination and Data Collection Meeting

An in-person meeting with stakeholders, referred to as the Stakeholder Coordination and Data Collection Meeting, is vital during the data collection phase of a levee mapping project. Information on the objectives, timing, attendees, messages to be delivered, pre- and post-meeting activities, and field reconnaissance efforts related to the meeting is provided in Subsections 6.4.3.1 through 6.4.3.7.

6.4.3.1 Meeting Objectives

The overarching objectives of the Stakeholder Coordination and Data Collection Meeting are:

- To introduce stakeholders to each other

- To discuss areas of flood risk, available data, and the FEMA process for analyzing and mapping flood hazards landward of non-accredited levees

To accomplish these objectives, the Project Team performed the upfront research and data and information collection activities described in Subsection 6.4.2. This first meeting is a working meeting, so it is important that attendees are prepared to contribute and that the meeting facilitator and other Project Team members encourage participation.

A comprehensive list of the meeting objectives is included below. It may not be possible to cover these objectives at every stakeholder meeting. However, this list includes the array of topics that may be discussed depending on the levee system.

- Introduce the Project Team to the community officials, Tribal officials, and other stakeholders with areas of influence within the areas potentially impacted by a new levee analysis and mapping project.
- Emphasize that the goal of the levee analysis and mapping project is to apply the technical procedure that best reflects the flood hazard in the area landward of the levee based on available resources, data, and community needs.
- Review available data on the levee system, confirm whether the data are accurate, and obtain stakeholders' perspectives about their flood hazards. This will help determine the appropriate procedure for modeling the levee system.
- Emphasize the importance of the stakeholders' responsibility in providing necessary data and keeping the public informed of flood hazards and the relevance of those hazards.
- Discuss floodplain management and flood insurance implications of the use of Zone D as the flood hazard designation on the FIRM.
- Discuss potential members of an LLPT, which is discussed in more detail in Section 6.6 of this document.

6.4.3.2 Meeting Timing

The Project Team is to hold the Stakeholder Coordination and Data Collection Meeting after Project Team members have collected available data, documentation, and information and have had initial discussions with identified stakeholders. The Project Team will plan the Stakeholder Coordination and Data Collection Meeting in coordination with the affected community officials, Tribal officials, and levee owner(s)/operator(s).

6.4.3.3 Meeting Attendees

The Project Team is to invite all stakeholders contacted during the levee data collection and stakeholder engagement process to the Stakeholder Coordination and Data Collection Meeting. It may not be possible for all stakeholders to attend all meetings. However, their input is important, and Project Team members should attempt to coordinate with these stakeholders in advance of the meeting if their attendance is not feasible or to arrange for remote participation when necessary. Additionally, Project Team members are to ask stakeholders for suggestions of other stakeholders who should be included in the Stakeholder Coordination and Data Collection

Meeting and any subsequent meetings. Project Team members are to follow up on meeting outcomes and actions with those stakeholders who are not able to attend in person or remotely.

6.4.3.4 Meeting Messages

Messages that are to be emphasized during the Stakeholder Coordination and Data Collection Meeting include, but are not limited to, the following:

- The levee analysis and mapping approach is a process with a variety of options, where the stakeholders are actively engaged in the process.
- The goal of the levee analysis and mapping project is to apply the procedure that best reflects the flood hazard in the area landward of the levee system based on available resources, data, and community needs.
- It is important for community officials to keep the public informed of flood hazards and associated risks and the relevance of those risks and identifying the public as a stakeholder in the process.
- The use of Zone D landward of the levee system has both floodplain management and flood insurance implications.
- Some risk of flooding will always exist landward of a levee system.
- Additional information is available from the Living with webpage on the FEMA website, available at https://www.fema.gov/flood-maps/living-levees

6.4.3.5 Pre-Meeting Activities

Meeting-related actions and materials that the Project Team is to compile before the Stakeholder Coordination and Data Collection Meeting include, but are not limited to, the following:

- Coordinate with stakeholders upfront to obtain data; understand the levee system being assessed and its history; and to learn about a community's or Tribe's resources, assets, future plans, vision, etc.
- Confirm best available data (including the timing of such data) and discuss data-sharing agreements.
- Prepare talking points to discuss the levee system, the levee analysis and mapping approach, and the project lifecycle.
- Prepare NFIP compliance/adoption information as appropriate.
- Arrange for a field reconnaissance visit during the Stakeholder Coordination and Data Collection Meeting if appropriate.
- Prepare and distribute a meeting invitation, meeting agenda appropriate for the levee system, and map for discussion purposes.

The FEMA Project Officer, the FEMA Regional Tribal Liaison, or other FEMA Regional Office staff will identify any additional items that may be needed when Tribal nations are affected through consultation and coordination with Tribal officials.

6.4.3.6 Meeting Activities

Stakeholder Coordination and Data Collection Meeting activities include, but are not limited to, the following:

- An interactive, collaborative discussion. Project Team members are to facilitate discussions between community officials and other stakeholders, offer suggestions, and manage the time.
- Review of available data. Project Team members are to make a map providing a system-wide view of available data gathered to date available in GIS format. The GIS format allows a Project Team member to zoom in and out to specific, targeted areas for discussion purposes during the meeting.
- Identification of gaps in data collected. Project Team members are to work with meeting participants to identify data gaps that need to be filled and formulate a reasonable plan or alternatives, to fill the gaps especially if filling the gap is critical to project completion.
- Discussion of the procedures for analyzing and mapping the levee system(s) that are the focus of the project. Project Team members are to present the information in a logical way that illustrates the levee system(s) and the currently available and potentially available data. This will allow the majority of the meeting time to be focused on gaining a better understanding of the next steps for all participants.

6.4.3.7 Field Reconnaissance

In some instances, the Project Team may participate in a field reconnaissance of the levee system after the Stakeholder Coordination and Data Collection Meeting. The FEMA Project Officer will decide the type and level of field reconnaissance based on project needs and available resources.

Field reconnaissance generally is recommended along reaches where the Overtopping Procedure (discussed in Subsection 6.10.3 of this document) or the Structural-Based Inundation Procedure (discussed in Subsection 6.10.2 of this document) could potentially be used to model and map a levee reach. The field reconnaissance effort may be a drive along the levee system or a walk on top of the levee system to view areas of interest. The Project Team is to document the field reconnaissance using notes, markups, sketches, and/or photographs.

The field reconnaissance is not an inspection or an attempt by the Project Team to make technical conclusions on the quality, substance, or performance of the levee system. The primary purpose of the field reconnaissance is for the Project Team to gain a better understanding of the levee system to reflect the flood hazard information on the FIRM in areas landward of the levee system. FEMA analyses for flood hazard mapping do not predict or guarantee the performance, reliability, or overall safety of a levee system and are used only to identify the flood hazards landward of the levee system.

6.4.4 Initial Levee Data Analysis

The Project Team will analyze the collected data, information, and documentation to prepare for the LLPT Meeting(s). By performing this data analysis, the Project Team will be better prepared for specific discussions with the LLPT members about levee system history, characteristics, modeling procedures available, flood hazards, flood hazard communications, and outreach. The

FEMA Project Officer will determine the appropriate level of effort for this activity; the level of effort should be commensurate with the level of risk to the community, the complexity of the levee system, and the available data. Two main efforts may occur during this step.

1. The Project Team will analyze currently available and potentially available data to determine what reach-specific procedures could potentially be applied to the levee system(s) being analyzed. For example, if data to meet the structural requirements is not available and not expected to be available, the LLPT Meeting discussion should be focused on both the Natural Valley and Structural-Based Procedures.

2. The Project Team will conduct an analysis to determine baseline estimates and expected ranges of the SFHA extent and depth. This will usually include a Natural Valley analysis, evaluation of levee crest elevations, or the use of previously developed preliminary flood hazard zone boundaries. A rough analysis using the Structural-Based Inundation Procedure may be included as well. The Project Team will perform the analysis using readily available data, such as topographic data from the USGS National Elevation Dataset (available at https://nationalmap.gov/elevation.html) or more detailed data from the community.

As part of this initial Natural Valley analysis, the Project Team will develop 1-percent-annual-chance flood elevations by one of the following methods:

- Use the effective analysis.
- Prepare a Base Level analysis that applies the effective or a proposed flood discharge with a Base Level hydraulic model.
- Extend the effective BFEs landward of the levee.

In most situations, extending BFEs landward of the levee system represents a worst-case scenario for defining the limits of the SFHA. The Project Team will develop water-surface elevations for discussion purposes only, and the Project Team is to clearly inform the LLPT members that the final BFEs and SFHA delineations that will be shown on the FIRM may not match the results of this initial data analysis.

To show the results of this analysis, the Project Team will select depth profile locations to communicate the variability resulting from the various procedures as shown in Figure 13. For example, in Figure 13, the initial data analysis indicates that no single approach results in the shallowest depths landward of the levee. At the upstream end, the red area is the area where a Natural Valley analysis results in the deepest depths. In the central part of the levee (yellow area), however, the Natural Valley analysis results in the lowest depths, and the Structural-Based Inundation analysis results in the deepest depths. This initial analysis will provide the LLPT with an early indication of what the results from various types of analyses might provide.

The Project Team is to present the results through maps and a draft version of the Levee Analysis and Mapping Plan that summarizes the methods used and results. The Project Team will use the draft maps and draft plan to facilitate discussions with the LLPT regarding the available data and the range of potential outcomes. The FEMA Project Officer will provide templates for the draft maps and plan.

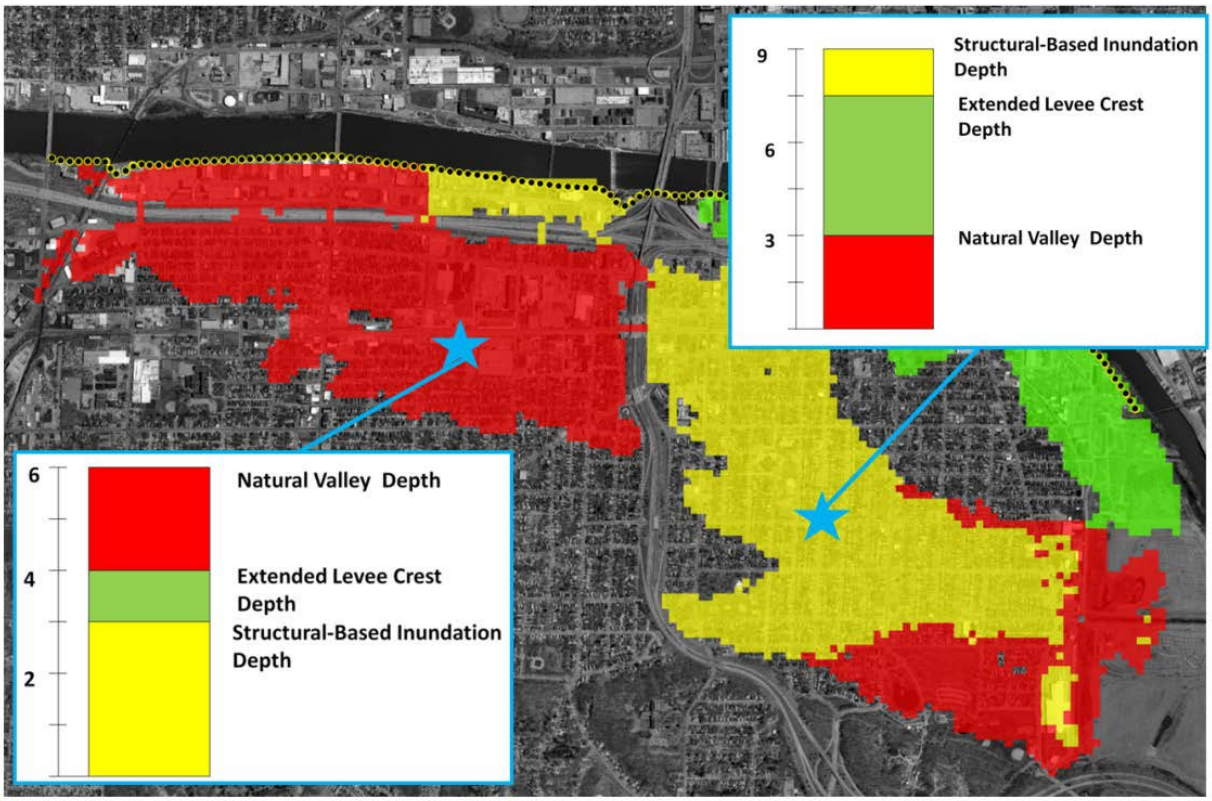

Figure 13: Sample of Potential Inundation Extents

6.5 Local Levee Partnership Team (Figure 11, Element 300)

6.5.1 Introduction and Mission

The levee analysis and mapping procedures provided for an interactive coordination effort with stakeholders, especially the key stakeholders that are invited to participate in the LLPT. A LLPT must be established with participation of diverse stakeholders based on the complexity and scope of the levee system under evaluation. The options discussed by the LLPT members and the decisions by FEMA regarding the appropriate analysis and mapping procedures to be used, must be documented, and made available to stakeholders. Participants in the LLPT will vary, depending on the scope and complexity of the levee system that is being analyzed and mapped.

The primary function of the LLPT will be to provide feedback and, if necessary, additional data, information, or documentation. The role of the FEMA Project Officer or other Regional Office representative as the facilitator of the LLPT will be to present results of the initial levee data analysis and any subsequent analysis, solicit and consider input from other LLPT members, and make the final decision on the technical procedure(s) to be applied to effectively analyze and map the flood hazards in the area landward of the levee system.

In consultation with the other LLPT members, the FEMA Project Officer or other Regional Office representative will determine the number and format for the LLPT meetings and coordination activities.

6.5.2 Transparency

The LLPT membership and activities must be transparent. To maintain this transparency, an assigned LLPT member or other designee is to create an attendance sheet documenting invitees and members attending meetings (in person, by telephone, or via the Web). In addition, the LLPT is to prepare meeting minutes that document important discussions, action items, and decisions made by FEMA. The LLPT is to make these documents available to stakeholders by U.S. mail, email, or postings to a publicly accessible website.

6.5.3 Membership

During the Stakeholder Coordination and Data Collection Meeting, the FEMA Project Officer or other Regional Office representative will explain the need for the LLPT and the types of individuals who could be members. The Project Officer or other representative from the FEMA Regional Office will always be a member of the LLPT but may not always attend meetings in person.

Once established, FEMA will provide outreach and training materials to enhance the ability of the LLPT members to meet their objectives successfully. For most projects, LLPT members will be a subset of those stakeholders that participated in the Stakeholder Coordination and Data Collection Meeting.

At minimum, all communities and tribes affected by flooding related to how the levee is analyzed and mapped will have the opportunity to have a participating member on the LLPT. If a community or tribe does not own or operate the levee in question, levee owners/operators will also have an opportunity to participate.

The following are the types of groups and individuals that could be invited to participate in the LLPT:

- Community CEO or designee (individual with decision-making authority, if not the CEO)
- CEO or designee of participating tribe (individual with decision-making authority)
- Community FPA
- Tribe FPA
- State NFIP Coordinator
- Levee owner and/or local project sponsor (if levee is not owned by a community)
- Local engineer/technical representative invited by the community
- FEMA Regional Office representative
- Representatives of OFA district offices that could provide additional input
- Other Project Team members (i.e., CTPs, FEMA Risk MAP providers, CTP subcontractors)
- Others as determined jointly by the community and FEMA Regional Office representative

6.5.4 Roles and Responsibilities

The FEMA Regional Office representative will coordinate with the LLPT, obtain LLPT member input, and make final decisions on the way to analyze and map the flood hazards in the areas landward of the levee system. The FEMA Regional Office representative will decide how reaches of the levee system are analyzed and mapped.

The Project Team will perform the levee analyses and mapping activities as directed by the FEMA Regional Office representative. This may include preparing the initial data analysis, as well as developing intermediate flood risk products. As previously stated, the non-FEMA LLPT members' primary role is to provide data and input to FEMA, including commenting on the creation of levee reaches and the procedures to be used for analyzing and mapping the reaches based on local levee conditions.

In some circumstances, State agencies other than the State agency represented by the State NFIP Coordinator may be active participants in the LLPT. Their roles will vary based on the specific agency's mission and relationship to the impacted communities and levee owners.

In many situations, a USACE District office will have a history of providing support to impacted communities and levee owners. The FEMA Regional Office representative should coordinate with USACE District office staff before establishing the LLPT to discuss what role the USACE District Office staff will assume on the LLPT. Likewise, the FEMA Regional Office representative will coordinate with OFAs other than USACE in determining their role when it is appropriate for them to participate.

6.6 Local Levee Partnership Team Meetings (Figure 11, Element 300)

6.6.1 Meeting Objectives

In addition to the general Risk MAP objectives, the LLPT has the following specific objectives:

- Provide all members the opportunity to explain the unique conditions that will influence the analysis and mapping associated with the non-accredited levee system.
- Allow for discussion on the information and data obtained and the results of any analyses presented.
- Allow for comment on methods for levee reaches, analyses, and mapping within the allowable guidelines.
- Develop, if necessary, a reasonable schedule for obtaining input or additional data.

6.6.2 Meeting Timing and Format

Depending on the complexity of the levee system under consideration, the FEMA Regional Office representative and LLPT members will determine the number and format for the LLPT Meetings and other coordination activities.

The initial LLPT Meeting will take place after the stakeholder coordination, data collection, and initial data analysis have taken place. As discussed in Section 6.4 of this document, the FEMA

Project Officer and other Project Team members will use the initial data analysis to help explain alternatives to the LLPT members and get their input.

In many instances, an initial field reconnaissance will have occurred before the initial LLPT Meeting. However, as discussed in Subsection 6.3.7 of this document, this reconnaissance activity could follow the initial LLPT Meeting, depending on the local situation.

The LLPT Meetings may be held in-person, via conference call, or via the Internet. Decisions regarding where and when to hold meetings will be based on the local logistical situation, availability of members, and the complexity of the levee system being evaluated.

6.6.3 Meeting Attendees

The FEMA Regional Office representative is to assure that all LLPT members are invited to all LLPT Meetings. (See Subsection 6.5.3 of this document for a list of potential LLPT participants).

6.6.4 Meeting Messages

The message for the initial LLPT Meeting (and subsequent meetings) continues to be "Living with levees - It's a shared responsibility". The specific message to the LLPT is that FEMA recognizes that unique local levee conditions exist, and the FEMA Regional Office representative will work with the other LLPT members and use local data and input to determine how best to analyze and map hazards in levee-impacted areas. An additional message is that, while FEMA has the final decision-making authority on how the flood hazards landward of the non-accredited levee system will be analyzed and mapped, the process for reaching that decision will emphasize an interactive exchange of information and ideas among the LLPT members.

6.6.5 Pre-Meeting Activities

The following activities will occur before the initial LLPT Meeting:

- The FEMA Regional Office representative will send an invitation email to the first LLPT Meeting (and all subsequent meetings) to each LLPT member.
- The FEMA Regional Office representative will provide LLPT members with introductory briefings and training materials on the procedures for analyzing and mapping non-accredited levee systems.
- The Project Team will conduct an initial data analysis, discussed in Subsection 6.4.4 of this document, to provide an overview of alternative approaches for various levee reaches. This could include any draft maps or other results that would be helpful to communicate the impact of different approaches.
- The Project Team will develop a summary of data and information obtained during the data collection and reconnaissance efforts.

6.6.6 Meeting Activities

During the LLPT Meeting(s), the FEMA Regional Office representative will:

- Explain the LLPT Meeting objectives and the need for transparency.

- Inform the LLPT members that meeting minutes to document who attended and what happened at the meeting will be produced and made available to all stakeholders.
- Provide a summary of the background of the flood hazard mapping project.
- Provide a summary of the levee analysis and mapping process.
- Answer any questions about the levee analysis and mapping process and the briefing and training information previously provided.
- Summarize the following information:
    - Meeting messages
    - Results from the data collection efforts
    - Results from the initial data analysis, including any draft map and USACE Levee Screening Tool results
    - Possible alternative approaches for analyzing and mapping flood hazards landward of the levee system(s)

6.7 Levee Analysis and Mapping Plan (Figure 11, Element 400)

The LLPT will use the data available to select the appropriate procedure to analyze and map the flood hazards landward of the levee system(s) being considered. The initial evaluation will be an estimate of the natural valley floodplains. This information can provide an initial sense of where flooding may occur landward of the levee system. If other information is available, such as an estimate of a levee breach analysis/map, the LLPT will also use that information. Some examples of key considerations in selecting the appropriate levee analysis and mapping procedure are as follows:

- Levee system characteristics
- Data availability
- 44 CFR 65.10 deficiency type
- Length/size of the levee system and/or levee reach
- Levee crest profile versus BFEs
- Levee system performance history
- Accreditation status of levee system on current, effective NFIP map(s)
- Flooding characteristics
- Contributing drainage area
- Terrain data
- Population consequence, risk, and population information
- Community, Tribe, levee owner, and/or local project sponsor willingness to contribute data or analyses

The LLPT may discover that a restoration project for the levee system is underway through coordination with State, community, or Tribal officials; levee owners; and/or OFAs, including USACE. FEMA has not revised the regulatory requirements provided in 44 CFR 61.12 for new construction projects that have made adequate progress toward completion nor the regulatory requirements provided in 44 CFR 65.14 for decertified levee systems that are being restored to base flood hazard-reduction capability. (See Figure 11, Element 500.)

Once the LLPT has completed its deliberations, the Project Team will produce a final version of the Levee Analysis and Mapping Plan. The Plan will include the following:

- Copies of the data developed, including agendas, meeting minutes, attendance sheets, and correspondence
- Summary of the data and information collected, when they were received, type, and source
- Summary of data, documentation, and information FEMA expects to receive from stakeholders, including the recommended timeframe for delivery
- Flood hazard analysis and mapping options based on data that are already available and timeframe for when data to be collected by stakeholders is to be provided to FEMA

In addition to the Levee Analysis and Mapping Plan, FEMA will use the data and information collected to update the NLD if data collected during this phase came from sources other than the NLD. See Chapter 3 of this document for more information on reporting updates to levee data documentation and inventory. FEMA will provide the final version of the Levee Analysis and Mapping Plan and database to the levee stakeholders with whom FEMA coordinated during the data collection and stakeholder engagement process, including all LLPT members.

6.8 Additional Data Collection (Figure 11, Element 410)

In some cases, the Levee Analysis and Mapping Plan may include a summary of data FEMA expects to receive from stakeholders that may affect the reach approaches used and the recommended timeframe for delivery of the additional data. The timeframe for the community providing additional data will depend on many factors, including:

- Whether the levee system was previously provisionally accredited
- Type of data being collected
- Planned project schedule, if the levee is part of a larger watershed or countywide flood hazard mapping project
- Contractual timeframes between the FEMA Regional Office and other Project Team members (i.e., CTPs, Risk MAP providers)
- Size and complexity of the levee system.

Table 3 presents suggested ranges of timeframes for supplying additional data. Because the appropriate timeframe for supplying additional data will depend on many factors, the chosen timeframe should fit the actual project conditions, but should generally not exceed the upper limits of the listed ranges.

Table 3: Suggested Timeline for Additional Data

Data Type	Timeframe Range		Stakeholder Responsible for Data
	Previous PAL Designation	No Previous PAL Designation	
Elevation Information for the Levee Crest and Toe	Up to 2 months	Up to 6 months	Levee Owner/Community
Operations and Maintenance Plan	Up to 3 months	Up to 3 months	Levee Owner/Community
Structural Design Requirements	Up to 6 months	Up to 18 months	Levee Owner/Community
Inspection Reports	Up to 2 months	Up to 2 months	Levee Owner/Community
Evaluation of Overtopping Erosion Potential	Up to 18 months	Up to 18 months	Levee Owner/Community

6.9 System-Wide Analysis and Mapping Procedures (Figure 11, Element 610)

For non-accredited levee systems, the Project Team will combine four major components to develop the final flood hazard information reflected on the FIRM:

1. A system-wide Zone D area developed using the Natural Valley Procedure
2. A system-wide SFHA based on an interior drainage analysis developed assuming the levee system remains in place
3. Merged SFHAs determined from the appropriate levee reach procedures detailed in Section 6.10 of this document
4. An SFHA developed for the flooding source side of the levee system assuming the levee system remains in place

A registered P.E. must sign and seal all engineering data developed for each procedure, and this will satisfy the certification requirements of 44 CFR 65.2 and 44 CFR 65.10(e). If required, structural, operations, maintenance, and overtopping analysis data submitted by a levee owner or community will be reviewed for completeness.

6.9.1 Natural Valley Zone D

FEMA will represent the uncertainty of the hazards associated with the non-accredited levee system(s) through use of the Zone D designation. FEMA uses the Zone D designation on a FIRM to identify areas of undetermined, but possible, flood hazards. In the future, FEMA may define and adopt another zone designation through the regulatory process.

The Project Team will depict any area within the Natural Valley footprint that is not an SFHA as Zone D on the FIRM. The Project Team will use the Zone D designation to identify the area of

possible base flood hazard that exists because the levee system is non-accredited. The Project Team will determine this area using the Natural Valley Procedure (discussed in Section 6.12 of this document). This is similar to the process used to determine the Zone X (shaded) areas for accredited levee systems.

The Zone D designation is used for non-accredited systems instead of the Zone X (shaded) designation used for accredited levee systems because the flood hazard potential is greater and more uncertain than with accredited levee systems.

If levee systems exist on both sides of a flooding source, or multiple systems that overlap exist, the Project Team will determine the extents of the Zone D area for each system independently, assuming the other systems remain in place.

6.9.2 Interior Drainage Analysis

The Project Team will evaluate the adequacy of the interior drainage systems and map an SFHA for the base flood where applicable. Interior drainage associated with levee systems usually includes storage areas, gravity outlets, pumping stations, and other residual flooding, or a combination thereof. In performing the interior drainage analyses, the Project Team will assume that all sections of the levee and associated structures will remain intact in their current condition.

Judgment will be required to determine if the interior drainage systems need to be analyzed. The FEMA Regional Office representative will decide how to analyze and map interior drainage after consultation with the community officials, levee owner(s), and/or local project sponsor(s), and the Project Team. If the potential for mappable flooding exists on the landward side of the levee system due to interior flooding, the Project Team will perform an interior drainage analysis. If the Project Team used the Natural Valley Procedure (discussed in Section 6.12 of this document or Structural-Based Inundation Procedure (discussed in Section 6.13 of this document) for the entire system, no additional interior drainage analysis may be required if those flooding conditions would result in flooding more extensive than the interior drainage analysis.

USACE Engineer Manual (EM) EM 1110-2-1413, Engineering and Design - Hydrologic Analysis of Interior Drainage Areas (or subsequent updates on this topic), provides guidance and criteria for performing an interior drainage analysis for levee systems, including joint probability analyses.

6.10 Levee Reach Analysis and Mapping Procedures (Figure 11, Element 620)

In addition to the system-wide hazard mapping associated with the Natural Valley Procedure, the levee system may be divided into reaches (see Figure 14) to develop additional SFHA. A levee reach is defined as any continuous length of a levee system to which a single technical procedure may be applied. A levee reach has no minimum or maximum length requirement. Individual reaches can be analyzed using the following procedures:

- Natural Valley Procedure
- Structural-Based Inundation Procedure
- Overtopping Procedure
- Freeboard Deficient Procedure
- Sound Reach Procedure

The Project Team may apply each procedure, except for the Sound Reach Procedure, at both the reach and system levels. The Sound Reach Procedure cannot be used because a levee system of sound reaches would be considered an accredited levee. The Project Team will complete the analysis of a single reach with all other levee reaches intact.

The Project Team will merge the flood hazard information that results from the analyses of the individual levee reaches within the system along with any interior drainage flood hazards. The result will be a composite SFHA delineation landward of the levee system. As mentioned in Subsection 6.9.2 of this document, the Project Team will designate any area within the Natural Valley footprint that is not SFHA as Zone D.

No stakeholder data or documentation is required for applying the Natural Valley Procedure. In situations where FEMA is not provided with the data/documentation required for use in the reach analysis procedures, the Project Team will apply the Natural Valley Procedure at the reach or system level.

The Project Team will apply the reach analysis procedures and corresponding stakeholder data requirements shown in Table 4 when analyzing non-accredited levee systems. It is the responsibility of the community, Tribe, levee owner, and/or local project sponsor to provide the data/documentation to support the standards in Table 4 for the levee reach if that approach is to be applied.

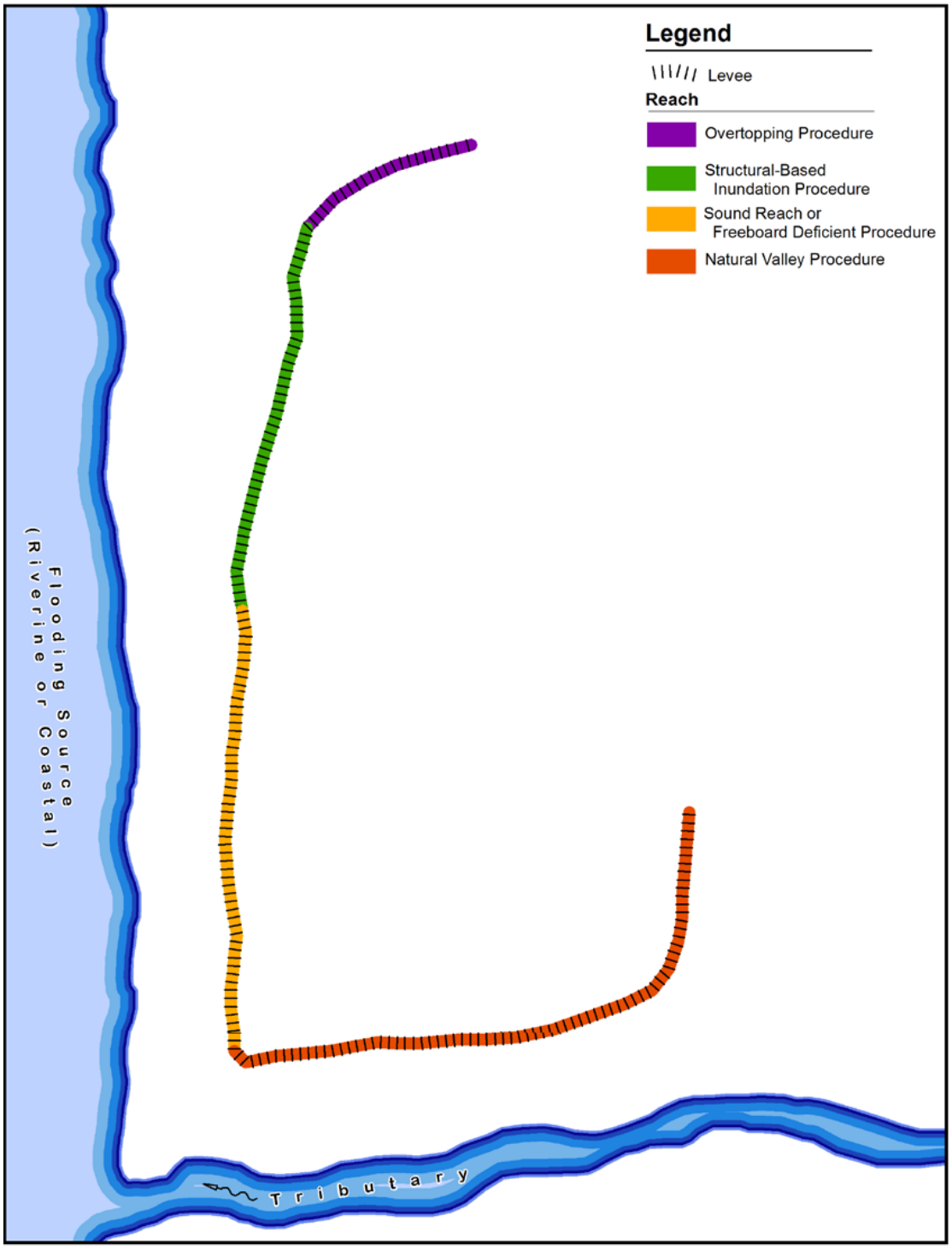

Figure 14: Example Segmentation of a Levee System

Table 4: Summary of Stakeholder Data Standards for Reach Analysis Procedures

Data Element	Applicable Portion of CFR	Reach Analysis Procedures				
		Sound	Freeboard Deficient	Overtopping Approach	Structural Based Inundation	Natural Valley
Elevation Information for Levee Crest and Toe	N/A	Required	Required	Required	Required	N/A
BFE + Freeboard Less than Levee Crest	44 CFR 65.10(b)(1)	Required	N/A	N/A	N/A	N/A
BFE Less than Levee Crest	N/A	Required	Required	N/A	N/A	N/A
O&M Plan	44 CFR 65.10(c)	Required	Required	Required	Recommended	N/A
Structural Design Standards	44 CFR 65.10(b)(2) – 44 CFR 65.10(b)(7)	Required	Required	Required	N/A	N/A
Inspection Reports	44 CFR 65.10(c)(2)(iv)	Required	Required	Required	Recommended	N/A
Evaluation of Overtopping Erosion Potential	N/A	N/A	N/A	Required	N/A	N/A

Surveyed elevation data for the levee crest and levee toe, if required, must meet FEMA standards. All engineering data submitted for each of the procedures must be signed and sealed by a registered P.E. The registered P.E.'s signature and seal have the same meaning as the certification required by the NFIP regulations as cited at 44 CFR 65.2 and 44 CFR 65.10(e). Review of this data shall be performed as described in Section 4.3 of this document.

FEMA will not fund any efforts solely related to certifying data for levee accreditation or making determinations of the levee's structural conditions.

6.11 Natural Valley Procedure (Figure 11, Element 620)

The Natural Valley Procedure can be applied to all non-accredited levee system reaches to determine the SFHA and to determine the Zone D area. Factors that the Project Team will need to consider when determining whether to use the Natural Valley Procedure to determine the SFHA for a reach are provided below.

6.11.1 Hydraulic Significance of the Levee Reach

In some cases, a levee reach is so significantly overtopped during the peak of the base flood event that the existence of the levee does not have a noticeable effect on the water-surface elevation (WSEL). Techniques and items to consider for this situation are included in Subsection 6.12.5.

6.11.2 Availability of Data

If no data are available to support the other procedures, the Project Team will apply the Natural Valley Procedure. In some locations, the SFHA shown on the effective FIRM for the flooding source side of the non-accredited levee system is based on a Base Level study and, therefore, the SFHA is designated as Zone A or Zone V. In these locations, FEMA will evaluate the need for new modeling of the flooding source for performing the Natural Valley Procedure. If the need does not exist, the SFHA shown for the effective flooding source mapping will continue to be designated Zone A. If the need exists, the SFHA for the flooding source may be designated Zone A or Zone AE, depending on the modeling method(s) used.

6.11.3 Needs of the Community

Because of the limited data requirements and resources required to analyze a levee reach using the Natural Valley Procedure, a community may prefer to use this method. Therefore, the community may also request that FEMA use the Natural Valley Procedure.

The Project Team will model and map the natural valley floodplain landward of the non-accredited levee systems as an SFHA, except when additional analysis indicates an alternate treatment. The Project Team will only depict the natural valley floodplain landward of non-accredited levee systems as Zone D when the Freeboard Deficient, Sound Reach, Overtopping, or Structural-Based Inundation Procedure is implemented.

6.11.4 Data or Documentation Requirements

No data or documentation are required from community officials, levee owners, and/or local project sponsors to proceed with the Natural Valley Procedure.

6.11.5 Technical Procedures

Using the Natural Valley Procedure, the Project Team will model the flooding along the levee reach by allowing the discharge to flow freely on either side of the levee for the entire levee reach. The levee will not impede conveyance in the model. For riverine levee reaches , topographic features of the levee should be in-place in the model if possible, but not allowed to obstruct lateral flow (see Figure 15). Figure 16 shows an example of an SFHA delineation when the Natural Valley Procedure is applied to a reach of a non-accredited levee system.

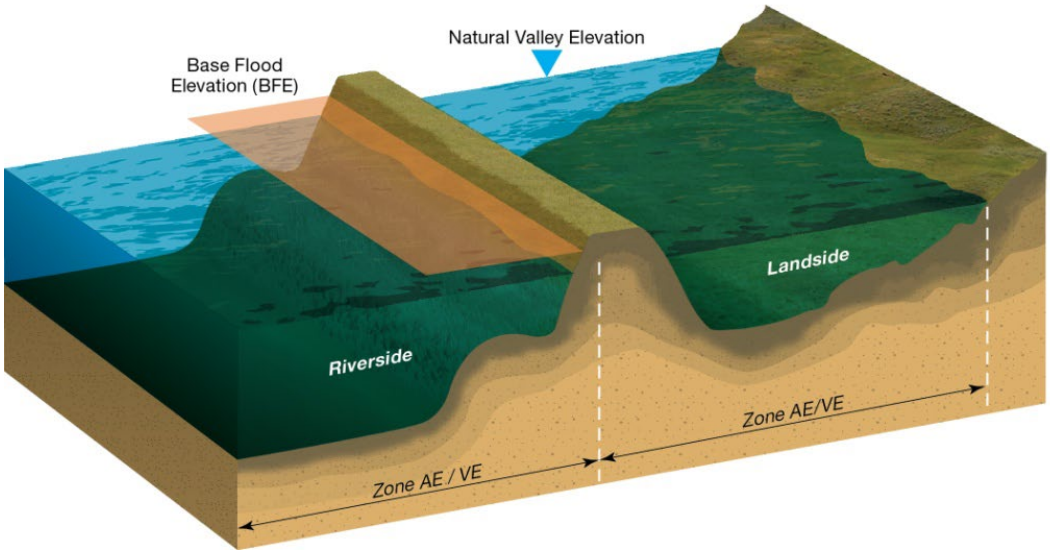

Figure 15: Natural Valley Cross-Section View

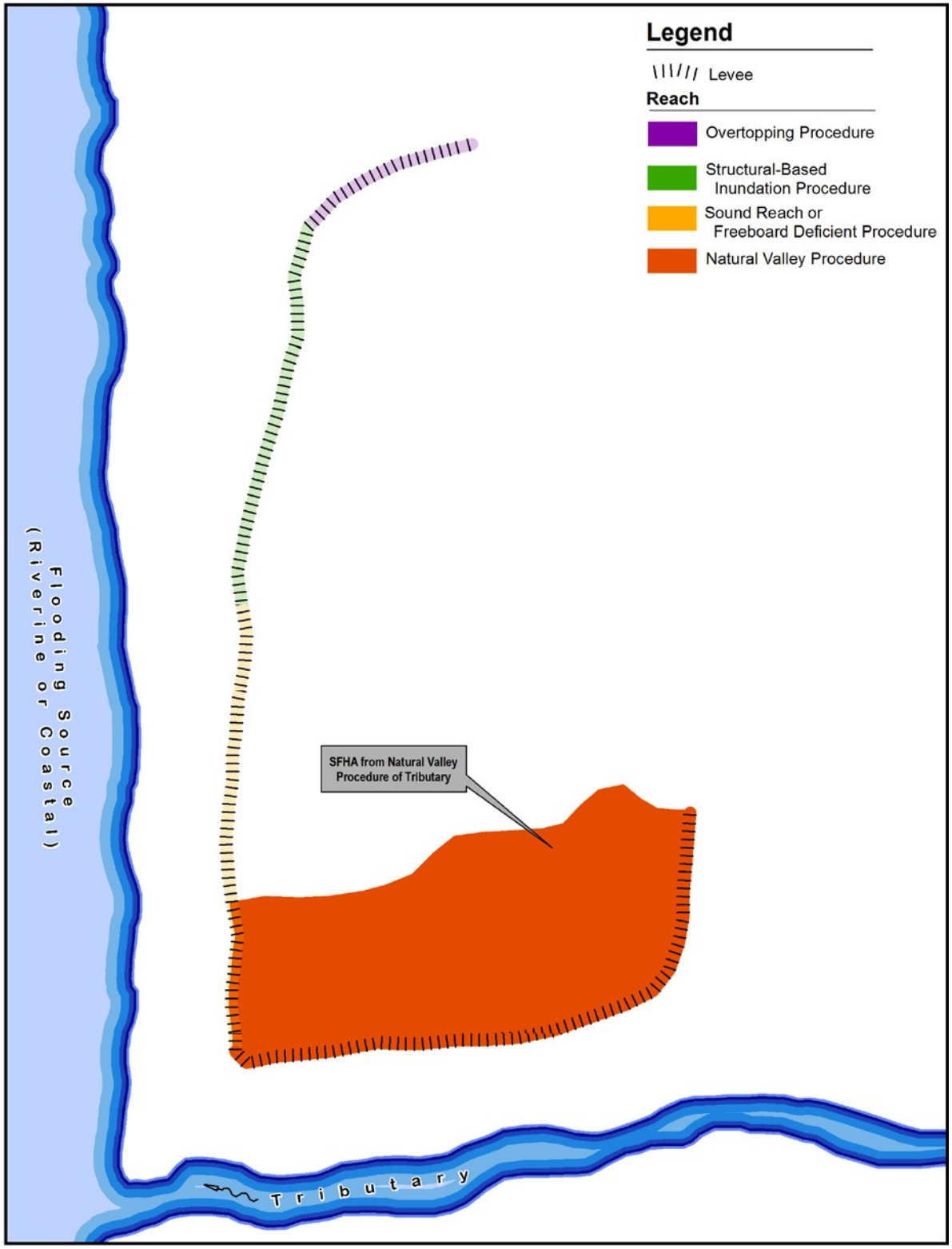

Figure 16: SFHA Delineation Using Natural Valley Procedure

6.11.5.1 Testing the Hydraulic Significance of the Levee Reach for Riverine Levees

Characteristics of the levee reach that may indicate the levee is not hydraulically significant include:

- Levee/floodwall is fully submerged, and landward conveyance is in the direction of the riverflow.
- Lateral exchange of flow across a levee that is overtopped is insignificant or does not exist because the water level on the landside of the levee equalizes with the flooding source.
- Height of the levee/floodwall is low compared to the WSEL over the crest of the levee/floodwall for the majority of the length of the levee/floodwall, as outlined in Section 6.13.

6.11.5.2 Modeling the Natural Valley Procedure on Levees Subject to Riverine or Lacustrine Flood Forces

Using the Natural Valley Procedure, the Project Team will model the riverine levee reaches by leaving the topographic features of the levee in the model, if possible, but allowing the discharge to flow on either side of the levee, as shown in Figure 15. The levee will be modeled as not impeding conveyance.

6.11.6 Coastal Levee Situations

Coastal non-accredited levees subject to flood forces will be intact within the storm surge model setup to determine peak storm-surge elevations seaward of the levees. In these situations, the Project Team will consider how the levee system will influence wave propagation. The team will then assume a steady-state condition landward of the levee and will extend the BFE landward of the non-accredited levee until it intersects the ground elevation (or the levee on the opposite side, in the case of a ring levee). The Project Team will evaluate the potential of waves forming again landward of the levee. The Project Team may apply a similar procedure when a detailed storm surge model is not available.

6.11.7 Natural Valley Letter of Acceptance

A community's agreement for using the Natural Valley Procedure for the levee system(s) may be documented in a "Natural Valley Letter of Acceptance." The FEMA Project Officer will provide the template for the Natural Valley Letter of Acceptance. In preparing this letter, the Project Team is to follow the appropriate concurrence process, as determined by the FEMA Project Officer, so that the letter is properly reviewed and approved.

6.12 Structural-Based Inundation Procedure (Figure 11, Element 620)

In some instances, levee systems have reaches with either known structural deficiencies or a lack of data to support one of the other procedures. For levee reaches that fall into this category, FEMA developed the Structural-Based Inundation Procedure to identify the limits of the base flood that may result from the potential levee failure. This procedure relies on the modeling of levee breaches along the levee reach.

Predicting the exact location of a future breach to a levee or floodwall is not possible. The Structural-Based Inundation Procedure, therefore, does not predict the probability of failure at any breach location nor does it provide a specific determination or evaluation of the overall levee system performance or require a determination of the likely failure mechanism. Implementation of the procedure instead results in the development of an SFHA based on the flood hazard due to potential breaches along a particular levee reach during a base flood event.

6.12.1 Data Requirements

The only mandatory data required are accurate top-of-levee and toe-of-levee elevations. However, in certain circumstances, FEMA may require the following information to apply the Structural-Based Inundation Procedure, which should follow the standards of 44 CFR 65.10:

- O&M Plan. Details of the O&M Plan standard are provided in 44 CFR 65.10(c).
- Structural design standards. Structural design should meet minimum design standards including data regarding closures in 44 CFR 65.10(b)(2), embankment protection in 44 CFR 65.10(b)(3), embankment and foundation stability in 44 CFR 65.10(b)(4), settlement in 44 CFR 65.10(b)(5), and any other design standards in 44 CFR 65.10(b)(6).
- Inspection reports. The standard for documentation of inspection is provided in 44 CFR 65.10(c)(1)(iii) and 44 CFR 65.10(c)(2)(iv).

No freeboard or WSEL requirements apply to the Structural-Based Inundation Procedure. Therefore, the Project Team will apply this procedure when the levee crest is lower than the base flood level, but high enough to impede flow.

6.12.2 Technical Procedures

Methods to identify possible locations of system breaches, modes of failure, geometry, failure triggers, and failure duration for use in mapping the base flood resulting from the breaches are described in Subsections 6.13.2.1 through 6.13.2.4. Given the number and nature of assumptions inherent in this procedure, FEMA will allow flexibility in the use of the Structural-Based Inundation Procedure to enable the use of engineering judgment. In rural settings, where levee systems reduce the hazard to primarily agricultural lands, yet the levees are hydraulically significant, simplification of the approach may be warranted to limit analysis costs that would not result in significantly different flood hazard mapping.

6.12.2.1 Determination of Modeled Breach Locations

The locations of possible levee breaches could be determined using the method described below.

- Select initial breach locations for each levee reach, one representing a breach location near the downstream end of the levee reach and another near the upstream end of the levee reach.
- Determine the hydrograph through each breach, also known as “the breach hydrograph”, and independently analyze the hazard for the base flood landward of the levee for each breach.
- Combine the resulting flood hazard boundary delineations into a composite SFHA delineation.

- Make an initial judgment, through examination of the terrain landward of the levee and/or preliminary modeling results, on whether the selected breach locations will result in a reasonable identification of the flood hazard. The flood hazard will be considered to have been reasonably identified when all potential storage areas and flow paths that can be reached by breach flows are reflected in the flood hazard mapping (as Zone AE, Zone AH, and/or Zone AO). The final SFHA on the landside of a reach using the Structural-Based Inundation Procedure must reflect the fact that a breach may occur at any location along the reach.
- Add additional breach locations to the initial locations if additional breaches can change the flood elevations or the extent of the composite flood hazard area significantly.

The assigned Project Team member generally will place the breach locations to capture the full flood hazard on the landside of the levee. The assigned team member will base exact locations on breach potential indicators, such as greatest overtopping depth, past breach locations, encroachment or known seepage locations, or changes in levee material or shape. For coastal areas, the assigned team member will also consider levee exposure to waves and potential wave runup.

6.12.2.2 Time of Breach Initiation

The time that a breach is assumed to be triggered will influence the peak flow and volume through the breach. For an overtopping breach, the assigned Project Team member will conduct a sensitivity analysis to estimate the breach initiation time that produces the most reasonable SFHA. The team member will choose the time that produces the most reasonable case using sound engineering judgment. For an internal failure analysis, the breach failure should initiate at the peak flood stage, unless information that suggests a different breach initiation time is appropriate.

Another option for the assigned Project Team member to consider when determining at what point to initiate the breach is the point in time when the water rises to an elevation at which the levee fails to meet all standard engineering criteria. This will be before peak stage in most cases.

6.12.2.3 Breach Shape

A rectangular shape extending vertically from the levee crest to the riverside toe elevation will be adequate to describe the breach shape, unless additional analysis determines breach side slopes are important and necessary for accurate modeling of the breach. The minimum breach width will be 100 feet for clay levees and 500 feet for sand levees. These minimum accepted breach widths are based on a qualitative review of the historic breach width information available. However, levee attributes and sound engineering practice should support the breach width chosen.

Based on an evaluation of historic breach widths, typically breach widths should be larger than these minimum accepted values. The breach width estimation may consider levee embankment height, levee material, crest width, depth and duration of overtopping, longitudinal velocity, area impacted by the levee, distance from the flooding source, and duration of flooding event. The method to estimate breach width will be based on sound engineering judgment, adjusted by comparing to historical documented levee breaches where available.

The assigned Project Team member will provide adequate justification for the choice of breach parameters. Unless other information is available, the team member will assume that the breach will extend vertically to the bottom of the levee.

6.12.2.4 Empirical Methods for Estimating Breach Shape

Dam Breach Equations

Several authors have developed empirical equations to estimate breach size, shape, and failure time for dam breaches. The equations are based on examination of historical data for dam breaches. Levee failures generally end with much wider breach bottom widths than dams, relative to the height of the levee/dam. The wide breach width may be caused in part by the erosive sheer force of floodflow parallel to levees and in part by the tendency for the hydraulic head over the breach to remain elevated for a longer period. Dam breach parameter empirical equations may be applicable to levees in some situations, but justification for their use will be needed if they are chosen for the levee breach width computation.

Historical Levee Breach Information

If available, historic levee breach information is an important tool in determining breach shape and development time. No nationwide compendium of historic breach information is available, but the assigned Project Team member performing the analysis will search for historical breach information.

Physically Based Models for Estimating Breach Shape

Where appropriate information is available to do so, the Project Team may use physically based breaching models. These models can be based on erodibility of the levee and levee foundation, levee, and levee foundation soil type, levee vegetative cover, flood stage, and flood duration.

When floodwalls fail, it is typically a partial breach as one or more sections (i.e., monolith) formed during the floodwall construction are forced apart by escaping water. When conducting a breach analysis on a floodwall, the assigned Project Team member will need to determine the number of sections that might fail as the breach width is based on the particular structure, available documentation, and engineering judgment. The minimum expected breach width for a floodwall is one section (i.e., monolith).

Development Time

Typically, the Project Team member can set the time for breach formation (the time from breach initiation to the time full breach width is realized) to zero to simplify the analysis. If is the assigned team member determines that the breach formation time would have a significant impact on the breach hydrograph, the assigned member may need to consider this variable in the analysis.

Sensitivity Analysis

A Project Team will conduct sensitivity analysis to evaluate the effects that varying the levee breach width and failure initiation time will have on the resulting flood hazards, within reasonable limits. This sensitivity analysis will include widening and narrowing the levee breach width within reasonable bounds and investigating the impacts of different breach initiation times. As the parameters are varied, the assigned team member will note the impacts to the peak discharge,

volume through the breach, and the SFHA. In general, the final parameters chosen by the assigned team member will represent the most reasonable flood hazard that result from the parameters evaluated.

To test the impact of failure initiation time, the assigned Project Team member will conduct a calculation initiating the breach at the point of overtopping of the levee on the ascending or rising limb of the flood hydrograph. Also, the assigned team member will perform a breach calculation at the time to peak flood stage, but not greater than 2 hours after overtopping begins. The team member may extend the duration of overtopping if technical calculations, prepared by a registered P.E., are provided by the community, Tribe, levee owner, and/or local project sponsor to indicate that the levee can withstand additional overtopping without failure. The assigned team member will compare breach flows or hydrographs and will use the one that produces the most reasonable flood hazard landward of the levee.

For coastal levees, the sensitivity analysis will include testing related to the duration of a storm surge hydrograph.

6.12.3 Mapping Breach Analysis Results

The SFHA shown on the FIRM will be based on a composite of the base flood hazard developed at each breach location. (See Figure 17.) Figure 18 shows an example of an SFHA delineation when the Structural-Based Inundation Procedure is applied to a reach of a non-accredited levee system. The Project Team will assure that the final SFHA reflects the fact that a breach may occur at any location along the Structural-Based Inundation levee reach. The modeled breach locations should not be apparent in the final SFHA delineation or BFEs.

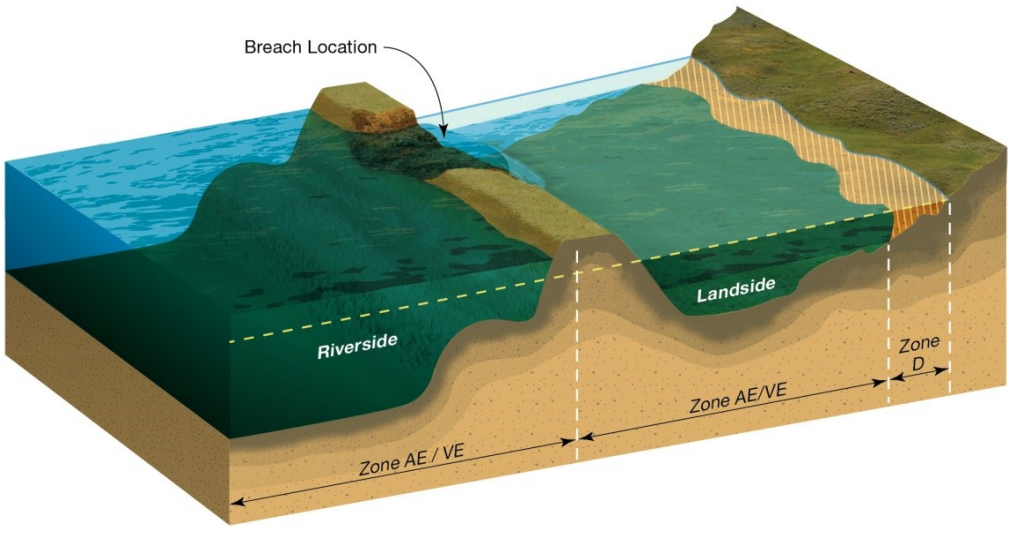

Figure 17: Structural-Based Inundation Cross-Section View

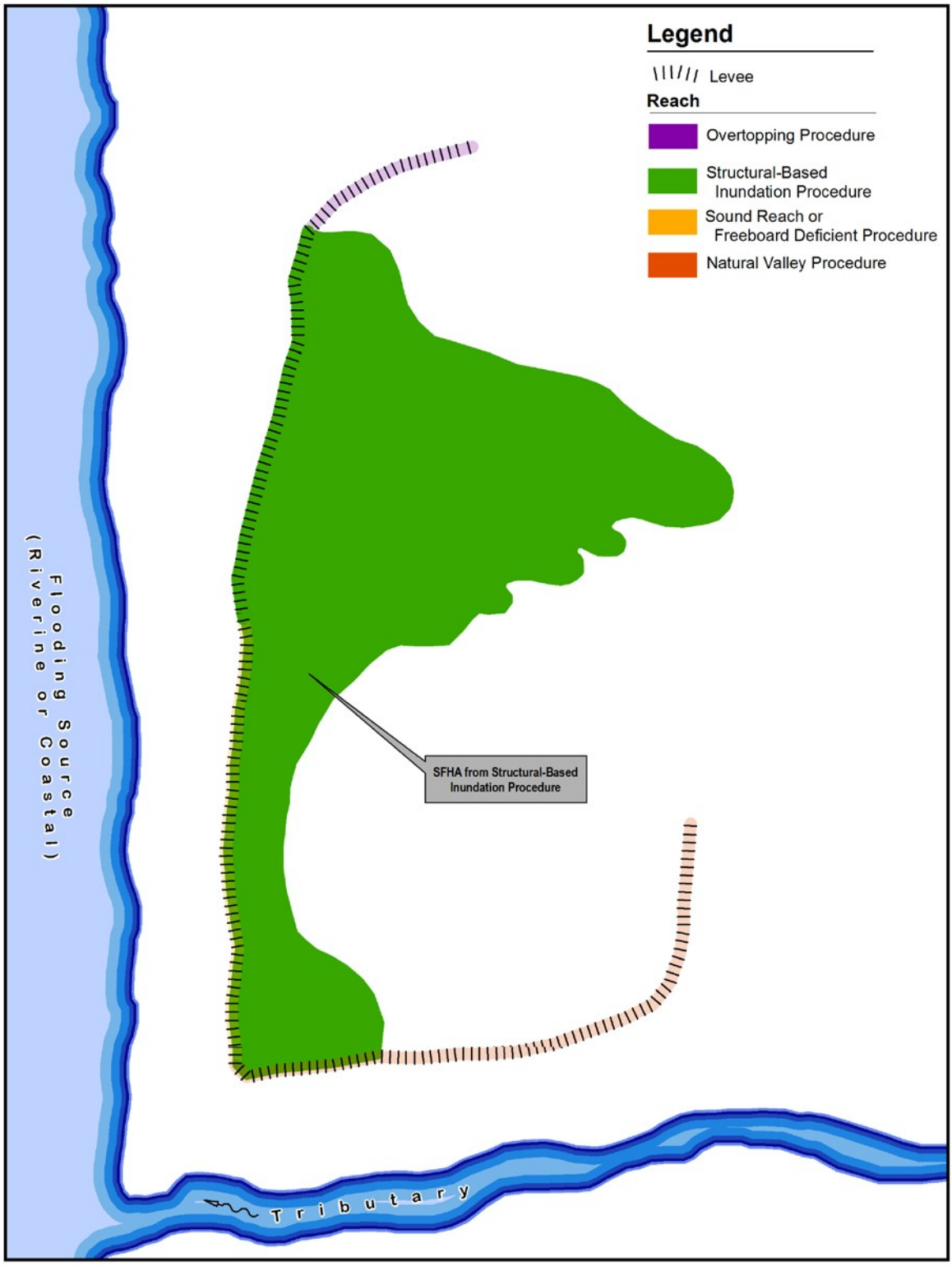

Figure 18: SFHA Delineation Using Structural-Based Inundation Procedure

6.13 Overtopping Procedure (Figure 11, Element 620)

In some instances, levee systems have locations that have been specifically armored to sustain overtopping flows or the rate of overtopping flow is sufficiently small or of sufficiently short duration that the system would not fail during the base flood. The Overtopping Procedure can be applied when the BFE is above the levee crest for a reach, but it can be demonstrated that the base flood event will not cause structural failure and the levee reach meets all standards of 44 CFR 65.10 except 44 CFR 65.10(b)(1).

6.13.1 Data Requirements

For the Overtopping Procedure to be used for a reach, the community, levee owner, or local levee sponsor must submit an analysis, signed, and sealed by a registered P.E., to FEMA. This analysis must indicate that no appreciable erosion of the levee crest, toe, embankment, or foundation occurs during the overtopping of the base flood event because of either currents or waves. The analysis must also demonstrate that the anticipated erosion will not result in structural failure. Failure is defined as breach of the levee, directly or indirectly, through loss of embankment material due to erosive forces, the reduction of the seepage path, or piping and subsequent instability. In addition, the community, levee owner, or local levee sponsor must submit documentation to meet the following standards from 44 CFR 65.10 to FEMA:

- O&M Plan. Details of the O&M plan standard are provided in 44 CFR 65.10(c).
- Structural design standards. Structural design must meet minimum design standards, including data regarding closures in 44 CFR 65(b)(2), embankment protection in 44 CFR 65.10(b)(3), embankment and foundation stability in 44 CFR 65.10(b)(4), settlement in 44 CFR 65.10(b)(5), interior drainage in 44 CFR 65.10(b)(6), and any other design standards as detailed in 44 CFR 65.10(b)(7).
- The structural design documentation should also include a discussion if the failure of an adjacent levee could affect the structural integrity reach if that adjacent levee reach is not categorized as Sound or Freeboard Deficient.
- Inspection reports. The standard for documentation of inspection is provided in 44 CFR 65.10(c)(1)(iii) and 44 CFR 65.10(c)(2)(iv).
- Elevation information for the levee crest and toe.
- Certified as-built drawings

All items must be signed and sealed by a registered P.E.

In addition to the standards detailed in 44 CFR 65.10, more expansive structural documentation as well as O&M documentation will be required for these reaches to certify the overtopping analysis. These are detailed further in the subsections below.

6.13.1.1 Loading Conditions Used for Evaluation

For the loading conditions used for evaluation, the certifying P.E. will use the base flood event plus a factor of safety, such as an elevation freeboard, that takes into account uncertainty in the data. The factor of safety used will depend on the levee reach and engineering judgment. For example, the factor of safety will vary when unique tie-in conditions exist, or control structures are

present. Because of the uncertainty in depth and duration of the overtopping flows, a factor of safety will typically be applied when considering the structural stability of the levee reach.

6.13.1.2 Armored Surfacing

Based on the certified engineering analysis submitted, a community, levee owner, and/or local project sponsor may be able to demonstrate that armoring is not required for a levee reach to fall within this scenario. However, in most cases, armoring will be expected. Some of the reasons for armored surfacing include:

- Some indication that flow along the levee reach may cause some erosion that will initiate levee breaching
- A lack of proper and continuous maintenance that would result in a non-continuous, non-uniform surface, including the lack of irrigation, fertilization, and annual inspections
- Concerns about localized irregularities, which lead to flow anomalies, because available survey data may not be indicative of localized conditions along the levee reach
- Local conditions, on the landside of the levee, include the presence of dips, depressions, or protrusions (including trees, posts, or other surface anomalies)
- Traffic rutting along the levee crest that induces non-uniform crest conditions, in terms of both levee profile and structural condition
- Difficulty in establishing and properly maintaining a dense and continuous grass cover (in semi-arid and arid regions)
- Debris carried by floodflow that could induce damage to the protective surfacing
- A small amount of damage to a dry or cracked embankment, leading to a catastrophic failure during overtopping
- Risk reduction in high-impact areas

The items below may be considered when determining the viability of an armored surface:

- History of Events. Flood levels, overtopping locations, damage assessments, and maintenance records can be considered to evaluate the damage that occurred during past overtopping events, especially if depth and duration can be established and evidence shows minor to no damage occurred. If the levee has experienced piping or sand boils, the stability of the levee should be questioned. These data will not be used to change the accreditation determination made at the beginning of the levee analysis and mapping process.
- Potential freeboard loss due to subsidence or localized settlement. Frequent, accurate surveys are critical so that an adequate safety factor is maintained in an area where long-term settlement and regional subsidence are common.
- Overtopping height and overtopping flow rate (cubic feet per second). Velocity and tractive-force calculations are key considerations to assess erosion potential.
- Overtopping duration. Levee design discharge or stage hydrographs indicating minutes, hours, or days of anticipated overtopping are especially critical for grass-covered levees.

- Uplift potential and maximum induced shear stress along the interface between the armored surfacing and the overtopping flow. Adequacy of the selected armoring scheme must be demonstrated for given site conditions.
- Resiliency of levee material. Granular and sandy soils will require surface armoring for small rates and depths of flow.
- Flow concentration potential. Surface discontinuities and irregularities can lead to irregular hydraulic flow patterns. Armoring is to be provided if gullies, tire tracks, access roads, fences, utility poles, animal burrows, cattle paths, roads, bike trails, or other conditions may exist that will concentrate flow. For grass-lined levees, the downstream slope can be evaluated to determine if it is uniform from crest to toe, with no interruptions or irregularities such as dips, depressions, or protrusions (e.g., trees, posts, or other surface anomalies).
- Effect of debris on flow patterns. Armored reaches can be subject to damage from flood-borne debris.
- Levee toe protection. This is especially required at the location of eddies, groins, and hydraulic jumps. The depth and thickness of toe protection need to be considered.
- Levee armoring alternatives. Alternatives include soil cement, articulated concrete blocks, roller-compacted concrete, gabions, geocells, and rock chutes. Each alternative will have placement thickness recommendations and associated components/feature design considerations (e.g., tieback levees, sub-drainage, anchoring requirement).
- Wind and wave action. The impact of breaking waves over the levee should be evaluated.
- Cavitation potential. How overtopping flows will affect armored surfacing should be evaluated.
- Levee height. Low levees may be more tolerant to overtopping.
- Interior side slopes. Flatter slopes (i.e., > 4H: 1V) are more tolerant. This is especially important for grass-covered levees.
- Inspections. Inspection frequency is especially important for grass-covered levees or after historical events where overtopping occurs, or the levees have been stressed.
- Validity of the O&M Plan. The O&M Plan should provide confidence in emergency planning that minimizes the effects of overtopping, including the impact at overtopping location(s) and interior drainage.
- Filter capability and free-draining bedding. Filter materials should be protected from high rates of flow.

6.13.1.3 Additional Considerations for Levees Subject to Coastal Flood Forces

A levee reach subject to coastal flood forces will need to include adequate embankment protection, foundation, and embankment stability. The levee reach will need to be designed, constructed, operated, and maintained to resist wave effects (potentially including wave overtopping and storm surcharge to resist erosion) and prevent flooding of interior areas landward of the levee crest.

For levee reaches subject to coastal flood forces with minimal freeboard, armored surfacing will need to be considered on both the seaward side and landsides of the coastal levee, including the crest, to ensure that the levee reach can withstand the wave forces to which the levee is subjected. Further discussion about armoring coastal levees is presented in USACE CERC-89-15, Criteria for Evaluating Coastal Flood Protection Structures.

6.13.2 Technical Procedures

If the appropriate data are provided as detailed in Subsection 6.14.1, the assigned Project Team member will route the flooding source hydrograph over the levee reach with the levee remaining intact. The assigned team member will then model the flooding landward of the levee system to determine the SFHA. (See Figure 19.) Figure 20 shows an example of an SFHA delineation when the Overtopping Procedure is applied to a reach of a non-accredited levee system.

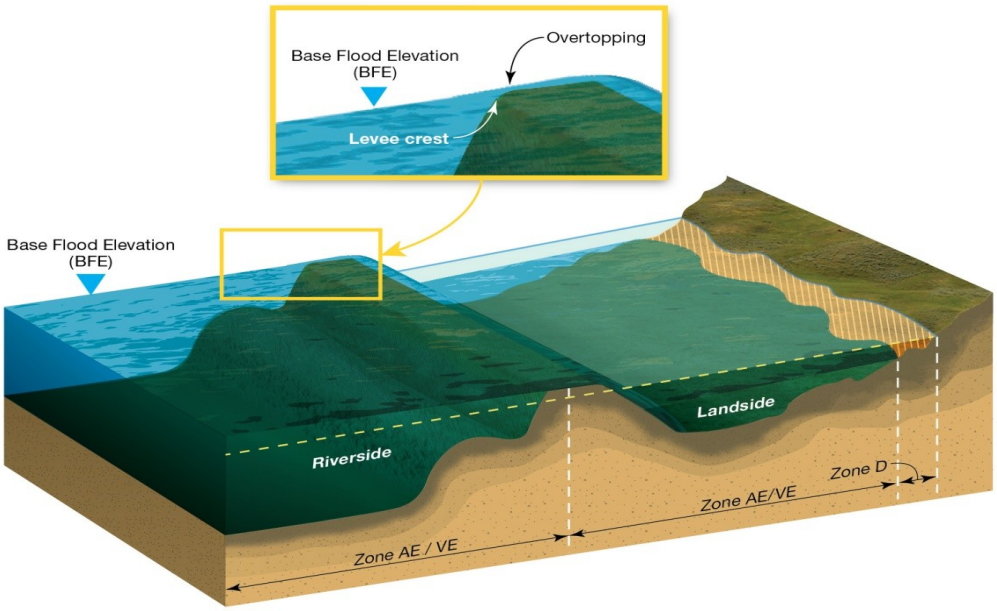

Figure 19: Overtopping Cross-Section View

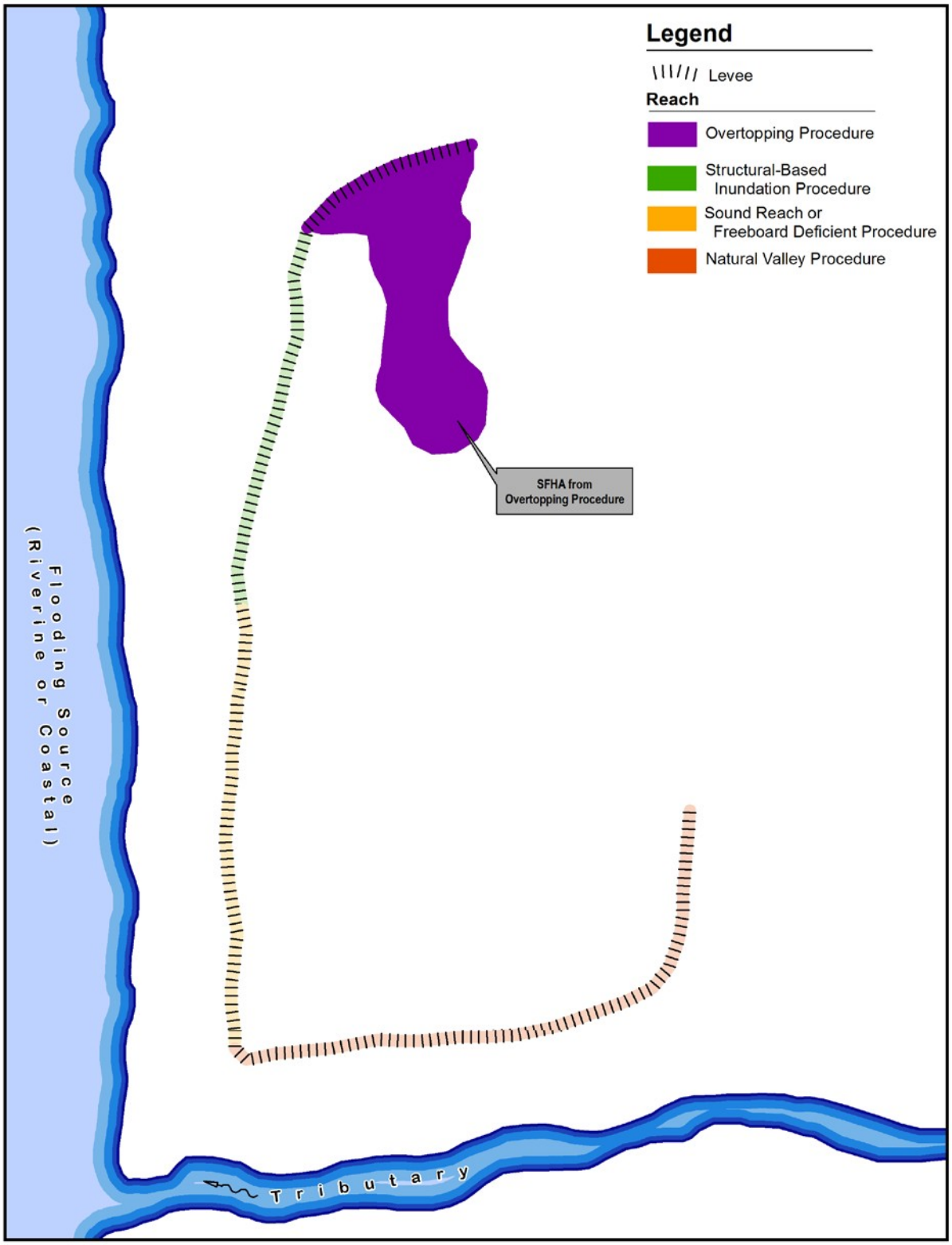

Figure 20: SFHA Delineation Using Overtopping Procedure

6.14 Freeboard Deficient Procedures (Figure 11, Element 620)

The Freeboard Deficient Procedure can be applied to reaches where the levee system meets the structural standards of 44 CFR 65.10, lacks adequate freeboard, and has a documented O&M Plan.

6.14.1 Data Requirements

To designate a levee reach as a Freeboard Deficient levee reach, the community, levee owner, or local levee sponsor must submit documentation to meet the following standards from 44 CFR 65.10 to FEMA:

- The top of the levee crest and closure structures along the entire reach must be above the BFE.
- O&M Plan. Details of the O&M Plan standard are provided in 44 CFR 65.10(c).
- Structural design standards. Structural design must meet minimum design standards, including data regarding closures in 44 CFR 65(b)(2), embankment protection in 44 CFR 65.10(b)(3), embankment and foundation stability in 44 CFR 65.10(b)(4), settlement in 44 CFR 65.10(b)(5), interior drainage in 44 CFR 65.10(b)(6), and any other design standards as detailed in 44 CFR 65.10(b)(7).
- The structural design documentation should also include a discussion of whether the failure of an adjacent levee could affect the structural integrity reach if that adjacent levee reach is not categorized as a Sound Reach or Freeboard Deficient levee reach.
- Inspection reports. The standard for documentation of inspection is provided in 44 CFR 65.10(c)(1)(iii) and 44 CFR 65.10(c)(2)(iv).
- Elevation information for the levee crest and toe.
-
- Certified As-built drawings.

All items must be signed and sealed by a registered P.E.

FEMA will review the submittal in accordance with the appropriate sections of Chapter 4 of this document.

6.14.2 Technical Procedures

No reach-specific modeling is required for a reach evaluated using the Freeboard Deficient Procedure, but the Project Team will map the system-wide Zone D area landward of the levee system for these reaches. (See Figure 21.) The SFHAs from the system-wide interior drainage analysis and/or adjacent levee reaches where different procedures have been applied may still be present on the landside of the levee with Freeboard Deficient levee reaches. This will depend on the presence of interior ponding areas and other terrain features on the landside of the levee.

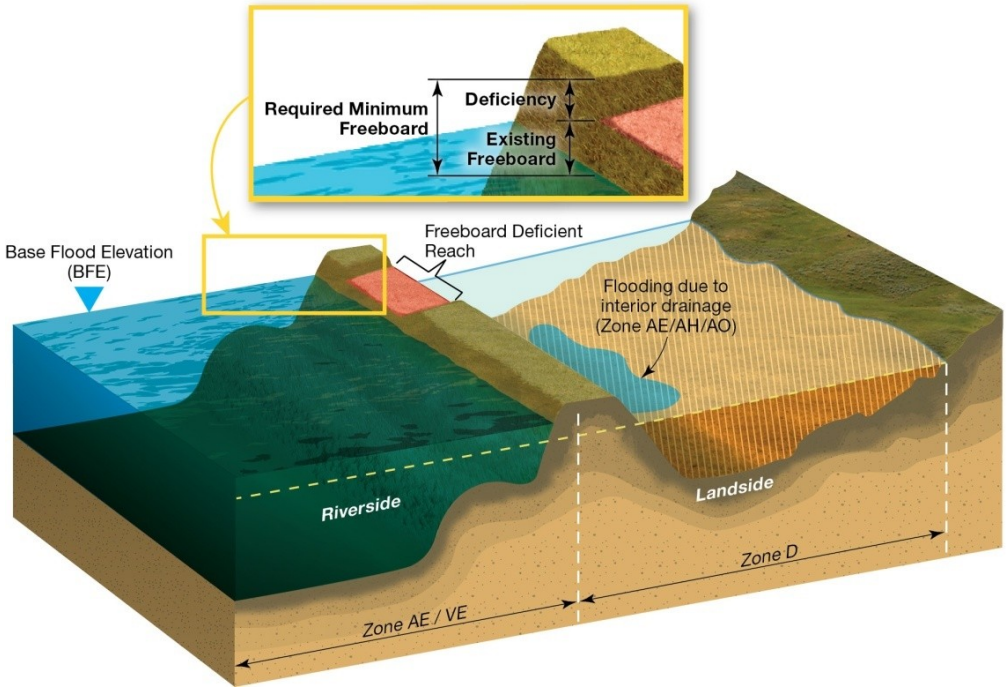

Figure 21: Freeboard Deficient Cross-Section View

6.15 Sound Reach Procedure (Figure 11, Element 620)

A Sound Reach is a levee reach that has been designed, constructed, and maintained, in accordance with sound engineering practices, to withstand and reduce the flood hazards posed by a base flood even if the entire system does not.

6.15.1 Data Requirements

Sound Reaches are part of a levee system that cannot meet accreditation requirements. Because they are only a component of a levee system, they cannot be accredited as a hydraulically independent system.

To designate a reach as sound, the community, levee owner, or local levee sponsor must submit technical data to FEMA to demonstrate that the levee reach will withstand the forces of the 1-percent- annual-chance flood event, and reasonably account for uncertainty. To accomplish this, documentation to meet the following standards from 44 CFR 65.10 must be submitted to FEMA:

- Freeboard. The levee reach must meet the minimum freeboard standards in 44 CFR 65.10(b)(1).
- O&M Plan. Details of the O&M Plan standard are provided in 44 CFR 65.10(c).
- Structural design standards. Structural design must meet minimum design standards, including data regarding closures in 44 CFR 65(b)(2), embankment protection in 44 CFR 65.10(b)(3), embankment and foundation stability in 44 CFR 65.10(b)(4), settlement in 44 CFR 65.10(b)(5), interior drainage in 44 CFR 65.10(b)(6), and any other design standards as detailed in 44 CFR 65.10(b)(7).

The structural design documentation should also include a discussion if the failure of an adjacent levee could affect the structural integrity reach if that adjacent levee reach is not categorized as Sound or Freeboard Deficient.

- Inspection reports. The standard for documentation of inspection is provided in 44 CFR 65.10(c)(1)(iii) and 44 CFR 65.10(c)(2)(iv).
- Elevation information for the levee.

- Certified as-built drawings.

All items must be certified and sealed by a registered P.E.

FEMA will review the submittal in accordance with Chapter 4 of this document.

6.15.2 Technical Procedures

No levee reach-specific modeling is required for a Sound Reach, but the Project Team will map the system-wide Zone D landward of the levee for these reaches. The SFHAs from the system-wide interior drainage analysis and/or adjacent levee reaches may still be present on the landside of Sound Reaches. (See Figure 22.) This will depend on the presence of interior ponding areas and other terrain features on the landward side of the levee. The SFHAs that form these areas will supersede the system-wide Zone D areas, as applicable.

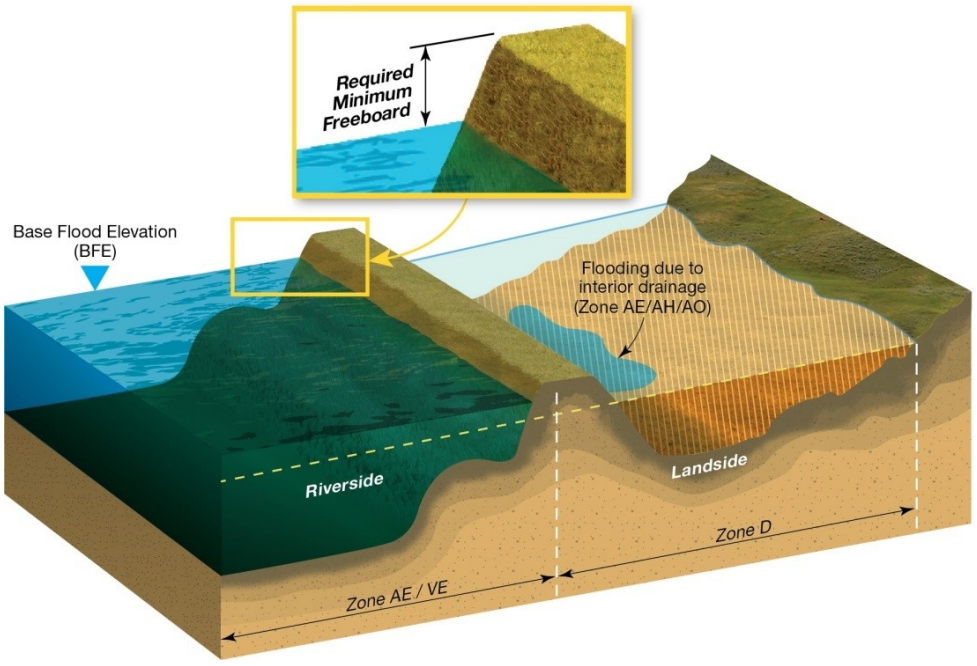

Figure 22: Sound Reach Cross-Section View

6.16 Flood Hazards Evaluated by Flooding Source (Figure 11, Element 630)

The assigned Project Team member will analyze and map the BFEs on the riverside of the levee assuming that all levee reaches remain intact. If a levee is overtopped and flow would be lost to the landside of the levee, the assigned team member may consider those losses and may reduce flow in the main flooding source in accordance with FEMA Guidance Document No. 80, Guidance for Flood Risk Analysis and Mapping - Hydraulics: One Dimensional Analysis, which is accessible from the FEMA Guidelines and Standards for Flood Risk Analysis and Mapping webpage.

6.17 Hydrograph Development

6.17.1 Riverine Hydrograph Development

Traditionally, projects conducted for flood insurance purposes have only calculated peak-flow or peak-surge elevation. Both the Structural-Based Inundation and Overtopping Procedures will often require a base flood hydrograph to complete the modeling, making the development of a flood hydrograph necessary. Computing and selecting a representative hydrograph shape with an appropriate volume is an important step. For many systems, the hydrograph shape and volume will be a key parameter influencing the resultant SFHA delineations.

FEMA determines that a cost-effective method is needed to estimate flood hydrographs for projects where only peak discharges/surge elevations are available, where a rainfall-runoff model or storm surge model is not available, or where funding is not sufficient to develop a rainfall-runoff or storm surge model. Procedures discussed below will use the base flood hydrograph for the levee analysis, but other flood return frequencies also could be used if appropriate.

The approach presented in this subsection is based on both the availability of data and the type of flooding. For flooding sources with gaging stations near the study location, two methods for developing desired-percent-chance flood hydrographs may be followed:

1. Scale a major (10-percent-annual-chance peak discharge or larger) observed flood hydrograph by multiplying the ordinates by a factor to create the desired-percent-chance flood hydrograph.
2. Develop a balanced synthetic flood hydrograph using peak discharges and N-day volumes.

The above methods for developing flood hydrographs are not the only acceptable approaches. The application of any method, including those above, should be evaluated for reasonableness.

The balanced synthetic flood hydrograph will be used when no major (10-percent-annual-chance peak discharge or larger) observed flood hydrograph is available for scaling to obtain the desired-percent-chance hydrograph, or the volume under the observed flood hydrograph is not considered representative of the desired-percent-chance hydrograph.

To scale a smaller hydrograph to a larger hydrograph, the assigned Project Team member will plot several observed flood hydrographs to determine a representative hydrograph shape that can be scaled to become a desired-percent-chance flood hydrograph. The observed hydrograph with the largest peak discharge and volume is the most logical choice. Unit discharge data are available from the USGS Instantaneous Data Archive for many gaging stations from the late

1980s through September 2007. Since October 1, 2007, the unit discharge data are available on the National Water Information System (NWIS).

The discharge ordinates of the representative observed hydrographs can be scaled by multiplying them by a ratio of the desired-percent-chance peak discharge to the observed peak discharge (or the reverse ratio if scaling down the observed hydrograph). If the gaging station drainage area is within 50 percent of the drainage area of the study location, the assigned Project Team member can transfer the desired-percent-chance hydrograph upstream or downstream using the ratio of drainage areas and regional flood frequency relations. Scaling the peak discharge also scales the flood volume with the time base of the hydrograph held constant (basin lag time assumed constant for a given watershed).

The above procedure is valid for steady flow. For unsteady flow, the Project Team member must take volume into consideration for hydrograph development.

The balanced synthetic hydrograph can be constructed using desired-percent-chance flood volumes for different durations (e.g., 1-day, 3-day, 7-day). The N-day flood volumes can be obtained from daily discharge data in the NWIS. Some of the available computer programs for estimating the desired-percent-chance N-day flood volumes include the USACE Hydrologic Engineering Center Statistical Software Package (HEC-SSP) and USGS Surface-Water Statistics (SWSTAT) computer program. The balanced synthetic hydrograph is shaped using an observed major flood hydrograph. More information on this method is provided in the USBR Flood Hydrology Manual and in USACE Engineer Manual 1110-2-1415, Hydrologic Frequency Analysis (or subsequent updates on this topic).

If the effective FIS Report was based on a rainfall-runoff model, the assigned Project Team member can use that model to obtain the appropriate flood hydrograph for ungagged watersheds. If a rainfall-runoff model was not developed for the effective FIS Report, a rainfall-runoff model may have been developed for other purposes, such as a master drainage plan. If available, the team member can scale the flood hydrographs from that model to be consistent with the peak discharges developed for the effective FIS Report.

If a continuous simulation rainfall-runoff model is available, then several simulated flood hydrographs are available. The assigned Project Team member can scale the simulated flood hydrograph with largest volume and peak discharge to get the desired-percent-chance flood hydrograph.

If no rainfall-runoff model is available, it may be feasible for the assigned Project Team member to develop a simplified rainfall-runoff model for a single watershed area with no subdivision and no channel/reservoir routing or model calibration. The team member can scale the flood hydrographs from this model to be consistent with peak discharges determined from other methods.

Examples of dimensionless unit hydrographs are provided in Figure 23, where the vertical ordinate is a ratio of discharge (Q) to the peak discharge (Qp) and the horizontal ordinate is a ratio of time (t) to basin lag time (T_L) to time to peak (T_P).

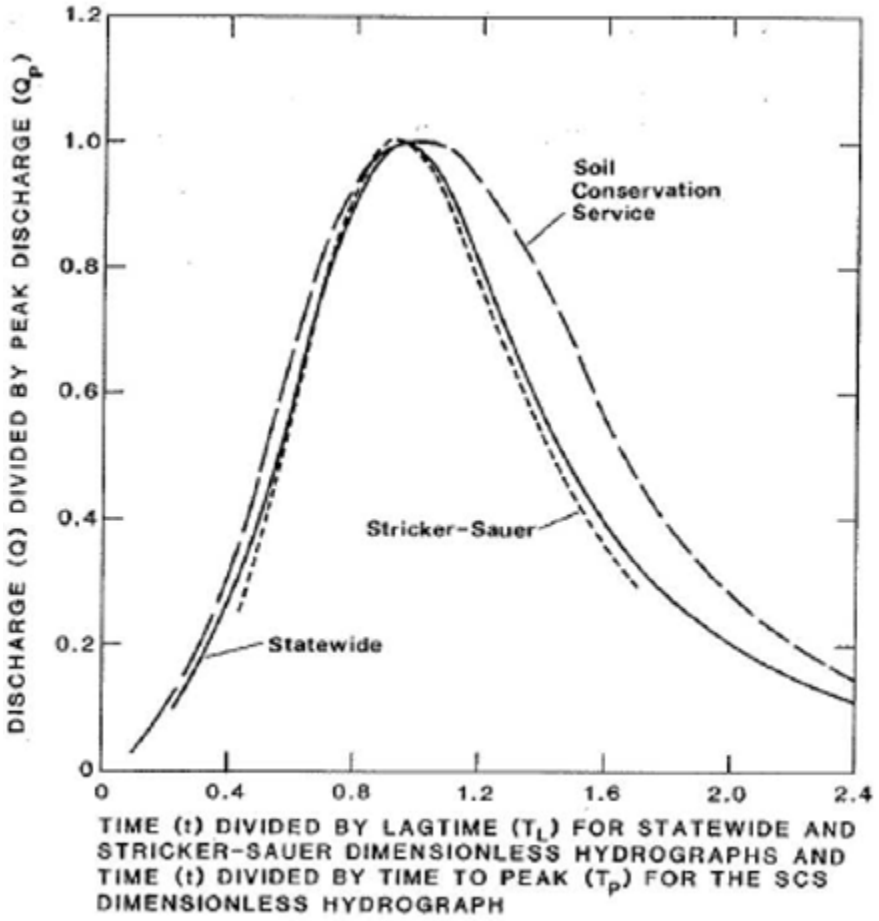

Figure 23: Sample Dimensionless Unit Hydrograph

The "Statewide" hydrograph in Figure 23 was developed by E, J. Inman in USGS Water-Supply Paper 2317, Simulation of Flood Hydrographs for Georgia Streams, using data for 80 gaging stations in Georgia. This dimensionless hydrograph is implemented in the USGS National Streamflow Statistics (NSS) Computer Program. The "Stricker-Sauer" hydrograph (USGS Open-File Report 82-365, Techniques for Estimating Flood Hydrographs for Ungaged Urban Watersheds), was theoretically developed from Clark unit hydrograph procedures. The "SCS" dimensionless hydrograph is described in Chapter 16, Part 630, Hydrology, of the Natural Resources Conservation Service (NRCS) National Engineering Handbook. The USGS dimensionless hydrographs shown in Figure 23 (Stricker-Sauer) can be converted to desired-percent-chance flood hydrographs by multiplying the discharge ratio by the desired-percent-chance peak discharge and the time ratio by basin lag time. The resultant flood hydrograph is assumed to be a typical flood hydrograph for a desired-percent-chance peak discharge. There is no implication that the volume under the hydrograph has a desired-percent chance of being exceeded. The desired-percent-chance peak discharge and the basin lag time are watershed-specific characteristics that determine the shape of the hydrograph.

Other flood hydrograph estimation methods developed by State, regional, and local agencies can be used in a similar manner. In the more arid regions of the Western United States, methods

developed by State, regional, and local agencies may be particularly relevant because the USGS national dimensionless hydrograph was developed for streams in Georgia and other USGS statewide analyses are generally restricted to the Eastern United States.

In addition to the Georgia dimensionless hydrograph ("statewide") available in the USGS NSS program, the USGS has developed dimensionless hydrographs for several other states:

- Water-Resources Investigations Report 89-4076, Techniques for Simulating Flood Hydrographs and Estimating Flood Volumes for Ungaged Basins in East and West Tennessee.
- Water-Resources Investigations Report 89-4087, Determination of Flood Hydrographs for Streams in South Carolina: Volume 1. Simulation of Flood Hydrographs for Rural Watersheds in South Carolina.
- Water-Resources Investigations Report 97-4279, Techniques for Simulating Peak-Flow Hydrographs in Maryland.

The dimensionless hydrographs developed for other states agree reasonably well with the Georgia dimensionless hydrographs, but the state-specific hydrographs are to be used if available. For ungaged streams that are not regulated by flood-control structures, the dimensionless hydrograph method may be used to estimate the desired-percent-chance hydrograph.

The desired-percent-chance peak discharge for rural and urban ungaged watersheds may be estimated from USGS regression reports or from other regression equations developed for the study area. The basin lag time may be estimated by regression equations given in USGS reports on dimensionless hydrographs, many of which are summarized in Appendix B of USGS Techniques and Methods 4-A6, The National Streamflow Statistics Program: A Computer Program for Estimating Streamflow Statistics for Ungaged Sites, and other regression equations developed for basin lag time. The basin lag time as used in the USGS dimensionless hydrograph approach is the time from the center of mass of rainfall excess to the center of mass of runoff.

Using rainfall-runoff data for 81 watersheds in Maryland, in Estimation of Time of Concentration for Maryland Streams, Thomas and others demonstrated that the basin lag time used to define the USGS dimensionless hydrograph was, on average, only 5 percent less than the watershed time of concentration. Therefore, basin lag time as defined above may be approximated by the time of concentration as estimated by the NRCS travel time method documented in Technical Release 55, Urban Hydrology for Small Watersheds.

The balanced synthetic hydrograph method described above for gaged streams may also be applied to ungaged streams by implementing the method below.

- Estimate N-day volumes (e.g., 1-day, 3-day, 7-day) at gaging stations in the vicinity of the ungaged streams.
- Develop regression equations for estimating the desired-percent-chance N-day volumes for ungaged streams.

- Construct a balanced synthetic hydrograph with the desired-percent-chance N-day volumes.

This method is more time consuming, but it may be used if the dimensionless hydrograph method does not provide reasonable results or in areas where the dimensionless hydrograph method may not be applicable.

6.17.2 Coastal Hydrograph Development

For coastal analyses, one way to create a synthetic storm surge hydrograph is using procedures in the Federal Highway Administration (FHWA) Hydrologic Engineering Circular No. 25, Tidal Hydrology, Hydraulics, and Scour at Bridges. If data from a detailed coastal model are not available. The required variables for the method are:

- Peak surge elevation (S_p)
- Forward speed of the storm (f)
- Radius of maximum winds (R)

S_p is given directly from the published BFE noted in the FIS Report, while a range of values for both R and f are possible for a given location.

Coastal Flood Risk Projects based on modern methods involving Joint Probability Method (JPM) analysis contain enough information about the range of storm parameters that a representative R and f to associate with the value of S_p can be calculated directly. For flood hazard mapping projects where the Project Team did not employ a JPM approach for determining the BFE, these values may need to be estimated by examining historical storms in the region.

Pilot tests suggest that the ultimate extent of flooding landward of a breached or overtopped coastal levee is not highly sensitive to the shape of the synthetic hydrograph, so the exact choice for f and D may not be a critical factor. The peak surge and width of failure in a breaching condition is of primary importance within this analysis.

6.18 Regulatory Floodways

For some communities, regulatory floodways may have already been delineated for levee-impacted areas along a flooding source. FEMA has developed an approach for modeling and delineating the regulatory floodway in levee-impacted areas.

The following guiding principles form a basis to support this effort and are discussed in more detail in the subsections that follow:

1. Baseline Model
   The baseline model is either the effective model (for the base flood event) if an effective floodway exists or the baseline model does not consider any existing encroachments since the area was first shown on an NFIP map.

2. Surcharge Limits (Values)

   NFIP regulations and Standard SID 69 states:

Floodway surcharge values must be less than or equal to 1.0 ft. If the state (or other jurisdiction) has established more stringent regulations, these regulations take precedence over the NFIP regulatory standard. Further reduction of maximum allowable surcharge limits can be used if required or requested and approved by the communities impacted". Standard SID 70 states "If a stream forms the boundary between two or more states and/or tribes, either the 1.0-foot maximum allowable rise criterion or existing floodway agreements between the parties shall be used.

3. Effective Floodway

   a. Existing Conditions - Presence of an effective floodway provides a starting point for:

      1. Baseline model; and

      2. Floodway encroachment.

      If no effective floodway exists, then the baseline model using equitable consideration of both overbanks becomes the initial floodway analysis.

   b. Proposed or Changed Conditions - If the proposed or changed project results in BFE increases in excess of those permitted under 44 CFR 60.3 (c)(10) or (d)(3), the community must apply for CLOMR per 44 CFR 65.12. CLOMRs are encouraged for all levee projects.

4. Equal Conveyance

   Standard SID 73 states: "A methodology based on equitable consideration of both overbanks must be used to establish the minimal regulatory floodway. Variations to this approach must be made in coordination with FEMA and impacted communities.

5. Removal or No Floodway

   In some situations, floodways may not make sense if there is already a built-out condition, or other flow conditions not supporting a floodway analysis exists. In these situations, coordination with FEMA and affected communities is needed to come to an agreement on the proper approach.

6. Hydraulically Insignificant Levees (refer to Subsection 6.19.3)

   For levees which are considered hydraulically insignificant, that is, the levee does not significantly affect the natural flow through the valley or is significantly overtopped during the base flood event, the floodway is modeled using the Natural Valley Procedure with initial floodway analyses using the current floodway procedures. For mapping purposes, a structure is considered hydraulically insignificant if, during a base flood event, the peak WSELs landward of the structure may be the same regardless of whether the structure was in place.

7. Hydraulically Significant Levees (refer to Subsection 6.19.4)
   For levees which are considered hydraulically significant, which can include accredited levees and/or non-accredited levees, the floodway is computed in one of two ways:

   a. Levee on one bank

b. Levee on both banks

8. Mapping Floodway Boundaries on the Levee
   Standard SID 452 states, “Floodway boundaries shall be placed on the riverside of a levee unless the community specifically requests otherwise, or where hydraulic calculations demonstrate a floodway is warranted elsewhere”. Where the floodway boundary lands on the levee, the boundary is placed at the computed location, unless the State or community request otherwise. Some States, who have jurisdiction over the floodways, regularly show the floodway boundaries on the landside toe. The floodway should not extend past the landside toe for an accredited levee without concurrence from the FEMA Regional Office and FEMA Headquarters.

6.18.1 Coordination with Communities

The regulatory floodway is a community floodplain management tool. While a default approach is presented below, FEMA decisions about the final approach to determining the regulatory floodway will be made in coordination with officials of the affected communities, the levee owner(s), and impacted property owners. In addition, when the jurisdictions along either side of a flooding source are different, coordination between the Project Team, the State NFIP Coordinator(s), and local jurisdictions affected will need to take place before the modeling approach is finalized.

Development and designation of floodways in urban situations where significant development has already occurred may not be beneficial to the community as minor public and homeowner projects will need to demonstrate “no-rise” in the BFE. In such situations, designation of a floodway hinders floodplain management rather than aids it. A more equitable solution could be to actively manage development using the model to prevent development from creating more than the cumulative allowable rise, per the code of federal regulations, if the community has this capability. Such situations require additional coordination among FEMA, the State, and the communities.

6.18.2 Floodway Analysis and Mapping Methods

The floodway should be modeled as described in FEMA Guidance Document No. 79, Guidance for Flood Risk Analysis and Mapping: Floodway Analysis and Mapping. Per this guidance, the baseline model for the allowable surcharge is the model used to determine the BFEs the first time a floodway was adopted for the reach. Unless it is demonstrated that the model should be revised for reasons other than encroachments into the floodplain, all subsequent revisions to the floodway are limited to the maximum allowable surcharge above the elevations determined in the base model. That way, as hydraulic models are updated to reflect encroachments into the floodway fringe, the cumulative effect of those and future encroachments is limited to the maximum allowable surcharge.

In case of leveed reaches, it is acceptable to compare the floodway WSELs to the “with-levee" BFEs to determine surcharges if acceptable surcharge limit cannot be achieved using the baseline WSEL. In these situations, the methodology outlined in the following subsections limit the floodway encroachments at the levee. Coordination with FEMA and community officials is required in case the encroachment location on the riverside of the levee is warranted. Generally, the floodway analysis in leveed reaches consist of up to three parts:

1. An initial floodway analysis to determine the natural valley based on equitable reduction on both overbanks to set the regulatory floodway location.

2. An intermediate floodway analysis to verify that the allowable surcharges are not exceeded with the levee in place.

3. A final floodway analysis that has surcharges within the allowable limits.

The conditions used for the baseline model and the floodway analyses steps listed above (and described below) could vary on case-by-case basis. Coordination with FEMA and the affected communities will be required in these cases.

6.18.3 Hydraulically Insignificant Levees

If a levee is determined to be hydraulically insignificant and the Natural Valley Procedure is used, the regulatory floodway may still extend landward of the levee. The assigned Project Team member will develop the floodway analysis following established standards and procedures. In addition, if the levee is overtopped during the base flood event and a defined flow path must be preserved, the assigned team member may find that a floodway analysis of the flow path may be required.

6.18.4 Hydraulically Significant Levees

If a levee(s) is determined to be hydraulically significant, the procedures outlined below are applied for floodway modeling. It is likely that a combination of the scenarios discussed below will exist at various cross sections along the levee system. The methods described in Subsections 6.19.5 through 6.19.9 can be applied to specific cross sections. However, the Project Team should evaluate consideration of the model as a whole when adjusting encroachment stations due to the impact to surcharge values and community input.

6.18.5 Hydraulically Significant Levees – On One Bank

For streams with no effective floodway, an initial floodway analysis will be developed using the natural valley analysis with current standards and procedures. For streams with an effective floodway, an initial floodway analysis is performed using the natural valley analysis with the effective floodway encroachment stations to verify that the allowable surcharge limits can still be met. If the initial floodway analysis resulted in floodway encroachment stations on the riverside of the levee and meeting the allowable surcharge limits, the floodway can be delineated at the computed locations. If the floodway limit is located on the riverside of the levee and the impacted State and/or community with jurisdiction over the floodway requests, FEMA will map the floodway limit on the landside toe of the levee for an accredited levee system. In case of a non-accredited levee system, States or communities may decide to delineate the floodway at the computed location within the levee-impacted area. In these cases, the intermediate steps discussed below are not necessary.

If the initial floodway analysis resulted in a floodway encroachment landward of the levee (see Figure 24), an intermediate floodway analysis can be developed. This is done by maintaining the location of the encroachment stations on the non-leveed side and shifting the leveed-side encroachment stations to the levee line. (See Figure 25.) The resulting regulatory floodway elevations are compared to the baseline without floodway elevations to determine if the surcharges are within the allowable limit. If the surcharges are within the allowable limit, the floodway can be delineated at the location computed in this model.

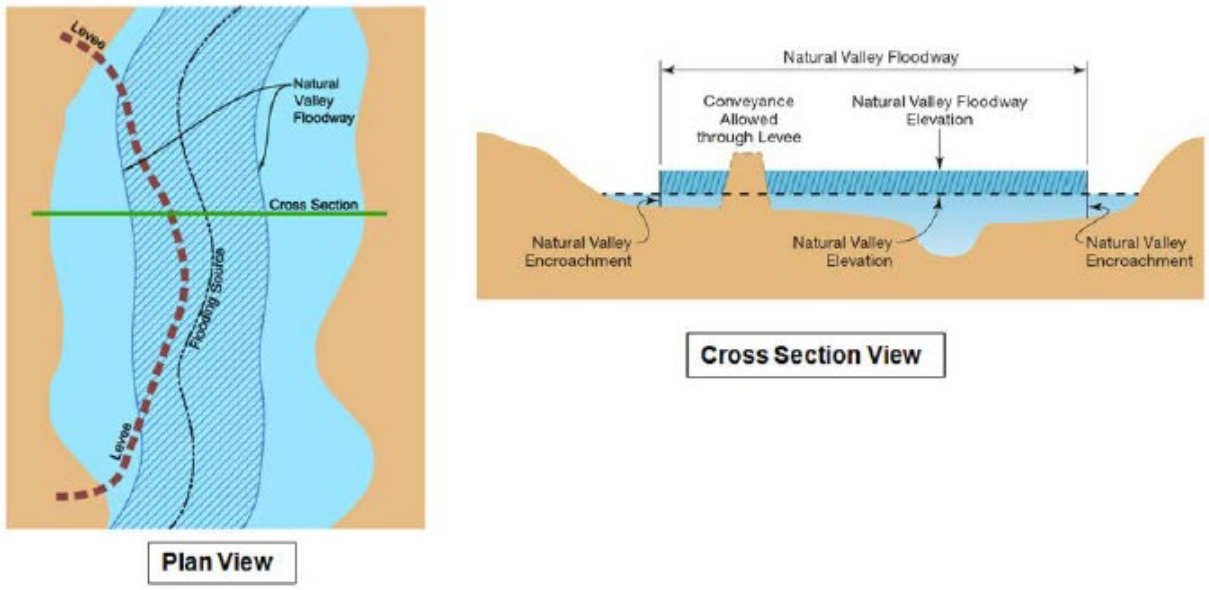

Figure 24: Floodway Analysis Process Initial Analysis

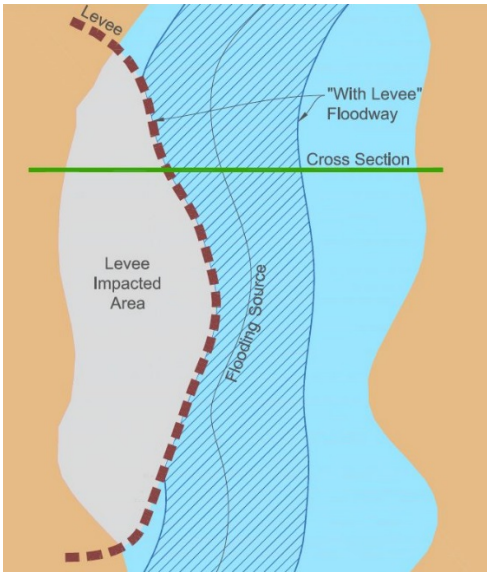

Figure 25: Floodway Analysis Process Initial Analysis

If surcharge in the intermediate floodway model exceeds the maximum allowable limit, the regulatory floodway on the non-levee side is widened to bring the surcharge within the allowable limit, as shown in Figure 26. This condition would require coordination with the State or community officials and affected property owners. If the surcharges cannot be kept within allowable limit by widening the non-levee side, the surcharge can be reevaluated by comparing the results of the intermediate floodway analysis to the with-levee BFE. Situations may arise where it is not possible to bring the floodway surcharge within allowable limit by widening the floodway or evaluating the surcharges against the with-levee BFEs. In these situations, coordination among community officials, affected property owners, and FEMA is required to determine the most appropriate approach.

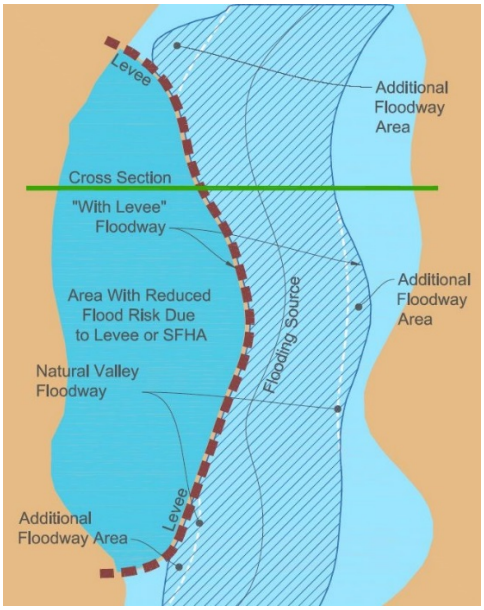

Figure 26: Final Regulatory Floodway

6.18.6 Hydraulically Significant Levees on Both Banks

When hydraulically significant levees exist on both banks, three scenarios could potentially result from the initial natural valley floodway analysis methodology outlined in Subsection 6.19.2.

- Both encroachment stations computed on the levees or on the riverside of the levees.
- One encroachment station is computed on the landside of the levee and the other is on or riverside of the levee.
- Both encroachment stations are computed on the landside of the levees.

6.18.7 Both Encroachment Stations Computed on Levee or on Riverside of Levee

If the initial floodway analysis resulted in a floodway encroachment on the riverside of the levee on both sides (Figure 27), the floodway can be delineated at the computed location. However, if requested by the community, the floodway may be mapped at the landside toe of the levees.

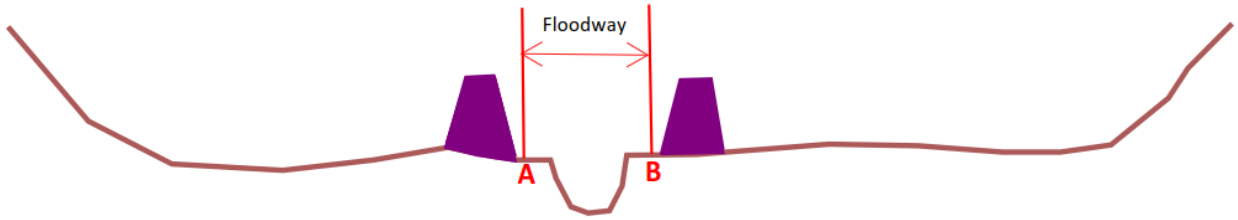

Figure 27: Both Encroachments (A and B) on Riverside of Levees

6.18.8 One Encroachment Station Is on Landside of the Levee and the Other Is on the Levee or on the Riverside of the Levee

If the initial floodway analysis resulted in a floodway encroachment on the riverside of the levee on one side and on the landside of the levee on the other side, as shown by points A and B, respectively, in Figure 28 below, then an intermediate floodway analysis will be developed.

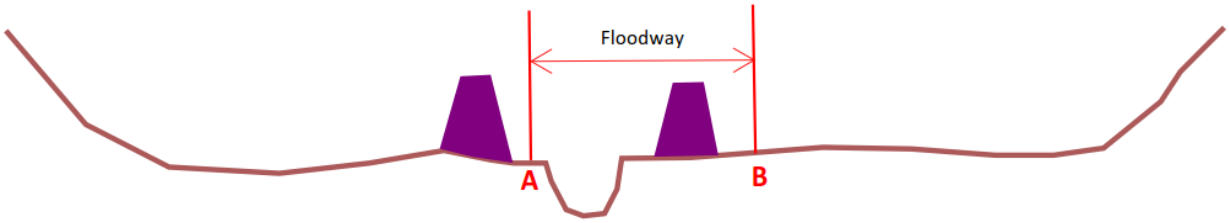

Figure 28: One Encroachment on Riverside of Levee (A) and the Other on Landside of Levee (B)

This is done by maintaining the location of the encroachment station A and shifting encroachment station B to the levee location as shown in Figure 29. The resulting regulatory floodway elevations are compared to the baseline model elevations to determine if the surcharges are within the allowable limit. If the surcharges are within the allowable limits, the floodway can be delineated at the location computed in this model. If requested by the community, the floodway on one or both sides may be mapped at the landside toe of the levee.

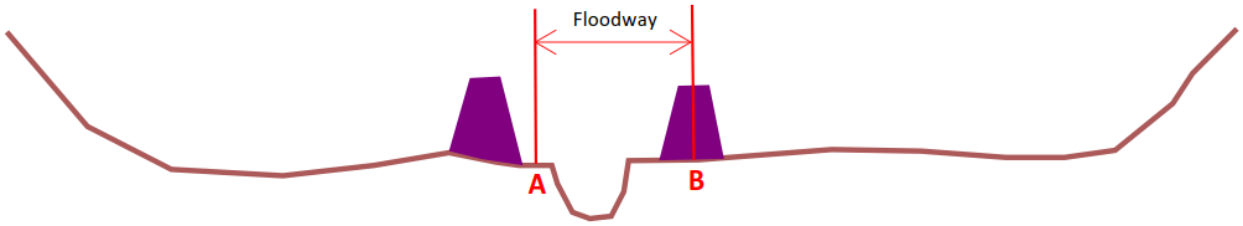

Figure 29: The Landside Encroachment (B) Moved to the Levee

If surcharge in the intermediate floodway model exceeded the maximum allowable, the regulatory floodway on side A is widened to bring the surcharge within the allowable limits, as shown in Figure 30. If the surcharge limit cannot be met by moving the encroachments to the levees, the surcharge can be reevaluated by comparing the results of the intermediate floodway analysis to

the with-levee BFE. Situations may arise where it is not possible to bring the floodway surcharge within the allowable limit by widening the floodway and using the with-levee BFE for surcharge calculation. Coordination between community officials and FEMA is required to determine the most appropriate approach.

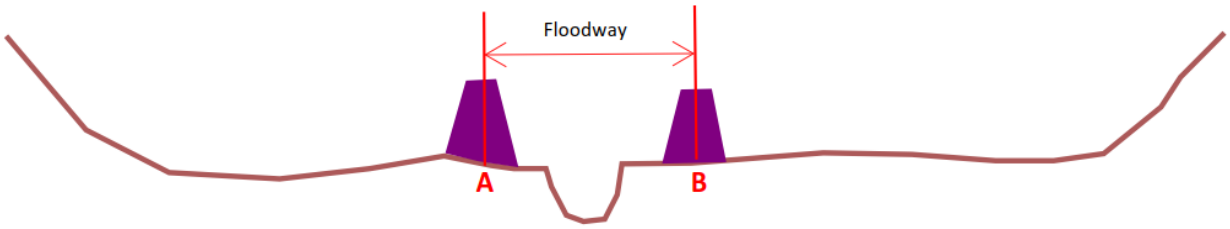

Figure 30: Both Encroachments at Levees

6.18.9 Both Encroachment Stations Fall on Landside of the Levees

If the initial floodway analysis resulted in a both floodway encroachments on the landside of the levees on both banks, as shown in Figure 31 below, then an intermediate floodway analysis will be developed. This is done by moving both encroachments to the levee (as shown in Figure 30) and comparing the floodway elevation to the baseline model elevations to determine if the surcharges are within the allowable limits. If they are within the allowable limits, then the floodway is mapped at the levees.

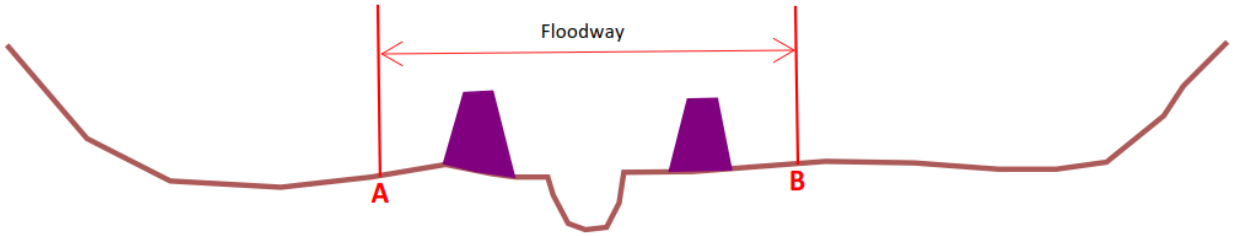

Figure 31: Both Encroachments Landward of the Levees

If surcharge in the intermediate floodway model exceeded the maximum allowable, the surcharge can be reevaluated by comparing the results of the intermediate floodway analysis to the with-levee BFE. If the surcharges are within allowable limit, the floodway can be mapped at the levees. If the surcharges exceed the allowable limit, coordination between community officials and FEMA is required to determine the most appropriate approach.

6.18.10 The Methodology for Development of the Regulatory Floodway

This subsection outlines the step-by-step process for determining the final floodway encroachment stations for hydraulically significant levees on both banks. Steps 5 and 6 apply only to non-accredited levees.

As mentioned in previous sections, the regulatory floodway is a community floodplain management tool, and the final approach to determining the regulatory floodway will be made in coordination between FEMA and the affected communities. The method below is a general guideline expected to be applicable for floodway identification in most levee situations. These

steps should be applied in consideration of the model as a whole when adjusting encroachment stations.

1. Compute the WSEL with both levees holding to produce the with- levee BFE.
2. Compute the WSEL with the left levee holding (BFE riverside of right levee).
3. Compute the WSEL with the right levee holding (BFE riverside of left levee).
4. Perform the Natural Valley Procedure floodway analysis to determine encroachment stations A and B. (See Figure 32.)

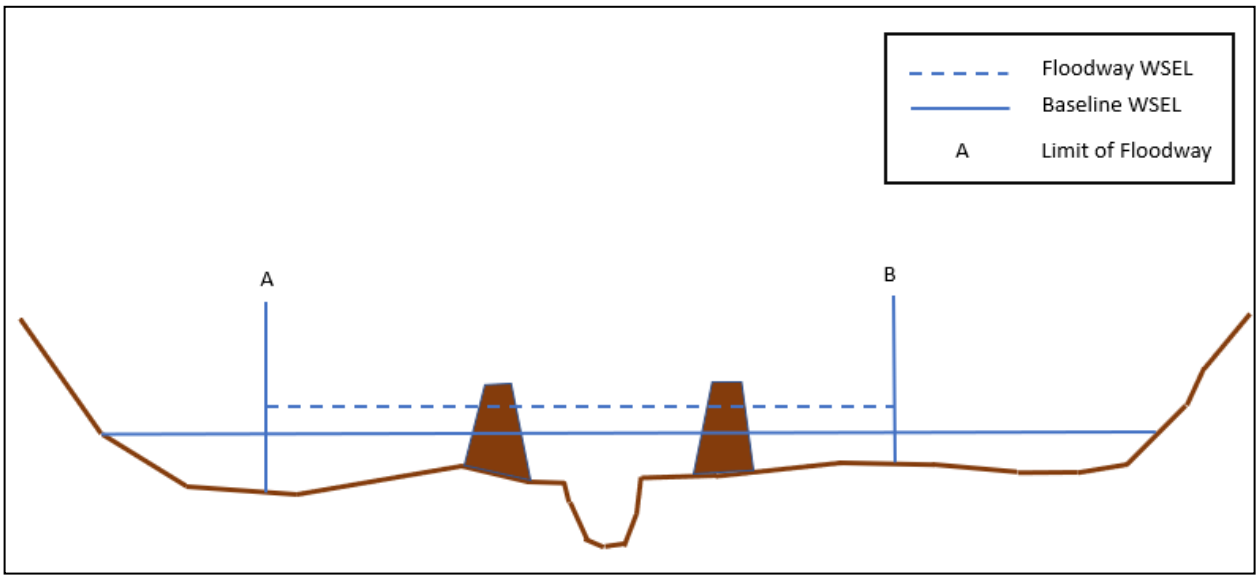

Figure 32: Use of Natural Valley Procedure to Determine Initial Encroachment Stations A and B

5. Run floodway analysis with the left levee holding to determine encroachment station C. Left encroachment station is set at the left levee. (See Figure 33.)

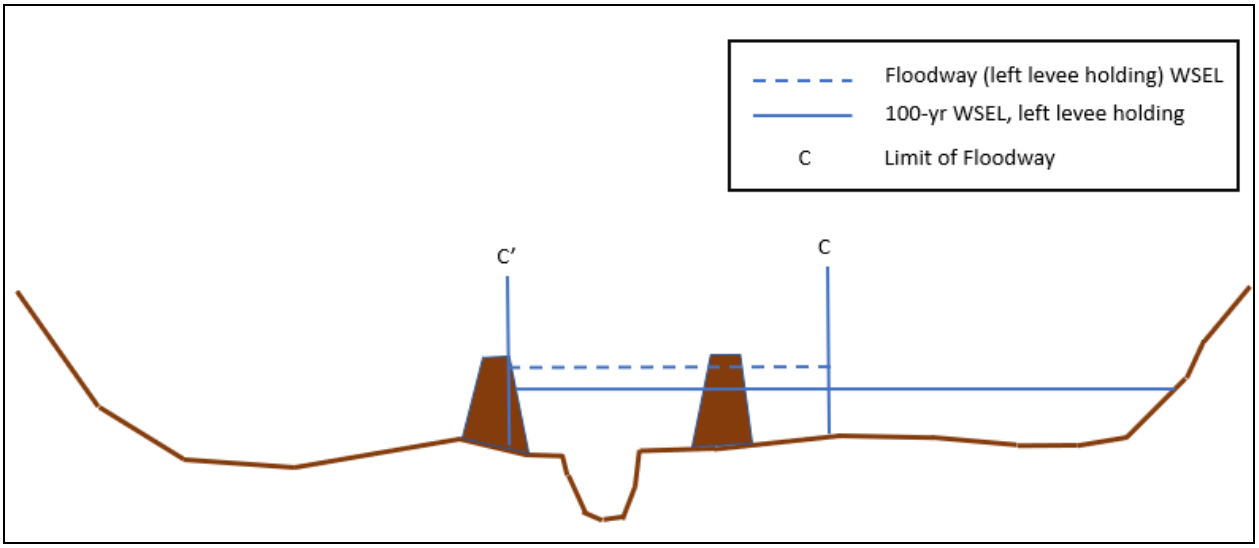

Figure 33: Using Left levee holding to find encroachment station C

6. Run floodway analysis with the right levee holding to determine encroachment station D. Right encroachment station is at the right levee. (See Figure 34.)

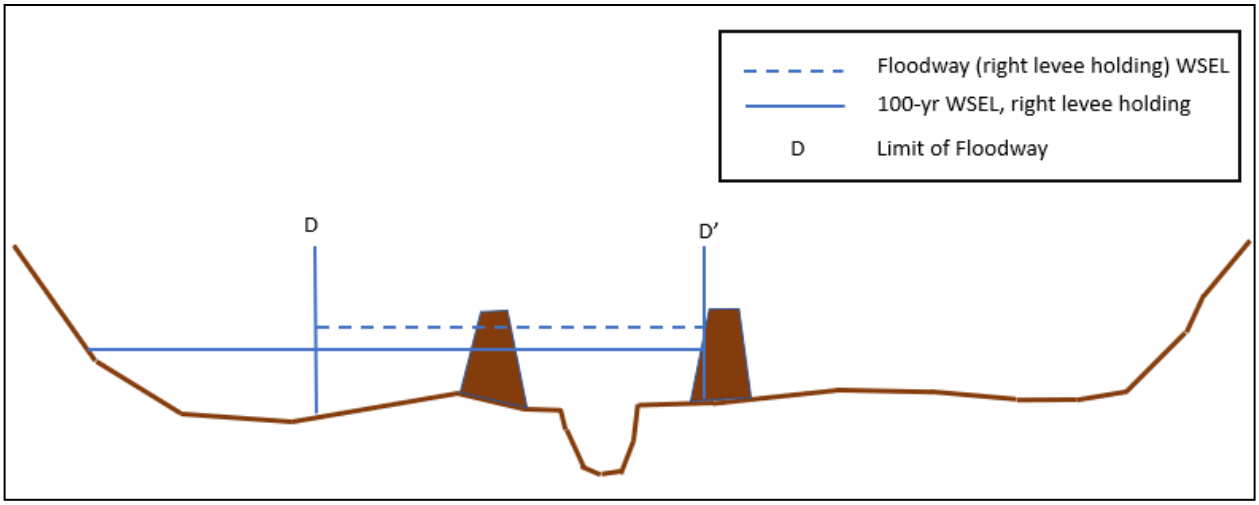

Figure 34: Right Levee Holding to Find Encroachment Station D

7. If both levee systems are accredited, start with A and B as initial locations as shown in Figure 32. If both levees are non-accredited, start with C and D as initial locations from encroachments computed in previous steps. (See Figure 35.) if the left levee is non-accredited and right levee is accredited, start with B and D as initial locations from encroachments computed in previous steps. (See Figure 36.) If the right levee is non-accredited and left levee system is accredited, start with A and C as initial locations from encroachments computed in previous steps. (See Figure 37.) Then follow the steps outlined below.

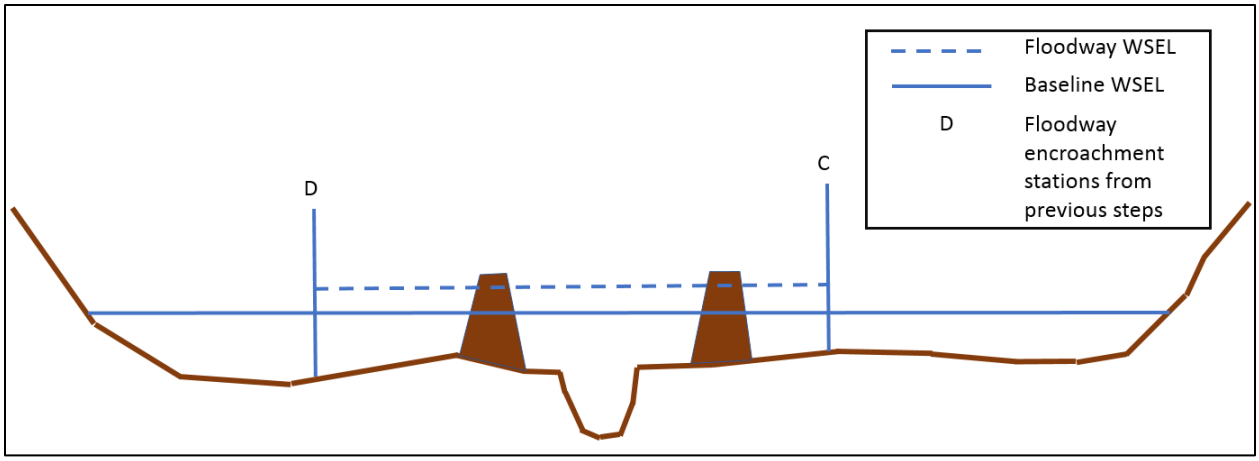

Figure 35: Both levees Are Non-accredited

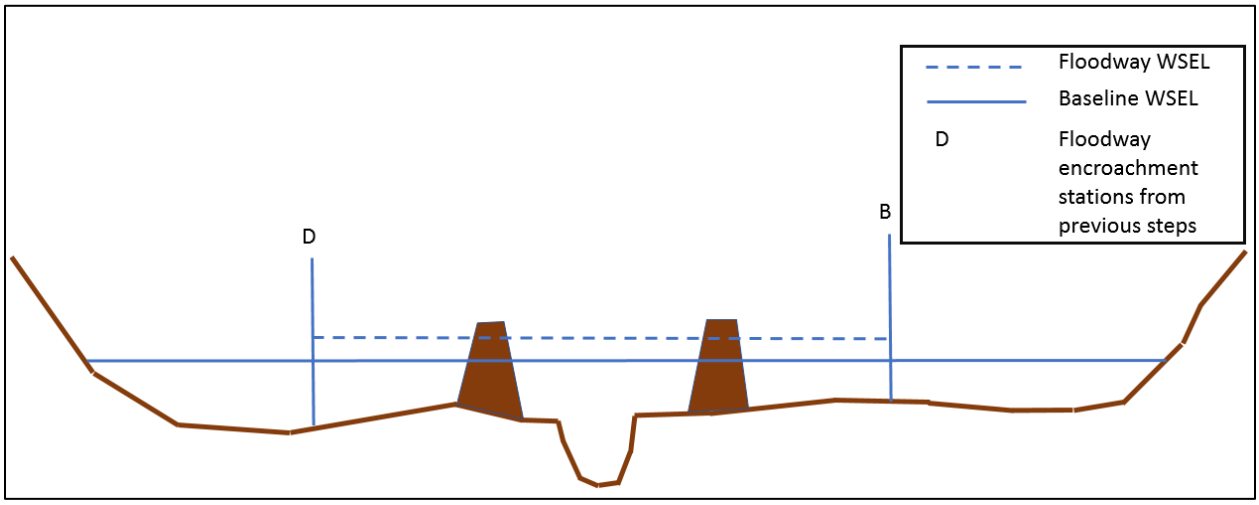

Figure 36: Left Levee Is Non-accredited, Right Levee Is Accredited

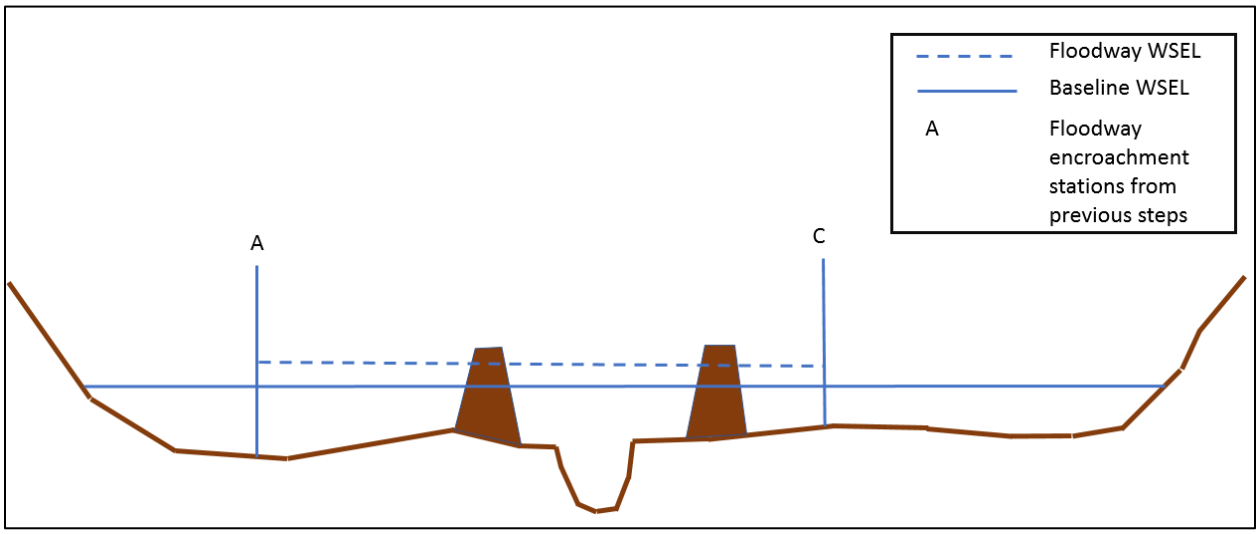

Figure 37: Right Levee Is Non-accredited, Left levee Is Accredited

a. Start with initial encroachment stations from Step 7. Compute the surcharge for the floodway using the baseline WSEL. If the surcharges are within the maximum allowable limit, and both the left and the right encroachments are on the riverside of the levee, the floodway analysis is complete. The floodway is mapped on the riverside of the levee at the final computed location.

b. If the surcharges are higher than the maximum allowable limit and the encroachments are on the riverside of the levee, move the encroachments to the levees (C' and D'). If the surcharge is within the allowable limits, the floodway analysis is complete. If the surcharge is still higher than the allowable limits, proceed to Step d.

c. If both or either of the encroachments are on the landside of the levee, then move the landside encroachment(s) to the levee(s) (C' and/or D') and test if surcharge is within allowable limit using the baseline water-surface elevation. If it is within the allowable limit, the floodway analysis is complete. If the surcharge is higher than allowable, move the riverside encroachment to the levee (C' or D') where applicable, and test if the surcharge is within allowable limits. If it is, the floodway analysis is complete. If the surcharge is still higher than the allowable limits, proceed to Step d.

d. If surcharges with encroachments set at the levees are higher than the allowable limit using the baseline WSEL, evaluate whether the allowable surcharge can be met by widening encroachments at the non-leveed cross sections. If the surcharge is still higher than the allowable limits, test the surcharge using the with-levee WSEL. If the surcharge is within allowable limits using the with-levee baseline, then the analysis is complete. If the surcharge is still higher than the allowable limits, proceed to Step e (for non-accredited levees) or Step f (for accredited levee systems).

e. In the case of non-accredited levee systems, if the surcharge with encroachments set at the levees is higher than the limit using the with-levee baseline WSEL, encroachments C and D can be moved to the landside of the levees until the allowable surcharge is achieved. If the allowable surcharge limits cannot be met by moving the encroachment outward or the affected communities do not want a floodway on the landside of the levee, coordination between the community and FEMA is required to identify the appropriate approach.

f. In the case of accredited levee systems, if the surcharge with encroachments set at the levees is higher than the allowable limit using the with-levee baseline WSEL, typically encroachments A and B can be not moved to the landside of the levees. Adjust encroachments at adjacent non-leveed cross sections to achieve an allowable surcharge. If the allowable surcharge limits cannot be met by adjustment of encroachments at non-leveed sections, coordination between the community and FEMA is required to identify the appropriate approach.

6.19 Hydraulic Modeling on Landside of the Levee

This subsection presents recommended guidance to be used for the mapping of the landside flood hazard area for levee reaches that are evaluated using the Overtopping or Structural-Based Inundation Procedures. For these procedures, often an unsteady flow will be required. While Appendix C of FEMA's Guidelines and Specifications for Flood Hazard Mapping Partners

(discusses both one- and two-dimensional unsteady-flow modeling, this subsection provides additional guidance specific to levees.

The flood hazard area created by levee overtopping or breach is assumed to be subject to the same annual-chance flooding as the exterior flooding source. For example, if a levee is breached by the base flood, the assigned Project Team member will delineate the area on the landside of the levee as an SFHA on the FIRM.

Hydrologic or hydraulic analyses are necessary to compute the flood elevations created by the inflow. Reservoir routing and pump operation will be the features generally applied to determine flood elevations for hydrologic analyses.

One-dimensional (1-D), two-dimensional (2-D) steady flow, and unsteady flow solution methods are the hydraulic analysis methodologies applicable to compute flood elevations. The applicability and data requirements for these methodologies are summarized below.

6.19.1 Hydrologic Flow Routing

Hydrologic flow routing is applicable when floodplain storage, not conveyance, is the dominant factor determining the flood elevation. This will generally be applicable if the inflow is for a limited duration and the interior floodplain has the capability to store the volume of flow entering the impacted area. A stage-inflow hydrograph of the exterior flooding source is essential to determine the duration and rate of the inflow, and to conduct a hydrologic flow routing. Depending on the mode of failure, the assigned Project Team member can compute inflow hydrographs by applying appropriate hydraulic computations. Most hydrologic flow routing models also have the capability to reflect flow evacuation features, such as pumping stations.

6.19.2 Hydraulic Modeling

A hydraulic approach is applicable when an alternate flow path is created on the landside of the levee for floodwater to flow downstream. Conveyance and floodplain storage along the flow path are the dominant factors controlling the flood elevations. For general floodplain analyses based on the formulation of basic equations of motion, four types of solutions procedures are available. They are categorized as 1-D steady flow, 1-D unsteady flow, 2-D steady flow, and 2-D unsteady flow solutions. Where groundwater is close to ground level, it may be appropriate for the assigned Project Team member to account for groundwater interaction.

The Project Team can select any hydraulic analysis software accepted by FEMA for flood hazard area development for hydraulic modeling. General data requirements and applicability of the different types of hydraulic flow modeling are provided in Subsections 6.20.3 through 6.20.6.

6.19.3 One-Dimensional Steady Flow Analysis

One-dimensional steady flow analyses are applicable where flow is limited to defined flow paths. Inflow would be peak flow rates generated from the subject levee failure conditions – overtopping, segment failure, dynamic breach, or final breach condition. Weir and split flows are two commonly used options.

Inflow discharges due to overtopping can be computed by applying lateral weir flow computations. For weir flow assumptions to be applicable, the flow crossing the crest profile of the levee or flood wall must not be submerged on the landside of the levee. The weir flow method is also applicable if the final breach geometry creates weir-flow conditions.

When overtopping flow accumulated on the floodplain creates a fully submerged condition on the landside of the levee, split flow becomes applicable. When a breached levee fails to the natural ground level, inflow may be computed as split-flow conditions in the vicinity of the breach location. The breach or overtopping flow may return to the same river downstream, join another flooding source, or flow into a large water body whose WSEL will not noticeably change despite receiving the inflow from levee failure. In addition, most steady flow analyses can also reflect constant pumping rates.

One-dimensional steady flow models are generally not applicable in coastal situations.

6.19.4 One-Dimensional Unsteady Flow Analysis

Unsteady flow analyses are most suitable if the flow is limited to defined flow paths and defined storage areas are present in the overbank. However, unsteady flow models using link-node concepts to represent flow have the capability to model a larger number of flow paths and offline floodplain storage. Unsteady flow analyses have the capability to simulate online floodplain storage and dynamic impacts of pumping activities.

Unsteady flow analyses can be applied to a variety of downstream boundary conditions. Flow may rejoin the same river downstream, at other flooding sources, travel to storage/ponding areas, or reach an ocean impacted by daily tide level variations.

Unsteady 1-D numerical models also may be applied to model the hydraulics for coastal levee overtopping and breach scenarios. In selecting an appropriate model, consideration is to be given to models that include modules for incorporating flow-control structures and supercritical flow.

Models developed with modules accounting for dam-break scenarios may also be applied to levee breach scenarios. Models that are applicable to coastal flooding sources and include wave overtopping also exist and can be used.

6.19.5 Two-Dimensional Flow Analysis

Two-dimensional flow routing is most applicable to natural floodplains with flat terrain or urban floodplains where flow directions are dictated by streets, storm drain alignments, and obstructions caused by buildings. When levee breach or overtopping occurs, inflow from the channel may be modeled as 1-D flow near the breach and develop into 2-D flow, either forming flow paths or remaining as sheet flow to spread over the floodplain. A typical 2-D model can model levee, flow paths, street flow, or shallow flow conditions.

Generally, 2-D models have the capability to provide unsteady flow solutions. A hydrograph and can be generated outside of the 2-D model and provided as input. Inflow hydrographs can be computed using methodologies described for 1-D unsteady flow analysis. Some 2-D software accepted for flood study development can also model levee overtopping, piping, and slope stability failure as well as flow routing on the adjoining floodplain.

Two-dimensional analyses provide a convenient method to simulate multiple modes of failure at different locations without significant additional effort. Two-dimensional analysis is also applicable to simulate flood ponding in areas between two levees or areas impacted by ring levees. When a breach occurs in one of the levees, areas between two levees will be inundated until the ponding elevation reaches the equivalent elevation of the flooding source side or overtops the other levee. In the latter situation, the ponding elevation is to be mapped as the elevation of levee being overtopped. Pumping and other flood-mitigating features may be reflected in most 2-D models through rating curves.

The storm surge modeling system most prevalently used in coastal flood hazard studies includes the ADCIRC 2-D circulation model, which is then coupled with a 2-D wave model (STWAVE or UnSWAN). A 2-D model will have varying levels of complexity. A simple 2-D model using terrain data may be easily produced. In comparison, a complex 2-D model that includes detailed hydraulic structures and streets may be time-consuming to prepare.

6.19.6 Combination of One-Dimensional and Two-Dimensional Models

Increasingly, 1-D unsteady flow and 2-D software developers have provided the capability to link 1-D and 2-D solutions as needed. Users have the capability to use the appropriate solutions for appropriate locations. Some such models also have options to model the levee breach process. The channel flow is typically modeled as 1-D, using cross sections. Landside flow from a levee breach or overtopping is routed using 2-D grids or finite element mesh.

The selected analysis methodology should be able to reflect flow conditions adequately and develop reliable flood elevations and flood hazard area boundaries for the area landward of a levee that does not meet the 44 CFR 65.10 criteria. Decision factors include the consequences of levee failure, nature of the terrain, complexity of the levee systems, mode of failure mechanisms, data availability, and availability of funds.

6.20 Flood Hazard Mapping

6.20.1 Mapping Process

In the event that a stakeholder disagrees with the final analysis and mapping procedures used to create the FIRM, the current FEMA appeals and Scientific Resolution Panel procedures may be used. These procedures are documented in FEMA Guidance Document No. 26, Guidance for Flood Risk Analysis and Mapping: Appeal and Comment Processing. The guidance document is accessible from the FEMA Guidelines and Standards for Flood Risk Analysis and Mapping webpage.

The final mapped flood hazard boundaries landward of non-accredited levee systems will be a worst-case combination of three main sources:

1. The composite SFHA resulting from the levee reaches evaluated by the Overtopping, Structural-Based Inundation, or Natural Valley Procedures for each levee reach. Sound and Freeboard Deficient levee reaches will not have an SFHA associated with the individual reach analysis.
2. The SFHA resulting from the interior drainage analysis.

3. The area developed using the Natural Valley Procedure, which will be used to depict the potential base flood hazard that exists landward of a non-accredited levee system in areas where an SFHA has not been identified. This Zone D will be shaded on the FIRM differently than a typical Zone D to clarify the difference in how the two zones are developed.

This concept is illustrated in Figure 38. If BFEs are to be shown on the FIRM, they will be based on the highest elevation of the composite mapping.

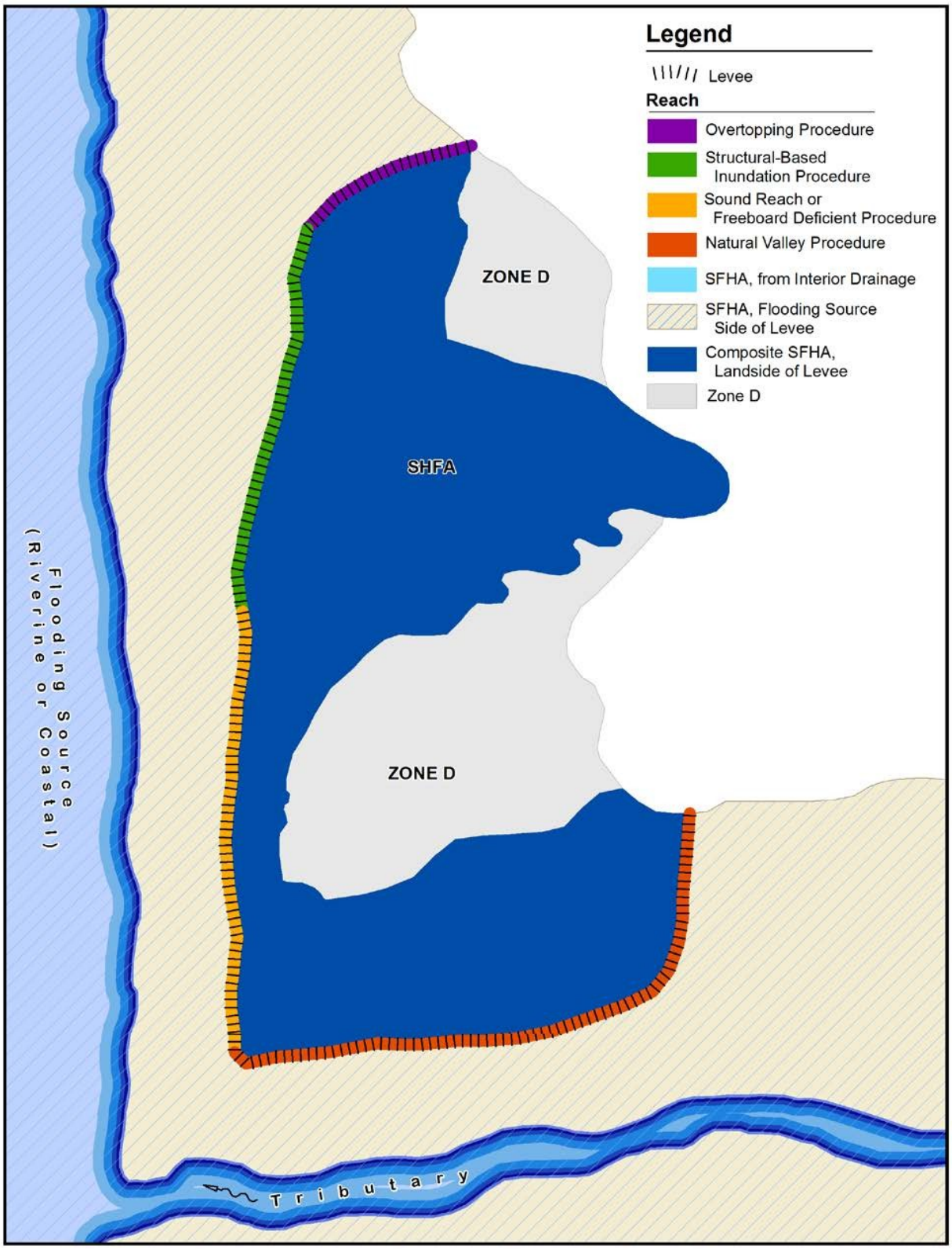

Figure 38: Composite Mapping of Flood Hazards for the Levee System

When the Structural-Based Inundation Procedure is used, the SFHA for that levee reach will be a composite of each independently analyzed breach location. The resulting floodplain from the analysis of a Structural-Based Inundation reach must reflect the fact that a breach could occur at any location along the reach. To achieve this, it may be acceptable for the assigned Project Team member to extrapolate breach analysis results to areas that were not analyzed separately. This will most often occur in situations where breach flows seek a flow path or storage area that is not directly adjacent to the levee. The final mapping will not reflect the analyzed breach locations, however; the final mapping will reflect the composite flood hazards resulting from all breach analyses conducted.

The input data requirements to map BFEs on the FIRM for the Overtopping and Structural-Based Inundation Procedures follow FEMA Guidance Document 31, Guidance for Flood Risk Analysis and Mapping: Mapping Base Flood Elevations on Flood Insurance Maps. The guidance document is accessible from the FEMA Guidelines and Standards for Flood Risk Analysis and Mapping webpage.

6.20.2 Flood Insurance Implication of Zone D Mapping

The NFIP defines Zone D as an area of possible, but undetermined, flood hazards. Historically, FEMA has used the Zone D designation in areas where a flood hazard analysis has not been completed.

When analyzing and mapping areas landward of non-accredited levee systems, FEMA will use Zone D to designate the possible 1-percent–annual-chance flood inundation on FIRMs. Zone D will supplement the SFHAs developed through the procedure(s) applied to individual levee reaches. The size and location of the Zone D areas will vary and be based on the results of the composite SFHA analysis that results from the Natural Valley Procedure. The natural valley analysis is hydraulically modeled for riverine levee reaches by retaining the topographic features of the levee in the model but allowing the discharge to flow on either side of the levee, assuming that the levee does not impede conveyance.

Flood insurance is available in Zone D; however, properties located in Zone D areas are not subject to the federally mandated flood insurance purchase requirement. Lenders may, however, require insurance coverage for properties located landward of levee systems regardless of the zone designation, as a condition of a loan, as part of their regular lending practices.

6.20.3 Floodplain Management Implications of Zone D Mapping

FEMA views the analysis of the non-accredited levee systems as an intermediate step in the possible process leading to full levee accreditation. Because Zone D is not considered an SFHA, SFHA regulations do not apply. Floodplain management requirements are applied at the discretion of local officials as long as the community complies with the minimum standards of the NFIP regulations cited at 44 CFR 60.3(a).

FEMA will depict the Zone D area landward of the levee system on the FIRM with a different symbology than the traditional Zone D area. The differentiation between Zone D types will allow various stakeholders to identify Zone D areas landward of the levee system for use in determining flood insurance requirements, enforcing floodplain management and mitigation, and communicating risk.

If the community chooses to enforce elevation requirements in Zone D areas landward of the levee for new construction, local officials could require development to take place at a set height above grade, taking an approach similar to floodplain management in an SFHA with established BFEs. If requested, tools that FEMA would make available to communities to aid in the enforcement of elevation requirements include flood depth grids and WSELs derived from the Zone D natural valley analysis. These tools would provide flood depths and elevations to which a community could regulate new construction. The data could be provided to the community upon completion of the non-accredited levee analysis.

6.20.4 Guidance Regarding FIRM Graphic and Database Standards

This subsection presents guidance on how to depict flood hazard information associated with non-accredited flood-control structures. The Zone D flood hazard zone designation, with a zone subtype defined as "Area with Undetermined Flood Hazard Due to Non-Accredited Levee System" should be used for the Zone D flood hazard area on the landward side of the non-accredited levee. For FIRMs developed using the current standards, the Project Team will apply the detailed specifications summarized in FEMA FIRM Panel Technical Reference.

In addition, FIRMs prepared under these graphical specifications will include the following note inside the map body. The note should be placed in the proximity of the subject levee feature(s).

Note: This panel contains levees that have not been accredited and are therefore not shown as reducing the hazard from the base flood.

The modeling results for the natural valley analysis should also be stored in the regulatory FIRM database. The community can use the natural valley cross-section GIS data to assist in elevation determinations for the purpose of map amendments and revisions. Therefore, the modeling cross sections from the natural valley analysis must be included in the regulatory FIRM database S_XS feature class. As described in the FEMA FIRM Database Technical Reference, all cross sections used in the development of the effective hydraulic models shall be stored in the S_XS table, regardless of flood hazard zone depiction on the effective panel. The Zone D cross sections are provided as backup data, as such they shall be assigned a XS_LN_TYP field value of "NOT LETTERED, NOT MAPPED". The Zone D cross sections must be assigned an appropriate model identifier in the MODEL_ID field of the S_XS table, as well as an appropriate source citation in the SOURCE_CIT field, to provide a link between the natural valley model and the spatial data. In addition, the S_XS table must link to data in the L_XS_ELEV table. The L_XS_ELEV table is designed to store cross section information for all event types and levee scenarios. For more information about populating the S_XS and L_XS_ELEV tables see the FIRM Database Technical Reference.

The Technical References cited above are accessible from the FEMA Technical References webpage (https://www.fema.gov/media-library/assets/documents/34519).

6.21 Guidance Regarding Flood Insurance Study Report Standards

This subsection includes guidance on how to capture flood hazard information associated with a non-accredited flood-control structure in the Flood Insurance Study report.

6.21.1 Text

For flood hazard mapping projects performed using the current standards, the assigned Project Team member will need to add information to Table 5: Summary of Hydrologic and Hydraulic Analyses. The flooding source should be identified as <Streamname> (Landside of Levee Reach #) and extents should correspond to the extents of the levee reach. The methodology used to determine the Zone D area should also be included in the table. An example of this table with appropriate information included is provided in Table 5 below.

The Technical References cited above are accessible from the FEMA Technical References webpage (https://www.fema.gov/media-library/assets/documents/34519).

Table 5: Sample Summary of Hydrologic and Hydraulic Analyses Table Guidance Clarification Routing

Flooding Source	Study Limits		Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
	Downstream Limit	Upstream Limit					
Culvert Creek (Landside of Levee Reach 1)	Confluence with South Fork Inundation River	1.3 miles upstream of confluence of Ripple Creek	Scaled Stream Gage Hydrograph	FLO-2D v. 2009.06	3/31//2012	AE	Modeling using the Structural-Based Inundation Procedure
Culvert Creek (Landside of Levee Reach 2)	1.3 miles upstream of confluence of Ripple Creek	0.5 miles upstream of confluence of Ripple Creek	Scaled Stream Gage Hydrograph	HEC- RAS 4.0	3/31//2012	AE	Modeling using the Natural Valley Procedure
Culvert Creek (Landside of Levee)	Confluence with South Fork Inundation River	0.5 miles upstream of confluence of Ripple Creek	Log Pearson Type III Frequency Analysis	HEC- RAS 4.0	3/31//2012	D	Modeling using the Natural Valley Procedure

Additional text is needed in Section 4.4 of the FIS when the Freeboard Deficient approach is used, and when Zone D is used. When Freeboard Deficient approach is used, the Project Team shall include the following text:

> "Please note that the **Levee System Name** meets the structural standards of 44 CFR 65.10 except lacking adequate freeboard. The flood hazard area landward for the levee system is mapped as Zone D per the freeboard deficient approach under FEMA's analysis and mapping procedures for non-accredited levee systems. The Zone D flood hazard area was determined based on a natural valley analysis of the **Flooding Source Name**.

When Zone D from an analysis and mapping procedure is used, the Project Team shall include the following text:

> In Zone D areas, floodplain management requirements are applied at the discretion of local officials as long as the community complies with the minimum standards of the National Flood Insurance Program (NFIP) regulations cited at 44 CFR 60.3(a). FEMA will depict the Zone D area landward of the levee system on the FIRM with a different symbology than the traditional Zone D area. The differentiation between Zone D symbology will allow various stakeholders to identify Zone D areas landward of the levee system for use in determining flood insurance requirements, enforcing floodplain management and mitigation, and communicating risk. For additional information regarding floodplain management requirements within Zone D areas, please consult with the local floodplain administrator for these communities. There is water surface elevation information available for these Zone D areas for communities use, as referenced in the Zone D Fact Sheets:
>
> - Understanding Zone D for Levees: "Areas of Undetermined Flood Hazards" https://www.fema.gov/sites/default/files/2020-08/fema_understanding-zone-D-levees.pdf
>
> - Modeling and Mapping Non-Accredited Levees: Understanding the Zone D Designation https://www.fema.gov/media-library-data/5b0ef91fd61d29eb3d4be72a47d6f140/508_LAMP_FS_ZoneD.pdf.

6.21.2 Floodway Data Table

The Floodway Data Table will show the elevations and surcharges based on the With Levee run. However, if applicable, the Floodway Data Table also will include the following footnote to alert future users that may modify the regulatory floodway:

> *The floodway limits on the non-leveed side of the flooding source are determined from the Natural Valley analysis.*

6.22 Documentation

For levee reaches analyzed and mapped using the Structural-Based Inundation Procedure, the Project Team will document levee breach location, parameters, and description of the methods used to determine this data. The Project Team also will document any historic breach data or other data used to support various procedures and decisions that were available.

The Project Team is to include documentation, such as reports submitted to satisfy the standards of 44 CFR 65.10, except for survey data for each reach, in the General Folder of the Hydraulics Data Capture Standards submission. See the FEMA Data Capture Technical Reference for more information on levee documentation in the Hydraulics task.

6.23 Review Procedures

FEMA Regional Offices may determine that the review for mapping non-accredited levees should be conducted through the regional support staff of FEMA's Risk MAP providers. Decisions made

during the process should be coordinated with the entity performing the independent Quality Assurance/Quality Control (QA/QC) review.

Submittals must include backup data and supporting information for all calculations, in case a more detailed review is required. A more detailed review must be coordinated with FEMA Headquarters.

The Project Team independent QA/QC reviewer will verify that all components use the same flooding elevations and conditions, and that the entire levee system (if a system consists of different segments) is considered in the submittal.

6.23.1 Reviewing Data Required to Apply Different Procedures

FEMA will review the submittal in accordance with Chapter 4 of this document. Due to the complexity and uniqueness of each coastal levee, the FEMA Project Officer or designee will coordinate and consult with FEMA Headquarters for all levees affected by coastal forces.

To verify that a submittal meets the overtopping analysis standard, the Project Team member assigned to perform an independent QA/QC review will verify that the submission includes documentation supporting two main items.

1. The documentation shows that no appreciable erosion of the levee crest, toe, embankment, or foundation occurs during the overtopping of the base flood event because of currents or waves.
2. The documentation indicates that the anticipated erosion will not result in structural failure (i.e., breach of the levee, directly or indirectly, through loss of embankment material due to erosive forces or the reduction of the seepage path or piping and subsequent instability).

The Project Team member assigned to perform the independent QA/QC review will verify that the submission includes a discussion of the items to consider as discussed in this guidance document and why they may or may not apply.

6.23.2 Reviewing Modeling and Mapping for Non-Accredited Levees

All hydraulic analyses, hydrologic analyses, and floodplain mapping submitted performed by the Project Team will be reviewed to verify that they satisfy FEMA standards. All data and documentation submitted to satisfy the standards of 44 CFR 65.10 will be reviewed per the criteria in Chapter 4.

For reaches modeled using the Structural-based Inundation Procedure, the Project Team member assigned to perform the independent QA/QC review will focus on verifying the following:

- The resulting SFHA does not indicate where individual breaches were located.
- The analysis reflects that the levee reach could breach at any location within the reach.
- How the submitter determined that additional breach locations were not required is documented.
- The breach parameters chosen fall within the historic ranges for the size, location, flooding source type, and soil type of the levee.

- The resulting SFHA reasonably reflects the composite results of all breach analyses.

7.0 Non-Levee Reaches and Non-Levee Features

Physical manmade features that were not designed and constructed as levees may exist near or within flood-prone areas, and these features may impact the conveyance of floodwaters. Levee systems may tie into these manmade features, whose existence and performance are necessary for excluding floodwaters from the levee-impacted area. In this case, these features are referred to as "non-levee reaches" in this document. Alternately, these features may exist independent of a levee system, but still may inadvertently impact floodwater conveyance; those features are referred to as "non-levee features" in this guidance document.

In either case, these features may be represented on effective FIRMs as reducing flood hazards and must be reconsidered when a new Flood Risk Project is initiated so that FEMA appropriately analyzes and maps the flood hazards that may be impacted by these features. For non-levee reaches that are part of or tie into a levee system for which the levee owner is seeking accreditation, the owner must provide documentation and certified data to FEMA demonstrating that the entire levee system meets the requirements of 44 CFR 65.10. If this requirement cannot be met, FEMA will analyze the levee system and map the levee-impacted area in accordance with FEMA's levee analysis and mapping procedures for non-accredited levee systems (refer to Chapter 6 of this document). To demonstrate that a non-levee feature impacts the conveyance of floodwaters, detailed data and engineering analyses must be provided to FEMA and certified by a registered P.E. in accordance with sound engineering practice. If an entity seeks accreditation for a non-levee feature, that entity must demonstrate that the feature meets the requirements of 44 CFR 65.10.

Previous FEMA mapping procedure documents (including Procedure Memorandum No. 51, dated February 27, 2009, which has been superseded by this document) used the term "non-levee embankments" to describe some of these types of features. Although this term is not used in this document, roadway and railroad embankments are examples of physical manmade features that are not typically designed and constructed to function as a levee system or other flood-control structure. However, these features may inadvertently represent flood hazard reduction or other impacts to the conveyance of floodwaters on current effective FIRMs, and as such, may indicate a lesser flood hazard and corresponding risk than what may actually exist in areas near these structures. Thus, it is important to understand the impact each feature may have on the flooding source to appropriately analyze and map the corresponding flood hazard in these areas.

It should also be noted that FHWA issued a memorandum on September 10, 2008, titled Highway Embankments versus Levees, and other Flood Control Structures, to their field offices and State Departments of Transportation (DOTs), emphasizing that most highway embankments are not designed and constructed to perform as a levee system or other flood-control structure. This memorandum also highlighted the distinctions between highway embankments, levee systems, and other flood-control structures; clarified the FHWA role with respect to flood control; and acknowledged that communities may have incorrectly assumed that these structures provide some level of flood hazard reduction.

This chapter provides clarity on the appropriate classification and subsequent data considerations, analysis, and mapping requirements for physical manmade features that are not designed and constructed as levee systems. In addition, guidance is provided that emphasizes the importance of coordination with communities to understand the location and impacts of these features to appropriately analyze and map the flood hazards in these areas.

7.1 Non-Levee Reach

Non-levee reaches are considered a form of manmade high ground that a levee system ties into and whose existence and performance is necessary for excluding floodwaters from the levee-impacted area. USACE also refers to these types of structures as “non-project segments.” To demonstrate that non-levee reaches meet the requirements of 44 CFR 65.10, they must be evaluated based on their current condition to determine eligibility for accreditation of the entire levee system of which they are a part. Coordination with communities and the owners of the non-levee reaches is essential to identify these features, appropriately analyze and map the flood hazards associated with these non-levee reaches, and to provide communities with information and tools to help them communicate flood risk and mitigation opportunities in these areas. Figure 39 provides an example of a non-levee reach.

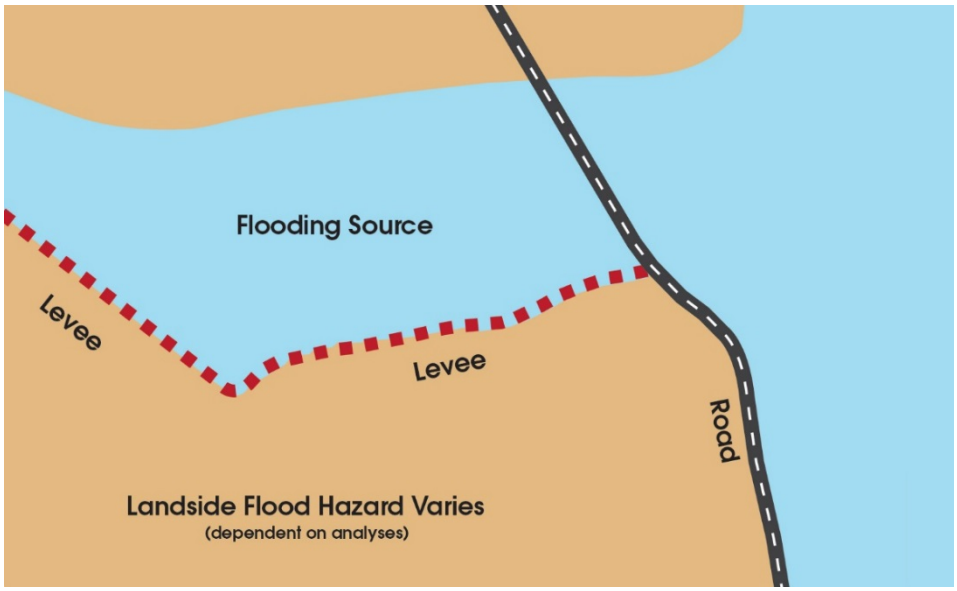

Figure 39: Non-Levee Reach

7.2 Non-Levee Features

A non-levee feature is considered a physical feature that is not designed, constructed, operated, or maintained as a flood-control structure, but may inadvertently confine flow during some flood events. These features may encroach on the floodplain but are not connected to any existing levee system and do not meet the definition of a levee system. They may include roadway and railroad embankments, canals, berms, retaining walls, seawalls, and other features, which involve placing fill or other material within flood-prone areas and which may impact the conveyance of floodwaters in these areas.

These features carry an inherent risk and may have inadvertently been represented as providing flood hazard reduction on a FIRM. Therefore, it is important to fully understand the impact of these features to identify the appropriate flood hazards in these areas. Coordination with communities and the owners of these non-levee features, when applicable, is essential to identify, analyze, and map the flood hazards associated with these non-levee features, and to provide communities with information and tools to help them communicate flood risk and mitigation opportunities in these areas. Figure 40 provides an example of a non-levee feature.

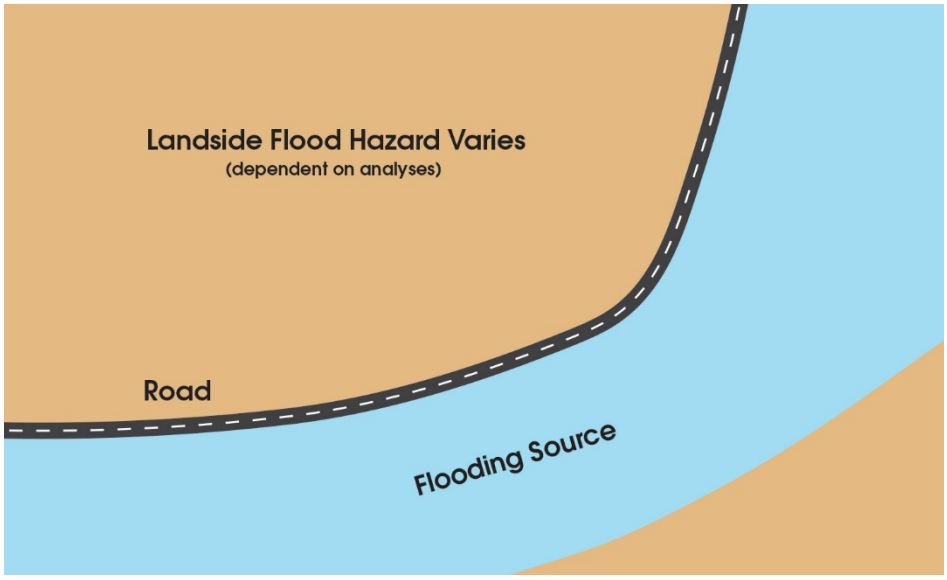

Figure 40: Non-Levee Feature

The flood hazard on the landside of most non-levee features will be analyzed and mapped as not providing base flood hazard reduction. If an entity seeks accreditation for a non-levee feature, that entity must demonstrate that the feature meets the requirements of 44 CFR 65.10. To demonstrate that a non-levee feature impacts the conveyance of floodwaters, detailed data and engineering analyses must be provided to FEMA and certified by a registered P.E. in accordance with sound engineering practice.

FEMA has documented several best practices that use various acceptable approaches for modeling and mapping of non-levee features based on standard engineering practice. Individuals should coordinate with the FEMA Regional Office or FEMA Headquarters to discuss flood hazard analysis and mapping requirements that may be appropriate for particular non-levee features.

7.3 Communication of Risk

To appropriately analyze and map the flood hazards in impacted areas, FEMA will coordinate with communities during the Discovery Phase of a Flood Risk Project, and throughout the project lifecycle as necessary, to understand the location and impacts of non-levee reaches and non-levee features. Where physical manmade features that were not designed and constructed as levee systems exist near or within flood-prone areas, the impact of these features on the conveyance of floodwaters may change over time. The current effective FIRMs may inadvertently represent these features as providing flood hazard reduction or other impacts to the conveyance of floodwaters, and as such, may indicate a lesser flood hazard and corresponding risk than what may actually exist in areas near these structures.

Communities and property owners may not be fully aware of the risk associated with these non-levee features. Therefore, coordination with local stakeholders is essential to identify, analyze, and map the flood hazards associated with these non-levee features to provide relevant information and tools to help them understand their flood risk and mitigation opportunities in these areas.

8.0 FEMA and Other Federal Agency Coordination

OFAs may have a role in working with FEMA to develop levee-related policy, identify flood risk, conduct mitigation, and outreach activities, or provide data to inform the FEMA flood hazard mapping program for areas impacted by levees.

8.1 USACE

Though FEMA and USACE have different roles and responsibilities related to levee systems, both agencies have complementary objectives related to reducing risk to life and property and communicating flood hazards and risks. FEMA has information and data to supplement USACE Levee Safety Program activities. Conversely, information from USACE Levee Safety Program activities will supplement FEMA activities. Jointly, FEMA and USACE will align activities, information, and messaging related to levee systems to improve public awareness of flood risk. Main areas of engagement between the USACE Levee Safety Program and FEMA flood hazard identification activities are further described below.

- Leveraging Data: Both USACE and FEMA perform activities using best available information to include, but not limited to, mapping, hydrologic, hydraulic, and coastal modeling, and infrastructure condition. Early coordination of both USACE Levee Safety Program and FEMA activities will result in finding opportunities to share and leverage information that will benefit both agencies. Both agencies will use the NLD as the main database of information for both the NFIP and USACE Levee Safety Program.
- Mapping Levee-Related Flood Hazards for the NFIP: Communities or parties seeking recognition of a levee system as reducing the base flood hazard on FIRMs, also referred to as levee accreditation, must provide data and documentation in accordance with 44 CFR 65.10. USACE and FEMA have agreed to specific cases when information collected by USACE through their Levee Safety Program will inform some or all requirements for levee accreditation, and that is further specified in Chapter 4 of this document. In cases when information collected by USACE informs some of the requirements for levee accreditation, the communities or parties seeking accreditation will have to provide information to fulfill the remaining requirements. Because some of the USACE Levee Safety Program activities are conducted on a levee segment basis, caution should be taken to ensure information is used, presented, and considered collectively on a levee system basis when using USACE information to inform a levee accreditation decision. Examples of USACE information include inspections and risk assessments.
- Risk Communication: Both USACE and FEMA have the objective to increase public awareness as related to flood risk. In areas with levee systems, USACE typically engages directly with levee sponsors and FEMA engages directly with community officials. Coordination of these relationships helps improve public awareness and effective risk communication. USACE and FEMA will coordinate to ensure consistent messages related to risk, levee condition, and mapping/modeling efforts. One example is the importance for FEMA to verify and maintain NFIP-related information in the NLD and ensure that information is accurate and includes the appropriate messaging for levee sponsors and communities.

- Engagement Processes: FEMA will develop engagement processes with the appropriate USACE District and Division offices and will identify processes to ensure information is exchanged in the most efficient, beneficial, and meaningful way possible. Engagement processes should include cross-walking FEMA mapping efforts with USACE Levee Safety Program activities and planning for joint engagement with levee sponsors and communities where most efficient and effective.
- Routine Coordination: Each step in the FEMA KDP process asks if there is a levee system in the project footprint, and if so, is there an ongoing or recently completed USACE project or analysis that may impact how the levee is represented on the FIRM? This question is asked at each KDP to serve as a reminder that levee system conditions and data change over time, so it is important for FEMA to routinely coordinate with USACE to ensure the most current information is taken into consideration throughout the Risk MAP project lifecycle.
- Disaster Recovery: Under the Stafford Act, FEMA may direct USACE (as an operating agent for the U.S. Department of Defense) to use its available resources to provide assistance in case of a major disaster or emergency declaration by the President. In areas with levee systems, USACE levee safety information and expertise contribute to the recovery efforts.
- Coordination of Agency Processes and Policies: USACE and FEMA will coordinate on the development and implementation of levee-related policy, including coordination of acceptable technical standards related to operation and maintenance plans, emergency preparedness plans, and levee design, construction, and rehabilitation activities.

Additional OFAs may have levee system-related data and may interact directly with communities and levee owners. If during the Flood Risk Project lifecycle, a Project Team determines that OFAs have information about a particular levee system, FEMA will contact the agencies to determine what useful input may be available. Some potential items to consider from different agencies are:

- USBR: USBR works in the western states and is involved with levees, canals, and dams. They may have useful data, such as construction drawings and O&M procedures.
- USGS: USGS is a primary source of hydrologic data used to determine flows and potential water-surface profiles related to the levees.
- NOAA: NOAA is a primary source for coastal data used to evaluate impacts on levees in coastal areas.
- NRCS: NRCS has historical involvement with some agricultural levees; drawings and design data may be available.
- United States Section of the International Boundary and Water Commission (IBWC) (Rio Grande River): IBWC has worked on, and been responsible for the design, construction, operation, and maintenance of, some levees along the Rio Grande River. However, they rarely have data related to interior drainage, so coordination with the local communities will still be required.

- U.S. Department of Agriculture (USDA): FEMA has developed some talking points related to agricultural levees, potential impacts on crop insurance, and potential coordination with local USDA staff that might be useful. (See Table 6.)
- Federal Energy Regulatory Commission (FERC): Some dam or levee structures may be owned by hydropower companies and regulated by FERC, whose efforts are usually related to safety and security, so the availability of information may be restricted.
- U.S. Environmental Protection Agency (EPA): As part of levee accreditation process, there may be a need for the levee owner to coordinate with EPA related to local environmental requirements.
- U.S. Department of Housing and Urban Development (HUD): FEMA and HUD sometimes coordinate outreach activities, so coordination with the FEMA Regional Office will be necessary to determine if there is a need for further coordination.
- The U.S. Fish and Wildlife Service (USFWS): Similar to EPA, there may be circumstances where FEMA needs to contact USFWS. For instance, dealing with vegetation on levees to provide shade to control water temperatures related for salmon in the northwest.

Any other Federal or State agency that owns or operates a levee system would likely be a source of useful information.

Table 6: Crop Insurance, Flood Insurance Rate Maps, and Levees

Internal Talking Points for FEMA/Contract Staff Attending Community Levee Meetings

Background	Stakeholders in rural areas have asked FEMA staff about what impact Flood Insurance Rate Maps (FIRMs) and levee accreditation status may have on their crop insurance policy rates.
Crop Insurance Rate Determinations	• The USDA Risk Management Agency (RMA) makes crop insurance determinations. • Crop insurance premiums are determined by county and crop type on a case-by-case basis. RMA focuses on **actual flood events**, not a statistical 1-percent-annual-chance flood event. The determinations by RMA are based on gage data and USACE flood-related data, satellite imagery, aerial photography, and soil maps, to indicate the severity and/or extent of flooding. In addition, the timing of past floods compared to crop type is used to determine premiums.
FEMA/USACE Related Resources	• **FIRMs:** FIRMs are not used by RMA for making crop insurance premium determinations. The base flood event on a FIRM is a statistical prediction of a flood, not a depiction of an actual event. • **NLD:** RMA does, on occasion, use this data source. It provides information on levee location, condition, and the "Leveed Area.".

Role of Levees	• **Levee Impact:** Levees may have positive or negative impacts on cropland.
	  ○ Positive: May reduce risk of flooding.
	  ○ Negative: Interior drainage can back up on the landside of the levee, causing crop damage – especially if pump stations, flap gates, etc. are not properly operated and maintained. An actual levee breach will

	impact crop insurance premiums. RMA monitors levee repairs with USACE and/or local levee districts.
Summary	• FEMA does not determine crop insurance premiums. • Flood hazard boundaries shown on FIRMs have no impact on the USDA crop insurance program related to premium rating. • A levee may be considered by RMA on a case-by-case basis. It could provide flood risk reduction, but it could also make interior drainage worse. • Data collected for FEMA's flood hazard mapping studies or accreditation per 44 CFR 65.10 may be provided to RMA to assist in rating information, but FEMA will only do so when requested by stakeholders or RMA staff.

The need for additional information on engagement with OFAs should be coordinated through the FEMA Regional Office.

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Critical Facility

For some activities and facilities, even a slight chance of flooding is too great a threat. Typical critical facilities include hospitals, fire stations, police stations, storage of critical records, and similar facilities. These facilities should be given special consideration when formulating regulatory alternatives and floodplain management plans. A critical facility should not be located in a floodplain if at all possible. If a critical facility must be located in a floodplain it should be provided a higher level of protection so that it can continue to function and provide services after the flood. Communities should develop emergency plans to continue to provide these services during the flood.

Under Executive Order 11988, Floodplain Management, Federal agencies funding and/or permitting critical facilities are required to avoid the 0.2 percent (500-year) floodplain or protect the facilities to the 0.2 percent chance flood level.

National Flood Insurance Program Requirements

- 60.22 - Planning Considerations

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FEMA Flood Map Service Center: Search By Address

Navigation

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MSC Search All Products (/portal/advanceSearch)

MSC Products and Tools (/portal/resources/productsandtools)

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- Product Availability (/portal/productAvailability)

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Whether you are in a high risk zone or not, you may need flood insurance (https://www.fema.gov/national-flood-insurance-program) because most homeowners insurance doesn't cover flood damage. If you live in an area with low or moderate flood risk, you are 5 times more likely to experience flood than a fire in your home over the next 30 years. For many, a National Flood Insurance Program's flood insurance policy could cost less than $400 per year. Call your insurance agent today and protect what you've built.

Learn more about steps you can take (https://www.fema.gov/what-mitigation) to reduce flood risk damage.

Search Results—Products for **SAN BUENAVENTURA, CITY OF**

Show ALL Products » (https://msc.fema.gov/portal/availabilitySearch?addcommunity=060419&communityName=SAN

The flood map for the selected area is number **06111C0741F**, effective on **01/29/2021**

DYNAMIC MAP

PRINT MAP/ FIRMette

MAP IMAGE

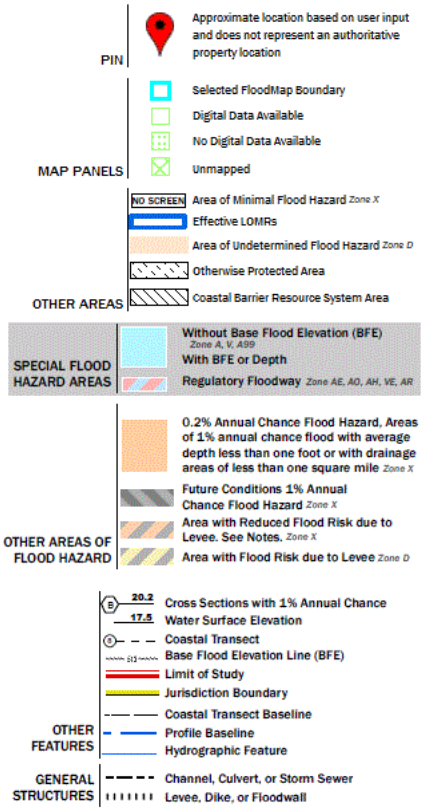
DOWNLOAD FIRM PANEL (https://msc.fema.gov/portal/downloadProduct?productTypeID=FINAL_PRODUCT&productSubTypeID=FIRM_PANEL&productID=06111C0741F)

Changes to this FIRM

Revisions (0)
Amendments (0)
Revalidations (0)

You can choose a new flood map or move the location pin by selecting a different location on the locator map below or by entering a new location in the search field above. It may take a minute or more during peak hours to generate a dynamic FIRMette.

Go To NFHL Viewer » (https://hazards-fema.maps.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d



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Technical Guidance Manual for Stormwater Quality Measures - New Developmer

This page is to communicate information on the revisions to Technical Guidance Manual for Stormwater Co this page is updated, please send a request to David Laak (David.Laak@ventura.org) with "TGM Stakeholder

[NEW] TGM Errata Update 2018 Version

The 2015 TGM Errata Update was updated in 2018 to correct minor errors and unintentional omissions. Du to the evolving nature of stormwater quality management, the TGM may continue to be updated to correct errors, to incorporate new and innovative control measures, or to add the Hydromodification Control Plan.

► Errata Update TGM (June 2018)

► 2018 Errata Update Summary

► 2018 TGM Tool - An updated electronic tool to assist land development project applicants in meeting th new LID requirements under the new Permit. *[To ensure you use the correct version of this tool always che with the agency that has jurisdiction over your project before starting. Links are provided at the bottom of this page.]*

TGM Errata Update 2015 Version

The 2011 TGM was updated in 2015 to correct minor errors and unintentional omissions. Due to the evolvin nature of stormwater quality management, the 2011 TGM may continue to be updated to correct errors, to incorporate new and innovative control measures, or to add the Hydromodification Control Plan.

► Errata TGM (May 2015)

► Errata Comments

The Technical Guidance Manual was approved by the Executive Officer of the LA Regional Board on Jul 13, 2011. The new rules became effective on October 11, 2011. For more information on how the effecti date applies to projects see page 1-8 of the TGM.

► Final 2011 Technical Guidance Manual (July 2011)

► An electronic tool to assist land development project applicants in meeting the new LID requiremer *of this tool always check with the agency that has jurisdiction over your project before starting. Links ar*

► Ventura Stormwater Permit LID Alternative Compliance Stakeholder Meeting Announcement

► July 13, 2011 Approval Letter from Regional Board

Training Materials from June 21st, 2011, Seminar

▶ Morning Presentation (June 2011)

▶ Afternoon Presentation (June 2011)

▶ Flow Charts (June 2011)

Related Documents

▶ Final Technical Guidance Manual unapproved (November 2010)

▶ Transmittal letter to Regional Board (November 2010)

▶ Summary of comments and changes (November 2010)

▶ Effective date language (October 2010)

▶ Comment Letter - Calleguas Municipal Water District (October 2010)

▶ Comment Letter - City of Ventura (October 2010)

▶ Comment Letter - Contech (October 2010)

▶ Comment Letter - Jackson, DeMarco, Tidus & Peckenpaugh (October 2010)

▶ Comment Letter - Jensen Design (October 2010)

▶ Comment Letter - Natural Resources Defense Council & Heal the Bay (October 2010)

▶ Comment Letter - Paul Crabtree (October 2010)

▶ Comment Letters Summary (October 2010)

▶ Presentation - Rebecca Winer-Skonovd - TGM Revision, Step-by-Step Process (September 2010)

▶ Presentation - Lisa Austin - Land Development TGM Revisions (September 2010)

▶ Ventura County TGM for Stormwater Quality Control Measures (September 2010)

▶ Ventura County Technical Guidance Manual for Stormwater Quality Control Measures (May 2010)

▶ Presentation - Meeting Purpose and Objectives (January 2010)

▶ Presentation - Lisa Austin, Geosytnec Consultants (January 2010)

▶ Presentation - Rebecca Winer-Skonovd, Larry Walker Associates (January 2010)

▶ Meeting agenda (January 2010)

▶ Draft process flow chart (January 2010)

▶ Draft alternative compliance flow chart (January 2010)

▶ Draft outline of Technical Guidance Manual (January 2010)

Technical Guidance Manual (July 2002) - Applicable only to projects with applications deemed complete pr

▶ Main Report (includes page updates)

The member agencies of the Ventura Countywide Stormwater Quality Management Program are:

CITY OF OJAI CALIFORNIA
CITY OF SAN BUENAVENTURA FOUNDED 1782
PUBLIC
VENTURA COUNTY
WORKS
CITY OF PORT HUENEME VENTURA COUNTY, CA
CITY OF OXNARD CALIFORNIA
CITY OF FILLMORE CALIFORNIA
COUNTY of VENTURA
CITY C

May 2021

DRAFT

2020 Urban Water Management Plan

for the City of San Buenaventura

Prepared by Kennedy/Jenks Consultants

Kennedy/Jenks Consultants

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2020 Urban Water Management Plan

DRAFT

May 26, 2021

Prepared for

City of San Buenaventura
336 Sanjon Road
Ventura, CA 93002

K/J Project No. 2044229*00

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H Groundwater Sustainability Plan Oxnard Subbasin
I Santa Paula Basin 2010 Amended and Restated Stipulated Judgment
J Data to Document Consistency with Delta Plan Policy WR P1
K Reporting of Energy Intensity of Water
L 2020 Water Shortage Event Contingency Plan

Acronyms

The following abbreviations and acronyms are used in this report.

AB	Assembly Bill
Act	Urban Water Management Planning Act
AF	acre-feet
AFY	acre-feet per year
AMI	Advanced Metering Infrastructure

AWPF	Advanced Water Purification Facility
BMPs	Best Management Practices
CALGreen	California Green Building Code
Casitas	Casitas Municipal Water District
CAT	Climate Action Team
CCF	Hundred Cubic Feet
CEQA	California Environmental Quality Act
Cfs	cubic feet per second
City	City of San Buenaventura (Ventura)
COG	Council of Governments
CWRR	Comprehensive Water Resources Report
DDW	State Water Resources Control Board Division of Drinking Water
DMMs	Demand Management Measures
DWR	Department of Water Resources
EIR	environmental impact report
EPA	Environmental Protection Agency
ERP	Emergency Response Plan
ETo	evapotranspiration
FCGMA	Fox Canyon Groundwater Management Agency
Foster Park	Ventura River Foster Park Area
FY	fiscal year
GIS	Geographic Information System
GPCD	gallons per capita per day
Gpf	gallons per flush
Gpm	gallons per minute
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
HCD	State Department of Housing and Community Development
HCF	hundred cubic feet
JPA	Joint Powers Authority
kWH	kilowatt-hour
LAFCO	Local Agency Formation Commission
MBGSA	Mound Basin Groundwater Sustainability Agency
MCL	maximum contaminant level
MF	microfiltration
MG	million gallons

mg/L	milligrams per liter
MGD	million gallons per day
MOU	Memorandum of Understanding
NPDES	National Pollutant Discharge Elimination System
OVSD	Ojai Valley Sanitary District
Plan	Urban Water Management Plan
RHNA	Regional Housing Needs Allocation
RWQCB	Regional Water Quality Control Board
SBX7-7	Senate Bill 7 of Special Extended Session 7
SCAG	Southern California Association of Governments
SCRE	Santa Clara River Estuary
Sf	square feet
SGMA	Sustainable Groundwater Management Act
SGPWA	San Gorgonio Pass Water Agency
SPBPA	Santa Paula Basin Pumpers Association
SWP	State Water Project
TAC	Technical Advisory Committee
TDS	Total Dissolved Solids
United	United Water Conservation District
UF	Ultrafiltration
UVRGA	Upper Ventura River Groundwater Agency
UWMP	Urban Water Management Plan
VCFCD	Ventura County Flood Control District
VCG	Ventura County Council of Governments
Ventura Water	City of San Buenaventura Water and Wastewater Department
VWRF	Ventura Water Reclamation Facility
WEAP	Water Efficiency Allocation Plan
WSECP	Water Shortage Event Contingency Plan
WSS	Water Sense Specification

Section 1: Introduction/Lay Description

1.1 Overview

This volume presents the Urban Water Management Plan 2020 (Plan) for the City of San Buenaventura and its Ventura Water Department (the City or Ventura Water) service area, which includes the City boundary as well as unincorporated areas within the City's Sphere of Influence. This chapter describes the general purpose of the Plan, discusses Plan implementation, and provides general information about the service area characteristics. A list of acronyms and abbreviations is provided at the end of the table of contents.

1.2 Purpose

An Urban Water Management Plan (UWMP) is a planning tool that generally guides the actions of water management agencies. It provides managers and the public with a broad perspective on a number of water supply issues. It is not a substitute for project-specific planning documents, nor was it intended to be when mandated by the State Legislature. For example, the Legislature mandated that a plan includes a section which "describes the opportunities for exchanges or water transfers on a short-term or long-term basis." (California Urban Water Management Planning Act, Article 2, Section 10630(d).) The identification of such opportunities, and the inclusion of those opportunities in a general water service reliability analysis, neither commits a water management agency to pursue a particular water exchange/transfer opportunity, nor precludes a water management agency from exploring exchange/transfer opportunities not identified in the plan. When specific projects are chosen to be implemented, detailed project plans are developed, environmental analysis, if required, is prepared, and financial and operational plans are detailed.

In short, this Plan is a management tool, providing a framework for action, but not functioning as a detailed project development or action. It is important that this Plan be viewed as a long-term, general planning document, rather than as an exact blueprint for supply and demand management. Water management in California is not a matter of certainty and planning projections may change in response to a number of factors. From this perspective, it is appropriate to look at the Plan as a general planning framework, not a specific action plan. It is an effort to generally answer a series of planning questions including:

- What are the potential sources of supply and what is the reasonable probable yield from them?
- What is the probable demand, given a reasonable set of assumptions about growth and implementation of good water management practices?
- How well do supply and demand figures match up, assuming that the various probable supplies will be pursued by the implementing agency?

Using these "framework" questions and resulting answers, the implementing agency will pursue feasible and cost-effective options and opportunities to meet demands.

The California Urban Water Management Planning Act (Act) requires preparation of a plan that:

- Accomplishes water supply planning over a 20-year period in five-year increments (the City is going beyond the requirements of the Act by developing a plan which spans 25 years.)

- Identifies and quantifies adequate water supplies, including recycled water, for existing and future demands, in normal, single-dry, and multiple-dry years.

- Implements conservation and efficient use of urban water supplies.

State legislation, Senate Bill 7 of Special Extended Session 7 (SBX7-7) was signed into law in November 2009, which calls for progress towards a 20 percent reduction in per capita water use statewide by 2020. The legislation mandated each urban retail supplier develop and report an interim 2015 water use target, their baseline daily per capita use and 2020 compliance daily per capita use, along with the basis for determining those estimates. This UWMP reports on Ventura Water's final progress in meeting the SBX7-7 targets.

In short, the Plan answers the question: *Will there be enough water for the area served by the City in future years, and what mix of programs should be explored for making this water available?*

It is the stated goal of the City to deliver a reliable and high-quality water supply for customers, even during dry periods. The analysis in this Plan documents that it is necessary for the City to implement planned water supply projects in order to meet normal and dry-year demands. In the near term (2020-2026) until such time as planned supplies come on-line, anticipated supplies in a multiple-dry year are insufficient and the City would have to call on existing customers to undertake extraordinary conservation. After planned water supplies are available the potential for a water supply shortage is lessened.

1.2.1 Relationship to the City's Annual Comprehensive Water Resources Report

The Urban Water Management Plan is required by the California State Water Code. The UWMP is a long-term planning tool that provides water purveyors and their customers a broad perspective on water supply issues over a 20-year period (this plan goes further and looks at 25 years). The UWMP is a management tool, providing the framework for action but not functioning as a detailed project development plan.

In 2013 the City Council directed Ventura Water and the Community Development Department to work together to develop a short-term balance of water supply and demand. The result of this collaboration is the annual Comprehensive Water Resources Report (CWRR). The CWRR specifically focuses on water demand of approved (entitled) projects only. The CWRR focuses on a short timeframe and on near-term demand changes. The CWRR estimates demands from approved projects whereas the UWMP estimates demands from population projections. In the latest 2021 CWRR the estimated demand of approved projects would be fully vested by year 2025. This latest CWRR estimates demand to the year 2030 using a growth rate of 0.54 percent (the Department of Finance historical data for City of San Buenaventura population growth).

Understanding and monitoring water supply and demand is essential to planning for and managing a stable and reliable water system to support the community and economic growth. The City's supply and demand play an important role and dramatically influence the planning for, development of, and investment of significant dollars in capital improvements, maintaining current water supply and investing in new water supplies. Therefore, the annual CWRR is an important tool that the City utilizes to update the City's annual projected water supply and demand.

1.3 Structure and Organization of the Plan

This plan is organized as follows:

- Introduction
- Water Demand
  - SBX7-7 Reduction
- Water Resources
- Recycled Water
- Water Quality
- Reliability Planning
- Demand Management Measures
- References
- Appendices

Appendix A contains a checklist documenting how this UWMP meets the requirements of the Urban Water Management Planning Act and SBX7-7. Starting with the 2015 UWMP, urban water suppliers are required to report and submit information in standardized tables developed by the Department of Water Resources (DWR). These standardized tables are provided as Appendix B of this document.

This plan is being prepared for Ventura Water, a Department of the City, and is an individual rather than Regional Urban Water Management Plan. Data provided in this plan are reported in calendar years rather than fiscal years. To the extent possible water volumes are reported in acre-feet (AF). Tables 1-1 and 1-2 document the structure of this plan.

TABLE 1-1
PUBLIC WATER SYSTEM COVERED BY THIS PLAN

Public Water System Number	Public Water System Name	# of Municipal Connections 2020	Volume of Water Supplied 2020 (AF)*
CA5610017	City of San Buenaventura Water Department	32,285	13,556

Notes: *Includes all metered consumption

TABLE 1-2
AGENCY AND PLAN STRUCTURE

Type of Agency	
☐	Agency is a Wholesaler
☑	Agency is a Retailer
Fiscal or Calendar Year	
☑	UWMP Tables are in Calendar Year
☐	UWMP Tables are in Fiscal Year
Units of Measure Used in this UWMP	
☑	Acre Feet (AF)
☐	Million Gallons (MG)
☐	Hundred Cubic Feet (CCF)

1.4 Implementation of the Plan

Preparation of UWMP 2020 was coordinated by Ventura Water. Ventura Water staff met with and coordinated the development of the UWMP with various City Departments as well as the Ventura Water Commission. Based on the City's 2005 General Plan, Sustainable Infrastructure, Policy 5B, Ventura Water has adopted guidelines which require that adequate water supply, system capacities, and wastewater collection system and treatment capacities are available before new development can be approved by the Community Development Department. This subsection provides the cooperative framework within which the Plan will be implemented including agency coordination, public outreach, and resources maximization.

1.4.1 Joint Preparation of the Plan

The UWMP Act requires a water supplier to coordinate the preparation of its plan with other appropriate agencies in the area. This includes other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable. Various agencies are involved in supplying water to the City or having jurisdiction over a portion of the water resources. This section briefly discusses each one. Table 1-3 summarizes the efforts the City has taken to include the various City Departments, agencies, and citizens in the preparation of this document.

TABLE 1-3
AGENCY COORDINATION SUMMARY [PENDING]

	Participated in UWMP Development	Commented on the Draft	Attended Public Meetings	Contacted for Assistance	Received Copy of Draft	Sent Notice of Intention to Adopt	Not Involved / No Information
City of San Buenaventura Community Development Department	X					X	
City of Oxnard Public Works Water Division						X	
County of Ventura Resource Management Agency						X	
Calleguas Municipal Water District	X					X	
Casitas Municipal Water District	X					X	
Fox Canyon Groundwater Management Agency						X	
United Water Conservation District						X	
Santa Paula Basin Technical Advisory Committee						X	
Upper Ventura River Groundwater Agency						X	
Mound Basin Groundwater Sustainability Agency						X	
Ojai Valley Sanitary District						X	
Ventura County Local Agency Formation Commission						X	

- **City of San Buenaventura Community Development Department**
  The Community Development Department is responsible for planning and zoning, economic development, housing and redevelopment for the City of San Buenaventura. The department works with various city departments, city commissions, and the City Council to guide and provide advice regarding growth in the city. The Community Development Department works with the community and City Council to create and document the vision for land use in the city and the various policies and regulations applicable to redevelopment and new development. The Community Development Department was consulted regarding changes in population and economic activity in the service area which may affect water demands.

- **City of Oxnard Public Water Works Division**
  The City of Oxnard is a neighboring jurisdiction that was contacted to be given the opportunity to provide input to the 2020 UWMP.

- **Ventura County Resource Management Agency**
  Ventura Water serves a very minor amount of water to connections outside the City limits within the unincorporated County. These connections must meet the City's policy for water connections (Municipal Code Section 22.110.055). Ventura Water notified the County Resource Management Agency of the UWMP Update and the methods by which the County could provide input to the plan. In December 2015, the County of Ventura started an update to its General Plan; Ventura Water participated in the General Plan Update. The 2040 General Plan Update was adopted in October of 2020.

- **Fox Canyon Groundwater Management Agency (FCGMA)**
  The FCGMA was created by state legislation in 1982 to manage local groundwater basins and resources in a manner to reduce overdraft of the Oxnard Plain and stop seawater intrusion. A major goal of the FCGMA is to regulate and reduce future extractions of groundwater from the Oxnard Plain aquifers, in order to operate the basin at a safe yield. Ventura Water withdraws water from the Oxnard Plain Groundwater Basin and is subject to the management policies of the FCGMA. Ventura Water notified FCGMA of the 2020 UWMP Update and the methods by which the FCGMA could provide input to the plan.

- **United Water Conservation District (United)**
  United is primarily a groundwater recharger and a wholesale purveyor in central Ventura County and does not provide any water directly to the City. However, all of the City's groundwater wells within the Mound, Oxnard Plain, and Santa Paula groundwater basins are within United's boundaries and are subject to United's semi-annual extraction fees. Ventura Water notified United of the 2020 UWMP Update and the methods by which United could provide input to the plan.

- **Santa Paula Basin Technical Advisory Committee (TAC)**
  The Santa Paula Basin is subject to a stipulated judgment and is managed by the Santa Paula Basin Technical Advisory Committee (TAC) with equal representation from United Water Conservation District (UWCD), the Santa Paula Basin Pumpers Association (SPBPA), and Ventura Water. The TAC is charged with establishing a program to "monitor conditions in the basin, including but not necessarily limited to verification of future pumping amounts, measurements of groundwater levels, estimates of inflow to

and outflow from the basin, increases and decreases in groundwater storage, and analyses of groundwater quality." The Judgment also allows for the development of a management plan for the operation of the basin and empowers the TAC to determine the safe yield of the basin. Ventura Water notified the Santa Paula Basin TAC of the 2020 UWMP Update and the methods by which the TAC could provide input to the plan.

- **Upper Ventura River Groundwater Agency (UVRGA)**
  The Upper Ventura River Groundwater Agency was created in 2016 by several agencies using a Joint Powers Agreement. In 2017, the Agency became a Groundwater Sustainability Agency. The UVRGA is managed by a seven-member Board of Directors – five public agency directors, including Ventura Water, and two stakeholder directors that represent environmental and agricultural interests.[1]

  Ventura Water notified the UVRGA of the 2020 UWMP Update and the methods by which the UVRGA could provide input to the plan.

- **Mound Basin Groundwater Sustainability Agency (MBGSA)**
  The Mound Basin Groundwater Sustainability Agency (MBGSA) was created in 2017 by several agencies using a Joint Power Agreement and became a Groundwater Sustainability Agency in June 2017. The MBGSA includes United Water Conservation District, the County of Ventura, the City of San Buenaventura, the Mound Basin Ag Water Group (agricultural stakeholder), and an environmental stakeholder. "United is authorized under the California Water Code to conduct water resource investigations, acquire water rights, build facilities to store and recharge water, construct wells and pipelines for water deliveries, commence actions involving water rights and water use, and prevent interference with or diminution of stream/river flows and their associated natural subterranean supply of water (California Water Code, section 74500 et al.). The County of Ventura exercises water management and land use authority on land overlying the entire county including Fillmore and Piru Basins. The City of [San Buenaventura] is a local municipality that exercises water supply, water management, and land use authority within the city's boundaries."[2]

  Ventura Water notified the MBGSA of the 2020 UWMP Update and the methods by which the MBGSA could provide input to the plan.

- **Ojai Valley Sanitary District (OVSD)**
  The OVSD is an adjacent district that collects and treats wastewater from a population of approximately 20,000 across the City of Ojai, the unincorporated Ojai Valley, and the north Ventura Avenue area. Ventura Water notified the OVSD of the 2020 UWMP Update and the methods by which the OVSD could provide input to the plan.

- **Ventura County Local Agency Formation Commission**
  The Ventura Local Agency Formation Commission (LAFCo) was formed and operates under the provisions of state law, specifically what is now known as the Cortese-Knox-

[1] Upper Ventura River Groundwater Agency, https://uvrgroundwater.org/about/
[2] Mound Basin Groundwater Sustainability Agency, https://www.moundbasingsa.org/about-us/

Hertzberg Local Government Reorganization Act of 2000 (California Government Code Section 56000 et seq.). State law provides for LAFCos to be formed as independent agencies in each county in California. LAFCos implement state law requirements and state and local policies relating to boundary changes for cities and most special districts, including spheres of influence, incorporations, annexations, reorganizations and other changes of organization. In this capacity the Ventura LAFCo is the boundary agency for cities and most special districts in Ventura County.

All LAFCos have general objectives such as to, 1) encourage the orderly formation and expansion of local government agencies, 2) preserve agricultural land resources, 3) discourage urban sprawl. Additionally, all LAFCos have authorities such as to, 1) regulate boundary changes, 2) establish spheres of influence – the probable physical boundaries and service area of a city or special district, and 3) conduct reviews of public services and special studies, 4) initiate special district consolidations or dissolutions, and 5) act on out of agency service agreements between public agencies and between public agencies and private parties.[3]

Ventura Water notified the LAFCo of the 2020 UWMP Update and the methods by which the LAFCo could provide input to the plan.

- **Casitas Municipal Water District (Casitas)**
  Casitas is a wholesaler of treated surface water from Lake Casitas to the City under the terms and conditions of the 2017 Agreement. Casitas' service area is in Western Ventura County, including the City of Ojai, Upper Ojai, the Ventura River Valley area, the City of Ventura to Mills Road, and the Rincon and beach area to the ocean and Santa Barbara County Line. Casitas supplies water to 60,000-70,000 people and to hundreds of farms. The western portion of the City of San Buenaventura is within the Casitas service area[4]. Ventura Water notified Casitas of the 2020 UWMP Update and the methods by which Casitas could provide input to the Plan.

1.4.2 Plan Adoption

The City began preparation of this Plan in August 2020. A draft of the plan was presented to and reviewed by the City Water Commission on April 27 and May 25, 2021. The final draft of the Plan was adopted by the City Council on [TBD] by Resolution No. 2021-[TBD] (Appendix C) and submitted to DWR within 30 days of City Council approval. This plan includes all information necessary to meet the requirements of Water Conservation Act of 2009 (Wat. Code, §§ 10608.12-10608.64) and the Urban Water Management Planning Act (Wat. Code, §§ 10610-10656). Additionally, the plan has also been submitted to all appropriate entities and made available for public review per the requirements of the Urban Water Management Planning Act.

[3] Ventura Local Agency Formation Commission, https://www.ventura.lafco.ca.gov/about-us-2/
[4] Casitas Municipal Water District, https://www.casitaswater.org/about-us/about-casitas-water

1.4.3 Public Outreach

Urban water agencies preparing plans are required to hold a public hearing on the UWMP prior to its adoption. In response to these requirements, a public hearing was conducted [TBD] by the City to receive public comment and input on the UWMP. Table 1-4 presents a timeline for public participation during the development of the Plan. A copy of the public outreach materials, including paid advertisements, newsletter covers, website postings, and invitation letters are attached in Appendix D.

TABLE 1-4
PUBLIC PARTICIPATION TIMELINE

Public Workshops and Hearings	Date	Public Participation Task
UWMP Status Update	March 23, 2021	Presentation at City Water Commission
UWMP Administrative Draft	April 27, 2021	Presentation at City Water Commission
UWMP Final Draft, Final Draft Available for Public Review	May 25, 2021	Presentation to City Water Commission, Available for Public Review
Public Hearing and Adoption	June 14, 2021	City Council Meeting

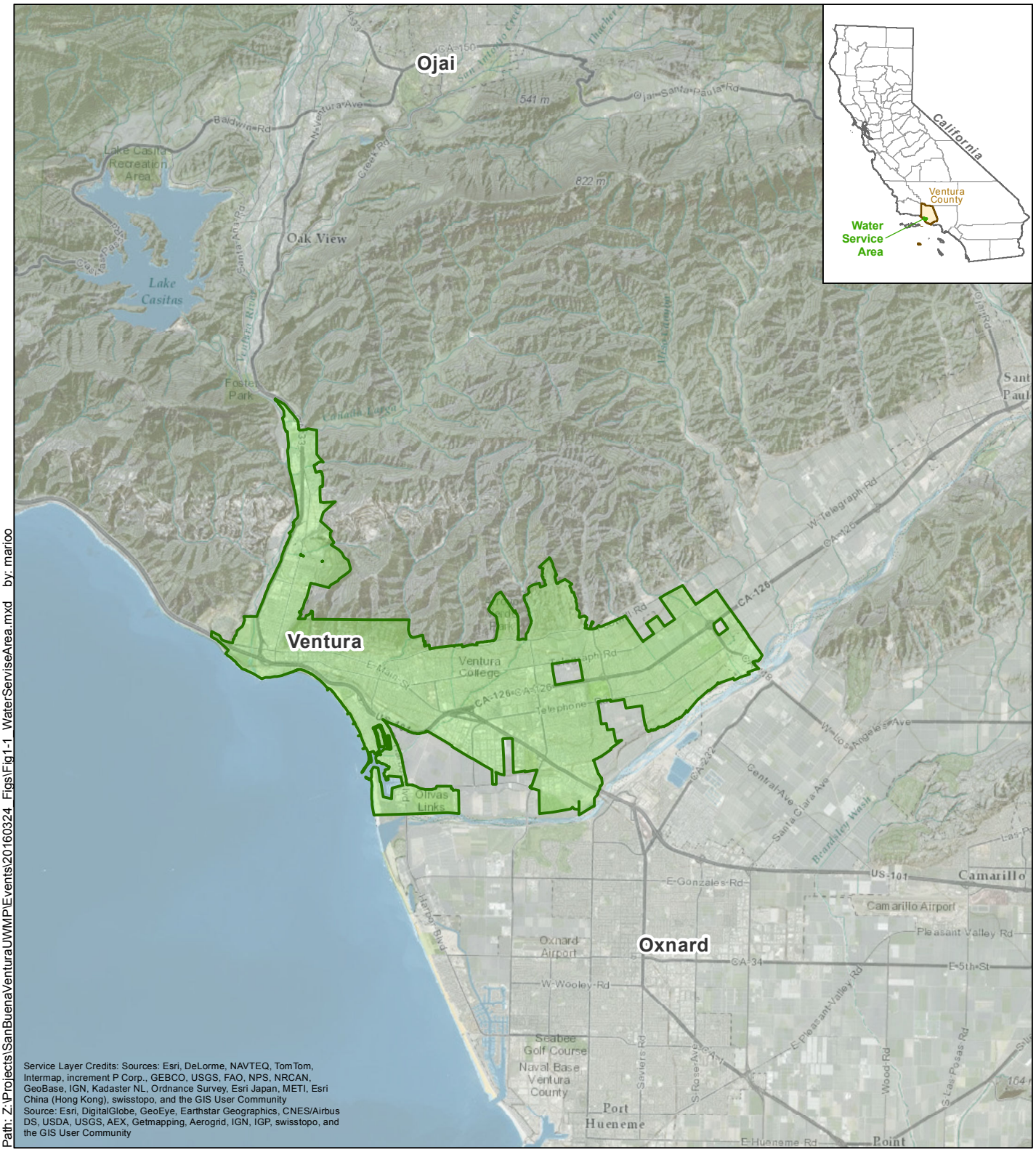
1.5 System Description

The City is located 62 miles north of Los Angeles and 30 miles south of Santa Barbara along the California coastline. The City's planning area is bounded by the Ventura River on the west, Foster Park on the north, Franklin Barranca and the Santa Clara River to the east, with the Pacific Ocean as the southern boundary. The total planning area encompasses approximately 40 square miles. The City water service area is shown on Figure 1-1.

The City developed as a result of the ninth and last mission founded in California by Father Junipero Serra in 1782. In 1866, the City incorporated an area of about one square mile around the original Mission San Buenaventura. Since that time, the City has grown. An estimated population of 113,500[5] is currently supplied water from the City's water system. This includes several unincorporated County areas, such as the upper North Ventura Avenue area to the north and developing areas east of the City boundary.

The City Charter provides for a City Council-Manager form of government. A seven-member City Council is elected at large for four-year terms, with the Mayor selected by the City Council for a two-year term. The City of San Buenaventura Water Commission was formed in 2015 to provide policy guidance on water and wastewater issues to City Council as representatives of the community and Ventura Water customers. The Water Commission reviews and makes advisory recommendations regarding water rates, water resources infrastructure projects in the

[5] This population estimate is based the 2021 Comprehensive Water Resources Report. Current (2020) population as estimated by the DWR Population Tool (described in section 2.3.20) is 115,815. The calculation of gallons per capita per day targets in section 2.3 uses the population as estimated by the DWR Population Tool.



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Legend

Water Service Area

N

0 7,000 14,000

Scale: Feet

Kennedy/Jenks Consultants

City of Ventura UWMP
Ventura, CA

Ventura Water Service Area

KJ 1644212*00
January 2021

Figure 1-1

five-year capital improvement program, the integrated water resources management plan, water supply options, the Urban Water Management Plan approval process, a water dedication and in-lieu fee requirement, and other water resource issues.

The Spanish Fathers of Mission San Buenaventura developed the first water system for the City. It consisted of an aqueduct (now abandoned) to convey water from the Ventura River, near San Antonio Creek, to a reservoir located behind the Mission.

During subsequent development around the Mission, additional groundwater was obtained from wells in the Ventura and Santa Clara River basins. Water facilities were developed and operated for the City by several individuals and companies over the period of 1869 to 1923. In 1923, the City acquired the water system, along with its water rights from the Ventura River, from the Southern California Edison Company and assumed the responsibility of providing water to City residents. In years following, the City developed additional sources of surface and groundwater, including wells and improvements to the surface water diversion from the Ventura River. Also, since 1960, the City has purchased surface water from Casitas Municipal Water District to supplement its water supplies. As the City boundaries expanded east, the City took over other water systems such as Mound Water Company and Saticoy Water Company. As development occurs on the east side of the City, additional groundwater facilities have also been completed to meet increasing demands.

Currently, the City's water system serves approximately 32,285 water service connections, which includes the population of the City plus some additional areas outside the City boundaries. The western portion of the City is within the Casitas Municipal Water District service area. The mid and eastern portion of the City are within United Water Conservation District's boundaries. Water service is provided to all residential, commercial, industrial and irrigation customers, including fire protection users.

The City water system is a geographically complex system of 16 pressure zones, 10 active wells, 19 booster stations, approximately 385 miles of pipelines ranging from 4-inches to 36-inches in diameter, and a total storage capacity of approximately 52 million gallons (MG) in 27 tanks and reservoirs. The system delivers water from sea level to a maximum elevation of over 1,000 feet. The City operates three purification facilities, including one membrane filtration treatment plant for surface water sources on the west side of the City, and two iron/manganese removal treatment plants for groundwater sources on the east side (City of San Buenaventura 2011). The City also maintains and operates the Ventura Water Reclamation Facility for wastewater treatment and reclamation. See Section 4 for further description of the Reclamation Facility.

1.6 Land Use

The City's 2005 General Plan is the basis for understanding land use in the Ventura Water service area. Each year as part of the CWRR, Ventura Water updates the land use information from the 2005 General Plan to reflect projects built in the past year. Table 1-5 provides a summary of land uses in the water service area as estimated through 2020. Based on the "build-out" envisioned in the 2005 General Plan Table 1-5 provides a summary of remaining developable land.

TABLE 1-5
SUMMARY EXISTING LAND USE – DECEMBER 2020

Land Use	As of December 2020	Potential Remaining Development
Residential (units)	3,230	5,088
Retail (sf)	447,026	794,351
Office (sf)	474,521	738,693
Industrial (sf)	1,191,437	1,043,696
Hotel (sf)	25,360	504,640

1.7 Population

The City water service area is an established community comprised primarily of residential areas with opportunities for infill development. Large commercial and industrial areas exist along Main Street, Harbor Boulevard, Telephone Road, Ventura Avenue, Telegraph Road and Victoria Avenue (City of San Buenaventura 2011). In 2005, the City adopted the 2005 Ventura General Plan to redirect future growth toward 'Infill First' with an emphasis on encouraging more dense development of housing alongside commercial uses in the above-mentioned commercial corridors, as well as Johnson Drive and Wells Road. The City's estimated population growth for the water service area is shown in Table 1-6. The population numbers reflect both the population within the City limits as well as the minor number of customers in the unincorporated county.

Future projections for areas within the City reflect a 0.54 percent annual growth rate through 2030[6]. From 2030-2045, the future projections for areas within the City also reflect a 0.54 percent annual growth rate[7]. Population estimates were extrapolated to fit five-year increments. It is important to note that these figures are not intended to represent support for, nor reflect any commitment to, this level of growth. Rather, it is to provide a safe margin in planning for long-term water improvements that might be needed given the amount of growth that could be allowed under the City's 2005 updated General Plan as assessed in the certified EIR.

TABLE 1-6
POPULATION PROJECTIONS

	2020	2025	2030	2035	2040	2045
Ventura Water Service Area	113,500	116,598	119,780	123,049	126,408	129,858

[6] Projections were provided by the 2021 Comprehensive Water Resources Report.
[7] Maximum historic growth rate that the City of Ventura saw prior to Thomas Fire (2010-2018).

1.8 Social, Economic and Demographic Factors Affecting Water Management

The following information has been taken from the 2019 Local Profile for San Buenaventura prepared by the Southern California Association of Governments. The 2019 Local Profile was the most recent information that could be obtained for the City.

Between 2000 and 2018, the total population of the City of San Buenaventura increased by 10,353 to 111,269. During this 18-year period, the city's population growth rate was lower than the Ventura County rate. The city, while the County seat, makes up 13 percent of the total population of Ventura County. Between 2000 and 2018, the 55-64 age group experienced the largest increase in share of the city's population, growing from 8.3 to 13.7 percent. Conversely the 35-54 age group declined as percent of the population from 32 to 25.6 percent. In this same timeframe, the share of Hispanic population in the city increased from 24.3 percent to 35.4 percent and the share of Non-Hispanic White population in the city decreased from 68.1 percent to 56.3 percent. The share of Non-Hispanic Asian population in the city increased modestly, from 2.9 percent to 3.7 percent as did the share of the Non-Hispanic Black population (1.3 percent to 1.4 percent). There was a modest decline in the share of Non-Hispanic American Indian or Alaska Native population in the city from 0.6 percent to 0.4 percent.

Between 2000 and 2018, the total number of households in the City of San Buenaventura increased by 3,299 units, or 8.6 percent, lower than the county growth rate of 12.5 percent. As of 2018 the City's average household size was 2.6, lower than the county average of 3.1. Seventy seven percent of all city households had 3 people or fewer and about 29 percent of the households were single-person households. A small percentage of households, about 10 percent had 5 people or more. Between 2000 and 2018, homeownership rates decreased and the share of renters increased. In 2018 approximately 46.2 percent of households were renters and 53.8 owners. In 2018, the median home sales price in the city was $583,000, the same as that in the county overall.

The housing stock consist primarily of single-family detached homes (approximately 89%) with limited amounts of multi-family housing (approximately 11%).

The majority of the City of San Buenaventura housing stock pre-dates 1980 as shown in Table 1-7.

TABLE 1-7
HOUSING CHARACTERISTICS CITY OF SAN BUENAVENTURA (2018)

Housing Age	Percent of Housing Stock	Housing Age	Percent of Housing Stock
1939 and earlier	7.6	1980 to 1989	13.2
1940 to 1949	4.2	1990 to 1999	8.0
1950 to 1959	15.2	2000 to 2009	8.5
1960 to 1969	22.4	2010 to 2018	4
1970 to 1979	20.0		

About 34 percent of households earned less than $50,000 annually and approximately 33 percent of households earned $100,000 or more. From 2000 to 2018, median household income increased by $20,693, from $52,166 to $72,859. Housing costs are significant portion of income. In 2018 housing costs accounted for an average of 34.7 percent of total household income for renters and an average of 22.5 percent of total household income for homeowners.

Data shows a decreasing number of jobs in the city from 2007 to 2018 with a significant decline in jobs in the manufacturing sector (17.2 percent) and construction sector (declined of 37.7 percent), and a modest decline in administrative and professional jobs (6.1 percent).

1.9 Climate

The City has a climate that is similar to a Mediterranean coastal city. That is, the winters are cool, and the summers are mild. The average temperature range is in the 70s and it is uncommon for the temperature to drop below freezing. The area has an average rainfall of approximately 13.5 inches. Table 1-8 shows the average annual climate information by month.

TABLE 1-8
ANNUAL CLIMATE INFORMATION

	Jan	Feb	Mar	Apr	May	Jun
Standard Monthly Average ETo (in)	2.5	2.6	3.7	4.6	5.1	5.3
Average Rainfall (in)	3.51	2.73	1.89	0.90	0.29	0.04
Average High Temperature (ºF)	66.9	65.3	68.2	68.0	67.7	70.9

	Jul	Aug	Sept	Oct	Nov	Dec
Standard Monthly Average ETo (in)	5.9	5.5	4.3	3.4	2.6	2.2
Average Rainfall (in)	0.03	0.01	0.07	0.81	0.81	2.47
Average High Temperature (ºF)	73.0	74.3	74.3	73.7	71.2	69.9

Source:
Evapotranspiration (ETo) data from Station #152 in the City of San Buenaventura as provided on the CIMIS website database at www.cimis.water.ca.gov for the period of record from January 2000 to November 2020.
The average rainfall data is from Ventura County Watershed Protection District's web site for Station 066E, https://www.vcwatershed.net/hydrodata/php/getstations.php?dataset=rain_hour&order=site_id, for the period October 2005 to September 2020.
The average temperature figures are from the Western Regional Climate Center web site at www.wrcc.dri.edu for Station 049285 VENTURA.

1.10 Potential Effects of Climate Change

A topic of growing concern for water planners and managers is climate change and the potential impacts it could have on California's future water supplies. Climate change models have predicted that potential effects from climatic changes will result in increased temperature, early snow melt, and a rise in sea level.

In the 2013 update of the *DWR California Water Plan*, the implications of future climate conditions are evaluated. These changing hydrological conditions could affect future planning efforts, which are typically based on historic conditions. The *California Water Plan* identifies the following probable impacts due to changes in temperature and precipitation:

- More winter runoff and less spring/summer runoff due to warmer temperatures.

- Greater extremes in flooding and droughts.
- Greater water demand for irrigation and landscape water due to increased temperatures and their impacts on plant water needs.
- Increased sea level rise, increased threat of coastal flooding, and salt water intrusion into coastal groundwater aquifers.

In the 2019 report of *Projected Changes in Ventura County Climate* (Oakley et. al. 2019), the implications of future climate conditions are evaluated. These changing hydrological conditions could affect future planning efforts, which are typically based on historic conditions. The report of *Projected Changes in Ventura County Climate* identifies the following probable impacts due to changes in temperature, precipitation, evaporative demand, and other variables:

- Increases in both maximum and minimum temperatures and heat extremes.
- More intense precipitation focused during the winter season.
- Increased evapotranspiration.
- Increased drought risk.
- Potential for longer wildfire season with more ignitions as population growth continues.
- Reduced marine stratus.
- Reduction in Sierra Nevada snowpack.
- Longer duration and more intense atmospheric rivers.

Even without population changes, water demand could increase. Precipitation and temperature influence water demand for outdoor landscaping and irrigated agriculture. It is typical that about half of the water used by residential development is for outdoor use and therefore it is assumed that outdoor water use is a large component of the City of San Buenaventura water demands.

1.11 Fundamental Findings of the Urban Water Management Plan

It is the stated goal of the City to deliver a reliable and high quality water supply for customers, even during dry periods. The analysis in this Plan documents that it is necessary for the City to implement planned water supply projects in order to meet normal and dry-year demands. In the near term (2021 to 2024) until such time as planned supplies come on-line, there is little buffer between supplies and demands and it may be necessary for the City to call on existing customers to undertake extraordinary conservation should drought persist. After planned water supplies are available the potential for a water supply shortage is lessened.

Section 2: Water Demands

2.1 Overview

This chapter describes historic and current water usage and the methodology used to project future demands within the City's service area. The City's water system provides potable water to residential, commercial, institutional, industrial, and irrigation customers. Untreated water is provided to an industrial user and a few irrigation customers in the vicinity of the raw water pipeline system in the North Ventura Avenue area. Recycled water is provided for general irrigation of two golf courses, a City park, and landscape irrigation along the existing distribution alignment. The City's water use sectors are described below[8].

- **Residential Sector**
  The residential sector of the City is comprised of single and multi-family residential customers. The residential accounts serve apartment and condominium complexes as well as mobile home parks. The residential sector represents approximately 66 percent of the City's total water consumption. Within the residential sector, single family accounts make up approximately 61 percent of the total residential demand.

- **Commercial/Institutional Sector**
  The City contains several different types of commercial/institutional customers including retail establishments, office buildings, laundries, schools, prisons, hospitals nursing homes, churches, and campgrounds. The City includes several tourist-driven businesses such as hotels, which benefit from the high volume of tourist traffic. Currently, there are approximately 2,700 commercial/institutional accounts. The commercial/institutional sector accounts for approximately 25 percent of the City's water consumption.

- **Industrial Sector**
  The City contains a relatively small industrial sector including manufacturing. Currently, there are two industrial accounts. The industrial sector utilizes approximately less than one percent of the City's water demand.

- **Landscape Irrigation Sector**
  This sector only includes water usage from dedicated irrigation meters. Water used for irrigation on properties without separate irrigation meters is included in other sectors. The City's landscape metered uses include assessment districts, contract parks, City parks, cemeteries, median strips, golf courses and other irrigation areas. The landscape irrigation sector accounts for approximately three and a half percent of the City's water consumption.

[8] Account quantities and consumption percentages are derived from the 2020 Water Deliveries Report.

- **Other Uses**
  The City has other miscellaneous usage, which include the following: fireline consumption, temporary construction meters, fire training. This usage is estimated to be one percent of the total water demand.

- **Recycled Water**
  The City provides recycled water delivered from the City's Water Reclamation Facility for general irrigation at two golf courses, a City park, and landscape irrigation along the existing distribution alignment. This usage accounts for approximately four percent of total water demand[9].

- **Water Loss**
  Water loss is estimated based on a comparison of billing records (consumption) versus production records and does not include recycled water in this report. Based on City historical information it is estimated at approximately 5 to 10 percent of total produced water since 2005. The City of San Buenaventura reviewed apparent loss (loss due to meter inaccuracies) and real loss (due to leaks or theft) from 2015 to 2019 using AWWA's Water Audit Software. The software estimates water loss average of 7.61%. The 2019 Water Loss Audit Report is provided in Appendix E.

2.2 Historical Water Use

Currently the City has approximately 32,285 service connections serving 113,500 people[10]. All service connections are metered. Water consumption within the City has decreased in recent years. The annual per capita usage from 1940 to 1970 averaged about 277 gallons per capita per day (GPCD). In the period 1985 through 1989, the annual per capita use averaged about 196 GPCD. In the period 1994 through 2010, the per capita figure dropped to an average of 166 GPCD. This decrease in per capita consumption is the result of plumbing code changes such as low flow fixtures and low water consuming appliances in some existing and all new housing; and an active water conservation program adopted by the City in 1975 and further strengthened with regulations in 1990. As detailed in Section 2.4, the baseline GPCD for the 10-year period was 176 and the baseline GPCD for the 5-year period was 167. In 2015 the reported GPCD was 159. In 2020 the reported GPCD was 104.

[9] Recycled water consumption percentage from the 2021 CWRR.

[10] This population estimate is based on input from the 2021 Comprehensive Water Resources Report. Current (2020) population as estimated by the DWR Population Tool (described in section 2.3.20) 115,815. Calculations for compliance with gpcd targets uses the DWR Population Tool estimates.

TABLE 2-1
DEMANDS - ACTUAL 2020

Use Type	Level of Treatment	Volume (AF)
Single family	Drinking Water	5,489
Multi-family	Drinking Water	3,443
Commercial/Institutional	Drinking Water	3,219
Irrigation	Drinking Water, Untreated	380
Other	Drinking Water	160
Water Loss[1]	Drinking Water, Untreated	865
Total Potable and Untreated Water Production [2]		*13,556*
Recycled Water	Recycled Water	564
	Total Water Demand	**14,120**

Notes:
2020 demand from billing records = 12,746 AF (excludes recycled water)
2020 production from production report = 13,556 AF (excludes recycled water)
[1] 2020 production minus 2020 demand (excludes recycled water)
[2] From production source report (does not include recycled water)

2.3 Water Loss

Distribution system water losses is the physical potable water losses from the pressurized water distribution system. Ventura Water estimates its distribution system loss using the American Water Works Association Method, annually. As required, Ventura Water reports information on water losses annually to the State. Table 2-2 reports water loss estimates 2015 to 2019. The Water Loss Audit Reports submitted to the State for these years is provided in Appendix E.

TABLE 2-2
ESTIMATED WATER LOSS 2015-2019

Period Covered	Estimated Water Loss (AF) (volume of apparent and real water losses)	% of Water Produced
Calendar Year 2015	1,449	10.1
Calendar Year 2016	933	6.8
Calendar Year 2017	1,122	8.4
Calendar Year 2018	620	4.6
Calendar Year 2019	1,079	8.3

At the current time a water loss standard has not been adopted by the State of California. Future UWMPs prepared by Ventura Water will report on compliance with any State water loss standards.

2.4 Existing and Target Per Capita Water Use

As required by SB X7-7, the Water Conservation Bill of 2009, this section identifies the water use targets in 2015 and 2020 to demonstrate a 20% reduction in per capita water use by 2020. Included are calculations of the baseline gross water use expressed as per capita daily water use (gallons per capita per day, or GPCD), baseline and target population, and year 2020 urban

water use target. This section includes a description of how Ventura Water calculated its baseline and target per capita water demands, in accordance with Method No. 1 described in "*Methodologies for Calculating Baseline and Compliance Urban Per Capita Water Use*" (DWR Methodologies, 2011). Ventura Water has completed the SB X7-7 Verification Form, attached as Appendix F, and summarized in Tables 2-4 and 2-5 of this chapter.

2.4.1 Base Daily Per Capita Water Use for SBX7-7 Reduction

Two baseline periods are to be determined during the calculation of the base daily per capita water use. The first is a continuous 10- to 15-year period used to calculate baseline per capita use, and the second is a continuous 5-year period used to determine whether the 2020 per capita water use target meets the legislation's minimum water use reduction requirements of at least a 5% reduction per capita water use.

The legislation allows the first continuous baseline period to increase from a 10-year to a 15-year base period if the amount of recycled water delivered in 2008 was 10% or greater of total water demand. Ventura Water's recycled water use in 2008 did not meet 10% or greater total water demand; therefore, under the legislation, Ventura Water may not use anything greater than a 10-year base period.

Tables 2-3 and 2-4 summarize the Base Daily Water Use calculation for Ventura Water. As a part of the SB X7-7 requirements, both a 10-year base period and a 5-year base period were selected in the 2010 UWMP, and were not able to be altered after having been selected. Years 1995 to 2004 were selected for calculation of the 10-year base period while years 2003 to 2007 were selected for calculation of the 5-year base period.

TABLE 2-3
BASELINE PERIOD RANGES

Baseline	Parameter	Value	Units
10 to 15 year baseline period	2008 total water deliveries	19,234	AFY
	2008 total volume of delivered recycled water	625	AFY
	2008 recycled water as a percent of total deliveries	3.2 %	Percent
	Number of years in baseline period[1]	10	Years
	Year beginning baseline period range	1995	-
	Year ending baseline period range[2]	2004	-
5 year baseline period	Number of years in baseline period	5	Years
	Year beginning baseline period range	2003	-
	Year ending baseline period range[3]	2007	-

Notes:
Data is for Calendar Year

[1]If the 2008 recycled water percent is less than 10 percent, then the first baseline period is a contiguous 10-year period. If the amount of recycled water delivered in 2007 is 10 percent or greater, the first baseline period is a contiguous 10 to 15 year period.

[2] The ending year must be between December 31, 2004 and December 31, 2010.

[3] The ending year must be between December 31, 2007 and December 31, 2010.

As shown in the top portion of Table 2-4, the Ventura Water Baseline GPCD is estimated to be 176. As shown in the second portion of Table 2-4, the Ventura Water 5-year Baseline GPCD is 167.

TABLE 2-4
GALLONS PER CAPITA PER DAY

	Year	Service Area Population [1]	Gross Water Use (AFY)	Gross Water Use (million gallons a day)	Daily Per Capita Water Use (GPCD)
10 to 15 Year Baseline GPCD					
1	1995	96,334	18,060	16.12	167
2	1996	97,634	19,489	17.40	178
3	1997	98,950	19,851	17.72	179
4	1998	100,285	18,568	16.58	165
5	1999	101,637	20,703	18.48	182
6	2000	103,008	21,567	19.25	187
7	2001	103,610	18,960	16.93	163
8	2002	104,216	19,933	17.80	171
9	2003	104,825	20,394	18.21	174
10	2004	105,437	22,298	19.91	189
10 to 15 Year Average Baseline GPCD					**176**
5 Year Baseline GPCD					
	Year	**Service Area Population [1]**	**Gross Water Use (AF)**	**Gross Water Use (million gallons a day)**	**Daily Per Capita Water Use (GPCD)**
1	2003	104,825	20,394	18.21	174
2	2004	105,437	22,298	19.91	189
3	2005	106,053	19,594	17.49	165
4	2006	106,673	18,149	16.20	152
5	2007	107,297	18,926	16.90	157
5 Year Average Baseline GPCD					**167**
Compliance Year GPCD					
	2020	115,815	13,557	12.1	**104**

[1] From DWR Population Tool

2.4.2 2015 and 2020 Targets

The year 2020 target was established in the 2015 UWMP. To assist the reader, this section reviews how the 2020 Target was established.

The City chose to meet SBX7-7 targets as an individual agency rather than as part of a regional alliance. Ventura Water selected Method 3, achieving 95% of the applicable South Coast Hydrologic Region target. The South Coast Hydrologic Region target is 149 GPCD, 95% of this target is 142 GPCD.

The Maximum Allowable GPCD is 95 percent of the 5-year Baseline GPCD or 159. The Compliance Water Use Target, under Method 3 (142 GPCD) is less than the Maximum Allowable GPCD and therefore no adjustments to the Compliance Water Use Target were needed. This makes Ventura Water's Compliance (2020) Water Use Target 142 GPCD. These calculations are summarized in Table 2-5.

Table 2-5
2020 Target Compliance

10-yr Base Daily Per Capita Water Use (GPCD)	2020 Target Calculated with Method 3 (95% of South Coast Hydrologic Region)	5-yr Base Daily Per Capita Water Use (GPCD)	Maximum Allowed GPCD Target (95% of 5-Year Base)	Confirmed 2020 Target (GPCD)
176	142	167	159	142

2.4.3 Achievement of Target

As shown in Table 2-6, the Ventura Water is in compliance with the 2020 Target, with an actual 2020 GPCD of 104. DWR has allowed for optional adjustments to the 2020 GPCD, including extraordinary events, economic adjustments, and weather normalization. Ventura Water made no such adjustments to the 2020 GPCD, as compliance was achieved without these factors.

Table 2-6
SBX7-7 2020 Compliance

Actual 2020 GPCD	Target GPCD	Total Adjustments	Adjusted 2020 GPCD	Did Supplier Achieve Targeted Reduction for 2020?
104	142	0	142	Yes

2.5 Projected Water Use

The earliest codes and standards for water fixtures and appliances came from the Federal Energy Policy Act of 1992 (taking effect in 1994). Besides Department of Energy (DOE) regulations, the codes and standards affecting water use in California are contained primarily in the CALGreen Building Code, the California Plumbing Code, California Water Code, and California Appliance Efficiency Standards.

The 2010 California Green Building Standards Code (CALGreen) set new standards for the flow rates of plumbing fixtures in new construction. The 2010 CalGreen Code went into effect on January 1, 2011 and its purpose was to reduce indoor water use in California buildings by 20%. The code also required that for buildings over 50,000 sq ft separate water meters be provided (e.g., required that multifamily dwellings have individual rather than master meters). The 2010 CalGreen Building code did have some provisions for outdoor water use including a

requirement for automatic irrigation systems utilizing weather and/or soil moisture-based irrigation controllers and a requirement that new landscapes of a given size conform to water budgets of either local ordinance or the State Model Water Efficient Landscape.

Updates to the CALGreen code in 2012 expanded the scope of CALGreen to include not just new construction but additions and alterations to buildings.

During the 2015-2016 drought, CALGreen was amended to require that new landscapes of a given size conform to water budgets of either local ordinance or the State Model Water Efficient Landscape, whichever is more stringent. In addition, the Code was amended to further reduce the allowable flow rate of faucets and urinals. Subsequently the CALGreen Code was revised to reduce the maximum flow rate of showerheads to align with Appliance Efficiency Regulations. This included a requirement that for all newly constructed residential developments, including hotels and motels, where disinfected tertiary recycled water was available from a municipal source, include provisions for potable water supply and a recycled water supply.

Starting January 1, 2017, California regulation required that upon sale, all single-family, multifamily, and commercial real property disclose all noncompliant plumbing fixtures. Effectively, as a condition of sale, all residential and commercial properties built prior to January 1, 1994, will need to replace all noncompliant plumbing fixtures with water conserving plumbing fixtures including toilets, shower heads, and faucets.

Unlike showerheads, faucets, and toilets, clothes washers are not covered by the California Plumbing Code, but rather regulated by the DOE. The current standards for residential clothes washers took effect in 2018. The standards, which were based on a consensus agreement between manufacturers and efficiency advocates, specify minimum energy and water efficiency levels. The metric for water efficiency is the integrated water factor (IWF), which is expressed in terms of gallons of water consumed per cubic foot of washer capacity. A lower IWF indicates better water efficiency. The standards specify an IWF of 6.5 for top-loading machines and 4.7 for front loading machines. Standard residential clothes washers have a capacity of approximately 4 cubic feet.

The table below summarizes appliance standards over time.

Fixture and Appliance Standards Over Time

	1975	1980	1992	2009	2011	2013	2016	2018
Shower (gpm)	3.5	2.5	2.5	2.5	2.0	2.0	2.0	1.8
Toilets (gpf)	5.0	3.6	1.6	1.6	1.28	1.28	1.28	1.28
Kitchen Faucet/ Lavatory Faucet (gpm)	2.5	2.5	2.5	2.2	1.8	1.8/1.5	1.8/1.2	1.8/1.2
Clothes Washers (gal/cycle/cubic ft)	15.0	15.0	15.0	9.5	9.5	9.5	9.5	6.5/4.7*

Data for 1975 to 2013 from Consol and California Homebuilding Foundation. 2014. Codes and Standards Research Report, California's Residential Indoor Water Use.
Data for 2016 and 2018 from Appliance-Standards.org.
*top loading machine/front-loading machine

The table above illustrates that there is limited water savings potential in new California homes; existing homes, particularly those built prior to 1980 represent a huge source of potential water savings. Conversely, the age of the housing stock is an indication of the affect that codes and

standards likely have on water demands. If the majority of the housing stock is older, the effect of the codes and standards is limited. If the growth rate of the service area is slow, the effect of codes and standards is also limited.

The City has approximately 42,000 housing units; 70% of which were built before 1980. Since 2014 it is estimated that certificates of occupancy have been issued for less than 1,600 housing units. This means new housing meeting the newest water efficiency standards makes up less than 4% of the residences. However, with rebate programs, natural replacement of old or malfunctioning appliances, retrofit upon resale, or remodels, some of the older housing is likely water efficient.

The water demands for this UWMP utilize water demand factors developed in April 2020, which were used in the 2021 CWRR. These water demand factors have been applied to the existing and anticipated land uses in the Ventura Water service area. The water demand factors looked at billing data for the City, for various uses, for the period 2013 through 2018, a water loss factor was applied to the raw factor, and a planning-level contingency factor was applied to account for variability due to weather and drought. The water demand factors capture changes in demand due to aggressive water conservation and codes and standards that have occurred over time. Because growth in the Ventura Water service area is minimal (approximately 0.54% a year) it is not necessary to apply a different water demand factor to new dwellings. Applying an optimistically "low" water demand factor on new development could skew demand trends when it is uncertain if (a) the development will truly occur and (b) the development will have a truly low water demand.

2.5.1 Normal Year

The normal/average year is a year in the historical sequence that most closely represents median runoff levels and patterns. Projected water demands in a normal year are shown in Table 2-7. Table 2-7 provides estimates of demands in each year from 2025 to 2045 assuming growth in the service area consistent with the City General Plan (see Section 1.6) and assuming water demand grows at a similar rate to population. Projections assume similar customer water use as occurred 2015 to 2019.

The water projections in Table 2-7 are based on the City's annual CWRR. The 2021 CWRR includes demand estimates based only on approved projects that would be fully vested by year 2025 and estimates demands to year 2030 using a growth rate of 0.54 percent. In addition, drought years are included in the baseline demand used in the CWRR. After year 2030 this UWMP assumes growth in demand of 0.54 percent. The projections in Table 2-7 assume a "normal" water year. In a normal water year, it is assumed that Drought Water Rates are no longer in effect and that various drought shortage restrictions are lifted. Demand in dry years is considered in the section below.

TABLE 2-7
PROJECTED WATER USE 2025 TO 2045 - NORMAL YEAR (AF)

Use Type	2025	2030	2035	2040	2045
Potable and Untreated Water Demand					
Single family	5,761	5,919	6,080	6,246	6,416
Multi-family	3,614	3,712	3,814	3,918	4,025
Commercial/Institutional/Industrial	3,378	3,471	3,565	3,663	3,763
Parks/Landscape/Irrigation	399	410	421	432	444
Other [a]	168	173	177	182	187
Water Loss [b]	908	933	958	984	1,011
Total Potable and Untreated Water Demand	*14,228*	*14,617*	*15,015*	*15,425*	*15,846*
Recycled Water	576	576	576	576	576
Total Water Demand	**14,804**	**15,193**	**15,591**	**16,001**	**16,422**

Notes:

a Other category includes authorized consumption for miscellaneous uses that do not fit the definition of the above (i.e., oil industry use, temporary construction water, and fire training.

b Water Loss assumed to grow at the same rate as water overall demands

2.5.2 Dry Years

2.5.3 Weather Effects on Water Usage

Historically, when the weather is hot and dry, water usage increases. The amount of increase varies according to the number of consecutive years of hot, dry weather and the conservation activities imposed. During cool-wet years, historical water usage has decreased to reflect less water usage for external landscaping.

California faces the prospect of significant water management challenges due to a variety of issues including regulatory restrictions, climate change, and population growth. Climate change is of special concern because of the range of possibilities and their potential impacts on water supplies. The most likely scenarios involve accelerated sea level rise and increased temperatures, which will shift more runoff to winter months. The other much-discussed climate scenario or impact is an increase in precipitation variability, with more extreme drought and flood events posing additional challenges to water managers[11].

However, the probability that water use will increase during dry conditions is countered by conservation actions, including drought rates, that may be implemented by Ventura Water, as has been done in the recent drought events. Over the past decade the water use per person (in GPCD) in the City's service area has seen a consistent decline. Ventura Water has experienced

[11] Final California Water Plan Update 2009 Integrated Water Management: Bulletin 160.

great success in water conservation after implementing multiple customer outreach and customer rebate programs and applying drought rates, as were first implemented in 2014 following a request for a 10 percent voluntary conservation by customers and a subsequent 20% mandatory conservation by customers. In 2015, drought rates were implemented. More information on Ventura Water's demand management programs can be found in Chapter 6 of this UWMP. Table 2-8 projects demands during dry years and it is assumed that demands will increase by 10% in dry periods (Table 2-7).

TABLE 2-8
PROJECTED WATER USE 2025 TO 2045 - DRY YEAR (AF)

Use Type	2025	2030	2035	2040	2045
Potable and Untreated Water Demand					
Single family	6,337	6,511	6,688	6,870	7,058
Multi-family	3,975	4,083	4,195	4,309	4,427
Commercial/Institutional/Industrial	3,716	3,818	3,922	4,029	4,139
Parks/Landscape/Irrigation	439	451	463	476	489
Other [a]	185	190	195	200	206
Water Loss [b]	999	1,026	1,054	1,083	1,112
Total Potable and Untreated Water Demand	*15,650*	*16,079*	*16,516*	*16,967*	*17,430*
Recycled Water	576	576	576	576	576
Total Water Demand	**16,226**	**16,655**	**17,092**	**17,543**	**18,006**

Notes:

a Other category includes authorized consumption for miscellaneous uses that do not fit the definition of the above (i.e., oil industry use, temporary construction water, and fire training.

b Water Loss assumed to grow at the same rate as water overall demands

2.6 Low Income Projected Water Demands

Senate Bill 1087 requires that water use projections of an UWMP include the projected water use for single-family and multi-family residential housing for lower income households as identified in the housing element of any city, county, or city and county in the service area of the supplier. The City of San Buenaventura last updated its Housing Element in September 2013 for the 2014-2021 5th cycle of Regional Housing Needs Assessment (RHNA). The City Housing Element projects that 44 percent of households to be low-income (extremely low/very low/low) (City of San Buenaventura 2013). Despite this, the Housing Element does not provide any information that can be used to develop trends to calculate the associated water demand specific to low -income households in the Ventura Water service area.

Table 2-9 makes an estimate of future low-income household water demands in the Ventura Water service area. Table 2-8 assumes a similar occurrence of low-income households in the water service area as in the City of San Buenaventura (i.e., 40 percent). These demands are included (and are not in addition to) the water demands described in Tables 2-7 and 2-8.

Ventura Water will not deny or condition approval of water services, or reduce the amount of services applied for by a proposed development that includes housing units affordable to lower income households unless one of the following occurs:

- The City specifically finds that it does not have sufficient water supply.
- The City is subject to a compliance order issued by the Division of Drinking Water Services that prohibits new water connections.
- The applicant has failed to agree to reasonable terms and conditions relating to the provision of services.
- The City finds it is not in compliance with the City's current Water Shortage Event Contingency Plan.

TABLE 2-9
PROJECTED WATER USE LOW INCOME HOUSEHOLDS (AF)

Water Use [a]	2025	2030	2035	2040	2045
Estimated Low-Income Household Water Use - Normal Year	4,125	4,238	4,353	4,472	4,594
Estimated Low-Income Household Water Use - Dry Years	4,537	4,662	4,788	4,919	5,053

Note:

a Assumes 44 percent all future households in Ventura Water service area qualify as "low" income per the definition provided in Senate Bill 1087.

Pursuant to Government Code Section 65589.7 the City is to grant priority for the provision of water and sewer services to proposed developments that include housing units affordable to lower income households.

Section 3: Water Resources

3.1 Overview

This section describes the water resources available to the City for the 25-year period covered by the Plan. Both currently available and planned supplies are discussed.

There are presently six distinct water sources providing water to the City water system.

- Casitas Municipal Water District (Casitas)
- Ventura River Foster Park Area (Foster Park)
- Mound Groundwater Basin (Mound Basin)
- Oxnard Plain Groundwater Basin (Oxnard Plain Basin)
- Santa Paula Groundwater Basin (Santa Paula Basin)
- Reclaimed water and reuse from the Ventura Water Reclamation Facility.

In addition, the City has a 10,000 AFY contract amount from the California State Water Project, which is not utilized within the City service area because currently there are no facilities to deliver the water to the City, but it is a planned supply (see Section 3.7.1 below).

3.1.1 Management of Supplies

The City operates its water supply system by utilizing a conjunctive use operating procedure. The procedure involves utilizing surface water (such as the Ventura River) during wet years, to the fullest extent possible, while letting groundwater sources rest. During dry years when the surface water source is reduced, the groundwater sources are pumped to meet demands.

Conjunctive use of the City's existing groundwater sources is limited by the requirement to maintain long-term production from the groundwater basins within their safe or operational yield. Conjunctive use of groundwater requires treatment and blending ratios to meet water quality goals.

Conjunctive use of potential future supply sources may include potable reuse or California State Water Project (SWP) water.

In the future, the City will continue delivering recycled water as occurs now (~576 AFY). The remainder of available recycled water will be delivered to the planned potable reuse facility, VenturaWaterPure.

3.1.2 Consideration of Supplies in Different Hydrologic Conditions

A primary purpose of an UWMP is to identify and quantify water supplies in a normal, single-dry, and multiple-dry years as follows.

- Normal year supply represents the supplies Ventura Water considers available during normal, long-term average conditions.

- The single dry-year supply is the supply anticipated to be available should there be a repeat of past dry conditions. In this UWMP Ventura Water has considered the driest year (for which data is available), by supply source, to estimate the overall single-dry year supply.

- The multiple dry year drought supply considers a five-consecutive-year drought. In this UWMP Ventura Water has evaluated the driest 5-year sequence (for which data is available), by supply source, to estimate supplies in year 1 through year 5 of a drought.

The UWMP Act requires that a supplier compare supplies and demands for these different hydrologic conditions. The UWMP does not try to anticipate specific hydrologic conditions in any particular year, however, the Act does require that a supplier compare supplies and demands assuming a drought extending from year 2021 to 2025. This section of the UWMP goes into details about supplies available in different hydrologic year types, the reader is directed to Section 6 for the comparison of supplies and demands for different hydrologic year types.

3.2 Local Surface Water

3.2.1 Casitas Municipal Water District (Casitas)

Casitas operates and maintains the Ventura River Project, a part of which is the 238,000 AF capacity storage reservoir known as Lake Casitas. Casitas diverts and stores storm water runoff to Lake Casitas for subsequent filtration treatment and supply of potable water to agricultural and urban uses in western Ventura County. The Casitas service area includes the Ojai Valley, the western part of the City, Oak View, Upper Ojai Valley, and the coastal area between the City and Santa Barbara County.

In July 1995, the City signed an operating agreement with Casitas, establishing the City's minimum annual purchase at 6,000 AFY, which was subject to the allocation program described below during drought periods. In May 2017, the City Council and Casitas Board of Directors approved a new Water Services Agreement between the City and Casitas that establishes that Casitas shall supply the City with sufficient water to meet its in-district projected water demand (this agreement is provided as Appendix G). The present five-year (FY 09-10 to FY 13-14) average normal (non-drought) water supply from Casitas is estimated to be 5,062 AFY.

The demand from the proposed development projects that are anticipated to be utilizing water by Fiscal Year 2020 are added to the five-year average normal (non-drought) water supply from Casitas of 5,062 AFY. Projects completed since fiscal year 2014 and projects expected to be completed within calendar year 2020 are assumed to be utilizing water in Fiscal Year 2020. The supply from Casitas is estimated to be 5,425 AFY.

Over the last two years, Casitas has been working to develop its Comprehensive Water Resources Plan and update the yield model for Lake Casitas to incorporate more recent data related to storage capacity, diversion efficiency, hydrology, climate change, and other factors. On April 21, 2021, the Casitas Board of Directors directed staff to reduce the available supply yield for the Casitas System from 20,840 acre-feet per year (AFY) to

15,010 AFY for planning purposes. The Board also directed staff to use a planned demand of 15,525 AFY, which is based on average water production for the Casitas System over the last 10 years (Calendar Year 2011-2020). Based on these actions, Casitas plans to adjust the baseline allocations for its customers and update its Water Event Action Plan (WEAP) ahead of the 2022/2023 Fiscal Year. The City of Ventura will coordinate with Casitas after its WEAP has been updated, to determine if revisions to the 2017 Water Services Agreement are warranted. If adjustments are made to the City's allocation, then this document will be amended at that time.

3.2.1.1 Reliability – Water Quality

Treated surface water from Lake Casitas has historically had levels of disinfection by-products that occasionally exceeded the respective maximum contaminant levels (MCLs) for total trihalomethanes (TTHMs) and haloacetic acids (HAAs). In cases when the levels of TTHMs and HAAs are exceeding or near exceeding the respective MCLs, the City will typically reduce the intake of Casitas water until the issue passes.

Casitas will be implementing potential treatment options to reduce the formation of disinfection by-products in their finished water. In the interim the City will be exploring options at its treatment facility to further reduce the level of disinfection by-products detected in the delivered water.

3.2.1.2 Reliability – Other

No infrastructure issues that may limit planned use of water from Lake Casitas have been identified.

3.2.1.3 Reliability – Water Year Type

The 2017 Water Services Agreement between the City and Casitas indicates that, in the event that Casitas must enact its Water Efficiency and Allocation Program (2015 WEAP) due to a water shortage, Casitas may adjust the City's allocation consistent with the percentage reduction for the WEAP stage.

Casitas has assigned five stages of water storage in Lake Casitas that serve as a guidance to triggering the implementation of water use reduction goals and measures.

Stage Conditions from Casitas Municipal Water District's "Water Efficiency and Allocation Program" dated May 9, 2018

Stage	Stage Title	Lake Casitas Storage (%)	Demand Reduction
1	Water Conservation	100% to 50%	0%
2	Water Shortage Warning	50% to 40%	20%
3	Water Shortage Imminent	40% to 30%	30%
4	Severe Water Shortage	30% to 25%	40%
5	Critical Water Shortage	25% to 0%	50%

As of February 2020, Casitas was in a Stage 3 water supply condition per Casitas Resolution No. 16-00. The lake level as of February 19, 2020 was 41.6 percent full. The Casitas Board of Directors made the decision to remain in a Stage 3 water supply condition in June of 2020.

The Water Services Agreement between Casitas and the City specifies that the City's Stage 1 Allocation shall be the average of the City's Projected Water Demand during the five (5) most recent years during which neither the City nor Casitas are implementing their water shortage contingency plans. The projected water demand from the past five non-drought fiscal years (FY 09-10 to FY 13-14) certification letters from the City to Casitas including demand associated with land use change is 5,425 AFY. A Stage 3 demand reduction of 30% would result in a supply of 3,798 AFY.

Although the Lake is currently slightly above 40% capacity, it is likely that Casitas will remain in a Stage 3 water supply condition. In order to be conservative, this report assumes a reduction of 30% to the City's Casitas supply for the 2021 Supply Drought Impact and a 40% reduction for 2022.

Consistent with the DWR Guidebook, this UWMP evaluates supplies and demands in different hydrologic year types based on past years. For the average year, supply available in 2013 was used; 2014 was selected for the single-dry year; and a repeat of the multi-dry period from 2014-2018 is used to approximate supplies for future long-term droughts. This information is used in coordination with the anticipated WEAP stage and anticipated water demand growth in the portion of the City within Casitas to estimate supply, as reflected in Table 3-1.

TABLE 3-1
ESTIMATED SUPPLY FROM CASITAS MUNICIPAL WATER DISTRICT (AFY)

	2025	2030	2035	2040	2045
Normal Year [1]	5,805	5,963	6,126	6,293	6,465
Single-Dry Year	5,805	5,963	6,126	6,293	6,465
Multi-Year Drought					
Year 1	5,805	5,963	6,126	6,293	6,465
Year 2	4,644	4,771	4,901	5,035	5,172
Year 3	4,064	4,174	4,288	4,405	4,526
Year 4	4,064	4,174	4,288	4,405	4,526
Year 5	4,064	4,174	4,288	4,405	4,526

1 Given the current level of Lake Casitas, Normal supplies may not be available even if average rainfall occurs in a specific year.

3.2.2 Ventura River

Production from the Ventura River is a function of several factors including diversion capacity, local hydrology, environmental impacts, and the storage capacity of the Ventura River alluvium and upstream diversions. Currently all Ventura River water is collected using surface diversion, subsurface collectors, and shallow wells. A surface intake structure at Foster Park is unused due to the natural channeling of the active river system bypassing the structure.

3.2.2.1 Reliability – Water Quality

Surface water from the Ventura River contains natural organics, which results in the formation of disinfection by-products during the treatment and disinfection processes. Turbid water and high levels of organics, such as after heavy rainstorms, can result in treatment issues and high levels of disinfection by-products in the finished water. During these times, which typically occur during rainy months, water from the Ventura River may be significantly reduced until the water quality improves. The City will be implementing potential treatment options to reduce the formation of disinfection by-products in the finished water.

3.2.2.2 Reliability – Other

Production wells at Foster Park were destroyed during 2001 and 2005 storm events. These events have reduced the City's ability to extract water from Foster Park to a maximum capacity of 4,200 AFY. The 2020-2026 Capital Improvement Program includes the Foster Park Wellfield Production Restoration project. The project involves the replacement of the destroyed wells and construction of new facilities to restore historical production capabilities of 6,700 AFY during wet years. Therefore, the projected future water supply from the Ventura River / Foster Park is 4,200 AFY.

3.2.2.3 Reliability – Water Year Type

Due to continued drought conditions and heightened environmental requirements, the City's ability to draw water from the Ventura River continues to be significantly challenged and impacted. The City entered into a settlement with Santa Barbara Channelkeeper in 2019, which was amended in 2020, which requires the City to modify its pumping based on reduced flows in the Ventura River. The current agreement requires the City to turn off the Nye Wells 7 and 8 when the daily average flow rate in the River drops below 4 cubic feet per second (cfs) (for three consecutive days), and to cease operations at the intake facility when flows drop below 3 cfs (for three consecutive days) as measured at the City's stream gauge upstream of Foster Park (VR1). The intake may be shutdown sooner if flows in the River recede quickly.

To evaluate supply into the future, in different year types, historic supply from past years has been evaluated. For the normal year, supply available after 2005 was used; 2015 was selected for the single-dry year; and a repeat of the multi-dry period from 2015-2019 is used to approximate supplies in for future long-term droughts. These supplies have been modified as necessary to reflect assumptions about regulatory and environmental requirements into the future. See Table 3-2.

TABLE 3-2
ESTIMATED SUPPLY FROM VENTURA RIVER (AFY)

	2025	2030	2035	2040	2045
Normal Year	4,200	4,200	4,200	4,200	4,200
Single-Dry Year	1,298	1,298	1,298	1,298	1,298
Multi-Year Drought					
Year 1	1,298	1,298	1,298	1,298	1,298
Year 2	1,298	1,298	1,298	1,298	1,298
Year 3	1,298	1,298	1,298	1,298	1,298
Year 4	1,298	1,298	1,298	1,298	1,298
Year 5	1,298	1,298	1,298	1,298	1,298

3.3 Groundwater

The City obtains water from three groundwater basins, which have historically provided roughly an average of 8,750 AFY (from 2016 to 2020), or 65 percent of the City's total supply. Table 3-3 shows the historical production from these basins. These groundwater basins are described below.

TABLE 3-3
HISTORIC GROUNDWATER PRODUCTION (AFY)

Basin Name	Metered or Unmetered	2016	2017	2018	2019	2020
Mound Basin	Metered	2,671	1,397	2,529	3,286	2,371
Oxnard Plain Basin	Metered	3,702	3,825	3,317	3,323	3,691
Santa Paula Basin	Metered	2,898	2,593	3,096	2,509	2,544
	Total	*9,271*	*7,815*	*8,942*	*9,118*	*8,605*
Groundwater as a % of Total Supply		67%	57%	66%	70%	63%

3.3.1 Mound Groundwater Basin

The Mound Groundwater Basin is identified in DWR Bulletin 118[12], 2003 Update as the Mound Subbasin of the Santa Clara River Valley Groundwater Basin (Basin No. 4-4.03). The basin

[12] Bulletin 118 describes the occurrence and nature of groundwater in California. The publication officially defines groundwater basin boundaries and provides information for each of the State's hydrologic regions. For more information, please see: https://water.ca.gov/Programs/Groundwater-Management/Bulletin-118

underlies the northern part of the Ventura coastal plain and is bounded on the north by the Santa Ynez and Topa Topa Mountains, on the south by the Oak Ridge and Saticoy faults, the northeast by the Santa Paula Subbasin, and the west by the Pacific Ocean.

The Mound Basin is designated high-priority by DWR and the Mound Basin Groundwater Sustainability Agency (MBGSA) has been recognized by DWR as the GSA for the basin. The MBGSA was formed through a Joint Exercise of Powers Agreement (JPA) by and among the United Water Conservation District (UWCD), the City, and the County of Ventura. In addition to representatives from each of the 3 member agencies, the Board of Directors includes an agricultural stakeholder director and environmental stakeholder director. The Mound Basin GSA is required to develop a Groundwater Sustainability Plan that establishes the sustainable yield of the Mound Basin by January 2022.

The Mound Groundwater Basin has historically provided water for overlying beneficial uses and satisfies agricultural, municipal, and industrial demands. Historical use has been documented to temporarily exceed the yield of the basin and result in water levels that have fallen below sea level and created a threat of seawater intrusion. To abate this threat the City abandoned its historical coastal well facilities and located groundwater extraction near the center of the Mound Basin. A report (Fugro 1997) compiled as part of a 1996 study of the basin indicated that historical data supports a basin yield of at least 8,000 AFY during drought conditions as long as pumping is reduced during wet years to allow water levels to recover. The City's average annual extraction from 2000 to 2009 was approximately 4,000 AFY. The remainder of the available yield is utilized by other basin users.

3.3.1.1 Reliability – Water Quality

The Mound Groundwater Basin has elevated total dissolved solids (TDS) and sulfate. Ventura Water blends Mound Basin groundwater with other sources to reduce TDS. While City of San Buenaventura water meets all applicable primary standards, City water does have TDS concentrations that exceed secondary standards (standards set for aesthetic, taste, and odor rather than protection of public health). Water quality is not considered a limitation for using supplies from the Mound Groundwater Basin, but the City continues to look for ways to improve the quality, such as blending with future water supply sources.

3.3.1.2 Reliability – Other

Currently, two City wells withdraw water from the Mound Groundwater Basin: Victoria Well No. 2, which was installed in 1995, and Mound Well No. 1, which began production in April 2003. Pumping from Victoria Well No. 1, which was installed in 1982, was discontinued due to maintenance and water quality issues. The City recently reached an agreement with the County on deeding to the County its interest in Victoria Well No. 1 and leasing land for drilling of Mound Well No. 2. Construction of Mound Well No. 3 is currently in progress and is scheduled to be in production in 2021. Design of Mound Well No. 2 is also in progress and scheduled to be in production in 2022. Mound Well No. 2 will serve as a replacement well for Victoria Well No. 1; Mound Well No. 3 will serve as a backup well.

Due to operational constraints, recent production from the Mound Basin has been lower than the historical 10-year average. Victoria Well No. 2 was not operational in 2020, so the only well producing water from Mound Basin in 2020 was Mound Well No.1. The City's current water supply from the Mound Basin is the current average production rate of Mound Well No. 1 or

2,400 AFY. In the near future, once Mound Wells No. 2 and 3 are operational, production from the Mound Basin will increase.

3.3.1.3 Reliability – Water Year Type

The City finalized a study in March to review the perennial yield of the Mound Basin and determine if the annual average yield of the basin is still believed to be accurate. The Report concludes that the perennial yield of the Mound Basin is between 6,600 and 7,400 AFY. While this is consistent with the long-term average production, it is lower than the average production from 2000-2009 (which is used to determine the City's capacity of 4,000 AFY). The Mound Basin GSA will utilize this analysis in conjunction with other information to determine the Sustainable Yield of the Mound Basin as defined by SGMA. This analysis will not be complete until the Groundwater Sustainability Plan is submitted in 2022.

The groundwater basin is managed over the long-term and variations in year-to-year supply are not anticipated at this time. For this reason, the City's anticipated basin yield, in all hydrologic years, is based on "Fugro West, Inc. June 1997. Mound Groundwater Basin Annual Report" and set at 4,000 AFY.

3.3.2 Oxnard Plain Groundwater Basin

The Oxnard Plain Groundwater Basin is identified in DWR Bulletin 118, 2003 Update as the Oxnard Subbasin of the Santa Clara River Valley Basin (Basin No. 4-4.02), located in southern Ventura County. The basin is bounded on the north by the Oak Ridge fault, the south by the Santa Monica Mountains, the east by the Pleasant Valley and Las Posas Valley Basins, and the west by the Pacific Ocean.

Wells near the Buenaventura Golf Course pump from the Fox Canyon Aquifer of the Oxnard Plain Groundwater Basin. Currently, three wells, Golf Course Wells No. 5, 6, and 7 produce potable water for the City's system. Average annual yield from the City's Golf Course wells over the past 5 years has been about 3,500 AFY.

There are limited carryover provisions provided by the FCGMA in the Oxnard Plain Basin that do allow the City to pump less water in wet years and more water in dry years, but all water must be pumped within five years

3.3.2.1 Reliability – Water Quality

The Oxnard Plain Groundwater Basin has elevated TDS. Ventura Water blends Oxnard Plain Basin groundwater with other sources to reduce TDS. While City of San Buenaventura water meets all applicable primary standards, City water does have TDS concentrations that exceed secondary standards (standards set for aesthetic, taste, and odor rather than protection of public health). Water quality is not considered a limitation for using supplies from the Oxnard Plain Groundwater Basin, but the City continues to look for ways to improve the quality, such as blending with future water supply sources.

3.3.2.2 Reliability – Other

No infrastructure issues that may limit planned use of water from the Oxnard Plain Groundwater Basin have been identified.

3.3.2.3 Reliability – Water Year Type

The Oxnard Plain Groundwater Basin is managed by the Fox Canyon Groundwater Management Agency (FCGMA), which was created by state legislation in an effort to reduce overdraft and stop seawater intrusion. The FCGMA is the Groundwater Sustainability Agency (GSA) for the Oxnard Plain. The Groundwater Sustainability Plan for the Oxnard Subbasin, provided in Appendix H, was completed in December 2019.

At the October 23, 2019 meeting of the FCGMA Board of Directors, there was a unanimous vote to adopt the ordinance for a new pumping allocation system for the Oxnard and Pleasant Valley basins, effective October 1, 2020. The new well-based allocation will be the average pumping for the base period of 2005-2014. On December 12, 2019, the FCGMA Board voted to repeal portions of some past drought ordinances and this set the City's pumping allocation in the Oxnard Plain Basin to 4,827 AFY effective January 1, 2020.

Neither the allocation ordinance nor the GSP establish the pumping reductions that will take place to meet the sustainable yield for the Oxnard Plain Basin. However, the GSP suggests a linear ramp down from current pumping to the estimated sustainable yield by 2040. Based on these estimates, the City can expect (without additional projects being implemented) its allocation to decrease by 44% by 2040. Therefore, the projected future supply for the Oxnard Plain Basin are projected to decline from 5,304 AFY to 2,970 AFY.

3.3.3 Santa Paula Groundwater Basin

The Santa Paula Groundwater Basin is identified in DWR Bulletin 118, 2003 Update as the Santa Paula Subbasin (Basin No.4-4.04). The basin is bounded on the north by the Topa Topa Mountains, the south by the Oak Ridge and South Mountain, the Oak Ridge fault, and the Saticoy fault, the east by a bedrock constriction, and the west by the Oxnard Plain and Mound subbasins. Water from the Santa Paula Basin is extracted through Saticoy Wells No. 2 and No. 3, with a peak pumping capacity of 3,000 GPM.

The management of the Santa Paula Basin was established under a court stipulated judgment entered in 1996 and amended and restated in 2010 (provided in Appendix I). United, the Santa Paula Basin Pumpers Association and the City are all parties to the Judgement. In summary, the Judgment adjudicates groundwater rights, regulates individual and collective pumping, provides for basin management through a Technical Advisory Committee (TAC), and reserves jurisdiction in the Superior Court to resolve future disputes and provide for supplementary orders as necessary. Because the Santa Paula Basin is already managed per a stipulated judgment, it is exempt from most provisions of SGMA.

The Santa Paula Basin Judgment allows the City to utilize 3,000 AFY. The City is not limited to this allocation in any single year but may produce seven times its average annual allocation (21,000 AF) over any running seven-year period. In addition, the City has acquired water rights in the amount of 126 AFY, bringing its current total allocation to 3,126 AFY.

3.3.3.1 Reliability – Water Quality

The Santa Paula Groundwater Basin has elevated TDS and requires treatment for iron and manganese. Water quality is not considered a limitation for using supplies from the Santa Paula

Basin, but the City continues to look for ways to improve the quality, such as blending in the future with SWP water.

3.3.3.2 Reliability – Other

The City currently relies on Saticoy Well No. 3 for production and utilizes Saticoy Well No. 2 as an occasional back-up supply due to decline in production. The estimated annual production capacity for Well No. 3 is 2,450 AFY. The City is planning to construct replacement well Saticoy Well No. 4, which is anticipated to be producing water in 2025.

3.3.3.3 Reliability – Water Year Type

If the monitoring performed by the TAC determines that groundwater safe yield is being exceeded, then the City may have its pumping allocation reduced. Upon and motion and hearing as prescribed in the Judgment, if the Court finds that the safe yield of the Basin is less than the total pumping allocations, the Judgment describes six "Overdraft" stages and requires reduced production at each stage.

- Stage 1: Affects the pumping allocation of the Santa Paula Basin Pumpers Association and not the City.
- Stage 2: City of San Buenaventura pumping limited to 1,141 AFY.
- Stage 3: City of San Buenaventura pumping limited to 641 AFY.
- Stage 4: City of San Buenaventura pumping limited to 481 AFY.
- Stage 5: City of San Buenaventura allocation is reduced to zero.
- Stage 6: Affects the pumping allocation of the Santa Paula Basin Pumpers Association.

If the above Stages were to go into effect, the City's allocation from acquired water rights would be reduced proportionally by the same percentage reduction then required by the members of the Santa Paula Basin Pumpers Association. There is also an exception in the Judgment for emergency conditions for the City to reasonably supply public needs.

Based on recent work completed by the technical working group regarding conditions in the Basin, it is projected that no Stage reductions will be implemented even if the drought remains in effect through 2021. It is also projected that under normal conditions, that the allocation will remain at 3,000 AFY with the addition of water rights equaling 126 AF.

The groundwater basin is managed over-long term and variations in year to year supply are not anticipated. For this reason, anticipated basin yield, in all hydrologic years, is based on the original City allocation plus 126 AFY for City acquired water rights.

3.4 Groundwater Supplies Normal, Single-Dry and Multiple Dry Year

Table 3-4 depicts the anticipated groundwater supplies during Normal, Single-Dry, and Multiple Dry Years, by groundwater source.

TABLE 3-4
PROJECTED GROUNDWATER SUPPLIES FOR DIFFERENT YEAR TYPES (AFY)

	2025	2030	2035	2040	2045
Normal Year					
Mound Basin	4,000	4,000	4,000	4,000	4,000
Oxnard Plain Basin	4,813	4,199	3,584	2,970	2,970
Santa Paula Basin	3,126	3,126	3,126	3,126	3,126
Total Normal Year	*11,939*	*11,325*	*10,710*	*10,096*	*10,096*
Single-Dry Year					
Mound Basin	4,000	4,000	4,000	4,000	4,000
Oxnard Plain Basin	4,813	4,199	3,584	2,970	2,970
Santa Paula Basin	3,126	3,126	3,126	3,126	3,126
Total Single-Dry Year	*11,939*	*11,325*	*10,710*	*10,096*	*10,096*
Multiple-Dry Years					
Mound Basin	4,000	4,000	4,000	4,000	4,000
Oxnard Plain Basin	4,813	4,199	3,584	2,970	2,970
Santa Paula Basin	3,126	3,126	3,126	3,126	3,126
Total Multiple-Dry Year	*11,939*	*11,325*	*10,710*	*10,096*	*10,096*

Note:

In multiple dry years additional groundwater may be utilized to meet demands when surface water supplies are reduced (conjunctive use).

3.5 Recycled Water and Reuse

Recycled water is a current and future source for Ventura Water. Recycled water is detailed in Chapter 4.

3.6 Transfers, Exchanges and Groundwater Banking Programs

Water supplies may be purchased from other water agencies and sources, and the City may explore these opportunities in the future.

As described in Section 3.7.1, the City of San Buenaventura has participated in the SWP turnback pool and exchanged SWP with other State Water Contractors (San Gorgonio Pass Water Agency). Participation in the turnback pool could be considered a transfer.

City does not participate in any official groundwater banking programs. The City has limited ability to bank groundwater. The limited carryover provisions provided by the FCGMA in the Oxnard Plain Basin does allow the City to pump less water in wet years and more water in dry years, but all water must be pumped within five years. In the Santa Paula Basin, the allocation is based on a seven-year running average, so the City can also pump more in dry years and less in wet years as long as the 7-year total is not exceeded in any given 7-year period.

3.7 Planned Water Supply Projects and Programs

Continued new and infill development that is already entitled, along with anticipated future entitlements, will continue to increase overall demand for water in the service area, despite developer contributions to future water supplies through dedication of water rights, implementing extraordinary conservation measures, and/or payment of Water Resource Net Zero fees. Consequently, combined with legal and regulatory requirements on both groundwater and surface water supplies and impacts of climate change, the City has recognized that consumption is nearing available supply and new supply projects need to be implemented. Consistent with Article X, Section 2 of the California Constitution, in order to mitigate the water resource impacts of new or intensified development, it is necessary and desirable for new or intensified development to provide supplemental water resources to the City water system in an amount proportional to the new demand, implement extraordinary conservation measures to offset demand, and/or to pay a water resource fee based upon the cost of obtaining water supplies to meet the demand of new or intensified development. Upon direction from City Council, Ventura Water prepared and evaluated a Water Rights Dedication and Water Resources Net Zero Policy (Net Zero Policy). The Net Zero Policy was developed after months of review and input from the Ventura Water Commission. The City Council adopted the Net Zero Policy in Ordinance 2016-004 and Resolution 2016-027. Revenues from the Net Zero Policy will provide funding for new water supply projects, such as the VenturaWaterPure Program.

Revenues from rates, grants, and loans will finance the following planned supply projects:

- SWP Water
- VenturaWaterPure

Ventura Water has conceptually studied ocean desalination. However, in the Ventura Water Supply Projects Environmental Impact Report (EIR), it was only evaluated at the programmatic level and not the project level of detail. Further evaluation would be required if ocean desalination were pursued as a future supply source.

3.7.1 SWP Water

The City does not physically take SWP Water because it lacks the facilities to do so. However, since at least 1999 has sold, transferred, or exchanged the water to other SWP Contractors. The City has a 10,000 acre-foot per year entitlement from the SWP. The base contractual agreements concerning the City's annual entitlement to 10,000 acre-feet of SWP are: (1) the 1963 State Water Supply Contract of 20,000 acre-feet entitlement of SWP water between the Department of Water Resources (DWR) and Ventura County Watershed Protection District (VCWPD) known formerly as Ventura County Flood Control District (VCFCD); (2) the 1970 agreement between VCFCD and Casitas known formerly as the Ventura Municipal Water District that assigned the 20,000 acre-feet entitlement to Casitas; and (3) the 1971 agreements between Casitas and the City providing the City with an annual entitlement of 10,000 acre-feet and Casitas and United with an annual entitlement of 5,000 acre-feet each.

In the contract with Casitas, the City retains full authority and responsibility for determining the point and method of delivery of the allocation. To date, the City has not constructed the improvements necessary to receive direct delivery of its allocation.

The City pays annual SWP Table A water fees to DWR, which cover construction costs for SWP facilities and administration to deliver allotments of water throughout the state. In addition, the citizens of Ventura participated in an advisory vote on November 3, 1992 and selected desalinating seawater over importing water through the SWP, as the preferred supplemental water supply option. However, based on the City Attorney Office's review of the City's SWP Table A water, the City cannot unilaterally end its involvement in the SWP's financial obligations and SWP Table A water without great risk.

The Monterey Amendment to the State Water Contract in 1999 provided the City a formal mechanism to allow the City to place their SWP water into a “turn back” pool to be purchased by other SWP contractors. The City has taken part in the SWP “turn back” pool over the past several years which has provided a small annual revenue offset. Since 2018, the City has participated in exchanges with San Gorgonio Pass Water Agency which allows the City to receive revenue to offset current SWP fixed costs and receive additional SWP in the future. The City has also worked recently with United who requested to receive the City’s allocation at the “turn back” pool rate which provided water benefits to the County area as a whole.

On January 23, 2017, City Council authorized an alignment study to determine how the interconnection project could be designed and operated to supply water to serve the regional needs of the City, Calleguas, Casitas Municipal Water District, and United Water Conservation District (United). The final alignment study was completed in 2018, and the environmental review process pursuant to CEQA was commenced.

On August 5, 2019, the City of San Buenaventura City Council voted to certify the State Water Interconnection Project Final Environmental Impact Report. As stated in the Final EIR, the project will enable delivery of SWP water by wheeling through Metropolitan Water District of Southern California and Calleguas to the City. The connection will also facilitate direct delivery of SWP water to United and direct or in-lieu delivery of SWP water to Casitas. In addition, the interconnection would allow the City to deliver water to Calleguas during an outage of its imported water supplies and for Calleguas to deliver water to the City during an outage of the City’s water supplies. In both outage scenarios, water delivered would be returned by the receiving party to the providing party following the outage. The interconnection will be a pipeline used to transport water between Calleguas’ and the City’s distribution systems. The pipeline will be approximately 7 miles in length originating in the eastern portion of the City, traversing southerly and easterly through unincorporated Ventura County, to the southwestern end of the City of Camarillo. Final design on the Interconnection began in mid-2020 and construction is anticipated to start the end of 2022.

Benefits to the City include making up for losses in annual yield from existing supply sources (Lake Casitas, Ventura River, and groundwater), improving water quality, and providing a backup supply for the City’s other potential, long-term water supply options. Operational details will be developed through the project design and planning process and negotiations with project partners. These details will be reflected in future CWRRs and UWMPs when available.

While the City’s water supply contract for SWP water provides the City with a maximum annual allocation of 10,000 AF, the actual allocation of available water is set DWR annually. DWR allocations are finalized in the Spring of each year and consider the following:

- hydrologic conditions

- existing storage in reservoirs
- operational and regulatory constraints
- contractor demands

To improve system water quality, Ventura Water anticipates using approximately 1,300 AF of SWP in any year it is available, but this amount may increase to compensate for deficiencies in other supply sources or decrease based on the amount of SWP that might be available.

While the City of San Buenaventura's SWP entitlement (Table A Entitlement) is 10,000 AFY this amount is not the long-term average supply expected. According to Department of Water Resources, Technical Addendum to the State Water Project Final Delivery Capability Report 2019 (August 26, 2020) Table B-32. Ventura County Watershed Protection District Future Conditions:

- The Long-Term Average delivery of SWP to the City of San Buenaventura will be 54% of the Table A Entitlement (5,400 AFY). So, 5,400 AFY is the assumed SWP Normal Year Supply. The City estimates it will need 1,300 AFY to blend with groundwater to improve water quality. Additional water may be used to rest groundwater sources in wet years or if other sources are unavailable.
- The State Water Project Final Delivery Capability Report is based on hydrology from 1922 to 2003 (e.g., the current modeling does not consider years past 2003, including 2015). The single-dry year delivery was in year 1977 and (had the City of San Buenaventura had a means to take the water) delivery would have been 9% of Table A or 900 AFY – this is the Single-Dry Year Supply, according to the 2020 SWP Delivery Capability Report.
- The driest 5-year period would be if years 1930-1934 were replicated.
    - In 1930 about 20% of allocation was available, or about 2,000 AF
    - In 1931 about 33% of allocation was available, or about 3,300 AF
    - In 1932 about 13% of allocation was available, or about 1,300 AF
    - In 1933 about 38% of allocation was available, about 3,800 AF
    - In 1934 about 11% of allocation was available, about 1,100 AF

These amounts may be supplemented based on an agreement with San Gorgonio Pass Water Agency (SGPWA). In 2018 and 2019, the City executed agreements with SGPWA to exchange its State Water Project Allocation. As a result of these agreements, SGPWA is obligated to return 2,075 AF of water to City by 2030 (Ventura Water 2021).

3.7.1.1 Delta Reliance

In the future, a small portion of the water received by Ventura Water may come from the Sacramento-San Joaquin Delta (Delta). The 2020 UWMP Guidebook describes how urban water suppliers that anticipate participating in or receiving water from a "covered action" related to the Delta should provide information in their 2020 UWMPs to demonstrate consistency with *Delta Plan Policy WR P1, Reduce Reliance on the Delta Through Improved Regional Water*

Self-Reliance (Reduced Reliance Policy). DWR has suggested that any entity receiving imported water from the SWP should anticipate being part of a "covered action".

DWR suggests suppliers do the following to demonstrate consistency with WR-P1:

- *Establish a base period for evaluation of Delta water*. Ventura Water has not taken Delta water directly in the past. Rather Ventura Water has paid for participation in the SWP and in some years participated in the "turnback pool" to recoup some costs or sold/exchanged/transferred to others.
- *Provide data on State Water Project Water received in the past*. No SWP water has been received directly in the past.
- *Provide information on supplier contribution to regional self-reliance (local supplies brought online 2010-2045 in 5-year increments)*. Ventura Water has been locally self-reliant for its entire history. To improve local supplies, starting in 2010 Ventura Water developed a recycled water system capable of delivering 700 AFY. Starting in 2025 Ventura Water anticipates producing and utilizing 2,800 AFY advanced treated water (VenturaWaterPure, see section 3.7.2). This has been accompanied with aggressive measures to reduce demand, including public outreach and drought rates. There has been a consistent decline in gallons per capita per day, demonstrating the success of water use efficiency for improving local self-reliance.
- *Project SWP water that will be received by Ventura Water through 2045*. Ventura Water anticipates taking an average of 1,300 AFY SWP starting in year 2025.

Data related to Delta reliance is provided in Appendix J.

3.7.2 VenturaWaterPure

The City of San Buenaventura is currently in the planning phases for the proposed VenturaWaterPure Program which includes additional diversion of tertiary treated effluent discharge from the Santa Clara River Estuary to a new proposed Advanced Water Purification Facility (AWPF) for potable reuse. Potable reuse is the proven use of recycled water to supplement drinking water supplies. After years of special studies, environmental assessment, demonstration facility testing, and stakeholder meetings, the City determined the best way to enhance environmental protection while improving local water quality and supply reliability is to divert highly treated wastewater discharges for potable reuse. The final product of this state-of-the-art AWPF would be a new, locally owned source of highly purified drinking water that provides the City of San Buenaventura with a long-term drought resilient water supply solution. On October 14, 2019, the City of San Buenaventura City Council unanimously voted to certify the EIR for the Ventura Water Supply Projects, which included a project level environmental review of the VenturaWaterPure Program. The City is currently working on the next steps on this Program including land acquisition, permitting, final design, and bidding for construction.

Based on the completion of the Special Studies and additional assessments detailed in the Final EIR, the future water supply provided by the VenturaWaterPure Program is projected to be at least 2,800 AFY in Phase 1a and 4,000 AFY in Phase 1b.

3.7.3 Ocean Desalination

In 2013, City staff was engaged in discussions with local water agencies in regard to potential regional desalination projects. In the City's 2015 UWMP, seawater desalination was included as a potential future part of the City's long term water supply portfolio and as an additional emergency water supply during times of drought. The desalination facility would be designed with a delivery capacity of up to 2.7 million gallons per day or 3,000 AFY.

According to the Ventura Water Supply Projects EIR certified on October 14, 2019, if sufficient water supply is not available from the VenturaWaterPure Program, then the City may need to develop desalination facilities to meet future water supply needs. Phase 2 of the proposed projects would augment water supplies to meet future water needs, including the accommodation of planned growth, either through increasing the amount of recycled water produced, or construction of an ocean desalination facility. This would be accomplished through either the expansion of the AWPF as a first option pending regulatory approvals, or, if this option is not approved or does not meet the City's water supply needs, through construction of an ocean desalination facility. Since ocean desalination was only evaluated at a program level in the Ventura Water Supply Projects EIR and environmental impacts were not evaluated in detail, ocean desalination is not quantified as a potential additional future supply source.

3.8 Anticipated Water Supply Sources in Normal, Single Dry, and Multiple Dry Years

Table 3-5 shows Ventura Water supplies in 2020. Tables 3-6, 3-7, and 3-8 provide details on supplies anticipated to be available to Ventura Water in average/normal, single-dry, and multiple dry years given existing and planned supplies.

TABLE 3-5
WATER PRODUCTION CALENDAR YEAR 2020 (AF)

Water Supply Source	Volume (AF)	Type
Casitas Municipal Water District [a]	2,533	Drinking Water
Ventura River [b]	2,417	Drinking Water
Groundwater [c]	8,606	Drinking Water
Recycled Water [d]	564	Recycled Water
Total Supplies	**14,120**	

Notes:

a City records

b See Section 3.2.2.

c See Section 3.3

d See Section 4.1.1

TABLE 3-6
WATER SUPPLY ESTIMATES - AVERAGE/NORMAL YEAR (AF)

Water Supply Source	2025	2030	2035	2040	2045
Casitas Municipal Water District [a]	5,805	5,963	6,126	6,293	6,465
Ventura River [b]	4,200	4,200	4,200	4,200	4,200
Groundwater [c]	11,939	11,325	10,710	10,096	10,096
Recycled Water [d]	576	576	576	576	576
SWP Water [e]	1,300	1,300	1,300	1,300	1,300
Planned Potable Reuse [f]	0	2,800	4,000	4,000	4,000
Total Supplies [g]	**23,820**	**26,164**	**26,912**	**26,465**	**26,637**

a See Table 3-1

b See Table 3-2

c See Table 3-4

d See Section 4.1

e See Section 3.7. The City estimates it will need 1,300 AFY to blend with groundwater to improve water quality. Additional water may be used to rest groundwater sources in wet years or if other sources are unavailable.

f See Section 3.7.

g Maximum supplies do not account for reduction to meet water quality objectives.

TABLE 3-7
WATER SUPPLY ESTIMATES - SINGLE-DRY YEAR (AF)

Water Supply Source	2025	2030	2035	2040	2045
Casitas Municipal Water District [a]	5,805	5,963	6,126	6,293	6,465
Ventura River [b]	1,298	1,298	1,298	1,298	1,298
Groundwater [c]	11,939	11,325	10,710	10,096	10,096
Recycled Water [d]	576	576	576	576	576
SWP Water [e]	900	900	900	900	900
Planned Potable Reuse [f]	0	2,800	4,000	4,000	4,000
Total Supplies [g]	**20,518**	**22,862**	**23,610**	**23,163**	**23,335**

a See Table 3-1

b See Table 3-2

c See Table 3-4

d See Section 4.1

e See Section 3.7. In a single dry year its estimated that the SWP will be able to supply up to 900 AF, SWP supply may be used in-lieu of groundwater or other supplies when available and when those supplies are, or are expected to be, reduced. This table represents a dry-year scenario where other supplies are reduced and hence use of SWP supplies is assumed.

f See Section 3.7.

g Maximum supplies do not account for reduction to meet water quality objectives.

TABLE 3-8
WATER SUPPLY ESTIMATES - MULTIPLE-DRY YEARS (AF)

Water Supply Source	2025	2030	2035	2040	2045
Casitas Municipal Water District [a]					
Year 1	5,805	5,963	6,126	6,293	6,465
Year 2	4,644	4,771	4,901	5,035	5,172
Year 3	4,064	4,174	4,288	4,405	4,526
Year 4	4,064	4,174	4,288	4,405	4,526
Year 5	4,064	4,174	4,288	4,405	4,526
Ventura River [b]					
Year 1	1,298	1,298	1,298	1,298	1,298
Year 2	1,298	1,298	1,298	1,298	1,298
Year 3	1,298	1,298	1,298	1,298	1,298
Year 4	1,298	1,298	1,298	1,298	1,298
Year 5	1,298	1,298	1,298	1,298	1,298
Groundwater [c]					
Year 1	11,939	11,325	10,710	10,096	10,096
Year 2	11,939	11,325	10,710	10,096	10,096
Year 3	11,939	11,325	10,710	10,096	10,096
Year 4	11,939	11,325	10,710	10,096	10,096
Year 5	11,939	11,325	10,710	10,096	10,096
Recycled Water [d]					
Year 1	576	576	576	576	576
Year 2	576	576	576	576	576
Year 3	576	576	576	576	576
Year 4	576	576	576	576	576
Year 5	576	576	576	576	576
SWP Water [e]					
Year 1	2,000	2,000	2,000	2,000	2,000
Year 2	3,300	3,300	3,300	3,300	3,300
Year 3	1,300	1,300	1,300	1,300	1,300
Year 4	3,800	3,800	3,800	3,800	3,800
Year 5	1,100	1,100	1,100	1,100	1,100
Planned Potable Reuse [f]					
Year 1	0	2,800	4,000	4,000	4,000
Year 2	0	2,800	4,000	4,000	4,000
Year 3	0	2,800	4,000	4,000	4,000
Year 4	0	2,800	4,000	4,000	4,000
Year 5	0	2,800	4,000	4,000	4,000
Water Available In Multiple Year Drought [g]					
Year 1	21,618	23,962	24,710	24,263	24,435
Year 2	21,757	24,070	24,785	24,305	24,442
Year 3	19,177	21,473	22,172	21,675	21,796
Year 4	21,677	23,973	24,672	24,175	24,296
Year 5	18,977	21,273	21,972	21,475	21,596

a See Table 3-1

b See Table 3-2

c See Table 3-4

d See Section 4.1

e See Section 3.7. Because other supplies are likely to be reduced in multi-year drought use of SWP water is assumed.

f See Section 3.7.

g Maximum supplies do not account for reduction to meet water quality objectives.

3.9 Energy Intensity of the City of San Buenaventura's Water System

Water energy intensity is the amount of energy, calculated on a whole-system basis, required for use of water in a specific location, such as the Ventura Water service area. DWR provides guidance for calculating the operational energy intensity of water, defined as the total amount of energy expended by the urban water supplier on a per AF basis to take water from the location where the urban water supplier acquires the water to its point of delivery. DWR requires that urban water suppliers only report the energy intensity associated with water management processes occurring within their operational control and not include energy embedded in water supplies purchased from a wholesale water agency. Table 3-9 below provides an estimate, using the total utility approach, of the water energy intensity of Ventura Water's potable water system. DWR's Energy Intensity spreadsheet is provided in Appendix K.

Table 3-9
Energy Intensity Ventura Water Potable Water Supply -Total Utility Approach

Start Date for Reporting 10/1/2017	**Sum of All Water Management Processes**	**Non-Consequential Hydropower**	
End Date for Reporting 9/30/2018	*Total Utility*	*Hydropower*	*Net Utility*
Volume of Water Entering Process (AF)	13850.54	0	13850.54
Energy Consumed (kWh)	10,042,668	0	10,042,668
Energy Intensity (kWh/MG)	2225.2	0	2225.2

Section 4: Recycled Water and Reuse

This section of the Plan describes the existing and future recycled water opportunities available to the City service area. The description includes estimates of potential supply and demand for 2020 to 2045 in five-year increments, as well as the City's incentives and optimization plan.

4.1 Recycled Water Planning

The City has access to recycled water supply through the Ventura Water Reclamation Facility (VWRF). The City has sole ownership in the wastewater treatment and water recycling facilities in its service area. Currently, the VWRF discharges most of its tertiary treated effluent to the Santa Clara River Estuary with approximately 576 AFY diverted as recycled water for landscape irrigation.

The City has been planning a potable reuse facility to increase their recycled water supply. The City began planning for the VenturaWaterPure facility in 2015 and has since nearly completed the planning phase. As such, the City is not planning to expand their recycled water system beyond this but will continue to deliver the recycled water that they have historically delivered from the VWRF.

4.1.1 Wastewater Collection and Treatment

The VWRF is permitted at 14 million gallons per day (MGD) and discharges up to 9 MGD. The VWRF currently discharges an average of 6.6 MGD. The VWRF provides wastewater collection and treatment service for approximately 98 percent of City residences as well as McGrath State Beach Park and the North Coast Communities (County Service Area No 29). In February 2016, the City took over sewer service for the formerly unincorporated Montalvo community served by Montalvo Community Services District. The VWRF produces recycled water that is treated to tertiary Title 22 standards through tertiary filtration and disinfection. Currently, approximately 6 percent of the treated effluent is reused as recycled water; the rest is discharged to the SCRE.

The City's wastewater collection system consists of approximately 290 miles of sewer pipelines ranging in size from 4 to 42 inches, 11 wastewater lift stations, and the VWRF, a tertiary treatment plant. In addition, the City has recently taken over the 7.5 miles of sewer mains formerly owned by the Montalvo Community Services District. The collection system conveys flows generally from east to west and north to south, culminating at the VWRF for treatment.

The City first provided a municipal sewer system more than a century ago. In 1888, this system extended from Crimea Street west to the Ventura River and from the Pacific Ocean north to Ramona Street. The City later built and operated a primary treatment facility that included an ocean outfall at the foot of Figueroa Street between 1929 and 1959. At that time the outfall was abandoned, and the treatment plant replaced with a pump station, which delivered all wastewater flow from the western portion of Ventura through a 3-mile force main to the VWRF. The VWRF, at 1400 Spinnaker Drive, was constructed in 1958 as a 4 MGD secondary treatment facility utilizing trickling filters. The facility is located on the north bank of, and discharges treated effluent to the SCRE. The facility has provided reclaimed water since the

1970's to the City owned Olivas Park Municipal Golf Course approximately one-quarter mile east of the treatment plant. In 1972 the facility was expanded with the addition of a 10 MGD Activated Sludge treatment process. At that time tertiary filters were also constructed to provide filtered effluent for both reclamation and discharge to the SCRE. Subsequent facility construction projects have added solids treatment, nutrient removal, improved chloramine contact and expanded reclamation pumping and distribution facilities.

Table 4-1 documents wastewater collection in 2020; Table 4-2 documents wastewater treatment and discharge in 2020.

TABLE 4-1
WASTEWATER COLLECTED WITHIN SERVICE AREA 2020 (AF)

Name of Wastewater Collection Agency	Wastewater Volume Metered or Estimated?	Volume of Wastewater Collected in 2020	Name of Agency Receiving Collected Wastewater	Treatment Plant Name	Is WWTP Located Within UWMP Area?	Is WWTP Operation Contracted to a Third Party?
City of San Buenaventura	Metered	8,108	City of San Buenaventura	Ventura Water Reclamation Facility	Yes	No

Note: Currently, approximately 6% of the treated effluent is reused as recycled water, the remaining is discharged to the Santa Clara River Estuary.

TABLE 4-2
WASTEWATER TREATED AND DISCHARGED WITHIN SERVICE AREA 2020

Wastewater Treatment Plant Name	Discharge Location/ Method of Disposal	Does the Plant Treat Wastewater Generated Outside the Service Area?	Treatment Level
Ventura Water Reclamation Facility	Discharge to Santa Clara River Estuary	No	Tertiary

Wastewater Treated (AF)	Discharged Treated Wastewater (AF)	Recycled Within Service Area (AF)	Recycled Outside of Service Area (AF)
8,108	7,544	564	0

Current Recycled Water Uses

Recycled water from the VWRF is used for general irrigation of two public golf courses, a City park and nearby landscape areas. After the VenturaWaterPure facility is constructed and

operational, the City still plans to provide recycled water from the VWRF for the same irrigation purposes. Existing recycled water uses include:

- Golf courses - Olivas Links Golf Course and Buenaventura Golf Course irrigation
- Parks - Marina Park irrigation
- Others - Landscape irrigation near Olivas Drive and in the Harbor area.

The two golf course customers, Olivas Links Golf Course and the Buenaventura Golf Course, account for approximately 90 percent of the total recycled water. In addition, discharge to the Estuary is also considered a beneficial use of the recycled water. Table 4-3 provides a summary of existing actual recycled water uses compared to the projected values in the 2015 UWMP.

In 2016, in response to the drought, the City increased its efforts to replace potable demand with recycled water demand. The City implemented a program, referred to as the mobile reuse program, whereby commercial and industrial entities and City residents can use a recycled water filling station at the VWRF. The filing station is used by multiple entities such as AERA Energy, the Ventura County Transportation Department, the City of San Buenaventura City Parks Department, and the San Buenaventura State Park, in addition to City residents, for the self-hauling of recycled water for irrigation and dust control. The mobile reuse program was in operation through part of 2020, however, was paused due to the COVID-19 pandemic.

TABLE 4-3
2015 UWMP RECYCLED WATER USE PROJECTION
COMPARED TO 2020 ACTUAL (AF)

Beneficial Use Type	2015 Projection for 2020 (AF)	Actual 2020 Use (AF)
Agriculture	0	0
Landscape Irrigation	700	564
Commercial Use	0	0
Industrial Use	0	0
Geothermal/Energy	0	0
Seawater Intrusion Barrier	0	0
Recreational Impoundment	0	0
Wetlands or Wildlife Habitat	0	0
Groundwater Recharge	0	0
Surface Water Augmentation	0	0
Direct Potable Reuse	0	0
Other	0	0
Total	**700**	**564**

4.1.2 Potential and Projected Use

Recycled water could be put to potable reuse at the VenturaWaterPure facility. In 2015, the City initiated a pilot project to test the feasibility of constructing an advanced water purification facility (AWPF) to maximize quantity and reliability of potable supplies by purifying tertiary treated effluent produced by the VWRF and optimizing its potable reuse, rather than discharging into the SCRE. The pilot facility operated for 9 months and produced favorable results, indicating highly reliable purification technologies, providing information on operational needs and costs, and the absence of risk to public health and safety. As a result, the City is proceeding with the design of a full-scale AWPF.

Other Methods to Expand Recycled Water Use

The City will expand their recycled water use significantly via the VenturaWaterPure facility and is not planning to further expand traditional recycled water use.

Projected Recycled Water Demand

Table 4-4 shows the projected recycled water uses including the historic uses for golf course, park, and landscape irrigation (excluding the VenturaWaterPure facility).

TABLE 4-4
PROJECTED RECYCLED WATER USES

Beneficial Use Type	2025	2030	2035	2040	2045
Agriculture	0	0	0	0	0
Landscape Irrigation	576	576	576	576	576
Commercial Use	0	0	0	0	0
Industrial Use	0	0	0	0	0
Geothermal/Energy	0	0	0	0	0
Seawater Intrusion Barrier	0	0	0	0	0
Recreational Impoundment	0	0	0	0	0
Wetlands or Wildlife Habitat	0	0	0	0	0
Groundwater Recharge	0	0	0	0	0
Surface Water Augmentation	0	0	0	0	0
Direct Potable Reuse [a]	0	0	0	0	0
Other	0	0	0	0	0
Total	**576**	**576**	**576**	**576**	**576**

Notes:

a VenturaWaterPure accounted for in Tables 3-6 through 3-8.

4.1.3 Methods to Encourage Recycled Water Use

Ventura Water is focusing efforts on potable reuse through the VenturaWaterPure facility but will encourage customers to continue to participate in the mobile reuse program and will require new construction projects to utilize recycled water for landscape irrigation if located adjacent to a recycled water pipeline.

Section 5: Water Quality

The quality of any natural water is dynamic in nature. This is true for surface water and local groundwater. During periods of intense rainfall or snowmelt, routes of surface water movement are changed; new constituents are mobilized and enter the water while other constituents are diluted or eliminated. The quality of water changes over the course of a year. These same basic principles apply to groundwater. Depending on water depth, groundwater will pass through different layers of rock and sediment and leach different materials from those strata. Water depth is a function of local rainfall and snowmelt. During periods of drought, the mineral content of groundwater increases. Water quality is not a static feature of water, and these dynamic variables must be recognized.

The City's water sources are within current and anticipated Environmental Protection Agency (EPA) and State Water Resources Control Board Division of Drinking Water (DDW) levels for primary water quality standards. Based on current conditions and knowledge, water quality is not anticipated to affect water supply reliability. However, water quality issues are constantly evolving. It is well recognized water quality treatment can have significant costs.

The City's east side receives its water from groundwater wells and has significantly higher levels of TDS and minerals (hardness) compared to the water delivered to the City of San Buenaventura's west end. As such, TDS levels in excess of 1,000 parts per million (ppm) are experienced on a daily basis in the eastern portions of the system. To meet secondary water quality standards, the DDW encourages the City to explore ways to limit TDS levels to 1,000 ppm. At this time, groundwater from multiple wells in both the Mound and Oxnard Plain basins are treated and blended at the Bailey Treatment Plant to achieve the lowest TDS levels possible without sacrificing supplies. Groundwater in the Mound Basin is high in TDS and sulfate. Some portions of the groundwater exceed the sulfate maximum contaminant level (MCL) of 500 ppm, with conditions between 421 and 790 ppm in the distribution system (Ventura Water 2020). To improve TDS water quality additional westside water supplies or treatment of eastside sources will be required (Ventura Water 2020). The initial target is to lower TDS levels in the eastern portion of the system to 1,000 ppm by 2025 with possible further reduction in the future. The City continues to monitor for regulated as well as unregulated contaminants, in the event they are added to the contaminants list in future drinking water standards.

The City is also planning a blending strategy to improve groundwater quality. Some of the City's SWP allocation would help mitigate water quality issues via blending at the Saticoy Conditioning Facility. Water from the VenturaWaterPure facility would also be used to blend water at the Bailey Treatment Plant.

Section 6: Reliability Planning

6.1 Overview

The Act requires urban water suppliers to assess water supply reliability that compares total projected water use with the expected water supply over the planning period in five-year increments. The Act also requires an assessment for a single dry year and a multiple year drought lasting 5 years. This chapter presents the reliability assessment for the Ventura Water service area.

6.2 Normal Water Year

The normal/average year is a year in the historical sequence that most closely represents median runoff levels and patterns. This section summarizes Ventura Water supplies available to meet demands over the 25-year planning period during an average/normal year and compares them to demands for the same period. Assumptions about supplies and demands are provided in Chapters 2 and 3. Table 6-1 demonstrates that with planned supplies (see section 3.7) the City anticipates adequate supplies for years 2025 to 2045 under Normal conditions.

TABLE 6-1
COMPARISON OF SUPPLY CAPACITY AND PROJECTED DEMANDS IN AVERAGE/NORMAL YEAR (AF)

	2025	2030	2035	2040	2045
Supplies					
Casitas Municipal Water District [a]	5,805	5,963	6,126	6,293	6,465
Ventura River [a]	4,200	4,200	4,200	4,200	4,200
Groundwater [a]	11,939	11,325	10,710	10,096	10,096
Recycled Water [a]	576	576	576	576	576
SWP [a]	1,300	1,300	1,300	1,300	1,300
Planned Potable Reuse [a]	0	2,800	4,000	4,000	4,000
Total Supplies [b]	**23,820**	**26,164**	**26,912**	**26,465**	**26,637**
Estimated Demands (Table 2-7)	**14,804**	**15,193**	**15,591**	**16,001**	**16,422**
Difference (Supply - Demand)	***9,016***	***10,972***	***11,321***	***10,465***	***10,216***
Difference as % of Demand	***61%***	***72%***	***73%***	***65%***	***62%***

Notes:

a See Table 3-6

b Maximum supplies do not account for potential reductions to meet water quality objectives.

During the Water Commission Meeting on October 27, 2015 the Water Commission determined that it was appropriate to use a supply surplus buffer of 20% for normal hydrological years. The buffer has been used for the purpose of determining water supply needs and capital cost estimates for building or attaining new supply sources that will meet the surplus buffer. Table 6-1 demonstrates that, per Water Commission policy and as a result of the water supply planning conducted over the last 5 years, City water supplies after 2025 will be adequate.

6.2.1 Single-Dry Year

The water supplies and demands for the Ventura Water service area over the 25-year planning period were analyzed in the event that a single-dry year occurs. Table 6-2 summarizes the existing and planned supplies available to meet demands during an assumed single-dry year. Table 6-2 anticipates that with the planned supplies coming online after 2025, supplies will be sufficient to meet demands in a single-dry year.

TABLE 6-2
COMPARISON OF SUPPLIES AND DEMANDS IN SINGLE-DRY YEAR (AF)

	2025	2030	2035	2040	2045
Supplies					
Casitas Municipal Water District [a]	5,805	5,963	6,126	6,293	6,465
Ventura River [a]	1,298	1,298	1,298	1,298	1,298
Groundwater [a]	11,939	11,325	10,710	10,096	10,096
Recycled Water [a]	576	576	576	576	576
SWP [a]	900	900	900	900	900
Planned Potable Reuse [a]	0	2,800	4,000	4,000	4,000
Total Supplies [b]	**20,518**	**22,862**	**23,610**	**23,163**	**23,335**
Estimated Demands (Table 2-8)	**16,226**	**16,655**	**17,092**	**17,543**	**18,006**
Difference (Supply - Demand)	***4,292***	***6,208***	***6,518***	***5,620***	***5,329***
Difference as % of Demand	***26%***	***37%***	***38%***	***32%***	***30%***

Notes:

a See Table 3-7

b Maximum supplies do not account for potential reductions to meet water quality objectives.

6.2.2 Multiple-Dry Year

The water supplies and demands for Ventura Water's service area over the 25-year planning period were analyzed in the event that a five-year multiple-dry year event occurs. Table 6-3 summarizes the existing and planned supplies available to meet demands during multiple-dry years. Table 6-3 documents that with planned supplies, Ventura Water should be able to meet demands in a multiple-dry year period.

TABLE 6-3
COMPARISON OF SUPPLIES AND DEMANDS IN MULTIPLE-DRY YEARS (AF)

	2025	2030	2035	2040	2045
Supplies [a, b]					
Year 1	21,618	23,962	24,710	24,263	24,435
Year 2	21,757	24,070	24,785	24,305	24,442
Year 3	19,177	21,473	22,172	21,675	21,796
Year 4	21,677	23,973	24,672	24,175	24,296
Year 5	18,977	21,273	21,972	21,475	21,596
Estimated Demands (Table 2-8)					
Year 1	16,226	16,655	17,092	17,543	18,006
Year 2	16,226	16,655	17,092	17,543	18,006
Year 3	16,226	16,655	17,092	17,543	18,006
Year 4	16,226	16,655	17,092	17,543	18,006
Year 5	16,226	16,655	17,092	17,543	18,006
Difference (Supply - Demand)					
Year 1	5,392	7,308	7,618	6,720	6,429
Year 2	5,531	7,415	7,693	6,762	6,436
Year 3	2,950	4,819	5,080	4,132	3,789
Year 4	5,450	7,319	7,580	6,632	6,289
Year 5	2,750	4,619	4,880	3,932	3,589
Difference as % of Demands					
Year 1	25%	30%	31%	28%	26%
Year 2	25%	31%	31%	28%	26%
Year 3	15%	22%	23%	19%	17%
Year 4	25%	31%	31%	27%	26%
Year 5	14%	22%	22%	18%	17%

Notes:

a See Table 3-8

b Maximum supplies do not account for potential reductions to meet water quality objectives.

6.2.3 Summary of Comparisons

As shown in the analyses above, with planned supplies, Ventura Water has adequate supplies to meet demands during average, single-dry, and multiple-dry years.

6.3 Drought Risk Assessment

The Water Code requires that every urban water supplier include in its UWMP, a drought risk assessment for its water service to its customers. This is to benefit and inform the demand management measures and water supply projects and programs to be included in the urban water management plan.

Annually Ventura Water prepares a CWRR. This report will form the basis for the Annual Assessment of shortage (see Appendix L). As part of preparing the CWRR, Ventura Water looks in detail at anticipated supplies and demands for the current year and two future years and also provides longer term projections.

6.3.1 Data and Methodologies Used

6.3.1.1 Water Demands

The water demands for this UWMP utilize water demand factors developed in April 2020, used in the 2021 CWRR. These water demand factors have been applied to the existing and anticipated land uses in the Ventura Water service area. The water demand factors looked at billing data for the City, for various uses, for the period 2013 through 2018, a water loss factor was applied to the raw factor, and a planning-level contingency factor was applied to account for variability due to weather and drought. The water demand factors capture changes in demand due to water conservation and codes and standards that have occurred overtime. Because growth in the Ventura Water service area is minimal (approximately 0.54% a year) it is not necessary to apply a different water demand factor to new dwellings. The current water demand factors are used and have been adjusted to account for new dwellings. Applying an optimistically “low” water demand factor on new development could skew demand trends when it is uncertain if (a) the development will truly occur and (b) the development will have a truly low water demand.

To evaluate water demand, Ventura Water has examined current and projected land uses. The land use evaluation started with the current general plan and a summary of built dwelling-units (residential) and square footage (non-residential). Using known development projects constructed since the adoption of the general plan, a summarized total of the existing land use within the City service area through the end of the recent calendar year was developed.

The City of San Buenaventura maintains a database of projects that are in the City’s planning process and categorizes the projects as: “In Planning Process,” “In Plan Check,” “Under Construction,” or have “All Planning Approvals.” Ventura Water has evaluated the database for projects that are either “Under Construction,” or have “All Planning Approvals.” In coordination with City Planning, Ventura Water has created a table of the “Under Construction and Approved Projects” anticipated to utilize water in the near term, which is defined as the next five years.

Using the anticipated land uses and the water demand factors Ventura Water has estimated water demands 2021 through 2025 shown in Table 6-11 below.

6.3.1.2 Water Supplies

This Drought Risk Assessment looks at all the water supplies anticipated to be available 2021 through 2025, including any limitations due to infrastructure, regulations, and assuming drought conditions.

Casitas Municipal Water District

As of February 2020, Casitas is currently in a Stage 3 water supply condition per Casitas Resolution No. 16-00. The current lake level as of February 19, 2020 was 41.6 percent full. The Casitas Board of Directors made the final decision to remain in a Stage 3 water supply condition in June of 2020. The City's calendar year 2020 supply from Casitas was 3,794 AF.

Although the Lake is currently slightly above 40% capacity, it is likely that Casitas will remain in a Stage 3 water supply condition. To be conservative, a reduction of 30% to the City's Casitas supply for 2021 and a 40% reduction for 2022, and a 30% reduction 2023 to 2025 are assumed. However, due to growth in the Casitas service area, there is a slight increase in the amount of water the City is eligible to receive from Lake Casitas. This growth is also accounted for in the anticipated drought supplies shown in Table 6-4.

TABLE 6-4
ANTICIPATED SUPPLIES FROM CASITAS CONSECUTIVE DRY YEARS 2021-2025 (AF)

2021	2022	2023	2024	2025
3,798	3,864	3,369	2,864	2,185

Notes:

Assumes 30% reduction in supply Years 2021, 2023, 2024, and 2025
Assumes 40% reduction in supply Year 2022

Ventura River

Production from the Ventura River is limited by infrastructure, the settlement with Santa Barbara Channelkeeper, and low-flow hydrology as detailed in section 3.2.2 and summarized in Table 6-5 below.

TABLE 6-5
ANTICIPATED SUPPLIES FROM VENTURA RIVER
CONSECUTIVE DRY YEARS 2021-2025 (AF)

2021	2022	2023	2024	2025
736	1,298	1,298	1,298	1,298

Notes:

Assumes repeat of the average two driest years (2015-2016) for year 2021

Assumes repeat of single-driest year (2015) for years 2022-2025

Groundwater

As described in Sections 3.3 and 3.4, groundwater supplies are anticipated to be reliable sources of supply for the City. Table 6-6 reflects the anticipated supplies. In Table 6-6 a gradual turn-down of supply from the Oxnard Plain subbasin is assumed to account for pumping reductions anticipated as part of implementation of the GSP.

TABLE 6-6
ANTICIPATED GROUNDWATER SUPPLIES
CONSECUTIVE DRY YEARS 2021-2025 (AF)

	2021	2022	2023	2024	2025
Mound	3,270	4,000	4,000	4,000	4,000
Oxnard Plain	5,304	5,181	5,058	4,936	4,813
Santa Paula Basin	2,661	2,661	2,661	2,661	3,126
Total	*11,235*	*11,842*	*11,719*	*11,597*	*11,939*

State Water Project

SWP water is not anticipated to be available in the Ventura Water service area until 2025. For the purposes of the Drought Risk Assessment, it is assumed the SWP is also experiencing a 5-year drought and supply is assumed to be similar to year 1935 hydrology (State Water Project Final Delivery Capability Report 2019 (August 26, 2020) Table B-32), see Table 6-7.

TABLE 6-7
ANTICIPATED SWP SUPPLIES
CONSECUTIVE DRY YEARS 2021-2025 (AF)

2021	2022	2023	2024	2025
-	-	-	-	1,100

Notes:
No delivery infrastructure until 2025. Assumes year 1934 hydrology based on State Water Project Final Delivery Capability Report 2019 (August 26, 2020) Table B-32

VenturaWaterPure

The VenturaWaterPure Project is planned to be operable in 2025, but may not be producing regular supply until after 2025. Therefore, Table 6-8 does not include supply from VenturaWaterPure. For subsequent years, supply from VenturaWaterPure is estimated to be 2,800 AFY after 2025 and 4,000 AF after year 2030, in all hydrologic year types.

TABLE 6-8
ANTICIPATED VENTURAWATERPURE SUPPLIES
CONSECUTIVE DRY YEARS 2021-2025 (AF)

2021	2022	2023	2024	2025
-	-	-	-	-

Recycled Water

As described in Section 4 and reflected in Table 6-9, recycled water is anticipated to provide a reliable 576 AFY of supply.

TABLE 6-9
ANTICIPATED RECYCLED WATER SUPPLIES
CONSECUTIVE DRY YEARS 2021-2025 (AF)

2021	2022	2023	2024	2025
576	576	576	576	576

Summary All Supplies Consecutive Drought Years 2021-2025

In Table 6-10 below a summary of all anticipated supplies for consecutive drought years is provided. Table 6-11 provides a comparison of supplies and demands assuming consecutive drought 2021-2025.

TABLE 6-10
SUMMARY ANTICIPATED SUPPLIES
CONSECUTIVE DRY YEARS 2021-2025 (AF)

	2021	2022	2023	2024	2025
Casitas	3,798	3,864	3,369	2,864	2,185
Ventura River	736	1,298	1,298	1,298	1,298
Mound	3,270	4,000	4,000	4,000	4,000
Oxnard Plain	5,304	5,181	5,058	4,936	4,813
Santa Paula	2,661	2,661	2,661	2,661	3,126
Recycled Water	576	576	576	576	576
State Water Project	0	0	0	0	1,100
VenturaWaterPure	0	0	0	0	0
Total	16,345	17,580	16,962	16,335	17,098

TABLE 6-11
FIVE YEAR DROUGHT RISK ASSESSMENT

2021	Total
Gross Water Use [1]	15,631
Total Supplies	16,345
Surplus/Shortfall w/o WSCP Action	714
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	0
WSCP - use reduction savings benefit	0
Revised Surplus/(shortfall)	0
Resulting % Use Reduction from WSCP action	0%

2022	Total
Gross Water Use [1]	15,828
Total Supplies	17,580
Surplus/Shortfall w/o WSCP Action	1,752
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	0
WSCP - use reduction savings benefit	0
Revised Surplus/(shortfall)	0
Resulting % Use Reduction from WSCP action	0%

2023	Total
Gross Water Use [1]	16,026
Total Supplies	16,962
Surplus/Shortfall w/o WSCP Action	936
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	0
WSCP - use reduction savings benefit	0
Revised Surplus/(shortfall)	0
Resulting % Use Reduction from WSCP action	0%

2024	Total
Gross Water Use [1]	16,223
Total Supplies	16,335
Surplus/Shortfall w/o WSCP Action	112
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	0
WSCP - use reduction savings benefit	0
Revised Surplus/(shortfall)	0
Resulting % Use Reduction from WSCP action	0%

2025	Total
Gross Water Use [1]	16,226
Total Supplies	17,098
Surplus/Shortfall w/o WSCP Action	872
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	0
WSCP - use reduction savings benefit	0
Revised Surplus/(shortfall)	0
Resulting % Use Reduction from WSCP action	0%

Notes:

1. The gross water use value assumes the worst-case scenario of less than 50% of normal rainfall and applies a 10% upward adjustment to the demand projections.

Section 7: Demand Management Measures

7.1 Demand Management

The purpose of the Demand Management Measures (DMM) section of this UWMP is to (a) provide a description of the past water conservation programs that Ventura Water has implemented since 2016 to meet its urban water use reduction targets and (b) describe the activities and actions Ventura Water plans to use in the future to meet its urban water use reduction targets. For the purposes of this UWMP the DMMs are categorized as "Foundational" and "Other". Foundational DMMs, listed below, are those DMMs that the UWMP Act and Water Code specifically mention:

a. Water waste prevention ordinances
b. Metering
c. Conservation pricing
d. Public education and outreach
e. Programs to assess and manage distribution system real loss
f. Water conservation program coordination and staffing support

Activities outside of the Foundational DMMs that encourage less water use in the City service area fall in the "Other DMM" category.

This chapter discusses the DMMs that Ventura Water undertakes as part of normal business. However, given the extraordinary and continuing drought, this chapter also describes those measures that were undertaken specifically to address dry conditions.

7.1.1 Foundational DMMs

7.1.1.1 Water Waste Prohibition

Ventura Water prohibits water waste through its Water Conservation Ordinance (Division 22 – Public Utilities, Chapter 22.170). Specifically, Section 22.170.010 states:

"Water waste prohibited.

A. Prohibited uses. No person shall use or permit the use of water:
    1. For the watering of turf, ornamental landscape, open ground crops and trees, including agricultural irrigation, in a manner or to an extent which allows water to run to waste;
    2. Such that the escape of water through leaks, breaks or malfunction within the water user's plumbing or distribution system occurs for any period of time beyond which such break or leak should reasonably have been discovered and corrected. It shall be presumed that a period of 48 hours after the water user discovers such leak, break or malfunction, or receives notice from the city of such

condition, whichever occurs first, is a reasonable time within which to correct such condition;

3. In conjunction with use of a handheld hose to wash automobiles, trucks, trailers, boats, or other types of mobile equipment without the use of a workable positive shutoff nozzle;
4. For the operation of any ornamental fountain, or similar structures, unless water for such use is recycled for lawful reuse without substantial loss;
5. For washing of sidewalks, walkways, driveways, parking lots or any other hard-surfaced areas by hose or flooding, except as otherwise necessary to prevent or eliminate conditions dangerous to the public health and safety or for other legitimate necessity;
6. For serving of water by a restaurant to its customers without first being requested by the customer;
7. The application of potable water to outdoor landscaped during and within 48 hours of measurable rainfall; or
8. Knowingly for any indiscriminate running of water or washing with water not otherwise prohibited above which is wasteful and without reasonable purpose."

7.1.1.2 Metering

All existing services and new service connections in the City are metered and billed volumetrically

Efforts in 2020

In March 2016, the City Council adopted the Meter Upgrade Project to replace all manually-read water meters with advanced metering infrastructure (AMI) that automatically relay water usage to the City's billing system through a secured network. The project launched in October 2018, with plans to replace all 32,000 Ventura Water meters by October 2021. To date, the project is 75 percent complete with over 25,000 meters installed.

In April 2020, Ventura Water launched Home Connect, a new online portal that allows Ventura Water customers to track their hourly water usage, set water-use budgets, and receive leak detection notifications for improved water use management. Upon completion, the Meter Upgrade Project is projected to save more than 600 acre-feet of water per year.

7.1.1.3 Conservation Pricing

All of the City's retail customers are metered and billed with commodity rates for both water and sewer service. The City does not have any unmetered services and all new connections are metered and billed volumetrically.

Efforts in 2020

Every five years, a Cost of Service and Rate Design Study is conducted for the water and wastewater enterprises to ensure fair and equitable rates for all City customers and to generate sufficient revenue to meet operating and capital costs. In response to seasonal drought conditions, the City has periodically adopted and implemented new rate structures. These

events occurred in Fiscal Year (FY) 2012-2013, FY 2014-2015, and FY 2015-2016, in response to water shortage events. New rates were established to achieve full revenue recovery during drought and non-drought years. In May 2020, the City declared a Stage 2 Water Shortage Event, shifting from the Stage 3 Water Shortage Event declared in September 2015 that remained in effect through June 30, 2020. The City is currently conducting a new Water and Wastewater Rate Design Study. If adopted by City Council, new rates will be implemented in July 2021.

7.1.1.4 Public Education and Outreach

Ventura Water has consistently and actively encouraged water conservation through an extensive public education and outreach campaign. Outreach has utilized multiple venues including social media, printed media (bill inserts, handouts), outdoor advertising (billboards), radio, television, hosting of water conservation workshops, participation in community events (parades and street fairs). These outreach activities are summarized in Table 7-1.

TABLE 7-1
VENTURA WATER OUTREACH PROGRAMS

Action	Description	2016	2017	2018	2019	2020
Monthly E-Newsletter	The monthly Pipeline Newsletter provides information on capital improvement projects, conservation programs, public meetings, workshops, and special events.	X	X	X	X	X
Website	Ventura Water regularly updates the website with FAQs, public notices, water quality data, water conservation information, public meeting information, project updates, and more.	X	X	X	X	X
Outreach Events	15-20 public outreach events per year, consisting of job fairs, City-sponsored events, Chamber of Commerce events, with giveaways and informational handouts.	X	X	X	X	X
Social Media	Ventura Water maintains an active and engaged presence on Facebook, Twitter, YouTube, and Instagram.	X	X	X	X	X
Public Engagement Materials	Water quality Consumer Confidence Report. Brochures “Protecting our Pipes”; “Understanding Water and Wastewater Charges”; “Customer Assistance Program”; “Water Disaster Preparedness”; and “Fats, Oils, and Grease”.	X	X	X	X	X
Targeted Outreach	Brochures, annual mailer, postcards, and door hangers.	X	X	X	X	X
Conservation Giveaways	Ventura Water continues to offer customers water conservation giveaways including materials such as “Doing Our Part to Save Water” yard signs, low-flow showerheads, faucet aerators, toilet leak detection kits, shower times, dish squeegees, and more.	X	X	X	X	X

Table 7-1 cont.

Action	Description	2016	2017	2018	2019	2020
WaterWise Gardening Series	Ventura Water, in partnership with the city's Environmental Sustainability Department, offers monthly workshops that cover water wise and sustainable gardening practices.	X	X	X	X	X
Townhall Meetings/ Public Informational Meetings	Ventura Water plans, attends, and hosts public meetings to share water shortage rates information, ordinance changes, and customer programs to provide an opportunity for residents to voice concerns	X	X	X	X	X
Customer Water Waste Hotline	Hotline where customers can report water waste.	X	X	X	X	X
Water Take 1	A home grown international short film contest that brings awareness to the value of water.	X	X	X	X	X

Between September 2016 and July 2018, Ventura Water held nine water conservation contests to bring awareness of saving water during drought periods to the community.

The Ventura Water Outreach team, an assembly of Ventura Water staff who represent the laboratory, the wastewater collections system, the wastewater plant operations, water distribution, and the General Managers office host and attend multiple events to perform face to face public engagement related to drought messaging (see Table 7-2).

7.1.1.5 Programs to Assess and Manage Distribution System Real Loss

Consistent with Senate Bill 555, Ventura Water conducts a water loss audit each year and provides a report to DWR. For the January to December 2019 period, Ventura Water utilized the Water Audit Methodology (Appendix L of the Guidebook) to estimate both real and apparent water loss. Based on this recent audit, the City estimates that apparent losses (meter inaccuracies) account for about one percent of total water loss; real losses are estimated to be about 7 percent of production. The Water Loss Audit Reports for 2015-2019 are provided in Appendix E.

7.1.1.6 Water Conservation Program Coordination and Staffing Support

The conservation program is managed by Ventura Water's Management Analyst, who oversees water resources management for the City. Program activities are managed by various City staff as part of their regular assignment, which equates to one full time employee.

TABLE 7-2
DROUGHT SPECIFIC OUTREACH PROGRAMS

Monthly class March – October 2016 - 2019	Water Wise Gardening Class
March 2016 - 2018	Wild and Scenic Film Festival
March 2016 - 2019	Water Take 1 Event
April 2016 - 2019	AWA Water Symposium
April 2016 - 2019	Earth Day Ecofest
March 2017 – December 2018	Channel Islands Native Garden Plant Sale
April 2017	Pierpont Elementary Earth Day Event
April 2017	E.P. Foster Earth Day Event
May 2016 - 2018	Surf N Suds
July 2017	Smart Sprinkler Controller Workshop
April 2018	Walk for Water
May 2018	Ocean Friendly Garden/Water Conservation Workshop
May 2019	Water Wise Workshop with WCDC
August 2019	Summer Open House Event at Ventura Water Reclamation Facility

7.1.2 Other DMMs

7.1.2.1 Wholesale Agency Assistance Programs

Ventura Water will continue to work cooperatively with Casitas Municipal Water District to participate in regional DMM programs, informational groups and projects, determination of the most cost-effective DMMs, and tailoring programs specific to the City. Ventura Water customers that are within the Casitas service area qualify for many conservation incentives, including water audits, free low flow showerheads and aerators, and rebates for high efficiency toilets and washing machines. These conservation opportunities are described at Casitas' website (www.casitaswater.org). Water conservation activities undertaken by Casitas in the Ventura Water area are summarized in Table 7-3.

An example of coordination between Ventura Water and Casitas is the Water Wise Incentive Program. The Water Wise Incentive Program is a new regional water conservation program that provides outdoor water use efficiency incentives to customers of Ventura Water, the City of Santa Paula and Casitas Municipal Water District. Starting in 2016, the Water Wise Incentive Program began offering rebates for turf removal, weather-based irrigation controllers, high-efficiency nozzles, and rainwater harvesting and reuse. The City, Casitas, and the City of Santa Paula cooperatively designed the program and successfully pursued grant funding for the project.

TABLE 7-3
VENTURA WATER PARTICIPATION IN WHOLESALE AGENCY PROGRAMS

Description	2016	2017	2018	2019	2020
Water Efficiency Surveys	72	81	116	94	98
High Efficiency Toilets (1.1 gpf)	-	-	-	21	33
High Efficiency Washing Machine Rebates	29	56	14	53	106
Weather-Based Irrigation Controllers	14	134	130	113	82
High Efficiency Sprinkler Nozzles	873	1,629	4,465	2,578	1,205
Instant Hot Water Recirculating Pump	-	-	-	227	241
Rain Barrel Voucher	295	122	92	109	62

To date, Ventura Water's Water-Wise program has resulted in an estimated water savings of 104 AFY.

7.1.2.2 Ventura Water Partnerships with Ventura Unified School District

Since 2009, the City of San Buenaventura Water Department and Environmental Sustainability Division have provided environmental educational programming to Ventura Unified School District in the form of classroom presentations, assemblies, special event participation, special projects and equipment (i.e. recycle bins, composting bins, gardening supplies). Over 30,000 students have received education on water conservation, stormwater pollution prevention and waste reduction.

In 2017, Ventura Water provided financial support and technical staff support to Juanamaria Elementary School and ATLAS Elementary schools for projects and programs that increase recycling, build wildlife habitats, and reduce waste and water consumption.

In 2017, Ventura Water provided financial support and technical staff support to Ventura High School Greener World Action Team for replacing 1,100 square feet of turf with a water wise landscape at Ventura High School.

In 2018, Ventura Water provided financial support and technical staff support to ATLAS Elementary School for implementing a water wise garden on campus.

Green School Program

Ventura Water offers free education classroom presentations to students in Kindergarten through 12th grade. Lesson plans are grade-specific and aligned with Next Generation Science Standards. All lesson plans included hands-on activities, covering topics such as water conservation, water resource management, watershed protection, and more. This program aims to bring awareness of the importance of local water resource management and water conservation as a way of life.

Table 7-4 summarizes the school outreach metrics.

TABLE 7-4
SCHOOL OUTREACH METRICS

	2016	2017	2018	2019	2020
# of students	-	6,210	5,800	4,150	*
# of presentations	-	240	234	125	-

*Postponed due to COVID-19.

Field Trips

Beginning in 2016, Ventura Water partnered with MERITO Foundation, a local-based nonprofit organization dedicated to providing meaningful watershed experiences to multicultural youth and their community. Students, parents, and educators were invited to visit the Ventura Water Reclamation Facility for a day of hands-on science-based learning. Students tour the Ventura Water Reclamation Facility, conduct water quality testing out of Ventura Water's on-site wildlife ponds and assess ecosystem health through bird species identification. Through this field experience, students are exposed to careers in water science and the many roles and responsibilities necessary to sustain a safe and healthy environment. Ventura Water offers free field trips to the reclamation and drinking water treatment plants throughout the school year. Teachers and educators can schedule a field trip on Ventura Water's website. Since 2016, Ventura Water has provided field trips for over 1,600 students.

7.1.2.3 Efforts In 2020

WaterWise Turf and Replacement Program

Since 2015, the City has offered $2 per square foot rebates to qualifying customers that replace their lawn with a water wise landscape. To date, approximately 633 projects have been completed with more than 520,000 square feet of turf removed, resulting in a project water savings of 21 AFY. This program continues to be offered to Ventura Water customers.

Mobile Reuse Program

In June 2016, the City launched a Residential Mobile Reuse Program which provides high-quality recycled water for local residents and commercial businesses. The recycled water can be picked up at the Fill Station located at the Ventura Water Reclamation Facility. Residents, City Parks, and State Parks utilize the water for landscape irrigation while AERA Energy and the Ventura County Transportation Department utilize the water for dust control mitigation. Benefits of the program include expanded recycled water usage in the City and conservation of potable water. To date, the Residential Mobile Reuse Program has provided over 51 acre-feet in recycled water.

Enforcement of Water Waste Prohibition

Ventura Water staff continues to monitor and respond to water waste incidents. Residents are encouraged to anonymously report water waste through a website form or by calling Ventura Water Customer Care. City staff investigates an average of 10 water waste incidents per month.

7.2 Planned DMMs to Meet Water Use Targets

Ventura Water customers have already achieved demand reductions sufficient to meet SBX7-7 water use targets. Ventura Water will continue to perform Foundational DMMs. These DMMs, expanding opportunities for new recycled water use customers in the service area, as well as potable reuse, will help the City to keep its GPCD within or lower than the SBX7-7 water use targets.

Section 8: Water Shortage Event Contingency Plan

Ventura Water has prepared a separate standalone Water Shortage Event Contingency Plan (WSECP), contained in Appendix L. The WSECP was adopted by the City Council on April 26th, 2021. This section includes a brief summary of the WSECP and includes the drought risk assessment required by the UWMP Guidelines.

8.1 Purpose of the WSECP

The City of San Buenaventura has developed a WSECP to provide guidance if triggering events occur — whether from reduced supply, increased demand, or an emergency declaration — and to identify corresponding actions to be taken during the various stages of a water shortage. The plan includes voluntary and mandatory stages which are intended to be fair to all water customers and users while having the least impact on business, employment, and quality of life for residents.

8.2 Annual Assessment

New provisions in Water Code Section 10632.1. require that an urban water supplier such as Ventura Water, conduct an annual water supply and demand assessment ("Annual Assessment"), on or before July 1 of each year, to be submitted to DWR. As part of the WSECP Ventura Water has identified the timeline, staff and outside agency coordination, and other actions necessary to conduct the Annual Assessment.

8.3 Shortage Stages

The WSECP describes six water shortage stages corresponding to progressive ranges of up to 10, 20, 30, 40, and 50 percent shortages and greater than 50 percent shortage.

8.4 Water Shortage Response Actions

The WSECP identifies water shortage response actions, including:

- Communication with customers
- Public outreach
- Supply augmentation
- Operational changes
- Customer demand reduction measures (including enforcement)
- Monitoring of production and demand

Section 9: References

California Department of Water Resources (DWR). 2021. Final Urban Water Management Plan Guidebook. March

_____. 2003. California's Groundwater, Bulletin 118 Update 2003. October.

City of San Buenaventura.2013. San Buenaventura General Plan Housing Element Update. September 2013 Housing Element Technical Report, Page 2-39, Chart 2-26.

_____. 2011. Water Master Plan. March.

Fugro West, Inc. June 1997. "Mound Groundwater Basin Annual Report

Oakley, N.S., Hatchett, B.J., McEvoy, D., Rodriguez, L., 2019. Projected Changes in Ventura County Climate. Western Regional Climate Center, Desert Research Institute, Reno, Nevada. Available at: wrcc.dri.edu/Climate/reports.php. Available at: www.countyofventura.org.

Ventura Water. 2021. 2021 Comprehensive Water Resources Report. April.

_____. 2020. 2020 Drinking Water Consumer Confidence Report. May.

_____. 2017. State Water Interconnection Alignment Study Water Quality Assessment Technical Memorandum. September.

Ventura County Watershed Protection District's web site for Station 066E, https://www.vcwatershed.net/hydrodata/php/getstations.php?dataset=rain_hour&order=site_id, for the period October 2005 to September 2020.

Western Regional Climate Center, Station 049285. Available at: www.wrcc.dri.edu

Notice! As the state transitions from the COVID-19 emergency, please contact your local Water Board to arrange necessary file reviews. ×

Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties

Below is the first electronic version of the LARWQCB Basin Plan.

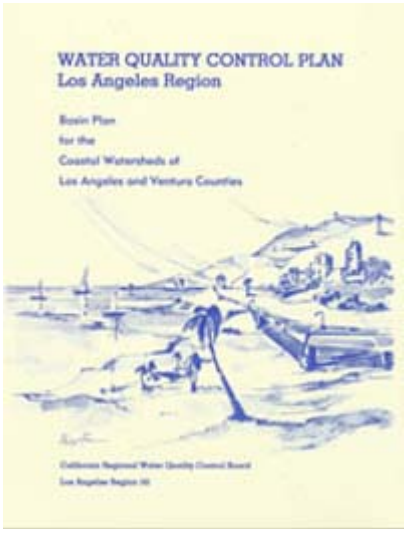
1. Chapter 1: Introduction
2. Chapter 2: Beneficial Uses
    - Chapter 2: Beneficial Uses Tables
        - Table 2-1
        - Table 2-1a
        - Table 2-2
        - Table 2-3
        - Table 2-3a
        - Table 2-4
        - Table 2-4a
    - Chapter 2: Beneficial Uses Figures
3. Chapter 3: Water Quality Objectives
4. Chapter 4: Strategic Planning and Implementation
5. Chapter 5: Plans and Policies
6. Chapter 6: Monitoring and Assessment
7. Chapter 7: TMDLs (Total Maximum Daily Loads)
8. Chapter 8: Groundwater Quality Management

- References
- Appendix 1

Related Links

- Basin Plan Amendment
- Total Maximum Daily Load(s)
- Regional Programs

- LARWQCB Programs



(Page last updated 5/18/20)

Water is a precious resource in California, and maintaining its quality is of utmost importance to safeguard the health of the public and the environment.

Statewide Campaigns

- EPA Water Sense
- Report an Environmental Concern
- Save Our Water
- Flex Alert
- Register to Vote

Quick Links

- Ex Parte Communications
- Fees
- Make a Payment
- Grievance Procedure
- Financial Assistance
- Business Help

CALIFORNIA GRANTS PORTAL

Resources

CEDEN
Data & Databases
Drought Information
FAAST
Language Access Complaint
Queja de Acceso al Idioma
MyWaterQuality
Performance Report
Tribal Affairs

Working with the Board

Decisions Pending and Opportunities for Public Participation
Employment
Fees
Frequently Asked Questions
Grants & Loans
Board Priorities
Laws / Regulations
Make a Payment
Plans / Policies
Paperless Office
Public Records Center

Website Accessibility Certification

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The California Water Boards include the State Water Resources Control Board and nine Regional Boards
The State Water Board is one of six environmental entities operating under

the authority of the California Environmental Protection Agency
CalEPA | ARB | CalRecycle | DPR | DTSC | OEHHA | SWRCB

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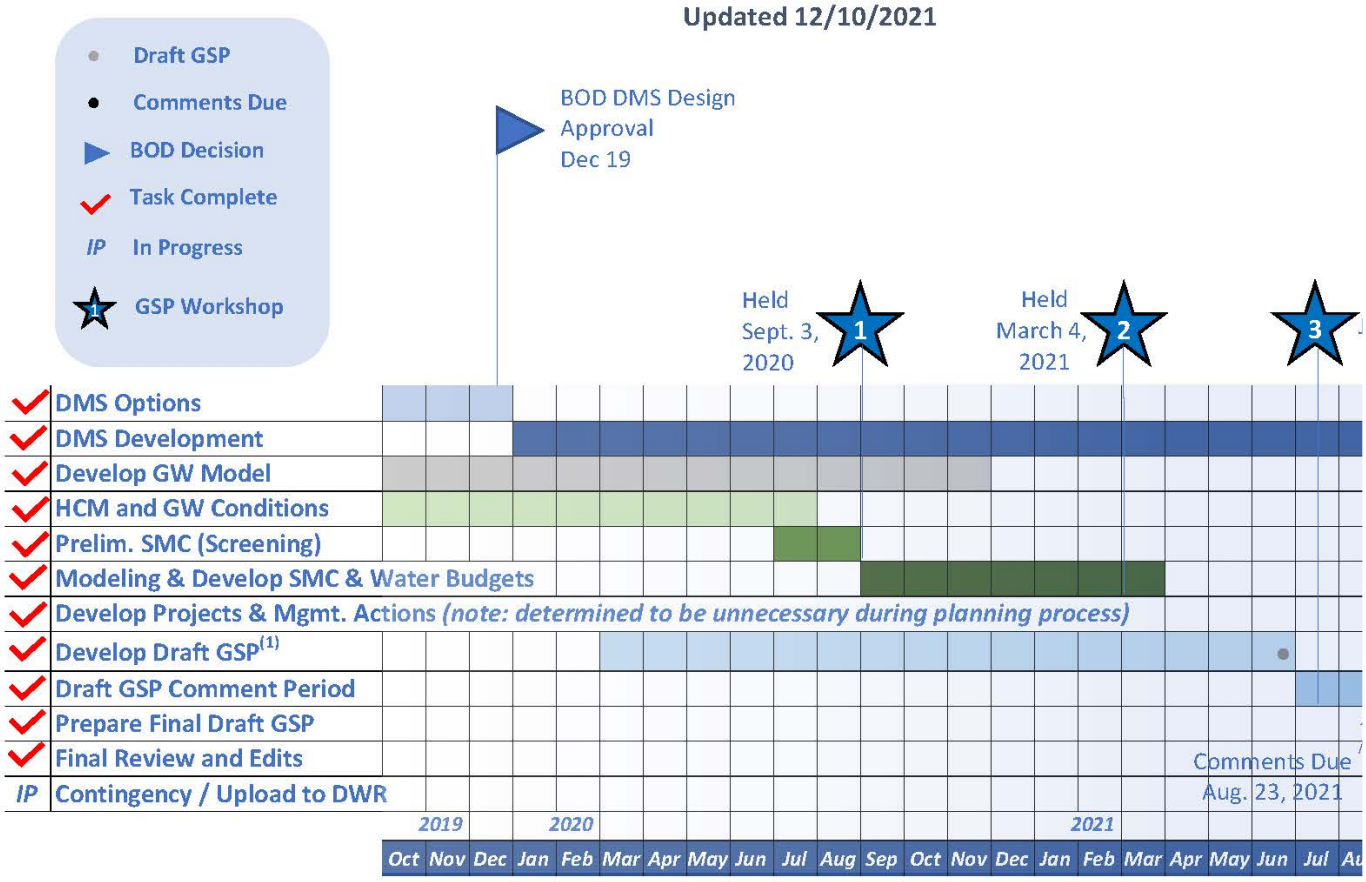
MoundBasin (https://www.moundba

GROUNDWATER SUSTAINABILITY AGENCY

Mound Basin GSA
GSP Development Schedule
Updated 12/10/2021



Notes:

(1) GSP topics not listed above generally consist of background or supporting information and will be prepared concurrently with the above-listed ta

BOD = Board of Directors; DMS = Data Management System; HCM = Hydrogeologic Conceptual Model; GSA = Groundwater Sustainability Agency; GSP = Groundwater Sustainability Plan; GW = Groundwater

8a -Attachment A GSP Update

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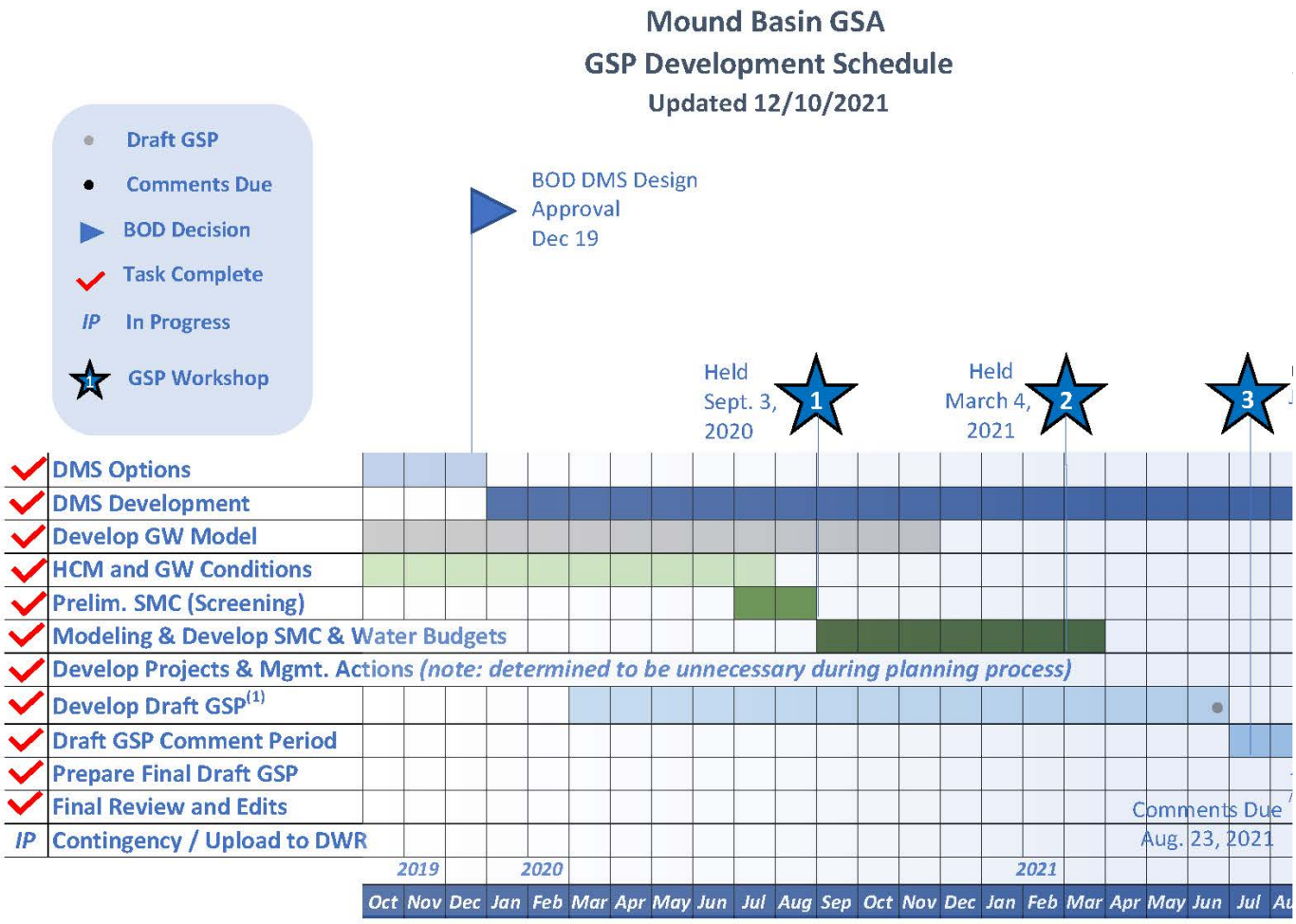

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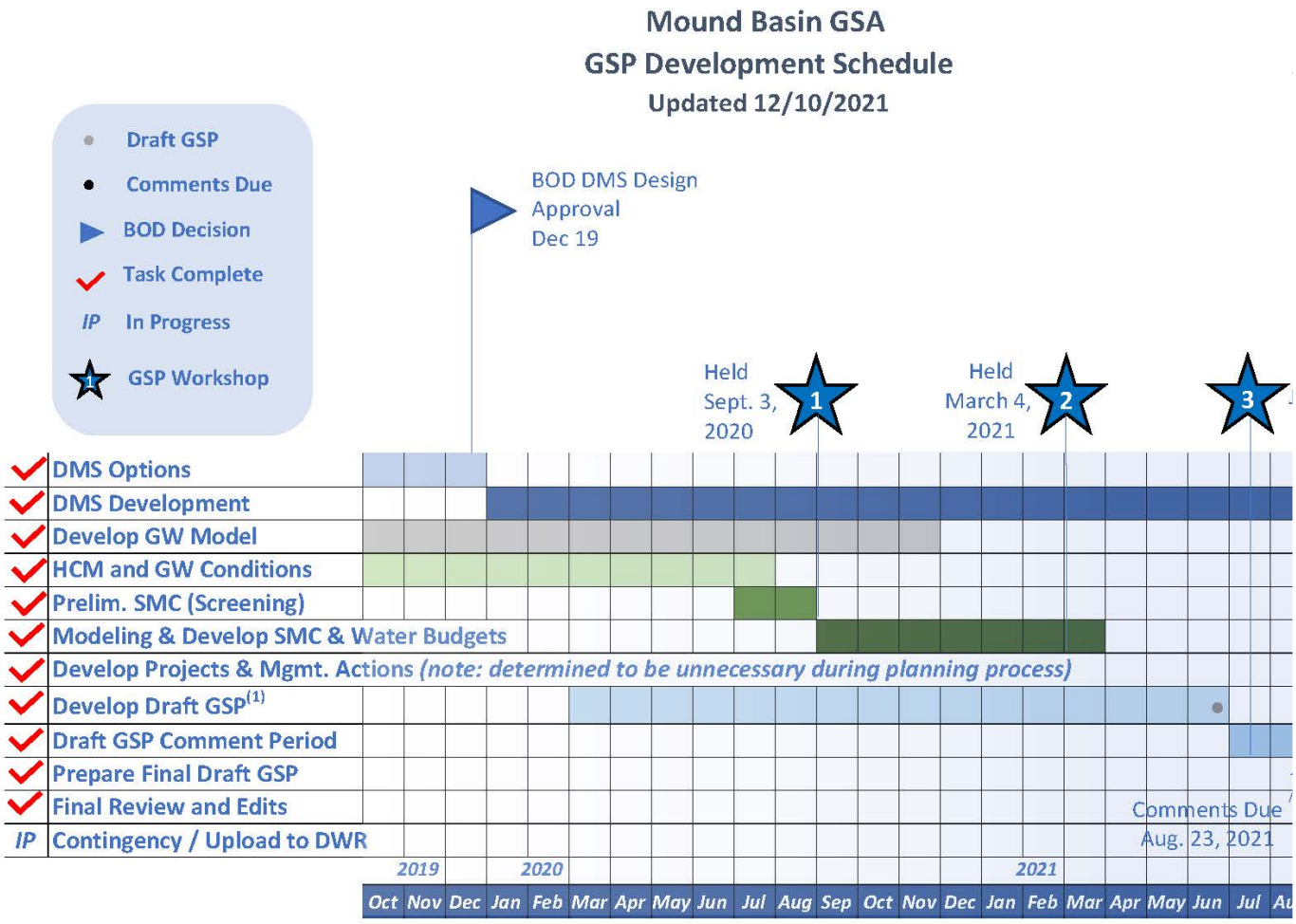

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8a -Attachment A GSP Update

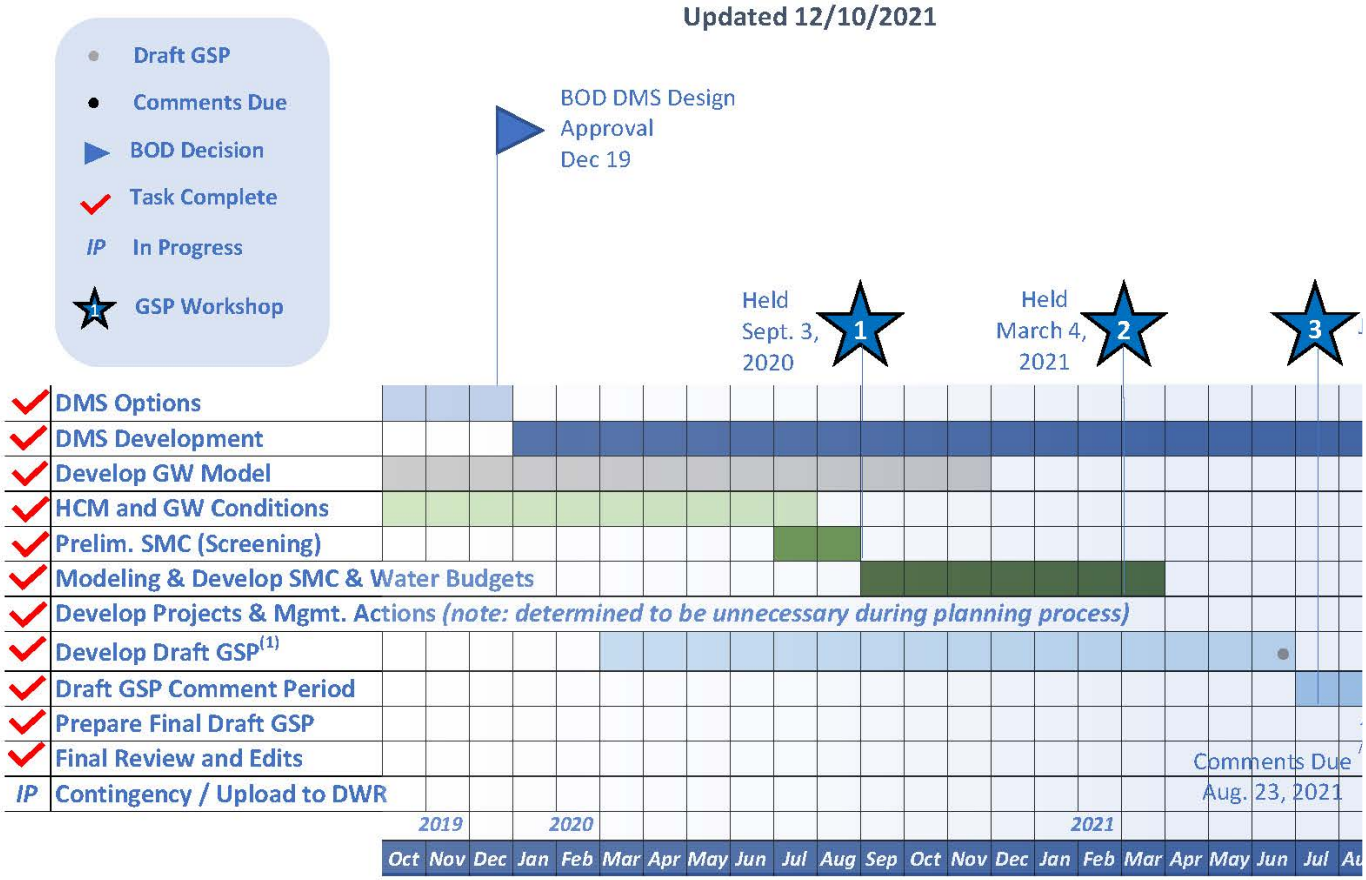
COVID-19

Mound Basin
GROUNDWATER SUSTAINABILITY AGENCY

The next Regular Board of Directors meeting is being held on Monday, February 27, 2023, at 3:00 p.m. via Zoom. The meeting Agenda along with the Zoom link will be made available here prior to the meeting. Thank you for your continued interest in Mound Basin GSA

(https://www.moundba

Mound Basin GSA
GSP Development Schedule
Updated 12/10/2021



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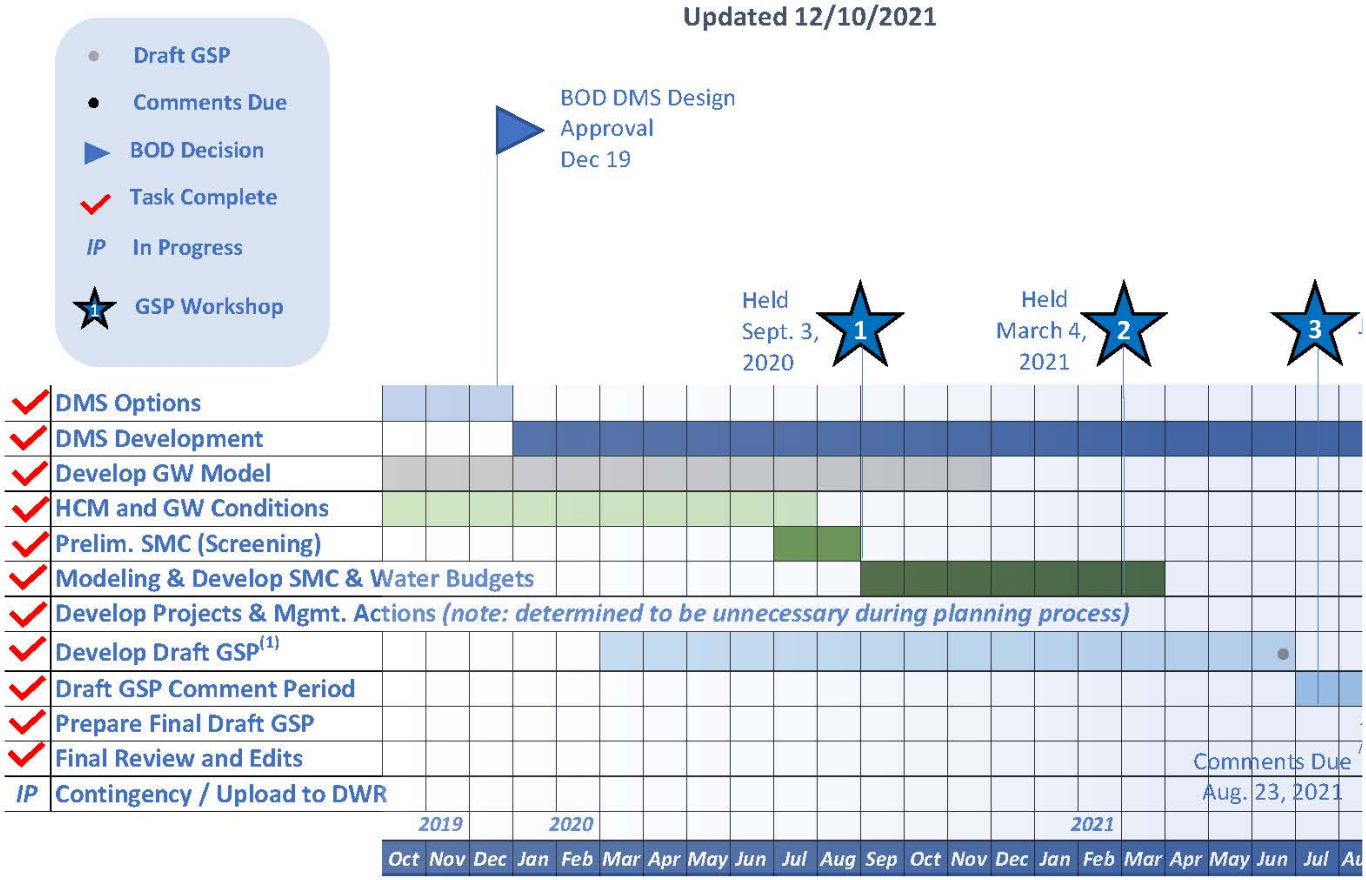
8a -Attachment A GSP Update

CONTACT INFORMATION

Mound Basin
P.O. Box 3544, Ventura, CA 9[illegible]

MoundBasin (https://www.moundba
GROUNDWATER SUSTAINABILITY AGENCY

Mound Basin GSA
GSP Development Schedule
Updated 12/10/2021



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8a -Attachment A GSP Update

State of California
Office of Administrative Law

In re: **State Water Resources Control Board**	**NOTICE OF APPROVAL OF REGULATORY ACTION**
Regulatory Action:	**Government Code Section 11353**
Title 23, California Code of Regulations	**OAL File No. 2013-0422-02 S**
Adopt sections: 3939.45 **Amend sections:** **Repeal sections:**	

This Government Code section 11353 rulemaking by the State Water Resources Control Board (Board) amends the Water Quality Control Plan for the Los Angeles Region as adopted by the Los Angeles Regional Water Resources Control Board (Regional Board) on December 6, 2012, pursuant to Resolution No. R12-011 and approved by the Board on February 19, 2013, pursuant to Resolution No. 2013-0005. These basin plan amendments establish a Total Maximum Daily Load (TMDL) for algae, nutrients, and eutrophic conditions in the Ventura River including the river's estuary and tributaries. The TMDL established in this action allows for an implementation schedule of six to twelve years depending on the source.

OAL approves this regulatory action pursuant to section 11353 of the Government Code.

Date: 6/4/2013

Kevin D. Hull
Attorney

For: DEBRA M. CORNEZ
Director

Original: Thomas Howard
Copy: Jenny Newman

13559

STATE OF CALIFORNIA--OFFICE OF ADMINISTRATIVE LAW

NOTICE PUBLICATION/REGULATIONS SUBMISSION

REGULAR

(See instructions on reverse)

STD. 400 (REV. 01-2013)

For use by Secretary of State only

ENDORSED FILED
IN THE OFFICE OF
2013 JUN -4 PM 1:59
DEBRA BOWEN
SECRETARY OF STATE

OAL FILE NUMBERS	NOTICE FILE NUMBER	REGULATORY ACTION NUMBER	EMERGENCY NUMBER
	Z-	2013-0422-02S	

For use by Office of Administrative Law (OAL) only

2013 APR 22 AM 11:12
OFFICE OF ADMINISTRATIVE LAW

NOTICE | REGULATIONS

AGENCY WITH RULEMAKING AUTHORITY
State Water Resources Control Board

AGENCY FILE NUMBER (If any)
2013-0005

A. PUBLICATION OF NOTICE (Complete for publication in Notice Register)

1. SUBJECT OF NOTICE	TITLE(S)	FIRST SECTION AFFECTED	2. REQUESTED PUBLICATION DATE

3. NOTICE TYPE	4. AGENCY CONTACT PERSON	TELEPHONE NUMBER	FAX NUMBER (Optional)
☐ Notice re Proposed Regulatory Action ☐ Other			

OAL USE ONLY	ACTION ON PROPOSED NOTICE	NOTICE REGISTER NUMBER	PUBLICATION DATE
	☐ Approved as Submitted ☐ Approved as Modified ☐ Disapproved/ Withdrawn		

B. SUBMISSION OF REGULATIONS (Complete when submitting regulations)

1a. SUBJECT OF REGULATION(S)
TMDL for Algae, Nutrients, and Eutrophic Conditions in the Ventura Rvr

1b. ALL PREVIOUS RELATED OAL REGULATORY ACTION NUMBER(S)

2. SPECIFY CALIFORNIA CODE OF REGULATIONS TITLE(S) AND SECTION(S) **(Including title 26, if toxics related)**

SECTION(S) AFFECTED (List all section number(s) individually. Attach additional sheet if needed.)

ADOPT: 3939.45
AMEND:
REPEAL:

TITLE(S): 23

3. TYPE OF FILING

- ☐ Regular Rulemaking (Gov. Code §11346)
- ☐ Resubmittal of disapproved or withdrawn nonemergency filing (Gov. Code §§11349.3, 11349.4)
- ☐ Emergency (Gov. Code, §11346.1(b))
- ☐ Certificate of Compliance: The agency officer named below certifies that this agency complied with the provisions of Gov. Code §§11346.2-11347.3 either before the emergency regulation was adopted or within the time period required by statute.
- ☐ Resubmittal of disapproved or withdrawn emergency filing (Gov. Code, §11346.1)
- ☐ Emergency Readopt (Gov. Code, §11346.1(h))
- ☐ File & Print
- ☒ Other (Specify) Gov't Code 11353
- ☐ Changes Without Regulatory Effect (Cal. Code Regs., title 1, §100)
- ☐ Print Only

4. ALL BEGINNING AND ENDING DATES OF AVAILABILITY OF MODIFIED REGULATIONS AND/OR MATERIAL ADDED TO THE RULEMAKING FILE (Cal. Code Regs. title 1, §44 and Gov. Code §11347.1)

5. EFFECTIVE DATE OF CHANGES (Gov. Code, §§ 11343.4, 11346.1(d); Cal. Code Regs., title 1, §100)

- ☐ Effective January 1, April 1, July 1, or October 1 (Gov. Code §11343.4(a))
- ☐ Effective on filing with Secretary of State
- ☐ §100 Changes Without Regulatory Effect
- ☒ Effective other (Specify) Upon Approval (Gov't Code 11353)

6. CHECK IF THESE REGULATIONS REQUIRE NOTICE TO, OR REVIEW, CONSULTATION, APPROVAL OR CONCURRENCE BY, ANOTHER AGENCY OR ENTITY

- ☐ Department of Finance (Form STD. 399) (SAM §6660)
- ☐ Fair Political Practices Commission
- ☐ State Fire Marshal
- ☐ Other (Specify)

7. CONTACT PERSON	TELEPHONE NUMBER	FAX NUMBER (Optional)	E-MAIL ADDRESS (Optional)
Jenny Newman	213-576-6691		jnewman@waterboards.ca.gov

8. **I certify that the attached copy of the regulation(s) is a true and correct copy of the regulation(s) identified on this form, that the information specified on this form is true and correct, and that I am the head of the agency taking this action, or a designee of the head of the agency, and am authorized to make this certification.**

SIGNATURE OF AGENCY HEAD OR DESIGNEE: Victoria A. Whitney
DATE: 4/19/13

TYPED NAME AND TITLE OF SIGNATORY
Victoria A. Whitney, Deputy Director, Division of Water Quality, State Water Board

For use by Office of Administrative Law (OAL) only

ENDORSED APPROVED
JUN 04 2013
Office of Administrative Law

CONCISE SUMMARY OF REGULATORY PROVISIONS

TITLE 23. Waters
Division 4. Regional Water Quality Control Boards
Chapter 1. Water Quality Control Plans, Policies, and Guidelines
Article 4. Los Angeles Region

§ 3939.XX - "A Total Maximum Daily Load for Algae, Nutrients, and Eutrophic Conditions in the Ventura River including the Estuary and its Tributaries".

On December 6, 2012, the Los Angeles Regional Water Quality Control Board adopted Resolution No. R12-011, amending the Water Quality Control Plan for the Los Angeles Region (Basin Plan) by establishing a Total Maximum Daily Load (TMDL) for Algae, Nutrients, and Eutrophic Conditions in the Ventura River including the Estuary and its Tributaries. The TMDL includes numeric targets for dissolved oxygen and pH equal to their numeric water quality objectives in the Basin Plan. The TMDL also includes numeric targets for algal and phytoplankton biomass and percent cover as numeric interpretations of the water quality condition that will demonstrate attainment of the narrative water quality objective for biostimulatory substances in the Basin Plan. The method to develop these numeric targets is based on the California Nutrient Numeric Endpoints (NNE) approach, developed by U.S. EPA Region 9 and the State and Regional Water Quality Control Boards. The TMDL includes waste load allocations (WLAs) and load allocations (LAs) for discharges from the Ojai Valley Waste Water Treatment Plant (WWTP), the Ventura County Municipal Separate Storm Sewer (MS4), the Caltrans MS4, agriculture sources, horse/intensive livestock activities, grazing activities, general industrial and construction stormwater permittees, onsite wastewater treatment systems, and other National Pollution Discharge Elimination System (NPDES) permittees in the Ventura River watershed in order to attain numeric targets.

The regulatory mechanisms used to implement the WLAs include the Ojai Valley WWTP NPDES permit, the Ventura County MS4 permit, the Caltrans MS4 permit, the general industrial storm water permits, the general construction storm water permits, and other NPDES permits. The regulatory mechanisms used to implement the LAs include Basin Plan discharge prohibitions, waste discharge requirements (WDRs), and waivers of WDRs or other regulatory mechanisms in accordance with the State Nonpoint Source Implementation and Enforcement Policy (NPS Policy). The TMDL allows for an implementation schedule of up to 6-12 years to meet the WLAs and LAs, depending on the source. Discharge monitoring to demonstrate compliance with WLAs and LAs shall be included in the regulatory mechanisms for each source, and ambient monitoring to assess watershed-wide waterbody conditions shall be conducted either individually or cooperatively among all dischargers.

STATE WATER RESOURCES CONTROL BOARD
RESOLUTION NO. 2013-0005

APPROVING AN AMENDMENT TO THE WATER QUALITY CONTROL PLAN FOR THE LOS ANGELES REGION TO INCORPORATE A TOTAL MAXIMUM DAILY LOAD FOR ALGAE, EUTROPHIC CONDITIONS, AND NUTRIENTS IN THE VENTURA RIVER, INCLUDING THE ESTUARY, AND ITS TRIBUTARIES

WHEREAS:

1. On December 6, 2012, the Regional Water Quality Control Board for the Los Angeles Region (Los Angeles Water Board) adopted Resolution No. R12-011, an amendment to the Water Quality Control Plan for the Los Angeles Region (Basin Plan amendment), to incorporate a Total Maximum Daily Load (TMDL) for algae, eutrophic conditions, and nutrients in the Ventura River, including the Estuary, and its tributaries.

2. The Los Angeles Water Board found that the analysis contained in the California Environmental Quality Act (CEQA) "Substitute Environmental Documents" for the proposed Basin Plan amendment, including the CEQA Checklist, the final staff report entitled "Algae, Eutrophic conditions, and Nutrients Total Maximum Daily Loads for Ventura River and its Tributaries," and the responses to comments complies with the State Water Board's regulations for the implementation of CEQA, as set forth in the California Code of Regulations, Title 23, sections 3775 through 3781. The State Water Board has reviewed the Substitute Environmental Documents for the Basin Plan amendment and concurs with the Los Angeles Water Board's findings and determinations, including the Statement of Overriding Considerations.

3. The Los Angeles Water Board also adopted the Basin Plan amendment pursuant to the "Necessity" standard of the Administrative Procedures Act, Government Code section 11353, subdivision (b).

4. The Los Angeles Water Board found the Basin Plan amendment is consistent with the Statement of Policy with Respect to Maintaining High Quality of Waters in California (State Water Board Resolution No. 68-16) and the federal Antidegradation Policy (40 C.F.R. § 131.12), in that it does not allow degradation of water quality, but requires restoration of water quality and attainment of water quality standards during dry weather and maintenance of existing water quality and attainment of water quality standards in wet weather.

5. The State Water Board finds that the Basin Plan amendment is in conformance with Water Code section 13240, which specifies that regional water quality control boards may revise basin plans, and section 13242, which requires a program of implementation for achieving water quality objectives, and section 13141, which requires an estimate of the total cost of the implementation of an agricultural water quality control program, along with an identification of potential sources of financing. The State Water Board also finds that the TMDL as reflected in the Basin Plan amendment is consistent with the requirements of section 303(d) of the federal Clean Water Act.

6. A Basin Plan amendment does not become effective until approved by the State Water Board and until the regulatory provisions are approved by the Office of Administrative Law (OAL). The TMDL must also receive approval from the U.S. Environmental Protection Agency (U.S. EPA).

7. Los Angeles Water Board staff determined that minor, non-substantive changes to the language of the Basin Plan amendment were necessary to correct minor clerical errors or to improve clarity and consistency. The Los Angeles Water Board's Executive Officer made these minor non-substantive changes in a memorandum dated January 8, 2013. The memorandum contains correcting language to the Implementation Plan section of the Basin Plan amendment in order to be consistent with the total phosphorus load and waste load allocations and to accurately reflect the intention of the Los Angeles Water Board.

THEREFORE BE IT RESOLVED THAT:

The State Water Board:

1. Approves the Basin Plan amendment adopted under Los Angeles Water Board Resolution No. R12-011.

2. Authorizes and directs the Executive Director or designee to submit the Basin Plan amendment adopted under Los Angeles Water Board Resolution No. R12-011 to OAL for approval of the regulatory provisions and to U.S. EPA for approval of the TMDL.

CERTIFICATION

The undersigned Clerk to the Board does hereby certify that the foregoing is a full, true, and correct copy of a resolution duly and regularly adopted at a meeting of the State Water Resources Control Board held on February 19, 2013.

AYE:	Chairman Charles R. Hoppin Vice Chair Frances Spivy-Weber Board Member Tam M. Doduc Board Member Felicia Marcus
NAY:	None
ABSENT:	Board Member Steven Moore
ABSTAIN:	None

Jeanine Townsend
Clerk to the Board

State of California
California Regional Water Quality Control Board, Los Angeles Region

RESOLUTION NO. R12-011
December 6, 2012

Amendment to the Water Quality Control Plan for the Los Angeles Region to Incorporate a Total Maximum Daily Load for Algae, Eutrophic Conditions, and Nutrients in Ventura River, including the Estuary, and its Tributaries

WHEREAS, the California Regional Water Quality Control Board, Los Angeles Region (Regional Board) finds that:

1. The Federal Clean Water Act (CWA) requires the Regional Board to establish water quality standards for each waterbody within its region. Water quality standards include beneficial uses, water quality objectives that are established at levels sufficient to protect those beneficial uses, and an antidegradation policy to prevent degrading waters. Waterbodies that do not meet water quality standards are considered impaired.

2. Section 303(d)(1) of the CWA requires each state to identify the waters within its boundaries that do not meet water quality standards. Those waters are placed on the state's "303(d) List" or "Impaired Waters List". For each listed water, the state is required to establish the Total Maximum Daily Load (TMDL) of each pollutant impairing the water quality standards in that waterbody. Both the identification of impaired waters and TMDLs established for those waters must be submitted to the United States Environmental Protection Agency (U.S. EPA) for approval pursuant to CWA section 303(d)(2).

3. A consent decree between U.S. EPA, Heal the Bay, and Santa Monica BayKeeper was approved on March 22, 1999, which resolved litigation between those parties relating to the pace of TMDL development in the Los Angeles Region. The consent decree directs the U.S. EPA to ensure that TMDLs for all 1998-listed impaired waters in the Los Angeles Region be established within 13 years of the consent decree. The consent decree combined waterbody pollutant combinations in the Los Angeles Region into 92 TMDL analytical units. In accordance with the consent decree, the Algae, Eutrophic Conditions, and Nutrients TMDL for Ventura River (including the Estuary and its Tributaries) addresses the listing for algae, eutrophic conditions, nitrogen, and low dissolved oxygen in Ventura River Estuary, Ventura River Reaches 1 and 2, San Antonio Creek and Cañada Larga (Analytical Unit 88). In 2010, the consent decree was modified to include an extension for Analytical Unit 88 until March 2013. Based on the consent decree schedule, TMDLs addressing these listings must be approved or established by U.S. EPA by March 2013.

4. The elements of a TMDL are described in sections 130.2 and 130.7 of Title 40 of the Code of Federal Regulation (40 CFR) and section 303(d)(1), subdivisions (C) and (D), of the CWA, as well as in U.S. EPA guidance documents (Report No. EPA/440/4-91/001). A TMDL is defined as the sum of the individual waste load allocations for point sources, load allocations for non-point sources, and natural background. (40 CFR § 130.2.) TMDLs must be set at levels necessary to attain and maintain the applicable narrative and numeric water quality standards with seasonal variations and a margin of safety that takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality. (40 CFR § 130.7(c)(1).) Section 130.7 of Title 40 of the Code of Federal Regulations also dictates that TMDLs shall take into account critical conditions for stream flow, loading, and water quality parameters. TMDLs typically include one or more numeric "targets"; i.e., numerical translations of the existing water quality standards that represent attainment of those standards, contemplating the TMDL elements described above. Since a TMDL must represent the "total" load, TMDLs must account for all sources of the relevant pollutants, irrespective of whether the pollutant is discharged to impaired or unimpaired upstream reaches.

5. Neither TMDLs nor their targets or other components are water quality objectives, and thus their establishment does not implicate California Water Code section 13241. Rather, under California law, TMDLs are programs to implement existing standards (including objectives), and are thus established pursuant to California Water Code section 13242. Moreover, TMDLs do not create new bases for direct enforcement against dischargers apart from the existing water quality standards they translate. Like most other parts of the Water Quality Control Plan for the Los Angeles Region (Basin Plan), TMDLs are not generally self-implementing. The targets merely establish the bases through which load allocations (LAs) and waste load allocations (WLAs) are calculated. The LAs and WLAs may be implemented in any manner consistent with the Water Quality Control Policy for Addressing Impaired Waters: Regulatory Structure and Options, adopted by the State Water Resources Control Board (State Board) on June 16, 2005 (Resolution No. 2005-0050). Federal regulations also require that National Pollutant Discharge Elimination System (NPDES) permits be consistent with the assumptions and requirements of available WLAs. (40 CFR § 122.44(d)(vii)(B).)

6. As envisioned by California Water Code section 13242, the TMDL contains a "description of surveillance to be undertaken to determine compliance with objectives." The Compliance Monitoring element of the TMDL recognizes that monitoring will be necessary to assess the progress of pollutant load reductions and improvements in water quality in the Ventura River Watershed. The TMDL establishes the types of data and information that will be necessary to obtain. The Regional Board's Executive Officer will ensure that appropriate entities develop and submit monitoring programs and technical reports necessary to achieve the purposes of the TMDL. The Executive Officer will determine the scope of these

programs and reports, taking into account any legal requirements, including this TMDL, and if necessary issue appropriate orders to appropriate entities.

7. Upon establishment of TMDLs by the State or U.S. EPA, the State is required to incorporate, or reference, the TMDLs into the State Water Quality Management Plan. (40 CFR §§ 130.6(c)(1), 130.7.) The Basin Plan and applicable statewide plans serve as the State Water Quality Management Plans governing the watersheds under the jurisdiction of the Los Angeles Regional Board. Attachment A to this resolution contains the language to be incorporated into the Basin Plan for this TMDL.

8. The Ventura River watershed is located in the northwestern portion of Ventura County with a small portion in the southeastern portion of Santa Barbara County. The watershed is characterized by rugged mountains in the upper basins transitioning to less steep areas and valleys. The watershed drains an area of about 220 square miles with an elevation ranging from 6,000 feet to sea level. Major tributaries to the river, include Matilija Creek, North Fork Matilija Creek, San Antonio Creek, Coyote Creek, and Cañada Larga. The river starts at the confluence of Matilija Creek and North Fork Matilija Creek and flows for about 16 miles in a southern direction to the estuary and Pacific Ocean. The river has intermittent direct discharges to the ocean; longshore transport of sand can cause a sand bar to form at the mouth of the estuary in the late summer and early fall obstructing flow.

9. In addition to natural variations in flow, flow regimes in the Ventura River have been altered to support water supply. Lake Casitas and Matilija Reservoir are the two reservoirs within the watershed. Perennial flow occurs from the headwaters to the Robles Diversion Dam, located about two miles downstream from the Matilija Dam. The flow downstream of the Robles Diversion Dam to the confluence with San Antonio Creek is intermittent, particularly during the dry summer months. Flow in the river is disrupted at Foster Park due to subsurface diversions and groundwater extraction. However, the river flow below Foster Park to the estuary increases due to effluent discharges from the Ojai Valley Wastewater Treatment Plant.

10. Eighty-five percent of the land use in the Ventura River watershed is classified as open space and with approximately half of the watershed located within the Los Padres National Forest. Approximately 4.5 percent of the watershed consists of agricultural land with the developed area being small compared to the open space and agriculture. The cities of Ojai and Ventura are the largest urban areas in the watershed and the communities of Casitas Springs, Foster Park, Oak View, Valley Vista, Mira Monte, Meiners Oaks, Upper Ojai, and Live Oak Acres are within the unincorporated Ventura County.

11. The Regional Board's goal in establishing the TMDL for algae, eutrophic conditions, and nutrients in the Ventura River Watershed is to protect the water

contact recreation (REC-1) and non-contact water recreation (REC-2) beneficial uses, as well as uses associated with habitat preservation and protection as applicable including: warm fresh water habitat (WARM), cold fresh water habitat (COLD), estuarine habitat (EST), wetland habitat (WET), marine habitat (MAR), wildlife habitat (WILD), rare, threatened, or endarngered species (RARE), migration of aquatic organisms (MIGR), and spawning, reproduction, and/or early development (SPWN).

12. Regional Board staff have prepared a detailed technical document that analyzes and describes the specific necessity and rationale for the development of this TMDL. The technical document entitled "Algae, Eutrophic Conditions, and Nutrients Total Maximum Daily Loads for Ventura River and its Tributaries" is an integral part of this Regional Board action and was reviewed, considered, and accepted by the Regional Board before acting. Further, the technical document provides the detailed factual basis and analysis supporting the problem statement, numeric targets (interpretation of the narrative and numeric water quality objectives used to calculate the waste load and load allocations), source analysis, linkage analysis, waste load allocations (for point sources), load allocations (for non-point sources), margin of safety, and seasonal variations and critical conditions of this TMDL.

13. On December 6, 2012, prior to the Regional Board's action on this resolution, a public hearing was conducted on this TMDL. Notice of the hearing was published in accordance with the requirements of California Water Code section 13244. This notice was published in the Ventura County Star on July 20, 2012.

14. The public has had a reasonable opportunity to participate in the review of this TMDL. A draft of the TMDL was released for public comment on July 20, 2012; a Notice of Hearing was published and circulated 45 days preceding Regional Board action. The draft of the TMDL was also made available on the Regional Board's website. Regional Board staff responded to oral and written comments received from the public; and the Regional Board held a public hearing on December 6, 2012 to consider adoption of the TMDL.

15. In amending the Basin Plan to establish this TMDL, the Regional Board considered the requirements set forth in sections 13240 and 13242 of the California Water Code.

16. Because the TMDL implements existing narrative and numeric water quality objectives (i.e., water quality objectives in the Basin Plan), the Regional Board (along with the State Board) has determined that adopting a TMDL does not require the Regional Board to consider the factors of California Water Code section 13241. The consideration of the California Water Code section 13241 factors, by section 13241's express terms, only applies "in establishing water quality objectives." Here, the Regional Board is not establishing water quality objectives, but as required by section 303(d)(1)(C) of the Clean Water Act is

adopting a TMDL that will implement the previously established objectives that have not been achieved. In making this determination, the Regional Board has considered and relied upon a legal memorandum from the Office of Chief Counsel to the State Board's basin planning staff detailing why TMDLs cannot be considered water quality objectives. (See Memorandum from Staff Counsel Michael J. Levy, Office of Chief Counsel, to Ken Harris and Paul Lillebo, Division of Water Quality: *The Distinction Between a TMDL's Numeric Targets and Water Quality Standards*, dated June 12, 2002.)

17. While the Regional Board is not required to consider the factors of California Water Code section 13241, it nonetheless has developed and received significant information pertaining to the California Water Code section 13241 factors and has considered that information in developing and adopting this TMDL. Section 13241, at a minimum, requires that water quality objectives ensure reasonable protection of beneficial uses. The designated beneficial uses in the Ventura River Watershed include aquatic life habitat uses, water contact recreation, and non-water contact recreation, navigation, ground water recharge, agricultural supply, municipal and domestic supply, and industrial service supply. The estuary has the designated use of navigation, commericial and sport fishing, and shellfish harvesting. In addition upstream reaches along with the listed tributaries are also designated for industrial service supply. The past, present and probable future beneficial uses of water have been considered in that the Ventura River Watershed is designated for a number of beneficial uses in the Basin Plan.

18. The environmental characteristics of the watershed are spelled out at length in the Basin Plan and in the technical documents supporting this Basin Plan amendment, and have been considered in developing this TMDL. Water quality conditions that reasonably could be achieved through the coordinated control of all factors that affect water quality in the area have been considered. This TMDL provides several compliance options, including improved nitrification-dentrification at the WWTP, structural best management practices (BMPs) such as constructed wetlands, biofiltration, agricultural BMPs and source reduction BMPs, as well as non-structural BMPs and alternatives such as pollution prevention, inspection and proper servicing of onsite waste treatment systems, and outreach and education. These options provide flexibility for responsible parties to reduce nutrient loading to the river, its tributaries, and the estuary. Attainment of the water quality standards through the compliance options is a reasonably achievable water quality condition for the watershed. However, to the extent that there would be any conflict between the consideration of the factor in California Water Code section 13241(c), if the consideration were required, and the Clean Water Act, the Clean Water Act would prevail.

19. Economic considerations were considered throughout the development of the TMDL. Some of these economic considerations arise in the context of Public Resources Code section 21159 and are equally applicable here. The implementation program for this TMDL recognizes the economic limitations on

achieving immediate compliance and allows a flexible implementation schedule of 6 to 12 years to meet the load and waste load allocations, depending on the source. The need for housing within the region has been considered, but this TMDL is unlikely to affect housing needs. Whatever housing impacts could materialize are ameliorated by the flexible nature of this TMDL and the 6- to 12-year implementation schedule.

20. The amendment is consistent with the State Antidegradation Policy (State Board Resolution No. 68-16), and the federal Antidegradation Policy (40 CFR § 131.12), in that it does not allow degradation of water quality, but requires restoration of water quality and attainment of water quality standards.

21. Pursuant to Public Resources Code section 21080.5, the Resources Agency has approved the Regional Boards' basin planning process as a "certified regulatory program" that adequately satisfies the California Environmental Quality Act (CEQA) (Public Resources Code, § 21000 *et seq.*) requirements for preparing environmental documents. (14 Cal. Code Regs. § 15251(g); 23 Cal. Code Regs. § 3782). The Regional Board staff has prepared "substitute environmental documents" for this project that contain the required environmental documentation under the State Board's CEQA regulations. (23 Cal. Code Regs. § 3775-3781.) The project itself is the establishment of a TMDL for algae, eutrophic conditions, and nutrients in the Ventura River Watershed. While the Regional Board has no discretion to not establish a TMDL (the TMDL is required by federal law), the Board does exercise discretion in assigning waste load allocations and load allocations, determining the program of implementation, and setting various milestones in achieving the water quality standards. The CEQA checklist and other portions of the substitute environmental documents contain significant analysis and numerous findings related to impacts and mitigation measures.

22. A CEQA Scoping meeting was conducted on May 30, 2012 at the Ventura City Hall Community Meeting Room to solicit input from the public and interested stakeholders in determining the appropriate scope, content, and implementation options of the proposed TMDL. At the meeting, staff presented the regulatory background, description of the project, location of the project, project purpose, and potential implementation alternatives. Staff received input from members of the regulated community, the Ventura River Watershed Council, the environmental community, and other stakeholders regarding reasonably foreseeable methods of compliance, reasonably foreseeable environmental impacts of the methods of compliance, reasonably foreseeable mitigation measures, reasonably foreseeable alternative means of compliance, and alternatives to the project. This meeting fulfilled the requirements under CEQA. (Public Resources Code § 21083.9; 23 Cal. Code Regs. § 3775.5). A notice of the CEQA Scoping meeting was sent to interested parties on May 16, 2012.

23. In preparing the substitute environmental documents, the Regional Board has considered the requirements of Public Resources Code section 21159 and section 15187 of Title 14 of the California Code of Regulations, and intends those documents to serve as a tier 1 environmental review. This analysis is not intended to be an exhaustive analysis of every conceivable impact, but an analysis of the reasonably foreseeable consequences of the adoption of this regulation, from a programmatic perspective. The "Lead" agencies for tier 2 projects will assure compliance with project-level CEQA analysis of this programmatic project. Project level impacts will need to be considered in any subsequent environmental analysis performed by other public agencies, pursuant to Public Resources Code section 21159.2.

24. The reasonably foreseeable methods of compliance for this TMDL include improved nitrification-denitrification at the WWTP; structural BMPs including constructed wetlands, alum injection systems, and biofiltration systems; agricultural BMPs including filter strips, improved irrigation efficiency, manure management, and grazing management; an anaerobic biodigester; onsite wastewater treatment system upgrades; and watershed-wide implementation, including riparian buffer strips and stream bank stabilization. Foreseeable methods of compliance also include non-structural BMPs, such as onsite wastewater treatment system inspections and servicing, manure management plans, illicit discharge ordinances and preventation plans, and outreach and education.

25. Consistent with the Regional Board's substantive obligations under CEQA, the substitute environmental documents do not engage in speculation or conjecture. The substitute environmental docuemnts only consider the reasonably foreseeable environmental impacts, including those relating to the reasonably foreseeable methods of compliance, reasonably foreseeable feasible mitigation measures to reduce those impacts, and the reasonably foreseeable alternative means of compliance, which would avoid or reduce the identified impacts.

26. The proposed Basin Plan amendment could have a potentially significant adverse effect on the environment. However, there are feasible alternatives, feasible mitigation measures, or both, that if employed, would substantially lessen the potentially significant adverse impacts identified in the substitute environmental documents. Such alternatives or mitigation measures are within the responsibility and jurisdiction of other public agencies, and not the Regional Board. California Water Code section 13360 precludes the Regional Board from specifying the design, location, type of construction, or particular manner in which responsible parties comply with Regional Board orders. When the parties responsible for implementing this TMDL determine how they will proceed, the parties responsible for those parts of the project can and should incorporate such alternatives and mitigation into any subsequent projects or project approvals. These feasible alternatives and mitigation measures are described in more detail

elsewhere in the substitute environmental documents. (14 Cal. Code Regs. § 15091(a)(2).)

27. The substitute environmental documents for this TMDL, and in particular the Environmental Checklist and staff's responses to comments, identify broad mitigation approaches that should be considered at the project level.

28. To the extent significant adverse environmental effects could occur, the Regional Board has balanced the economic, legal, social, technological, and other benefits of the TMDL against the unavoidable environmental risks and finds that specific economic, legal, social, technological, and other benefits of the TMDL outweigh the unavoidable adverse environmental effects, such that those effects are considered acceptable. The basis for this finding is set forth in the substitute environmental documents. (14 Cal. Code Regs. § 15093.)

29. The regulatory action meets the "Necessity" standard of the Administrative Procedures Act. (Gov. Code, section 11353(b).) As specified above, federal law and regulations require that TMDLs be incorporated, or referenced, in the state's water quality management plan. The Regional Board's Basin Plan is the Regional Board's component of the water quality management plan, and the Basin Plan is how the Regional Board takes quasi-legislative planning actions. Moreover, the TMDL is a program of implementation for existing water quality objectives and is, therefore, appropriately a component of the Basin Plan under Water Code section 13242. The necessity of developing a TMDL is established in the TMDL staff report, the section 303(d) list, and the data contained in the administrative record documenting the algae, eutrophic conditions, nitrogen, and low dissolved oxygen impairments in the Ventura River Watershed.

30. The Basin Plan amendment incorporating a TMDL and implementation schedule for algae, eutrophic conditions, and nutrients in the Ventura River Watershed must be submitted for review and approval by the State Board, the State Office of Administrative Law (OAL), and pursuant to CWA section 303(d) and/or 303(c) (as appropriate) by the U.S. EPA. The Basin Plan amendment will become effective upon approval by U.S. EPA. Once effective, a Notice of Decision will be filed with the Resources Agency.

31. If during the State Board's approval process, Regional Board staff, the State Board or State Board staff, or OAL determine that minor, non-substantive modifications to the language of the amendment are needed for clarity or consistency, the Executive Officer should make such changes consistent with the Regional Board's intent in adopting this TMDL, and should inform the Regional Board of any such changes.

32. Considering the record as a whole, this Basin Plan amendment is expected to result in an effect, either individually or cumulatively, on wildlife resources.

THEREFORE, be it resolved that pursuant to sections 13240 and 13242 of the California Water Code, the Regional Board hereby amends the Basin Plan as follows:

1. The Regional Board hereby approves and adopts the CEQA substitute environmental documentation, which was prepared in accordance with Public Resources Code section 21159 and section 15187 of Title 14 of the California Code of Regulations, and directs the Executive Officer to sign the environmental checklist.

2. Pursuant to sections 13240 and 13242 of the California Water Code, the Regional Board, after considering the entire record including oral testimony at the hearing, hereby adopts the amendments to Chapter 7 of the Water Quality Control Plan for the Los Angeles Region, as set forth in Attachment A hereto, to incorporate the elements and implementation schedule of the Algae, Eutrophic Conditions, and Nutrients Total Maximum Daily Loads for Ventura River, including the Estuary, and its Tributaries.

3. The Executive Officer is directed to forward copies of the Basin Plan amendment to the State Board in accordance with the requirements of section 13245 of the California Water Code.

4. The Regional Board requests that the State Board approve the Basin Plan amendment in accordance with the requirements of sections 13245 and 13246 of the California Water Code and forward it to the OAL for review and approval and finally, for review and approval pursuant to CWA sections 303(d) and/or 303(c), as appropriate, to the U.S. EPA.

5. If during the State Board's approval process, Regional Board staff, the State Board or State Board staff, or OAL determine that minor, non-substantive modifications to the language of the amendment are needed for clarity or consistency, the Executive Officer is authorized to make such changes, and shall inform the Regional Board of any such changes.

6. The Executive Officer is authorized to request a "No Effect Determination" from the Department of Fish and Game, and/or transmit payment of the applicable fee as may be required to the Department of Fish and Game.

I, Samuel Unger, Executive Officer, do hereby certify that the foregoing is a full, true, and correct copy of a resolution adopted by the California Regional Water Quality Control Board, Los Angeles Region, on Decmber 6, 2012.

Samuel Unger
Samuel Unger, P.E.
Executive Officer

12-18-12
Date

Amendment to the Water Quality Control Plan – Los Angeles Region

to Incorporate the

Total Maximum Daily Load for Algae, Eutrophic Conditions, and Nutrients In the Ventura River and its Tributaries

Adopted by the California Regional Water Quality Control Board, Los Angeles Region on **December 6, 2012.**

Amendments:

Table of Contents
Add:

Chapter 7. Total Maximum Daily Loads (TMDLs)

7-35 Ventura River and Tributaries Algae, Eutrophic Conditions, and Nutrients TMDL

List of Figures, Tables, and Inserts
Add:

Chapter 7. Total Maximum Daily Loads (TMDLs)
Tables

7-35 Ventura River and Tributaries Algae, Eutrophic Conditions, and Nutrients TMDL
7-35.1. Ventura River and Tributaries Algae, Eutrophic Conditions, and Nutrients TMDL - Elements
7-35.2. Ventura River and Tributaries Algae, Eutrophic Conditions, and Nutrients TMDL - Implementation Schedule

Chapter 7. Total Maximum Daily Loads (TMDLs) Summaries
Add:
7-35 Ventura River and Tributaries Algae, Eutrophic Conditions, and Nutrients TMDL

This TMDL was adopted by:

The Regional Water Quality Control Board on December 6, 2012**.**

This TMDL was approved by:

The State Water Resources Control Board on **[Insert date].**
The Office of Administrative Law on **[Insert date].**
The U.S. Environmental Protection Agency on **[Insert date].**

This TMDL is effective on **[Insert Date].**

The elements of the TMDL are presented in Table 7-35.1 and the Implementation Plan in Table 7-35.2.

Table 7-35.1. Ventura River and Tributaries Algae, Eutrophic Conditions, and Nutrients TMDL: Elements

TMDL Element	Regulatory Provisions
Problem Statement	The Ventura River Estuary and Reaches 1 and 2 are on the Clean Water Act (CWA) section 303(d) list as impaired for algae and eutrophic conditions. San Antonio Creek and Cañada Larga are on the CWA section 303(d) list as impaired for nitrogen and dissolved oxygen, respectively. Recent data confirm these impairments and demonstrate additional impairments for low dissolved oxygen in the Estuary, San Antonio Creek, and Reaches 1-4. The algae and nutrient-related impairments are caused by excessive loading of nutrients, particularly nitrogen and phosphorus, to Ventura River and its tributaries. The water quality impairments due to eutrophication and increased nutrient loading occur during the dry season when algae growth primarily occurs. For purposes related to this TMDL, the dry season is defined as occurring from May 1 to September 30. The water quality objectives used to assess impairment for this TMDL are the narrative water quality objective for biostimulatory substances and the numeric water quality objectives for dissolved oxygen (DO) and pH contained in Chapter 3. Nutrient loading and the resulting ecological responses in the Ventura River, including the Estuary, and its tributaries result in impairments of beneficial uses associated with recreation activities (water contact and non-contact) and aquatic life (warm and cold freshwater habitat; estuarine and wetland habitat; rare, threatened or endangered species; migration of aquatic organisms; spawning, reproduction, and/or early development). The most sensitive beneficial use is the cold water aquatic habitat use and the associated migratory and spawning and early development uses. The Ventura River and its tributaries are home to the Southern California Steelhead, which is an endangered species.

<table>
<tr><th>TMDL Element</th><th>Regulatory Provisions</th></tr>
<tr><td>Numeric Targets</td><td>The DO and pH numeric targets are set equal to their numeric water quality objectives in Chapter 3 of the Basin Plan. The numeric targets for algal and phytoplankton biomass and percent cover are established as a numeric interpretation of the water quality condition that will demonstrate attainment of the narrative water quality objective for biostimulatory substances contained in Chapter 3.

Numeric targets to interpret narrative water quality objectives are based on the California Nutrient Numeric Endpoints (NNE) approach, developed by USEPA Region 9 and the State and Regional Water Quality Control Boards.
<table>
<tr><th>Indicator</th><th>Numeric Target</th><th>Water body</th></tr>
<tr><td>Total Algal Biomass</td><td>150 mg/m^2 chlorophyll a as seasonal average</td><td>Ventura River and Tributaries</td></tr>
<tr><td>Macroalgal Cover (attached & unattached)</td><td>≤ 30 percent as seasonal average</td><td>Ventura River and Tributaries</td></tr>
<tr><td>Phytoplankton Biomass</td><td>20 μg/L chlorophyll a as seasonal average</td><td>Estuary (shallow subtidal area)</td></tr>
<tr><td>Macroalgal Cover</td><td>≤ 15 percent as seasonal average</td><td>Estuary (intertidal and shallow subtidal areas)</td></tr>
<tr><td>Dissolved Oxygen</td><td>≥ 7 mg/L as a daily minimum</td><td>Ventura River, Tributaries and Estuary</td></tr>
<tr><td>pH</td><td>6.5 – 8.5 (instantaneous value)</td><td>Ventura River, Tributaries, and Estuary</td></tr>
<tr><td colspan="3">Biomass and percent cover indicator targets apply during the dry season when algae growth primarily occurs. The seasonal averaging period for algal biomass and percent cover is the dry season of May 1 to September 30. River indicators are averaged over a sampling reach as required by the SWAMP monitoring protocol Bioassessment SOP 02. Estuary macroalgal cover is measured using 3 transects and evaluating percent cover at 10 random points along each transect. Results are reported as a transect average. See methods used in the Bight ’08 Estuarine Eutrophication Assessment (McLaughlin K et al. Southern California Bight 2008 Regional Monitoring Program: Estuarine Eutrophication Assessment. Southern California Coastal Water Research Project. Costa Mesa, CA).</td></tr>
</table>
</td></tr>
<tr><td>Source Analysis</td><td>The source analysis is an estimate of the amount of TN and TP entering the river from point and nonpoint sources based on available information such as discharge nutrient concentration data, land use data, rainfall-runoff models, studies, and literature reviews.

<u>Point sources:</u>

Stormwater runoff discharged via the municipal separate storm sewer system (MS4) contributes a large percentage of the nutrients to the Ventura River and its tributaries (21.3% in dry weather and 28.3% in wet weather). The Ojai Valley waste water treatment plant (WWTP) contributes a large portion of nutrient loading in dry weather (37.6%) but a smaller portion in wet weather (1.7%).

<u>Nonpoint sources:</u>

Horses/livestock and agricultural land uses contribute significant loading in both dry weather (33.5%) and wet weather (36.1%). Open space loading is a</td></tr>
</table>

TMDL Element	Regulatory Provisions
	significant source of nutrients in wet weather (19.1%) and a smaller source of nutrients in dry weather (7.6%). Septic systems are estimated to contribute 4.7% of the annual nutrient load. Groundwater discharge and direct atmospheric deposition to the water surface are responsible for a small portion of the annual load (1.3% and 0.2%, respectively).
Linkage Analysis	The critical condition is the dry season and the linkage analysis for both the Ventura River and Estuary is for dry-weather conditions. Basing the linkage analysis on *dry-weather* conditions is a conservative approach to assessing conditions in the *dry season*. Nutrients are loaded from the watershed to the Ventura River and Estuary in both dry and wet weather, but the nutrients loaded in the dry season are predominately responsible for the algae, eutrophic conditions, and nutrient impairments in the Ventura River and Estuary. <u>Linkage analysis for the river</u> The linkage analysis for the river is based on the River and Stream Water Quality Model (QUAL2K). QUAL2K predicts the nutrient concentrations and algal biomass in the various reaches of the Ventura River based on an estimate of watershed-based loading. The results of the model are used to determine allowable in-stream nutrient concentrations to meet algal biomass targets and to evaluate various source reduction scenarios to set dry-weather load and waste load allocations. <u>Linkage analysis for the Estuary</u> The linkage analysis for the Estuary is based on two lines of evidence that establish the relationship between nutrient loading to the Estuary and the resulting nutrient concentrations and algal biomass in the Estuary. The first approach uses the NNE BATHTUB spreadsheet modeling tool to establish the linkage between nutrient loading to the Estuary and the predicted water quality response, assuming that the open water portion of the Estuary, formed by the closing of the berm in the late summer and early fall, acts like a freshwater reservoir. The second approach uses empirical relationships between nutrient loading and algal biomass (peak macroalgae biomass and annual average chlorophyll a) in estuaries developed as part of a 2008 Southern California Bight Regional Monitoring Program study. Both approaches predict that the current nutrient loading to the Estuary will attain the phytoplankton numeric target. Moreover, the watershed loading reductions required to protect the river will reduce nutrient concentrations delivered to the Estuary and ensure attainment of numeric targets and protection of beneficial uses.

<table>
<tr><th>TMDL Element</th><th>Regulatory Provisions</th></tr>
<tr><td>Allocations</td><td>
Waste load allocations (WLAs) and load allocations (LAs) addressing point and nonpoint sources of nutrients are assigned to discharges to the Ventura River watershed. Because the critical condition for this TMDL is dry weather, and it is the dry-weather loading that results in water quality impairments, the allocations are primarily focused on dry-weather nutrient loading reductions. However, wet-weather WLAs and LAs are assigned as well.

<u>Dry-weather Allocations</u>

The dry-weather WLAs for Ojai Valley WWTP are expressed as seasonal loads. The TN WLA is expressed as a summer dry-weather load based on an estimated 153 summer dry-weather days and a winter dry-weather load based on an estimated 178 winter dry-weather days. The TP WLA is expressed as a dry-weather load based on an estimated 331 dry-weather days. Dry-weather WLAs for the Ojai Valley WWTP are as follows:

<table>
<tr><th>Summer Dry-Weather TN WLA (lb/season)</th><th>Winter Dry-Weather TN WLA (lb/season)</th><th>Dry-Weather TP WLA (lb/season)</th></tr>
<tr><td>8,044</td><td>12,477</td><td>5,799</td></tr>
</table>

At the TMDL reconsideration, the Ojai Valley WWTP allocation may be revised (i.e. increased) if the Ojai WWTP has accepted additional flows from other watershed sources such as septic systems in order to achieve the TMDL. The Ojai WWTP will document and report annually the number, flow and TN load from watershed sources for the Regional Board to consider as part of the TMDL reconsideration.

Dry-weather WLAs for Ventura County MS4 and Caltrans are expressed as daily loads based on an estimated 331 dry-weather days per year. Dry-weather WLAs for Ventura County MS4 and Caltrans are as follows:

<table>
<tr><th>Source Type</th><th>Dry-Weather WLA (lb/day)</th><th>Dry-Weather TP WLA (lb/day)</th></tr>
<tr><td>Dry-weather WLAs for Ventura MS4</td><td>28</td><td>0.5</td></tr>
<tr><td>Dry-weather WLAs for Caltrans</td><td>1.1</td><td>0.11</td></tr>
</table>

The dry-weather WLAs for the general industrial and construction stormwater permittees are equal to the in-stream nutrient concentrations required to meet algal biomass numeric targets. Dry-weather WLAs for general industrial and construction stormwater permittees are as follows:

<table>
<tr><th>Permittee</th><th>TN (mg/L)</th><th>TP (mg/L)</th></tr>
<tr><td>General Industrial Stormwater Permittees</td><td>1.15</td><td>0.115</td></tr>
<tr><td>General Construction Stormwater Permittees</td><td>1.15</td><td>0.115</td></tr>
<tr><td colspan="3">Applied as an annual dry-weather average.</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>TMDL Element</th><th>Regulatory Provisions</th></tr>
<tr><td></td><td>
Dry-weather LAs for Agriculture are expressed as daily loads based on an estimated 331 dry-weather days per year as follows:
<table>
<tr><th>Source Type</th><th>Dry-Weather TN LA (lb/day)</th><th>Dry-Weather TP LA (lb/day)</th></tr>
<tr><td>Agriculture</td><td>16</td><td>0.12</td></tr>
</table>
Dry-weather LAs for Horse facilities and intensive livestock operations are expressed as daily loads based on an estimated 331 dry-weather days per year as follows:
<table>
<tr><th>Source Type</th><th>Dry-Weather TN LA (lb/day)</th><th>Dry-Weather TP LA (lb/day)</th></tr>
<tr><td>Horse facilities/Intensive Livestock</td><td>0.6</td><td>0.14</td></tr>
</table>
The dry-weather LA for grazing activities is equal to a 10% percent reduction of the existing TN and TP load. The existing load will be quantified as part of management plans required to implement the TMDL.

<u>Dry- and Wet-weather LAs for OWTS</u>

LAs for OWTS are equal to 7,478 pounds TN per year based on a required 50% reduction in loading. The LAs apply in dry and wet weather. No LAs are assigned to OWTS for TP.

<u>Dry- and Wet-weather WLAs for Other NPDES permittees</u>

Dry-weather WLAs for other NPDES permittees are equal to the in-stream nutrient concentrations required to meet algal biomass numeric targets of 1.15 mg/L TN and 0.115 mg/L TP. Wet-weather allocations are set to attain site-specific nitrogen water quality objectives from Table 3-8. There are no site-specific objectives for Reach 1 or the Estuary, nor are there any “Other NPDES permittees” that discharge to Reach 1 or the Estuary. Thus, there are no wet-weather WLAs assigned to Other NPDES permittees for Reach 1 or the Estuary.

<u>Wet-weather Allocations</u>

Wet-weather allocations for stormwater, agriculture, and horse/livestock sources are set to attain site-specific water quality objectives from Table 3-8 of the Basin Plan, provided in the table below. There are no site-specific objectives for Reach 1 or the Estuary. For Reach 1 and the Estuary, Wet-weather WLAs for stormwater sources are equal to existing water quality in stormwater discharges (maximum TN = 7.4 mg/L) and LAs for agriculture and horse/livestock sources are equal to water quality benchmarks of 10 mg/L nitrate-N + nitrite-N in the Agriculture Waiver.
</td></tr>
</table>

<table>
<tr><th>TMDL Element</th><th>Regulatory Provisions</th></tr>
<tr><td></td><td>
Wet-weather allocations for stormwater, agriculture, and horse/livestock sources are as follows:
<table>
<tr><th>Reach</th><th>Nitrate-N + Nitrite-N (mg/L)</th></tr>
<tr><td>Estuary</td><td>*</td></tr>
<tr><td>Reach 1</td><td>*</td></tr>
<tr><td>Reach 2</td><td>10</td></tr>
<tr><td>Cañada Larga</td><td>10</td></tr>
<tr><td>Reach 3</td><td>5</td></tr>
<tr><td>San Antonio Creek</td><td>5</td></tr>
<tr><td>Reach 4</td><td>5</td></tr>
<tr><td>Reach 5</td><td>5</td></tr>
</table>
*WLAs for stormwater are equal to 7.4 mg/ L TN and LAs for agriculture and horse/livestock sources are equal to 10 mg/L nitrate-N + nitrite-N.

Wet-weather WLAs for the Ojai Valley WWTP are based on existing performance of the facility. Existing performance was calculated as the 90th percentile of the last 12 years of effluent data.

Wet-weather WLAs for Ojai Valley WWTP
<table>
<tr><th>TN (mg/L)</th><th>TP (mg/L)</th></tr>
<tr><td>7.6</td><td>2.6</td></tr>
</table>
</td></tr>
<tr><td>Margin of Safety</td><td>The sources of uncertainty in this TMDL are related to the selection of the algal biomass target, the relationship between nutrient concentrations and algal biomass in freshwater river systems and estuaries, the estimate of watershed-based nutrient loading, and the model-predicted water quality conditions in the receiving water. These areas of uncertainty are addressed with both an implicit margin of safety that includes conservative assumptions made when estimating watershed-based nutrient loading and the assignment of dry-weather allocations to address a dry-season impairment, and an explicit margin of safety calculated as the difference between the model-predicted maximum concentration in-stream after implementation of reduction scenarios and the desired in-stream concentrations. The explicit margin of safety was calculated as seven percent.</td></tr>
<tr><td>Seasonal Variations and Critical Conditions</td><td>This TMDL addresses impairments that are causing exceedances of the biostimulatory substances water quality objective during the dry season, when algae growth primarily occurs, in the Ventura River, the Estuary and its tributaries. The critical condition is the dry season. Nutrients are loaded from the watershed to the Ventura River and its tributaries, and the Estuary in both dry and wet weather, but the nutrients loaded in the dry season are predominately responsible for the algae, eutrophic conditions, and nutrient impairments. Nutrient</td></tr>
</table>

TMDL Element	Regulatory Provisions
	concentrations present in the river during the winter months are sufficient to support algal growth; however, cofactors in the winter, such as greater flow and lower temperatures, mitigate algal growth in the winter. Also, the typical seasonal succession of primary producers generally shifts in the winter to be dominated by aquatic plants. The watershed nutrient wet-weather loads are generally delivered directly to the ocean and thus do not contribute to exceedance of the biostimulatory substances objective in the river or Estuary, which occurs during the dry season when algae growth primarily occurs. Nonetheless, to protect water quality year-round, wet-weather WLAs and LAs are assigned to meet water quality objectives and/or maintain existing discharge quality.
Monitoring	The TMDL monitoring program consists of three components: 1) receiving water monitoring, 2) discharge monitoring, and 3) optional special studies. All monitoring requirements may be included in subsequent permits or other orders and are subject to Executive Officer approval. <u>Receiving Water Monitoring</u> Responsible parties (Ojai Valley Sanitary District, Ventura County Watershed Protection District, Ventura County, City of Ojai, City of Ventura, Caltrans, and agricultural dischargers) are responsible for developing and implementing a comprehensive monitoring plan to assess numeric target attainment and measure in-stream nutrient concentrations. Responsible parties are encouraged to work together to submit a joint watershed wide plan. Ten years from the effective date of the TMDL, horse intensive livestock, and grazing activities shall participate in the implementation of the watershed-wide monitoring plan or submit their own plan. The monitoring plan should outline a program to sample for algal biomass, algal percent cover, nutrients (total and dissolved), *in situ* water quality parameters (dissolved oxygen, pH, temperature, electrical conductivity), and flow for the river and estuary. Monitoring should include visual observations documenting whether the Estuary is open or closed. The monitoring procedures/methods, analysis, and quality assurance shall be SWAMP comparable, where appropriate. The sampling frequency and locations must be adequate to assess beneficial use condition and attainment of applicable water quality objectives. At a minimum, for algal biomass and percent cover, the monitoring frequency shall be once per month in the dry season (May 1st to September 30th). After two years, if a significant difference between monthly algal biomass measurements is not observed, algal biomass monitoring may be reduced to three times per dry season, during the months of May, July, and September. DO and pH shall be measured continuously for two week periods on a quarterly basis. Continuous monitoring of DO and pH shall occur during the months of May and September in the 2nd and 3rd quarters. . All other parameters shall be monitored monthly. River indicators shall be averaged over a sampling reach as described in the SWAMP monitoring protocol - Bioassessment SOP 02. Estuary macroalgal cover is measured using three transects and evaluating percent cover at 10 random points along each transect. Results are reported as a transect average. See methods used in the Bight '08 Estuarine Eutrophication Assessment

TMDL Element	Regulatory Provisions
	(McLaughlin K et al. Southern California Bight 2008 Regional Monitoring Program: Estuarine Eutrophication Assessment. Southern California Coastal Water Research Project. Costa Mesa, CA). Existing receiving water monitoring conducted under other programs can be leveraged to assist in meeting these monitoring requirements. Responsible parties may build upon existing monitoring programs in the Ventura River watershed when developing the receiving water quality monitoring plan for this TMDL. Receiving water monitoring requirements shall be incorporated into the permit, waste discharge requirements (WDRs), or waiver for each responsible party upon issuance, renewal, or modification. The responsible parties may continue to coordinate a watershed-wide monitoring program to meet this requirement in order to fulfill individual permit, WDR, or waiver requirements. Receiving water monitoring shall continue beyond the final implementation date of the TMDL unless the Executive Officer approves a reduction or elimination of such monitoring. <u>Discharge Monitoring</u> Discharge monitoring will assess attainment of the WLAs and LAs. Discharge monitoring shall be required by regulatory mechanisms used to implement the WLAs and LAs. The monitoring to determine compliance with WLAs and LAs shall be conducted as specified in the Implementation Plan in the following section. The monitoring procedures/methods, analysis, and quality assurance shall be Surface Water Ambient Monitoring Program (SWAMP) comparable, where appropriate, and are subject to Executive Officer Approval. <u>Special Studies</u> Responsible parties within the watershed may conduct optional special studies designed to refine WLAs, LAs, and/or numeric targets. The results of special studies and monitoring may be used to revise numeric targets and allocations, if supported, when the TMDL is reconsidered. The following are potential special studies. ▪ Build upon the algal biomass and total nitrogen relationship established in the 2008 UCSB Study (UCSB, 2009) and collect data to support the establishment of reach-specific relationships. ▪ Confirm the conclusion that an algal biomass target of 150 mg/m^2 is fully protective of aquatic life and minimizes the risk of low DO events. ▪ Collect additional source assessment information and model input data to refine model-predicted relationships between watershed loading and in-stream nutrient concentrations. ▪ Investigate the influence of OWTS on surface water quality. ▪ Collect data to support development of an estuary model, which takes into account tidal influence, the dynamics of macroalgae and phytoplankton growth, residence time, and breaching conditions.

<table>
<tr><th>TMDL Element</th><th>Regulatory Provisions</th></tr>
<tr><td>Implementation Plan</td><td>
<u>WLA Implementation</u>

The regulatory mechanisms used to implement the WLAs include the Ojai Valley WWTP NPDES permit, the Ventura County MS4 permit, the Caltrans MS4 permit, the general industrial storm water permits, the general construction storm water permits, and other NPDES permits. Effluent limits consistent with the assumptions and requirements of the WLAs shall be incorporated into each permit, following the effective date of this TMDL, at the time of permit issuance, modification, or renewal.

<u>Ojai Valley WWTP</u>

The dry-weather TN WLAs for the Ojai WWTP shall be incorporated into the permit as seasonal numeric effluent limitations. The summer effluent limitation shall be equal to the summer dry-weather WLA of 8,044 lbs/season (May 1 to September 30). Compliance with the summer effluent limitation shall be determined by calculating the sum of the products of the average monthly TN concentration, a conversion factor, and the daily flow for each dry-weather day, over the summer season. The winter dry-weather WLA and wet-weather WLA shall be combined into a single concentration-based winter season effluent limitation, calculated as the weighted average of 4 mg/L (the allowable winter dry-weather concentration) and 7.6 (the allowable wet-weather concentration), based on the assumption that there are 178 winter dry-weather days and 34 wet-weather days in a year. The resulting concentration of 4.6 mg/L shall be expressed as a monthly effluent limitation from October 1 to April 30. This calculation is consistent with the assumptions and requirements of the winter dry-weather and wet-weather WLAs.

For TP, compliance with the dry-weather WLA-based effluent limitation shall be determined by calculating the sum of the products of the monthly average TP concentration and the daily flow for each dry-weather day, over an annual period. Wet-weather days shall be excluded from the dry-weather WLA compliance determination. The wet-weather TP WLAs shall be incorporated as effluent limitations, expressed as a daily maximum concentration, to be assessed at a minimum with monthly sampling during months when rain occurs.

Ojai WWTP shall achieve compliance with wet-weather TP WLAs upon incorporation into the permit and shall achieve compliance with dry-weather TP WLAs, winter season TN limits, and summer season TN limits within 10 years of the effective date of the TMDL. Ojai Valley WWTP shall have interim WLAs based on current plant performance.

Ojai Valley WWTP interim dry-weather WLAs (monthly average)
<table>
<tr><th>TN
(mg/L)</th><th>TP
(mg/L)</th></tr>
<tr><td>7.6</td><td>2.6</td></tr>
</table>
</td></tr>
</table>

TMDL Element	Regulatory Provisions
	Ventura County MS4 and Caltrans The WLAs for the Ventura County MS4 permittees and Caltrans shall be incorporated into the permits as numeric water quality-based effluent limitations. Permittees may be deemed in compliance with water-quality based effluent limitations if they demonstrate that (1) there are no violations of the water quality-based effluent limitation at the Permittee's applicable MS4 outfall(s); or (2) there is no direct or indirect discharge from the Permittee's MS4 to the receiving water during the time period subject to the water quality-based effluent limitation. Wet-weather numeric effluent limitations shall be expressed as event mean concentrations and shall apply immediately upon issuance, modification, or renewal of the permits. Compliance with wet-weather WLAs shall be assessed at a minimum with two wet-weather sampling events per year. If permittees provide a quantitative demonstration that watershed control measures and BMPs will achieve wet-weather water quality-based effluent limitations, then compliance with wet-weather water quality-based effluent limitations can be determined by implementing those actions, subject to Executive Officer approval. Dry-weather numeric effluent limitations shall be assessed at a minimum with quarterly sampling and shall be attained within 6 years of the effective date of the TMDL. Compliance will only be assessed on the day of sampling. Dry-weather sampling may occur 72 hours after a storm event. Consistent with the assumptions of the dry-weather waste load allocations, compliance with water quality-based effluent limitations may be demonstrated with area-weighted effluent limitations. Area-weighted effluent limitations shall be 0.0025 lb/day/acre TN and 4.7×10^{-5} lb/acre/day TP for the Ventura County MS4, and 0.0042 lb/acre/day TN and 4.2×10^{-4} lb/acre/day TP for Caltrans, derived by dividing the daily loads by the total land use area in the watershed covered by their respective permits (11,085 acres for the Ventura County MS4 and 251 acres for Caltrans, excluding the Coyote Creek subwatershed). Ventura County MS4 permittees and Caltrans shall provide an implementation plan to the Regional Board outlining how they intend to achieve compliance with the WLAs. The report shall include implementation methods and a quantitative analysis of the expected water quality outcomes of the implementation methods, an implementation schedule, proposed interim milestones, and compliance points. The report shall provide reasonable assurance that implementation methods will be sufficient to achieve the WLAs. General Industrial and Construction Stormwater Permittees The dry- and wet-weather WLAs for the general and industrial stormwater permittees shall apply immediately upon permit issuance, modification, or renewal and shall be incorporated into permits as numeric water quality-based effluent limitations. Wet-weather effluent limitations shall be expressed as event mean concentrations and dry-weather effluent limitations shall be expressed as instantaneous maximums. Compliance with wet-weather WLAs shall be assessed

TMDL Element	Regulatory Provisions
	at a minimum with one wet-weather sampling event. Compliance with dry-weather WLAs shall be assessed at a minimum by averaging the results of two grab samples. <u>Other NPDES Permittees</u> The dry- and wet-weather WLAs for other NPDES permittees shall apply immediately upon permit issuance, modification, or renewal of applicable permits and shall be incorporated into permits as numeric effluent limitations. Wet-weather effluent limitations shall be expressed as event mean concentrations and dry-weather effluent limitations shall be expressed as instantaneous maximums. Compliance with wet-weather WLAs shall be assessed at a minimum with one wet-weather sampling event. Compliance with dry-weather WLAs shall be assessed at a minimum with two grab samples. <u>LA Implementation</u> The regulatory mechanisms that will be used to implement the LAs include Basin Plan discharge prohibitions, WDRs, and waivers of WDRs. <u>Agricultural Discharges</u> The LAs for irrigated agricultural lands shall be implemented through the Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands or other appropriate Regional Board order. Agricultural lands shall achieve compliance with dry- and wet-weather LAs within 6 years of the effective date of the TMDL. To implement the LAs in this TMDL, the monitoring program shall be revised to add representative sites in the lower watershed to monitor runoff from other crop types. In addition, VCAILG shall work with the Regional Board staff to relocate monitoring sites in the upper watershed to better assess potential dry-weather runoff from agriculture. The existing monitoring program for the Agriculture Waiver requires two dry-weather and two wet-weather sampling events. In order to implement the dry-weather LAs, dry-weather sampling may occur 72 hours after a storm event. The revised monitoring program shall be subject to approval by the Executive Officer. To assist in implementation of LAs, area-weighted benchmarks can be applied; if used, they shall be 0.008 lb/day/acre TN and 6.3×10^{-5} lb/acre/day TP, derived by dividing the daily loads by the total agriculture area in the watershed (1971 acres, excluding orchards and the Coyote Creek subwatershed). Order No. 2010-0186 states, “It is expected that source control management practices, such as improved irrigation efficiency and fertilizer management, employed by Dischargers to attain surface Water Quality Benchmarks will reduce loading to groundwater as well.” To implement this TMDL, the VCAILG water quality management plan shall specify that all growers in the Ventura River watershed shall implement nutrient-related source control BMPs. If the LAs are

TMDL Element	Regulatory Provisions
	implemented in another Regional Board order in the future, then that order shall require growers in the Ventura River watershed to implement nutrient-related source control BMPs. The estimated costs for BMPs to control agricultural discharges such as filter strips, mulching, improved irrigation efficiency, nutrient management, manure management, and grazing management are approximately $1031 per acre, $808 per acre, $1784 per acre, $55 per acre-year, $4,500 (average cost of manure bunker), and $1,356 (average cost of a typical watering facility), respectively. Potential sources of financing for these implementation alternatives, such as Clean Water Act section 319(h) grant funding, are discussed in Chapter 4. As discussed in Chapter 4, the U.S. Department of Agriculture Soil Conservation Service and the Resource Conservation Districts provide information on, and assistance in, implementing BMPs. <u>OWTS</u> The LAs for OWTS shall be implemented through discharge prohibitions, WDRs, or waivers of WDRs. Commercial and multifamily OWTS are currently regulated by the Regional Board through WDRs. Single family residential OWTS are currently regulated by the City of Ojai, the City of Ventura, and the County of Ventura, as specified in memorandums of understanding (MOUs) with the Regional Board, in order to implement a waiver of WDRs for single family residential OWTS adopted by the Regional Board in 2004. The MOUs require the Regional Board to evaluate the local agency every five years to ensure their municipal plumbing code and OWTS program is substantially equivalent to any statewide standards adopted pursuant to California Water Code sections 13290 and 13291. The State Water Resources Control Board (State Board) Water Quality Control Policy for Siting, Design, Operation, and Maintenance of Onsite Wastewater Treatment Systems (OWTS Policy) was adopted by the State Board to comply with California Water Code sections 13290 and 13291 on June 19, 2012. The OWTS Policy must be approved by the Office of Administrative Law before it becomes final and in effect. The OWTS in the Ventura River watershed fall under Tier 3 of the OWTS policy and this TMDL establishes the Advanced Protection Management Program for the watershed. The geographic area for the Advanced Protection Management Programs to implement this TMDL shall initially be the entire Ventura River watershed. The Regional Board will work with local agencies to determine which existing OWTS or areas of OWTS are contributing to the overall loading from OWTS to the Ventura River and its tributaries. Areas found not to be contributing to the overall loading may be removed from the Advanced Protection Management Program as approved in a Local Agency Management Program. Existing OWTS are required to be upgraded or modified to enhance their nitrogen removal or meet other requirements of the Advanced Protection Management Program if it is determined they are contributing to the impairment, and are subsequently covered under approved special provisions of a Local Agency

TMDL Element	Regulatory Provisions
	Management Program, or the Regional Board issues subsequent orders requiring upgrades or modifications. Existing OWTS will remain regulated by existing MOUs and future Local Agency Management Programs until the above determination is made and subsequent upgrades are required. New or replacement OWTS installations, as defined by the OWTS Policy upon its becoming effective, that are within the Advanced Protection Management Program area, shall meet the supplemental treatment requirements for nitrogen per Tier 3 of the OWTS Policy. The Regional Board will evaluate the existing MOUs and any future submittal of a Local Agency Management Program under the OWTS Policy with the City of Ventura, the City of Ojai, and the County of Ventura to determine if their OWTS programs need to be updated to reflect the OWTS Policy, or if additional changes are needed to implement the LAs. OWTS dischargers shall achieve compliance with dry- and wet-weather LAs within 10 years of the effective date of the TMDL. <u>Horse and Intensive Livestock Activities</u> The LAs for horse and intensive livestock activities shall be regulated by WDRs, waivers of WDRs, or other regulatory mechanisms in accordance with the Nonpoint Source Implementation and Enforcement Policy (NPS Policy). The Regional Board will determine which horse and intensive livestock activities shall be subject to the WDRs, waivers of WDRs or other regulatory mechanisms during their development based on factors that may include, but are not limited to, type of operation, density of animals, and risk to water quality. Horse and intensive livestock activities shall be required to develop management plans for Executive Officer approval and implement management measures identified in management plans to attain LAs. Compliance with LAs will be demonstrated with monitoring approved by the Executive Officer of the Regional Board through the monitoring program developed as part of the waiver, WDR, or other regulatory mechanism. Monitoring may consist of documentation of BMP implementation, and may include water quality monitoring as needed. Horse and intensive livestock activities shall achieve compliance with dry- and wet-weather LAs within 10 years of the effective date of the TMDL. <u>Grazing Activities</u> The LAs for grazing activities shall be regulated by WDRs, waivers of WDRs, or other regulatory mechanisms in accordance with the NPS Policy. Because the dry-weather load from grazing activities has not been quantified as of the effective date of this TMDL, and dry-weather LAs are based on a 10% reduction of existing dry-weather load, grazing activities shall be required to either conduct monitoring or utilize other acceptable data or studies as approved by the Executive Officer to determine baseline dry-weather pollutant load caused by grazing activities, unless the Regional Board has already quantified the existing dry-weather pollutant load. In addition, grazing activities may conduct baseline

TMDL Element	Regulatory Provisions
	monitoring to confirm wet-weather pollutant loading. Baseline monitoring shall be required by WDRs, waivers of WDRs, or other regulatory mechanism, if necessary. Baseline monitoring may consist of water quality monitoring of sites impacted by grazing and compared to water quality monitoring from unimpacted natural background sites. If it is determined that there are no water quality impacts due to dry- and/or wet-weather pollutant loading from grazing in the Ventura River watershed, then the TMDL may be revised to adjust the source assessment and allocation scenario when the TMDL is reconsidered. If it is determined that there are water quality impacts due to dry- and/or wet-weather pollutant loading from grazing in the Ventura River watershed, then grazing activities shall develop management plans for approval by the Executive Officer and implement management measures identified in management plans to attain LAs. Compliance with LAs will be demonstrated with monitoring approved by the Executive Officer of the Regional Board through the monitoring program developed as part of the waiver, WDR, or other regulatory mechanism. Monitoring may consist of documentation of no discharge due to BMP implementation, and may include water quality monitoring during conditions under which discharge may occur, including wet weather. Grazing activities shall achieve compliance with dry- and wet-weather LAs within 10 years of the effective date of the TMDL.

Table 7-35.2. Ventura River, Ventura River Estuary, and Tributaries Algae, Eutrophic Conditions and Nutrients TMDL: Implementation Schedule

Task	Due Date
Submit results of optional special studies	4 years after effective date of TMDL
Reconsider TMDL to revise numeric targets and allocations if supported by special studies or other changes in the watershed.	5 years after effective date of TMDL
Ojai Valley Sanitary District	
Wet-weather and interim dry-weather WLAs apply	Effective date of TMDL
Submit receiving water monitoring plan to assess numeric target attainment and measure in-stream nutrient concentrations	1 year after effective date of TMDL
Initiate receiving water monitoring plan	90 days after approval of monitoring plan
Discharge monitoring plan incorporated into permit	Upon permit adoption, renewal, or modification
Dry-weather WLA apply	No later than 12 years after effective date of TMDL*
Ventura County MS4 Permittees and Caltrans	
Wet-weather WLAs apply	Effective date of TMDL
Discharge monitoring plan incorporated into permit	Upon permit adoption, renewal, or modification
Submit monitoring plan to assess numeric target attainment and measure in-stream nutrient concentrations.	1 year after effective date of TMDL
Initiate receiving water monitoring plan	90 days after approval of monitoring plan
Submit implementation plan to achieve compliance with the WLAs. The plan shall include implementation methods, an implementation schedule, proposed interim milestones, and compliance points.	2 years after effective date of TMDL
Dry-weather WLAs apply	6 years after effective date of TMDL
General Industrial and Construction Stormwater Permittees	
Wet-weather and dry-weather WLAs apply	Effective date of TMDL
Discharge monitoring plan incorporated into permit	Upon permit adoption, renewal, or modification
Other NPDES Permittees	
Wet-weather and dry-weather WLAs apply	Effective date of TMDL
Discharge monitoring plan incorporated into permit	Upon permit adoption, renewal, or modification

Task	Due Date
Agricultural Discharges	
Discharge monitoring plan incorporated into Agriculture Waiver or other order or waiver	Upon adoption, renewal, or modification
Submit monitoring plan to assess numeric target attainment and measure in-stream nutrient concentrations.	1 year after effective date of TMDL
Initiate receiving water monitoring plan	90 days after approval of monitoring plan
Wet-weather and dry-weather LAs apply	6 years after effective date of TMDL
Onsite Waste Water Treatment Systems	
Regional Board staff and Ventura County will work to determine areas of OWTS to be included in an Advanced Protection Management Program area and a plan for a 50 percent reduction of loading from OWTS in these areas	3 years from the effective date of the TMDL
Wet-weather and dry-weather LAs apply	10 years after effective date of TMDL
Horse/ Intensive Livestock Activities	
Discharge monitoring plan submitted as part of waiver, WDR, or other regulatory mechanism requirement or in response to Regional Board order	5 years after effective date of TMDL
Conduct receiving water monitoring to assess numeric target attainment and measure in-stream nutrient concentrations	10 years after effective date of TMDL
Wet-weather and dry-weather LAs apply	10 years after effective date of TMDL
Grazing Activities	
Baseline monitoring plan or acceptable existing data or studies to determine baseline dry-weather pollutant load submitted as part of waiver or WDR requirement or in response to Regional Board order, unless the Regional Board has quantified the existing pollutant load	2 years after effective date of TMDL
Results of baseline monitoring submitted, if necessary	18 months after approval of baseline monitoring plan
Discharge monitoring plan submitted as part of waiver, WDR, or other regulatory mechanism requirement or in response to Regional Board order	5 years after effective date of TMDL
Conduct receiving water monitoring to assess numeric target attainment and measure in-stream nutrient concentrations	10 years after effective date of TMDL
Wet-weather and dry-weather LAs apply	10 years after effective date of TMDL

* If TMDL reconsideration results in more stringent WLAs, then the implementation schedule for OVSD may be extended, if necessary, by only the amount of time required to upgrade treatment processes to meet the more stringent WLAs.

ALGAE, EUTROPHIC CONDITIONS, AND NUTRIENTS TOTAL MAXIMUM DAILY LOADS FOR VENTURA RIVER AND ITS TRIBUTARIES

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LOS ANGELES REGION
320 WEST 4TH STREET
LOS ANGELES, CALIFORNIA 90013

REVISED DRAFT: NOVEMBER 16, 2012

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LIST OF ACRONYMS

ASSETS	Assessment of Estuarine Trophic Status
BMP	Best Management Practice
BURC	Beneficial Use Risk Category
Caltrans	California Department of Transportation
CASQA	California Stormwater Quality Association
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CFS	Cubic Feet per Second
CWA	Clean Water Act
CZARA	Coastal Zone Act Reauthorization Amendments
DEM	Digital Elevation Model
DO	Dissolved Oxygen
DWR	Department of Water Resources
GIS	Geographic Information System
EPA	Environmental Protection Agency
FOTG	Field Office Technical Guide
LA	Load Allocation
LARWQCB	Los Angeles Regional Water Quality Control Board
LiDAR	Light Detection and Ranging
MANAGE	Measured Annual Nutrient loads from Agricultural Environments
MGD	Million Gallons per Day
mL	Milliliters
MOU	Memorandum of Agreement
MS4	Municipal Separate Storm Sewer System
NAIP	National Agriculture Imagery Program
NEAA	National Estuarine Eutrophication Assessment
NOAA	National Oceanic and Atmospheric Administration
NMFS	National Marine Fisheries Service
NNE	Nutrient Numeric Endpoint
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Source
NRCS	Natural Resources Conservation Service
NTS	Natural Treatment System
OWTS	Onsite Wastewater Treatment Syatem
OVSD	Ojai Valley Sanitary District
QAPP	Quality Assurance Project Plan
REC-1	Water Contact Recreational Use
REC-2	Non-contact Recreational Use
SBCK	Santa Barbara Channelkeeper
SCAG	Southern California Association of Governments
SCCWRP	Southern California Coastal Water Research Project
SMC	Southern California Stormwater Monitoring Coalition
SWRCB	State Water Resources Control Board
TIN	Total Inorganic Nitrogen
TN	Total Nitrogen
TP	Total Phosphorus
TMDL	Total Maximum Daily Load

UCSB	University of California, Santa Barbara
US EPA	Unites States Environmental Protection Agency
USDA	United States Department of Agriculture
USGS	United States Geological Survey
VCAILG	Ventura County Agricultural Irrigated Lands Group
VCWPD	Ventura County Watershed Protection District
WDR	Waste Discharge Requirement
WLA	Waste Load Allocation
WQA	Water Quality Assessment
WQO	Water Quality Objective
WWTP	Wastewater Treatment Plant

1. INTRODUCTION

The Ventura River Estuary and the Ventura River (including its tributaries), located in Ventura County, are identified on the 1998, 2002, 2006, and 2010 Clean Water Act (CWA) Section 303(d) list of impaired waterbodies due to algae, eutrophic conditions, low dissolved oxygen, and nitrogen (Table 1-1). The CWA requires the development of Total Maximum Daily Loads (TMDLs) to restore impaired waterbodies to fully support their beneficial uses. This document provides the background information used by the California Regional Water Quality Control Board, Los Angeles Region (Los Angeles Regional Board) in the development of the TMDL for Algae, Eutrophic Conditions, and Nutrients in the Ventura River and its Tributaries.

Table 1-1 CWA Section 303(d) list of algae, eutrophic conditions, and nitrogen impairments in the Ventura River and its tributaries

Waterbody Name	Pollutant(s)
Ventura River Estuary	Algae, Eutrophic
Ventura River Reach 1 and 2 (Estuary to Weldon Canyon)	Algae
San Antonio Creek	Nitrogen
Cañada Larga	Low Dissolved Oxygen

As documented in this staff report, the algae and nutrient-related impairments are caused by excessive loading of nutrients, particularly nitrogen and phosphorus to Ventura River and its tributaries.

1.1 Regulatory Background

Section 303(d) of the Clean Water Act (CWA) requires that "Each State shall identify those waters within its boundaries for which the effluent limitations are not stringent enough to implement any water quality standard applicable to such waters." The CWA also requires states to establish a priority ranking for waters on the 303(d) list of impaired waters and establish TMDLs for such waters.

The elements of a TMDL are described in 40 CFR sections 130.2 and 130.7 and Section 303(d) of the CWA, as well as in the U.S. Environmental Protection Agency guidance (U.S. EPA, 2000a). A TMDL defined as the "sum of the individual waste load allocations for point sources and load allocations for nonpoint sources and natural background" (40 CFR section 130.2) such that the capacity of the waterbody to assimilate pollutant loadings (the Loading Capacity) is not exceeded. TMDLs are also required to account for seasonal variations, and include a margin of safety to address uncertainty in the analysis.

States must develop water quality management plans to implement the TMDL (40 CFR section 130.6). The U.S. EPA has oversight authority for the 303(d) program and is required to review and either approve or disapprove the TMDLs submitted by states. If the

U.S. EPA disapproves a TMDL submitted by a state, U.S. EPA is required to establish a TMDL for that waterbody.

A schedule for development of TMDLs in the Los Angeles Region was established in a consent decree (Heal the Bay Inc., et al. v. Browner C 98-4825 SBA) approved on March 22, 1999. The consent decree combined waterbody pollutant combinations in the Los Angeles Region into 92 TMDL analytical units. In accordance with the consent decree, this TMDL addresses the waterbodies in analytical unit 88. This document summarizes the analyses performed and presents the TMDL for Algae, Eutrophic Conditions, and Nutrients in the Ventura River and its Tributaries.

1.2 Elements of a TMDL

There are seven elements of a TMDL. Sections 2 through 7 of this document are organized such that each section describes one of the elements, with the analysis and findings of this TMDL for that element. The elements are:

- Section 2: Problem Identification. This section reviews the data used to add the waterbody to the 303(d) list, and summarizes existing conditions using that evidence along with any new information acquired since the listing. This element identifies those beneficial uses that are not supported by the waterbody; the water quality objectives (WQOs) designed to protect those beneficial uses; and summarizes the evidence supporting the decision to list each reach, such as the number and severity of exceedances observed.
- Section 3: Numeric Targets. The numeric targets for this TMDL are based upon the WQOs described in the Basin Plan.
- Section 4: Source Assessment. This section develops the quantitative estimate of nutrient loading from point sources and nonpoint sources to the Ventura River and its tributaries.
- Section 5: Linkage Analysis. This analysis shows how the sources of pollutants discharged to the waterbody are linked to the observed conditions in the impaired waterbody.
- Section 6: Pollutant Allocations. Each pollutant source is allocated a quantitative load that it can discharge to meet the numeric targets. Point sources are assigned waste load allocations (WLAs) and nonpoint sources are assigned load allocations (LAs). Allocations are designed such that the waterbody will not exceed numeric targets for any of the compounds or related effects. Allocations are based on critical conditions, so that the allocated pollutant loads may be expected to remove the impairments at all times.
- Section 7: Implementation and Monitoring. This section describes the plans, regulatory tools, or other mechanisms by which the WLAs and LAs may be achieved. The TMDL provides cost estimates to meet the WLAs and LAs. The TMDL includes a monitoring program to assess TMDL effectiveness and attainment of water quality standards. It also describes special studies to address

uncertainties in assumptions made in the development of this TMDL and the process by which new information may be used to refine the TMDL.

1.3 Environmental Setting

The Ventura River watershed (Figure 1-1) is located in the northwestern portion of Ventura County with a small portion in the southeastern portion of Santa Barbara County. The watershed drains a fan-shaped area of about 220 square miles with an elevation from 6,000 feet to sea level. The Ventura River has several major tributaries, including Matilija Creek, North Fork Matilija Creek, San Antonio Creek, Coyote Creek and Cañada Larga. Matilija creek (15 miles) drains the Santa Ynez Mountains as it flows to the Matilija Reservoir and the Matilija Dam. The creek continues below the dam for about one half mile before it joins North Fork Matilija Creek. North Fork Matilija Creek, which is about 12 miles long, generally follows Highway 33 in the Los Padres National Forest until it joins Matilija Creek.

The Ventura River starts at the confluence of Matilija Creek and North Fork Matilija Creek. The Ventura River then flows for about 16 miles in a southerly direction to the estuary and the Pacific Ocean. The Ventura River has intermittent direct discharge to the ocean; longshore transport of sand can cause a sand bar to form at the mouth of the estuary in the late summer and early fall.

The Ventura River Estuary extends from the ocean to approximately 150 meters upstream of the railroad bridge based on tidal influence. The Estuary includes an open water area that is separated from the ocean by a berm that forms during the dry season. The berm is breached during storm events and slowly rebuilds through the summer, sometimes not fully building until August or September. The Estuary is flushed by tides when the berm is open and is dominated by slightly brackish to freshwater when the berm is closed (Ventura River Watershed State of the Watershed Report).

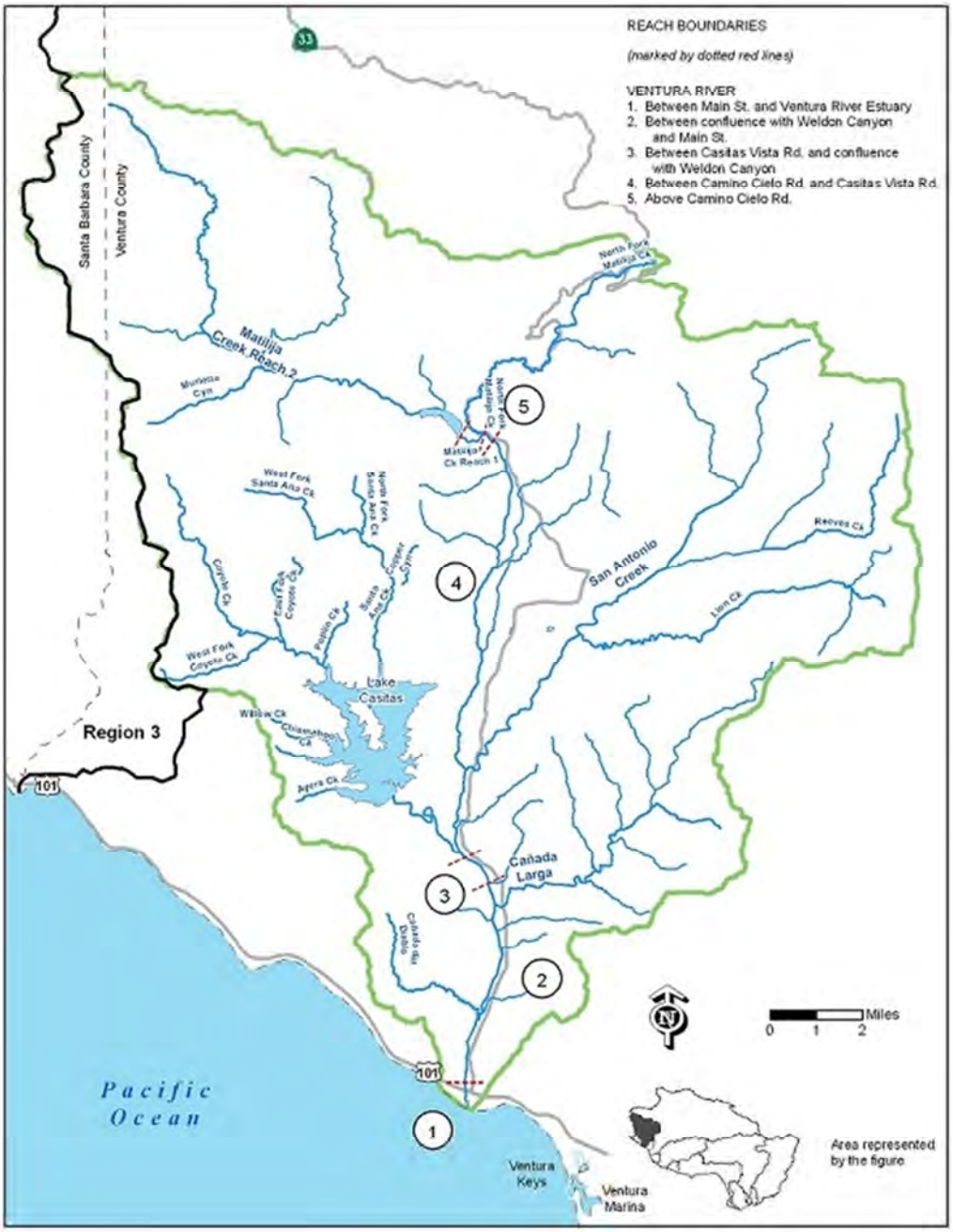


Figure 1-1 Major Surface Waters in Ventura River Watershed

The watershed topography is characterized by rugged mountains in the upper basins transitioning to less steep areas and valleys in the lower watershed. The gradient in the watershed ranges from about 150 feet per mile at the headwaters to about 40 feet per mile near mouth of the river. The U.S. Bureau of Reclamation classifies the watershed topography as fifteen percent valley, forty percent foothill, and forty-five percent mountain. The highest point in the watershed is at 6,025 feet in the Santa Ynez Mountains.

There are two reservoirs within the watershed: Lake Casitas and Matilija Reservoir. Lake Casitas serves as an important source of municipal supply water and is a popular recreation

area. The Matilija Reservoir was originally constructed in 1947 to supply water for both agriculture and municipal uses and provide limited flood control. However, over the years large amounts of sediment has been trapped behind the dam and the storage capacity has been significantly reduced. Today the current dam capacity is estimated at less than 500 acre-feet (Tetra Tech, 2012). In 1998 studies were initiated to investigate the effect of removing the dam and the *Matilija Dam Ecosystem Restoration Project* was developed. This project aims to remove both Matilija Dam and the sediment accumulated behind the dam. Removal of the dam would eliminate a barrier to fish passage on Matilija Creek and facilitate the migration, spawning, and rearing of southern steelhead trout.

1.3.1 Land Use

Based on the Southern California Association of Governments (SCAG) Geographic Information System (GIS) database, eighty-five percent of the land use in the Ventura River watershed (Figure 1-2) is classified as open space and approximately one half of the watershed lies within the Los Padres National Forest. The Matilija Wilderness area, which is managed by the Los Padres National Forest and Ojai Ranger District, is an open space area with access only allowed by foot on marked trails. The remainder of the forest area in the watershed is designated as semi-primitive and has roads leading to recreation areas.
Agricultural land use is the second largest in the watershed at 4.5 percent of the watershed area. The developed area of the watershed is very limited compared to the open space areas, high density and low density residential land uses account for 1.9 and 2.9 percent, respectively. The cities of Ojai and Ventura are the largest urban areas in the watershed and the communities of Casitas Springs, Foster Park, Oak View, Valley Vista, Mira Monte, Meiners Oaks, Upper Ojai and Live Oak Acres are within the unincorporated Ventura County. Industrial areas in the watershed are generally used for oil production and mining and account for 2.1 percent of the watershed area. The remaining land uses (Public Facilities, Recreation, Commercial, Education Institutions, Horse Ranch/Livestock, Transportation, and Mixed Urban) each account for less than 1 percent of the land use within the watershed (Table 1-2).

Table 1-2 Land Uses of Ventura River Watershed

Land Use	Area (Square miles)	Percentage (%)
Open Space	186	84.6
Agriculture	9.98	4.5
Low Density Residential	6.33	2.9
Industrial	4.65	2.1
Water	4.17	1.9
High Density Residential	4.08	1.9
Public Facilities	1.17	0.5
Recreation	1.15	0.5
Commercial	0.70	0.3
Education Institutions	0.59	0.3
Horse Ranch/Livestock	0.57	0.3
Transportation	0.39	0.2
Mixed Urban	0.02	<0.1
Total of all classes	**220**	**100**

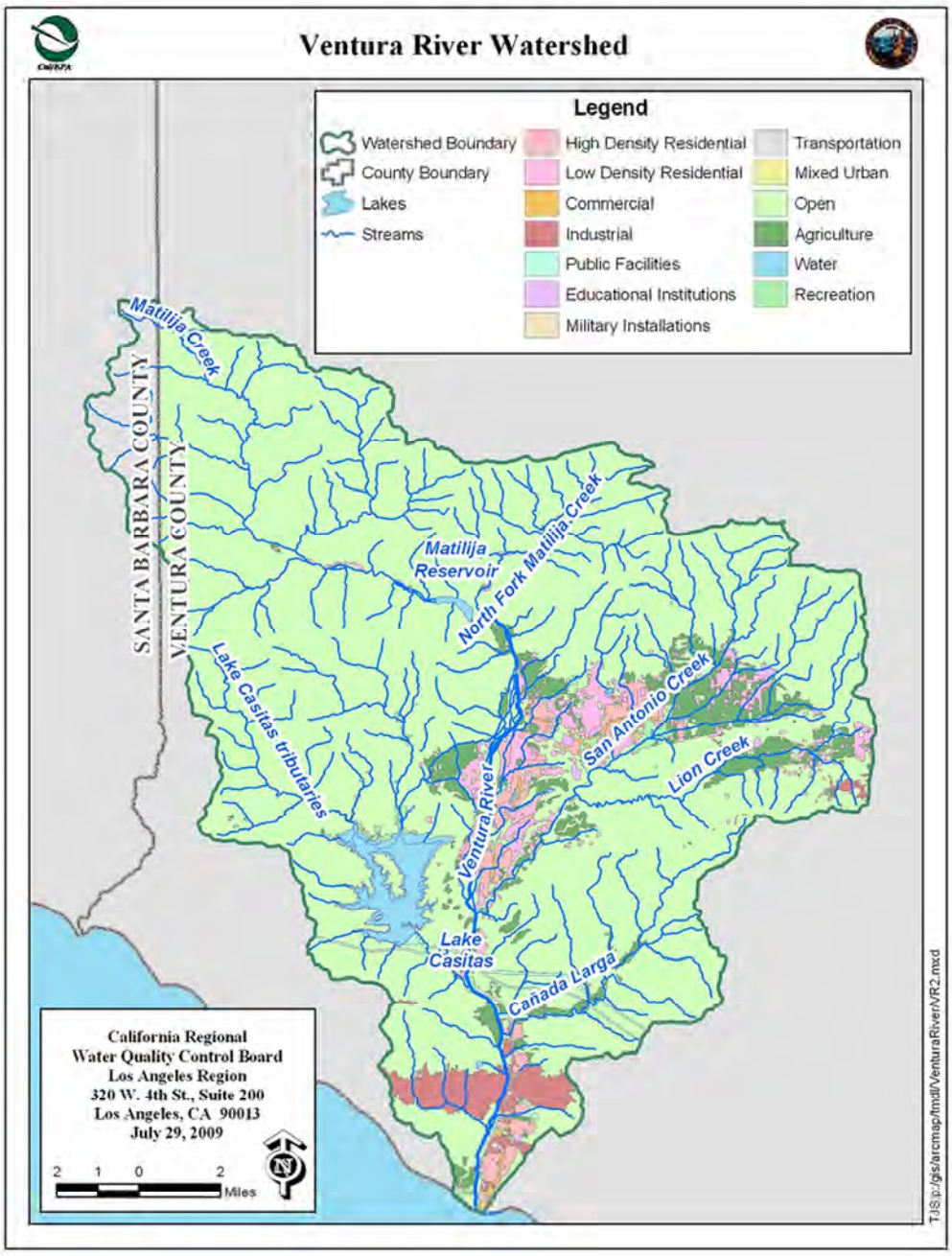


Figure 1-2 Land Uses of the Ventura River Watershed

1.3.2 Hydrology

Flow in the Ventura River varies seasonally due to the Mediterranean climate pattern of wet cool winters from November through March and dry warm summers from April through October. Annual rainfall can vary considerably from year to year. Figure 1-3 presents the annual rainfall from 2005 to 2010 as measured by Ventura County Watershed Protection District at Ojai County Fire Station.

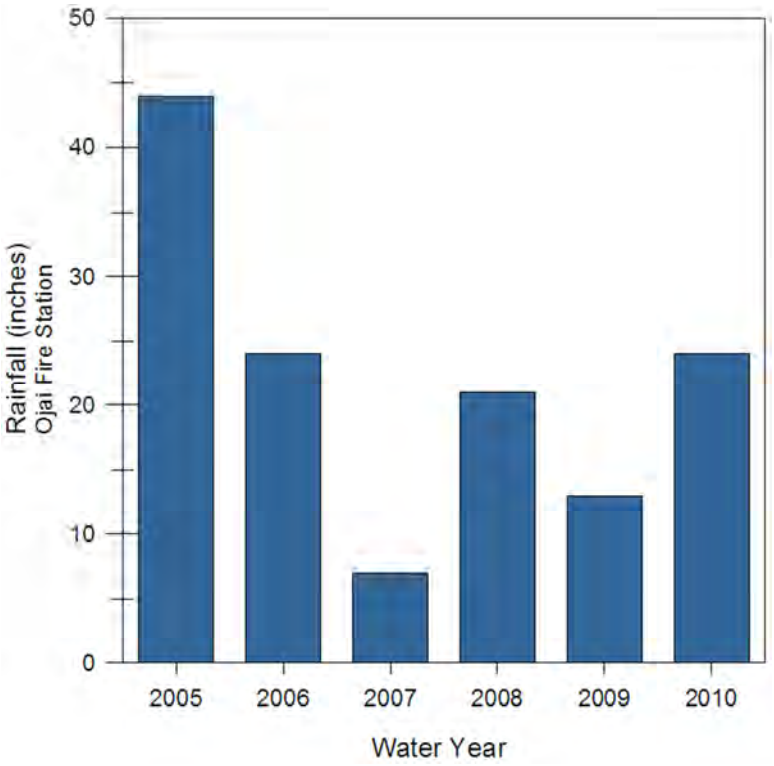


Figure 1-3 Annual rainfall at Ojai County Fire Station

High flows predominate during the rainy season, starting in winter through early spring. For example, Figure 1-4 presents flow in the Ventura River at Foster Park from October 2000 – 2008; peak flows occur after winter storm events and the flows decline to very low levels, less than 1 cfs, during the dry season. However, this pattern is mitigated in the lower Ventura River by effluent from the Ojai Valley Waste Water Treatment Plant (WWTP), which constitutes a majority or, at times, all of the flow in this section of the river during the summers and fall of dry years. The red hydrograph is the flow from Ojai Valley WWTP.

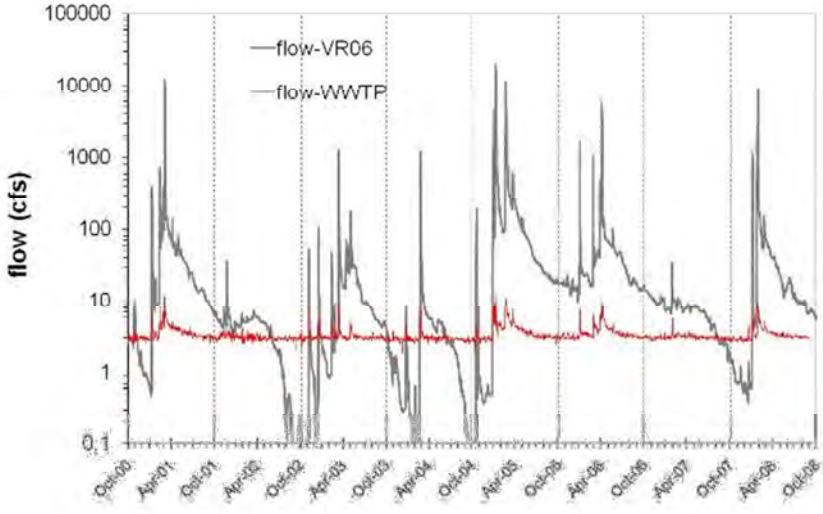


Figure 1-4 Stream Flow in Ventura River at Foster Park and Effluent Discharge from Ojai Valley WWTP (Klose et al., 2009)

In addition to natural variations in flow, based on annual rainfall, flow regimes in the Ventura River have been altered to support water supply. Typically there is perennial flow from the headwaters to the Robles Diversion Dam, which is located about two miles downstream from the Matilija Dam. The Robles Diversion Dam was built in 1958 and is used to divert water from the Ventura River into Lake Casitas via the Robles-Casitas Canal. The flow downstream of the Robles Diversion Dam to the confluence with San Antonio Creek is intermittent, particularly during the dry summer months. Geologic features in the area of Casitas Springs (lower part of Reach 4) causes rising groundwater and provides perennial base flow in the river. The flow in the river is disrupted at Foster Park due to subsurface diversions and groundwater extraction. However, the river flow below Foster Park to the estuary increases due to effluent discharges from the Ojai Valley WWTP.

2. PROBLEM IDENTIFICATION

This section provides an overview of the impairments of the Ventura River Estuary and Ventura River by nutrients and related effects. Subsection 2.1 provides background information on nutrient enrichment. Subsection 2.2 presents the numeric and narrative water quality objectives and beneficial uses applicable to the Ventura River and Estuary. Subsection 2.3 provides a review of the information used by the Regional Board to list the Ventura River and Estuary, San Antonio Creek and Cañada Larga for algae, eutrophic conditions, nitrogen, and low dissolved oxygen. Additional data, where available, were used to assess the current condition of the waterbodies.

2.1 Nutrient Enrichment Problems in Rivers & Estuaries

Nutrients, including nitrogen (N) and phosphorus (P), are essential for plant growth and are often important limiting nutrients in aquatic environments. However, in situations of nutrient enrichment, the nutrients N and P are no longer limiting; in fact, they are readily available in the waterbody, which causes an increase in primary production and eutrophication. Eutrophication is defined by increased nutrient loading to a waterbody and the subsequent ecological response. Accelerated input of nutrients into rivers and estuaries leads to degraded waterbody conditions. Symptoms of eutrophication in rivers and estuaries are listed below.

- Increased algal biomass (macroalgae and phytoplankton)
- Reductions in dissolved oxygen (hypoxia)
- Alterations in algal species composition
- Alterations in food resources and habitat structure
- Harmful algal blooms

The relationship between nuisance algae growth and nutrient enrichment in creek and stream systems has been well-documented in the literature (Dodds and Welch, 2000; Biggs, 2000; Busse et al., 2006). Eutrophication and nutrient enrichment problems rank as one of the top causes of impairment to the nation's waters (EPA Rivers Criteria tech guide 2000 and NOAA Estuary report 1999). The problems associated with these impacts can range from a recreational nuisance to serious aquatic life and public health concerns. For example, high amounts of algal biomass and other aquatic plants interfere with swimming or wading, angling, and/or aesthetic enjoyment of the waterbody and impair the recreational beneficial uses. The aquatic life impacts of eutrophication can include fish kills, lowered fishery production, loss or degradation of important habitats (e.g. seagrass, cobble/gravel niche space), and smothering of benthic organisms (NOAA 1999 and EPA CADDIS).

There are many complex ways in which excess nutrient loads can impact beneficial uses. The conceptual models in Figures 2-1 and 2-2 outline the interactions between nutrients and biological responses in streams and estuaries, respectively. There are numerous overlapping physical, chemical, and biological factors that affect how a waterbody responds to increased nutrient loading. For example, nutrients, temperature, and light often interact together and influence processes within the aquatic ecosystem. The models below

work to demonstrate the interaction and influence of various factors and to assess pathways that are contributing to the impairment of beneficial uses.

Increased nutrient loading into the stream can result in increased algal growth (Figure 2-1). The high levels of algal biomass through respiration (consumption of oxygen and production of carbon dioxide) and photosynthesis (consumption of carbon dioxide and production of oxygen) can cause significant increases in diurnal dissolved oxygen (DO) and pH swings and result in decreased overall DO (Welch and Jacoby 2004, Anderson and Carpenter, 1998). Streams impacted by high levels of algal biomass will often demonstrate supersaturated DO concentrations and high pH values in late afternoon and minimum DO and pH values in early morning (Anderson Carpenter, 1998). Low overnight DO concentrations can have considerable negative impacts on fish and in extreme cases the overnight low DO concentrations can be lethal for fish.

Adequate concentrations of dissolved oxygen are critical for the survival of fish and cold water fishes like steelhead have even greater oxygen requirements as compared to warm water fish. Decreased oxygen levels will increase the physiological stress of fish because their metabolic demands are not being met. This can impact growth and development at different steelhead life stages including eggs, alevins, and fry, as well as the swimming, feeding, and reproductive ability of juvenile and adult fish (Carter, 2005, Bjornn and Reiser, 1991).

2.1.1 Risk Cofactors for Rivers

The combination of increased nutrient loading and other factors, referred to as “cofactors”, together cause impacts (i.e. elevated algal growth, decreased DO, high pH), which lead to beneficial use impairments. The risk cofactors, in conjunction with nutrient loads, contribute to the degraded conditions manifested by the Ventura River watershed. Risk cofactors include light, temperature, flow, and canopy cover. Key cofactors in the Ventura River system are discussed below.

Riparian habitat serves several functions in stream systems including, providing shade and moderating water temperature. Riparian areas also serve to stabilize banks, prevent erosion and add to overall stream channel complexity through inputs of woody debris and aid in pool formation (Ventura River Steelhead Restoration Plan, 1997). Reductions in riparian habitat have associated reductions in shade and increased water temperatures, which promotes the growth of algae and influences changes in DO and pH. Furthermore, channel alterations including erosion, straightening, and hardening prevent the river from maintaining productive stable stream banks and disconnect the river from riparian habitat thereby preventing an important riparian function - filtering runoff.

Also, decreased flow conditions are more susceptible to high temperatures and low DO and long time periods between scour events.

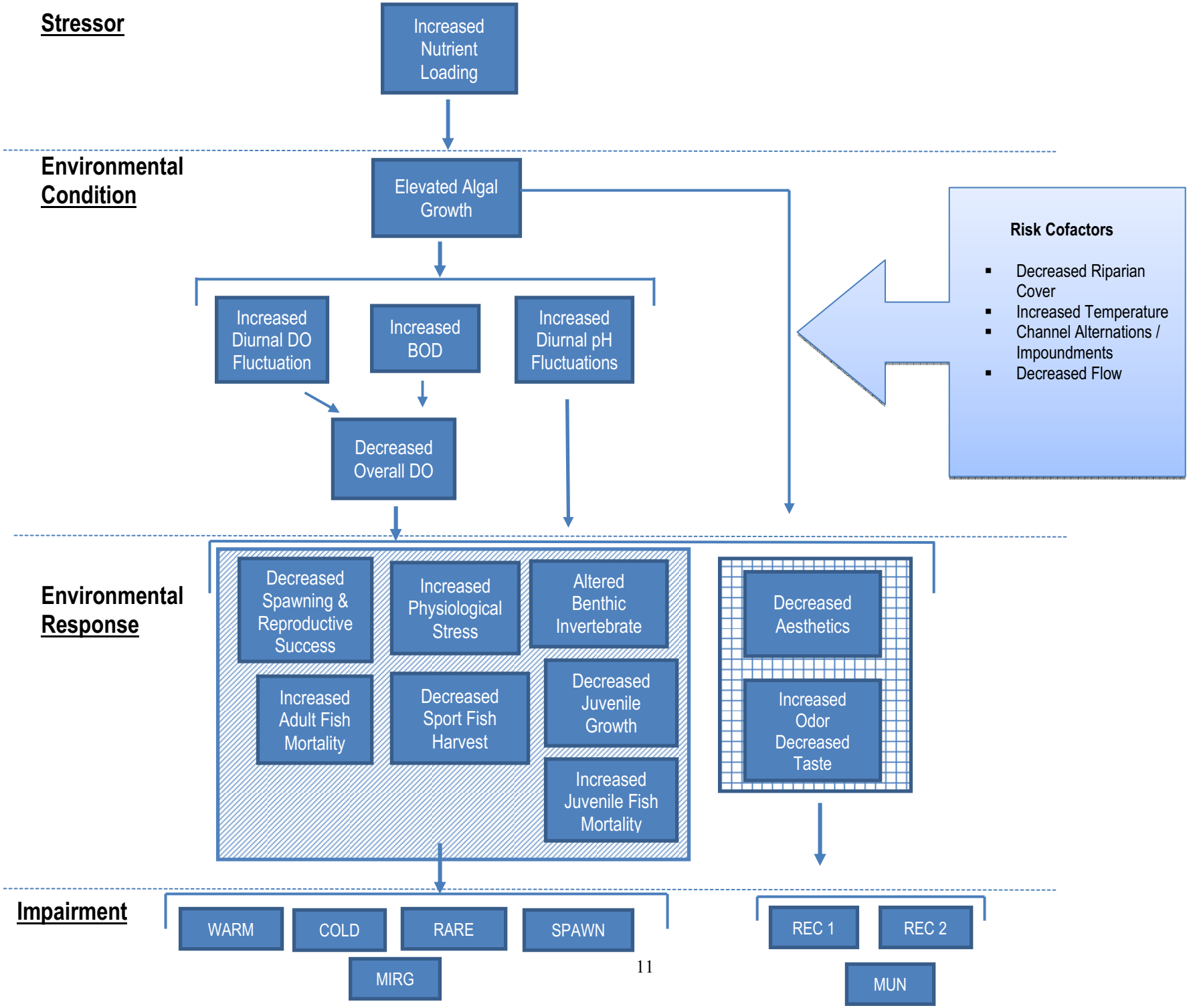


Figure 2-1 Conceptual Model for Rivers

Similar to river systems the immediate response to increased nutrient loading in estuaries is increased algal growth and potential changes in the primary producer community (Figure 2-2). As nutrient levels increase, the shallow subtidal conditions become more favorable for epiphytes (algae growing on the surface of other aquatic plants), and/or macroalgae. In deeper estuaries, phytoplankton biomass increases. This increased algal biomass (i.e. available organic matter) has effects on the biogeochemical cycling in the estuary's sediments and water. These effects include increased respiration in the sediment and water, greater frequency and duration of low dissolved oxygen conditions, and increased ammonium and sulfide in sediment pore water. The poor habitat conditions cause negative impacts on benthic organisms and higher level consumers including other invertebrates, fish, and birds (Green, 2011).

2.1.2 Risk Cofactors for Estuaries

There are also cofactors for estuaries that influence how the waterbody responds to increased nutrient loading and the potential risk of beneficial use impairment. These co-factors include light, temperature, mixing, and residence time. For example, estuaries with lower residence time and more frequent flushing generally accumulate less organic matter and maintain sufficient oxygen levels. Also, the effects of nutrient loading on macroalgal cover and biomass are strongly influenced by the hydrologic connection between the estuary and ocean (Sutula, 2011). Estuaries perennially connected to the ocean are expected to have decreased effects (i.e. changes to water and sediment physiochemical parameters) from macroalgae because these effects generally decrease with increased water depth. However, intertidal and shallow subtidal areas are more likely to be affected by macroalgae mats because there is a greater amount of algal biomass relative to the volume of water (Sutula, 2011). Finally, as in rivers, the availability of light and increased water temperatures promotes algal growth, which can influence changes in estuary oxygen and pH.

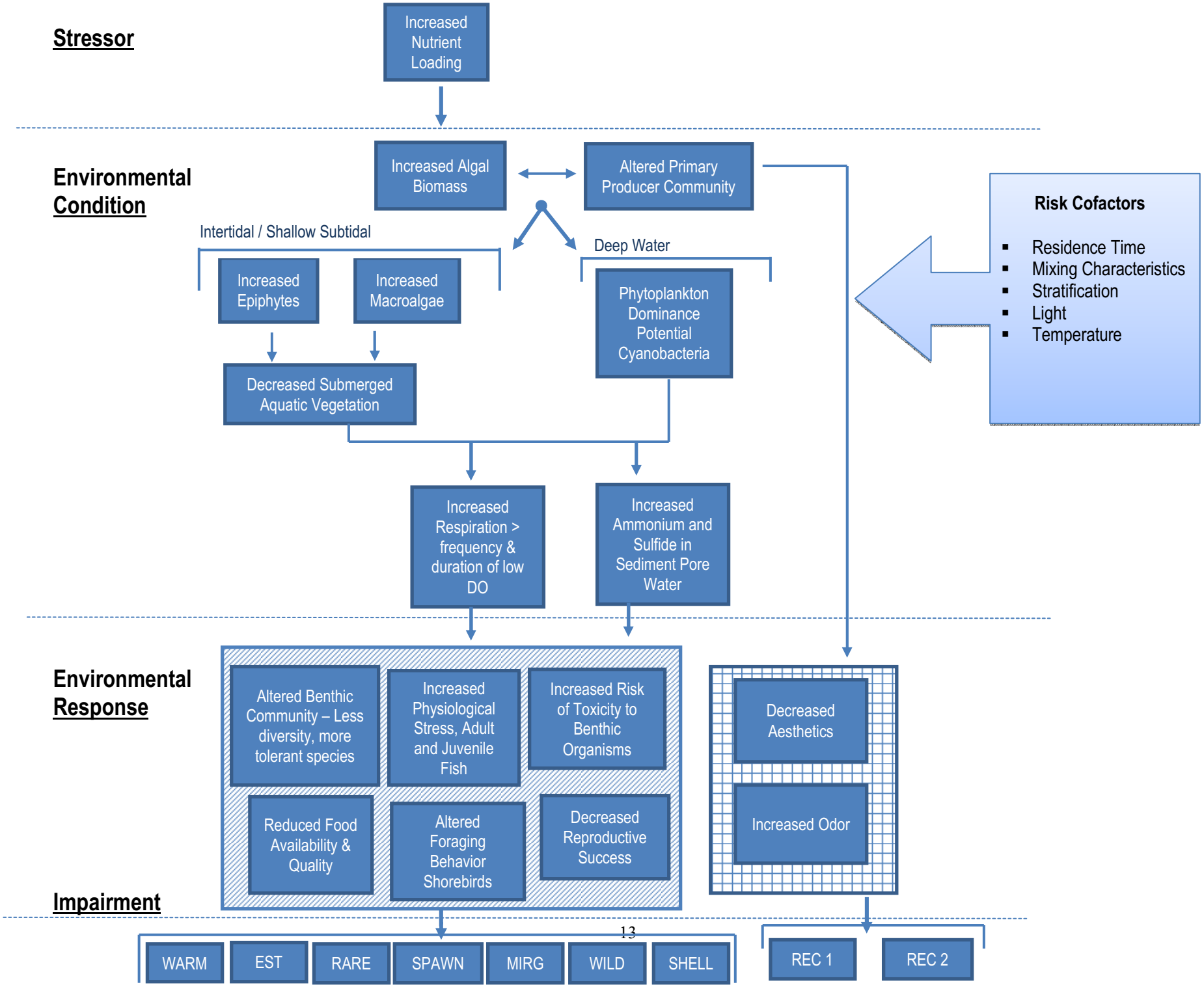


Figure 2-2 Conceptual Model for Estuaries

2.2 Water Quality Standards

California water quality standards consist of the following three elements: 1) beneficial uses, 2) narrative and/or numeric water quality objectives, and 3) an antidegradation policy. In California, beneficial uses are defined by the regional boards in their Water Quality Control Plans (Basin Plans). Narrative and numeric objectives are designed to be protective of the beneficial uses specified in the Los Angeles Region Basin Plan.

2.2.1 Beneficial Uses

The Basin Plan for the Los Angeles Regional Board (LARWQCB, 1994) defines twenty (20) beneficial uses for Ventura River and Ventura River Estuary (Table 2-1). These beneficial uses are recognized as existing (E), potential (P) or intermittent (I) uses. Nutrient loading and the resulting ecological responses in Ventura River and the estuary may result in impairments of beneficial uses associated with recreation (REC1 and REC2), aquatic life (WARM, COLD, EST, WILD, RARE, MIGR, SPWN, and WET), and water supply (MUN).

The most sensitive beneficial use in the Ventura River watershed is the cold water aquatic habitat (COLD) use and the associated migratory (MIGR) and spawning and early development (SPWN) uses. The Ventura River and its tributaries is home to the Southern California Steelhead, which was first recognized as endangered by the NOAA National Marine Fisheries Service (NMFS) in 1997. It status as endangered was reaffirmed in 2006. According to NMFS, the total population of the Southern California Steelhead has dropped from 32,000-46,000 spawning adults to less than 500 (NOAA 2012). The Ventura River, Ventura River Estuary, San Antonio Creek, Canada Larga, Matilija Creek and North Fork Matilija Creek among other tributaries have been designated by NMFS as critical habitat for the remaining population of the Southern California Steelhead.

The municipal and domestic supply (MUN) use designation applies to Ventura River Reaches 1 and 2, Canada Larga, and Matilija Creek as a potential (P) beneficial use. This beneficial use, for Ventura River and its tributaries, is indicated with an asterisk in the Basin Plan as a conditional use. Conditional designations are not recognized under federal law and are not water quality standards requiring TMDL development at this time. (See Letter from Alexis Strauss [US EPA] to Celeste Cantú [State Board], Feb. 15, 2002)

Table 2-1 Beneficial Uses of the Ventura River Watershed

Watershed	MUN	IND	PROC	AGR	GWR	FRSH	NAV	REC1	REC2	COMM	WARM	COLD	EST	MAR	WILD	RARE	MIGR	SPWN	SHELL	WET
Ventura River Estuary							E	E	E	E	E		E	E	E	E[e]	E[f]	E[f]	E	E
Ventura River R 1	P*	E		E	E	E		E	E		E	E			E	E	E	E		E
Ventura River R 2	P*	E		E	E	E		E	E		E	E			E	E	E	E		E
Ventura River R 3	P*	E		E	E	E		E	E		E	E			E	E	E	E		E
Ventura River R 4	E	E	E	E	E	E		E	E		E	E			E	E[g]	E	E		E
Ventura River R 5	E	E	E	E	E	E		E	E		E	E			E	E[g]	E	E		E
Cañada Larga	P*		I	I	I	I		I	I		I	I			E		I	I		
San Antonio Creek	E	E	E	E	E			E	E		E	E			E		E	E		E
San Antonio Creek (above Lion Creek)	E	E	E	E	E	E		E	E		E	E			E		E	E		E
Matilija Creek	P*				E			E	E			E			E		E	E		E
North Fork Matilija Creek	E*	E	E	E	E			E	E		E	E			E	E	E	E		E

e – One or more rare species utilize all oceans, bays, estuaries, and coastal wetlands for foraging and/or nesting
f – Aquatic organisms utilize all bays, estuaries, lagoons, and coastal wetlands, to a certain extent, for spawning and early development. This may include migration into areas which are heavily influenced by freshwater inputs.
g – Condor refuge

2.2.2 Water Quality Objectives

The Basin Plan specifies narrative and numeric objectives, which both apply to Ventura River and Ventura River Estuary. The following narrative objectives apply to this TMDL.

> **Biostimulatory Substances:** *Waters shall not contain biostimulatory substances in concentrations that promote aquatic growth to the extent that such growth causes nuisance or adversely affects beneficial uses.*
>
> **Taste and Odor:** *Waters shall not contain taste or odor producing substances in concentrations that impart undesirable tastes or odors to fish flesh or other edible aquatic resources, cause nuisance, or adversely affect beneficial uses.*

The numeric water quality objects applicable to this TMDL are listed below.

> **Dissolved Oxygen (DO):** *At a minimum the mean annual DO concentrations of all waters shall be greater than 7.0 mg/L, and no single determinations shall be less than 5.0 mg/L except when natural conditions cause lesser concentrations.*
>
> *The dissolved oxygen content of all surface waters designated as both COLD and SPWN shall not be depressed below 7 mg/L as a result of waste discharges.*
>
> **pH:** *The pH of inland surface waters shall not be depressed below 6.5 or raised above 8.5 as a result of waste discharges. Ambient pH levels shall not be changed more than 0.5 units from natural conditions as a result of waste discharge.*
>
> *The pH of bays or estuaries shall not be depressed below 6.5 or raised above 8.5 as a result of waste discharges. Ambient pH levels shall not be changed more than 0.2 units from natural conditions as a result of waste discharge.*
>
> **Ammonia:** *In order to protect aquatic life, ammonia concentrations in inland freshwaters shall not exceed the values calculated for the appropriated in-stream conditions shown in tables 3-1 to 3-3 in the Basin Plan.*
>
> *For inland surface waters not characteristic of freshwater the four-day average concentration of un-ionized ammonia shall not exceed 0.035 mg/L and the one-hour average concentration shall not exceed 0.233 mg/L.*
>
> *Determination of Freshwater, Brackish Water or Saltwater Conditions*
> *For inland surface waters in which the salinity is equal to or less than 1 part per thousand 95% or more of the time, the applicable objectives are the freshwater objectives, based on the US EPA "1999 Update of Ambient Water Quality Criteria for Ammonia." (2) For waters in which the salinity is equal to or greater than 10 parts per thousand 95% or more of the time, the applicable objectives are a 4-day average concentration of 0.035 mg un-ionized NH3/L and a one-hour average concentration of 0.233 mg un-ionized NH3/L. (3) For waters in which the*

salinity is greater than 1 but less than 10 parts per thousand, the applicable objectives the more stringent of the freshwater or saltwater objectives.

Nitrogen: *Waters shall not exceed 10 mg/L nitrogen as nitrate-nitrogen plus nitrite-nitrogen (NO3-N + NO2 – N), 45 mg/L as nitrate (NO3), 10 mg/L as nitrate-nitrogen (NO3-N) or 1 mg/L as nitrite-nitrogen (NO2-N) or as otherwise designated in Table 3-8.*

Basin Plan Table 3-8 presents the nitrogen objective for Ventura River Reaches 5,4,3, and 2 as 5mg/L. This limit also applies to Cañada Larga and San Antonio Creek as tributaries to Reaches 2 and 4, respectively.

This nitrogen objective is established for the protection of the MUN beneficial use and objectives in Table 3-8 are waterbody specific. As presented in the problem identification and water quality assessment sections of this document, the numeric objective of 10 mg/L and the waterbody specific objective 5 mg/L is not sufficiently protective to control excessive algal growth and eutrophic conditions in the river and estuary and thus protect the most sensitive beneficial use in the watershed, which is aquatic life. Current nitrate loading in the watershed is a contributor to the exceedence of the biostimulatory substances narrative objective. Therefore, this TMDL will set numeric targets and allocations at levels necessary to attain the biostimulatory substances objective and protect all beneficial uses.

2.2.3 Antidegradation

State Board Resolution 68-16, “Statement of Policy with Respect to Maintaining High Quality Water” in California, known as the "Antidegradation Policy," protects surface and ground waters from degradation. Any actions that can adversely affect water quality in all surface and ground waters must be consistent with the maximum benefit to the people of the state, must not unreasonably affect present and anticipated beneficial use of such water, and must not result in water quality less than that prescribed in water quality plans and policies. Furthermore, any actions that can adversely affect surface waters are also subject to the federal Antidegradation Policy (40 CFR 131.12). The proposed TMDL will not degrade water quality, and will in fact improve water quality as it is designed to achieve compliance with existing water quality standards in order to ensure that beneficial uses of the Ventura River system are fully supported.

2.3 Water Quality Data Summary

This section presents a review of the data used by the Los Angeles Regional Board to identify reaches of the Ventura River and Estuary, San Antonio Creek, and Cañada Larga as impaired by algae, eutrophic conditions, nitrogen, and low dissolved oxygen. Additional data, where available, were also used to assess the current condition of the waterbodies.

2.3.1 Basis for 303(d) Listings

The basis for the algae and eutrophic condition impairments in Ventura River Reach 1 and 2 and the estuary was the 1996 Water Quality Assessment (WQA) conducted by Regional Board. There is limited information available regarding these listings; however, the information that is available is summarized below.

As part of the 1996 WQA, Regional Board staff conducted field surveys that included observations of algae during the summer season. The field logs used in this work included qualitative observations of algae. A standard field log worksheet, developed by Regional Board staff, was used to summarize observations made during sampling events. The worksheet directed staff to evaluate algal cover ranging from zero to dense (> 50% cover) and floating versus attached algae. The worksheet results were compiled and waterbodies were characterized as impaired or attaining beneficial uses.

San Antonio Creek is listed for nitrogen on the 2002 303(d) list. The fact sheet (2002 CWA 303(d) List Staff Report, 2003 page 4-198) presents the staff recommendation of listing this waterbody due to greater than 10% exceedances of the applicable nitrogen objectives of 5 mg/L. Similarly, Cañada Larga was identified as impaired and placed on the 2002 303(d) list for greater than 10% exceedances of the dissolved oxygen objective (2002 CWA 303(d) List Staff Report, 2003 page 4-78).

2.3.2 Assessment of Current Water Quality Data

Staff has evaluated data from various sources including those listed below.

- Regional Board funded contracts, University of California, Santa Barbara Study
- Ojai Valley Sanitation District receiving water monitoring
- Santa Barbara Channel Keeper (SBCK), Ventura Stream Team
- Ventura County Watershed Protection MS4 monitoring
- Southern California Stormwater Monitoring Coalition (SMC)
- Regional Board Surface Water Ambient Monitoring Program (SWAMP)

<u>Dissolved Oxygen</u>

The photosynthetic and respiration activities of algae can drive significant changes in DO concentrations over a 24-hour period. In fact, when algae are abundant they can act as the most significant influence on the magnitude of diurnal oscillations in dissolved oxygen concentrations (Wetzel, 2001). Considering algal respiration and photosynthesis separate from other factors (e.g. water turbulence, water depth, and temperature), nighttime respiration reduces dissolved oxygen until the daytime activity of photosynthesis reverses the process and produces oxygen. However, other physical factors including temperature, turbulence, and water depth also work to incorporate oxygen from the atmosphere into the water. These physical processes mediate declining nighttime oxygen concentrations.
The graph below (Figure 2-3) summarizes the pre-dawn dissolved oxygen measurement made by the SBCK during the growing season from 2008 through 2011. The pre-dawn measurements of dissolved oxygen are not the exact minimum oxygen concentration in the

river because of physical factors also influencing the amount of oxygen in the river. However, the pre-dawn measurements provide a very reasonable estimate of the minimum dissolved oxygen observed during a 24-hour period. Two noteworthy elements of this figure are that 1) sites in the upper watershed (Matilija above the dam and North Fork Matilija) express pre-dawn DO concentrations below the 7 mg/L water quality objective less frequently than sites in the middle and lower parts of the watershed and 2) all sites demonstrate interannual variability most likely related to the magnitude of algal growth and flow conditions.

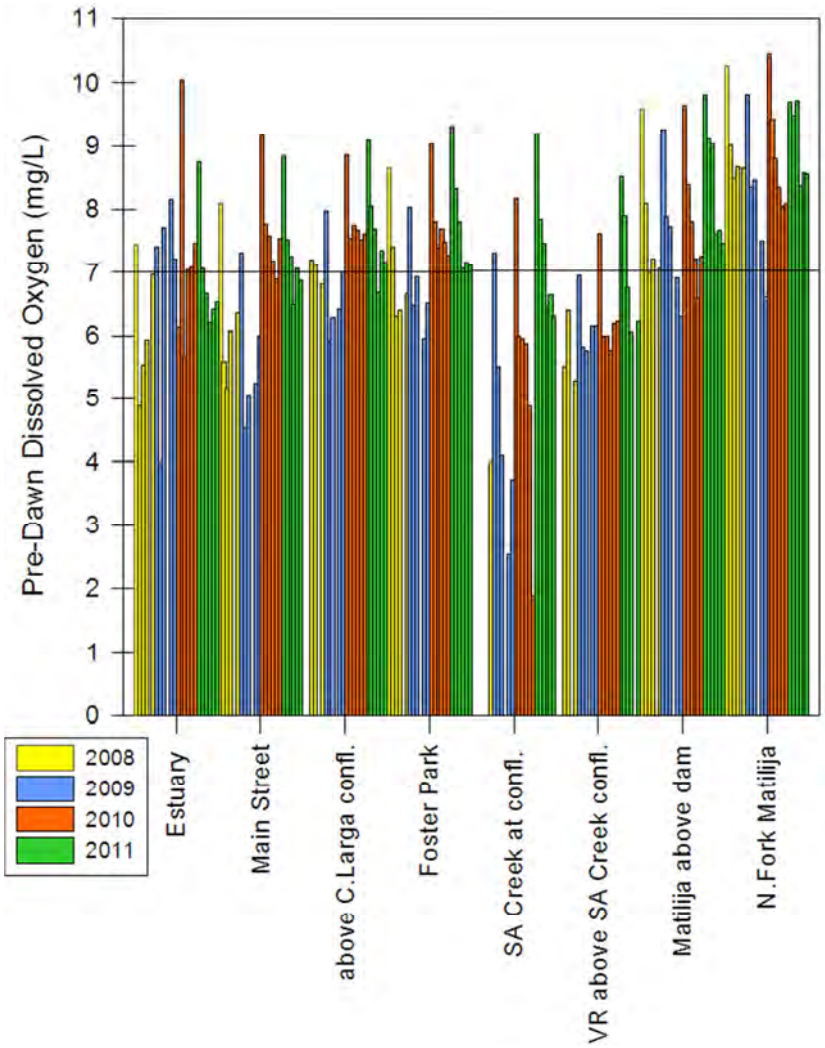


Figure 2-3 Pre-dawn dissolved oxygen measurements during the growing season, 2008 through 2011

Figures 2-4 – 2-10 present the difference between pre-dawn and afternoon DO measurements at strategic locations in the watershed. These figures show more clearly the influence of algal biomass on daily dissolved oxygen concentrations. The pre-dawn measurements represent the daily minimum concentration when nighttime respiration processes have reduced oxygen concentrations. The afternoon measurement captures the daily maximum concentration when photosynthesis leads to super saturated conditions.

The most dramatic oxygen depletion events occurred on San Antonio Creek in the late summer months (Figure 2-7). It is likely that low flow conditions contributed to the depleted oxygen condition. The minimum stream oxygen concentration is proportional to the amount of algal biomass present in the river – greater amount of algal biomass, the greater amount of oxygen removed during nighttime respiration. However, it is also inversely proportional to the amount of flow – a greater flow mitigates the impact of algal respiration on DO because it is more difficult and requires larger amounts of algae to effect large volumes of flowing water. The flow in San Antonio Creek at the confluence of Ventura River typically decreases to approximately 1 cfs by late summer (SBCK flow data).

A less extreme example was observed in the upper watershed at Matilija Creek (Figure 2-9); the lowest DO measurement was consistently observed in late summer when flows were at the lowest (~ 1 – 3 cfs). In contrast to the upper watershed and tributary areas, the lower watershed sites (Main Street and estuary) expressed low DO concentrations earlier in the summer aligned with maximum algal biomass growth. Extreme low flow conditions were prevented by discharge from the Ojai Valley WWTP (Figure 2-4 and 2-5).

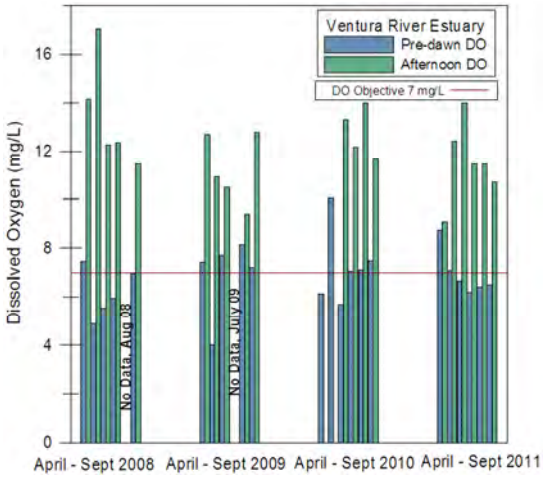


Figure 2-4 Estuary DO Measurements

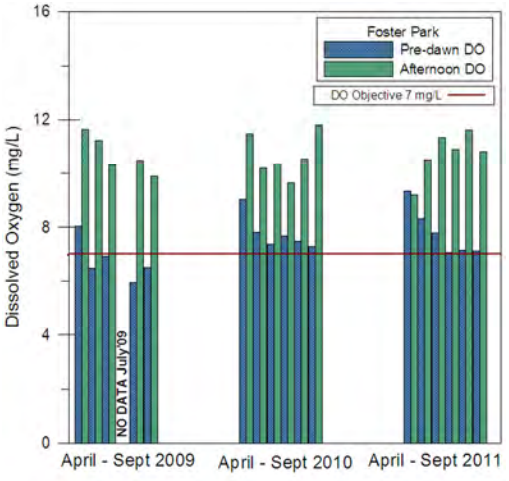


Figure 2-6 Foster Park DO Measurements

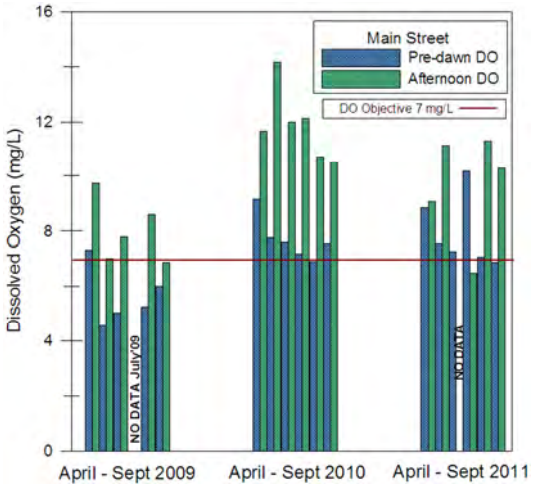


Figure 2-5 Main Street DO Measurements

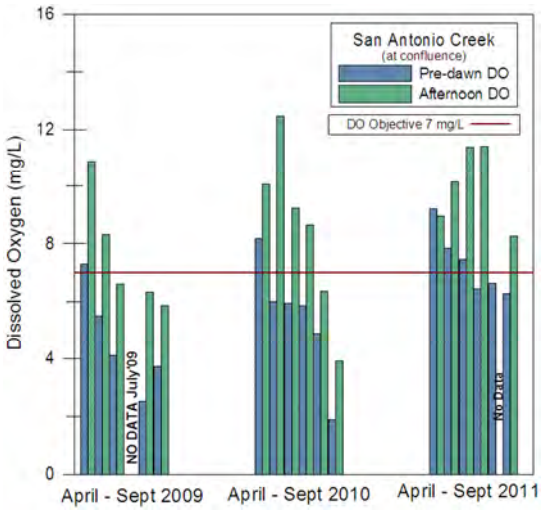


Figure 2-7 San Antonio Creek DO Measurements

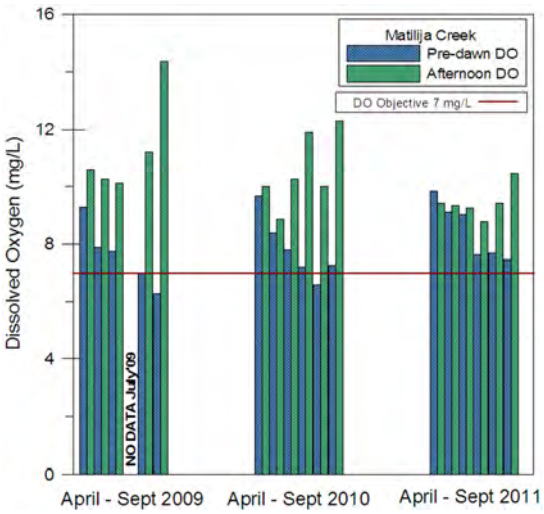


Figure 2-9 Matilija Creek DO Measurements

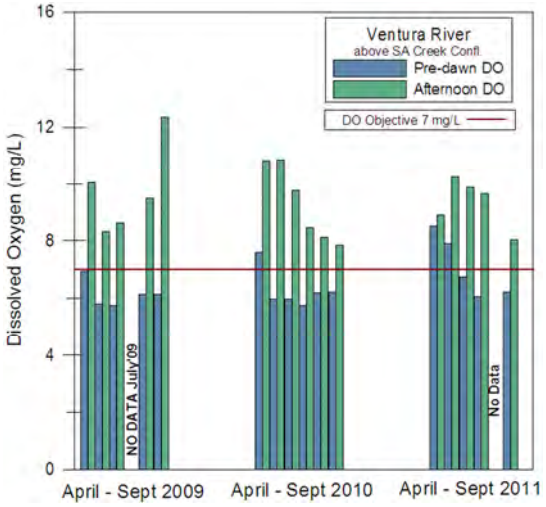


Figure 2-8 Ventura River above San Antonio Creek A Creek DO Measurements

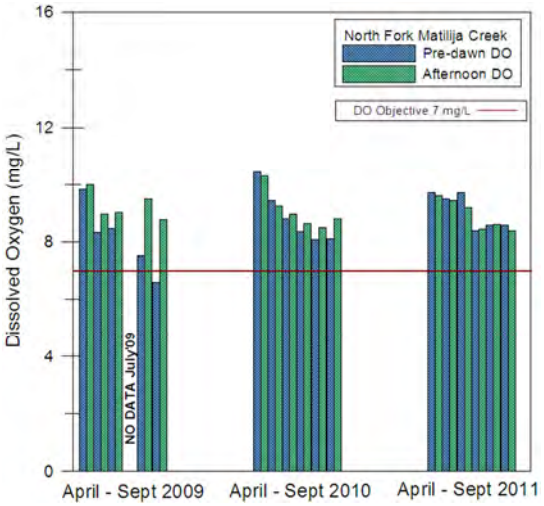


Figure 2-8 North Fork Matilija Creek DO Measurements

As can been seen from these graphs and the data in Appendix A, DO concentrations below the water quality objectives are repeatedly observed during the summer months. The SBCK pre-dawn DO data was assessed in accordance with the SWRCB *Policy for Developing California's Clean Water Act Section 303 (d) List* to evaluate potential DO impairments. The following stream locations were identified as impaired.

- Ventura River Estuary
- Ventura River at Main Street
- Ventura River above Cañada Larga confluence
- Ventura River at Foster Park
- Ventura River above San Antonio Creek confluence
- San Antonio Creek at confluence with Ventura River
- Lower San Antonio Creek
- Upper San Antonio Creek
- Pirie Creek (tributary to San Antonio Creek)

The DO objective of 7 mg/L was applied in this assessment to be protective of the COLD and SPWN beneficial uses. This objective was also applied to estuary because the estuary is designated with both SPWN and MIGR beneficial uses and endangered Southern California steelhead trout are present in this watershed.

Nutrients

The nutrient concentrations measured in-stream by SBCK demonstrate seasonal patterns with an expected amount of variability. Nitrogen, presented as nitrate - nitrogen in the figures below, generally peaks in the winter months as it is mobilized by winter storms and then begins to decline as it is taken up by algae and plants through the growing season. The sites Ventura River at Foster Park and Main Street (Figure 2-11 and 2-12) are a well-defined examples of this seasonal cycle; the variation in winter nitrogen peaks are related to the amount of rainfall in any given year and concentrations decline near zero during the prime growing season. A notable exception to this pattern is the increased nitrate concentration in San Antonio Creek in late spring and early summer 2001, 2005, and 2011. Based on the analysis presented in Nutrient Concentrations in the Ventura Watershed: 2008-2011 (Leydecker, March 2012), this nitrate increase is related to groundwater recharge with high nitrate waters in the upper San Antonio Creek drainage area.

Additionally, Ventura River at Shell Road and Ventura River above the Cañada Larga confluence exhibit a slightly different pattern. These sites are approximately 1.9 and 0.45 miles downstream of the Ojai Valley WWTP, respectively, and the in-stream nitrate concentrations reflect the continual nutrient inputs from the treatment plant. For example, seasonal peaks in concentration occur in late summer/early fall as discharge from the treatment plant increasingly dominates the flow in the river.

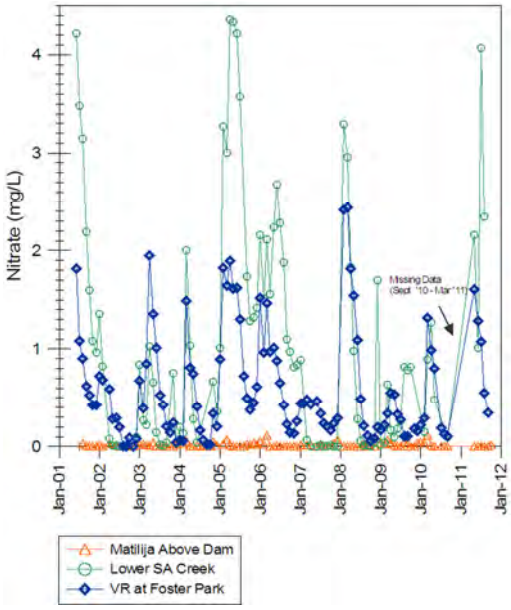


Figure 2-9 Nitrate Concentration Upper Watershed

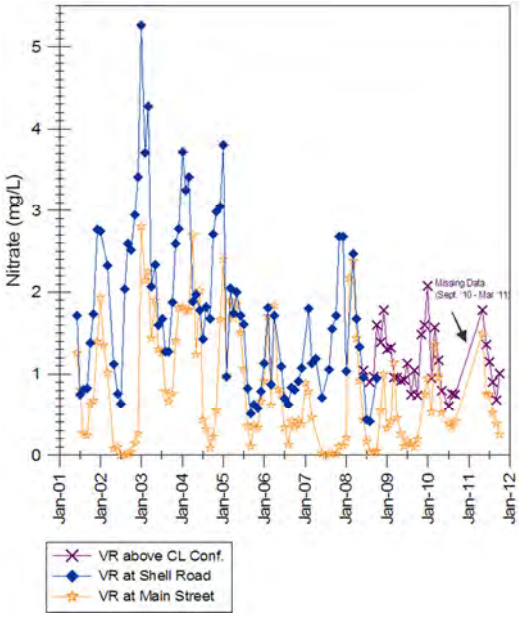


Figure 2-10 Nitrate Concentration lower watershed

Phosphate (dissolved) concentrations in the upper watershed (Matilija Creek) are generally measured as zero or nondetect with very slight increased concentrations (0.01 – 0.02) observed during the winter. The data from Ventura River at Foster Park show similar results albeit with slightly higher winter time increases (~0.01 – 0.03). Although, samples collected in November 2009 show a marked spike to approximately 0.1 mg/L phosphate. Phosphate concentrations measured below the treatment plant (Ventura River at Shell Road and above Cañada Larga confluence) exhibit increased dry season concentrations as the discharge accounts for the majority of flow. Phosphate measured at Main Street appears to follow the pattern of upstream measurements, but report slightly lower concentrations reflecting the biological uptake and processing between the sites.

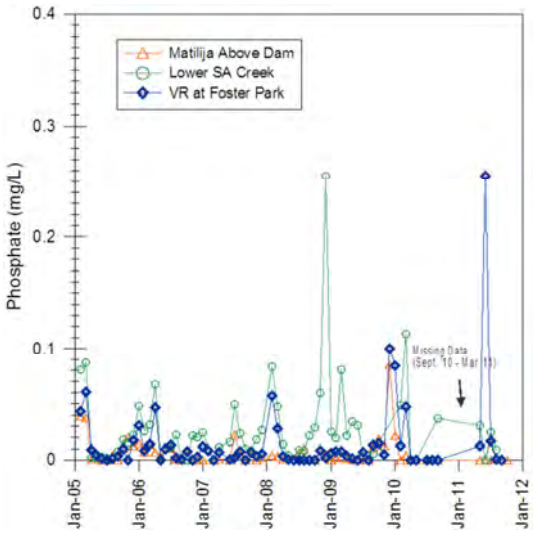


Figure 2-11 Phosphate Concentration Upper Watershed

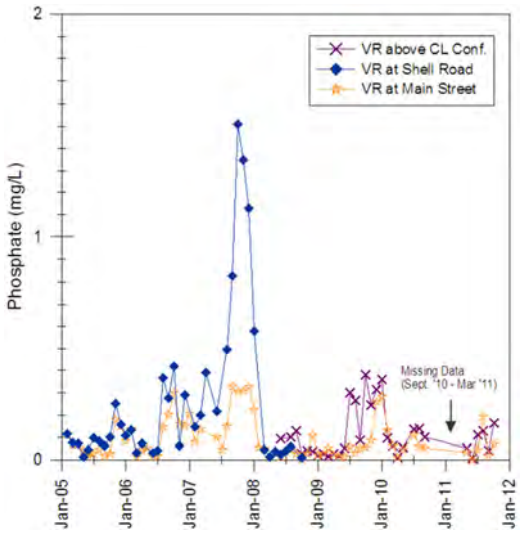


Figure 2-12 Phosphate Concentration Lower Watershed

As discussed above, in the late summer discharge from the WWTP dominates the flow in the lower portion of the watershed (Reaches 1 and 2). Thus, the in-stream nutrient concentrations largely reflect nutrients discharged from the plant. Over the years due to treatment upgrades and improved plant performance the amount of nitrogen discharged from the treatment plant has dramatically reduced. Figure 2-15, presents the effluent Total Inorganic Nitrogen (TIN) concentrations from treatment plant over time (Jan. 1979 – Dec 2011).

Through the mid-1990s, the plant operated with advanced secondary treatment including nitrification to oxidize ammonia, but not denitrification to reduce nitrate to nitrogen gas. Thus, the plant's discharge contained large amounts of nitrogen; the graph presents an average TIN effluent concentration of approximately 20 mg/L from the 1980s through the mid 1990s. In the summer of 1996 the Ojai Valley Sanitary District (OVSD) completed plant upgrades including denitrification and tertiary treatment, the result the improved treatment is clearly seen on the graph. The average effluent TIN concentration was reduced to 5 mg/L; a 75 percent reduction. Decreased in-stream nitrate concentrations also reflect improvements at the treatment plant (Figure 2-16). Prior to the upgrades in 1996 the average nitrate concentration approximately 1,000 yards downstream was 9.5 mg/L and after the upgrade the average in-stream concentration was 2.4 mg/L.

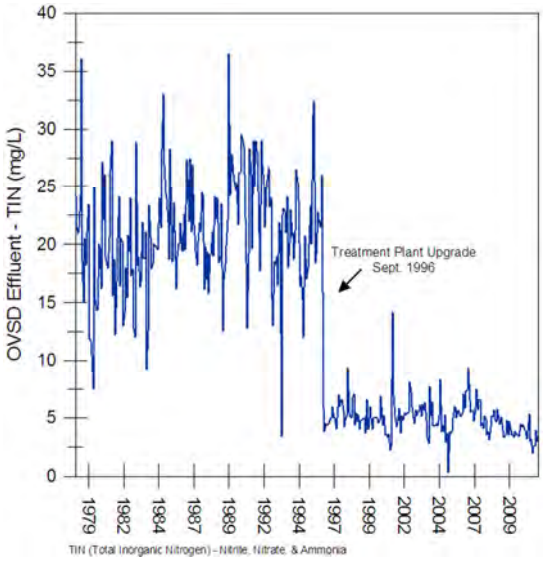


Figure 2-13 OVSD Effluent TIN Concentration 1979-2009

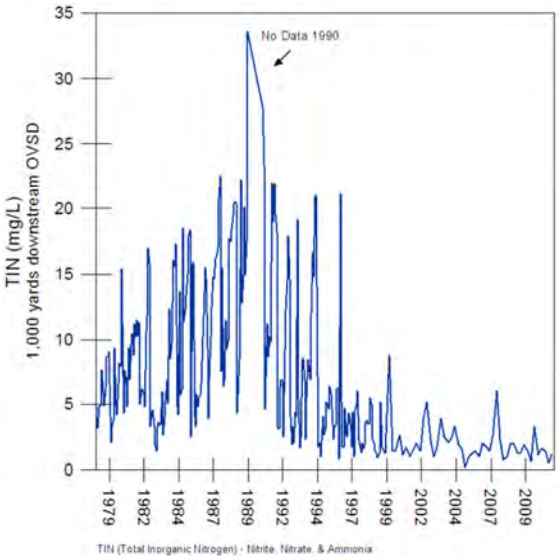


Figure 2-14 Ventura River TIN Concentration Downstream OVSD 1979-2009

Algal Biomass

Benthic and macroalgae (total algal biomass) can be found throughout the Ventura River watershed. In 2008 as part of a Regional Board contract the University of California, Santa Barbara measured algal biomass at targeted locations in the watershed. Sites were selected to provide a gradient of development and land use in the watershed. Each site was sampled twice, once in early summer (June 2008) and once in late summer (September 2008). Figure 2-17 below presents a watershed map and bar graphs of the total algal biomass

results. Algal biomass in the upper watershed was quite low over both months (<60 mg/m^2). In the middle portion of the watershed (approximately San Antonio Creek to Foster Park) there was a marked difference in biomass present in June versus September and concentrations were considerably greater as compared to the upper watershed sites. In June 2008 biomass measured in the middle watershed ranged from approximately 200 – 400 mg/m^2; by September biomass levels had declined and ranged from 90 – 150 mg/m^2. The highest algal biomass concentrations were reported in the lower watershed below the wastewater treatment plant. The maximum concentration was in the Ventura River at Main Street, 1037 mg/m^2 in June, and the minimum concentration observed (in the lower watershed) was 225 mg/m^2 at the Shell Road site in September 2008.

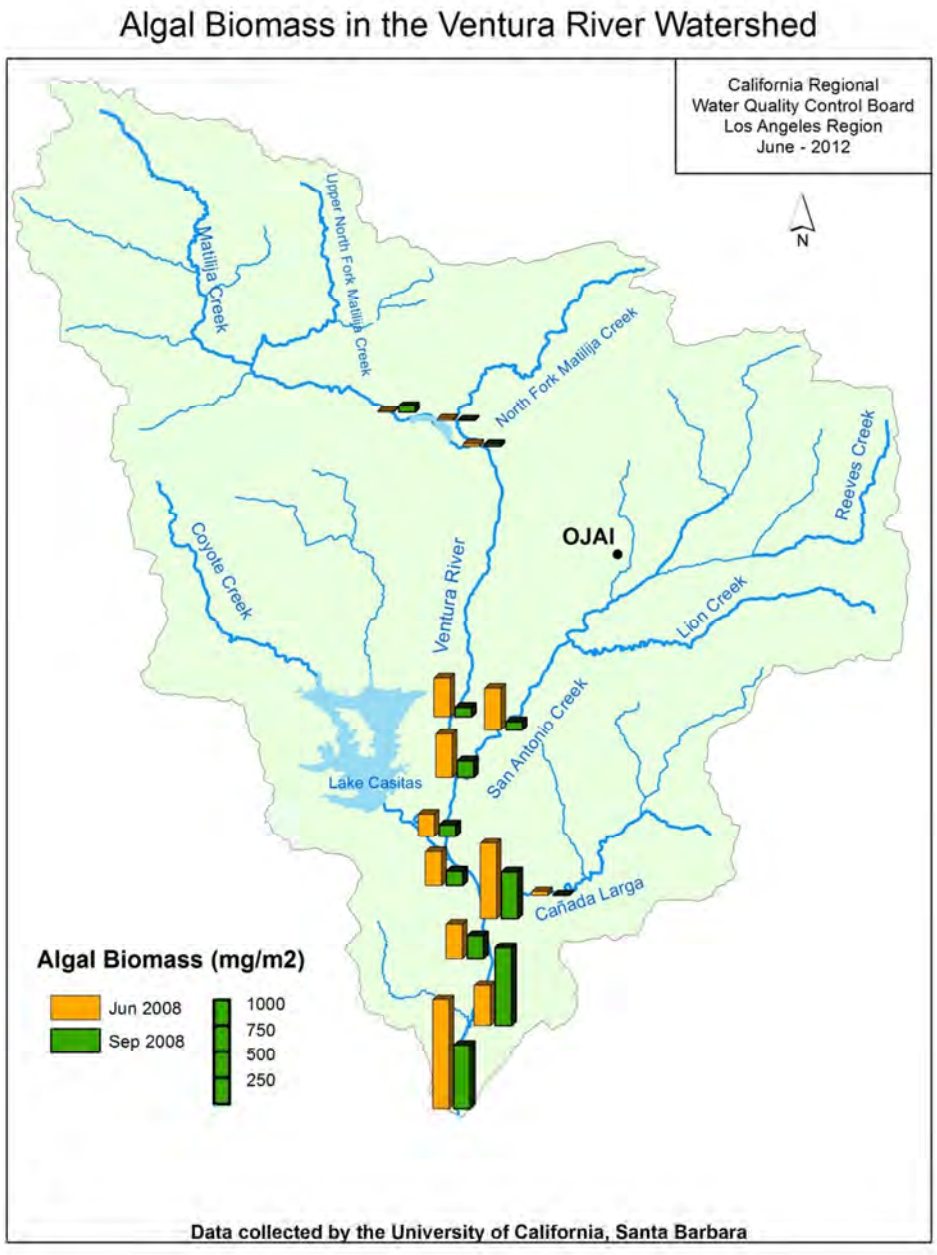


Figure 2-15 Algal Biomass Ventura River Watershed, 2008

In addition to the project conducted by UCSB, the Southern California Stormwater Monitoring Coalition (SMC) collected algal biomass data as part of the bioassessment monitoring required under the Ventura County MS4 permit. This monitoring program has a probabilistic design (i.e. random site selection and not the same sites every year) and only samples sites in spring to early summer because this timeframe coincides with the index period (spring to early summer) for benthic macroinvertebrates sampling. Since this algae data was collected as part of a larger monitoring program the results may not capture the seasonal maximum algal biomass. However, the results do provide useful information to assess conditions and investigate algal dynamics in the watershed.

Although there are results from multiple years presented on Figure 2-18 it is best to evaluate results from the same year at different locations because the interannual variation in algal biomass can be significant. In 2008 the SMC found small (<20.0 mg/m^2) amounts of algal biomass in Upper North Fork Matilija Creek and Ventura River Reach 4. In 2009 sites in North Fork Matilija and upper Reach 4 maintained low amounts of biomass; however, the site in San Antonio Creek had higher concentration (~ 50 mg/m^2) and lower Ventura River was found to be 112 mg/m^2. Matilija Creek and Ventura River near Foster Park had similar amounts of algal biomass as measured in 2010 and in 2011; the upper tributaries and San Antonio Creek had biomass concentrations from 25 – 100 mg/m^2. In summary, different amounts of algae grow in different watershed locations and different amounts of algae grow in different years.

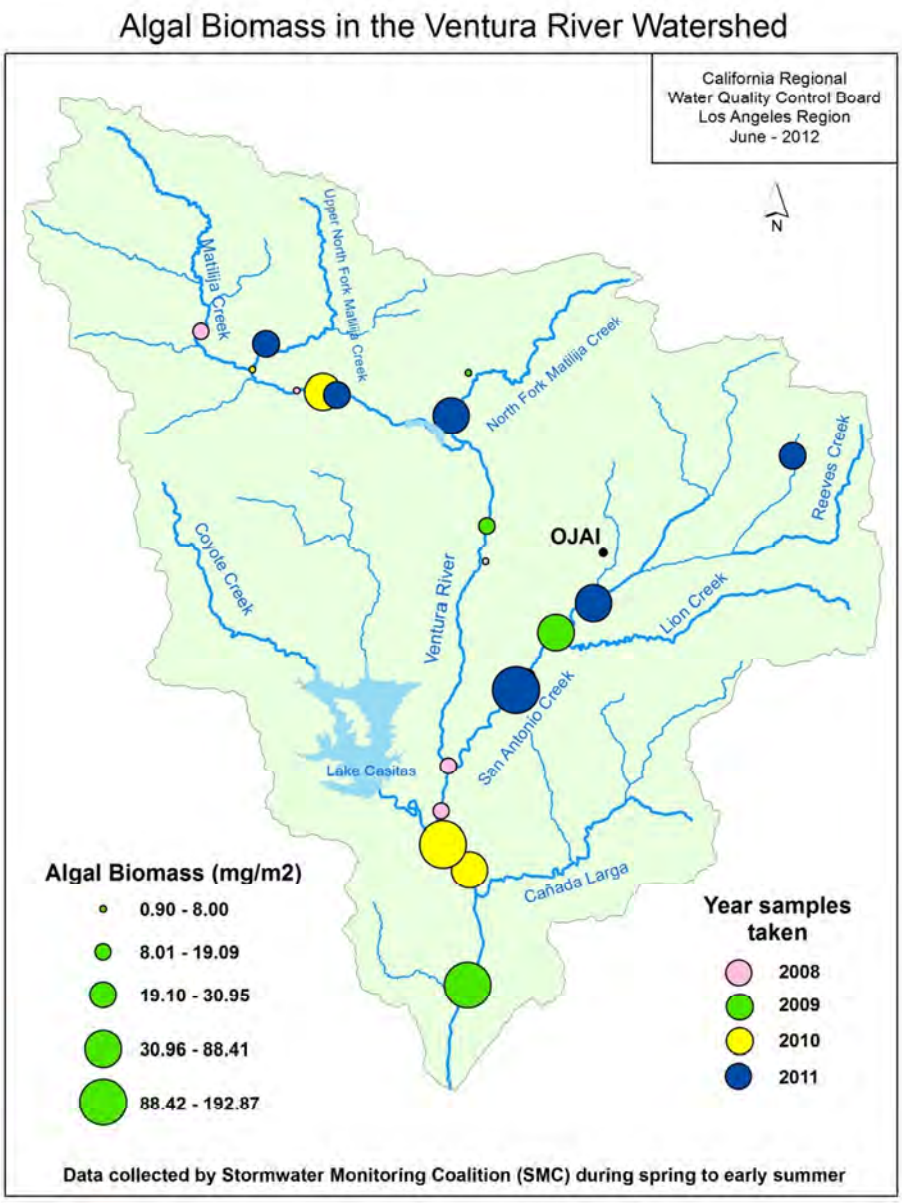


Figure 2-16 Algal Biomass Ventura River Watershed, 2008-2011

The interannual variation in algal biomass growth appears to be closely related to rainfall in the preceding year (Lydecker, 2003 and Lydecker et al., 2004). For example, large winter storms that scour the river removing plants, brush, and riparian cover change the river's physical habitat creating an open channel with available light and nutrients, which favors algae growth. The photographs below provide a dramatic example of the physical changes that can occur (photos provided by Al Lydecker). In 2004 the Ventura River at Main Street Bridge had a large amount of trees and plants established in the river channel and the open water portion of the channel was quite narrow. However, the very large winter storms of 2005 completely cleared the channel of vegetation and shifted the river's physical habitat to favor algal growth.

Figure 2-17 Main Street Bridge 2005

Overtime, during years with more typical rainfall or drought years the river channel is reclaimed by fast growing riparian trees (e.g. willows), shrubs, and various aquatic plants this once again narrows the channel, increases shading, and creates a habitat in which algae are less competitive. These changes can be observed moderately overtime, that is dramatic storm events are not the only observation of interannual variation on the river. The photos below document the succession of the channel from fairly open, favoring algal growth, to

being dominated by rooted aquatic plants (Ventura River at Main Street Bridge looking upstream) (photos from Al Lydecker, Watershed U handout 2010).

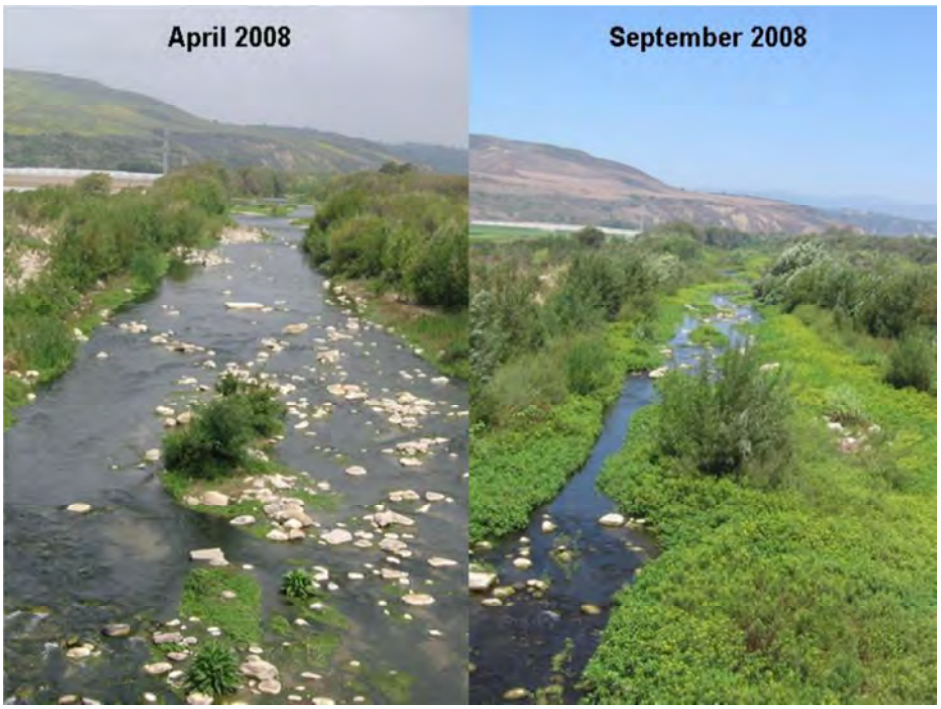


Figure 2-18 Main Street Bridge 2008

The interannual changes described above occur throughout the watershed; although not as dramatically as observed in the lower watershed. (Lydecker, 2010).

The physical changes that occur on the Ventura River due to the wet-winter dry-winter rainfall pattern impacts the ecology of the river and influences the amount algae observed from year to year (Lydecker, 2010). Because of the changing physical conditions and related cofactors it is important that the TMDL address nutrient loading to the river in addition to any watershed wide projects that may be designed to promote certain cofactors such as, increased riparian area and canopy cover.

Algal species composition is another line of evidence when evaluating stream nutrient conditions. Shifts in algal species composition can reflect changes in nutrient concentrations (US EPA, 2000b). The 2008 UCSB study evaluated algal species composition in the Ventura River Watershed (Figure 2-21). In the June sample set (Figure a) all sites were composed of *Cladophora* and diatoms; however, the upper watershed sites had considerably lower percentages of *Cladophora* and statistically significant higher amounts of diatoms (UCSB, 2009). By late summer (Figure b) diatoms and other marcoalgae genera had become more prominent that *Cladophora*. The summer time shifts in algal composition in the Ventura River have also been documented by the work of SBCK and regional expert Al Lydecker (Lydecker, 2008).

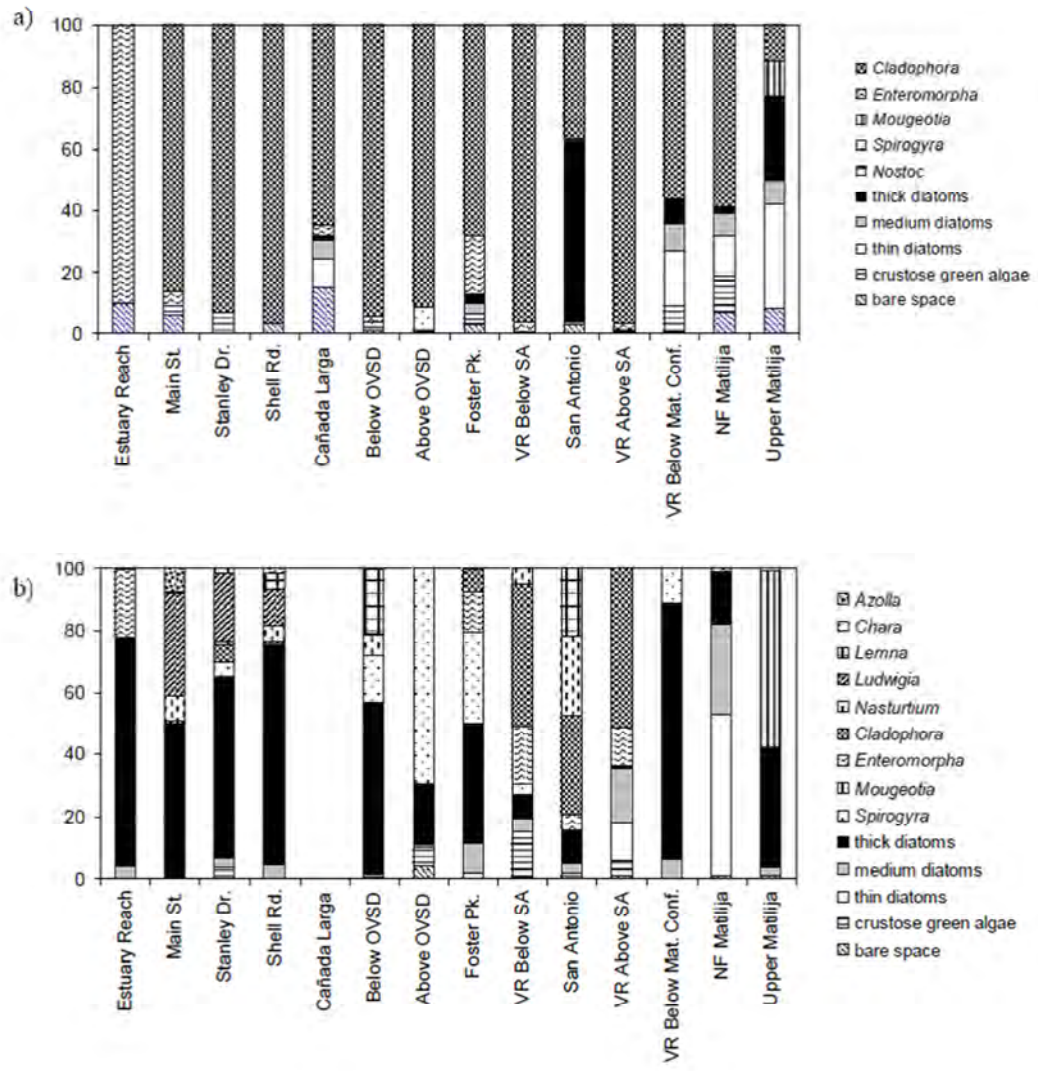


Figure 2-19 Percent Cover of Different Algal Types (UCSB, 2008)

2.4 Problem Statement

This data analysis demonstrates the water quality problems related to eutrophication and increased nutrient loading and documents the exceedance of the dissolved oxygen and biostimulatory substances water quality objectives during the dry season (May 1st to September 30th), when algae growth primarily occurs. The nutrient concentrations in the Ventura River and Estuary contribute to the excessive algal biomass growth, which in turn contributes to low DO conditions. The DO information presented documents repeated poor DO conditions during the dry season which contribute to multiple impacts on cold water fish, including decreased growth, increased stress, decreased reproductive success and increased juvenile and adult fish mortality. The changes in the river and estuary ecosystem

degrades cold water habitat leading to impaired aquatic life and recreation beneficial uses. This TMDL will address impairments causing the dry season (May 1st to September 30th) exceedance of the biostimulatory substances water quality objective in Ventura River, Estuary and tributaries (Table 2-2).

Table 2-2 Impairments addressed by this TMDL

Waterbody	Impairment
Ventura River Estuary	Algae, eutrophic conditions, and low DO
Ventura River Reach 1	Algae, low DO
Ventura River Reach 2	Algae, low DO
Cañada Larga	Low DO
Ventura River Reach 4	Low DO
San Antonio Creek	Nitrogen and low DO

While the nutrient concentrations present in the river during the winter months are sufficient to support algal growth, cofactors such as, flow and temperature exert greater influence on the river. Also, the typical seasonal succession of primary producers generally shifts in the winter to be dominated by aquatic plants (Al Lydecker, personal communication). The changes in cofactors and ecology minimize winter season algal growth. For example, the first significant rain event of the season will scour algae from the river and higher winter flows make it difficult for algae to recolonize. Additionally, cooler temperatures and reduced light further diminish winter season algal growth. The watershed nutrient wet-weather loads are generally delivered directly to the ocean and thus don't contribute to exceedance of the biostimulatory substances objective in the river or Estuary, which occurs during the dry season (May 1st to September 30th).

3. NUMERIC TARGETS

The section identifies numeric targets that can be used to assess attainment of water quality objectives and the protection of beneficial uses. Multiple numeric targets may be used when a single target is not sufficient to fully evaluate attainment of water quality standards and protect beneficial uses. For the pollutants addressed by this TMDL the numeric targets are expressed as algal biomass, macroalgal percent cover, phytoplankton biomass, dissolved oxygen, and pH (Table 3-1). The DO and pH numeric targets are set equal to the numeric water quality objectives contained in Chapter 3 of the Basin Plan and the numeric targets for algal and phytoplankton biomass and cover are established as a numeric interpretation the water quality condition that will demonstrate attainment of the water quality condition that will attain the narrative water quality objective for biostimulatory substances contained in Chapter 3 of the Basin Plan.

Table 3-1 TMDL Numeric Targets

Indicator	Numeric Target	Waterbody
Total Algal Biomass	150 mg/m^2 chlorophyll *a* as seasonal average	Ventura River and tributaries
Macroalgal Cover (attached & unattached)	$\leq$ 30 percent (seasonal average)	Ventura River and tributaries
Phytoplankton Biomass	20 µg/L chlorophyll *a* as seasonal average	Estuary (shallow subtidal area)
Macroalgal Cover	$\leq$ 15 percent (seasonal average)	Estuary (intertidal and shallow subtidal areas)
Dissolved Oxygen	$\geq$ 7 mg/L daily minimum	River, Tributaries and Estuary
pH	6.5 – 8.5 (instantaneous value)	River, Tributaries and Estuary
Biomass and percent cover indicator targets apply during the dry season when algae growth promarily occurs. The seasonal averaging period for algal biomass and percent cover is the dry season of May 1 to September 30. River indicators are averaged over a sampling reach as required by the SWAMP monitoring protocol Bioassessment SOP 02. Estuary macroalgal cover is measured using 3 transects and evaluating percent cover at 10 random points along each transect. Results are reported as a transect average. See methods used in the Bight '08 Estuarine Eutrophication Assessment (McLaughlin K et. al. Southern California Bight 2008 Regional Monitoring Program: Estuarine Eutrophication Assessment. Southern California Coastal Water Research Project. Costa Mesa, CA.		

The approach for setting the total algal biomass numeric target and establishing the TMDL is based on the California Nutrient Numeric Endpoints (NNE) framework (Tetra Tech 2006). The CA NNE, developed by USEPA Region 9 and the State and Regional Water Quality Control Boards, is a science-based approach to translate the narrative water quality objective for *Biostimulatory Substances* to numeric endpoints that can be applied in a TMDL or other regulatory program. The approach works to establish nutrient numeric endpoints based on an evaluation of site-specific risk to beneficial uses. The objective of the CA NNE is to control excess nutrient loads/concentrations to levels such that the risk or probability of impairing the beneficial uses is limited to an acceptably low level.

The NNE framework establishes a suite of biologically-based numeric thresholds (e.g. algal biomass) and links these thresholds to numeric nutrient endpoints (i.e. nutrient concentrations or loads) to address eutrophication. The linkage between the biological thresholds and numeric nutrient endpoints relies upon established load response relationships among nutrients, risk cofactors and biological response indicators and water quality models. The water quality models allow the derivation of site-specific nutrient allocations on the basis of site-specific conditions (i.e. most sensitive beneficial use, local characteristics of risk cofactors). This is presented in Sections 5 and 6, Linkage Analysis and Allocations.

The CA NNE is a scientifically sound approach because, except in extreme cases, increased nutrient concentrations do not directly impair beneficial uses. Rather, they cause indirect impacts by affecting biological response indicators like algal growth and low dissolved oxygen, which do directly impair beneficial uses (see conceptual models in Section 2). The indicators set as TMDL numeric targets provide a more direct measurement of beneficial use condition and whether beneficial uses are being fully supported in the waterbody. Additionally, the NNE framework provides multiple indicators (multiple TMDL numeric targets) in a weight of evidence approach, which provides a more robust means to assess beneficial uses.

For the total algal biomass indicator there is not definitive scientific consensus on the threshold that results in beneficial use impairment. This is because site-specific factors often play a significant role in determining the biological response to nutrient loading. To address this issue and provide for site-specific considerations the CA NNE includes a range of threshold values for biological indicators as presented in three Beneficial Use Risk Categories (BURC) (Tetra Tech, 2006). The categories are described below.

- BURC I: beneficial uses are attained and achieves narrative objective
- BURC II: may require an impairment assessment and site-specific nutrient endpoints
- BURC III: beneficial uses impaired and exceeds narrative objective

The BURC I/II boundary is the threshold below which there is general consensus that nutrients will not present a significant risk of beneficial use impairment. The BURC II/III boundary represents a value that is sufficiently high that there is consensus that the risk of beneficial use impairment by nutrients is likely above that threshold. Within BURC II, additional water body-specific cofactors should be considered as part of the analysis to determine an appropriate target.

Table 3-2 CA NNE Beneficial Use Risk Categories

Response Indicator	Risk – Category Boundary	Beneficial Use						
		COLD	WARM	REC 1	REC2	MUN	SPWN	MIGR
Benthic Algal Biomass in streams (mg chl-a/m2) -Maximum	I / II	100	150	C	C	100	100	B
	II / III	150	200	C	C	150	150	B
B – additional research is need to quantify linkage C – addressed by aquatic life criteria								

Regional Board staff used various lines of evidence to develop a numeric target for this TMDL. The California Nutrient Numeric Endpoints sets a benthic algal biomass target for the boundary between Beneficial Use Risk Category II and III for streams with a cold water aquatic habitat use (COLD) at 150 mg chlorophyll-a/m2, interpreted as a maximum biomass in time averaged over a reach (i.e., it does not apply to single point measurements). The NNE boundary target is based on a review of both regional and international studies. The US EPA compiled results of research and expert recommendations and found general agreement that algal biomass greater than 150 mg/m2 indicates nuisance conditions and water quality degradation in streams (US EPA, 2000b). This value is expected to protect the aquatic life and recreation beneficial uses.

The CA NNE provides for the evaluation of other lines of evidence to ensure the applicability of the boundary condition. Regional Board staff considered the 2008 diurnal oxygen impacts on reaches of the Ventura River where high amounts benthic algal biomass were observed and the well-established fact that the frequent low DO conditions present stressful conditions for resident (adult and juvenile) and migrating fish. An algal biomass target of 150 mg/m2 is expected to minimize the risk of low DO events in the river and fully protect the aquatic life beneficial use (Welch and Jacoby, 2004).

The other biological indicators (macroalgal cover and phytoplankton biomass) are established as additional measures to track the symptoms of eutrophication and water quality improvements. These targets are based on the review of available data and scientific literature. The numeric target for attached and unattached macroalgal percent cover in the river is $\leq$ 30 percent. This value is based on recommendations from Biggs (2000); the guidelines presented in this document were developed to help protect streams from excessive nutrient loading.

The estuary phytoplankton biomass target of 20 µg/L is based on the Assessment of Estuarine Trophic Status (ASSETS), developed by the National Oceanic Atmospheric Administration (NOAA) National Estuarine Eutrophication Assessment (NEAA) (Bricker, 2003). The eutrophication indicators in the ASSETS framework were set to ensure accurate characterization of water quality conditions and the response ranges were selected to categorize and rank estuaries based on water quality ranges. Chlorophyll *a* is used a primary indicator for eutrophic condition. The values within the condition ranges were developed from data across the US and discussions with regional experts. The target of 20 µg/L is the maximum value within the medium condition water quality range.

For the macroalgal percent cover numeric target in the estuary, staff relied upon the classification framework presented in Scanlan (2007). The percent cover boundaries were set based on information from the UK Department of the Environment, Transport and the Regions 2001 expert workshop. The Scanlan study was not specific to estuaries in Mediterranean climates; however, a study conducted in coastal lagoons in Italy (Bona, 2006) corroborates the thresholds in Scanlan (2007) and demonstrates that these thresholds are reasonable for Mediterranean climates. The numeric target for percent cover algal biomass is set at $\leq$ 15 percent; this target equates to good water quality at moderate amounts of biomass. Both of these estuarine water quality assessment frameworks

(ASSETS and Scanlan) were also used by the Southern California Bight 2008 Regional Monitoring Program coordinated by the Southern California Coastal Water Research Project (SCCWRP) to evaluate estuarine eutrophication.

The numeric target for dissolved oxygen of 7 mg/L is set equal to the Basin Plan objective for all waters in the Ventura River Watershed designated COLD and SPWN. This target is also applied to the estuary, which is designated SPWN and MIGR because this watershed supports a Southern California steelhead trout cold water fishery.

Other Regional Boards in California have adopted algae and nutrient TMDLs for streams and estuaries which relied upon narrative water quality objectives and scientific literature and/or the CA NNE to translate the objective into TMDL numeric targets and allocations. Table 3-3 lists Regions and TMDLs in which this was done and the response indicator targets.

Table 3-3 Stream Nutrient TMDLs in Other Regions Where the Biostimulatory Substances Narrative Water Quality Objective were Applied

Region	TMDL		Indicator		
			Algal Biomass (mg/m^2)	Percent Cover	DO (mg/L)
1	Klamath River (2010)		150 (growing season average)	none	Reach specific monthly minimum 85 % saturation (winter) 90 % saturation (summer)
3	Chorro Creek (2006)		150*	algal cover ≤ 40%	≥ 7 (daily minimum)
4	Malibu Creek (2003)	Creek	150	algal cover ≤ 30% for floating algae and ≤ 60% for bottom algae	≥ 7 (daily average)
		Lagoon	150	algal cover ≤ 30% for floating algae and ≤ 60% for bottom algae	≥ 7 (daily average)

*The TMDL discusses the threshold of 150 mg/m^2 algal biomass as a level that represents nuisance conditions; however, it was not assigned as a TMDL numeric target.

4. SOURCE ASSESSMENT

This section identifies the potential sources of nutrients in the Ventura River watershed. In the context of TMDLs, pollutant sources are classified as either point sources or nonpoint sources. Nonpoint sources originate from land runoff, precipitation, atmospheric deposition, drainage, seepage or hydrologic modification. The term "nonpoint source" is defined to mean any source of water pollution that does not meet the legal definition of "point source" in section 502(14) of the Clean Water Act. A point source as defined in the Clean Water Act means any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. Point sources as defined in the Clean Water Act include discharges from wastewater treatment plants and industrial and municipal storm drain outfalls, but do not include agricultural storm water discharges and return flows from irrigated agriculture.

The data review in this section focuses on identifying potential sources and providing nutrient loading estimates using available methods and data. The major categories of nutrient sources in the Ventura River watershed are:

Point Sources

- Stormwater and dry weather runoff from storm drains
- Ojai Valley WWTP discharge

Nonpoint Sources

- Runoff from horse and cattle facilities
- Runoff from agricultural areas
- Runoff from undeveloped natural areas
- Onsite wastewater treatment systems (i.e., septic tanks)
- Groundwater discharge
- Atmospheric deposition

For the purposes of the source assessment, the Ventura River watershed was divided into seven subwatersheds based on a GIS layer from VCWPD (Figure 4-1). These subwatersheds are the Upper Watershed, Ventura River Reach 4, Ventura River Reach 3, the Lower Watershed, San Antonio Creek, Cañada Larga, and Other (Coyote Creek above Casitas Dam).

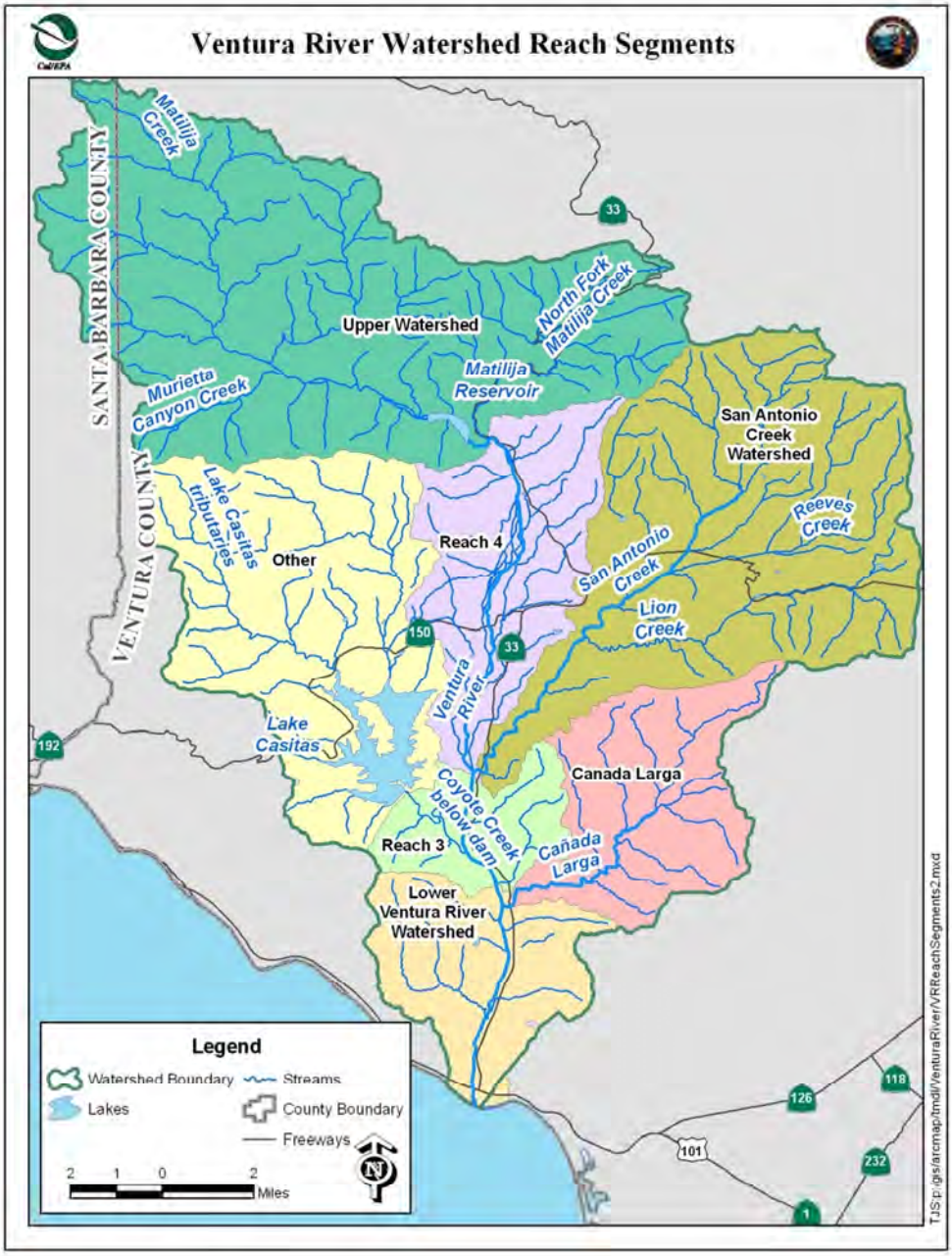


Figure 4-1 Ventura River Subwatershed

Most water in Lake Casitas goes to consumptive uses or evaporation and is rarely released below the dam (Tetra Tech, 2012). According to Casitas Municipal Water District staff, water is only released from the dam when it overflows. While there are valves at the base of the dam which can be opened in anticipation of high flows, those valves have never been opened and bottom waters are not discharged. The dam was built in 1958 and did not fill until 1978, when it spilled over. The last time water spilled over the Dam was in 1998 (an El Niño year). Thus, water is only released from the dam during very high flows and is released from the top of the reservoir. Therefore, the subwatershed draining to Lake

Casitas is not considered a potential source of nutrients to the Ventura River for the purposes of this source assessment. Land that drains to Coyote Creek downstream of the dam is considered a source and is included in this source assessment as part of the Reach 3 subwatershed.

Land use data (Table 4-1) were obtained from Southern California Association of Governments (SCAG, 2005). The 2005 dataset was used because the 2008 SCAG dataset is based on parcels and can leave out roads, which are considered in this source assessment. In addition, it should be noted that the total area for the 2005 SCAG land use data does not match the total area of the watershed based on the watershed delineation in the GIS maps provided by VCWPD. However, the discrepancy in area is due to differences in the area of open space, which has a negligible effect on the source assessment. The land uses in Table 4-1 were aggregated into 17 categories corresponding to high density residential, low density residential, commercial, industrial, public facilities, education, transportation, mixed urban, open, water, recreation, cropland/improved pasture, orchards/vineyards, nurseries, dairy/intensive livestock, other agriculture, and horse ranches land uses. The acreages of various land uses were further grouped based on similar nutrient loading patterns for the purposes of this source assessment.

Table 4-1 Drainage Areas (acres) for Various Land Uses in the Ventura River Watershed

Land Use	Upper Water-shed	Reach 4	Reach 3	Lower Water-shed	San Antonio Creek	Cañada Larga	Coyote Creek	Total for Water-shed
High Density Residential	0	1256	28.8	611	680	33.2	0	2610
Low Density Residential	110	1548	154	20.9	2160	33.3	24.4	4051
Commercial	0	83	0	207	153	1.69	0	445
Industrial	12.6	6.53	25.3	2766	163	5.08	0	2978
Public Facilities	0	97.1	275	53.6	80.7	127	112	746
Education	0	99.3	0.05	52.9	227	0.04	0	379
Transportation	0	7.58	44.3	185	6.38	8.40	0	251
Mixed Urban	0	0	0	6.30	7.62	0	0	13.92
Open	40,838	8990	4865	5950	24,829	11,721	21,827	119,018
Water	30.1	10.99	0	6.56	25.52	0	2596	2669
Recreation	34.4	45.0	28.7	84.1	408	0	134	735
Cropland/ Improved Pasture	0	487	171	133	695	335	0	1821
Orchards/ Vineyards	3.41	1027	101	214	3009	21.9	25.5	4401
Nurseries	0	0	0	4.33	12.3	0	0	16.7
Dairy/Intensive Livestock	0	3.93	0	0	0	0	0	3.93
Other Agriculture	4.93	19.7	5.98	12.7	82.0	7.65	9.21	142
Horse Ranches	9.41	107	9.12	0	207	18.8	5.53	357
Total for all land uses	41,043	13,787	5709	10,307	32,745	12,312	24,734	140,638

4.1 Point Sources

The NPDES permits for stormwater and dry weather urban runoff discharges in the Ventura River watershed are the Ventura County municipal separate storm sewer system (MS4) permit (R4-2010-0108), the statewide California Department of Transportation (Caltrans) MS4 permit (99-06-DWQ), the statewide general industrial stormwater permit (97-03-DWQ), and the statewide general construction stormwater permit (2009-0009-DWQ).

The NPDES permits for wastewater and industrial discharges in the Ventura River watershed are for the Ojai Valley WWTP (R4-2008-0039) and four general NPDES permits for Foster Park Well Field (R4-2003-0108), Development and Startup Project Well

#2 Aquifer Testing (R4-2003-0108), San Antonio Filter Plant (R4-2009-0047), and Golden State Water Company Ojai-Mutual Plant (R4-2003-0108) (Table 4-2).

Table 4-2 Summary of NPDES Permits in the Ventura River Watershed

Type of NPDES Permit	Total Permits
Ventura County MS4	1
Caltrans MS4	1
General Industrial Stormwater	28
General Construction Stormwater	14
Ojai Valley WWTP (Major)	1
General NPDES Permits	4
Total	50

This source assessment quantifies the point source loadings from stormwater and dry weather urban runoff sources and the Ojai Valley WWTP. The loadings from the general NPDES permits are not quantified in this source assessment. General Permit No. R4-2003-0108 is for discharges of groundwater from potable water supply wells to surface waters, including groundwater generated during well purging for data collection purposes, extracted from major well-rehabilitation and redevelopment activities, and generated from well drilling, construction, and development. General Permit No. R4-2009-0047 is issued to the San Antonio Filter Plant for the discharge of filter backwash water, redevelopment and start-up wastewater to San Antonio Creek. The discharges from the general NPDES permits are intermittent and considered negligible for the purposes of this source assessment.

4.1.1 Nutrient Loading from Stormwater and Dry Weather Urban Runoff Sources

Runoff from residential, industrial, commercial, and transportation areas is a significant source of nutrients to the Ventura River. The potential sources of nutrients from urban areas include fertilizer used for lawns and landscaping; organic debris from gardens, landscaping, and parks; trash such as food wastes; and domestic waste. Potential sources of nutrients from highways and transportation land uses include fallen leaves and other vegetation, vehicle exhaust, and atmospheric deposition. Nutrients build up, particularly on impervious surfaces, and are discharged into the receiving waters through storm drains when it rains or by dry weather runoff.

4.1.1.1 Wet-weather loading from Stormwater Sources

A Simple Method developed by Schueler (1987) was applied to estimate nutrient loads from urban stormwater runoff on annual basis to the Ventura River and its tributaries. This

method was based on a relationship between rainfall and stormwater runoff volume with an associated nutrient concentration.

Load (L) = P×Pj×R×C×A×0.226 **Equation (1)**

Where:
L: Annual wet-weather pollutant load (lb/year)
P: Annual rainfall depth (inches/year)
Pj: Factor that corrects P for storms that produce no runoff, use Pj = 0.9
R: Runoff coefficient for land use type (unitless)
C: Pollutant concentration in runoff (mg/L)
A: Drainage area (acres)
0.226 = unit conversion factor (L-lb/acre-inch-mg)

The annual rainfall data (Table 4-3) over a 20-water year period from 1987 through 2007 was obtained from "Data Summary Report – Ventura River Watershed Hydrology Model" prepared by Tetra Tech (2008). The average rainfall value for a rain gauge in each subwatershed was assigned to that subwatershed and used to estimate stormwater runoff volumes.

Table 4-3 Summary of annual rainfall data in the Ventura River Watershed from 1987 through 2007 (Tetra Tech, 2008)

Subwatershed	Rain Gauge Station	Average Annual Rainfall (inches/year)
Upper Watershed	Matilija Canyon (D207)	36.0
Reach 4	Meiners Oaks – County Fire Station	23.9
Reach 3	Ventura – Kingston Reservoir	20.7
Lower Watershed	Ventura – Downtown (Courthouse)	16.9
San Antonio Creek	Ojai – County Fire Station	22.3
Cañada Larga	Oak View - County Fire Station	22.9

In order to calculate nutrient loading from stormwater runoff, the following land use categories, based on Table 4-1, were assumed:

- Residential = High Density Residential + Low Density Residential
- Other Urban = Public Facilities + Education + Mixed Urban
- Commercial = Commercial
- Industrial = Industrial
- Transportation = Transportation

Runoff coefficients for several land uses (Table 4-4) were based on values reported by Ackerman and Schiff (2003). Staff compared the runoff coefficients from Ackerman and Schiff with runoff coefficients calculated by Larry Walker and Associates using the 2006 VCWPD Hydrology Manual (LWA, 2011). The runoff coefficients calculated by LWA were derived assuming a certain percent impervious land cover for each land use type. The runoff coefficient is also a function of soil type and rainfall intensity, but using land use and percent imperviousness to provide a rough estimate of runoff coefficients is appropriate. The runoff coefficients reported by Ackerman and Schiff and those calculated by LWA are very similar and make little difference in the calculation of loadings. This source assessment uses the Ackerman and Schiff runoff coefficients for residential, commercial, industrial, other urban, and transportation land uses. The residential runoff coefficient was used to calculate loading from both high density and low density residential land uses. A runoff coefficient of 0.9 was applied to the transportation land use in the Ventura River watershed because of the high percentage of impervious surfaces associated with this land use.

Table 4-4 Runoff coefficients for various land uses

Land Use	Runoff Coefficient
Residential	0.39
Other Urban	0.41
Commercial	0.61
Industrial	0.64
Transportation	0.9

The concentration of nutrients in stormwater runoff (Table 4-5) were obtained from stormwater event mean concentrations (EMCs) monitored by VCWPD from residential, commercial, and industrial land use sites throughout Ventura County (VCSQMD, 2001) and from outfall monitoring sites within the Ventura River watershed at Meiners Oaks and Ojai from 2010 and 2011 for the other urban land use category. EMCs represent the concentration of a pollutant contained in stormwater runoff over the length of a storm event. The EMCs of total nitrogen and total phosphorus measured from Caltrans statewide monitoring (Kayhanian et al., 2002) were applied to calculate nutrient loads from transportation.

Table 4-5 Nutrient EMCs for various land uses (VCSQMD, 2001; VCWPD, 2010 and 2011; and Kayhanian et al., 2002)

Land Use	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)
Residential	4.57	0.54
Other Urban	3.13	0.70
Commercial	1.91	0.24
Industrial	3.78	0.5
Transportation	3.0	0.3

The calculated annual nutrient loads from stormwater runoff for each subwatershed are shown in Table 4-6. The total nitrogen load to Ventura River and its tributaries from stormwater runoff is estimated to be 90,320 lb/year. The total phosphorus load is estimated to be 11,616 lb/year.

Table 4-6 Wet-weather TN and TP loading (lb/year) from stormwater discharges

Subwatershed	TN Load (lb/year)	TP Load (lb/year)
Upper Watershed	1663	200
Reach 4	26,168	3224
Reach 3	3622	580
Lower Watershed	29,912	3887
San Antonio Creek	27,472	3470
Cañada Larga	1483	255
Total Load	90,320	11,616

4.1.1.2 Dry-weather loading from urban runoff

Dry-weather runoff from activities such as irrigation, sidewalk washing, and car washing can pick up nutrients and flow into storm drains, which then discharge to receiving waters. Nutrient loading from dry weather urban runoff was calculated with the equation:

$$\mathbf{L = Q \times C \times A \times 6.24\times10^{-5}} \qquad \textbf{Equation (2)}$$

Where:
L: Daily dry-weather pollutant load (lb/day)
Q: Flow rate (foot^3/acre/day)
C: Pollutant concentration (mg/L)
A: Area (acres)
6.24×10^{-5} = unit conversion factor (lb-L/foot^3-mg)

The dry-weather flow rate for urban runoff was obtained from the VCSQMP Meiners Oaks and Ojai outfall monitoring stations (VCSWQMP, 2010). The reported flow rate for both of these stations from an event on March 17, 2010 was 0.5 cfs. This flow was multiplied by the percent urban land use that drained to each site (61% at Meiners Oaks and 49% at Ojai) in order to exclude flow contribution from other land uses. Then, the flow was divided by the area that drained to each site and the average of the two area-weighted flows was calculated. The resulting average area-weighted urban flow rate is 26.98 foot^3/acre/day.

The concentrations of total nitrogen and total phosphorus in dry weather urban runoff were obtained from the VCWPD Meiners Oaks and Ojai outfall monitoring stations for 2010 and 2011. The number of dry-weather days in the Ventura River Watershed was estimated to be 331 days based on data collected from Ventura River County Water District Gage 020 from 1987 to 2007. Multiplying the number of dry-weather days by the calculated daily nutrient load results in estimated annual dry-weather loads of 19,180 lb/year of TN and 243 lb/year of TP. See Table 4-7.

Table 4-7 Dry-weather TN and TP loading (lb/year) from dry-weather urban runoff

Subwatershed	TN Load (lb/year)	TP Load (lb/year)
Upper Watershed	205	1.91
Reach 4	5172	50.2
Reach 3	929	19.9
Lower Watershed	6712	109
San Antonio Creek	5805	55.8
Cañada Larga	357	5.45
Total Load	19,180	243

4.1.2 Nutrient Loading from Ojai Valley WWTP Discharge

The Ojai Valley WWTP has capacity of 3.0 MGD of tertiary-treated wastewater. The Ojai Valley Sanitary District serves 5,600 acres of watershed and the treatment plant provides wastewater collection services for an estimated population of 23,000 people in the city of Ojai and in the communities of Meiners Oaks, Mira Monte, Oak View, Casitas Springs, and Foster Park.

Based on data collected from 2000 through 2012, Ojai Valley WWTP discharged tertiary-treated wastewater through an outfall at an average rate of 2.1 MGD into Ventura River. The discharge outfall is located approximately 3,000 feet upstream of the confluence of the Ventura River with Cañada Larga. The effluent concentrations of total nitrogen ranged from 2.6 mg/L to 21.1 mg/L, with an average of 5.86 mg/L. Nitrate-N was the dominant nitrogen compound, with concentrations ranging from 1.6 mg/L to 14.1 mg/L, and an average of 4.71 mg/L. Nitrite-N was generally below the detection limit of 0.1 mg/L. Ammonia-N was generally below the detection limit of 0.2 mg/L. Organic-N concentrations ranged from 0.2 mg/L to 12.7 mg/L, with an average of 1.1 mg/L. The total phosphorus concentration ranged from 0.062 mg/L to 5.7 mg/L, with an average of 1.38 mg/L. Phosphate-P was the dominant phosphorus compound, with concentrations ranging from 0.07 mg/L to 3.8 mg/L, and an average of 1.2 mg/L. (OVSD, 2000-2012).

The nutrient loading to Ventura River from Ojai Valley WWTP was estimated by multiplying the average effluent flow with average total nutrient concentrations (Table 4-8). The average annual loads of TN and TP were 37,475 lb/yr and 8855 lb/yr, respectively.

Table 4-8 TN and TP loading from Ojai Valley WWTP (OVSD, 2000-2012)

	Average Effluent Flow (MGD)	Average TN (mg/L)	Average TP (mg/L)	Average TN Load (lb/day)	Average TP Load (lb/day)	Average TN Load (lb/year)	Average TP Load (lb/year)
Ojai Valley WWTP	2.1	5.86	1.38	103	24.3	37,475	8855

4.2 Nonpoint Sources

Nonpoint sources in the Ventura River watershed include inputs from agricultural lands, horses and livestock, onsite wastewater treatment systems, groundwater, undeveloped open space, wildlife, and atmospheric deposition. This section provides an overview of each source and presents data to characterize each source.

4.2.1 Nutrient Loading from Agricultural Lands

Phosphorus and nitrogen that are applied to agricultural lands as fertilizer can be washed into receiving waters due to irrigation or stormwater runoff. In addition, nutrients applied to the land can migrate to groundwater, which in areas of groundwater upwelling, can also be a source of nutrients to surface water. As of April 2011, there were 143 agricultural land owners representing 4066 irrigated acres in the Ventura River watershed enrolled in the Conditional Waiver for Discharges from Irrigated Lands (Agriculture Waiver) through the Ventura County Agricultural Irrigated Lands Group (VCAILG). According to the 2010 annual monitoring report, avocado and citrus orchards are the predominate crops in the Ventura River watershed (VCAILG, 2011).

4.2.1.1 Wet-Weather Nutrient Loading from Agriculture

Equation 1 and the annual rainfall data in Table 4-3 were used to estimate the wet-weather nutrient loading from agricultural lands. A runoff coefficient of 0.1 (Ackerman and Schiff, 2003) was applied to agricultural land uses (including cropland/improved pasture, orchards/vineyards, nurseries, and other agriculture) in the Ventura River watershed.

Nutrient concentrations in wet-weather agricultural runoff were obtained from 2007, 2008, 2009, and 2010 VCAILG annual monitoring reports (Table 4-9). Data for orchards were obtained from the two VCAILG monitoring sites in the Ventura River. Because there are no VCAILAG monitoring sites in the Ventura River watershed that collect runoff from cropland/improved pasture, nurseries, and other agriculture, data from these land uses were obtained from VCAILG's Central Ditch monitoring site in the nearby Santa Clara River Estuary subwatershed. Since total nitrogen and total phosphorus concentrations are not reported, the concentration of nitrate is assumed as the concentration for total nitrogen, and the concentration of phosphate is assumed as the concentration for total phosphorus. This is a reasonable assumption because these two elements are generally applied to agriculture facilities in the form of synthetic fertilizer which are dominated by the biologically available form of the nutrient.

Table 4-9 Concentrations of nutrients in wet-weather runoff for various agricultural land uses (VCAILG, 2008, 2009, 2010, 2011)

Land Use	Nitrate (mg/L)	Phosphate (mg/L)
Cropland/Improved Pasture	19.83	1.40
Orchards	1.84	0.16
Nurseries	19.83	1.40
Other Agriculture	19.83	1.40

From Equation (1), the annual wet-weather nitrogen load from agricultural lands to the Ventura River and its tributaries is estimated to be 21,390 lb/year (Table 4-10) and the phosphorus load is estimated to be 1572 lb/year (Table 4-11).

Table 4-10 Annual wet-weather nitrogen loading (lb/year) from agricultural land uses

Subwatershed	Cropland/Improved Pasture	Orchard	Nursery	Other Agriculture	Total Load
Upper Watershed	0	5	0	72	76
Reach 4	4691	918	0	190	5799
Reach 3	1432	78	0	50	1560
Lower Watershed	910	135	30	87	1161
San Antonio Creek	6251	2511	111	738	9611
Cañada Larga	3093	19	0	71	3182
Total Load	16,376	3666	140	1207	21,390

Table 4-11 Annual wet-weather phosphorus loading (lb/year) from agricultural land uses

Subwatershed	Cropland/Improved Pasture	Orchard	Nursery	Other Agriculture	Total Load
Upper Watershed	0	0	0	5	5
Reach 4	332	80	0	13	425
Reach 3	101	7	0	4	112
Lower Watershed	64	12	2	6	84
San Antonio Creek	442	218	8	52	720
Cañada Larga	219	2	0	5	225
Total Load	1158	319	10	85	1572

4.2.1.2 Dry-Weather Nutrient Loading from Agriculture

Equation 2 was used to calculate dry-weather nutrient loading from agriculture. A dry-weather runoff rate was obtained from the Ventura County Farm Bureau based on water demand by crop type and consensus values for percent runoff from water applied (Farm Bureau, 2010). The resulting runoff rate of 16.85 $feet^3$/acre/day was used for the calculation of nutrient loads from cropland/improved pasture, nurseries, and other agriculture. The runoff rate from orchards is zero because no dry weather runoff has been measured at the two VCAILG monitoring sites, which drain orchards, in the Ventura River watershed.

Nutrient concentrations in dry-weather agricultural runoff were obtained from 2007, 2008, 2009, and 2010 VCAILG annual monitoring reports. Concentrations for orchards are zero based on the two VCAILG monitoring sites in the Ventura River. Data for cropland/ improved pasture, nurseries, and other agriculture were obtained from VCAILG's Central Ditch monitoring site. Central Ditch drains a more intensely farmed drainage area than the Ventura River watershed and, in addition to surface water runoff, receives discharges from tile drains, which concentrate nutrient concentrations. The average concentrations of nitrate and phosphate in dry-weather runoff from these crop types are 15.4 mg/L and 0.06 mg/L, respectively. Since total nitrogen and total phosphorus concentrations are not reported, the concentration of nitrate is assumed as the concentration for total nitrogen, and the concentration of phosphate is assumed as the concentration for total phosphorus.

The estimated dry-weather nutrient loads from agricultural lands are summarized in Table 4-12 and 4-13. The number of dry-weather days in the Ventura River Watershed was estimated to be 331 days. The dry-weather loading of TN and TP to the Ventura River and its tributaries is 10,389 lb/year and 41.2 lb/year, respectively.

Table 4-12 Dry-weather nitrogen loading (lb/year) from agriculture land uses

Subwatershed	Cropland/Improved Pasture	Orchard	Nursery	Other Agriculture	Total Load
Upper Watershed	0.0	0	0	26.0	0.0
Reach 4	2565	0	0	104	2565
Reach 3	904	0	0	31.5	904
Lower Watershed	703	0	22.8	67.1	703
San Antonio Creek	3663	0	64.9	432	3663
Cañada Larga	1765	0	0	40.3	1765
Total Load	9600	0.0	88	701	10,389

Table 4-13 Dry-weather phosphorus loading (lb/year) from agriculture land uses

Subwatershed	Cropland/Improved Pasture	Orchard	Nursery	Other Agriculture	Total Load
Upper Watershed	0	0	0	0.1	0
Reach 4	10.2	0	0	0.4	10.2
Reach 3	3.6	0	0	0.1	3.6
Lower Watershed	2.8	0	0.1	0.3	2.8
San Antonio Creek	14.5	0	0.3	1.7	14.5
Cañada Larga	7.0	0	0	0.2	7.0
Total Load	38.0	0.0	0.3	2.8	41.2

4.2.2 Nutrient Loading from Horses/Livestock

Manure produced by horses, cattle, and other livestock in the Ventura River watershed is a significant source of nutrients. Manure can be washed into receiving waters during wet weather and can also migrate to groundwater, which can thence be discharged to surface water. Manure can also be discharged to receiving waters in dry weather due to poor manure management or grazing activities that disturb stream banks and riparian areas and cause erosion, which increases the discharge of sediment, animal waste, and nutrients to surface waters.

According to SCAG data, there are about 357 acres of horse ranches in the Ventura River watershed (Table 4-1). In addition, there are low-density residential properties within the watershed with horses on the properties. The low-density residential acreage is not accounted for in estimating the horse ranch acreage in the watershed. The actual area of horse-impacted land uses may be greater than 357 acres.

According to SCAG data, there are 3.93 acres of dairy/intensive livestock land use in the watershed (Table 4-1). Based on 2007 US Department of Agriculture (USDA) Census data, it was determined that there are approximately 1940 cattle in the Ventura River watershed (USDA, 2009). According to the Ventura County Resource Conservation District, each cow needs approximately 30 acres of land and most cattle operations in the Ventura River watershed are on leased land (Melvin, 2012). Thus, the SCAG area does not represent all of the cattle grazing activities in the watershed. Therefore, this source assessment considered the California Department of Conservation's Farmland Mapping Program to determine the area of cattle grazing in the Ventura River watershed. Spatial data of the area in Ventura County suitable for grazing was clipped to the Ventura River watershed using GIS. The grazing data were then overlain with SCAG data to exclude areas that were obviously not used for grazing, such as oil and gas exploration and areas slated for development. The resulting area suitable for grazing in the Ventura River watershed (excluding Coyote Creek) is about 34,000 acres and generally overlaps with SCAG open space land use classifications.

4.2.2.1 Wet-Weather Nutrient Loading from Horses/Livestock

Equation 1 and the annual rainfall data in Table 4-3 were used to estimate the wet-weather nutrient loading from horses/livestock. A runoff coefficient of 0.50 was assumed for

dairy/intensive livestock and horse ranch land uses. A runoff coefficient of 0.06 was applied for grazing areas because, for the purposes of this source assessment, it was assumed that all grazing activities occurred on open space land uses.

Nutrient concentrations in wet-weather runoff from dairy/intensive livestock and horse ranch land uses were obtained from a 2007 study on wet-weather runoff from horse paddocks (Airaksinen, 2007). Runoff was collected from several areas of two paddocks during three different sampling periods. The lowest numbers reported for the spring sampling period were selected for this source assessment: 18.3 mg/L total nitrogen and 3.4 mg/L total phosphorus.

Nutrient concentrations in wet-weather runoff from cattle grazing were obtained from the USDA Measured Annual Nutrient loads from Agricultural Environments (MANAGE) database, which includes measured nitrogen and phosphorus load data published in scientific peer-reviewed studies. The mean concentrations for rangeland/pasture from the MANAGE database are 4.85 mg/L total nitrogen and 0.69 mg/L total phosphorus.
From Equation 1, the wet-weather total nitrogen loads to Ventura River and its tributaries were estimated to be 175 lb/year from dairy/intensive livestock, 15,141 lb/year from horse ranches, and 39,009 lb/year from cattle grazing (Table 4-14). The total phosphorus loads were estimated to be 32 lb/year from dairy/intensive livestock, 2813 lb/year from horse ranches, and 5557 lb/year from cattle grazing (Table 4-15).

Table 4-14 Wet-weather nitrogen loading (lb/year) from horses/livestock

Subwatershed	Dairy/Intensive Livestock	Horse Ranches	Grazing
Upper Watershed	0	630	0
Reach 4	175	4759	2591
Reach 3	0	351	5783
Lower Watershed	0	0	4877
San Antonio Creek	0	8598	11,100
Cañada Larga	0	802	14,658
Total Load	175	15,141	39,009

Table 4-15 Wet-weather phosphorus loading (lb/year) from horses/livestock

Subwatershed	Dairy/Intensive Livestock	Horse Ranches	Grazing
Upper Watershed	0	117	0
Reach 4	32	884	369
Reach 3	0	65	824
Lower Watershed	0	0	695
San Antonio Creek	0	1597	1581
Cañada Larga	0	149	2088
Total Load	32	2813	5557

4.2.2.2 Dry-Weather Nutrient Load from Horses/Livestock

Dry-weather nutrient loading from horses was estimated using the number of animals, manure production rates, and the amount of nutrients transported to surface waters. The dry-weather nutrient loading from cattle was not quantified. Instead, this source assessment contains a qualitative discussion of cattle as a source of dry-weather nutrient loading.

Loading from Horse Ranches

In 2009, Hawks & Associates conducted a preliminary survey of horses in the main Ojai Valley, which includes most of the Reach 4 and a large portion of the San Antonio Creek subwatersheds. The estimated total number of horses in the Ojai Valley ranged from 2000 to 3000. For the purposes of this source assessment, it was assumed that there were 2000 horses in the entire Ventura River watershed and the horses were allocated among each subwatershed based on area.

The manure production rates and associated nutrients were based on the American Society of Agricultural Engineers (ASAE) Manure Production and Characteristics Standard (ASAE, 2003), as summarized in Table 4-16. The unit waste production rate was multiplied by the number of horses to determine the nutrient loading from horses. It was then assumed that 10 percent of the manure is loaded to waterbodies via washwater, dumping, or when animals go near stream banks. TKN is assumed as the concentration for TN for the calculation of nitrogen load.

Table 4-16 Daily nutrient waste production rates for horses (ASAE, 2003)

Animal Type	Weight (lb)	TKN (lb/day)	Total P (lb/day)	PO4-P (lb/day)
Horse	1000	0.3	0.07	0.019

The number of dry-weather days in the Ventura River Watershed was estimated to be 331 days. Multiplying the dry-weather TN and TP loading per horse by the number of horses in the watershed and apportioning this loading throughout the subwatersheds, results in the dry-weather nutrient loading presented in Table 4-17.

Table 4-17 Dry-weather nutrient loading from horses in the Ventura River Watershed

Subwatershed	TN (lb/year)	TP (lb/year)
Upper Watershed	0	0
Reach 4	1187	281
Reach 3	3058	724
Lower Watershed	3159	748
San Antonio Creek	5449	1290
Cañada Larga	7007	1658
Total Loads	19,860	4700

Loading from Cattle

While cattle grazing can have a significant impact on dry-weather nutrient loading, the impacts are indirect and can be difficult to quantify. For example, when cattle are allowed to graze directly on streambanks, the bank structure can be destabilized, causing soil and associated nutrient loading into the stream. The loss of riparian vegetation also reduces shade and the buffering capacity of the stream. Finally, the loss of riparian vegetation and weakened streambanks decreases the depth and increases the width of the stream, which can increase its temperature. Such indirect effects impact the amount of nutrient loading to the stream and the stream's ecological response to the nutrient loading. The impacts will vary considerably depending on site-specific conditions such as vegetation cover, grazing density, proximity to the stream, and period of use (USEPA, 2003). Without site-specific data on ranching practices in the Ventura River watershed, dry-weather loading from cattle grazing cannot be quantified.

Dry-weather loading from intensive livestock/dairy land uses was not quantified either. The dry-weather impacts from intensive livestock/dairy land uses are similar to the impacts from both grazing activities and horse ranches. However, the number of cows associated with intensive livestock/dairy versus the number of cows associated with grazing is not known. From Table 4-1, the area of intensive livestock/dairy is negligible (4 acres) compared to the area estimated for grazing (34,000 acres) and the area of horse ranches (357 acres), so the relative contribution of dry-weather loading form intensive livestock/dairy is small and roughly accounted for in the dry-weather loading estimates for horses.

Regardless of the fact that there is no quantified source assessment for intensive livestock/dairy land uses and cattle grazing activities, this TMDL assigns both of these sources load allocations.

4.2.3 Nutrient Loading from Onsite Wastewater Treatment System

An Onsite Wastewater Treatment System (OWTS), or septic system, consists of a septic tank and a soil absorption field that allows effluent to infiltrate through soil. Septic systems can be significant sources of nutrients to subsurface and surface waters when they are not properly sited or functioning. Wastewater with high concentrations of nitrogen and phosphorus may seep into shallow groundwater and eventually enter surface waters. Nitrogen is particularly mobile in groundwater, while phosphorus has a tendency to be absorbed by the soils.

This source assessment relies on an estimate conducted by LWA of the total number of septic systems discharging within the Ventura River watershed (2,131). LWA created a list of parcels with structures having private or public restrooms where there are no sewer lines. The total number of septic systems was derived by subtracting the parcels where sewer services are available from all parcels. The map of sewered areas and parcels with possibly-existing septic systems in the Ventura River watershed is shown in Figure 4-2 (LWA, 2011). The resulting estimated number of 2131 is borne out by a review of septic system applications/permits to the Ventura County Environmental Health Division, which

shows 1422 septic systems in the Ventura River watershed. This represents the number of septic systems permitted by Ventura County. The number of commercial and multifamily septic systems permitted by the Regional Board is approximately 22. There are potentially more unpermitted septics systems in the Ventura River Watershed. Thus, the number of 2131 estimated by LWA is a good approximation of the total number of septic systems in the watershed.

OWTS may fail due to improper siting, design, and/or maintenance. Inadequate treatment may also result from insufficient vertical separation to the groundwater, insufficient horizontal separation to a surface water, or surface discharge from a failed disposal field. Nutrient loss rates to surface water of 32% nitrogen and 10% phosphorus were obtained from a nutrient groundwater/surface water interaction study for the Malibu Lagoon (Lai, 2009) and were applied for the calculation of nutrient loads.

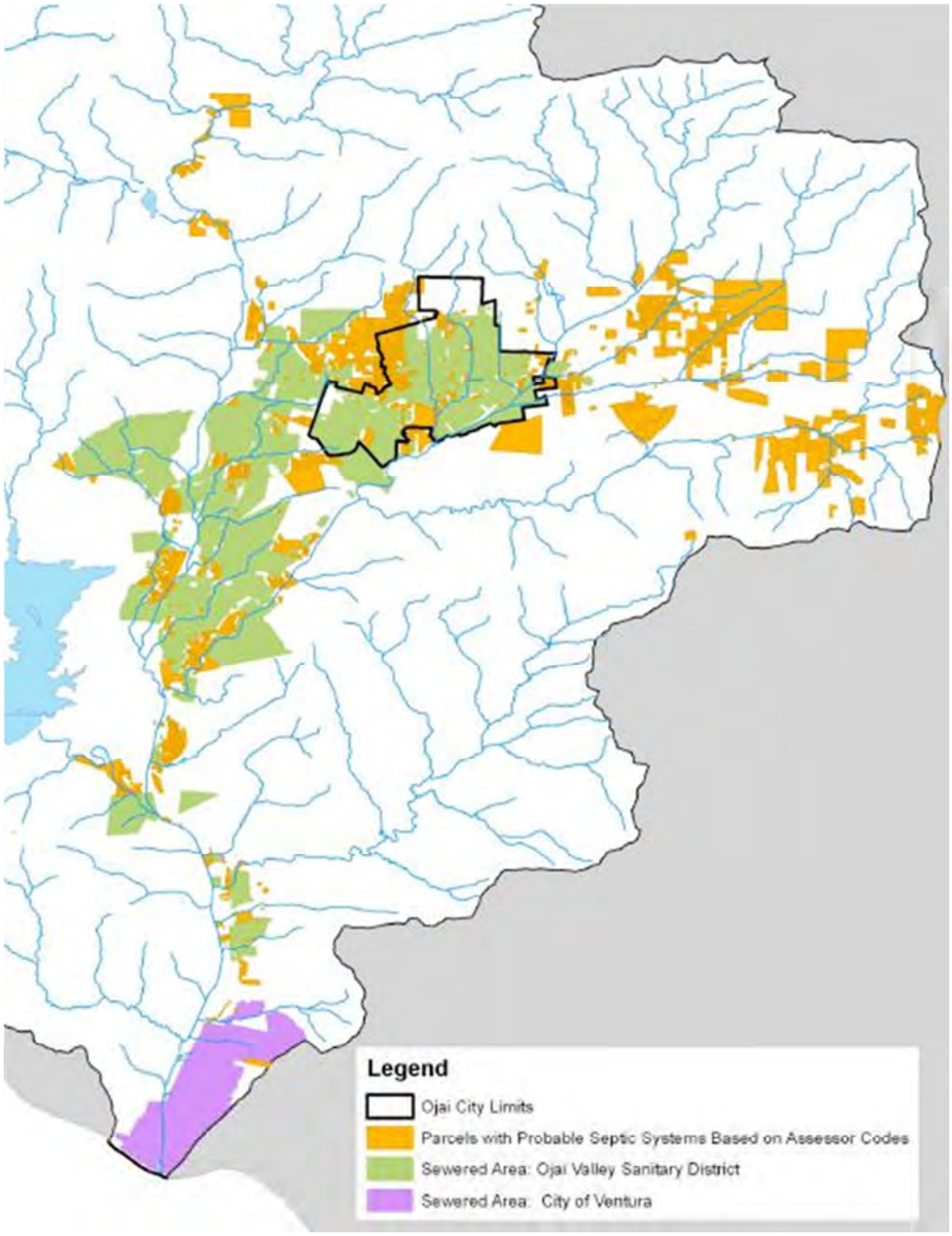


Figure 4-2 Potential OWTS in the Ventura River watershed (LWA, 2011)

The nutrient loads from septic systems were calculated assuming a daily average effluent flow rate of 200 gallons per household, and effluent nutrient concentrations of 36 mg/L nitrogen and 6 mg/L phosphorus (LWA, 2011). LWA estimated based the nitrogen and phosphorus concentrations on the average total nitrogen and phosphorus concentrations measured in Ojai Valley WWTP influent for the period of 1999-2008. The annual nutrient loading to the Ventura River watershed from OWTS is thus 14,955 lb-TN and 779 lb-TP.

4.2.4 Nutrient Loading from Open Space

Open spaces can contribute background nutrient loading due to decay of natural vegetation as well as nitrogen- and phosphorus-bearing rocks and soils. The nutrients are mobilized during wet-weather events or as groundwater discharge to surface waters.

4.2.4.1 Wet-weather loading from open space

Equation 1 and the annual rainfall data in Table 4-3 were used to calculate wet-weather nutrient loading from open space. A runoff coefficient of 0.06 was applied because of the largely pervious area that comprises natural undeveloped areas (Ackerman and Schiff, 2003). The pollutant concentrations in wet-weather runoff from open space were obtained from a SCCWRP study that measured total nitrogen and total phosphorus concentrations from 18 natural stream reaches across southern California (Yoon and Stein, 2008). The study collected total nitrogen and total phosphorus EMCs from two wet seasons between December 2004 and April 2006. The geometric means of all of the sampling events were 1.5 mg/L and 0.03 mg/L for total nitrogen and total phosphorus, respectively.

The open space area was adjusted by subtracting out the area that was used for the estimate of wet-weather loading from livestock grazing activities located in open space areas (Table 4-18).

Table 4-18 Adjusted open space areas

Subwatershed	Open Space (Acres)	Grazing Area (Acres)	New Open Space (Acres)
Upper Watershed	40,838	0	40,838
Reach 4 Watershed	8990	1833	7157
Reach 3 Watershed	4865	4722	143
San Antonio Creek	24,829	8414	16,414
Cañada Larga	11,721	10,820	901
Lower Watershed	5950	4878	1071

Using Equation 1, the wet-weather loading from open space is estimated to be 40,009 lb/year of total nitrogen and 750 lb/year of total phosphorus (Table 4-19).

Table 4-19 Wet-weather TN and TP loading (lb/year) from open space

Subwatershed	TN Load (lb/year)	TP Load (lb/year)
Upper Watershed	28,707	538
Reach 4	3340	62.6
Reach 3	57.8	1.1
Lower Watershed	354	6.6
San Antonio Creek	7148	134
Cañada Larga	403	7.6
Total Load	40,009	750

4.2.4.2 Dry-weather loading from open space

Equation 2 was used to calculate dry-weather nutrient loading from open space. Dry-weather flows from undeveloped areas are from interflow, rising groundwater, springs, and seeps. Dry-weather flows were obtained from USGS Gage 11116000 in North Fork Matilija from 1987-2007 as reported in the "Data Summary Report – Ventura River Watershed Hydrology Model" (Tetratech, 2008). The dry-weather flow was calculated as the median of reported monthly median flows for dry-weather months (April to October). The resulting flow (1.2 cfs) was then divided by the area that drains to USGS Gage 11116000 (9984 acres) to obtain an area-weighted open space dry weather flow of 10.38 cfs/acre/day.

The pollutant concentrations in dry-weather runoff from open space were obtained from a SCCWRP study that measured total nitrogen and total phosphorus concentrations from 22 natural stream reaches in dry weather across southern California (Stein and Yoon, 2007). The study collected nitrogen and phosphorus data from three dry seasons in spring 2005, fall 2005, and spring 2006. The geometric means of all of the sampling events were 0.33 mg/L and 0.05 mg/L for total nitrogen and total phosphorus, respectively. The number of dry-weather days in the Ventura River Watershed was estimated to be 331 days

From Equation 2, the annual dry-weather loads of TN and TP to Ventura River and its tributaries are estimated to be 6879 lb/year and 1042 lb/year, respectively (Table 4-20).

Table 4-20 Dry-weather TN and TP loading (lb/year) from open space

Subwatershed	TN Load (lb/year)	TP Load (lb/year)
Upper Watershed	2891	438
Reach 4	636	96.4
Reach 3	344	52.2
Lower Watershed	421	63.8
San Antonio Creek	1757	266
Cañada Larga	830	126
Total Load	6879	1042

4.2.5 Nutrient Loading from Groundwater Discharge

The Ojai Valley Basin, Upper Ojai Basin, Upper Ventura Basin, and Lower Ventura Basin are the major groundwater basins in the Ventura River watershed. The Ojai Basin is recharged where Thacher Creek, San Antonio Creek, and Reeves Creek enter the basin at alluvial fan heads (Tetratech, 2012). The groundwater is generally in an unconfined condition and recharge is primarily through percolation from active streambeds. However, a confining clay layer is located in the southwest corner of the basin along San Antonio Creek at depths of up to 200 feet where well may be artesian at times (LARWQCB, 2002).Groundwater from the Ojai Basin flows into the Upper Ventura River Basin and influences water quality there (VCWPD, 2010). A natural subsurface obstruction blocks subsurface flow below the Ventura River just above San Antonio Creek in the Casitas

Springs area, causing groundwater to rise as springs (LARWQCB, 2002). Water from the mainstem of the Ventura River recharges the Upper and Lower Ventura River Basins (Tetratech, 2012). Groundwater in the Upper Ventura Basin moves south through the alluvium, following the surface flow, and enters the Lower Ventura River subbasin below Foster Park (CDWR, 2004a). In the Lower Ventura River Subbasin, groundwater follows the course of the river to the Pacific Ocean (CDWR, 2004b).

Natural sources of nitrate in groundwater are due to decay of natural vegetation and nitrogen bearing rocks. Other than natural sources, surface water recharge, septic systems, and fertilizers and manure that migrate to groundwater via infiltration, are also causes of elevated nitrate concentrations in groundwater. No information is available on phosphorus concentrations in groundwater in the watershed.

Groundwater in the shallow alluvium provides the base flows to the Ventura River and its tributaries and is a major source of water during the dry season. Therefore, dissolved nutrients in groundwater have more significant impact during dry-weather periods.

In order to quantify the contribution of groundwater discharges to the main stem of the river, a groundwater budget based on estimates of the net gain or loss of groundwater in the Upper and Lower Ventura subbasins was used (Daniel B. Stephens & Associates, 2010).

According to this report, there is a net annual gain for the Upper Ventura subbasin for the budgeted time period (Water Years 1997 – 2007). It is thus not possible to calculate loading from groundwater discharges to surface water in the Upper Ventura subbasin. As described previously, there are other studies that document groundwater upwelling in the Upper Ventura subbasin, but none that provide a quantitative estimate of the amount of water that is discharged from groundwater to surface water. Thus, for the purposes of the TMDL source assessment, the amount of water that is discharged from groundwater to surface water was assumed to be zero over the entire Upper Ventura subbasin. This likely leads to an underestimate of the contribution of nutrient loading from groundwater in the upper portion of the Ventura River, especially given the variable and high concentrations on nitrate-nitrogen in surrounding wells (VCWPD, 2012).

The estimated groundwater discharge to surface water for the Lower Ventura River subbasin is 1,254 acre-feet/year or 1.73 cfs (Daniel B. Stephens & Associates, Inc., 2010). The average nitrate-N concentration is about 1.23 mg/L as measured in surrounding wells with depths from 30 to 100 feet (VCWPD, 2010). Therefore, the estimated nitrogen load to the Lower Ventura River subbasin is 4192 lb/year.

4.2.6 Nutrient Loading from Atmospheric Deposition

Atmospheric deposition is recognized as a potential source of nitrogen and phosphorus to coastal waters and watersheds in southern California. These pollutants are deposited by wet or dry deposition. Wet deposition refers to pollutants that are removed from the air by precipitation. Dry deposition occurs when pollutants settle out of the air and onto land or water surfaces. The two mechanisms of dry deposition are direct deposition (deposited directly onto a water surface) and indirect deposition (deposited onto surrounding land surfaces in the watershed and subsequently washed into surface waters). Direct atmospheric deposition is a very small proportion of the nutrient sources because the water surfaces of the Ventura River and its tributaries represent less than 1 % of the total watershed area. The much larger fraction of nutrient loading is by indirect deposition. The actual load attributed to indirect deposition is unknown because the fraction of deposited nitrogen and phosphorus that are consumed by terrestrial plants, transformed within the soils by bacteria, and abiotically degraded remains unquantified (Lu, et al., 2004). The contribution of nutrients by indirect deposition is accounted for in the wet-weather loading estimates for the various land uses described in the previous sections.

To calculate to the contribution of direct deposition during the dry-weather period, the length of the Ventura River, including its tributaries, is estimated to be 42 miles, and the average width of the river is approximately 20 feet. The surface area of the creek is thus approximately 0.16 square miles, or 41 hectares (ha). Because the deposition flux rate in the Ventura River watershed is not available, the mean dry deposition flux of total nitrogen (21.2 g/ha/day) in the Malibu Creek watershed is applied for calculation (Lu, et al., 2004). The resulting TN load is approximately 1.94 lb/day. The average dry-weather day in Ventura River watershed is 331 days. The annual nitrogen load from air deposition is thus approximately 534 lb/year. The general atmospheric deposition rate for total phosphorus is 1.64 g/ha/day (USEPA, 1994). The resulting TP load from air deposition is approximately 0.15 lb/day or 41 lb/year.

4.3 Summary of Source Assessment

A summary of the source assessment by sources/land use types is presented in Table 4-20. Based on available data and an estimation of nutrient loadings, stormwater and dry weather urban runoff via the MS4 contributes a large percentage of the nutrients to the Ventura River and its tributaries (21.3% in dry weather and 28.3% in wet weather). The Ojai Valley WWTP contributes a large portion of nutrient loading in dry-weather (37.6%) but a smaller portion in wet weather (1.7%). Horses/livestock and agricultural land uses contribute significant loading in both dry and wet weather. Open space loading is a significant source of nutrients in wet weather (19.1%) and a smaller source of nutrients in dry weather (7.6%). All sources of nutrients are assigned WLAs and LAs in the TMDL.

Table 4-21 Summary of TN loading for all sources/land uses in the Ventura River watershed

Source Type	TN (lb/year)	% total	% dry	% wet
Dry Weather				
Dry-weather Runoff from Urban Areas	19,180	6	21.3	n/a
Ojai Valley WWTP_dry days	33,984	11.7	37.6	n/a
Dry-weather Runoff from Agriculture	10,389	3.3	11.5	n/a
Dry-weather Runoff from Horse/Livestock	19,860	6.2	22.0	n/a
Dry-weather Runoff from Open Space	6879	2.2	7.6	n/a
Wet-weather				
Urban Wet-weather Runoff	90,320	28.3	n/a	43.1
Ojai Valley WWTP_wet days	3491	NA	n/a	1.7
Agriculture Wet-weather Runoff	21,390	6.7	n/a	10.2
Horse/Livestock Wet-weather Runoff	54,325	17.0	n/a	25.9
Open Space Wet-weather Runoff	40,009	12.5	n/a	19.1
Groundwater Discharge	4191	1.3		
Septic Systems	14955	4.7		
Atmospheric Deposition	641	0.2		
Total Load	319,614			

Table 4-22 Summary of TP loading for all sources/land uses in the Ventura River watershed

Source Type	TN (lb/year)	% total	% dry	% wet
Dry Weather				
Dry-weather Runoff from Urban Areas	243	0.7	1.7	n/a
Ojai Valley WWTP_dry days	8030	23.3	57.1	n/a
Dry-weather Runoff from Agriculture	41.2	0.1	0.3	n/a
Dry-weather Runoff from Horse/Livestock	4700	12.4	33.4	n/a
Dry-weather Runoff from Open Space	1042	2.7	7.4	n/a
Wet-weather				
Urban Wet-weather Runoff	11,615	30.6	n/a	50.2
Ojai Valley WWTP_wet days	824.8	NA	n/a	3.6
Agriculture Wet-weather Runoff	1572	4.1	n/a	6.8
Horse/Livestock Wet-weather Runoff	8403	22.1	n/a	36.3
Open Space Wet-weather Runoff	750.2	2.0	n/a	3.2
Groundwater Discharge	n/a	n/a		
Septic Systems	779	2.0		
Atmospheric Deposition	49.7	0.1		
Total Load	38,049			

5. LINKAGE ANALYSIS

Information on sources of pollutants provides one part of the TMDL analysis. To determine the effects of sources on water quality, it is necessary to also determine the linkage between the nutrient loading, expected in-stream water nutrient concentrations, and allowable amounts of algal biomass. This will define the assimilative capacity of the receiving water under critical conditions. This section describes the approach used to determine the nutrient loading that can be assimilated by Ventura River, its tributaries and the estuary, while ensuring attainment of the numeric targets (presented in Section 3) and protection of beneficial uses. This section also describes the critical condition.

5.1 Critical Condition

The critical condition is the period in which the receiving waterbody is most sensitive to the impacts associated with the pollutants of concern. The critical condition for the Ventura River and its tributaries, and the Estuary are evaluated separately.

5.1.1 Critical condition for the Ventura River and tributaries

As described in Section 2, the exceedances of the dissolved oxygen and biostimulatory substances water quality objectives caused by increased nutrient loading and eutrophication are a dry-season problem (May 1 to September 30). The ecology of algae in rivers is, in part, dependent on temperature and flow. An analysis of flow conditions in the Ventura River watershed (Tetratech, 2012) shows that flows vary depending on rainfall conditions, with highest flows at the end of winter and early summer due to receding baseflows from winter rains, and lowest flows at the end of summer and early winter. Dry-weather flows are highest in the upper watershed, both above and below the Matilija Dam (gages 603A and 602), and decrease lower in the watershed but above the Ojai WWTP (gage 607 in Reach 4 and gage 608 in Reach 3) due to evapotranspiration, infiltration, and water withdrawal. Storm flows are more consistent throughout the watershed, but are lower in Reach 4 than in Reach 3 and the upper watershed (Figure 5-1).

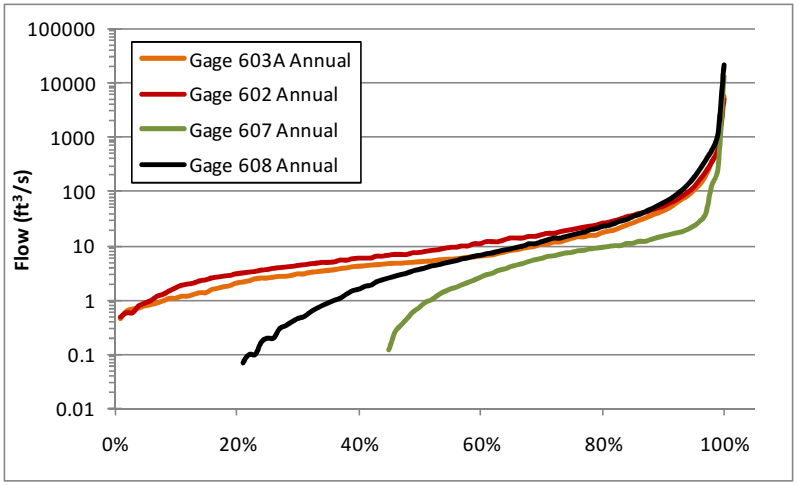


Figure 5-1 Distribution of Flows throughout the Ventura River (Tetratech, 2012)

Below gage 608, the Ojai WWTP is a significant source of water. The Ojai WWTP discharges to Reach 2 and regularly constitutes more than half the flow to the Estuary; 12 percent of the time it is 95 percent of the flow (Tetratech, 2012).

The critical condition in the Ventura River watershed occurs in dry season (May 1 to September 30) when flows are lowest and temperatures highest, creating favorable conditions for algae growth in the river.

Additionally, an analysis of nutrient uptake lengths (i.e. the average distance a nutrient molecule travels before being taken up by biota in the stream) in Ventura River demonstrated uptake lengths much longer than typically observed in small rivers. The summer uptake lengths for TN and TP were 3.6 km and 3.7 km, respectively. Typically, in small unimpaired streams, nutrient uptake lengths are on the order of meters not kilometers (Tetratech, 2012). The long nutrient uptake lengths indicate an ample supply of nutrients in the ecosystem – a nutrient molecule can travel a significant distance before it is taken up by biota in the system. Typically, when nutrients are in limited supply they are very quickly taken up and tightly recycled in the system resulting in very short uptake lengths. The long nutrient uptake length indicates that nutrients loaded in the upper watershed and tributaries have an impact on nutrients concentrations and biological response in the lower reaches; therefore, allocations are assigned to all sources throughout the watershed to attain numeric targets in all reaches and tributaries.

5.1.2 Critical Condition for the Ventura Estuary

The critical condition in the Estuary occurs during the dry season (May to October), when freshwater inputs dominate, temperatures are higher, and there is a higher probability of a berm forming at the Estuary mouth. A closed berm reduces flushing and increases the residence time of nutrients in the Estuary, which, as discussed in Section 2, are important co-factors affecting the Estuary's ecological response to nutrient loading.

An analysis was conducted on the hydrology of the Estuary (Tetratech, 2012). Flows to the Estuary were calculated by summing flows from Gage 608, Cañada Larga, and the Ojai Valley WWTP. It was determined that the majority of flows to the Estuary occur during winter months, except during drought years (e.g., 2006), due to the significance of wet-weather flows. However, it was also determined that the Estuary is directly connected to the ocean 81% of the time based on visual observations conducted by Ojai Valley Sanitation District between January 1999 and December 2003. When the Estuary was closed, it occurred during the months of July to October, during the dry season.

A predictive conceptual model was developed (Tetratech, 2012) based on the observation that the Estuary was usually closed when flows were less than 10 cfs and open when flows were greater than 10 cfs. It was assumed that a peak flow of 50 cfs was needed to open the Estuary, a flow of 10 cfs was needed to maintain a connection to the ocean, and a flow of less than 10 cfs for 30 days was needed for a berm to form and disconnect the Estuary from the ocean. When this model was applied to the flow record from 1982 to 2003, the Estuary was predicted to be closed 31% of the time. It is therefore concluded nutrients loaded to

the Estuary in wet weather do not remain in the Estuary because the Estuary is connected to the ocean during high flows.

Based on an assessment of the critical condition, which is the dry season, the linkage analysis for both the Ventura River and Estuary is conducted for dry-weather conditions. Basing the linkage analysis on *dry-weather* loading is a conservative approach to assessing conditions in the *dry season*. Nutrients are loaded from the watershed to the Ventura River and Estuary in both dry and wet weather (Section 4), but the nutrients loaded in the dry season are predominately responsible for the algae, eutrophic conditions, and nutrient impairments in the Ventura River, its tributaries and the estuary.

5.2 Linkage Analysis

5.2.1 Linkage Analysis for the Ventura River

The linkage analysis for the river is based on the River and Stream Water Quality Model (QUAL2K). QUAL2K is used to predict the nutrient concentrations and algal biomass in the various reaches of the Ventura River based on an estimate of watershed-based loading. Only the main stem of the river was modeled due to lack of data for the tributaries. QUAL2K is supported and distributed by the USEPA and has been widely used for studying the impact of conventional pollutants such as nutrients in streams. The QUAL2K model is suitable for simulating the hydrological and water quality conditions of a natural river or stream. It is a simple one-dimensional model that simulates basic stream transport and mixing processes. The processes employed in QUAL2K address nutrient cycles, algal growth, and dissolved oxygen dynamics. The complete description of the QUAL2K model, including model description, calibration and validation analysis, and model results, is included in Appendix B - Technical Memo – Algae and Nutrient Modeling for Ventura River.

5.2.1.1 Ventura River QUAL2K Model Development and Inputs

For modeling, the Ventura River mainstem was divided into 51 computational segments. Headwater data collected by UCSB in 2008 at the confluence of Matilija and North Fork Matilija Creeks (UCSB, 2009) were used to define the upstream boundary conditions for water quality parameters. Average flows from 2001-2008 compiled by Tetratech as part of development of the Ventura River Hydrology Model (Tetratech, 2008) were used to define the upstream boundary conditions for flow. (The model internally calculates the boundary conditions for each downstream segment.) San Antonio Creek, Cañada Larga and Ojai Valley WWTP were modeled as concentrated model inputs. San Antonio Creek and Cañada Larga flow data were obtained from average 2001-2008 data compiled by Tetratech for the 2009 hydrology model and water quality data were obtained from the 2008 UCSB study. For the Ojai Valley WWTP input, NPDES permit data were used to characterize water quality and flow. The watershed-based model inputs for all other sources were obtained from the TMDL source assessment (Section 4). Withdrawal from the Ventura River at Robles Diversion was modeled as an outflow. Meteorological conditions were represented by hourly data obtained from the NOAA weather station in Oxnard.

5.2.1.2 Ventura River QUAL2K Model Calibration and Validation

The model was run based on the inputs described previously. The predicted results of flow and in-stream water quality were compared to a set of data for calibration. The dataset was developed to create a full set of conditions representative of a typical dry-weather day. The water quality calibration data were obtained from the 2008 UCSB study for 14 points throughout the river, and the mean, minimum, and maximum values were calculated for comparison with model-predicted water quality. The model was calibrated for flow, nitrate, TN, phosphate, TP, and benthic algae. Figures 5-2 and 5-3 show the calibration results for flow and nitrate-nitrogen. The model was calibrated by adjusting model parameters to best fit the predicted and measured results.

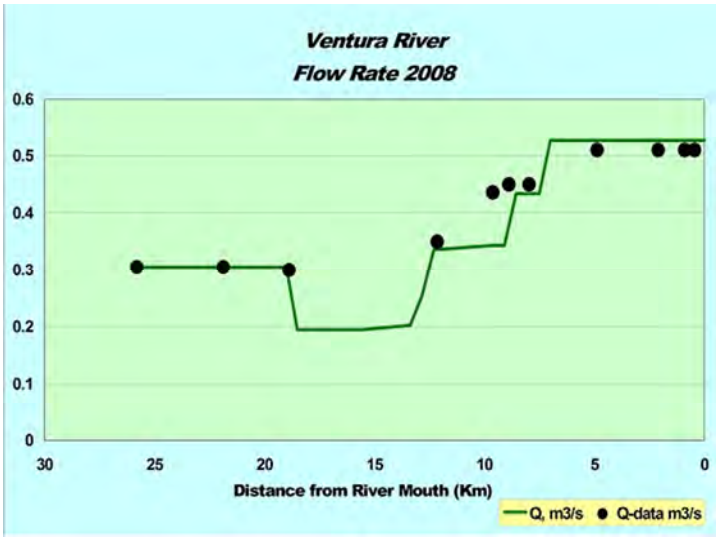


Figure 5-2 Comparison of calculated flow rate with 2008 observed data for calibration

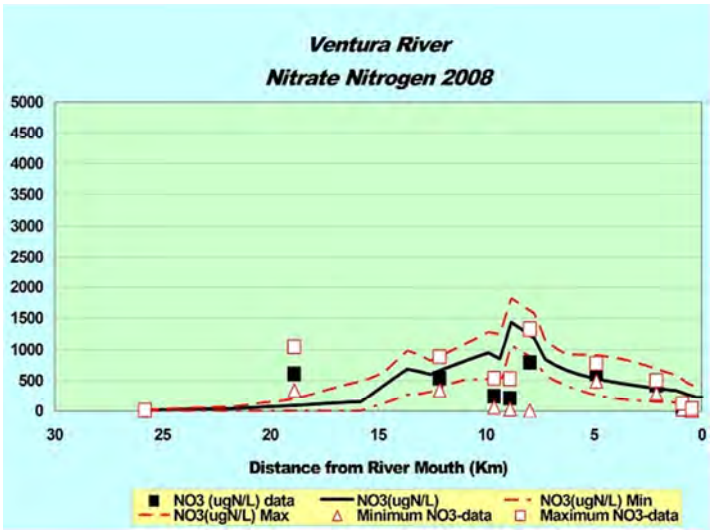


Figure 5-3 Comparison of calculated nitrate-nitrogen with 2008 observed data for calibration

To ensure that the model can reliably predict real situations, two additional sets of measured data, collected by SBCK Stream Team in 2006 and 2007, were used for model validation. The model parameters adjusted during calibration remained the same and only the inputs for San Antonio Creek, Cañada Larga and Ojai Valley WWTP were updated with 2006 and 2007 data. The model was validated for flow, nitrate and phosphate. No validation data were available for TN, TP, or algae. The model results show that flow and nutrient concentrations are validated reasonably well with the measured data (Figures 5-4 to 5-7).

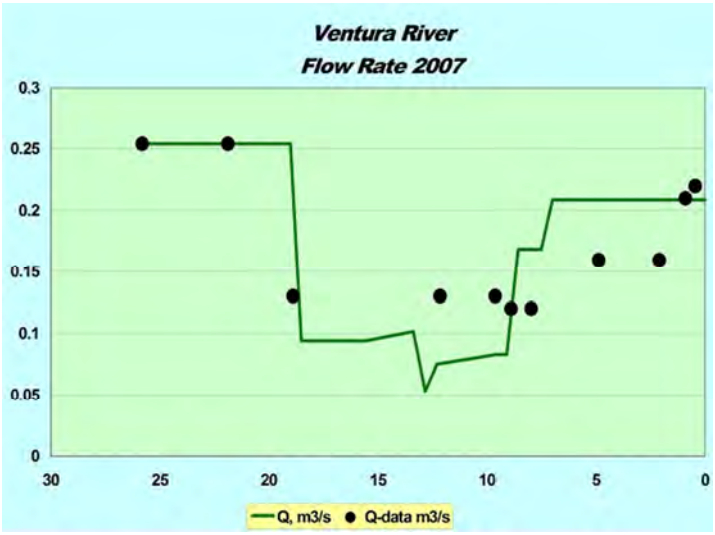


Figure 5-4 Comparison of calculated flow rate with 2007 observed data for validation

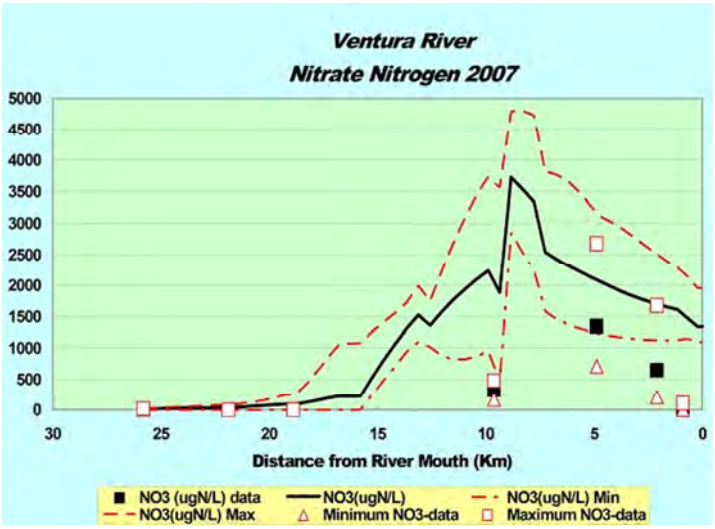


Figure 5-5 Comparison of calculated nitrate-nitrogen with 2007 observed data for validation

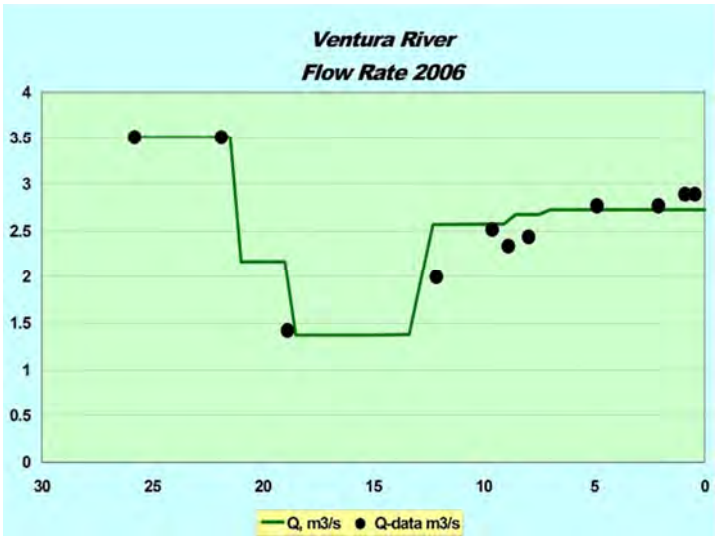


Figure 5-6 Comparison of calculated flow rate with 2006 observed data for validation

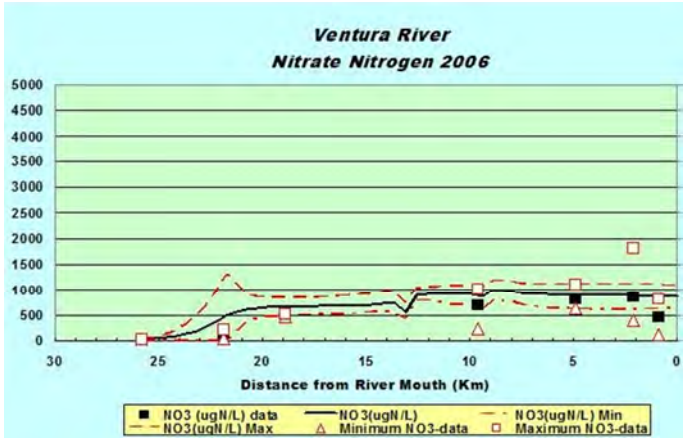


Figure 5-7 Comparison of calculated nitrate-nitrogen with 2006 observed data for validation

The model was able to successfully predict existing conditions (Figures 5-8 and 5-9). The model tracks the trend of in-stream measured water quality data and is approximately equal to the median of measured in-stream concentrations.

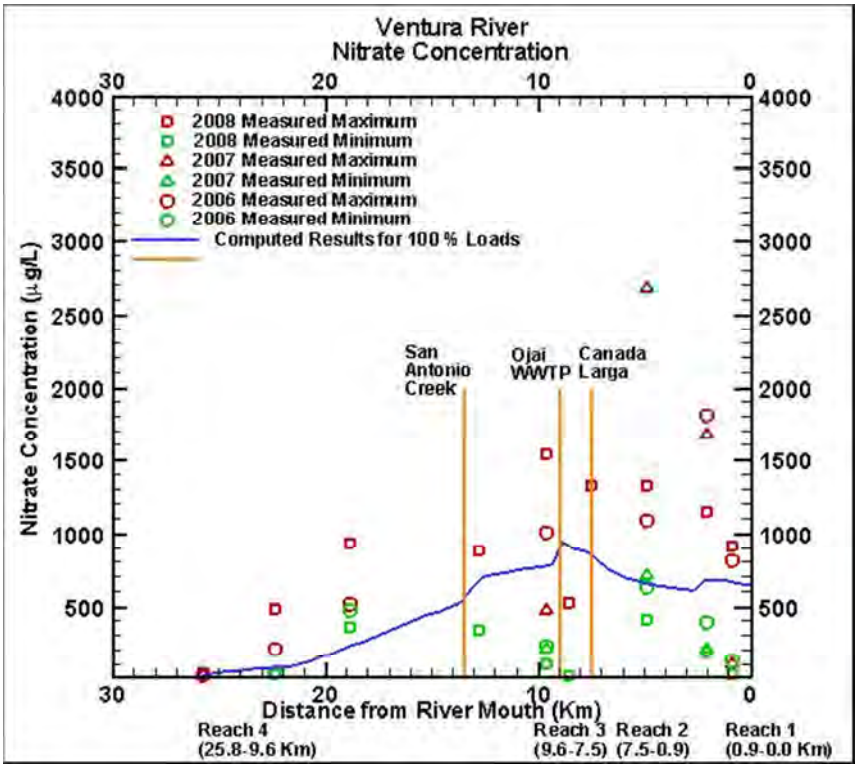


Figure 5-8 Predicted nitrate concentrations based on validated model

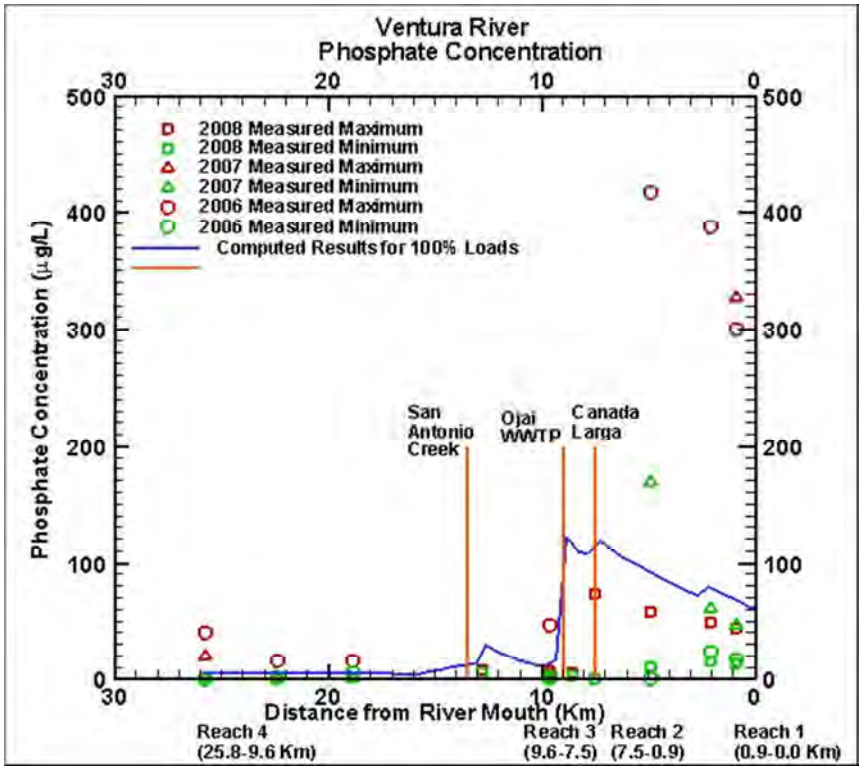


Figure 5-9 Predicted phosphate concentrations based on validated model

The results of the model were used to (1) determine allowable in-stream nutrient concentrations to meet algal biomass targets (Figure 5-10) and (2) evaluate various source reduction scenarios to set dry-weather load and waste load allocations (Section 6). An attempt was made to determine reach-specific relationships between allowable in-stream nutrient concentrations and algal biomass, but there were not enough reach-specific data to establish a significant relationship.

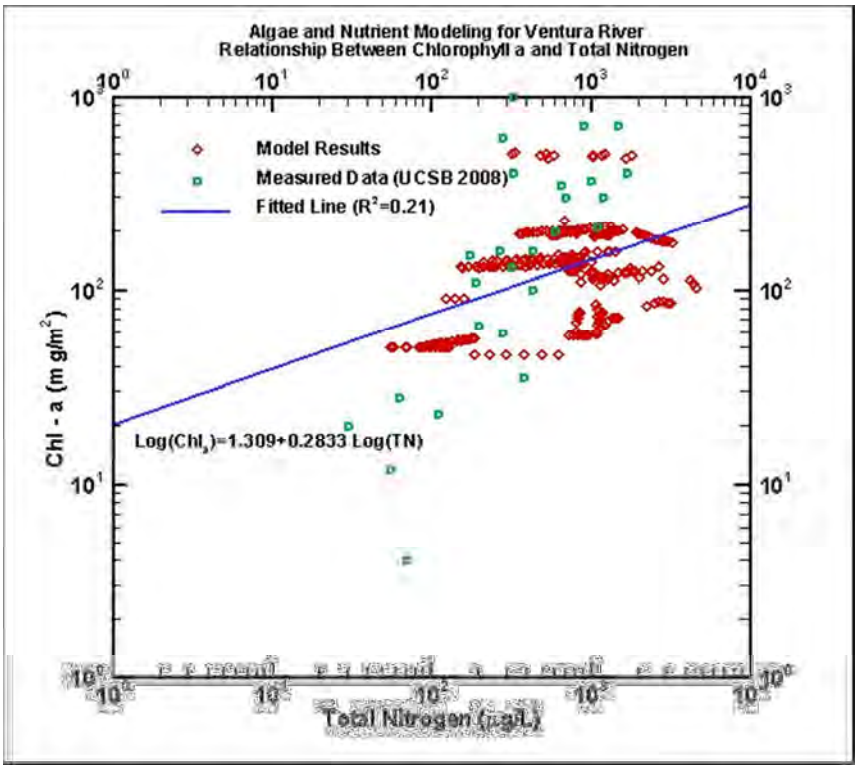


Figure 5-10 Relationship between chlorophyll a and total nitrogen in the Ventura River

The correlation between chl a and TN is based on a combination of both modeled data and measured data. This is because the measured data were obtained from just two sampling events during one year (2008), which does not capture the variability in algal biomass due to varying hydrological conditions (see, for example, Figure 2-18). The amount of algal biomass in the dry season is closely tied to severity of storms in the preceding winter season due to scouring of channels. The open channels created by large winter storms favor algal growth due to increased sunlight and temperature, but after several years with less rainfall, trees, shrubs and plants grow, which increase shading and inhibit algal growth (see, for example, Figures 2-19 and 2-20.) Therefore, modeled data, which were based on four years of data (2006-2008 and 2010) were used in addition to the 2008 measured data to represent a more complete set of hydrologic conditions. The use of the modeled data to supplement the measured data is appropriate because the model is able to successfully predict in-stream nitrate and phosphate (Figures 5-8 and 5-9). This correlation can be updated once a number of years of data have been collected that adequately bracket different hydrologic years, from drought conditions to high-flow years

5.2.2 Linkage Analysis for the Estuary

The linkage analysis for the Estuary is based on two lines of evidence that establish the relationship between nutrient loading to the Estuary and the resulting nutrient concentrations and algal biomass in the Estuary. The first approach uses the NNE BATHTUB spreadsheet modeling tool to establish the linkage between nutrient loading to the Estuary and the predicted water quality response. The second approach uses empirical relationships between nutrient loading and algal biomass in estuaries developed as part of the Southern California Bight Study 2008.

5.2.2.1 NNE BATHTUB Spreadsheet Modeling Tool

The NNE BATHTUB model was created for application to freshwater reservoirs and lakes. A simplifying assumption is made that the open water portion of the Estuary, formed by the closing of the berm in the late summer and early fall, acts like a freshwater reservoir. It is thus reasonable to apply BATHTUB to the Ventura Estuary during the critical condition.

The NNE BATHTUB spreadsheet tool was developed by Tetra Tech with support by US EPA Region IX and the State Water Resources Control Board. The NNE BATHTUB spreadsheet tool is a user friendly arrangement of the Army Corps of Engineers BATHTUB model (Walker, 1987, 1996) used to analyze the response of lake water quality to different nutrient loading situations. Tetra Tech configured the BATHTUB model to be used in an excel spreadsheet format. The model performs water and nutrient balance calculations under steady-state conditions. Eutrophication related water quality conditions are expressed in terms of total phosphorus, ortho-phosphorus, total nitrogen, inorganic nitrogen, chlorophyll a, transparency (Secchi depth), and hypolimnetic oxygen deletion rates. These conditions are predicted using semi-empirical relationships developed and tested on a wide range of reservoirs.

The following assumptions underlie the linkage analysis. Inputs to the Estuary include nutrient loading from the watershed as estimated by Tetratech by summing flows from Gage 608, Cañada Larga, and the Ojai Valley WWTP and multiplying them by median nutrient concentrations (Tetratech, 2012). Because the Estuary is connected to the ocean during wet-weather when the berm is breached, wet-weather flows do not remain in Estuary. The annual loading to the Estuary is thus assumed to be equal to the annual dry-weather load. During dry weather, evaporation and processes such as sedimentation, resuspension, and nutrient flux alter the concentrations of nitrogen and phosphorus in the Estuary. Nutrients in the system increase over the dry season, until the berm is breached during the following wet-weather season.

The NNE BATHTUB spreadsheet tool allows the user to input physical, chemical, and biological parameters. The input parameters are listed in Table 5-1. The model allows the user to analyze many different nutrient loading scenarios and evaluate the Estuary response. Likewise, the user may specify a chlorophyll-a concentration or change in Secchi depth and the model will predict the probability of exceeding the target under the

specified nutrient loading. Additionally, the model will show allowable nitrogen and phosphorus loading combinations to meet the target.

Table 5-1 Bathtub inputs

Parameter	Value
Volume	58,877 m^3
Surface Area	52,602 m^2
Mixed depth	80% of average depth
Evaporation Rate	63 in/ year
Secchi Depth	0.5 meters
Typical Chl-a	9.2 µg/L
TP Load	932 kg
TN Load	7,250 kg
Inorganic N	4,388 kg
Orthophosphate	954 kg
Inflow	6.56 hm^3

The volume and the surface area of the Estuary were calculated in consultation with SCCWRP using remote sensing data. A combination of light detection and ranging (LiDAR) and digital elevation model (DEM) data were used to estimate the bathymetry of the Ventura Estuary (Siebels, 2012, Appendix C).

First, the areal extent of the Estuary was defined based on wetlands polygons developed by SCCWRP using 2005 National Agriculture Imagery Program (NAIP) imagery and attributed using the Cowardin Classification system for wetlands. The polygons developed by SCCWRP were compared to National Wetlands Inventory data to verify the extent of the wetlands in the Ventura River Estuary. The polygons were then revised to delete one "riverine" polygon, redraw one unattributed polygon to align edges, and cut the uppermost polygons to fit the narrative description of the Estuary in Section 1. Although the revised polygons are based on 2005 NAIP imagery, they were also visually compared with 2010 and 2009 NAIP imagery, as well as observations of the Estuary by staff in 2011 and 2012, and historical photos of the Estuary from 1971 to 2010 obtained from the California Coastal Records Project. Based on these comparisons, it is found that the revised polygons present the typical areal extent of the Estuary (Figure 5-11).

Figure 5-11 Areal Extent of the Ventura River Estuary

The revised wetland polygons were then overlaid with LiDAR data to calculate the height of the estuary floor relative to the mean lower low water height. LiDAR data are preferred for estimating the height of the estuary floor because, unlike DEMs that use radar, LiDAR is able to penetrate through the water in the Estuary using light. DEM values were then used to estimate the height of the berm relative to the mean lower low water height. DEM values are preferred for estimating the height of the berm because the data are at a larger scale and average out the height and low points of the berm. The resulting height of the berm was determined to be 2.5 meters. It was assumed that a typical Southern California coastal estuary, when full, is 20 cm below the top of the berm (personal communication, Martha Sutula, SCCWRP, 2012). Thus, the water level of the Estuary is estimated at 2.3 meters. The depth of the Estuary was determined as the water level of the Estuary minus the height of the Estuary floor (Figure 5-12). The resulting volume is presented in Table 5-1.

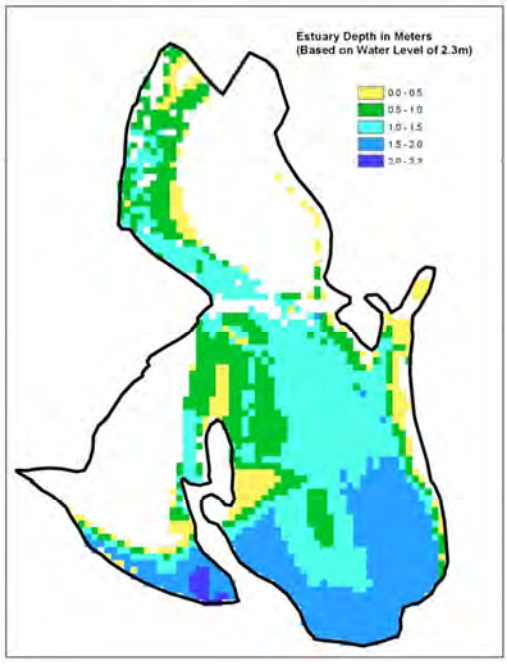


Figure 5-12 Estimated Depth of the Ventura River Estuary

The remaining inputs into the BATHTUB model are discussed as follows. BATHTUB calculates the average depth of the Estuary based on the input area and volume data. The mixing depth was conservatively assumed to be 80%. The evaporation rate was obtained from the El-Rio gage at the United Water Conservation District spreading grounds in Oxnard (Tetratech, 2012). The Secchi depth was based on a measurement collected by Regional Board staff in April 2012 by wading into the Estuary. It is likely that the Secchi depth is greater than the value reported in Table 5-1, and is probably equal to depth of Estuary (i.e., the bottom of the Estuary is visible). The typical chlorophyll a was obtained from an average of one measurement collected by Regional Board staff in April 2012, and two measurements collected by UCSB in 2008 (UCSB, 2009).

The loading and inflow inputs were obtained from the 2012 Tetratech report as previously discussed. The annual nutrient loads were calculated by multiplying the estimated median daily dry-weather loads by the number of dry-weather days in a year (318 days based on Tetratech's assumption that a dry day was any day it did not rain or it did not rain the day before.) The loading inputs obtained from the Tetratech report are lower than the predicted loading based on the freshwater model. (The freshwater model predicts an average load of 140 kg/day.) The loading estimates from the Tetratech report are based on the median dry-weather flow from long-term flow records, which reports lower flows to the estuary as compared to the predicted flows from the freshwater model. The freshwater model predicted load is based on three years of flow data (2006, 2007, and 2008) and tends to over predict nutrient loading due to higher predicted flows. This is because the three years of data used in the freshwater model do not reflect long-term cycles of wet years and drought conditions, as shown in Appendix B. However, the freshwater model does accurately predict in-stream nutrient concentrations; so it is clear that the difference in the loading estimates is related to flow and not nutrient concentrations. The Estuary linkage

analysis relied on the Tetratech report as the more accurate of the two loading estimates. The watershed reduction scenarios used to set allocations (Section 6) for the river will result in lower nutrient concentrations delivered to the estuary; thus, there will be an overall reduction in the nutrient load to the estuary.

5.2.2.2 Bathtub Model Results

There were not enough data to calibrate and validate the BATHTUB model for the Ventura Estuary. However, the predicted TN and TP concentrations were compared to limited data on existing TN and TP concentrations in the Estuary, including two samples collected by Regional Board staff in 2011 and 2012 and two samples collected by UCSB in 2008 (UCSB, 2009). The comparisons are shown in Table 5-2.

Table 5-2 BATHTUB-predicted phytoplankton and nutrient concentrations compared to measured nutrient concentrations

Predicted Chl-a µg/L	Predicted TP mg/L	Predicted TN (mg/L)	UCSB TP (mg/L)	UCSB TN (mg/L)	RB 2012 TP (mg/L)	RB 2012 TN (mg/L)	RB 2011 TP (mg/L)	RB 2011 TN (mg/L)
18.0	0.13	1.06	0.07	0.3	0.07	0.3	ND	1.02

As can be seen from Table 5-2, the existing loading from the watershed results in TN and TP concentrations in the Estuary that will attain the phytoplankton numeric target of 20 µg/L.

5.2.3 2008 Southern California Bight Study Relationships between nutrient loading and algal biomass

The second linkage approach for the estuary utilized the empirical relationships between algal biomass and estuarine nutrient loads developed with data from the 2008 Southern California Bight Regional Monitoring Program (Bight '08). The Bight '08 Eutrophication Assessment collected data on both response indicators and nutrient loading in 23 estuaries in southern California from November 2008 through October 2009 (McLaughlin K et al. Bight 2008 Regional Monitoring Program, 2012 Report). Statistical models were used to analyze the data and determine relationships between algal biomass and nutrient loads. The Bight 2008 was a regional assessment with data collected across many estuaries. Thus, when determining the relationships nutrient loads were normalized by estuarine area, volume, and residence time. Macroalgae and phytoplankton biomass both had significant positive relationships with nutrient loads. These relationships were used to evaluate nutrient loads and expected biological response in the Ventura River Estuary (McLaughlin K et al. Bight 2008 Regional Monitoring Program, 2012 Report).

The Bight '08 assessment developed several different equations evaluating the strength of various nutrient and algal biomass relationships; the relationships were strongest when estuary volume and residence time were taken into account (McLaughlin K et al. Bight 2008 Regional Monitoring Program, 2012 Report). The equations selected for this linkage

analysis were those that predict peak macroalgae biomass (R^2 = 0.1535, p value = 0.0.478) and annual average chlorophyll a (phytoplankton biomass) (R^2 = 0.0290, p value = .0.3959). The equation for peak phytoplankton biomass was not used because it was normalized to residence time only. Instead, the equation for average phytoplankton biomass was used because it was normalized for both residence time and volume and is consistent with the equation for peak macroalgae biomass. In addition, the data set for chlorophyll was limited and better suited for predicting an average phytoplankton biomass. Because the estuary is connected to the ocean during wet-weather when the berm is breached, wet-weather flows do not remain in the estuary. The loading and residence time are based on dry-weather conditions (TN dry-weather load = 22 kg/day, Residence Time = 2.97 days). The equations are presented below.

$$\log(Peak\ Macroalgae\ Biomass) = [0.15 * \log(\frac{Annual\ TN\ load}{365\ days} * res.time * \frac{1}{Estuary\ Vol})] + 1.7$$

$$\log(Annual\ Avg\ CHLa) = [0.10 * \log(\frac{Annual\ TN\ load}{365\ days} * res.time * \frac{1}{Estuary\ Vol})] + 0.82$$

5.2.3.1 Bight '08 Empirical Relationship Results

The results from the equations are presented in Table 5-3. The result for predicted annual average chlorophyll *a* is in good agreement with the limited measured data for chlorophyll in the estuary. The annual average chlorophyll *a* measured in the estuary is 9.2 µg/L; this is based on two samples collected by UCSB in the summer of 2008 and one sample collected by Regional Board staff in April 2012.

Additionally, based on thresholds presented in the Scanlan study (2007), described in the numeric targets section, (converted for dry weight, McLaughlin K et al. Bight 2008 Regional Monitoring Program, 2012 Report) estuaries with macroalgae biomass less than 70 grams of dry weight per meter squared are characterized with high to very high water quality at less than 15% cover. The numeric target macroalgae in this TMDL is set at ≤ 15 % cover. Thus, the current nutrient loading appears to attain the phytoplankton target for the estuary and limit macroalgae growth to acceptable levels. Moreover, the watershed loading reductions required to protect the river will reduce nutrient concentrations delivered to the estuary and ensure attainment of numeric targets and protection of beneficial uses.

Table 5-3 Predicted biological indicators based on Bight '08 Empirical Relationships

Biological Indicator	Predicted Result
Peak Macroalgae Biomass	50.8 (g dw/m^2)
Annual Avg. Chl. a	6.7 µg/L

6. POLLUTANT ALLOCATIONS AND TMDLs

This section explains the development of the loading capacity and allocations for nutrients in the Ventura River watershed. EPA regulations require that a TMDL include waste load allocations (WLAs), which identify the portion of the loading capacity allocated to existing and future point sources (40 CFR §130.2(h)) and load allocations (LAs), which identify the portion of the loading capacity allocated to nonpoint sources (40 CFR §130.2 (g)).

6.1 Dry-weather Allocations

As established in the problem statement and the linkage analysis, the critical condition for this TMDL is the dry season and it is loading in the dry season that results in water quality impairments. The allocations are thus primarily focused on dry-weather nutrient loading reductions. Basing the allocations on *dry-weather* loading is a conservative approach to addressing impairments in the *dry season*. Dry-weather is defined as a day with no rain. Wet-weather is defined as any day with rain.

Based on the relationship between nutrient concentrations and algal biomass obtained from the freshwater model (Figure 5-10), the allowable in-stream concentration of TN is equal to 1.15 mg/L. To maintain a balance of nutrients for biomass growth and prevent limitation by one nutrient or another, a ratio of total nitrogen to total phosphorus of 10:1 is used to derive the allowable in-stream concentration of total phosphorus equal to 0.115 mg/L (Thomann, Mueller, 1987).

The dry-weather allocations are based on an evaluation of several source reduction scenarios until one scenario was determined to result in in-stream nutrient concentrations that attain numeric targets for algal biomass, with an explicit margin of safety (Figures 6-1 and 6-2).

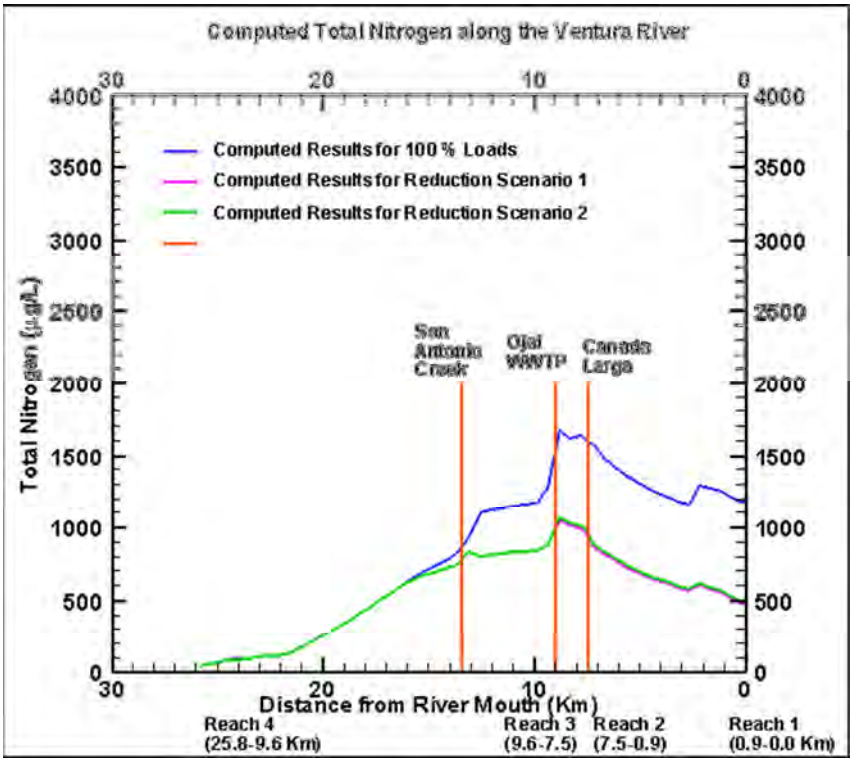


Figure 6-1 TN Reduction scenario to attain allowable in-stream TN concentrations

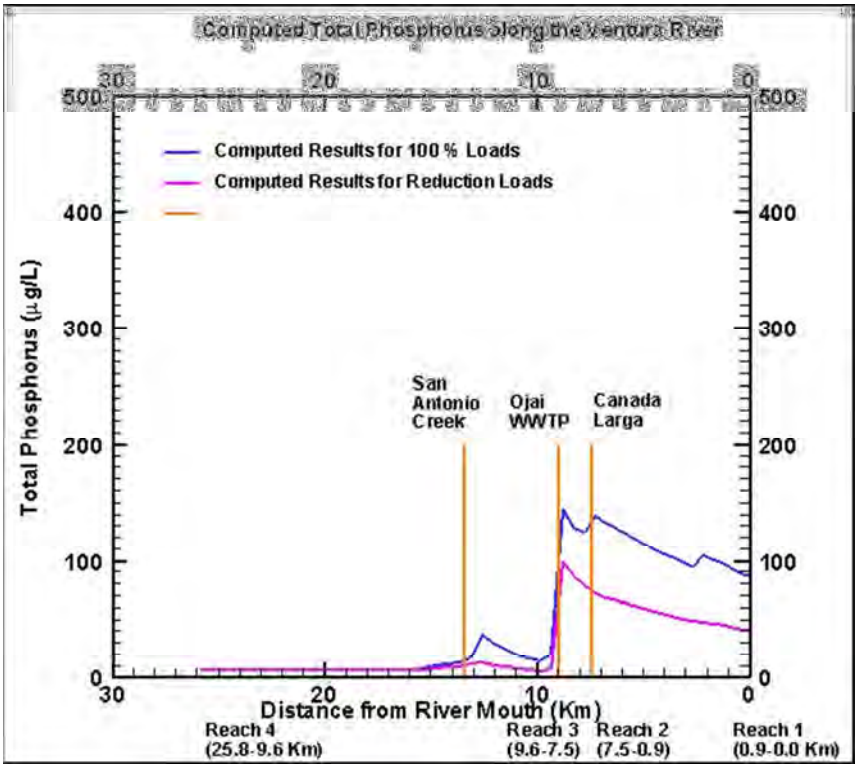


Figure 6-2 TP Reduction scenario to attain allowable in-stream TP concentrations

As described in the critical conditions section (Section 6), water quality impacts are due to watershed-wide loading of nutrients. Therefore, the reduction scenario was designed to reduce loads watershed-wide (Tables 6-1 and 6-2). The feasibility of implementation and the relative source contribution of each source were considered when assigning required load reductions. For example, the Ojai Valley WWTP can discharge slightly higher concentrations of TN in winter dry-weather (4 mg/L) than in summer dry-weather (3 mg/L) and still attain the required in-stream concentration of 1.15 mg/L TN (Figure 6-1, Reduction Scenario 2).

Table 6-1 Dry weather Allocation Scenario for TN

Source Type*	Existing Dry-Weather TN Load (lb/total dry days(331))	Allowable Dry-Weather TN Load (lb/total dry days(331))	Percent TN Reduction
Dry-weather WLAs for Ventura MS4	18,480	9,240	50%
Dry-weather WLAs for Caltrans	701	350	50%
Dry-weather WLAs for Ojai Valley WWTP	33,984	20,574	40%
Dry-weather LAs for Agriculture	10,389	5,194	50%
Dry-weather LAs for Horses/Intensive Livestock	19,860	199	99%
*Does not include allocation scenario for OWTS, General Stormwater permits, Grazing Activities, and Other NPDES permits. Allocations for all sources follow in subsequent tables/text.			

Table 6-2 Dry weather Allocation Scenario for TP

Source Type*	Existing Dry-Weather TP Load (lb/total dry days(331))	Allowable Dry-Weather TP Load (lb/total dry days(331))	Percent TP Reduction
Dry-weather WLAs for Ventura MS4	172	86.2	50%
Dry-weather WLAs for Caltrans	70.1	35.0	50%
Dry-weather WLAs for Ojai Valley WWTP	8030	5799	28%
Dry-weather LAs for Agriculture	41.2	20.6	50%
Dry-weather LAs for Horses/Intensive Livestock	4700	47	99%

*Does not include allocation scenario for OWTS, General Stormwater permits, Grazing Activities, and Other NPDES permits. Allocations for all sources follow in subsequent tables/text.

6.1.1 Dry-weather WLAs for Stormwater Sources

The identified reduction scenario is based on the assumption that TN and TP loading from dry-weather urban runoff from the Ventura County and Caltrans MS4s can be reduced by 50% based on reported removal efficiencies of structural and nonstructural BMPs (Section 7). The Ventura County MS4 annual monitoring reports document flows of less than 1 cfs at the Ojai and Meiners Oaks outfall monitoring sites. These flows are assumed for Caltrans facilities as well. These flows can be managed by standard structural and nonstructural BMPs that are consistent with the current MS4 permit obligations. Dry-weather WLAs shall be expressed as daily loads based on an estimated 331 dry-weather days per year (Table 6-3). Nutrient loading from stormwater sources is dependent on surface water runoff, which carries nutrients from the land to the river. The amount that is transported to the river is dependent on the amount of runoff, which is markedly different in dry weather and wet weather. The assignment of dry-weather and wet-weather WLAs reflects the difference in flow and corresponding nutrient loading under dry-weather and wet-weather conditions.

Table 6-3 Dry-weather WLAs for Ventura County MS4 and Caltrans

Source Type	Dry-Weather TN WLA (lb/day)	Dry-Weather TP WLA (lb/day)
Dry-weather WLAs for Ventura MS4	28	0.26
Dry-weather WLAs for Caltrans	1.1	0.11

6.1.2 Dry-weather WLAs for general industrial and construction stormwater permittees

The general industrial and construction stormwater permittees are prohibited from discharging non-storm water flows except as authorized by special conditions of statewide general permits. These special conditions require, for example, the inclusion of specific BMPs in pollution prevention plans and the prohibition of significant concentrations of pollutants. Therefore, dry-weather WLAs for general industrial and construction stormwater permittees are equal to the in-stream nutrient concentrations required to meet algal biomass numeric targets (Table 6-4).

Table 6-4 Dry-weather WLA for general industrial and construction stormwater permittees

Permittee	TN (mg/L) (annual dry-weather average)	TP (mg/L) (annual dry-weather average)
General Industrial Stormwater Permittees	1.15	0.115
General Construction Stormwater Permittees	1.15	0.115

6.1.3 Dry-weather WLAs for Ojai Valley WWTP

The dry-weather reduction assigned to Ojai WWTP is based on a report prepared for Ojai WWTP by MWH (2007) that contemplated TN limits equal to 3 mg/L and TP limits equal to 1 mg/L. In addition, based on comments from OVSD staff, the MWH report did not consider the impact of cooler winter temperatures on nitrogen treatment. The oxidation ditches at the plant rely upon a biological treatment process, which is affected by temperature and residence time. Thus, assigning WLAs during dry weather, without accounting for seasonal differences in summer dry-weather versus winter dry-weather performance does not reflect the operation of the plant. To account for seasonal differences in performance, it is assumed that after the upgrades described in the MWH implementation report are implemented, the Ojai WWTP can attain a TN concentration of 4 mg/L in winter dry weather. Because the critical condition is the dry *season*, it is possible to assign higher WLAs in winter dry *weather* and still attain required in-stream concentration of 1.15 mg/L in the dry *season* (see Figure 6-1, Reduction Scenario 2).

The required summer dry-weather seasonal WLA for TN was calculated as the product of 3 mg/L TN, the historical average daily flow (2000-2012), an 8.34 conversion factor, and the total number of summer dry-season days in a year (153 days). The required winter dry-weather WLA for TN was calculated as the product of 4 mg/L TN, the historical average daily flow, an 8.34 conversion factor, and the number of winter dry-weather days in a year (178 days, equal to 212 winter days – 34 wet days). The resulting summer dry-weather WLA (May 1 to September 30) is equal to 8,044 lbs and the resulting winter dry-weather WLA (October 1 to April 30) is equal to 12,477 lbs.

There is less of a seasonal effect on phosphorus treatment. Thus, Ojai WWTP receives a year-round dry-weather phosphorus WLA. The required mass-based WLA for TP was calculated as the product of 1 mg/L TP, the historical average daily flow, an 8.34 conversion factor, and the total number of dry-weather days in a year (331 days). Wet-weather days are excluded from the calculation. The resulting dry-weather WLA (year-round) is equal to 5,799 lbs. Assuming the treatment plant upgrades are implemented as described in the MWH report, the required reductions should be attained.

At the TMDL reconsideration, the Ojai WWTP allocation may be revised (i.e. increased) if the Ojai WWTP has accepted additional flows from other watershed sources. The Ojai WWTP will document and report annually the number, flow and TN load from watershed sources for the Regional Board to consider as part of the TMDL reconsideration.

6.1.4 Dry-weather LAs for Agriculture

The identified reduction scenario is based on the assumption that nutrient loading from dry-weather agricultural runoff can be reduced by 50% based on implementation of irrigation and nutrient management and dry-weather runoff treatment/infiltration BMPs (Section 7). Dry-weather LAs shall be expressed as daily loads based on an estimated 331 dry-weather days per year (Table 6-5). These allocations are consistent with the existing requirements

of the Agriculture Waiver adopted as Order No. 2010-0186. Nutrient loading from agriculture sources is dependent on surface water runoff, which carries nutrients from cropped areas to the river. The amount that is transported to the river is dependent on the amount of runoff, which is markedly different in dry weather and wet weather. The assignment of dry-weather and wet-weather WLAs reflects the difference in flow and corresponding nutrient loading under dry-weather and wet-weather conditions.

Table 6-5 Dry-weather LAs for Agriculture

Dry-Weather TN WLA (lb/day)	Dry-Weather TP WLA (lb/day)
16	0.06

6.1.5 Dry-weather LAs for Horse Facilities and Intensive Livestock Operations

Nutrient loading from horse facilities and intensive livestock operations is dependent on surface water runoff, which carries nutrients from the operations to the river. The amount that is transported to the river is dependent on the amount of runoff, which is markedly different in dry weather and wet weather. The assignment of dry-weather and wet-weather WLAs reflects the difference in flow and corresponding nutrient loading under dry-weather and wet-weather conditions. The reduction scenario assumes the elimination of dry-weather runoff from horse and intensive livestock facilities, represented as 1% of the existing load. As described in the source assessment section of the TMDL (Section 4), the estimated nutrient loading from horse facilities also approximates the nutrient loading from intensive livestock operations. Therefore, the source reductions for horse and intensive livestock facilities are jointly assigned. Nutrient contributions from horse and intensive livestock facilities are manageable in dry weather, considering the scale of the operations in the Ventura River watershed and the effectiveness of manure management practices at reducing dry-weather loading. Dry-weather LAs shall be expressed as daily loads based on an estimated 331 dry-weather days per year (Table 6-6).

Table 6-6 Dry-weather LAs for Horse Facilities and Intensive Livestock Operations

Dry-Weather TN WLA (lb/day)	Dry-Weather TP WLA (lb/day)
0.6	0.14

6.1.6 Dry-weather LAs for Grazing Activities

Nutrient loading from grazing activities is dependent on surface water runoff, which carries nutrients from grazed land to the river. The amount that is transported to the river is dependent on the amount of runoff, which is markedly different in dry weather and wet weather. The assignment of dry-weather and wet-weather WLAs reflects the difference in flow and corresponding nutrient loading under dry-weather and wet-weather conditions.

Dry-weather load reductions for grazing activities have not been quantified because their existing loading was not quantified. However, they are assigned a percent reduction of their existing TN and TP load equal to 10%. The existing load will be quantified as part of management plans required to implement the TMDL (see Section 7).

6.1.7 Dry- and Wet-Weather LAs for OWTS

LAs for OWTS were calculated based on an assumed reduction of TN loading equal to 50% based on requirements in the State Water Resources Control Board Policy for OWTS for supplemental treatment of certain OWTS in Tier 3, Impaired Areas. The resulting allowable load from OWTS is 7,478 pounds TN per year. The LAs are the same for dry and wet weather because there is little seasonal difference in loading from OWTS. No LAs are assigned to OWTS for TP.

6.1.8 Dry- and Wet-weather WLAs for Other NPDES Permittees

Dry-weather WLAs for other NPDES permittees are equal to the in-stream nutrient concentrations required to meet algal biomass numeric targets of 1.15 mg/L TN and 0.115 mg/L TP. Wet-weather allocations are set to attain site-specific nitrogen water quality objectives from Table 3-8 of the Basin Plan (Table 6-7). There are no site-specific objectives for Reach 1 or the Estuary, nor are there any "Other NPDES permittees" that discharge to Reach 1 or the Estuary. Thus, there are no wet-weather WLAs assigned to Other NPDES permittees for Reach 1 or the Estuary.

6.2 Wet-weather Allocations

6.2.1 Wet-weather allocations for Stormwater, Agriculture, and Horse/Livestock Sources

Based on the linkage analysis, wet-weather loads do not have a significant impact on receiving water quality in the Ventura River and its tributaries or the Estuary and biostimulatory objectives are attained. Thus, wet-weather allocations are set to attain site-specific water quality objectives from Table 3-8 of the Basin Plan (Table 6-7). There are no site-specific objectives for Reach 1 or the Estuary. For Reach 1 and the Estuary, wet-weather WLAs for stormwater sources are equal to existing water quality in stormwater discharges (maximum TN = 4.6 mg/L from Table 4-5) and LAs for agriculture and horse/livestock sources are equal to benchmarks of 10 mg/L nitrate-N + nitrite-N in the Agriculture Waiver.

Table 6-7 Wet-weather Allocations

Reach	Nitrate-N + Nitrite-N (mg/L)
Estuary	*
Reach 1	*
Reach 2	10
Cañada Larga	10
Reach 3	5
San Antonio Creek	5
Reach 4	5
Reach 5	5
*WLAs for stormwater are equal to 4.6 mg/ L TN and WLAs for agriculture and horse/livestock sources are equal to 10 mg/L nitrate-N + nitrite-N.	

6.2.2 Wet-weather Allocations for Ojai Valley WWTP

In wet-weather conditions, the biological performance of treatment operations at the Ojai Valley WWTP may be reduced due to lower temperatures and loading may increase due to increased inflows. Therefore, during wet-weather events, concentration-based WLAs are based on the 90th percentile of existing performance of the facility since 2000 (Table 6-8). Because the 90th percentile value is calculated based on the last 12 years of data, it includes older data prior to plant upgrades, and thus underestimates current performance (i.e., nutrient concentrations are higher); this results in attainable wet-weather WLAs.

Table 6-8 Ojai Valley WWTP Wet-weather WLAs

TN (mg/L)	TP (mg/L)
7.6	2.6

6.3 Margin of Safety

The sources of uncertainty in this TMDL are related to the selection of the algal biomass target, the relationship between nutrient concentrations and algal biomass in freshwater river systems and estuaries, the estimate of watershed-based nutrient loading, and the model-predicted water quality conditions in the receiving water. These areas of uncertainty are addressed with both an implicit and explicit margin of safety.

The implicit margin of safety includes conservative assumptions made when estimated watershed-based nutrient loading. For example, the nitrate and phosphate concentrations used to estimate dry-weather loading from agriculture is based upon measured data from an area more intensely farmed (and having tile drains, which concentrate nutrients) than in the Ventura River watershed. The flows for Canada Larga and San Antonio Creek were higher than the median flows obtained from long-term flow records. This overestimates the loading into the main stem of the river and conservatively predicts main stem nutrient concentrations. Finally, basing the allocations on dry-weather loading is a conservative approach to addressing impairments in the dry season. As presented in the TMDL the

water quality impairments are documented during the dry season, which is defined as May 1st – Sept. 30th. However, in southern California it is quite common to have warm springs (March, April) and/or warm falls (October, November); thus the dry-weather allocations work to protect the river during these periods and constitutes part of the TMDL implicit margin of safety.

The explicit margin of safety is calculated as the difference between the model-predicted maximum concentration in-stream after implementation of reduction scenarios and the desired in-stream concentrations of 1.15 mg/L TN and 0.115 mg/L TP. The resulting explicit margin of safety is 7%. This explicit margin of safety is applied to account for uncertainty in the algal biomass numeric target of 150 mg/m^2 and the relationship between the required in-stream nutrient concentrations necessary to attain this value. This explicit margin of safety also addresses the fact that the model-predicted nutrient concentrations are reflective of median measured concentrations, and do not capture not maximum concentrations (Figures 5-8 and 5-9).

7. IMPLEMENTATION

This section describes the regulatory mechanisms that will be used to implement the TMDL, how compliance with WLAs and LAs will be determined, implementation measures that could be used to attain WLAs and LAs, and an implementation schedule. This section also includes a discussion of monitoring requirements, special studies that may be conducted to evaluate assumptions in the TMDL, and a consideration of costs of the reasonably foreseeable methods of compliance with the TMDL.

7.1 Implementation of WLAs

The regulatory mechanisms used to implement the WLAs include the Ojai Valley WWTP NPDES permit, the Ventura County MS4 NPDES permit, the Caltrans MS4 NPDES permit, the general industrial storm water permits, the general construction storm water permits, and other NPDES permits. Effluent limits consistent with the assumptions and requirements of the WLAs shall be incorporated into each permit, following the effective date of this TMDL, at the time of permit issuance, modification, or renewal of the permit.

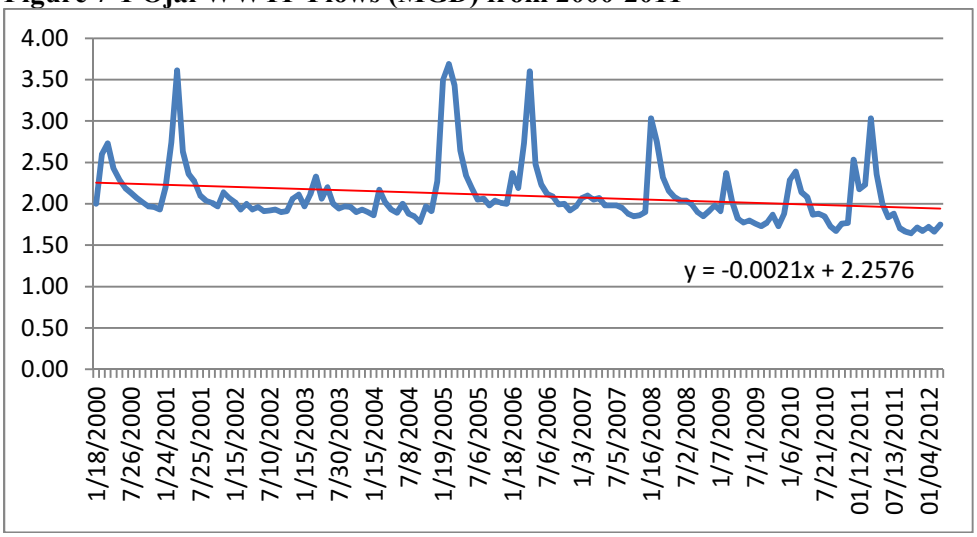
7.1.1 Ojai Valley WWTP

The TN WLAs for the Ojai WWTP shall be incorporated into the permit as seasonal numeric effluent limitations. The summer dry-weather effluent limitation shall be equal to the summer dry-weather WLA of 8,044 lbs/season (May 1 to September 30). Compliance with the summer dry-weather effluent limitation shall be determined by calculating the sum of the products of the monthly average TN concentration and the daily flow for each dry-weather day, over the summer season. The winter dry-weather WLA and wet-weather WLA shall be combined into a single concentration-based winter season effluent limitation, calculated as the weighted average of 4 mg/L (the allowable winter dry-weather concentration) and 7.6 (the allowable wet-weather concentration), based on the assumption that there are 178 winter dry-weather days and 34 wet-weather days in a year. The resulting concentration of 4.6 mg/L shall be expressed as a monthly effluent limitation from October 1 to April 30. This calculation is consistent with the assumptions and requirements of the winter dry-weather and wet-weather WLAs.

For TP, compliance with the dry-weather WLA-based effluent limitation shall be determined by calculating the sum of the products of the monthly average TP concentration and the daily flow for each dry-weather day, over an annual period. Wet-weather days shall be excluded from the dry-weather WLA compliance determination.

Based on the mass-based allocation scenario, it is possible that if flows approach the design capacity of 3 MGD, the Ojai WWTP will have to reduce concentrations of nutrients below 3 mg/L TN and 1 mg/L TP in order to attain WLAs. However, it is not expected that flows will increase significantly during the permit cycle; as result of very slow growth in the watershed, flows discharged from the Ojai WWTP have been constant, and have even slightly decreased, over the last 12 years (Figure 7-1). Thus, it is expected that Ojai WWTP will attain mass-based WLA-based effluent limitations.

Figure 7-1 Ojai WWTP Flows (MGD) from 2000-2011



In addition, the TMDL will be revised to adjust the allocation scenario and increase the allocation for the Ojai WWTP if the Ojai WWTP takes additional flows from other sources in the watershed such as septic systems in order to achieve the TMDL. The Ojai WWTP will document and report annually the number, flow and TN load from watershed sources for the Regional Board to consider as part of the TMDL reconsideration.

The wet-weather WLAs shall be incorporated as numeric effluent limitations, expressed as a daily maximum concentration, to be assessed at a minimum with monthly sampling during months when rain occurs. Ojai WWTP shall achieve compliance with wet-weather WLAs upon incorporation into the permit.

Ojai WWTP shall achieve compliance with dry-weather WLAs within 10 years of the effective date of the TMDL. Ojai Valley WWTP shall submit justification for an implementation schedule up to 10 years as part of their report of waste discharge in accordance with the Compliance Schedule Policy. Ojai Valley WWTP shall have interim dry-weather WLAs based on current plant performance (90th percentile of the last twelve years of data); i.e., equal to wet-weather WLAs (Table 7-1). Because the 90th percentile value is calculated based on the last 12 years of data, it includes older data prior to plant upgrades, and thus underestimates current performance (i.e., nutrient concentrations are lower); this results in attainable interim WLAs. The interim WLAs apply in both winter dry weather and summer dry weather.

Table 7-1 Ojai Valley WWTP interim dry-weather WLAs

TN (mg/L)	TP (mg/L)
7.6	2.6

7.1.2 Ventura County MS4 and Caltrans

The WLAs for the Ventura County MS4 permittees and Caltrans shall be incorporated into the permit as numeric water quality-based effluent limitations. Permittees may be deemed in compliance with water-quality based effluent limitations if they demonstrate that (1) there are no violations of the water quality-based effluent limitation at the Permittee's applicable MS4 outfall(s); or (2) there is no direct or indirect discharge from the Permittee's MS4 to the receiving water during the time period subject to the water quality-based effluent limitation.

Wet-weather numeric effluent limitations shall be expressed as event mean concentrations and shall apply immediately upon issuance, modification, or renewal of the permits. Compliance with wet-weather WLAs shall be assessed at a minimum with two wet-weather sampling events. If permittees provide a quantitative demonstration that watershed control measures and BMPs will achieve wet-weather water quality-based effluent limitations, then compliance with wet-weather water quality-based effluent limitations can be determined by satisfactory implementation of those actions, subject to Executive Officer approval.

Dry-weather WLAs shall be assessed at a minimum with quarterly sampling and shall be attained within 6 years. Compliance will only be assessed on the day of sampling. Dry-weather sampling may occur 72 hours after a storm event. The 6-year dry-weather implementation schedule is based on the estimated time needed to eliminate or treat the very low dry-weather storm drain flows observed in the watershed using standard structural and nonstructural BMPs that are consistent with the current MS4 permit obligations. If necessary, in order to request additional time to attain dry-weather WLAs, permittees shall demonstrate that they have effectively pursued design, permitting, and construction of necessary BMPs prior to the five-year TMDL reconsideration.

Consistent with the assumptions of the dry-weather waste load allocations, compliance may be demonstrated with area-weighted effluent limitations. Area-weighted effluent limitations should be 0.0025 lb/day/acre TN and 2.3×10^{-5} lb/acre/day TP for the Ventura County MS4, and 0.0042 lb/acre/day TN and 4.2×10^{-4} lb/acre/day TP for Caltrans, derived by dividing the daily loads by the total land use area in the watershed covered by their respective permits (11,085 acres for the Ventura County MS4 and 251 acres for Caltrans, excluding the Coyote Creek subwatershed).

Ventura County MS4 permittees and Caltrans shall provide an implementation plan to the Regional Board outlining how they intend to achieve compliance with the WLAs. The report shall include implementation methods, an implementation schedule, proposed interim milestones, and compliance points. The report shall provide reasonable assurance that implementation methods will be sufficient to achieve the WLAs.

7.1.3 General Industrial and Construction Stormwater Permittees

The dry- and wet-weather WLAs for the general and industrial stormwater permittees shall apply immediately upon permit issuance, modification, or renewal and shall be incorporated into permits as numeric effluent limitations. Wet-weather numeric effluent limitations shall be expressed as event mean concentrations and dry-weather numeric effluent limitations shall be expressed as instantaneous maximums. Compliance with wet-weather WLAs shall be assessed at a minimum with one wet-weather sampling event. Compliance with dry-weather WLAs shall be assessed at a minimum by averaging the results of two grab samples.

7.1.4 Other NPDES Permittees

The dry- and wet-weather WLAs for other NPDES permittees shall apply immediately upon permit issuance, modification, or renewal of applicable permits and shall be incorporated into permits as numeric effluent limitations. Wet-weather numeric effluent limitations shall be expressed as event mean concentrations and dry-weather numeric effluent limitations shall be expressed as instantaneous maximums. Compliance with wet-weather WLAs shall be assessed at a minimum with one wet-weather sampling event. Compliance with dry-weather WLAs shall be assessed at a minimum with two grab samples.

7.2 Implementation of LAs

Two primary federal statutes establish a framework in California for addressing nonpoint source water pollution: Section 319 of the Clean Water Act (CWA) of 1987 and Section 6217 of the Coastal Zone Act Reauthorization Amendments of 1990 (CZARA). In accordance with these statutes, the state assesses water quality associated with nonpoint sources of pollution and develops programs to address nonpoint sources. The *Plan for California's Nonpoint Source Pollution Control Program* (NPS Program Plan), which became effective in 2000, provides a coordinated statewide approach to dealing with nonpoint source pollution. Federal approval of the NPS Program Plan required the State Water Resources Control Board (SWRCB) to provide assurances that it has the legal authority to implement and enforce the NPS Program Plan. In 2004, the SWRCB adopted the Nonpoint Source Implementation and Enforcement Policy. This policy specified that the regional boards have the administrative permitting authorities to regulate nonpoint sources of pollution through Basin Plan discharge prohibitions, waste discharge requirements (WDRs), and waivers of WDRs. The regulatory mechanisms that will be used to implement LAs for each source category are described below.

7.2.1 Agricultural Discharges

The LAs for irrigated agricultural lands shall be implemented through the Agriculture Waiver or other appropriate Regional Board order. Under the existing Agriculture Waiver (Order No. 2010-0186), growers are required to monitor discharges and, if water quality exceeds objectives, growers are required to develop a water quality management plan and

implement best management practices (BMPs) to attain objectives. Each owner and/or operator of irrigated agricultural lands in the Ventura River Watershed shall be required to enroll in the Agriculture Waiver or other Regional Board order in order to comply with the LAs. Agricultural lands shall achieve compliance with dry- and wet-weather LAs within 6 years of the effective date of the TMDL.

The existing monitoring program for the Agriculture Waiver includes two monitoring sites in the upper watershed that monitor runoff from orchards. To implement the LAs in this TMDL, the monitoring program shall be revised to add representative sites in the lower watershed to monitor runoff from other crop types. In addition, VCAILG shall work with the Regional Board staff to relocate monitoring sites in the upper watershed to better assess potential dry-weather runoff from agriculture. The existing monitoring program for the Agriculture Waiver requires two dry-weather and two wet-weather sampling events. In order to implement the dry-weather LAs, dry-weather sampling may occur 72 hours after a storm event. The revised monitoring program shall be subject to approval by the Executive Officer of the Regional Board.

To assist in implementation of LAs, area-weighted benchmarks can be applied; if used, they shall be 0.008 lb/day/acre TN and 3.2×10^{-5} lb/acre/day TP, derived by dividing the daily loads by the total agriculture area in the watershed (1971 acres, excluding orchards and the Coyote Creek subwatershed).

Order No. 2010-0186 states, "It is expected that source control management practices, such as improved irrigation efficiency and fertilizer management, employed by Dischargers to attain surface Water Quality Benchmarks will reduce loading to groundwater as well." To implement this TMDL, the VCAILG water quality management plan shall specify that all growers in the Ventura River watershed shall implement nutrient-related source control BMPs. If the LAs are implemented in another Regional Board order in the future, then that order shall require growers in the Ventura River watershed to implement nutrient-related source control BMPs.

7.2.2 OWTS

The LAs for OWTS shall be implemented through discharge prohibitions, WDRs, or waivers of WDRs. Commercial and multifamily OWTS are currently regulated by the Regional Board through WDRs. Single family residential OWTS are currently regulated by the City of Ojai, the City of Ventura, and the County of Ventura, as specified in memorandums of understanding (MOUs) with the Regional Board, in order to implement a waiver of WDRs for single family residential OWTS adopted by the Regional Board in 2004. The MOUs require the Regional Board to evaluate the local agency every five years to ensure their municipal plumbing code and OWTS program is substantially equivalent to any statewide standards adopted pursuant to CWC sections 13290 and 13291.

CWC sections 13290 and 13291 require that the SWRCB adopt statewide regulations for the permitting and operation of OWTS (OWTS Policy). SWRCB adopted a policy to comply with CWC sections 13290 and 13291 on June 19, 2012. The OWTS Policy will become final and in effect once it is approved by the Office of Administrative Law. The

policy emphasizes local management of OWTS. The policy requires an Advanced Protection Management Program and local agencies are authorized to implement Advanced Protection Management Programs in conjunction with their existing programs and in collaboration with the Regional Board. The geographic area for the Advanced Protection Management Programs to implement this TMDL shall initially be the entire Ventura River watershed because the TMDL applies to all reaches and tributaries of the Ventura River and because of the demonstrated connectivity between groundwater and surface water throughout the watershed.

The OWTS in the Ventura River watershed fall under Tier 3 of the OWTS Policy. The Regional Board will work with local agencies to determine which existing OWTS or areas of OWTS are contributing to the overall loading from OWTS as described in the source assessment (Section 4). Areas found not to be contributing to the overall loading may be removed from the Advanced Protection Management Program as approved in a Local Agency Management Program. Existing OWTS are required to be upgraded or modified to enhance their nitrogen removal or meet other requirements of the Advanced Protection Management Program if it is determined they are contributing to the impairment, and are subsequently covered under approved special provisions of a Local Agency Management Program, or the Regional Board issues subsequent orders requiring upgrades or modifications. Existing OWTS will remain regulated by existing MOUs and future Local Agency Management Programs until the above determination is made and subsequent upgrades are required.

New or replacement OWTS installations, as defined by the OWTS Policy upon its becoming effective, that are within the Advanced Protection Management Program area, shall meet the supplemental treatment requirements for nitrogen per Tier 3 of the OWTS Policy.

The Regional Board will evaluate the existing MOUs and any future submittal of a Local Agency Management Program under the OWTS Policy with the City of Ventura, the City of Ojai, and the County of Ventura to determine if their OWTS programs need to be updated to reflect the OWTS Policy, or if additional changes are needed to implement the LAs. OWTS dischargers shall achieve compliance with dry- and wet-weather LAs within 10 years of the effective date of the TMDL.

7.2.3 Horse and Livestock Activities

The LAs for horse and livestock facilities shall be regulated by WDRs or waivers of WDRs. It is expected that a waiver program similar to the Agriculture Waiver will be adopted for horse and livestock activities. As part of the proposed program, horse and livestock facilities shall be required to conduct monitoring and develop management plans that will assess baseline water quality discharged from their facilities, determine reductions needed to attain LAs, and implement management measures to attain LAs.

Compliance with LAs will be demonstrated at monitoring sites approved by the Executive Officer of the Regional Board through the monitoring program developed as part of the waiver or WDR, or through a monitoring program that is required to implement this TMDL

in the event a waiver or WDR is not adopted in accordance with the TMDL implementation schedule. Horse and livestock facilities shall achieve compliance with dry- and wet-weather LAs within 10 years of the effective date of the TMDL.

7.3 Potential Implementation Strategies and Associated Costs

The TMDL requires responsible parties to attain WLAs and LAs for nutrients to prevent excessive algal growth and maintain adequate dissolved oxygen concentrations and pH values in the Ventura River and its tributaries. There are many implementation alternatives available to reduce nutrient loading. Rather than a single treatment solution, a combination of implementation measures may be required to reduce nutrients and algae to acceptable levels. The following discussion presents several potential implementation strategies that could be used to comply with the TMDL and their associated costs.

The cost estimates for the potential implementation actions are intended to provide the Regional Board with a reasonable range of potential costs of implementing this TMDL. The cost estimates are not additive; rather, responsible parties may implement individual potential treatment alternatives or a combination of alternatives and the costs would vary accordingly. The cost estimates account for a range of economic factors and require a number of assumptions regarding the extent of implementing many of the measures. In reviewing the cost estimates, it should be noted that there are multiple additional benefits associated with the implementation of these strategies. Many of the structural and non-structural BMPs to address nutrient loadings could also reduce the loading of other contaminants, which could assist in meeting the requirements of other existing or future Ventura River TMDLs.

7.3.1 Waste Water Treatment Plant Upgrades

7.3.1.1 Upgrading Nitrification-Denitrification (NDN) Processes at Ojai Valley WWTP

The Ojai Valley WWTP currently operates with advance secondary treatment including nitrification and denitrification. Three alternatives have been previously considered by the Ojai Valley Sanitation District to upgrade the WWTP in order to decrease nutrient discharges (MWH, 2007). The first two options consider a total nitrogen limit of 3mg/L, and a phosphorus limit of 1mg/L. The third scenario considers a total nitrogen limit of 1mg/L and a phosphorus limit of 0.1mg /L. The first two alternatives are presented here based on the WLAs for the Ojai WWTP equal to 3 mg/L TN and 1 mg/L TP.

7.3.1.2 Conversion to Modified Bardenpho process

The first alternative to improve the plant's denitrification capacity is to convert the existing three stage process (comprised of successive anaerobic, anoxic and anaerobic zones) to a five-stage Modified Bardenpho process. The upgrade consists of the addition to the existing process of a second (post-aeration) anoxic zone, including inclusions of carbon in the form of methanol to increase denitrification, followed by a third aerobic zone. The

capital cost for this option is estimated to be 16.6 million dollars, with operation and maintenance costs of $205,000 annually (adjusted to 2012 dollars).

7.3.1.3 Addition of denitrification filters

The second proposed implementation alternative is the addiction of denitrification filters to the existing facilities, a process that serves the dual purpose of denitrification and filtration of suspended solids. The heterotrophic microorganisms cultivated on the Granular media denitrification filters will require methanol addition as a source of carbon to sustain growth. The estimated construction cost is 17.2 million dollars and the maintenance cost is $270,000 per year (adjusted to 2012 dollars).

With either of these alternatives optimization of phosphorus removal can be added. Based on the MWH (2007) report the facility has capabilities to include alum or other coagulant treatments.

7.3.2 Urban Runoff Implementation Alternatives

7.3.2.1 Biofilter systems

Biofilters, also known as vegetated swales and filter strips, are vegetated slopes and channels designed and maintained to transport runoff slowly over vegetation. The slow movement of runoff through the vegetation provides an opportunity for sediments and particulates to be filtered and degraded through biological activity. In most soils, the biofilter also provides an opportunity for infiltration of dry-weather runoff and storm water, which further removes nutrients and reduces runoff volumes. Swales convey flows to a vegetation-lined channel and grass filter strips intercept sheet runoff to a uniformly graded buffer zone. Grass strips and vegetated swales can function as pretreatment systems for water entering bioretention systems or other BMPs. These can be installed as on-site features of developments or in street medians, parking lot islands, or curb extensions (CASQA, 2003). Biofilters can be used to effectively reduce nutrient loading; the range of removal efficiency is 20 – 80 percent (CASQA, 2003).

Vegetated swales or filter strips, based on case studies, are capable of managing runoff from small drainage areas with approximate sizes of 10 acres. Considering a unit swale that is 10 feet wide and 1,000 feet long, which results in a hydraulic residence time of at least 10 minutes, for each 10 acres of drainage area, the ratio of the swale surface area to each draining acre, is 1,000 square feet per acre (CASQA, 2003). The mid-range cost to construct a swale for treatment of a 10-acre drainage area is $20,000 (adjusted to 2012 dollars) (CASQA, 2003). The annual maintenance cost is estimated at 5% (Table 7-2).

Table 7-2 Summary of vegetated swales costs

Items	Unit Cost (per 10-acre drainage area)
Capital Cost	$20,000
Operation and Maintenance Cost	$100

7.3.2.2 Alum Injection Systems to treat urban runoff

Alum injection systems are another treatment option for dry weather or stormwater runoff. Alum injection is the process of adding aluminum sulfate salt (alum), to stormwater prior to discharge into the river. The systems can be installed and sited at appropriate locations in the watershed. Alum fixes itself to common pollutants, such as phosphorus, and the floc settles from the water column. Studies of the effectiveness of nutrient removal report 30 - 90 percent removal for nitrogen and phosphorus.

Parameters to be considered for design of the automated alum injection system include the stormwater drainage area, flow rate of stormwater discharge, locations of the system, and the seasonal precipitation. The construction cost for a drainage area of 1,500 acres ranges from $100,000 to $550,000 with the average capital cost of $2,100 per acre treated (adjusted to 2012 dollars). The overall operation and maintenance cost ranges from $37 to $287 per acre treated per year, with an average of $166 dollars per acre per year (Harper, Herr, Livingston, 1999) (Table 7-3).

Table 7-3 Summary of alum injection costs

Items	Unit Cost
Capital Cost	$2,100 per acre
Operation and Maintenance Cost	$166 per acre per year

7.3.2.3 Constructed wetlands

Constructed treatment wetlands are designed to maximize the removal of pollutants from storm water and dry-weather urban runoff through settling and uptake and filtering by vegetation. Constructed wetlands temporarily store runoff in a shallow marsh that support conditions suitable for the growth of wetland plants. These excess nutrients are absorbed by wetland soils and taken up by plants and microorganisms. The treatment efficiency of constructed wetlands varies considerably (TN 26% $\pm$ 49%, TP 43% $\pm$ 40%); however, proper design and maintenance helps to improve their performance (US EPA, 2003a).

CASQA (2003) reports an estimated cost of wetland installation for a 100 acre-foot facility of $1,800,000 (adjusted to 2012 dollars). Annual operation and maintenance costs are estimated at 5% of the construction cost (Table 7-4).

Table 7-4 Summary of storm water constructed wetland costs

Items	Unit Cost
Capital Cost	$18,000 per acre
Operation and Maintenance Cost	$900 per acre per year

7.3.2.4 Non-structural BMPs

Non-structural BMPs include educational and pollution prevention practices. Several nonstructural BMPs are listed below.

- Prohibition of non-stormwater discharges to the MS4
- Increased cleaning of catch basin inlets and open channels
- Public education and outreach
- Illicit connection and discharge prevention

The costs for a number of non-structural measures have been estimated for the entire Los Angeles Region (Devinny et al., 2004), which has an area of 3,100 square miles. The source control measure costs for the Ventura River watershed were scaled down proportionally. The Ventura River watershed is approximately 228 square miles. The watershed has 17.9 square miles of urban area that could need to be treated to comply with the TMDL. The following represent the approximate values for the Ventura River watershed for source control measures based on the Devinney et al., study:

- Public education - $28,871 per year
- Increased storm drain cleaning - $155,903 per year

The prohibition of non-stormwater discharges and the illicit connection elimination programs are existing MS4 programs and the costs were not estimated.

7.3.3 Agriculture Implementation Alternatives

7.3.3.1 Filter Strips

NRCS estimates that filter strips planted with native plant material are $1,031 per acre of filter strip installed. Staff estimated a ratio of treated agricultural land area to filter strip area of 60:1 using design methods described in *Design of Stormwater Filtering Systems* (CWP, 1996) and assuming a 99% pervious drainage area, a 1-inch storm, a minimum filter strip length of 25 feet, a berm height of six inches, and a 150-foot by 150-foot drainage area.

The calculated 60:1 ratio is consistent with the NRCS Conservation Practice Standard for Filter Strips (Code 393), which specifies that the ratio of the drainage area to filter strip area shall be less than 60:1 in regions with RUSLE-R (Revised Universal Soil Loss Equation- Rainfall-Erosivity) factor values of 35-175 (RUSLE-R factor values for California range from 60-100).

Assuming a ratio of treated agricultural land area to filter strip area of 60:1, the cost of filter strips is $17 per acre of agricultural land treated. According to Code 393, filter strips should be designed to have a 10-year lifespan. Assuming a 10-year lifespan and a 5 percent discount rate, the equivalent annual cost of filter strips is $2 per acre-year.

7.3.3.2 Mulching

NRCS estimates that mulching costs $808 per acre of mulch applied. The NRCS Conservation Practice Standard for Mulching (Code 484) specifies that mulching should be applied at a rate to achieve a minimum of 70 percent ground cover to provide erosion control. Therefore, the cost of mulching is $566 per acre of agricultural land treated.

According to the NRCS Field Office Technical Guide (FOTG) for mulching, the reported lifespan for this practice is one year, but local NRCS staff has reported that woody mulch can last two to three years and mulch residue can last up to five years. Assuming a lifespan of three years and a 5% discount rate, the equivalent annual cost of mulching is $208 per acre-year.

7.3.3.3 Improved Irrigation Efficiency and Nutrient Management

Often replacing a traditional irrigation system with a drip irrigation system can reduce nutrient runoff. Improved maintenance of the systems may further reduce farm runoff. Costs for installing and maintaining micro-irrigation systems vary according to the type of production found in the watershed (NRCS FOTG Cost Data 2010; see Table 7-5 below). On average, the installation cost is $1784 per acre, with a maintenance cost of $84.

Table 7-5 Summary of micro-irrigation costs

Items	Unit Cost
Nursery or greenhouse	
Capital Cost	$3,006 per acre
Operation and Maintenance Cost	$150 per acre per year
Lifespan	10 years
Orchard or vineyard > 10 acres	
Capital Cost	$1406 per acre
Operation and Maintenance Cost	$70 per acre per year
Orchard or vineyard < 10 acres	
Capital Cost	$2006 per acre
Operation and Maintenance Cost	$100 per acre per year
Row/field cropland. Buried manifold	
Capital Cost	$1506 per acre
Operation and Maintenance Cost	$75 per acre per year
Row/field cropland. Layflat manifold	
Capital Cost	$996 per acre
Operation and Maintenance Cost	$50 per acre per year
AVERAGE	
Capital Cost	$1784 per acre
Operation and Maintenance Cost	$89 per acre per year

The NRCS cost estimate for a nutrient management plan is $55 per acre-year (NRCS FOTG Cost Data, 2010).

7.3.3.4 Manure Management

Manure management requires horses and/or livestock owners to collect, store, and dispose of manure in a manner that minimizes nutrient contributions to the river. One method to properly store manure is to construct manure bunkers that prevent stormwater and dry-weather runoff from carrying nutrients to the river. The average cost to construct a manure bunker is $4,500 (Ecology Action, personal communication, in CRWQCB 2009; adjusted to 2012 dollars). This cost applies to bunkers constructed on an existing cement slab, or a where a new one was poured, and includes a permanent roof or a tarp cover. The cost of bunkers varies depending on the size and materials, and ranges from $3000 to $17,000.

7.3.3.5 Grazing Management

Grazing management protects stream banks, riparian zones, and minimizes nutrient contributions to the river and tributaries. Grazing management includes using fencing, stream crossings, and providing alternative drinking locations in order to exclude livestock from sensitive areas. Grazing management can also reduce upland erosion through prescribed grazing, seeding, and gully erosion control which utilizes grade stabilization and ponds. Federal land managers (i.e. Bureau of Land Management, Forest Service) have plans with recommendations for grazing management practices (US EPA, 2003b).

Preventing horses and cattle access to waterways requires the installation of fences along portions of streams susceptible to damage and installation of watering facilities to provide

an alternative water source for the animals. An average installation cost of fencing is $7.6 per feet. The costs range depending on the type of fencing from $2.20 – $13 (Table 7-6).

Table 7-6 Summary of fencing costs

Items	Unit Cost
Conventional*	
Capital Cost	$13 per feet
Operation and Maintenance Cost	$0.2 per feet per year
Electric	
Capital Cost	$2.2 per feet
Operation and Maintenance Cost	$0.1 per feet per year
Woven wire*	
Capital Cost	$13 per feet
Operation and Maintenance Cost	$0.2 per feet per year
AVERAGE	
Capital Cost	$6.1 per feet
Operation and Maintenance Cost	$0.1 per feet per year

* Based on the difficulty of the terrain in the Ventura River watershed, numbers for conventional and woven wire fences are for structures built on very rugged, undulating sites with heavy brush and/or with stony, shallow or sand soils. Such evaluation was not available for the cost of electric fencing.

The demand for alternative water facilities is related to the size of the ranching operation; unit cost for watering facilities varies based on volume (Table 7-7). The average cost of a typical watering facility is $1,356.

Table 7-7 Summary of watering facilities costs

Items	Unit Cost
2,501-5,000 gal	
Capital Cost	$2,413 per unit
Operation and Maintenance Cost	$46 per unit per year
601-2,500 gal	
Capital Cost	$1529 per unit
Operation and Maintenance Cost	$30 per unit per year
300-600 gal	
Capital Cost	$991 per unit
Operation and Maintenance Cost	$13 per acre per year
<300 gal	
Capital Cost	$491 per unit
Operation and Maintenance Cost	$9 per unit per year
AVERAGE	
Capital Cost	$1356 per unit
Operation and Maintenance Cost	$25 per unit per year

7.3.4 Anaerobic Biodigester Systems

Manure produced by horses and livestock can be converted to biogas for renewable source of energy. The biodigester mixes organic wastes and manure with water and bacteria. During anaerobic digestion, bacteria break down organic wastes and manure in an oxygen-free environment.

The Waste to Energy project team is proposing to build an anaerobic digester in the Ojai Valley (W2E) to convert organic wastes produced in the area to energy (electricity/biogas), compost, and liquid fertilizer (W2E, 2010). The solid organic wastes in the Ojai Valley are estimated to be 30-70 tons/day; the proposed biodigester, with a capacity of 50-75 tons/day, could potentially treat the majority this waste. The estimated construction costs for the plant are 6 to 8 million dollars (W2E, 2010) and subsequent annual costs for a 50 tons/day plant (scaled up from the 31 tons/day biodigester at UC Davis) are estimated to be about $420,000 annually. Annual revenues could total $725,000 per year based solely on sale of power. Accordingly, the payback period for the capital would be 5 to 10 years (Table 7-8). A feasibility study is to be completed by a grant administered by the Ventura County Watershed Protection District in 2012 and should be used for further planning.

Table 7-8 Summary of anaerobic biodigester systems costs

Items	Total Cost
Capital Cost	$6,000,000 to $8,000,000
Operation and Maintenance Cost	$420,000 annually
Revenue	$725,000 annually

7.3.5 OWTS Inspections and Upgrades

Various actions may be required to reduce the loading from OWTS. These may include actions ranging from inspection or regular monitoring to the installation of supplemental treatment. An assessment of a site to determine if a particular OWTS is contributing to surface water loading of nutrients could cost as much as $5,000 dollars. The Regional Board will work with local agencies to utilize existing monitoring wells and data to the extent practicable in order to reduce costs. If testing confirms the need for advanced treatment, the cost of upgraded systems could cost up to $22,000 dollars (SWRCB, 2012). There would also be ongoing maintenance and monitoring requirements to ensure the advanced treatment is performing well.

The cost of compliance for OWTS owners will depend on the type of system and the capacity of the system. Local agencies will likely incur additional costs to the extent that they need to revise their existing programs or practices. These local agency costs may be passed on to OWTS owners in the form of permit fees.

The relatively high costs of supplemental treatment OWTS may make the option of connecting to the community collection system attractive to members of a neighborhood or community where local siting conditions are challenging or not appropriate for individual systems. Connection fees are approximately $15,000 per connection. There are additional

costs with demolishing the existing OWTS and updating the site pluming to accommodate the sewer connection, which can cost approximately $10,000 per unit. (Jeff Palmer, personal communication, June 16, 2012.)

The SWRCB has set aside funds from its State Revolving Fund Program that can be made available to local qualified agencies who can then provide low-interest loans to homeowners to repair, replace, or upgrade their OWTS or connect to the sewer system.

7.3.6 Watershed Wide Implementation

7.3.6.1 Riparian Buffers and Stream Bank Stabilization

Riparian buffers consist of an area of trees, usually accompanied by grasses, shrubs, and other vegetation that are adjacent to a waterbody. They reduce the impact of nonpoint source pollution by trapping and filtering sediments, nutrients, and other chemicals from surface runoff and shallow groundwater. The leaf canopy provides shade that keeps the water cool, discouraging algae growth and thus retaining more dissolved oxygen. Trees and shrubs near the waterway stabilize the bank, improve and protect the aquatic environment, and protect stream banks from flood erosion and debris damage. Riparian enhancements may include a wide variety of practices intended to restore the natural condition and function of the river and its riparian area. These practices may include stream bank stabilization and outfall protection, planting of stream bank vegetation and establishment of sufficient stream buffers, removal of invasive plant species, improvement of floodplain connections, removal of fish barriers, and enhancement of wetlands (OCES, 1998).

7.3.7 Matilija Dam Removal

In order to restore ecological function of the Ventura River, removal of Matilija Dam and accumulated sediments behind the dam is planned. A final EIS/EIR was completed in 2004, which identified the preferred dam removal alternative. In the preferred alternative, the entire concrete dam structure above the original streambed will be removed; sediments will be slurried in pipelines to downstream sediment placement sites. This alternative is estimated to take three years to complete.

Slurry disposal site will be within the River's floodplain and the sediments may erode in storm events and contribute to winter nutrient loading. Potential slurry disposal sites are below the Robles Diversion. The sediments from the slurry disposal sites will be protected from erosion up to a 10-year storm.

Prior to the issuance of a Clean Water Act Section 401 Water Quality Certification from the Regional Board for the dam removal project, the project proponents will be required to develop an estimate of the potential for nutrient contributions from the stored sediments during storms and the appropriate level of sediment protection that will be required such that sediments do not cause or contribute to nutrient impairments addressed by this TMDL.

7.4 Monitoring Program

The monitoring programs will be designed to measure improvement in water quality and pollutant load reductions. The monitoring program has several goals including:

- Determine attainment of numeric targets;
- Determine compliance with the waste load and load allocations;
- Monitor the effect of implementation actions on river and estuary water quality.

The TMDL monitoring program will consists of three components 1) receiving water monitoring, 2) discharger monitoring, and 3) optional special studies. All monitoring requirements may be included in subsequent permits or other orders and are subject to Executive Officer approval.

7.4.1 Receiving Water Monitoring

Responsible parties (OVSD, Ventura County Watershed Protection District, Ventura County, the City of Ojai, the City of Ventura, Caltrans, and agricultural dischargers) are responsible for developing and implementing a comprehensive monitoring plan to assess numeric target attainment and measure in-stream nutrient concentrations. Responsible parties are encouraged to work together to submit a join watershed-wide plan. Once horse and livestock owners are enrolled in the regulatory mechanism to implement their LAs, they shall participate in the implementation of the watershed-wide monitoring plan or submit their own plan. The monitoring plan should outline a program to sample for algal biomass, algal percent cover, nutrients (total and dissolved), *in situ* water quality parameters (dissolved oxygen, pH, temperature, electrical conductivity), and flow for the river and estuary. Monitoring should include visual observations documenting whether the Estuary is open or closed. The monitoring procedures/methods, analysis, and quality assurance shall be SWAMP comparable where appropriate. The sampling frequency and locations must be adequate to assess beneficial use condition and attainment of applicable water quality objectives. At a minimum, for algal biomass and percent cover, the monitoring frequency shall be once per month in the dry season (May 1st to September 30th). After two years, if a significant difference between monthly algal biomass measurements is not observed, algal biomass monitoring may be reduced to three times per dry season, during the months of May, July, and September. DO and pH shall be measured continuously for two week periods on a quarterly basis. Continuous monitoring of DO and pH shall occur during the months of May and September in the 2nd and 3rd quarters. All other parameters shall be monitored monthly.

Existing receiving water monitoring conducted under other programs can be leveraged to assist in meeting these monitoring requirements. Responsible parties may build upon existing monitoring programs in the Ventura River watershed when developing the receiving water quality monitoring plan for this TMDL. Receiving water monitoring requirements shall be incorporated into the regulatory mechanisms for each responsible party upon issuance, renewal, or modification. The responsible parties may continue to coordinate a watershed-wide monitoring program to meet this requirement in order to

fulfill permit, WDR, or waiver requirements. Receiving water monitoring shall continue beyond the final implementation date of the TMDL unless the Executive Officer approves a reduction or elimination of such monitoring.

7.4.2 Discharge Monitoring

Discharge monitoring will assess attainment of the waste load and load allocations. Dischargee monitoring shall be required through the regulatory mechanisms used to implement the waste load and load allocations. Discharge monitoring shall be conducted at the frequency specified in Section 7.1 of the TMDL. The monitoring procedures/methods, analysis, and quality assurance shall be SWAMP comparable where appropriate.

7.4.3 Special Studies

Responsible parties within the watershed may conduct optional special studies designed to refine waste load and load allocations and numeric targets. The results of special studies and monitoring may be used to revise numeric targets and allocations, if supported, when the TMDL is reconsidered. The following are potential special studies.

- Build upon the algal biomass and total nitrogen relationship established in the 2008 UCSB Study (UCSB, 2009) and collect data to support the establishment of reach-specific relationships.
- Confirm the conclusion that an algal biomass target of 150 mg/m^2 is fully protective of aquatic life and minimizes the risk of low DO events.
- Collect additional source assessment information and model input data to refine model predicted relationships between watershed loading and in-stream nutrient concentrations.
- Investigate the influence of OWTS on surface water quality.
- Collect data to support development of an estuary model, which takes into account tidal influence, the dynamics of macroalgae and phytoplankton growth, residence time, and breaching conditions.

7.5 Implementation Schedule

The proposed implementation schedule shall consist of a phased approach consisting of monitoring and special studies before allocations become effective as presented in Table 7-9. The schedule allows six to 10 years from the effective date to meet the dry-weather and wet-weather load and waste load allocations in Ventura River and its tributaries.

Table 7-9 Implementation Schedule

Task	Due Date
Submit results of optional special studies.	4 years after effective date of TMDL
Reconsider TMDL to revise numeric targets and allocations if supported by special studies or other changes in the watershed.	5 years after effective date of TMDL
OVSD	
Wet-weather and interim dry-weather WLAs apply	Effective date of TMDL
Submit receiving water monitoring plan to assess numeric target attainment and measure in-stream nutrient concentrations	1 year after effective date of TMDL
Initiate receiving water monitoring plan	90 days after approval of receiving water monitoring plan
Compliance monitoring plan incorporated into permit	Upon permit adoption, renewal, or modification
Dry-weather WLA apply	No later than 10 years after effective date of TMDL*
Ventura County MS4 Permitees and Caltrans	
Wet-weather WLAs apply	Effective date of TMDL
Discharge monitoring plan incorporated into permit	Upon permit adoption, renewal, or modification
Submit receiving water monitoring plan to assess numeric target attainment and measure in-stream nutrient concentrations.	1 year after effective date of TMDL
Initiate receiving water monitoring plan	90 days after approval of receiving water monitoring plan
Submit implementation plan to achieve compliance with the WLAs. The plan shall include implementation methods, an implementation schedule, proposed interim milestones, and compliance points.	2 years after effective date of TMDL
Dry-weather WLAs apply	6 years after effective date of TMDL
General Industrial and Construction Stormwater Permittees	
Wet-weather and dry-weather WLAs apply	Effective date of TMDL
Discharge monitoring plan incorporated into permit	Upon permit adoption, renewal, or modification
Other NPDES Permitees	
Wet-weather and dry-weather WLAs apply.	Effective date of TMDL
Discharge monitoring plan incorporated into permit.	Upon permit adoption, renewal, or modification
Agricultural Discharges	
Discharge monitoring plan incorporated into Agriculture Waiver or other order	Upon adoption, renewal, or modification
Submit receiving water monitoring plan to assess numeric target attainment and measure in-stream nutrient concentrations	1 year after effective date of TMDL
Initiate receiving water monitoring plan	90 days after approval of receiving water monitoring plan

Task	Due Date
Wet-weather and dry-weather WLAs apply	6 years after effective date of TMDL
Onsite Waste Water Treatment Systems	
Wet-weather and dry-weather WLAs apply	10 years after effective date of TMDL
Horse/Livestock Owners	
Discharge monitoring plan submitted as part of waiver requirement or in response to Regional Board order	5 years after effective date of TMDL
Join watershed-wide group to conduct receiving water monitoring to assess numeric target attainment and measure in-stream nutrient concentrations or submit own plan	5 years after effective date of TMDL
Wet-weather and dry-weather WLAs apply	10 years after effective date of the TMDL

*If TMDL reconsideration results in more stringent WLAs, then the implementation schedule for OVSD may be extended, if necessary, by only the amount of time required to upgrade treatment processes to meet the more stringent WLAs.

8. REFERENCES

Ackerman, D. and K. Schiff. 2003. Modeling Storm Water Mass Emissions to the Southern California Bight. Journal of Environmental Engineering, 129 (4): 308-317.

Airaksinen, S., M.-L. Heiskanen, H. Heinonen-Tanski. 2007. Contamination of surface run-off water and soil in two horse paddocks. Bioresource Technology, 98:1762-1766.

American Society of Chemical Engineers (ASCE). 2003. Manure Production and Characteristics. ASAE D384.1

Anderson, C.W. and K.D. Carpenter. 1998. Water Quality and algal Conditions in the North Umpqua River Basin, Oregon, 1992-1995, and Implications for Resource Management. U.S. Department of the Interior, U.S. Geological Survey. Water Investigations Report 98-4125. Portland, OR. 78pp.

Biggs, B. J. 2000. Eutrophication of streams and rivers: Dissolved Nutrient-Chlorophyll Relationships for Benthic Algae. J. N. Am. Benthol. Soc. 19:17-31.

Fetscher, A.E., L. Busse, and P. R. Ode. 2009. Updated May 2010. Standard Operating Procedures for Collecting Stream Algae Samples and Associated Physical Habitat and Chemical Data for Ambient Bioassessments in California. California State Water Resources Control Board Surface Water Ambient Monitoring Program (SWAMP)
Bioassessment SOP 002.

Francesca Bona. Effect of seaweed proliferation on benthic habitat quality assessed by Sediment Profile Imaging. Journal of Marine Systems 62 (2006) 142–151

Bricker, S.B., C.G. Clement, D.E. Pirhalla, S.P. Orlando, and D.R.G. Farrow. 1999. National Estuarine Eutrophication Assessment: Effects of Nutrient Enrichment in the Nation's Estuaries. NOAA, National Ocean Service, Special Projects Office and the National Centers for Coastal Ocean Science. Silver Spring, MD: 71 pp.

S.B. Bricker , J.G. Ferreira, T. Simas. An Integrated Methodology for Assessment of Estuarine Trophic Status. Ecological Modelling 169 (2003) 39–60

Busse, L.B., J. C. Simpson, S.D. Cooper. 2006. Relationship Among Nutrients, Algae, And Land Use in Urbanized Southern California Streams. Can. J. Aquat. Sci. 63: 2621-2638.

California Department of Water Resources. 2004a. Ventura River Valley Groundwater Basin Upper Ventura River Basin. Bulletin 118. February 27, 2004

California Department of Water Resources. 2004b. Ventura River Valley Groundwater Basin Lower Ventura River Basin. Bulletin 118. February 27, 2004

California Stormwater Quality Association (CASQA). 2003. California stormwater BMP handbook: New development and redevelopment. January 2003. http://www.cabmphandbooks.com

California Regional Water Quality Control Board (CRWQCB), Central Coast Region. 2009. Total Maximum Daily Loads for Pathogens in Aptos Creek, Valencia Creek, and Trout Gulch, Santa Cruz County, California. Final Project Report.

http://www.waterboards.ca.gov/rwqcb3/water_issues/programs/tmdl/docs/aptos/pathogens/apt_path_tmdl_att2_projrep.pdf

Center for Watershed Protection (CWP). 1996. *Design of Stormwater Filtering Systems*. Prepared for the Chesapeake Research Consortium, Solomons, MD, and USEPA Region V, Chicago, IL, by the Center for Watershed Protection, Ellicott City, MD.

Daniel B. Stephens & Associates, Inc. August 20, 2010. Draft Groundwater Budget and Approach to a Groundwater Management Plan, Upper and Lower Ventura River Basin.

Devinny et al., 2004. Devinny, Joseph S., S. Kamieniecki, and M. Stenstrom "Alternative Approaches to Storm Water Quality Control" (2004), included as App. H to Currier et al. "NPDES Stormwater Cost Survey" (2005).

Dodds, W. and Welch, E. 2000. Establishing Nutrient Criteria in Streams. J. N. Am. Benthol. Soc. 19(1): 186-196

Farm Bureau of Ventura County. 2010. Written Communication with Los Angeles Regional Water Quality Control Board, "Re: Dry Weather Irrigation Runoff Estimates for the development of the algae TMDL for the Ventura River." Jan. 29, 2010.

Green, Lauri. Macroalgal Mats Control Trophic Structure and Shorebird Foraging Behavior in a Southern California Estuary. Dissertation, UCLA 2011.

Harper, H. H., Herr, J. L., Livingston, E.H. 1999. Alum Treatment of Stormwater: the First Ten Years. New Applications in Modeling Urban Water Systems. CHI, Guelph, Ontario, Canada.

Hawks & Associates. 2009. Preliminary Horse Survey Oct. 2009.

Kayhanian, M., L. Hollingsworth, M. Spongberg, L. Regenmorter, K. Tsay. 2002. Characteristics of Stormwater Runoff from Caltrans Facilities

Kristie Klose, Scott D. Cooper, and Al Leydecker. An Assessment of Numeric Algal and Nutrient Targets for Ventura River Watershed Nutrient Total Maximum Daily Loads (TMDLs). Final Report, May 2009. Marine Science Institute, Department of Ecology, Evolution, and Marine Biology University of California, Santa Barbara

Larry Walker Associates, 2011. Corrected Source Assesment Report: Nitrogen and Phosphorus in the Ventura River Watershed.

LARWQCB, 1996. 1996 California Water Quality Assessment - 305(b) Report supporting documentation for Los Angeles Region.

LARWQCB, 1998. 1998 List of Impaired Surface Waters (The 303(d) list). Los Angeles Regional Water Quality Control Board.

LARWQCB, 2002. State of the Watershed – Report on Surface Water Quality – The Ventura River Watershed. http://www.waterboards.ca.gov/losangeles/water_issues/programs/regional_program/wmi/ws_ventura.shtml

Lu, Rong, Schiff, Kenneth C., Stolzenbach, Keith D. Nitrogen Deposition on Coastal Watersheds in the Los Angeles Region. 2003-2004. Southern California Coastal Water Research Project Annual Report. pp. 73-81.

Reports by Al Lydecker of University of California-Santa Barbara, Marine Science Institute, Department of Ecology, Evolution, and Marine Biology

Lydecker, Al. Boom or Bust? October 31, 2003.
Lydecker, Simpson, Grabowski, and Lim, 2004. Nutrient Uptake and Cycles of Change: The Ventura River in Southern California
Lydecker, Al. Watershed U Handout, March 26, 2010.
Lydecker, Al. A July Look at Algae on the Ventura River, July 17, 2008.
Lydecker, Al. We're Back, September 28, 2008.
Lydecker, Al. A Look at Nutrient Concentrations in the Ventura Watershed: 2008-2011 March 15, 2012.

Marty Melvin. 2012. Personal Communication with Los Angeles Regional Water Quality Control Board, "Re: Cattle Numbers." June 8, 2012.

McLaughlin K., M. Sutula, L. Busse, S. Anderson, J. Crooks, D. Gibson, K. Johnston, L. Stratton, L. Tiefenthaler 2012. Southern California Bight 2008 Regional Monitoring Program: Estuarine Eutrophication Assessment. Southern California Coastal Water Research Project. Costa Mesa, CA.

MWH. 2007. Conceptual evaluation of process retrofit alternatives to achieve low nutrient discharges. Technical memorandum. Ref # 1342830/6.2

National Marine Fisheries Service, Southern California Steelhead Recovery Plan Summary. Southwest Regional Office, Long Beach, CA. January 2012

NRCS, 2000. USDA-NRCS Field Office Technical Guide. Downloaded from: http://efotg.nrcs.usda.gov/treemenuFS.aspx. Retrieved May 23, 2012.

NRCS FOTG Cost Data. 2010. ftp://ftp-fc.sc.egov.usda.gov/Economics/Costs/eFOTG/California/FY2010/

OCES, 1998. Oklahoma Cooperative Extension Service, Oklahoma State University. Riparian Area Management Handbook. E-952.

SCAG. 2005. Southern California Association of Governments. 2005 Land Use Data Update.

C.M. Scanlan, J. Foden, E. Wells, M.A. Best. The Monitoring Of Opportunistic Macroalgal Blooms for the Water Framework Directive. Marine Pollution Bulletin 55 (2007) 162–171

SCCWRP, 2007. Assessment of water quality concentrations and loads from natural landscapes. ED Stein, VK Yoon. Technical Report 500. Southern California Coastal Water Research Project. Costa Mesa, CA.

Schueler, T. 1987. Controlling urban runoff: a practical manual for planning and designing urban BMPs. Metropolitan Washington Council of Governments.

Stein, Eric and V. Yoon. 2007. Assessment of Water Quality Concentrations and Loads from Natural Landscapes. Southern California Coastal Water Research Project. Technical Report 500. February 2007.

Sutula M. (2011). Review of Indicators for Development of Nutrient Numeric Endpoints in California Estuaries. Southern California Coastal Water Research Project Technical Report No. 646. December 2011.

SWRCB, 2004. Policy for implementation and enforcement of the nonpoint source pollution control program (NPS Implementation and Enforcement Policy). May 2004.

SWRCB, 2012. Onsite Wastewater Treatment System Policy - Draft Substitute Environmental Document. June 6, 2012.

Tetratech. 2006. Technical Approach to Develop Nutrient Numeric Endpoints for California, 2006 Prepared by Tetra Tech Inc. For U.S. EPA Region IX

Tetratech. 2008. Data Summary Report – Ventura River Watershed Hydrology Model.

Tetratech. 2012. Ventura River Estuary and Flow Conditions. June 30, 2012.
Municipal Technology Branch (2004), U.S. Environmental Protection Agency, Washington, DC 20460. EPA832-R-93-005. http://water.epa.gov/type/wetlands/constructed/index.cfm

U.S. EPA, 2000a. Guidance for developing TMDLs in California. EPA Region 9. January 7, 2000.

US EPA, Office of Water. Nutrient Criteria Technical Guidance Manual. EPA-822-B-00-002. July 2000b

US EPA. 2000c. Constructed Wetlands Treatment of Municipal Wastewaters. National Risk Management Research Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268. EPA/625/R-99/010.
http://www.epa.gov/ORD/NRMRL

US EPA. 2003a. Constructed Wetlands for Wastewater Treatment and Wildlife Habitat: 17 Case Studies

US EPA. 2003b. National Management Measures to Control Nonpoint Pollution from Agriculture. EPA 841-B-03-004, July 2003

U. S. EPA National Menu of Stormwater Best Management Practices
http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm. Accessed on September 19 and 20, 2007.

USDA. 2009. United States Department of Agriculture. 2007 Census of Agriculture.

US EPA Causal Analysis/Diagnosis Decision Information System (CADDIS). Volume 2: Sources, Stressors & Responses. http://www.epa.gov/caddis/ssr_home.html. Accessed on July 16, 2012.

USDA. Manage Nutrient Database. http://www.ars.usda.gov/Research/docs.htm?docid=11079

Vada. K. Yoon and E. Stein. 2008. Natural Catchments as Sources of Background Levels of Storm-Water Metals, Nutrients, and Solids. Journal of Environmental Engineering, 135 (12): 961-973. December 2008.

Ventura County Agricultural Irrigated Lands Group (VCAILG).2008. 2007 Annual Monitoring Report. February 15, 2011.

Ventura County Agricultural Irrigated Lands Group (VCAILG).2009. 2008 Annual Monitoring Report. February 15, 2011.

Ventura County Agricultural Irrigated Lands Group (VCAILG).2010. 2009 Annual Monitoring Report. February 15, 2011.

Ventura County Agricultural Irrigated Lands Group (VCAILG).2011. 2010 Annual Monitoring Report. February 15, 2011.

Ventura Countywide Stormwater Quality Management Program (VCSQMP). 2001. Stormwater Quality Management Plan.

Ventura Countywide Stormwater Quality Management Program (VCSQMP). 2010. 2009/2010 Water Quality Monitoring Report.

Ventura County Watershed Protection District. February 10, 2010. Memorandum: "Ventura River Basin Groundwater Nitrate information."

Ventura River Steelhead Restoration Plan, December 1997. Prepared by Entrix Inc. (Walnut Creek, CA) and Woodward Clyde Consultants (Santa Barbara, CA) Project No. 351001

Welch, E.B. and J. M. Jacoby. 2004. Pollutant Effects in Freshwater: applied Limnology, Third edition. Spon Press. London, UK. 504 pp.

Wetzel. 2001. Limnology: Lake and River Ecosystems. Third Edition. Academic Press. London, UK. 985 pp.

W2. 2010. Waste to Energy (W2) Anaerobic Digester for the Ojai Valley Project Introduction. September 9, 2010.

Secondary Drinking Water Standards

California Code of Regulations, Title 22
Division 4. Environmental Health
Chapter 15. Domestic Water Quality and Monitoring Regulations
Article 16. Secondary Drinking Water Standards

Constituents	Maximum Contaminant Levels Consumer Acceptance Contaminant Levels
Aluminum	0.2 mg/L
Color	15 Units
Copper	1.0 mg/L
Foaming Agents [MBAS]	0.5 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Methyl-*tert*-butyl ether [MTBE]	0.005 mg/L
Odor---Threshold	3 Units
Silver	0.1 mg/L
Thiobencarb	0.001 mg/L
Turbidity	5 Units
Zinc	5.0 mg/L

Maximum Contaminant Levels
Consumer Acceptance Contaminant Levels Ranges

Constituents	Recommended	Upper	Short Term
Total Dissolved Solids [TDS]	500 mg/L	1,000 mg/L	1,500 mg/L
Specific Conductance	900 µS/cm	1,600 µS/cm	2,200 µS/cm
Chloride	250 mg/L	500 mg/L	600 mg/L
Sulfate	250 mg/L	500 mg/L	600 mg/L

Note: There are no public health goals (PHGs) or maximum contaminant level goals (MCLGs) for these constituents because secondary standards are set on the basis of aesthetic concerns.
Revised October 1, 2018

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About The Water Board

From left, Board Members Nichole Morgan and Laurel Firestone, Board Chair E. Joaquin Esquivel, Vice Chair Dorene D'Adamo, and Board Member Sean Maguire

Mission Statement

To preserve, enhance, and restore the quality of California's water resources and drinking water for the protection of the environment,

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- Structure of the Water Boards
- Water Board Membership
- Who We Regulate?
- History of the State Water Resources Control Board

Informational & Program Resources

- Quick Links to Key Program and Top Areas
- Brochure/Folleto:
  - Brochure About the California Water Boards (Revised February 2019)
  - Folleto Acerca de Las Juntas del Agua de California (English Version Revised February 2019)
- Citizen's Guide to Working with the California Water Boards (Updated May 2017)
- The Fact Sheet Page
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- Ombudsperson
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- Career Opportunities
- Contact Us (Phone Numbers)

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human uses and environmental resource protection.

Principles & Values

- Protection
- Sustainability
- Integrity
- Professionalism
- Leadership
- Collaboration
- Service
- Education/Outreach

The State Water Resources Control Board (State Water Board) and the nine Regional Water Quality Control Boards (Regional Water Boards), collectively known as the California Water Boards (Water Boards), are dedicated to a single vision: abundant clean water for human uses and environmental protection to sustain California's future. Under the federal Clean Water Act (CWA) and the state's pioneering Porter-Cologne Water Quality Control Act, the State and Regional Water Boards have regulatory responsibility for protecting the water quality of nearly 1.6 million acres of lakes, 1.3 million acres of bays and estuaries, 211,000 miles of rivers and streams, and about 1,100 miles of exquisite California coastline.

Water Boards or Water Resources?

The State Water Resources Control Board (State Water Board) and the nine Regional Water Quality Control Boards (Regional Boards) protects water quality and allocates surface water rights.

The Department of Water Resources is responsible for the management of water usage including the delivery of water to two-thirds of California's population through the State Water Project.

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Ombudsman

Phone List

Public Participation
Water Board Structure

Water is a precious resource in California, and maintaining its quality is of utmost importance to safeguard the health of the public and the environment.

Statewide Campaigns

- EPA Water Sense
- Report an Environmental Concern
- Save Our Water
- Flex Alert
- Register to Vote

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The California Water Boards include the State Water Resources Control Board and nine Regional Boards
The State Water Board is one of six environmental entities operating under

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US Army Corps
of Engineers ®
Los Angeles District

VENTURA RIVER 1 LEVEE SYSTEM

VENTURA COUNTY, CALIFORNIA
NLD ID # 380510086

PERIODIC INSPECTION REPORT NO 1
GENERALIZED EXECUTIVE SUMMARY
8 JUNE 2012

FINAL RATING: MINIMALLY ACCEPTABLE
FINAL RATING DATE: 13 MARCH 2012

PERIODIC INSPECTION REPORT PREPARED BY: FUGRO WEST, INC.
SUBMITTED: JUNE 2011
INSPECTED: 25-26 MAY 2010

EXECUTIVE SUMMARY

This Executive Summary provides an introduction to the periodic inspection, an overview of the system, a summary of the major findings of the periodic inspection, and the overall rating for the system.

1.1 SCOPE AND PURPOSE OF PERIODIC INSPECTION

Fugro has been authorized by the U.S. Army Corps of Engineers (USACE/Corps), Los Angeles District (L.A. District) to perform a Periodic Inspection (PI) of the Ventura River 1 Levee System (VR-1) in Ventura County, California. The purpose of the PI is to verify proper operation and maintenance, evaluate operational adequacy and structural stability, review design criteria to identify changes in current design standards, identify features to monitor over time, and improve the ability to communicate the overall condition. Levee certification is not part of this scope of work. The project is being funded under the American Reinvestment and Recovery Act.

1.2 SYSTEM SUMMARY

VR-1 is the reach of the Ventura River Levee system that has been designated by the Corps for PI, and consists of an approximate 2.65-mile-long stone-revetted left (east) bank levee that extends from the Pacific Ocean (Station 10+95) to the intersection with Canada de San Joaquin, where it continues approximately 1,100 feet along the left (south) bank of Canada de San Joaquin (Station 150+57). VR-1 provides flood control for the western portion of the City of San Buenaventura (Ventura) and adjacent areas along the Ventura River in Ventura County, California. Construction of the levee was completed by the Corps' L.A. District in December 1948. Other system features include: 15 culverts and side-drainage structures; the Southern Pacific Railroad (SPRR) Main Line Bridge crossing; the U.S. Highway 101 crossing; State Route 33 and Main Street crossings; the Stop-log Closure Structure at the SPRR (Ojai Branch) crossing; and Floodwalls #1 and #2. The Ventura County Watershed Protection District, or VCWPD (County), formerly known as the Ventura County Flood Control District (VCFCD), is the local agency responsible for the operation and maintenance of the levee. Figure 1 shows the location of VR-1.

1.3 SUMMARY OF MAJOR DEFICIENCIES FOUND

The VR-1 field inspection was conducted on May 25 and May 26, 2010. Several system deficiencies were observed and documented during the field inspection. Some of the primary deficiencies observed include the following:

1.3.1 Levee Embankments:

- Significant vegetation growth, particularly trees and bushes greater than 2 inches in diameter, was observed on both the riverward and landward sides of the levee within the vegetation-free zone. The vegetation threatens the operation and integrity of the levee.
- Several unpermitted encroachments were observed within the easement areas that are likely to negatively impact the integrity of the levee. Encroachments that will require permitting include seven non-Corps built culverts and side-drainage

structures, Floodwalls #1 and #2, the U.S. Highway 101 and State Route 33 crossings, an industrial development at the final upstream 200 feet of the levee, concrete k-rails, and utilities.

- Erosion zones were observed on both the riverward and landward side levee slopes, and the levee integrity may be threatened. Erosion zones consist of undercutting of the revetment and deterioration of access ramps on the riverward side.
- Areas of minor to significant riprap displacement and stone degradation were observed along the levee, and may pose a threat to the integrity of the levee in the event of a flood. For example, there was no riprap observed along the entire riverward side of multiple access ramps. Localized areas were observed along the levee where the riprap has degraded or deteriorated into 2- to 12-inch fragments. Other areas of displacement appear to be the result of human interference where the stone has been moved for the purpose of creating levee access locations.

1.3.2 Floodwalls:

- Floodwalls not shown on as-built plans that will require permitting include the approximate 550-foot-long Floodwall #1 and approximate 1,050-foot-long Floodwall #2.
- Active erosion and scouring were observed beneath Floodwall #1 during the field inspection, which may lead to structural instabilities before the next inspection.

1.3.3 Interior Drainage System

- A total of eight Corps-built and seven non-Corps-built, unpermitted culverts and side-drainage structures were observed during the field inspection. The County has provided as-builts plans for one culvert. Information regarding design and construction of the remaining six unpermitted culverts and side-drainage structures was not included in the documents reviewed.
- Several of the side-drainage structures contain debris and heavy sediment that has impaired the channel flow capacity and has blocked more than 10 percent of the culvert opening at the outfalls.
- A dirt access road, slurry sack headwalls and under-drains are unpermitted encroachments between the side-drainage structures and the riverbed. While these unpermitted features may enhance operations, maintenance, and emergency access within the riverbed, in some cases they appear to inhibit adequate drainage from the structures.
- Unpermitted 3-foot-long x 2-foot-wide catch basins with metal grates were observed within 15 feet of the landward side toe across from four side-drainage structure outfalls. We could not confirm in the field whether or not those catch basins are modified inlets at ponding areas for the side-drainage structures. The size and capacity of each catch basin is unknown.
- Significant damage and obstructions were observed at the outlet of the Abandoned 30-inch CMP Drain. In addition, information regarding the interior condition of the pipes (via video camera or visual inspection methods) was not provided.

- The slide gate at the inlet for the Abandoned 30-inch CMP Drain is heavily corroded and inoperable.

1.4 OVERALL SYSTEM RATING

The final rating for the system is “Minimally Acceptable”.

A Minimally Acceptable System is where one or more items are rated as Minimally Acceptable or one or more items are rated as Unacceptable and an engineering determination concludes that the Unacceptable items would not prevent the segment/system from performing as intended during the next flood event.

This levee system inspection was based on observations of field conditions and available data at the time of the inspection. The condition of any levee system depends on numerous and constantly changing internal and external conditions and is evolutionary in nature. It is incorrect to assume the present condition of the levee system will continue to represent the condition of the levee system in the future. Only through continued inspection, maintenance, repair, and rehabilitation can there be a reasonable chance that unsafe conditions can be avoided.

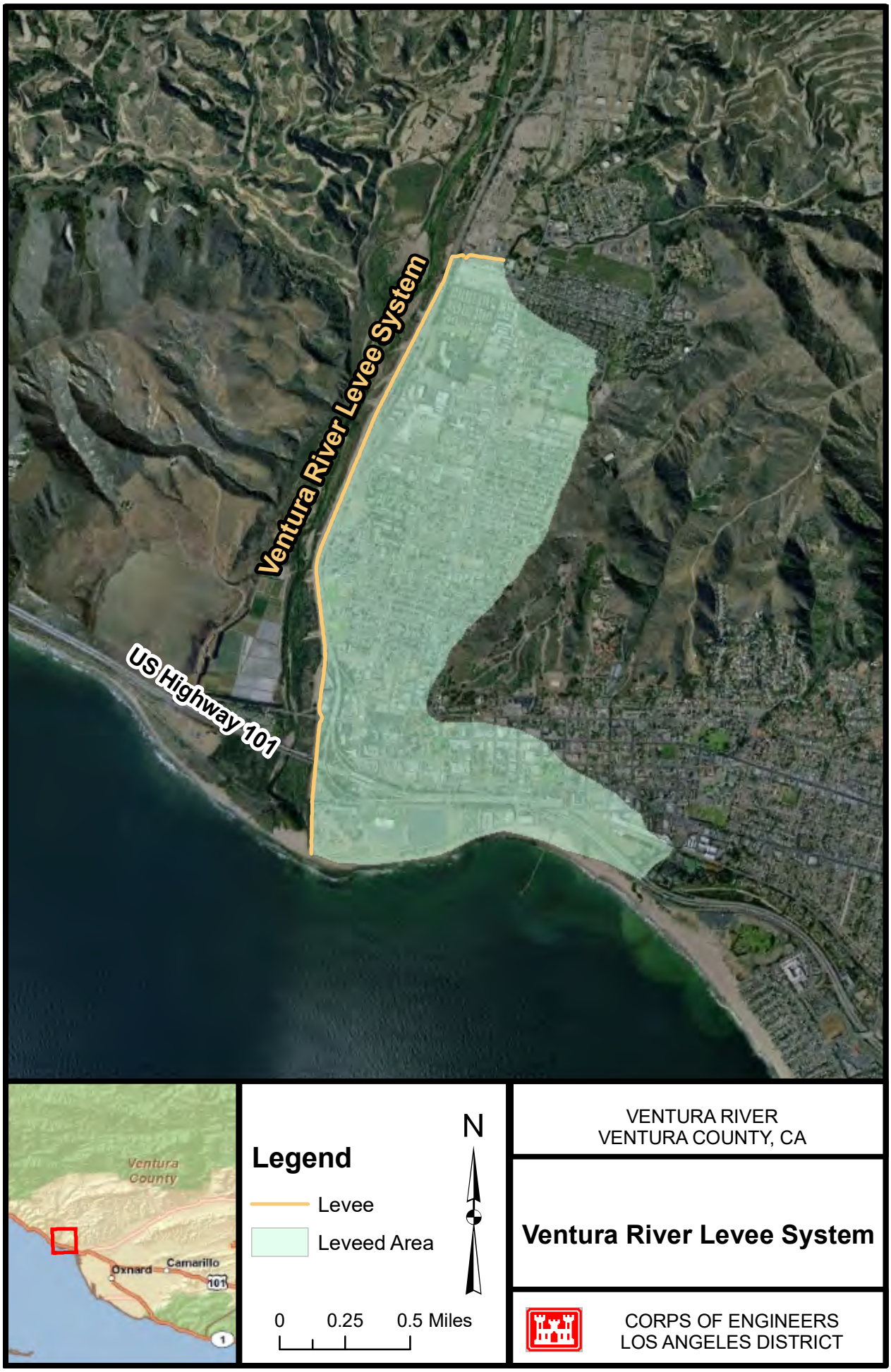
Ventura River Levee System
US Highway 101
Ventura County
Oxnard
Camarillo
101
Legend
Levee
Leveed Area
N
0
0.25
0.5 Miles
VENTURA RIVER
VENTURA COUNTY, CA
Ventura River Levee System
CORPS OF ENGINEERS
LOS ANGELES DISTRICT

Figure 1

Ventura County
Watershed Protection District
Water Resources Division

2015 Annual Report of Groundwater Conditions

Ventura County
Watershed Protection District
Water Resources Division

MISSION:

"Protect, sustain, and enhance
Ventura County watersheds now
and into the future for the benefit of
all by applying sound science,
technology, and policy."

2015 Annual Report of Groundwater Conditions

Cover Photo: Windmill Well in Upper Ojai Basin.

Ventura County Watershed Protection District
Water Resources Division
Groundwater Section

2015 Annual Report of Groundwater Conditions

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Report Published September 2016

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Executive Summary

The purpose of this report is to provide a summary of Calendar Year 2015 water quality and groundwater elevation conditions, and to highlight other significant activities. This report is written with a broad target audience in mind from residents to consultants and other professionals. The report presents information and data from a broad perspective and with greater detail for the groundwater basins. Basin summary sheets have been prepared for the second year and are included after this Executive Summary. These basin summary sheets include analysis of water level and water quality trends over a five year period as well as data regarding basin size, number and types of wells, amount of irrigated agriculture, and other key data. Subsequent report sections present more specific water level and water quality data for each of the studied basins, and finally appendices contain specific data used in the report.

Calendar year 2015 is the fourth consecutive year of below average rainfall in the County which is currently designated as an area of exceptional drought by the U.S. Drought Monitor (http://droughtmonitor.unl.edu/). The drought and regulatory constraints on surface water releases and diversions from Lake Piru have caused a decrease in Santa Clara River water diversions. As less surface water is available, groundwater demand increases locally. Groundwater elevations in most areas of the County have continued the declining trend from last year. Water quality samples from 221 wells were collected between August and December of 2015. Twenty eight of the wells sampled had nitrate (NO_3) concentrations above the State of California Maximum Contaminant Level (MCL) of 45 mg/l. Water quality trends within basins are generally unchanged from previous years, with varying trends among individual wells. Key water quality concerns in some basins continue to be high total dissolved solids (TDS), and nitrate exceeding the maximum contaminant level in localized areas.

Groundwater extraction in certain areas of the County is regulated by other agencies. In 2014, the Fox Canyon Groundwater Management Agency (FCGMA) set forth mandatory cut backs in groundwater extractions over an eighteen month period for municipal, industrial and agricultural users through adoption of Emergency Ordinance E. Emergency Ordinance E remains in effect until the drought conditions no longer exist and is currently at its maximum mandatory cut back requirement. On January 1, 2015, the Sustainable Groundwater Management Act (SGMA) became effective signaling a new era in groundwater management in California. As required under SGMA, all Bulletin 118 groundwater basins designated as high or medium priority and critically overdrafted, shall be managed by a groundwater sustainability plans (GSP) by January 31, 2020. Many of the basins underlying the County boundaries are designated as high or medium priority and three are critically overdrafted (Cuyama Valley Basin [DWR No. 3-13], Oxnard Basin [DWR No. 4-04.02] and Pleasant Valley Basin [DWR No. 4-06]). GSPs are currently being developed with the goal of achieving sustainable groundwater management of all basins within the County.

In 2014, the County updated Well Ordinance 4184 (now 4468) to reflect changes in new well construction and State Legislation. The County regulates groundwater well construction and destruction through its Well Ordinance, but does not regulate groundwater extraction. The purpose of Well Ordinance 4468 is to provide for protection of groundwater quality and supply by regulating the construction, maintenance, operation, use, repair, modification, and destruction of wells and engineering test holes (soil borings) in such a manner that the groundwater of the County will not be contaminated or polluted, and that water obtained from wells will be suitable for beneficial use and will not jeopardize the health, safety or welfare of the people of Ventura County.

Basin Summary Sheets

The following basin summary sheets provide an overview of data, trends, and facts for some of the larger groundwater basins in the County. Trends for groundwater levels were determined for 2015 and over the last five years. Trends for groundwater quality were determined for the last five year period. Trend analysis used sample sets with wells that were sampled or measured consistently over the five year period. In some instances this resulted in a small sample set. The spatial distribution of the wells may not cover the entire groundwater basin. Data from VCWPD and other agencies was used in the trend analysis.

Basin Summary Sheet Key

Groundwater Basin Surface Area: **Irrigated Acreage:** **Watershed:** **Aquifers:** **DWR Groundwater Basin Designation and Size:** **CASGEM Basin Priority:** **DWR Groundwater Basin Population:**	In this section you will find quick facts about the groundwater basin.
Known Water Supply Wells In this section you will find information about the number of wells, and other status, in the groundwater basin.	**Self Reported Groundwater Extraction / Extraction Estimate** In this section you will find information on groundwater extractions reported to an agency or an estimate of extractions if outside of an agency boundary.
Groundwater Levels in General for All Wells Gauged by County In this section you will find information about groundwater levels gauged by the County during the report year.	**Groundwater Quality in General for All Wells Sampled by County** In this section you will find information about groundwater quality for wells sampled by the County during the report year. Maximum Contaminant Level (MCL) is listed.
5 Year Groundwater Level Trend In this section you will find information about groundwater level trends over the last 5 year period for wells gauged by the County and other agencies.	**5 Year Groundwater Quality Trend 2011-2015** **SWN** **Nitrate** **Chloride** **TDS** **Sulfate** In this section you will find information about groundwater quality trends over the last 5 year period for wells sampled by the County and other agencies.
Sources of Groundwater Recharge This section describes sources of recharge to the groundwater basin.	**Subsurface Hydrologic Connection to Other Groundwater Basins** This section describes any known hydrologic connections between adjacent groundwater basins.
DWR CASGEM Groundwater Basin Prioritization Level - Medium This section provides any notable comments by DWR about groundwater basin concerns.	
Groundwater Quality Trend Notes: Trend is relatively flat, or no clear trend ; Level trending up ; Level Trending down	

Oxnard Plain Pressure Basin

Groundwater Basin Surface Area:	47,167 acres
Irrigated Acreage:	≈21,540 (estimate determined from Ventura County Ag Commissioner's data)
Watershed:	Santa Clara River and Calleguas Creek
Aquifers:	Unconfined and confined aquifers
DWR Groundwater Basin Designation and Size:	Santa Clara River Valley Basin, Oxnard Subbasin (4-4.02) Surface area 58,200 Acres. Note: DWR groups two County basins into Oxnard Subbasin (4-4.02) (DWR, 2014)
CASGEM Basin Priority:	High
DWR Groundwater Basin Population:	235,973 (2010)

Known Water Supply Wells (as of Feb. 2016)

Number of Wells: 895
Active: 371
Destroyed: 382
Abandoned: 57
Can't Locate: 85

Self Reported Groundwater Extraction to FCGMA (as of March 30, 2016)

Agricultural Extractions: 51,168 AF/Yr

Municipal, Industrial, and Domestic Extractions: 11,946 AF/Yr

Total: 63,114 AF/yr

2015 Groundwater Levels in General for All Wells Gauged by County

UAS "Key" well 01N21W07H01S - December level was down 6.51 feet from the January measurement.

LAS "Key" well 01N21W32K01S - December level was down 38.10 feet from the January measurement.

In general for all wells consistently measured in 2015 in the basin, water levels declined over the course of the year from the 1st quarter reading to the last quarter reading.

2015 Groundwater Quality in General for All Wells Sampled by County

(66 wells)

UAS - Oxnard Pressure basin groundwater: Oxnard aquifer samples are calcium sulfate type. Mugu aquifer samples are calcium sulfate type.

LAS - Oxnard Pressure basin groundwater: Hueneme aquifer samples are calcium sulfate type. Fox Canyon aquifer samples are sodium sulfate type.

Primary MCL Exceedances for Nitrate >45mg/l?	Yes, 2 wells
Secondary MCL Excedances for Chloride >250mg/l?	Yes, 4 wells
Secondary MCL Excedances for TDS >500mg/l?	Yes, 62 wells
Secondary MCL Excedances for Sulfate >250mg/l?	Yes, 50 wells

5 Year Groundwater Level Trend 2011 - 2015

UAS "Key" well 01N21W07H01S: ↓

LAS "Key" well 01N21W32K01S: ↓

Upper System

The 5 year trend based on 2011 through 2015 potentiometric surface maps is downward.

Lower System

The 5 year trend based on 2011 through 2015 potentiometric surface maps is downward.

5 Year Groundwater Quality Trend 2011-2015

Upper System

SWN	Nitrate	Chloride	TDS	Sulfate
02N22W24R02S	↓	↑	↑	↑
02N22W25A02S	↓	↑	↑	↑
02N22W25F01S	↓	↑	↑	↑
02N23W25M01S	↓	↓	↓	↓

Lower System

SWN	Nitrate	Chloride	TDS	Sulfate
01N21W06L05S	→	→	↓	→
01N21W08R01S	→	→	↓	↓
01N21W19J05S	→	→	↓	→
01N21W20K03S	→	→	↓	→
01N21W21H02S	→	↓	↓	↓
01N21W21H03S	→	→	↑	↑
01N21W28D01S	→	↓	↓	↓
01N22W03F05S	↑	→	↓	→
01N22W16D04S	→	→	→	→
01N22W19A01S	→	→	↓	↓
02N21W20Q05S	→	↓	→	↓
02N22W36E02S	↓	→	↓	↓

For upper system, one well is in the northwest, the remaining wells are in the northeast. For lower system the wells are generally in the center of the basin along a northeast to southwest line, and a small group in the southeast.

Sources of Groundwater Recharge

Basin Recharge:percolation of surface flow from the Santa Clara River, into the Oxnard Forebay; precipitation and floodwater from the Calleguas Creek drainage percolate into the unconfined gravels near Mugu Lagoon. Some underflow may come from the Las Posas and Pleasant Valley Basins on the east. Flow into and out of Mound basin dependent on water levels. (DWR,

Potable Water Sources

Groundwater from Oxnard Plain Pressure Basin via various purveyors. Groundwater from Oxnard Forebay basin via United Water system. Surface water from Santa Clara River via United Water System. Imported State Project water from Calleguas MWD to various water purveyors.

Subsurface Hydrologic Connection to Other Groundwater Basins

North: Oxnard Forebay basin, Mound basin

East/Northeast: Pleasant Valley basin, West Las Posas basin

DWR CASGEM Groundwater Basin Prioritization Level - High

Impact Comments: Saline intrusion, nitrates, pesticides, and PCBs have impacted some water wells per DWR Bulletin 118

Groundwater Quality Trend Notes: Trend is relatively flat, or no clear trend →; Level trending up ↑; Level Trending down ↓

Fillmore Basin

Groundwater Basin Surface Area:	24,392 acres
Irrigated Acreage:	≈12,230 acres (estimate determined from Ventura County Ag Commissioner's data)
Watershed:	Santa Clara River
Aquifers:	Unconfined Aquifer
DWR Groundwater Basin Designation and Size:	Santa Clara River Valley Basin, Fillmore Subbasin (4-4.05). Surface area 20,842 acres. (DWR, 2006)
CASGEM Basin Priority:	Medium
DWR Groundwater Basin Population:	16,417 (2010)

Known Water Supply Wells (as of Feb. 2016)

Number of Wells: 625
Active: 454
Destroyed: 76
Abandoned: 32
Can't Locate: 63

Self Reported Groundwater Extraction to UWCD (as of March 3, 2015)

Agricultural Extractions: 50,244 AF/Yr

Municipal Extractions: 4,716 AF/Yr

Total Extractions: 54,960 AF/Yr

2015 Groundwater Levels in General for All Wells Gauged by County

"Key" well 03N20W05D01S - December level was down 8.31 feet from the March measurement.

In general for all 14 wells measured in the basin, water levels declined over the course of the year from the 1st quarter reading to the last quarter.

2015 Groundwater Quality in General for All Wells Sampled by County

(13 wells)

The water in the 13 wells is calcium sulfate type.

Primary MCL Exceedances for Nitrate >45mg/l?	Yes, 2 wells
Secondary MCL Excedances for Chloride >250mg/l?	No
Secondary MCL Excedances for TDS >500mg/l?	Yes, 13 wells
Secondary MCL Excedances for Sulfate >250mg/l?	Yes, 13 wells

5 Year Groundwater Level Trend 2011 - 2015

"Key" well 03N20W05D01S: ↓

The 5 year trend based on 2011 through 2015 potentiometric surface maps is downward.

5 Year Groundwater Quality Trend 2011-2015

SWN	Nitrate	Chloride	TDS	Sulfate
03N20W01D03S	↓	↓	↓	↓
03N20W01F05S	↓	→	↓	↓
03N20W02R05S	↓	→	↓	↓
03N21W01P08S	↑	↑	↑	→
04N19W31F01S	↓	↑	↑	→
04N20W36D07S	↓	↑	→	→

One well is at the western end of the basin, the remaining wells are in the southeast.

Sources of Groundwater Recharge

Basin Recharge: Infiltration of precipitation. Subsurface flow from Piru basin. Surface flow percolation from Santa Clara River, Sespe Creek, and minor tributaries. (DWR, 2006) Imported State Project Water via Lake Piru release to Santa Clara River.

Subsurface Hydrologic Connection to Other Groundwater Basins

Upgradient: Yes, Piru groundwater basin.
Downgradient: Yes, Santa Paula groundwater basin.

DWR CASGEM Groundwater Basin Prioritization Level - Medium

Impact Comments: Many groundwater quality impairments in the basin; Nitrates problematic during dry periods; High TDS, etc. DWR Bulletin 118. REH - PubComm indicated WQ is localized and being managed

Groundwater Quality Trend Notes: Trend is relatively flat, or no clear trend →; Level trending up ↑; Level Trending down ↓

Santa Paula Basin

Groundwater Basin Surface Area:	21,100 acres
Irrigated Acreage:	≈9,100 acres (estimate determined from Ventura County Ag Commissioner's data)
Watershed:	Santa Clara River
Aquifers:	Unconfined Aquifer
DWR Groundwater Basin Designation and Size:	Santa Clara River Valley Basin, Santa Paula Subbasin (4-4.04) Surface area 22,899 Acres. (DWR, 2014)
CASGEM Basin Priority:	Medium
DWR Groundwater Basin Population:	46,816 (2010)

Known Water Supply Wells (as of Feb. 2016)

Number of Wells: 283
Active: 152
Destroyed: 75
Abandoned: 11
Can't Locate: 45

Self Reported Groundwater Extraction to UWCD (as of March 3, 2015)

Agricultural Extractions: 18,161 AF/Yr

Municipal Extractions: 3,741 AF/Yr

Total Extractions: 21,902 AF/Yr

2015 Groundwater Levels in General for All Wells Gauged by County

"Key" well 02N22W02C01S - December level was down 14.62 feet from the March measurement.

In general for 7 of the 9 wells measured in 2015 in the basin, water levels declined over the course of the year from the 1st quarter reading to the last quarter reading.

2015 Groundwater Quality in General for All Wells Sampled by County

(6 wells)

The water type for the 6 wells is calcium sulfate type.

Primary MCL Exceedances for Nitrate >45mg/l?	No
Secondary MCL Excedances for Chloride >250mg/l?	No
Secondary MCL Excedances for TDS >500mg/l?	Yes, 6 wells
Secondary MCL Excedances for Sulfate >250mg/l?	Yes, 6 wells

5 Year Groundwater Level Trend 2011 - 2015

"Key" well 02N22W02C01S: ↓

The 5 year trend based on 2011 through 2015 potentiometric surface maps is downward.

5 Year Groundwater Quality Trend 2011-2015

(Based on 3 wells sampled by other agencies)

SWN	Nitrate	Chloride	TDS	Sulfate
02N22W02K09S	→	→	→	→
03N21W15C06S	→	→	↑	↑
03N21W16A02S	↑	→	↑	→

Four wells are in the southwest and two are in the northeast portion of the basin.

Sources of Groundwater Recharge

Basin Recharge: Infiltration of precipitation. Subsurface flow from Fillmore basin. Surface flow percolation from Santa Clara River, and Santa Paula Creek (DWR, 2006) Imported State Project Water via Lake Piru release to Santa Clara River.

Potable Water Sources

Groundwater from Santa Paula Basin

Subsurface Hydrologic Connection to Other Groundwater Basins

Upgradient: Yes, Fillmore groundwater basin.
Downgradient: Yes, Mound and Oxnard Plain Forebay groundwater basins

DWR CASGEM Groundwater Basin Prioritization Level - Medium

Impact Comments: Nitrates can fluctuate significantly in the basin, and above MCL. Other inorganics present above MCL.TDS is known to be high.

Groundwater Quality Trend Notes: Trend is relatively flat, or no clear trend →; Level trending up ↑; Level Trending down ↓

Piru Basin

Groundwater Basin Surface Area:	10,656 acres
Irrigated Acreage:	≈5,600 (estimate determined from Ventura County Ag Commissioner's data)
Watershed:	Santa Clara River
Aquifers:	Unconfined Aquifer
DWR Groundwater Basin Designation and Size:	Santa Clara River Valley Basin, Piru Subbasin (4-4.06). Surface area 8,915 acres. (DWR, 2014)
CASGEM Basin Priority:	High
DWR Groundwater Basin Population:	2,666 (2010)

Known Water Supply Wells (as of Feb. 2016)

Number of Wells: 190
Active: 152
Destroyed: 19
Abandoned: 6
Can't Locate: 13

Self Reported Groundwater Extraction to UWCD (as of March 3, 2015)

Agricultural Extractions: 11,517 AF/Yr

Municipal Extractions: 515 AF/Yr

Total Extractions: 12,032 AF/Yr

2015 Groundwater Levels in General for All Wells Gauged by County

"Key" well 04N19W25C02S - December level was down 11.97 feet from the March measurement.

In general for 5 wells consistently measured in 2015 in the basin, water levels declined over the course of the year from the 1st quarter reading to the last quarter reading.

2015 Groundwater Quality in General for All Wells Sampled by County

(15 wells)

Piru basin groundwater is mainly calcium sulfate type.

Primary MCL Exceedances for Nitrate >45mg/l?	Yes, 2 wells
Secondary MCL Excedances for Chloride >250mg/l?	No
Secondary MCL Excedances for TDS >500mg/l?	Yes, 15 wells
Secondary MCL Excedances for Sulfate >250mg/l?	Yes, 15 wells

5 Year Groundwater Level Trend 2011 - 2015

"Key" well 04N19W25C02S: ↓

The 5 year trend based on 2011 through 2015 potentiometric surface maps is downward.

5 Year Groundwater Quality Trend 2011-2015

SWN	Nitrate	Chloride	TDS	Sulfate
04N18W30A03S	↓	↓	↑	↑
04N18W30J04S	↑	↑	↑	↑
04N19W26H01S	↓	↑	↓	↓
04N19W26J05S	↑	→	↓	↓
04N19W34J04S	↑	→	↓	↓

One well is in the southwest, the remaining wells are in the north central portion.

Sources of Groundwater Recharge

Basin Recharge: Infiltration of precipitation. Subsurface flow from East basin. Surface flow percolation from Santa Clara River, Piru Creek and Hopper Creek. (DWR, 2006) Imported State Project Water via Lake Piru release to Santa Clara River and percolation ponds.

Subsurface Hydrologic Connection to Other Groundwater Basins

Upgradient: Yes, East groundwater basin.
Downgradient: Yes, Fillmore groundwater basin.

DWR CASGEM Groundwater Basin Prioritization Level - High

DWR Impact Comments:GW Quality impacts: nitrates, storm runoff, leaking tanks, etc. (DWR Bulletin118). High Selenium and other inorganics, average TDS was 1450 mg/l (Ventura Co 2011 annual gw report)

Groundwater Quality Trend Notes: Trend is relatively flat, or no clear trend →; Level trending up ↑; Level Trending down ↓

Pleasant Valley Basin

Groundwater Basin Name:	Pleasant Valley
Groundwater Basin Surface Area:	20,267 acres
Irrigated Acreage:	≈7,980 (estimate determined from Ventura County Ag Commissioner's data)
Watershed:	Calleguas Creek
Aquifers:	Unconfined and confined aquifers
DWR Groundwater Basin Designation and Size:	Pleasant Valley Basin (4-6). Surface area 21,654 acres. (DWR, 2014)
CASGEM Basin Priority:	High
DWR Groundwater Basin Population:	69,392 (2010)

Known Water Supply Wells (as of Feb. 2016)

Number of Wells: 332
Active: 91
Destroyed: 171
Abandoned: 26
Can't Locate: 44

Self Reported Groundwater Extraction to FCGMA (as of March 30, 2016)

Agricultural Extractions: 14,772 AF/Yr

Municipal, Industrial, and Domestic Extractions: 4,792 AF/Yr

Total: 19,564 AF/yr

2015 Groundwater Levels in General for All Wells Gauged by County

"Key" well 01N21W03C01S - December level was down 41.88 feet from the January measurement.

In general for 13 wells measured in 2015 in the basin, water levels declined over the course of the year from the 1st quarter reading to the last quarter reading.

2015 Groundwater Quality in General for All Wells Sampled by County

(19 wells)

Pleasant Valley basin groundwater: 1 sample is sodium sulfate type, and 13 samples are are calcium sulfate type

Primary MCL Exceedances for Nitrate >45mg/l?	Yes, 2 wells
Secondary MCL Excedances for Chloride >250mg/l?	Yes, 3 wells
Secondary MCL Excedances for TDS >500mg/l?	Yes, 19 wells
Secondary MCL Excedances for Sulfate >250mg/l?	Yes, 14 wells

5 Year Groundwater Level Trend 2011 - 2015

"Key" well 01N21W03C01S: ↓

Upper System

The 5 year trend based on 2011 through 2015 potentiometric surface maps is downward.

Lower System

The 5 year trend based on 2011 through 2015 potentiometric surface maps is downward.

5 Year Groundwater Quality Trend 2011-2015

Upper System

SWN	Nitrate	Chloride	TDS	Sulfate
01N21W15H01S	→	↓	↓	↓

Lower System

SWN	Nitrate	Chloride	TDS	Sulfate
01N21W03K01S	↑	↑	→	↓
01N21W03R01S	↑	↓	→	↓
01N21W04K01S	→	↑	↑	↑
01N21W10G01S	→	↓	↓	→
01N21W15D02S	→	↓	↓	↓
02N21W34G01S	→	↑	→	→

One well is in the north central portion, the remaining are in the southwest.

Sources of Groundwater Recharge

Basin Recharge: dominantly from subsurface flow across the Springville fault zone. A modest amount of irrigation water and septic system effluent also contribute to basin recharge. (DWR, 2006)

Potable Water Sources

Groundwater from Pleasant Valley Basin, groundwater from Arroyo Santa Rosa basin via Camrosa Water District. Imported State Project water from Calleguas MWD to various water purveyors.

Subsurface Hydrologic Connection to Other Groundwater Basins

West: Yes, Oxnard Plain Pressure Basin.

East: No.

DWR CASGEM Groundwater Basin Prioritization Level - High

Impact Comments: PC - Discharge of poor quality GW from dewatering wells and effluent discharge from the wastewater treatment facility into the Arroyo Simi have led to rising water levels in the basin along with higher TDS and Chloride levels.

Groundwater Quality Trend Notes: Trend is relatively flat, or no clear trend →; Level trending up ↑; Level Trending down ↓

Mound Basin

Groundwater Basin Surface Area:	12,023 acres
Irrigated Acreage:	≈2,075 acres (estimate determined from Ventura County Ag Commissioner's data)
Watershed:	Santa Clara River
Aquifers:	Unconfined and confined aquifers
DWR Groundwater Basin Designation and Size:	Santa Clara River Valley Basin, Mound Subbasin (4-4.03) Surface area 14,846 Acres. (DWR, 2014)
CASGEM Basin Priority:	Medium
DWR Groundwater Basin Population:	77,886 (2010)

Known Water Supply Wells (as of Feb. 2016)

Number of Wells: 78
Active: 29
Destroyed: 35
Abandoned: 6
Can't Locate: 8

Self Reported Groundwater Extraction to UWCD (as of March 3, 2015)

Agricultural Extractions: 2,687 AF/Yr

Municipal Extractions: 3,303 AF/Yr

Total Extractions: 5,990 AF/Yr

2015 Groundwater Levels in General for All Wells Gauged by County

"Key" well 02N22W07M02S - December level was down 3.72 feet from the January measurement.

In general for 5 wells measured in 2015 in the basin, water levels declined in 3 wells and rose in 2 wells over the course of the year from the 1st quarter reading to the last quarter reading.

2015 Groundwater Quality in General for All Wells Sampled by County

(5 wells)

The water type in 4 wells are calcium sulfate type, 1 well is sodium sulfate type.

Primary MCL Exceedances for Nitrate >45mg/l?	No
Secondary MCL Excedances for Chloride >250mg/l?	No
Secondary MCL Excedances for TDS >500mg/l?	Yes, 5 wells
Secondary MCL Excedances for Sulfate >250mg/l?	Yes, 5 wells

5 Year Groundwater Level Trend 2011 - 2015

"Key" well 02N22W07M02S: ⇩

The 5 year trend based on 2011 through 2015 potentiometric surface maps is downward.

5 Year Groundwater Quality Trend 2011-2015

(Based on 5 wells sampled by other agencies)

SWN	Nitrate	Chloride	TDS	Sulfate
02N22W08F01S	⇨	⇧	⇩	⇩
02N22W08G01S	⇧	⇧	⇧	⇧
02N23W15J01S	⇨	⇧	⇨	⇧
02N23W15J02S	⇨	⇧	⇨	⇧
02N23W15J03S	⇧	⇧	⇨	⇨

Wells are generally in the center of the basin along a east to west line.

Sources of Groundwater Recharge

Basin Recharge: Infiltration of precipitation. Subsurface flow from Santa Paula basin. Surface flow percolation from Santa Clara River and, percolation of direct precipitation into the San Pedro Formation which crops out along the northern edge of the subbasin. (DWR, 2006) Imported State Project Water via Lake Piru release to Santa Clara River.

Potable Water Sources

Groundwater from Mound Basin, Ventura River Basin, Oxnard Plain Pressure Basin via Ventura Water System. Surface water from Ventura River diversion via Ventura Water System. Surface water from Lake Casitas via Casitas MWD to Ventura Water System.

Subsurface Hydrologic Connection to Other Groundwater Basins

Upgradient: Yes, Santa Paula groundwater basin.

East/Southeast: Yes, Oxnard Plain Forebay and Oxnard Plain Pressure groundwater basins. Flow into and out of basin dependent on groundwater levels.

DWR CASGEM Groundwater Basin Prioritization Level - Medium

Impact Comments: Some primary and secondary inorganic contaminants above the MCL (DWR Bulletin 118).

Groundwater Quality Trend Notes: Trend is relatively flat, or no clear trend ⇨; Level trending up ⇧; Level Trending down ⇩

East Las Posas Basin

Groundwater Basin Surface Area:	19,771 acres
Irrigated Acreage:	≈7,784 acres (estimate determined from Ventura County Ag Commissioner's data)
Watershed:	Calleguas Creek
Aquifers:	Unconfined and confined aquifers
DWR Groundwater Basin Designation and Size:	Los Posas Valley Basin (4-8). Surface area 42,353 acres. Note: DWR groups three County basins into Los Posas Valley Basin (4-8) (DWR, 2014)
CASGEM Basin Priority:	High
DWR Groundwater Basin Population:	39,385 (2010)

Known Water Supply Wells (as of Feb. 2016)

Number of Wells: 248
Active: 155
Destroyed: 59
Abandoned: 21
Can't Locate: 13

Self Reported Groundwater Extraction to FCGMA (as of March 30, 2016)

Agricultural Extractions: 20,915 AF/Yr

Municipal Extractions: 2,050 AF/Yr

Total: 22,964 AF/yr

2015 Groundwater Levels in General for All Wells Gauged by County

"Key" well 03N20W26R03S - December level was down 15.5 feet from the January measurement.

In general for 10 wells measured in 2015 in the basin, water levels declined over the course of the year from the 1st quarter reading to the last quarter reading.

2015 Groundwater Quality in General for All Wells Sampled by County

(13 wells)

The water type in 6 wells is calcium bicarbonate type and 7 wells are calcium sulfate type.

Primary MCL Exceedances for Nitrate >45mg/l?	Yes, 3 wells
Secondary MCL Exceedances for Chloride >250mg/l?	No
Secondary MCL Exceedances for TDS >500mg/l?	Yes, 9 wells
Secondary MCL Exceedances for Sulfate >250mg/l?	Yes, 4 wells

5 Year Groundwater Level Trend 2011 - 2015

"Key" well 03N20W26R03S: ⇧

The 5 year trend based on 2011 through 2015 potentiometric surface maps varies.

The majority of the wells in the basin show a downward trend while a few of the wells show a rising trend.

5 Year Groundwater Quality Trend 2011-2015

SWN	Nitrate	Chloride	TDS	Sulfate
02N20W09Q05/07S	⇧	⇨	⇨	⇨
02N20W16B06S	⇧	⇨	⇨	⇨
03N19W29K07/08S	⇧	⇨	⇨	⇨
03N19W29K06S	⇧	⇨	⇨	⇨

Two wells are located in the south, three wells are located in the east.

Sources of Groundwater Recharge

Basin Recharge: Infiltration of precipitation, minor stream flow across outcrops of the Fox Canyon and Grimes Canyon gravels, and percolation from flow in the Arroyo Las Posas. (DWR, 2006) Imported State Project Water via injection in the Calleguas Municipal Water District ASR well field.

Potable Water Sources

Groundwater from East Las Posas basin. Imported State Project Water from Calleguas MWD to various purveyors.

Subsurface Hydrologic Connection to Other Groundwater Basins

West:Possible connection to West Las Posas basin in NW part of basin.

South/Southeast: South Las Posas Basin.

Southwest: Restrictive subsurface structure between Pleasant Valley basin and East Las Posas basin may cause spillover from East Las Posas to Pleasant Valley when basin is full.

DWR CASGEM Groundwater Basin Prioritization Level - High

Impact Comments: TDS is generally high in this basin. Pubic Comment includes reports of subsidence, overdraft and saline intrusion (chloride from adjacient basin?)

Groundwater Quality Trend Notes: Trend is relatively flat, or no clear trend ⇨; Level trending up ⇧; Level Trending down ⇩

West Las Posas Basin

Groundwater Basin Name:	West Las Posas
Groundwater Basin Surface Area:	14,715 acres
Irrigated Acreage:	≈9,950 (estimate determined from Ventura County Ag Commissioner's data)
Watershed:	Calleguas Creek
Aquifers:	Unconfined and confined aquifers
DWR Groundwater Basin Designation and Size:	Los Posas Valley Basin (4-8). Surface area 42,353 acres. Note: DWR groups three County basins into Los Posas Valley Basin (4-8) (DWR, 2014)
CASGEM Basin Priority:	High
DWR Groundwater Basin Population:	39,385 (2010)

Known Water Supply Wells (as of Feb. 2016)

Number of Wells: 114
Active: 63
Destroyed: 39
Abandoned: 6
Can't Locate: 6

Self Reported Groundwater Extraction to FCGMA (as of March 30, 2016)

Agricultural Extractions: 11,135 AF/Yr

Municipal, Industrial, and Domestic Extractions: 1,945 AF/Yr

Total: 13,080 AF/yr

2015 Groundwater Levels in General for All Wells Gauged by County

"Key" well trend for 2015 not determined due to data availability.

In general for 11 wells measured in 2015 in the basin, water levels declined over the course of the year from the 1st quarter reading to the last quarter reading.

2015 Groundwater Quality in General for All Wells Sampled by County

(12 wells)

The water type in 10 wellw is calcium sulfate type, 2 calcium bicarbonate type.

Primary MCL Exceedances for Nitrate >45mg/l?	Yes, 1 well
Secondary MCL Excedances for Chloride >250mg/l?	No
Secondary MCL Excedances for TDS >500mg/l?	Yes, 11 wells
Secondary MCL Excedances for Sulfate >250mg/l?	Yes, 5 wells

5 Year Groundwater Level Trend 2011 - 2015

"Key" well 02N21W12H01S: ↓

The 5 year trend based on 2011 through 2015 potentiometric surface maps is downward.

5 Year Groundwater Quality Trend 2011-2015

SWN	Nitrate	Chloride	TDS	Sulfate
02N21W15M04S	↑	↑	↑	↑
02N21W17F05S	→	→	↓	↓
03N21W36Q01S	↓	↓	↓	→
02N21W13A01S	→	→	↑	↑

Wells are in various locations in the basin.

Sources of Groundwater Recharge

Basin Recharge: Infiltration of precipitation, minor stream flow across outcrops of the Fox Canyon and Grimes Canyon gravels, and percolation from flow in the Arroyo Las Posas. (DWR, 2006)

Potable Water Sources

Groundwater from West Las Posas basin. State Project water from Calleguas MWD to various water purveyors.

Subsurface Hydrologic Connection to Other Groundwater Basins

East: Possible connection to East Las Posas basin in NW part of basin.

Southwest: Yes, Oxnard Plain Pressure basin.

DWR CASGEM Groundwater Basin Prioritization Level - High

Impact Comments: TDS is generally high in this basin. Pubic Comment includes reports of subsidence, overdraft and saline intrusion (chloride from adjacient basin?)

Groundwater Quality Trend Notes: Trend is relatively flat, or no clear trend →; Level trending up ↑; Level Trending down ↓

Oxnard Plain Forebay Basin

Groundwater Basin Surface Area:	7,010 acres
Irrigated Acreage:	≈1,797 (estimate determined from Ventura County Ag Commissioner's data)
Watershed:	Santa Clara River
Aquifers:	Unconfined and confined
DWR Groundwater Basin Designation and Size:	Santa Clara River Valley Basin, Oxnard Subbasin (4-4.02) Surface area 58200 Acres. Note: DWR groups two County basins into Oxnard Subbasin (4-4.02) (DWR, 2014)
CASGEM Basin Priority:	High
DWR Groundwater Basin Population:	235,973 (2010) Note: DWR groups two County basins into Oxnard Subbasin (4-4.02)

Known Water Supply Wells (as of Feb. 2016)

Number of Wells: 304
Active: 105
Destroyed: 149
Abandoned: 18
Can't Locate: 32

Self Reported Groundwater Extraction to FCGMA (as of March 30, 2016)

Agricultural Extractions: 7,628 AF/Yr

Municipal, Industrial, and Domestic Extractions: 11,912 AF/Yr

Total: 19,540 AF/yr

2015 Groundwater Levels in General for Wells Gauged by County and UWCD

"Key" well 02N22W12R01S - Note: Measurements from UWCD. Well is dry as of November 2014 measurement. This is an upper system well.

In general for 2 of 3 wells measured by VCWPD in 2015 in the basin, water levels declined over the course of the year from the 1st quarter reading to the last quarter reading. VCWPD was unable to measure 1 well in 2015.

2015 Groundwater Quality in General for All Wells Sampled by County

(3 wells)

Forebay basin: 3 samples are calcium sulfate type.

Primary MCL Exceedances for Nitrate >45mg/l?	Yes, 1 well
Secondary MCL Excedances for Chloride >250mg/l?	No
Secondary MCL Excedances for TDS >500mg/l?	Yes, 3 wells
Secondary MCL Excedances for Sulfate >250mg/l?	Yes, 3 wells

5 Year Groundwater Level Trend 2011 - 2015

"Key" well 02N22W12R01S: Well is dry as of November 2014 measurement. This is an upper sysytem well.

Upper System

The 5 year trend based on 2011 through 2015 potentiometric surface maps is downward. ↓

Lower System

The 5 year trend based on 2011 through 2015 potentiometric surface maps is downward. ↓

5 Year Groundwater Quality Trend 2011-2015

Upper System (Includes wells sampled by other agencies)

SWN	Nitrate	Chloride	TDS	Sulfate
02N22W27M02S	↓	↑	↑	↑
02N22W14P02S	↑	↑	↑	↑
02N22W23B02S	↑	↑	↑	↑
02N22W23C02S	↑	↑	↑	↑
02N22W23G03S	↑	↑	↑	↑
02N22W23K05S	↑	↑	↑	↑

Lower System

SWN	Nitrate	Chloride	TDS	Sulfate
02N22W13N02S	→	↑	→	→
02N22W23H04S	→	↑	↓	→
02N22W26B03S	→	↑	↓	→

Wells are located in the southeast portion of the basin.

Sources of Groundwater Recharge

Basin Recharge: percolation of surface flow from the Santa Clara River and, some subsurface flow from Santa Paula Subbasin makes its way over or across the Oak Ridge fault. Some amount of irrigation return also occurs (DWR, 2006) Imported State Project Water via Lake Piru release to Santa Clara River.

Potable Water Sources

Groundwater from Oxnard Plain Forebay basin. Surface water from Santa Clara River diversion via United Water Conservation District. Groundwater from Oxnard Plain Pressure basin via Oxnard Water System. Imported State Project Water from Calleguas MWD via Oxnard Water System.

Subsurface Hydrologic Connection to Other Groundwater Basins

Upgradient: Yes, Santa Paula groundwater basin to the northwest and Oxnard Plain groundwater basin to the east and south.

Downgradient: Yes, Mound groundwater basin to the southwest. Oxnard Plain Pressure groundwater basin to the south and southwest. Flow into and out of Mound

DWR CASGEM Groundwater Basin Prioritization Level - High

Impact Comments: Saline intrusion, nitrates, pesticides, and PCBs have impacted some water wells per DWR Bulletin 118

Groundwater Quality Trend Notes: Trend is relatively flat, or no clear trend →; Level trending up ↑; Level Trending down ↓

South Las Posas Basin

Groundwater Basin Surface Area:	10,189 acres
Irrigated Acreage:	≈2,233 (estimate determined from Ventura County Ag Commissioner's data)
Watershed:	Calleguas Creek
Aquifers:	Unconfined and confined aquifers
DWR Groundwater Basin Designation and Size:	Los Posas Valley Basin (4-8). Surface area 42,353 acres. Note: DWR groups three County basins into Los Posas Valley Basin (4-8) (DWR, 2014)
CASGEM Basin Priority:	High
DWR Groundwater Basin Population:	39,835 (2010)

Known Water Supply Wells (as of Feb. 2016)

Number of Wells: 171
Active: 28
Destroyed: 80
Abandoned: 21
Can't Locate: 42

Self Reported Groundwater Extraction to FCGMA (as of March 30, 2016)

Agricultural Extractions: 1,765 AF/Yr

Municipal, Industrial, and Domestic Extractions: 82 AF/Yr

Total: 1,847 AF/yr

2015 Groundwater Levels in General for All Wells Gauged by County

"Key" well 02N19W05K01S - December level was down 0.65 feet from the January measurement.

In general for 2 wells measured in 2015 in the basin, water level declined in one well and remained the same in the second well over the course of the year from the 1st quarter reading to the last quarter reading.

2015 Groundwater Quality in General for All Wells Sampled by County

(4 wells)

The water type in one well is sodium sulfate and the remaining 4 wells are calcium sulfate type.

Primary MCL Exceedances for Nitrate >45mg/l?	No
Secondary MCL Excedances for Chloride >250mg/l?	No
Secondary MCL Excedances for TDS >500mg/l?	Yes, 4 wells
Secondary MCL Excedances for Sulfate >250mg/l?	Yes, 4 wells

5 Year Groundwater Level Trend 2011 - 2015

"Key" well 02N22W05K01S: ↓

In general for 2 wells consistently measured, a slight downward trend: ↓

5 Year Groundwater Quality Trend 2011-2015

SWN	Nitrate	Chloride	TDS	Sulfate
02N19W07B02S	↑	↓	↓	↓
02N19W07D02S	→	→	↓	↓
02N20W01Q01S	↓	→	↓	→

Wells are in the western portion of the basin.

Sources of Groundwater Recharge

Basin Recharge: Infiltration of precipitation, minor stream flow across outcrops of the Fox Canyon and Grimes Canyon gravels, and percolation from flow in the Arroyo Las Posas. (DWR, 2006)

Potable Water Sources

Groundwater from South and East Las Posas basins. Imported State Project Water from Calleguas MWD to various purveyors.

Subsurface Hydrologic Connection to Other Groundwater Basins

West/Northwest: East Las Posas groundwater basin.

DWR CASGEM Groundwater Basin Prioritization Level - High

Impact Comments: Some primary and secondary inorganic contaminants above the MCL (DWR Bulletin 118).

Groundwater Quality Trend Notes: Trend is relatively flat, or no clear trend →; Level trending up ↑; Level Trending down ↓

Cuyama Valley Basin

Groundwater Basin Surface Area:	16,560 acres
Irrigated Acreage:	≈1,410 (estimate determined from Ventura County Ag Commissioner's data)
Watershed:	Cuyama River
Aquifers:	Unconfined Aquifer
DWR Groundwater Basin Designation and Size:	Cuyama Valley (3-13) Surface area 242,114 Acres. (DWR, 2014)
CASGEM Basin Priority:	Medium
DWR Groundwater Basin Population:	1,236 (2010)

Known Water Supply Wells (as of Feb. 2016)

Number of Wells: 149
Active: 112
Destroyed: 7
Abandoned: 10
Can't Locate: 20

Water Demand Estimate

Irrigation Demand @ 2 AF/Ac*: 2,820 AF/Yr
Municipal/Domestic Demand @ 0.5 AF/person/Yr*: 618 AF/Yr
Total Estimated Demand*: 3,438 AF/Yr

*Actual demand is not known, typical demands are assumed for this estimate.

2015 Groundwater Levels in General for All Wells Gauged by County

Note: Wells are measured twice per year in the Cuyama Valley basin.

"Key" well 07N23W16R01S - Fall level was down 3.10 feet from the Spring measurement.

Both spring and fall measurements were obtained only on the above well in the basin in 2015.

2015 Groundwater Quality in General for All Wells Sampled by County

(3 wells)

The water type for all three samples is sodium bicarbonate type.

Primary MCL Exceedances for Nitrate >45mg/l?	No
Secondary MCL Excedances for Chloride >250mg/l?	No
Secondary MCL Excedances for TDS >500mg/l?	Yes, 3 wells
Secondary MCL Excedances for Sulfate >250mg/l?	No

5 Year Groundwater Level Trend 2011 - 2015

"Key" well 07N23W16R01S: ↓

In general for 2 wells consistently measured: ↓

5 Year Groundwater Quality Trend 2011-2015

SWN	Nitrate	Chloride	TDS	Sulfate
09N23W30E05S	↓	↑	↑	↑
09N24W25J01S	↓	↑	↑	↑

Wells are in the northern portion of the basin.

Sources of Groundwater Recharge

Basin Recharge: Infiltration of precipitation. Seepage from the Cuyama River. (DWR, 2006)

Potable Water Sources

Groundwater from Cuyama Valley groundwater basin.

Subsurface Hydrologic Connection to Other Groundwater Basins

Within Ventura County: None

DWR CASGEM Groundwater Basin Prioritization Level - Medium

Impact Comments:Local salinity and TDS impairments in basin (DWR Bulletin 118)

Groundwater Quality Trend Notes: Trend is relatively flat, or no clear trend →; Level trending up ↑; Level Trending down ↓

Arroyo Santa Rosa Basin

Groundwater Basin Surface Area:	3,270 acres
Irrigated Acreage:	≈1,755 (estimate determined from Ventura County Ag Commissioner's data)
Watershed:	Calleguas Creek
Aquifers:	Unconfined and confined aquifers
DWR Groundwater Basin Designation and Size:	Arroyo Santa Rosa Valley Basin (4-7). Surface area 3,747 acres. (DWR, 2014)
CASGEM Basin Priority:	Medium
DWR Groundwater Basin Population:	2,211 (2010)

Known Water Supply Wells (as of Feb. 2016)

Number of Wells: 87
Active: 40
Destroyed: 33
Abandoned: 5
Can't Locate: 9

Self Reported Groundwater Extraction to FCGMA (as of March 30, 2016) (West part of basin only)

Agricultural Extractions - 1,254 Af/Yr
Municipal, Industrial and Domestic - 0 Af/Yr

Water Demand Estimate (Whole basin)

Irrigation Demand @ 2 AF/Ac*:3,510 AF/Yr
Municipal Demand @ 0.5AF/person/Yr: 1,105
Total Demand Estimate: 4,615 AF/Yr
*Actual demand is not known, typical demands are assumed for this estimate.

2015 Groundwater Levels in General for All Wells Gauged by County

"Key" well 02N20W26B03S - December level was down 3.02 feet from the January measurement.

In general for 5 wells measured in 2015 in the basin, water levels declined over the course of the year from the 1st quarter reading to the last quarter reading.

2015 Groundwater Quality in General for All Wells Sampled by County

(4 wells)

The water type In 1 of the wells is magnesium bicarbonate type and 8 wells are magnesium sulfate type.

Primary MCL Exceedances for Nitrate >45mg/l?	Yes, 7 wells
Secondary MCL Excedances for Chloride >250mg/l?	No
Secondary MCL Excedances for TDS >500mg/l?	Yes, 9 wells
Secondary MCL Excedances for Sulfate >250mg/l?	No

5 Year Groundwater Level Trend 2011 - 2015

"Key" well 02N20W26B03S: ↓

In general for 5 wells consistently measured: ↓

5 Year Groundwater Quality Trend 2011-2015

SWN	Nitrate	Chloride	TDS	Sulfate
02N19W19P02S	↓	↑	↓	→
02N20W23R01S	↓	↓	↓	↓
02N20W25C06S	↓	→	↓	↓

Wells are generally in the southern central part of the basin.

Sources of Groundwater Recharge

Basin Recharge: Infiltration of precipitation. Subsurface flow from Tierra Rejada basin. Surface flow percolation from Arroyo Santa Rosa and Conejo Creek. Waste water returns from residential onsite septic systems. (MWH, 2013)

Potable Water Sources

Groundwater from Arroyo Santa Rosa Basin. Imported State Project Water via Calleguas Municipal Water District.

Non-Potable Water Source

Reclaimed water from Hill Canyon Waste Water Treatment Plant via Conejo Creek.

Subsurface Hydrologic Connection to Other Groundwater Basins

Upgradient: Arroyo Santa Rosa basin receive some subsurface inflow from Tierra Rejada basin. (MWH, 2013)

Downgradient: No

DWR CASGEM Groundwater Basin Prioritization Level - Medium

Impact Comments: Some primary and secondary inorganic contaminants above the MCL (DWR Bulletin 118).

Groundwater Quality Trend Notes: Trend is relatively flat, or no clear trend →; Level trending up ↑; Level Trending down ↓

Ojai Valley Basin

Groundwater Basin Surface Area:	6,470 acres
Irrigated Acreage:	≈2,135 (estimate determined from Ventura County Ag Commissioner's data)
Watershed:	Ventura River
Aquifers:	Unconfined and confined aquifers
DWR Groundwater Basin Designation and Size:	Ojai Valley Basin (4-2). Surface area 6,851 acres. (DWR, 2014)
CASGEM Basin Priority:	Medium
DWR Groundwater Basin Population:	8,268 (2010)

Known Water Supply Wells (as of Feb. 2016)

Number of Wells: 341
Active: 191
Destroyed: 82
Abandoned: 15
Can't Locate: 53

2015 Self Reported Groundwater Extractions to OBGMA

Extractions: 3,643 Af/yr

Water Demand Estimate

Irrigation Demand @ 2 AF/Ac*:4,270 AF/Yr
Municipal Demand @ 0.5 AF/person/Yr*: 4,134
Total Estimated Demand*: 8,404 AF/Yr

*Actual demand is not known, typical demands are assumed for this estimate.

2015 Groundwater Levels in General for All Wells Gauged by County

"Key" well 04N22W05L08S: - The December reading was down 55.80 feet from the March level.

In general for 13 wells consistently measured in 2015 in the basin, water levels declined in all wells over the course of the year from the 1st quarter reading to the last quarter reading.

2015 Groundwater Quality in General for All Wells Sampled by County

(15 wells)

Ojai Valley groundwater: 4 samples are calcium bicarbonate type, 1 sample is sodium bicarbonate type, and 10 samples are calcium sulfate type.

Primary MCL Exceedances for Nitrate >45mg/l?	Yes, 1 well
Secondary MCL Excedances for Chloride >250mg/l?	Yes, 1 well
Secondary MCL Excedances for TDS >500mg/l?	Yes, 14 wells
Secondary MCL Excedances for Sulfate >250mg/l?	Yes, 1 well

5 Year Groundwater Level Trend 2011 - 2015

"Key" well 04N22W05L08S: ↓

In general for 17 wells consistently measured: (15 wells) ↓ (2 wells) →

5 Year Groundwater Quality Trend 2011-2015

SWN	Nitrate	Chloride	TDS	Sulfate
04N22W04P05S	↑	↑	↑	↑
04N23W01K02S	↓	↓	↓	↓
05N22W33J01S	→	↓	↓	↓

One well is in the west, one is in the northeast, and one is in the southeast.

Sources of Groundwater Recharge

Basin Recharge:infiltration of precipitation on the valley floor, and percolation of surface waters through alluvial channels. (DWR, 2006)

Potable Water Sources

Groundwater from Ojai Valley Basin. Surface water from Lake Casitas via Casitas MWD to various water purveyors.

Subsurface Hydrologic Connection to Other Groundwater Basins

Upgradient: No

Downgradient: No. The basin is drained by Thacher and San Antonio Creeks to the Ventura River. (DWR, 2006)

DWR CASGEM Groundwater Basin Prioritization Level - Medium

Impact Comments: High nitrates and sulfates reported in the basin. Medium to high levels of nitrates reported in the basin

Groundwater Quality Trend Notes: Trend is relatively flat, or no clear trend →; Level trending up ↑; Level Trending down ↓

Tierra Rejada Basin

Groundwater Basin Surface Area:	1,774 acres
Irrigated Acreage:	≈450 (estimate determined from Ventura County Ag Commissioner's data)
Watershed:	Calleguas Creek
Aquifers:	Unconfined Aquifer
DWR Groundwater Basin Designation and Size:	Tierra Rejada (4-15) Surface area 4,611 Acres. (DWR, 2014)
CASGEM Basin Priority:	Very Low
DWR Groundwater Basin Population:	3,673 (2010)

Known Water Supply Wells (as of Feb. 2016)

Number of Wells: 51
Active: 31
Destroyed: 8
Abandoned: 1
Can't Locate: 11

Water Demand Estimate

Irrigation Demand @ 2 AF/Ac*:900 AF/Yr
Municipal/Domestic Demand @ 0.5 AF/person/Yr*: 1,834 AF/Yr
Total Estimated Demand*: 2,734 AF/Yr

*Actual demand is not known, typical demands are assumed for this estimate.

2015 Groundwater Levels in General for All Wells Gauged by County

No key well is in this basin.
In general for 3 wells measured in 2015 in the basin, water levels declined over the course of the year from the 1st quarter reading to the last quarter reading.

2015 Groundwater Quality in General for All Wells Sampled by County

(8 wells)

Tierra Rejada groundwater: 1 sample is magnesium bicarbonate type, 1 well is calcium bicarbonate and 6 well are calcium sulfate type.

Primary MCL Exceedances for Nitrate >45mg/l?	Yes, 2 wells
Secondary MCL Exceedances for Chloride >250mg/l?	No
Secondary MCL Exceedances for TDS >500mg/l?	Yes, 8 wells
Secondary MCL Exceedances for Sulfate >250mg/l?	No

5 Year Groundwater Level Trend 2011 - 2015

In general for 3 wells consistently measured: ↓

5 Year Groundwater Quality Trend 2011-2015

SWN	Nitrate	Chloride	TDS	Sulfate
02N19W10R02S	↑	↑	↓	→
02N19W11J03S	→	→	→	→
02N19W14Q02S	↓	↓	↓	↑
02N19W15J02S	→	↓	↓	↓
02N19W15N03S	→	↓	↓	→

Wells are in various locations in the basin.

Sources of Groundwater Recharge

Basin Recharge: Percolation of rainfall to the valley floor, stream flow, and irrigation return.(DWR, 2006)

Potable Water Sources

Groundwater from Tierra Rejada Basin, Arroyo Santa Rosa Basin via Camrosa Water District. State Project Water from Calleguas MWD via Camrosa Water District.

Subsurface Hydrologic Connection to Other Groundwater Basins

Upgradient: No

Downgradient: Yes, some subsurface flow into Arroyo Santa Rosa basin.

DWR CASGEM Groundwater Basin Prioritization Level - Very Low

Impact Comments: Locally high nitrates documented in the basin (DWR Bulletin 118).

Groundwater Quality Trend Notes: Trend is relatively flat, or no clear trend →; Level trending up ↑; Level Trending down ↓

Upper Ventura River Basin

Groundwater Basin Surface Area:	9,360 acres
Irrigated Acreage:	≈1,206 (estimate determined from Ventura County Ag Commissioner's data)
Watershed:	Ventura River
Aquifers:	Unconfined Aquifer
DWR Groundwater Basin Designation and Size:	Ventura River Valley Basin, Upper Ventura River Subbasin (4-3.01) Surface area 7,430 acres. (DWR, 2014)
CASGEM Basin Priority:	Medium
DWR Groundwater Basin Population:	15,961 (2010)

Known Water Supply Wells (as of Feb. 2016)

Number of Wells: 293
Active: 164
Destroyed: 45
Abandoned: 14
Can't Locate: 70

Water Demand Estimate

Irrigation Demand @ 2 AF/Ac*: 2,412 AF/Yr
Municipal/Domestic Demand @ 0.5 AF/person/Yr*: 7,980 AF/Yr
Total Estimated Demand*: 10,392 AF/Yr

*Actual demand is not known, typical demands are assumed for this estimate.

2015 Groundwater Levels in General for All Wells Gauged by County

"Key" well 04N23W16C04S - December level was down 23.0 feet from the March measurement.

In general for 16 wells measured in 2015 in the basin, water levels declined in 14 wells and rose in 2 wells over the course of the year from the 1st quarter reading to the last quarter reading.

2015 Groundwater Quality in General for All Wells Sampled by County

(2 wells)

Upper Ventura River basin: The groundwater in 1 well is sodium sulfate type, 1 well is calcium sulfate type.

Primary MCL Exceedances for Nitrate >45mg/l?	No
Secondary MCL Exceedances for Chloride >250mg/l?	No
Secondary MCL Exceedances for TDS >500mg/l?	Yes, 2 wells
Secondary MCL Exceedances for Sulfate >250mg/l?	No

5 Year Groundwater Level Trend 2011 - 2015

"Key" well 04N23W16C04S: ↓

In general for 16 wells consistently measured: (14 wells) ↓ (2 wells) →

5 Year Groundwater Quality Trend 2011-2015

SWN	Nitrate	Chloride	TDS	Sulfate
04N23W09G03S	→	↑	→	↓

Well is in the north portion of the basin.

Sources of Groundwater Recharge

Basin Recharge: percolation of flow in the Ventura River and, to a lesser extent, by percolation of rainfall to the valley floor and excess irrigation water. (DWR, 2006)

Potable Water Sources

Groundwater from Lower Ventura River basin. Surface water from Lake Casitas via Casitas MWD to various water purveyors.

Subsurface Hydrologic Connection to Other Groundwater Basins

Upgradient: No.
Downgradient: Lower Ventura River basin.

DWR CASGEM Groundwater Basin Prioritization Level - Medium

Impact Comments: TDS is known to be high in some parts of the basin (DWR Bulletin 118)

Groundwater Quality Trend Notes: Trend is relatively flat, or no clear trend →; Level trending up ↑; Level Trending down ↓

Section 1.0
Introduction

This report is a summary of work activities by County of Ventura Groundwater Section staff during calendar year 2015. Because groundwater conditions change over time, this report is prepared annually. Approximately fifty percent of the County staff's time in the Groundwater Section is dedicated to conducting field work. The field work includes:

- Inspection of permitted well sealing for new wells,
- Inspection of permitted destruction of old wells,
- Quarterly groundwater elevation measuring of approximately 180 wells, and
- Fall groundwater quality sampling of water supply wells.

Field work is critical to the protection of groundwater quality and quantity by ensuring well seals are properly constructed as required by the California Department of Water Resources (DWR) and Ventura County Well Ordinances. Improperly constructed well seals have the potential to act as a conduit for migration of contaminants and poor quality groundwater into better quality water, degrading water quality over time. The County strives to reduce or eliminate the risk that improperly constructed well seals can pose to our groundwater basins. Groundwater elevation and water quality data collected during field activities is used to determine water level and water quality trends, and to create a database available to residents, consultants, and other professionals.

The County staff also conducts administrative work which includes issuing permits for wells and soil borings, review of Discretionary Entitlement permit applications, and California Environmental Quality Act (CEQA) project reviews. County staff reviews Discretionary Entitlement permit applications and CEQA projects to assess a project's potential to impact groundwater quality and quantity, surface water quantity, and to verify a permanent water supply. Review findings are provided to the County Planning Division.

2015 is the fourth consecutive below average precipitation year. Groundwater elevations in most of the County basins showed a continuing decline during this extended drought. Water quality data was collected between August and December 2015. Data from 28 of the 221 wells exceeded the State of California's maximum contaminant level (mcl) for nitrate.

This 2015 report is the second annual report that presents Basin Summary Sheets for high and medium priority basins (per the State of California Basin priority designations), and some additional basins that County staff felt appropriate to include. Past County annual reports focused on providing data with some general findings about basin water quality and water level trends. The new basin summary sheets are a one page data sheet that provides facts and figures, and any water level and water quality trend data. The method of describing trends in these sheets is more complete than past methods used in the County Annual Report, and we feel is a better summary.

1.1 – Summary of Accomplishments

Over the last 12 months the Groundwater Section:

- Issued 117 various types of well permits, including 49 for new water supply wells, 4 water supply well destructions and 7 for water supply well repairs or modifications. 78 inspections of sealing and perforation work were performed by Groundwater Staff.

- Sampled 221 wells as part of the annual groundwater sampling program. Analytical results are included in Section 3 and Appendix D.

- Measured the water level, quarterly, in approximately 200 wells countywide. Of the fourteen groundwater basin “Key” wells measured during spring 2015 six were higher than the 2014 spring measurement and eight had declined from the spring 2014 measurement levels.

- Completed spring and fall potentiometric surface maps for: the Santa Clara River Valley, Upper Aquifer System, and Lower Aquifer System for 2015.

- Assisted the Fox Canyon Groundwater Management Agency (FCGMA) and other departments and Agencies with groundwater and mapping needs.

- Collaborated with other agencies to compile semi-annual groundwater level data and uploaded it to the California Statewide Groundwater Elevation Monitoring (CASGEM) website.

- Completed review and conditioning of numerous discretionary entitlement permits and CEQA documents.

- Completed and published the 2014 Groundwater Section Annual Report.

1.2 - General County Information

The County of Ventura was formed on January 1, 1873, when it separated from Santa Barbara County and is one of 58 counties in the State of California. Geographically, the county offers 42 miles of coastline and the Los Padres National Forest, which accounts for 46% of the county's land mass in the northern portion of the county. Fertile valleys in the southern half of the county make Ventura County a leading agricultural producer. Together, farming and the Los Padres National Forest occupy half of the county's 1.2 million acres.

A mild year-round climate, along with scenic geography makes the area attractive to the 850,000 culturally and ethnically diverse people who call Ventura County home. The unincorporated areas, along with the ten incorporated cities of Camarillo, Fillmore, Moorpark, Ojai, Oxnard, Port Hueneme, Santa Paula, Simi Valley, Thousand Oaks, and San Buenaventura (Ventura) ranks Ventura as the 11th most populous county in the State.

The following sections contain a general overview regarding population, climate, surface water and changes in groundwater conditions in Ventura County for 2015.

1.2.1 – Population

On May 1, 2015, the California State Department of Finance estimated Ventura County's population to be 848,073, an increase of 0.7 percent over the revised 2014 population estimate of 842,385. The Cities of Port Hueneme and Moorpark had the largest estimated percentage increase in population (1.7 and 1.6 percent respectively) over the previous year. Ventura County's population is expected to exceed 900,000 by the year 2025.

1.2.2 - Climate

The mean annual daily air temperature at the National Weather Service Oxnard area office was 68.1[1] degrees Fahrenheit, with an average daily high of 79.3[1] degrees Fahrenheit and an average low of 57.0[1] degrees Fahrenheit. The average annual rainfall, countywide (based on preliminary data from all active rain gages), was approximately 12 inches for the 2014/2015 water year[2]. Throughout the County, precipitation for the 2014/2015 water year was generally less than normal and ranged between 42 and 80 percent of normal. Oak View received 42% of normal, while the Camarillo area received 80% of the normal rainfall total. Figure 1-1 shows various rain gage/area rainfall totals comparing water year 2014/2015 to normal precipitation totals for that gage/area. Normals are determined from the 1957-1992 base period (i.e. the most recent 35 year period that represents average rainfall from gages with 80-120 years of record). Figure 1-2 shows a generalized distribution of rainfall across the county for wetter water years (2009 to 2010 and 2010 to 2011) and for drier water years (2013 to 2014 and 2014 to 2015). Figure 1-3 depicts average rainfall for the periods from 1995 to 1996 and 2014 to 2015 for all of Ventura County.

[1] Based on *preliminary* data from the National Climatic Data Center http://www.ncdc.noaa.gov.

[2] Water Year defined as: October 1 to September 30 of the following year. VCWPD precipitation data is *preliminary* and subject to change.

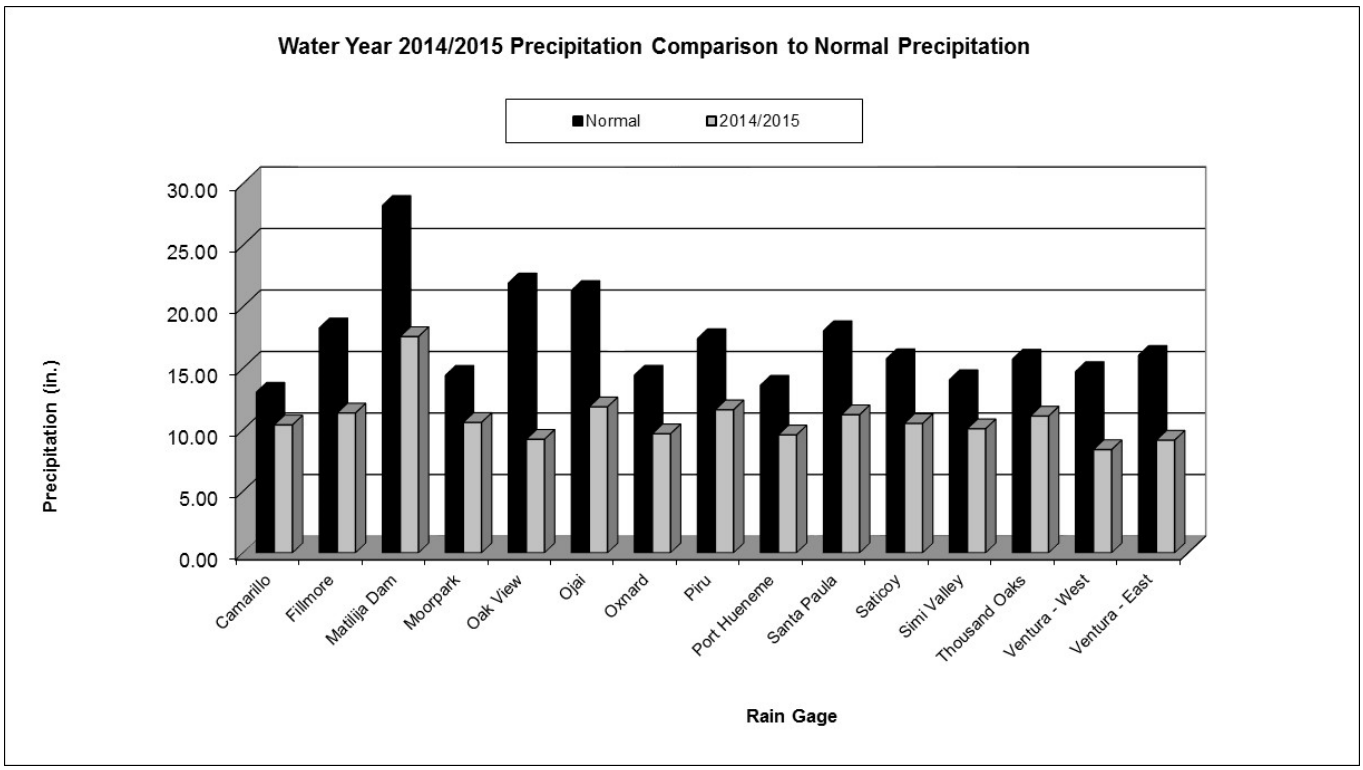


Figure 1-1: Chart comparing 2014/2015 rainfall totals to normal rainfall totals for the same area.

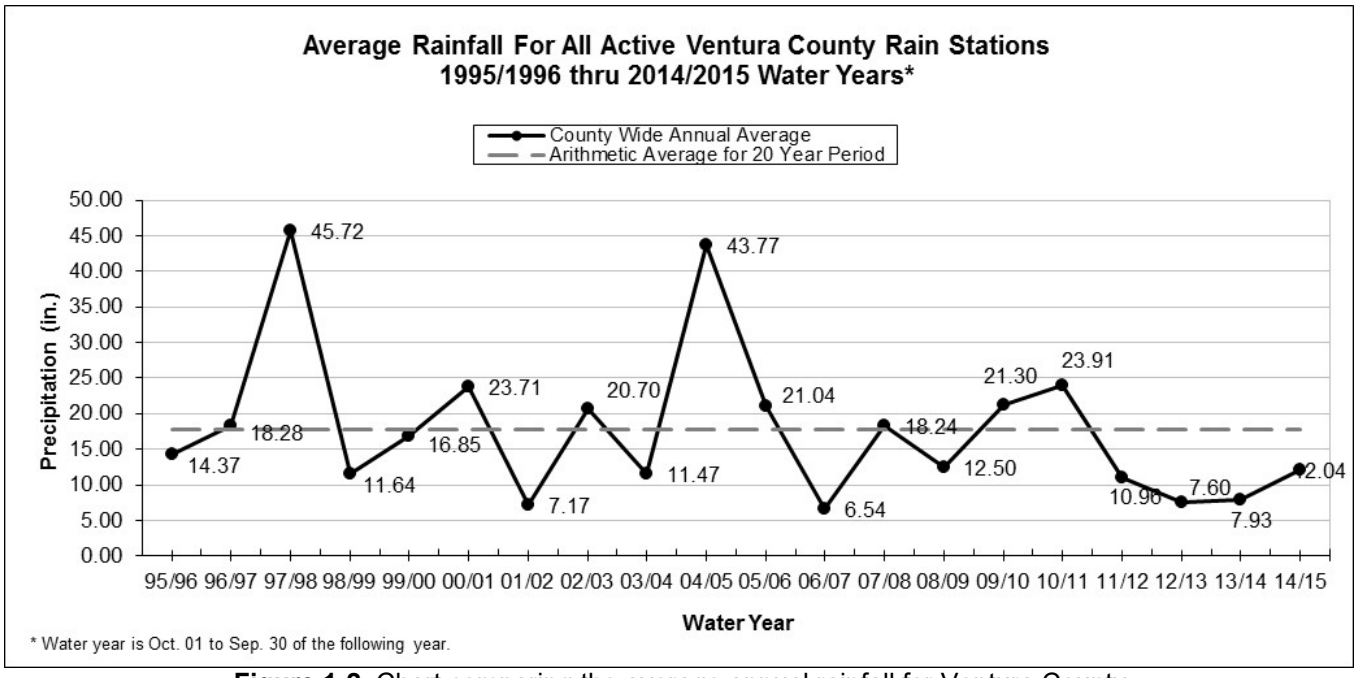


Figure 1-2: Chart comparing the average annual rainfall for Ventura County.

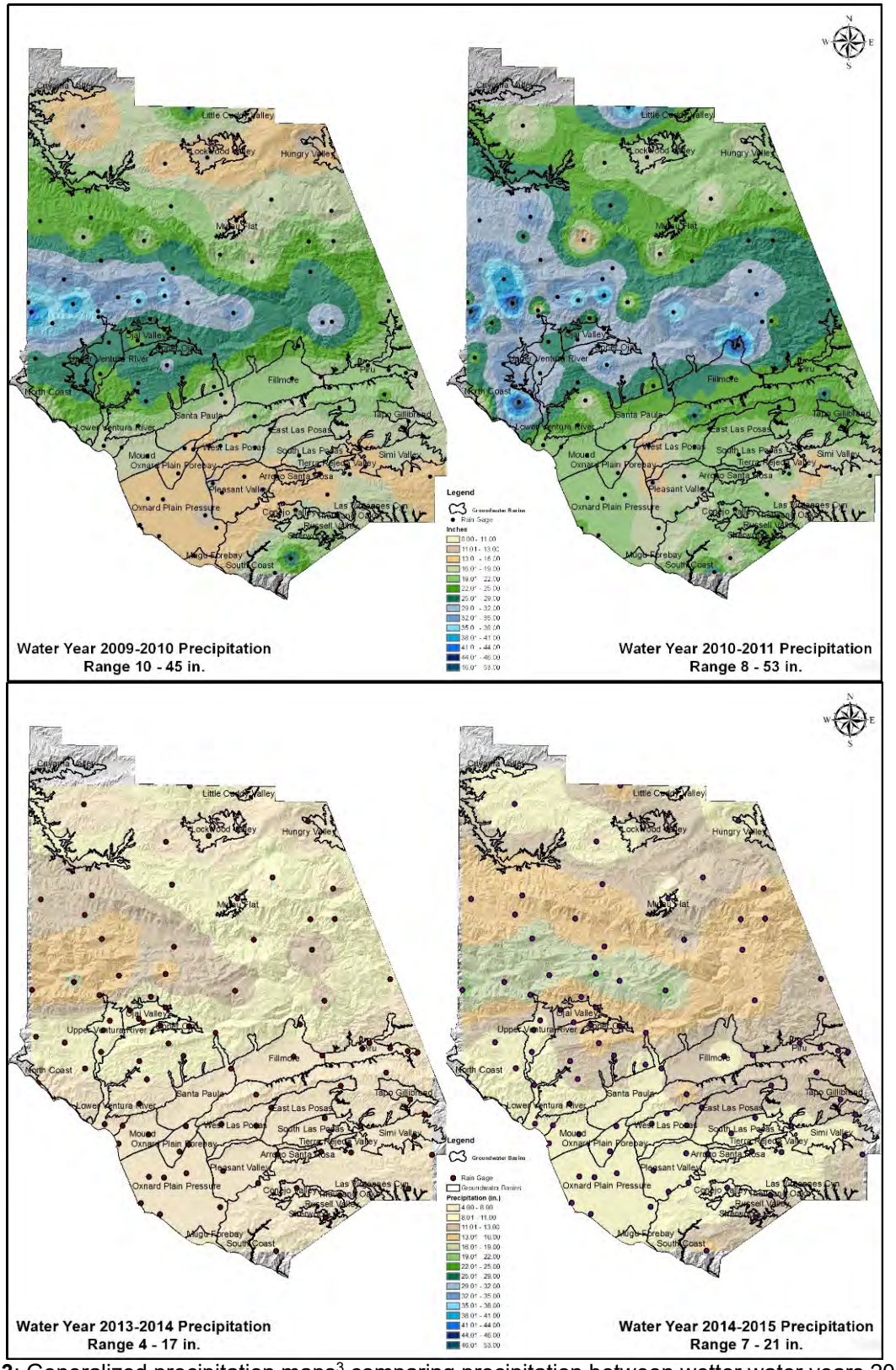


Figure 1-3: Generalized precipitation maps[3] comparing precipitation between wetter water years 2009/2010, 2010/2011 and drier water years 2013/2014 and 2014/2015.

[3] Based on data from all active Ventura County rain gages. Data is *preliminary* and subject to change.

1.2.3 – Surface Water

The presence of surface water is an important consideration in a groundwater conditions report because surface water resources may be hydrologically linked to groundwater resources. The natural connection between surface water and groundwater is typically understood in natural recharge of aquifers from surface water (losing streams), and discharge of groundwater to surface water (gaining streams). Surface water diversions to agriculture allow for use of surface water instead of extracting groundwater. Use of surface water to artificially recharge groundwater is an important part of conjunctively using surface and groundwater together.

In calendar year 2015 United Water Conservation District (UWCD) released approximately 6,533[4] acre feet (AF) of water from Lake Piru, which includes a fish passage requirement of 5 cubic feet per second (cfs) per day (3,622 AFY). UWCD diverted 2,640[4] AF from the Santa Clara River at the Freeman Diversion Dam with 1,231[4] AF sent to the Saticoy Spreading Grounds, 1,285[4] AF sent to the El Rio Spreading Grounds and 0[4] AF sent to the Noble pit, with some surface water also going to agricultural customers through the Pumping Trough Pipeline (PTP) and the Pleasant Valley Pipeline (PVP). At the end of 2015 there was 11,534[4] AF of water in storage in Lake Piru, 103,886[5] AF in Lake Casitas and 9,360[6] AF in Lake Bard. Casitas Water District releases 3,200 AF per year from Lake Casitas for the Robles Diversion Fish Passage.

In the Oxnard Plain, calendar year 2015 included reduced diversions of surface water for direct agricultural use and groundwater recharge. The reductions were a funciton of climatic conditions (drought) and regulatory constraints on releases of surface water from Lake Piru.

[4] Data provided courtesy of UWCD is preliminary and subject to change per UWCD. Freeman diversion data from UWCD operations logs.
[5] Data provided courtesy of Casitas MWD.
[6] Data provided courtesy of Calleguas MWD.

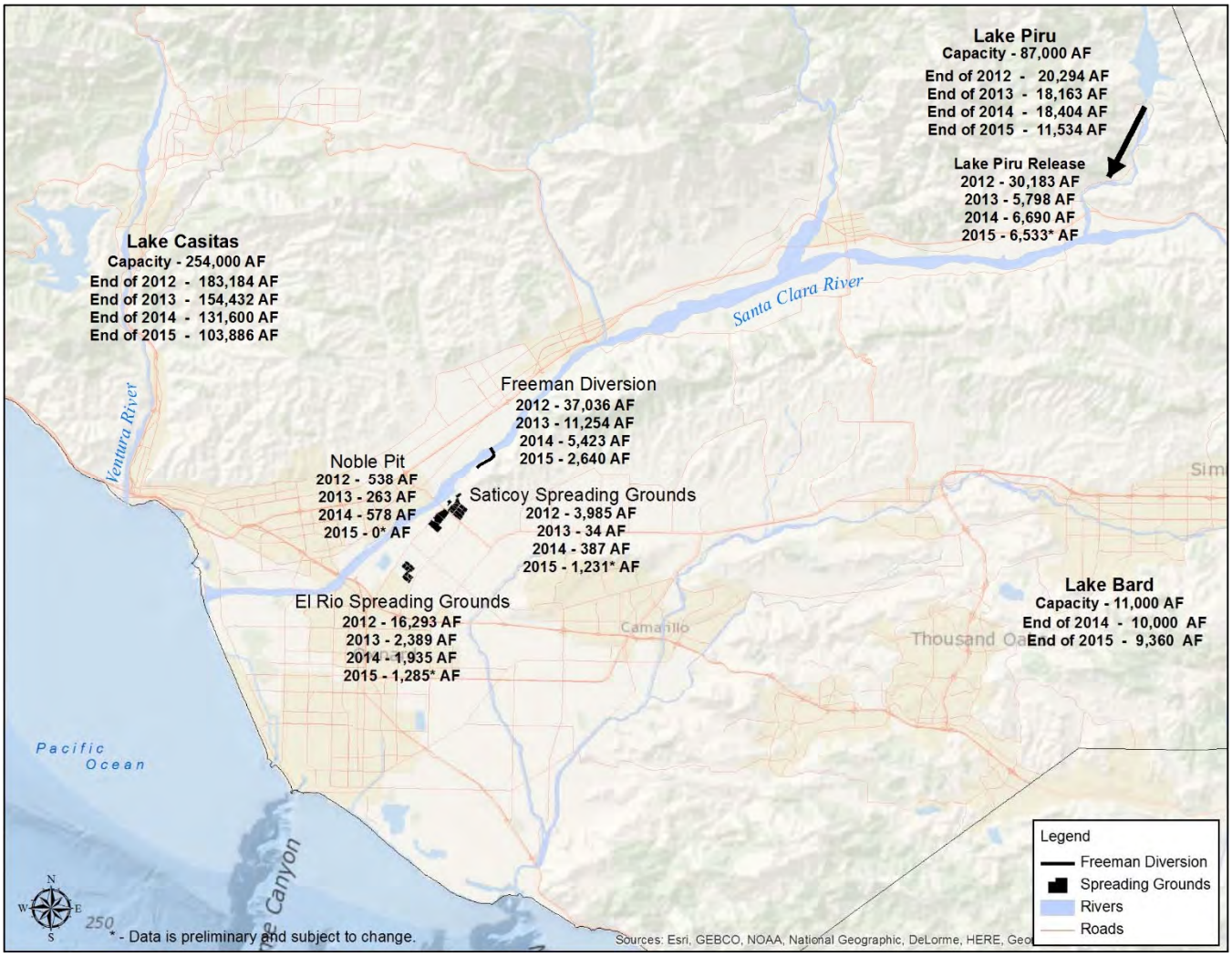


Figure 1-4: Map showing lake storage at the end of 2015 and Santa Clara River diversions.

1.2.4 – Groundwater

The majority of accessible groundwater is found in 32 groundwater basins within Ventura County. The group of basins in the south half of the County contain the largest groundwater reserves. The degree of interconnectedness of groundwater basins and aquifers within each basin is highly variable. Groundwater basins in the north half of the County do not join directly with other basins, while some groundwater basins in the south half of the County are connected on the surface and in the subsurface to varying degrees. The Groundwater Section of the Ventura County Watershed Protection District, the United Water Conservation District, dozens of individual water purveyors, and to a lesser extent the United States Geological Survey, all collect data to provide information concerning the status of groundwater in the County. Recharge of groundwater occurs naturally from infiltration of rainfall and river/streamflow, artificially through injection of imported water (Calleguas Municipal Water District) and spreading of diverted river water into recharge basins (United Water Conservation District).

Groundwater extraction data in certain basins is known and presented later in this report. Groundwater extraction data has been coarsely estimated in other basins.

Figure 1-5: Map showing groundwater basins in Ventura County.

Section 2.0
Duties and Responsibilities

2.1 – Well Ordinance

The County's Well Ordinance was updated in 2014 with the goal of regulating well construction, destruction, and operation in a manner designed to protect groundwater quality and quantity. The ordinance was updated to better align with the Sustainable Groundwater Management Act (SGMA). SGMA requires development of groundwater sustainability plans and sustainable management of our groundwater basins at the local level. The well ordinance update effort was significant, and opened up dialogue between the County and stakeholders regarding how well permits and well operation should be regulated. Overall the effort is considered a success and the County appreciates the input from its stakeholders in the process. The County's well ordinance follows well construction and destructions requirements set forth by the State of California Department of Water Resources.

2.1.1 – Permits

Permits are required in the County for construction and destruction of wells and soil borings such as groundwater extraction wells, cathodic protection wells, monitoring wells, and geotechnical borings. Permits are required to ensure wells and borings are properly constructed and sealed to mitigate the likelihood of migration of contaminants and poor quality water into better quality water and to document well construction details and well placement. After County staff issues a well permit, staff inspects placement of well seals to verify that the well was sealed per the California DWR Well Standards.

The Groundwater Section issues permits for wells and engineering test holes throughout the County, except within the City of Oxnard, which issues their own well permits within the City of Oxnard boundaries. The Groundwater Section conditioned and issued 117 permits for wells and engineering test holes during calendar year 2015. Table 2-1 below shows the total number of permits issued for the year by type of permit. Figure 2-1 below shows the total number of permits issued per year for the period 2006 to 2015.

Table 2-1: Permits issued by type for calendar year 2015.

Type of Work	Engineering Test Hole	Monitoring Well – Destruction	Monitoring Well – New	Water Supply Well – New	Water Supply Well – Destruction	Water Supply Well - Repair	Cathodic Protection Well	Geothermal Heat Exchange	**TOTAL**
Number 2015	22	11	23	49	4	7	1	0	117

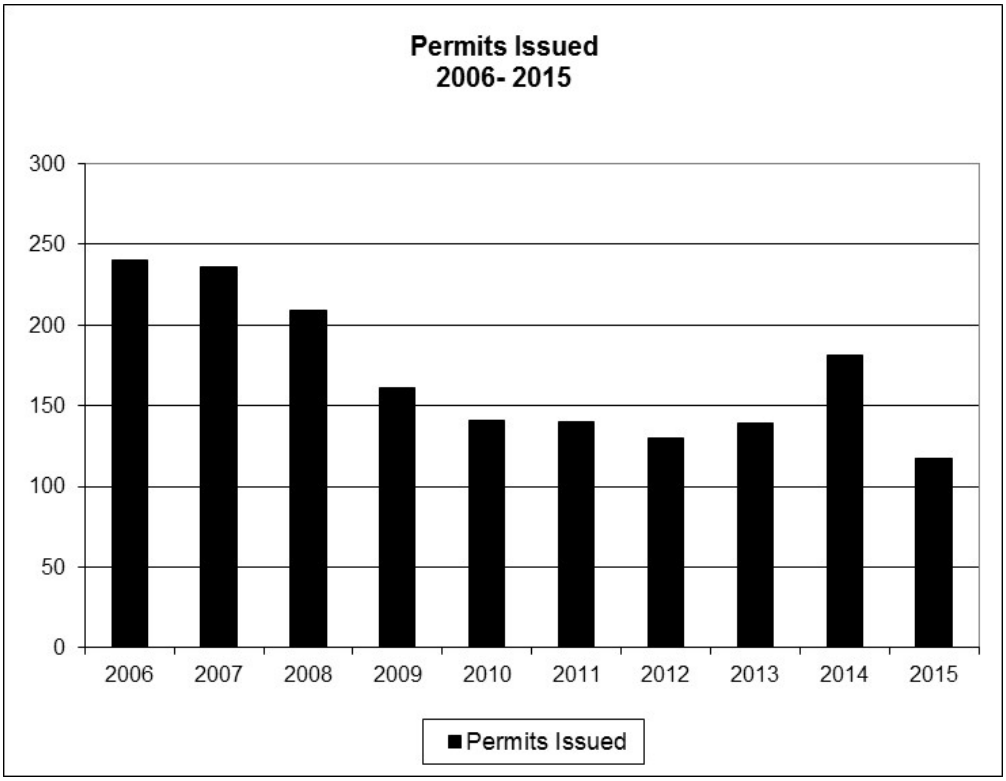


Figure 2-1: Permits issued for the period 2006 to 2015.

2.2 – Inspections

Groundwater Section staff perform inspections on all well perforation and sealing work for each new water supply well, water well destruction, new cathodic protection well or destruction, and major modifications or repairs to existing water supply wells per the County's Well Ordinance. In 2015, staff performed 78 inspections throughout the County. Figure 2-2 shows the distribution of new well and well destruction locations inspected by Groundwater staff during 2015.

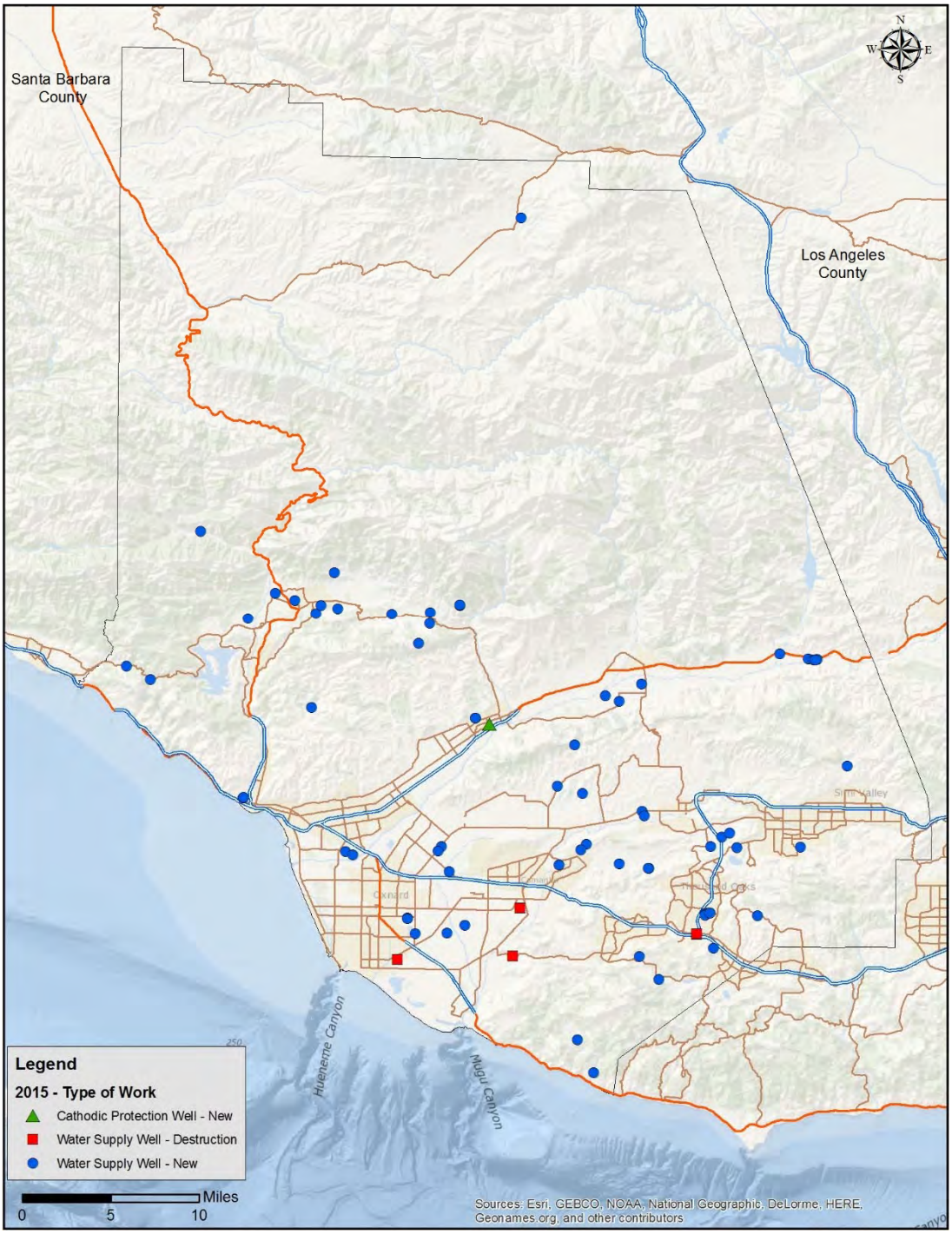


Figure 2-2: Location of well inspections in 2015.

2.3 – Inventory and Status of Wells

The Groundwater Section maintains an inventory of wells and their status in a database. There are several purposes of maintaining this information which include verifying well locations, tracking owner-reported well operation in order to determine if a well is abandoned, tracking well ownership, and assisting land owners in determining if wells are on particular parcels. The database contains details for wells of all types including water supply wells, long-term monitoring wells, cathodic protection wells, and also springs that were given a state well number. At the end of 2015 there were 9,054 well records in the database in the following categories.

2015 Status	Number
Active	4,016
Abandoned	416
Can't Locate	1,821
Non Compliant	88
Non Compliant Abandoned	136
Destroyed	2,562
Exempt	15

- Active wells are those wells that meet or exceed the minimum requirement of 8 hours pumping per calendar year as described in the County of Ventura Well Ordinance No. 4468.
- Abandoned wells are those wells that do not meet the 8 hour minimum usage requirement or are in a condition that no longer allows the well to be used.
- 'Can't Locate' wells are old rural wells for which the Groundwater Section has historic well location data but the locations are now in areas that have subsequently been urbanized. There are several reasons why a well may be listed as "Can't Locate." The current owner of the property where the historical well was understood to be located may be unaware of the existence of a well on his/her property, or an approved search has been conducted and no well has been found.
- Non-Compliant wells are generally active wells where the owner of the well has failed to respond to written communication from the Groundwater Section.
- Non-Compliant Abandoned wells are those wells where the owner of an abandoned well has failed to respond to written communication from the Groundwater Section to take action on an inactive well. The County's Well Ordinance prohibits anyone from owning an abandoned well. Abandoned wells pose a safety risk and may also act as a potential pathway for contaminants to reach groundwater.
- Destroyed wells are wells that have been properly destroyed under permit.
- Exempt wells are wells that have been found to be in good enough condition to remain inactive for a period of 5 years before being re-activated or re-inspected. To be listed as exempt, a well inspection report from a professional geologist or civil engineer and application fee, must be submitted by the well owner to the Groundwater Section for review and approval.

Section 3.0
Groundwater Quality

3.1 – Water Quality Sampling

The Groundwater Section collects water quality data to analyze and obtain a general overview of the quality of the groundwater in Ventura County groundwater basins. We also work with and share groundwater quality data with other data collecting organizations in the County. This is very important as there is no other systematic county wide groundwater quality monitoring program in place. Without the data, groundwater quality may not be known. Collected data is publically available, upon request, and is also used by stakeholders, consultants, and other professionals.

In 2015, Groundwater staff sampled a total of 221 water supply wells throughout the County. The well sampling procedures include contacting well owners to get approval to sample wells, obtaining sample bottles from the laboratory, collecting water samples, delivering the samples to the laboratory within the sample holding times, receiving the water quality analyses from the lab, entering water quality data in the database, and providing a copy of the data to the well owner. Because the County does not own or operate the wells it samples (with some very limited exceptions) it relies on well owner permission to make their wells available. Some of the wells sampled are large capacity wells and are only sampled when normally in operation. The County works to sample many of the same wells each year, but because the County does not own most of the wells, it is not always able to control the well's availability for sampling. Sometimes wells are not available to sample for various reasons, e.g. the pump is being repaired, rainy weather makes pumping unnecessary, lock on gate changes, etc. When a preferred well cannot be sampled, County staff will seek to find an alternative well to sample. The process is flexible, but can also be limiting because County staff may not always be able to sample the same well year after year, and long term water quality from individual wells is valuable to determine water quality trends.

All samples were analyzed for irrigation suitability to determine the concentration of general minerals (see Appendix D – Water Quality Section). Analyses were conducted by Fruit Growers Laboratory in Santa Paula. California Title 22 metals were also analyzed on select samples and eleven samples were analyzed for Gross Alpha particles. Analytical results were entered into the Section's database and used to describe the chemistry of groundwater in the basins sampled. Complete results are listed in Appendix D, and general interpretations of the data are detailed in the following sub-sections. Because the wells sampled each year may vary care must be taken when comparing data from past reports. We make an effort to sample certain wells every year and sample additional wells as time and budget allow. Wells sampled in the north half of the County are shown in Figure 3-1. Wells sampled in the south half of the County are shown in Figure 3-2.

Additional groundwater quality data that was not used in this report is available from other sources, including data from water districts and agencies that collect and analyze groundwater samples for their own use. Organic groundwater chemistry data is also available for some areas of the County through the State Regional Water Quality Control Board's Geotracker website for environmental cleanup sites.

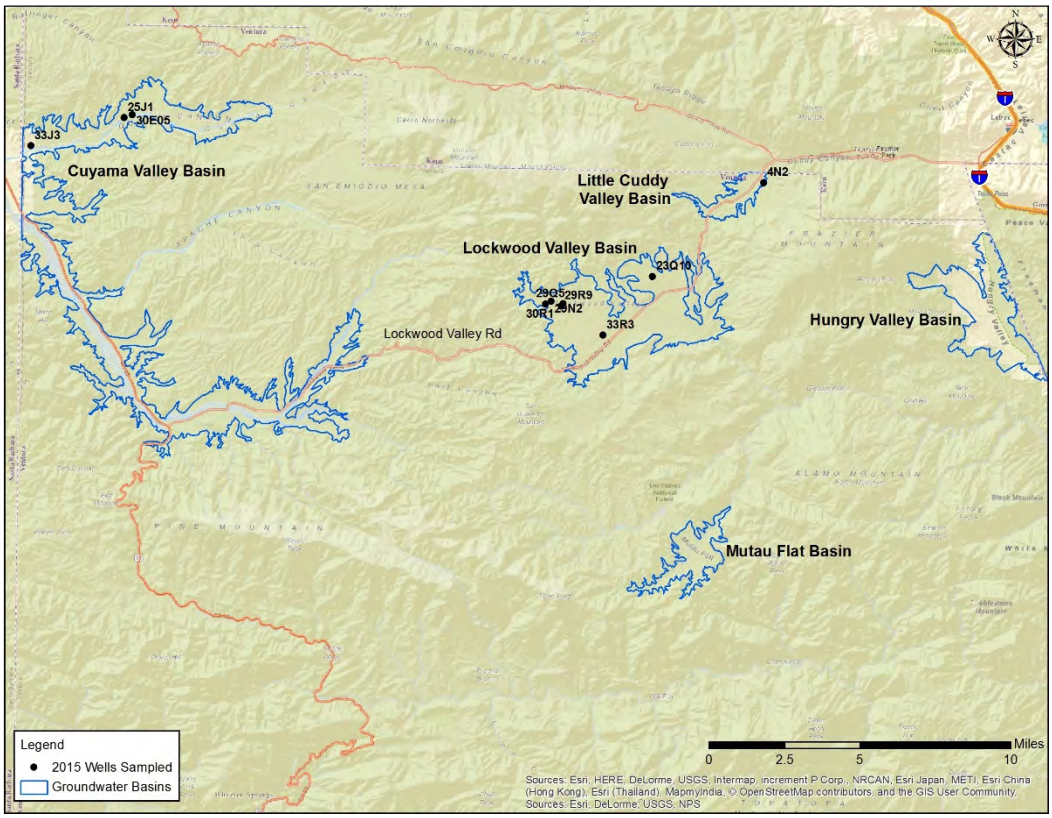


Figure 3-1: Map depicting sample locations for the northern half of the County.

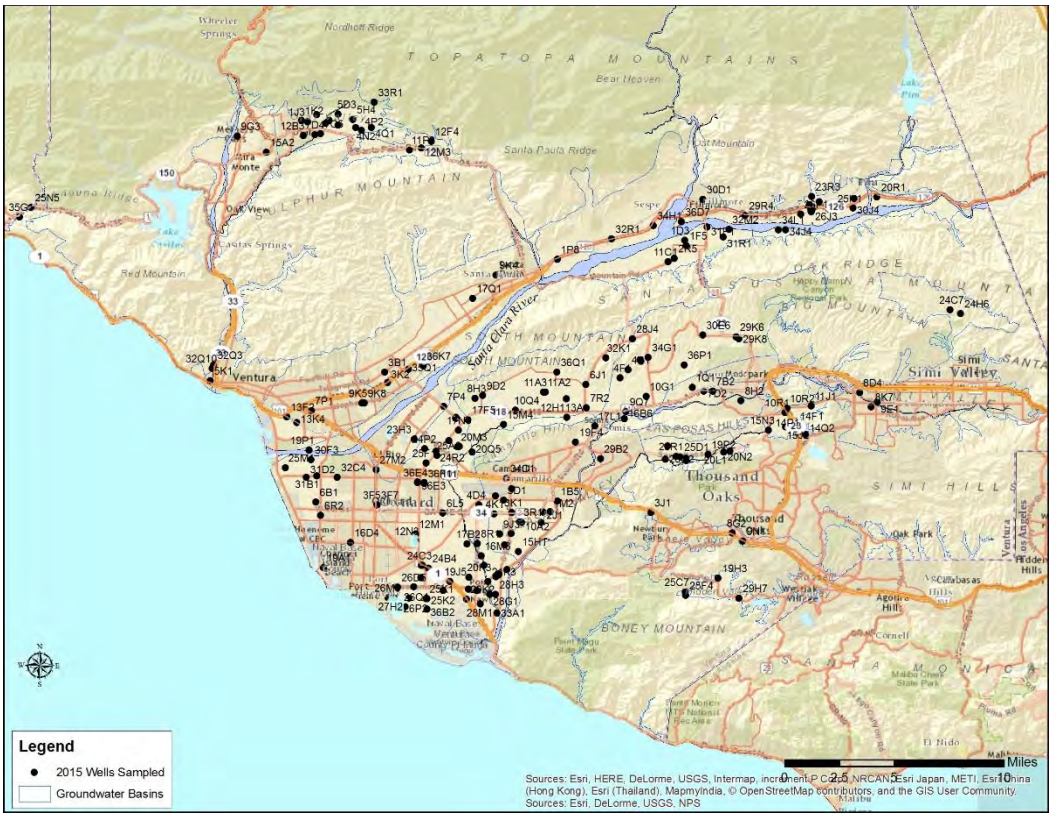


Figure 3-2: Map depicting sample locations for the south half of the County.

3.2 – Current Conditions

General interpretations of the groundwater quality data for each groundwater basin sampled this year is included in this section. Unless otherwise listed, the data interpretation is limited to data collected by the County staff. Basin summaries are presented in order from largest to smallest total available storage capacity as reported in California Department of Water Resources Bulletin No. 118. Ventura County groundwater, in general, has slightly high total dissolved solids and sulfate (SO_4^{2-}). Several areas are nitrate impacted (meaning Basin Management Water Quality Objectives for nitrate are exceeded).

The Groundwater Section uses the United States Environmental Protection Agency (EPA) National Drinking Water Regulations and California Code of Regulations (CCR) Title 22, Section 64431 (Table 3-1 below) for describing groundwater quality in Ventura County relative to maximum contaminant levels (MCL). National Primary Drinking Water Regulations, or primary standards, are legally enforceable standards that apply to public water systems. Primary standards protect public health by limiting the levels of contaminants in drinking water. Maximum contaminant level or MCL is the highest level of a contaminant allowed in drinking water by the United States Environmental Protection Agency. MCLs are set as close as feasible to the level that below which there is no known or expected health risk. National Secondary Drinking Water Regulations, or secondary standards, are guidelines for contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. The EPA recommends secondary standards to water systems but does not require systems to comply with the secondary standards. However, states may choose to adopt the secondary standards as enforceable standards. CCR, Title 22, Section 64431 lists MCLs for metals adopted by the State of California. In order to be certified as a permanent domestic or municipal water supply, water from wells located in the County of Ventura must meet these standards.

Table 3-1: U.S. Environmental Protection Agency Primary and Secondary Standards and California Code of Regulations, Title 22 Maximum Contaminant Levels (February 2012).

Primary Contaminants	Chemical Formula	EPA MCL (mg/l)	CCR, Title 22 MCL (mg/l)
Antimony	Sb	0.006	0.006
Arsenic	As	0	0.01
Asbestos		7 MFL[1]	7 MFL[1]
Barium	Ba	2	1
Beryllium	Be	0.004	0.004
Cadmium	Cd	0.005	0.005
Chromium	Cr	0.1	0.05
Copper	Cu	1.3	
Cyanide		0.2	0.15
Fluoride	F^-	4	2
Lead	Pb	0	
Mercury	Hg	0.002	0.002
Nitrate (as Nitrogen)	N	10	10
Nitrate[2]	NO_3^-		45
Nitrite (as Nitrogen)	N	1	1
Selenium	Se	0.05	0.05
Thallium	Tl	0.0005	0.002

Table continued from previous page **Secondary Contaminants**			
Aluminum[3]	Al	0.5 to 0.2	
Chloride	Cl^-	250	
Iron	Fe	0.3	
Manganese	Mn	0.05	
pH		6.5-8.5	
Silver	Ag	0.1	
Sulfate	SO_4^{2-}	250	
Total Dissolved Solids	TDS	500	
Zinc	Zn	5	

[1] MFL = Million fibers per liter longer than 10 um

[2] CCR, Title 22 standard for Nitrate reported as NO_3

[3] CCR, Title 22 lists Aluminum as a primary contaminant

The major ionic species in most natural waters are Na^+, K^+, Ca^{++}, Mg^{++}, Cl^-, CO_3^{2-}, HCO_3^-, and SO_4^{2-}. As water flows through an aquifer it assumes a diagnostic chemical composition from interactions with the lithology. One of the more widely used ways to present water chemistry graphically is the trilinear or piper diagram. The diagram is comprised of three pieces: a ternary diagram in the lower left representing the cations (positive charged ions), a ternary diagram in the lower right representing the anions (negative charged ions), and a diamond plot in the middle representing a combination of the two. The diamond diagram tells you different things depending on what you're plotting. For groundwater, the top quadrant is calcium sulfate waters, the left quadrant is calcium bicarbonate waters, the right quadrant is sodium chloride waters, and the bottom quadrant is sodium bicarbonate waters. Figure 3-3 shows the form of a piper diagram.

The first step in determining the water type is to convert the concentration of each anion or cation group in a sample to milliequivalents/L (meq/L) and normalize the concentrations. The percent concentrations are then plotted on the appropriate ternary diagram. The position of the points are projected parallel to the magnesium and sulfate axes, respectively until they intersect in the center field (Fetter, 1988). Piper diagrams for each basin are located in Appendix D starting on pg. 140.

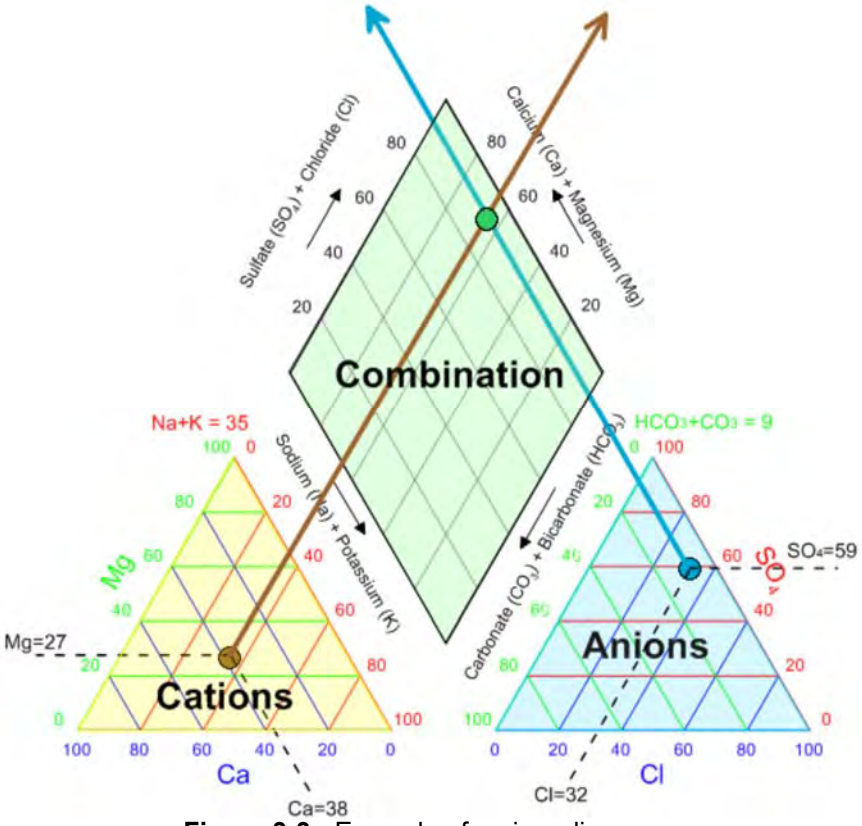


Figure 3-3: Example of a piper diagram.

Figure 3-4 shows a plot of the water quality from a well sampled this year. The cations plot as calcium type on the cations triangle and the anions plot in the sulfate type on the anions triangle. Positions of the points projected on to the diamond shaped center field shows the water is calcium sulfate type.

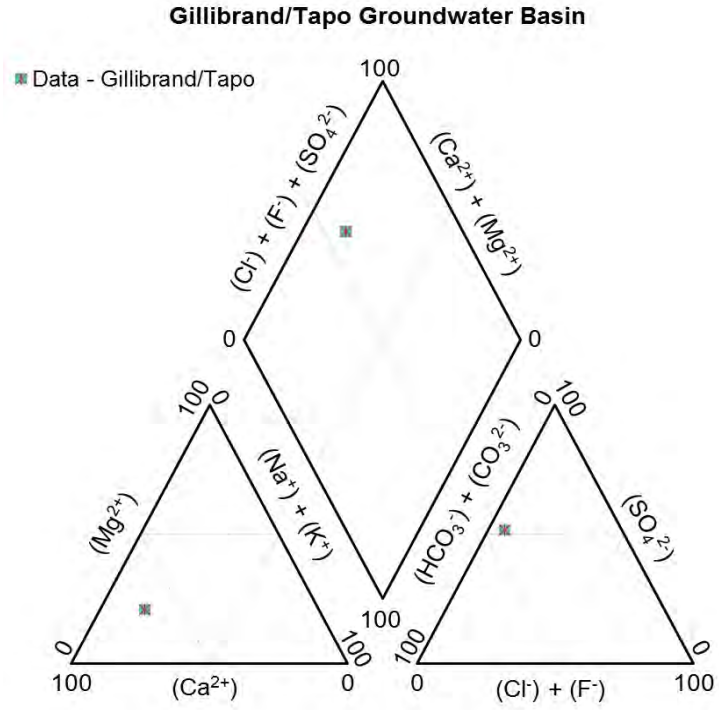


Figure 3-4: Piper diagram showing water quality of a well from Gillibrand/Tapo groundwater basin.

A second method to present results, a stiff diagram, is shown in Figure 3-5. The same cations and anions that are plotted in the piper diagrams are also shown in the stiff diagrams. The ions are plotted on either side of a vertical axis in milliequivalents per liter (meq/L), cations on the left of the axis and anions on the right. The polygonal shape created is useful in making a quick visual comparison between water from different sources. Stiff diagrams for wells sampled this year are included on each basin map.

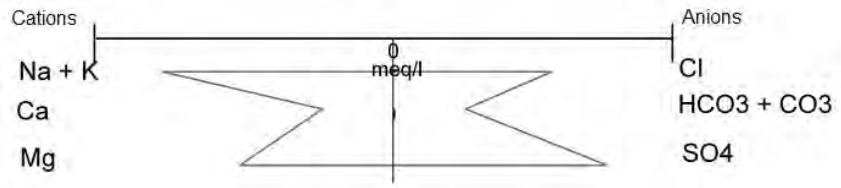


Figure 3-5: Example stiff diagram.

3.2.1 - Oxnard Plain Pressure Basin

The Oxnard Plain Pressure Basin is the largest and most complex of the groundwater basins in Ventura County. The Oxnard Plain Pressure Basin consists of two major aquifer systems. The Upper Aquifer System (UAS) consists of, from shallowest to deepest, the Perched, Semi Perched, Oxnard, and Mugu aquifers. Of the UAS aquifers, only the Oxnard and Mugu aquifers are sampled for water quality by the County. The Lower Aquifer System (LAS) consists of, from shallowest to deepest, the Hueneme, Fox Canyon and Grimes Canyon aquifers. There are approximately 895 water supply wells in the Oxnard Plain Pressure Basin; 371 are active. There are no wells perforated solely in the Grimes Canyon aquifer so the County cannot sample it specifically. The basin map in Figures 3-6 thru 3-8 show approximate well locations and (in call out boxes) concentrations of total dissolved solids (TDS), sodium (Na^+), potassium (K^+), calcium (Ca^{2+}), magnesium (Mg^{2+}), chloride (Cl^-), bicarbonate (HCO_3^-), carbonate (CO_3^{2-}) and sulfate (SO_4^{2-}) for the wells sampled in the Upper Aquifer System of the Oxnard Plain Pressure Basin. Figures 3-9 and 3-10 show the same information for wells sampled in the Lower Aquifer System.

3.2.1.1 - Oxnard Aquifer (UAS)

The Oxnard aquifer is the shallowest of the confined aquifers. The Oxnard aquifer is the most developed (based on the number of wells) production zone. Average depth to the main water bearing material is 80 feet making it the easiest and least expensive aquifer in which to construct a water supply well. The piper diagram, Figure E-1 shows low variability in water quality of the wells sampled this year. There is no dominant cation, though data plot closest to a calcium cation type; sulfate is clearly the major anion. The water is best classified as a calcium sulfate type. Groundwater samples were collected from nine wells in the Oxnard Aquifer. A comparison of the stiff diagrams with those from the 2014 report shows no significant change in water quality type.

Water from one of the wells has a concentration of iron (Fe) and water from four of the wells have manganese (Mn) concentrations above the secondary MCL for drinking water. Samples from all twelve of the wells have sulfate (SO_4^{2-}) and TDS concentrations above the secondary MCL for drinking water; sulfate concentrations range from 350 to 2050 mg/L. Total dissolved solids (TDS) ranged from 829 to 4043 mg/l. Water from two of the wells sampled have nitrate (NO_3^-) concentration above the primary MCL for drinking water. Samples from four wells were analyzed for Title 22 metals. Lead concentration was above the MCL for drinking water. The concentrations of all other Title 22 metals were below the MCL for drinking water.

Groundwater plumes with elevated nitrate concentrations are common in the northern portion of the basin. Sources of nitrate are nitrogen based fertilizers in agricultural areas and septic systems in residential areas.

3.2.1.2 - Mugu Aquifer (UAS)

The Mugu aquifer is the lowest layer of the UAS and has similar physical and chemical characteristics to the Oxnard Aquifer, but has slightly better water quality, in part, because with increasing depth contaminants are generally less likely to infiltrate. This is shown graphically in the piper diagram, Figure E-2, and stiff diagram Figure 3-7. Average depth to the main water bearing material is 200 ft. Five wells that are perforated only in the Mugu aquifer were sampled. The piper diagram, Figure E-2, shows low variability in water quality of the wells sampled this year. There is no clearly dominant cation, though data plots closest to a calcium cation type; sulfate (SO_4^{2-}) is clearly the major anion. The water is best classified as a calcium sulfate type. All five wells sampled have TDS concentrations above the MCL for drinking water. TDS ranges from 898 to 1560 mg/l. All five wells sampled have sulfate (SO_4^{2-}) concentrations above the secondary MCL for drinking water, three wells have iron concentrations above the secondary MCL, three wells have manganese concentrations above the secondary MCL. One water sample was analyzed for Title 22 metals. The concentrations of all the Title 22 metals were below the MCL for drinking water.

Figure E-3, piper diagram shows water chemistry of Upper Aquifer wells that are screened in both the Oxnard and Mugu aquifers. It shows moderate variability in water quality of the wells sampled this year. There is no dominant cation but the data plots close to the calcium cation type; sulfate (SO_4^{2-}) is the dominant anion in seven of the samples, chloride is the dominant anion in one sample, and there is no dominant anion for two samples but the data plots close to the sulfate anion type. The water is calcium sulfate type. The piper diagram, Figure E-4, shows a comparison of all the wells sampled in the UAS. TDS ranges from 772 to 1920 mg/l. Five of the wells have iron concentrations above the secondary MCL, nine wells have manganese and sulfate (SO_4^{2-}) above the secondary MCL and all ten wells have TDS concentrations above the secondary MCL.

OXNARD PLAIN PRESSURE BASIN
Upper Aquifer System

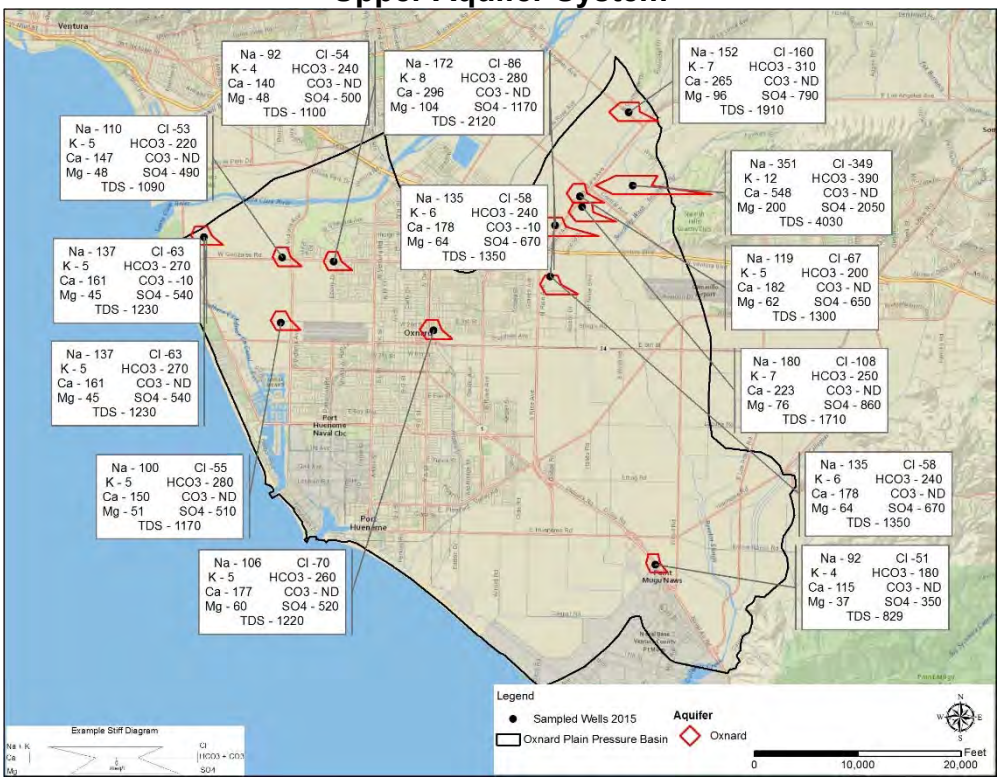


Figure 3-6: Map showing approximate location of sampled wells with concentrations (mg/l) of selected inorganic constituents and piper diagrams for the Oxnard aquifer.

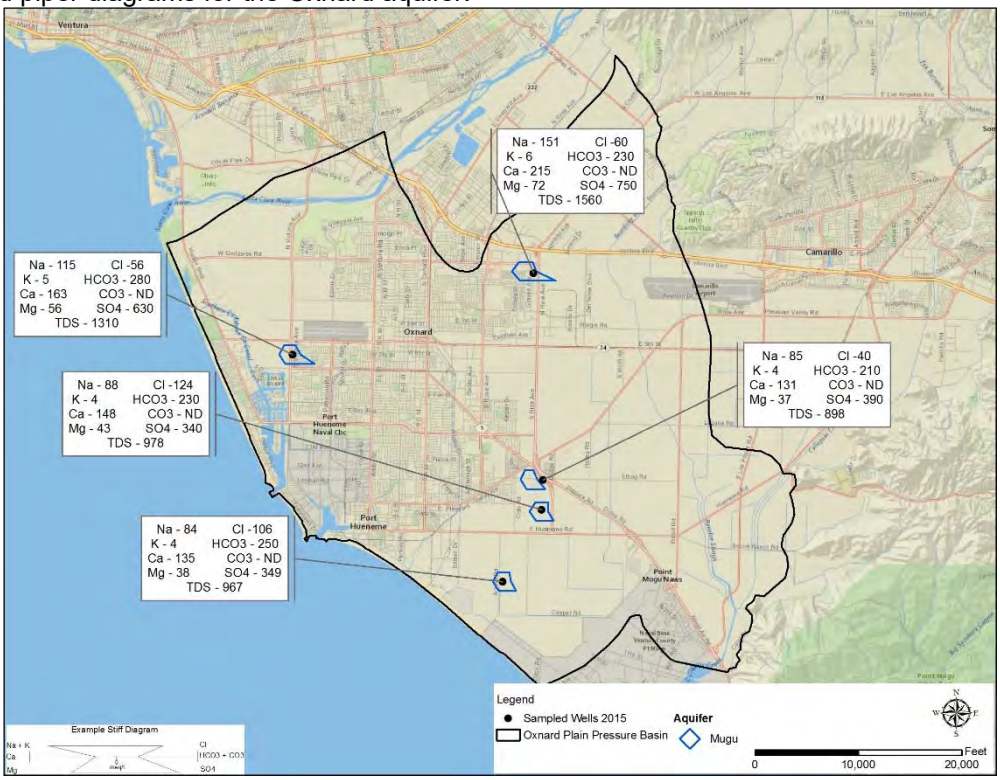


Figure 3-7: Map showing approximate location of sampled wells with concentrations (mg/l) of selected inorganic constituents and piper diagrams for the Mugu aquifer.

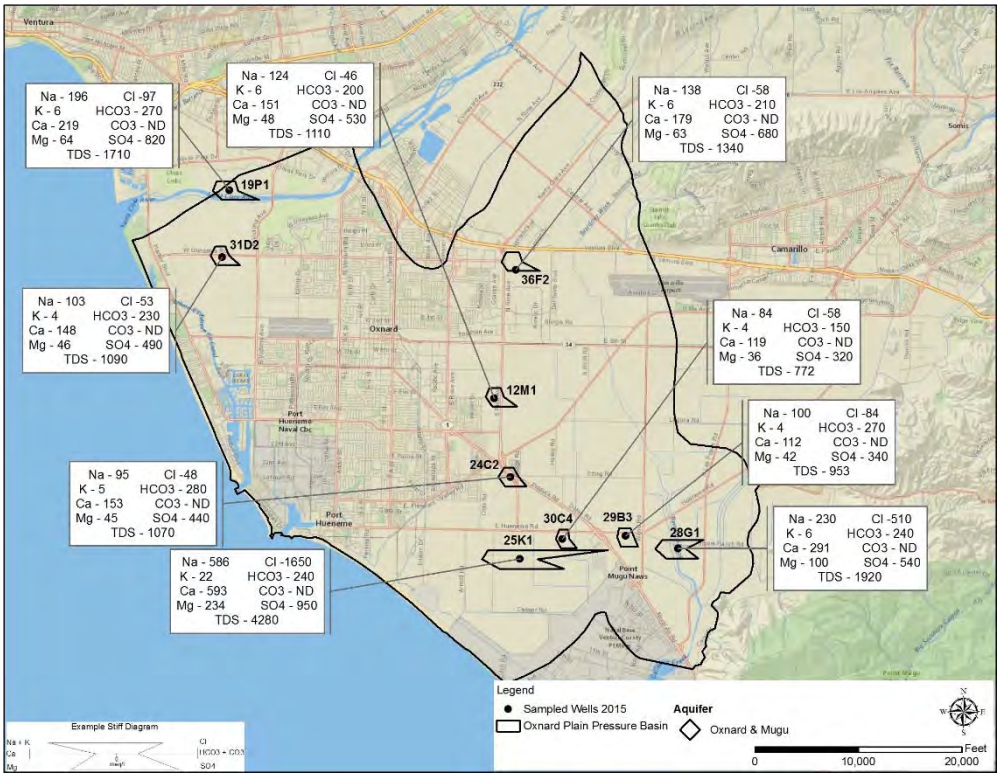


Figure 3-8: Map showing approximate location of sampled wells with concentrations (mg/l) of selected inorganic constituents and piper diagrams for wells screened in both the Oxnard and Mugu aquifers.

3.2.1.3 - Hueneme Aquifer (LAS)

The Hueneme aquifer is the shallowest of the Lower Aquifer System aquifers with depth to the main water bearing material approximately 375 feet. Very few wells are perforated exclusively in the Hueneme aquifer, making an accurate determination of water quality for the aquifer difficult. Five wells screened solely in the Hueneme aquifer were sampled this year. Figure E-5, piper diagram, shows low variability in water quality of the wells sampled this year. There is no clearly dominant cation, though the data plots closest to a calcium cation type; sulfate (SO_4^{2-}) is the major anion. The water is best classified as a calcium sulfate type. All five wells sampled have elevated TDS and sulfate (SO_4^{2-}) concentrations compared to the secondary MCL for drinking water. Two samples have iron and three samples have manganese concentrations above the MCL for drinking water. Overall, water quality has not changed significantly since the previous round of sampling.

3.2.1.4 - Fox Canyon Aquifer (LAS)

The Fox Canyon aquifer is the second most developed production zone in the Oxnard Plain Pressure Basin based on the number of wells and depth of perforations. Depth to the main water bearing material is approximately 580 feet. The Fox Canyon aquifer generally has excellent water quality and high yield rates, but is subject to seawater intrusion near Point Mugu and the Hueneme Submarine Canyon. Extractions are monitored and allocated by the Fox Canyon Groundwater Management Agency in order to mitigate aquifer overdraft and reduce the intrusion of seawater.

The piper diagram, Figure E-6, shows moderate to high variability in water quality of the wells sampled this year. Sodium is the dominant cation in two samples. There is no dominant cation in the remainder of the

samples. Bicarbonate is the dominant anion in two samples; two samples have no dominant anion; and sulfate (SO_4^{2-}) is the dominant anion in remaining 12 samples of the samples. The water type of the majority of the samples is calcium sulfate. There is more variation in water chemistry compared to last year. More wells were sampled and there is a higher concentration of calcium and sulfate. For wells perforated solely in the Fox Canyon Aquifer sampled this year, TDS concentrations range from 449 mg/l to 1050 mg/l; all 16 wells sampled have TDS above the secondary MCL for drinking water. Eight water samples have iron (Fe^{+}) concentrations above the secondary MCL for drinking water. One well had a concentration of iron (Fe^{+}) at approximately 45 times MCL. The same well had a manganese (Mn^{+}) concentration of almost 10 times the MCL. These high levels can be attributed to corrosion in the well or well equipment. The water came out black and would not clean up. Six water samples have manganese (Mn^{+}) and twelve have sulfate (SO_4^{2-}) concentrations above the secondary MCL for drinking water. Four samples were analyzed for Title 22 metals. One sample had lead above the MCL for drinking water. The concentrations of all remaining Title 22 metals were below the MCL for drinking water.

Six of the Oxnard Plain Pressure Basin wells that were sampled this year are perforated in both the Hueneme aquifer and the Fox Canyon aquifer and will be referred to as LAS wells. Results for those wells are included in Appendix D and shown on the map of the Lower Aquifer System (LAS) Figure 3-10. The piper diagram, Figure E-7, shows moderate variability in water quality of the wells sampled this year. Sodium is the dominant cation in one sample with no dominant cation in the remainder, but samples plot close to the calcium cation type. Sulfate (SO_4^{2-}) is the dominant anion in five of the samples; there is no dominant anion in the remaining sample but it plots near the bicarbonate anion type. One water sample is sodium sulfate type and the remainder are calcium sulfate. TDS concentration of water from these wells varies between 859 mg/l and 1380 mg/l. Samples from four wells have iron above the secondary MCL and three have manganese concentrations above the secondary MCL for drinking water. Five have sulfate above the secondary MCL and all six have TDS concentrations above the secondary MCL for drinking water. Water samples from four of the Hueneme/Fox wells were analyzed for Title 22 metals. One sample has lead above the MCL but all remaining Title 22 metals were well below the primary MCL for drinking water.

Four of the Oxnard Plain Pressure Basin wells that were sampled this year are perforated in the Fox Canyon and the Grimes Canyon aquifers. They are also referred to as LAS wells. Results for those wells are included in Appendix D and shown on the map of the Lower Aquifer System (LAS) Figure 3-10. The piper diagram, Figure E-8, shows moderate variability in water quality of the wells sampled this year. Sodium is the dominant cation in three samples with no dominant cation in the fourth. Sulfate (SO_4^{2-}) is the dominant anion in one of the samples; there is no dominant anion in the remaining samples. Three water samples are sodium sulfate type and the remainder is calcium sulfate. TDS concentration of water from these wells varies between 886 mg/l and 1120 mg/l. Samples from three wells have iron above the secondary MCL and one has manganese concentration above the secondary MCL for drinking water. One has sulfate above the secondary MCL, one has chloride above and all four have TDS concentrations above the secondary MCL for drinking water. A water sample from one of the Fox/Grimes wells was analyzed for Title 22 metals. One sample has lead above the MCL but all remaining Title 22 metals were well below the primary MCL for drinking water.

Four of the Oxnard Plain Pressure Basin wells that were sampled this year are perforated in the Hueneme Fox Canyon and the Grimes Canyon aquifers. They are also referred to as LAS wells. Results for those wells are included in Appendix D and shown on the map of the Lower Aquifer System (LAS) Figure 3-10. The piper diagram, Figure E-9, shows moderate variability in water quality of the wells sampled this year. Sodium is the dominant cation in one sample with no dominant cation in the remaining three samples. Sulfate (SO_4^{2-}) is the dominant anion in one of the samples; there is no dominant anion in the remaining samples. Three water samples are calcium sulfate type and the remaining sample is sodium sulfate type. TDS concentration of water from these wells varies between 772 mg/l and 1370 mg/l. A sample from one well has manganese concentration above the secondary MCL for drinking water and one has sulfate above

the secondary MCL, and all four have TDS concentrations above the secondary MCL for drinking water. A water sample from one of the Fox/Hueneme/Grimes wells was analyzed for Title 22 metals. All Title 22 metals were well below the primary MCL for drinking water.

Aerial photo showing the extent of the Oxnard Pressure Plain groundwater basin.

OXNARD PLAIN PRESSURE BASIN
Lower Aquifer System

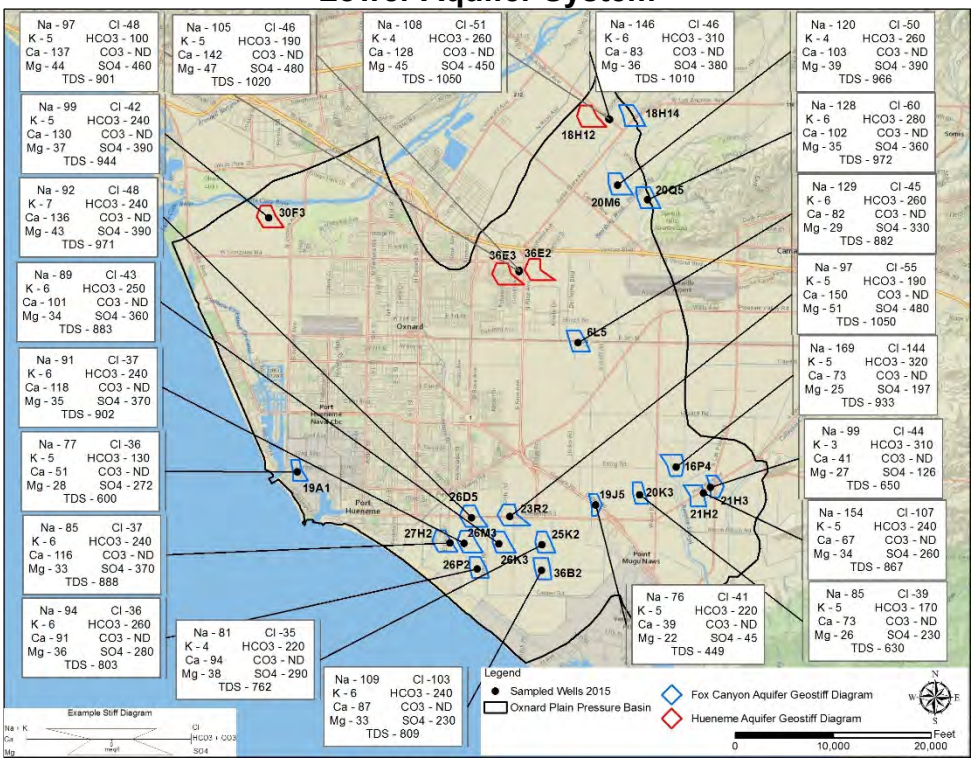


Figure 3-9: Map showing approximate location of sampled wells with concentrations (mg/l) of selected inorganic constituents and piper diagrams for the Hueneme and Fox Canyon aquifers.

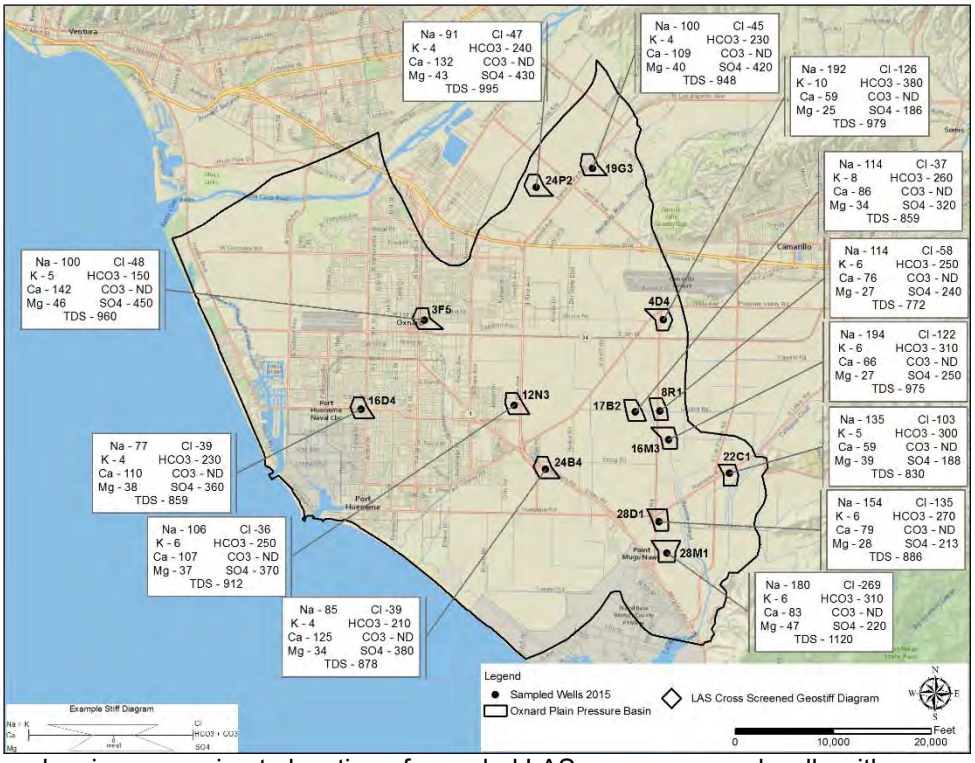
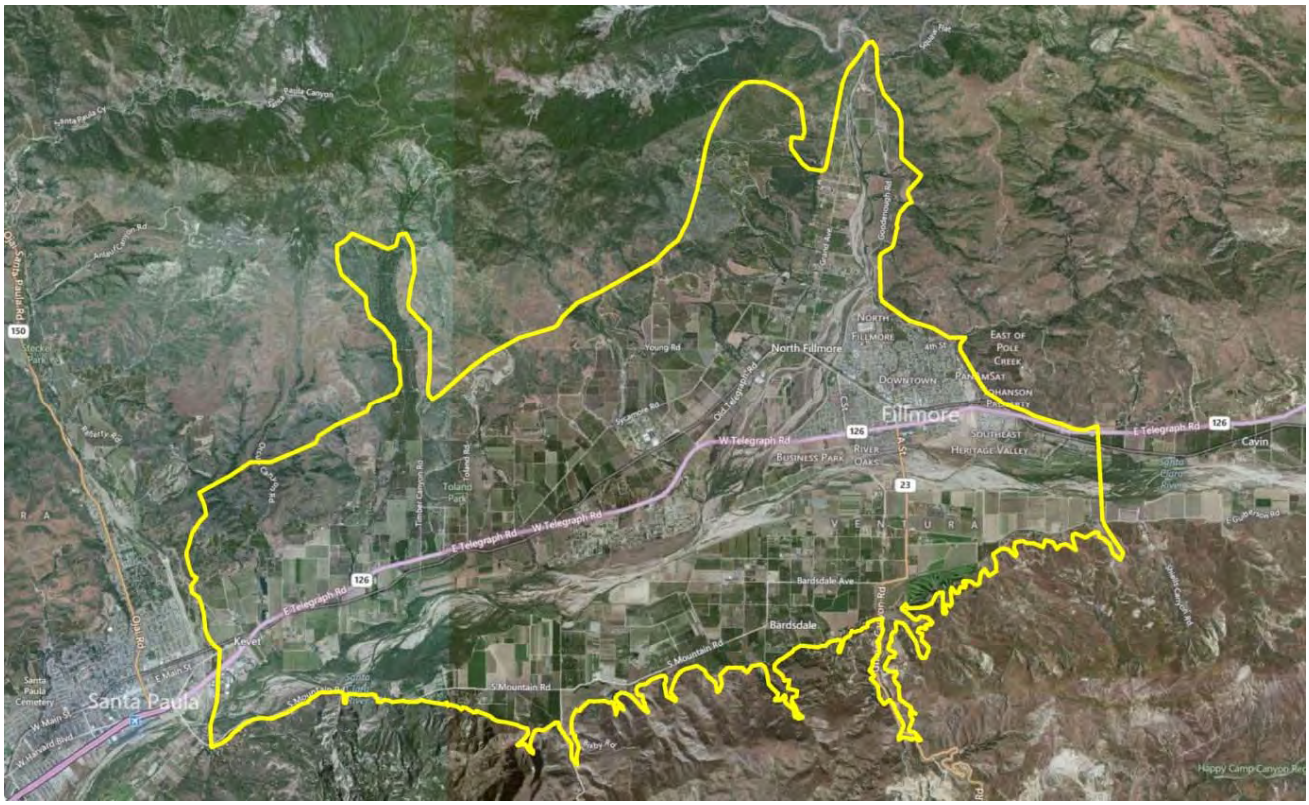


Figure 3-10: Map showing approximate location of sampled LAS cross screened wells with concentrations (mg/l) of selected inorganic constituents and piper diagrams.

3.2.2 - Fillmore Basin

The Fillmore Basin, though small in geographic area, has a total aquifer thickness of almost 8,000 feet in some places. Despite the depth of the basin, County records indicate that water wells are generally no deeper than approximately 950 feet. Water quality can vary greatly depending on depth of the well. Shallow groundwater is generally younger and recharged by river flows. Deeper groundwater is older and has acquired chemistry through dissolution of constituents from the surrounding sediments. There are approximately 625 water supply wells in the Fillmore Basin; 454 are active. Historically, nitrate (NO_3^-) concentrations have been elevated, but of the thirteen wells sampled this year only two showed elevated NO_3^- concentration relative to the primary MCL for drinking water. The piper diagram, Figure E-12, shows low variability in water quality of the wells sampled this year. The dominant cation for two samples is calcium; there is no dominant cation for the remainder of the samples. Data plots closest to a calcium cation type. Sulfate is the major anion. The water is calcium sulfate type. TDS ranges from 946 mg/l to 2250 mg/l, well above the secondary MCL for drinking water. Groundwater samples from all thirteen wells are above the secondary MCL for drinking water for sulfate (SO_4^{2-}) and water from two wells is above the secondary MCL for manganese. A water sample from one well was analyzed for Title 22 metals. All Title 22 metals are below the primary MCL for drinking water. Water quality tends to become poorer to the south east portion of the basin in the vicinity of the Oak Ridge fault. Figure 3-11 shows approximate well locations and concentrations of total dissolved solids (TDS), sodium (Na^+), potassium (K^+), calcium (Ca^{2+}), magnesium (Mg^{2+}), chloride (Cl^-), bicarbonate (HCO_3^-), carbonate (CO_3^{2-}) and sulfate (SO_4^{2-}) for the wells sampled in the Fillmore Basin.

Water samples from all the wells sampled in the Fillmore, Santa Paula and Piru Basins were compared in a piper diagram, Figure E-15. The piper diagram shows low variability; the data from the three is very similar and the water type for all is calcium sulfate.



Aerial photo showing the extent of the Fillmore groundwater basin.

FILLMORE BASIN

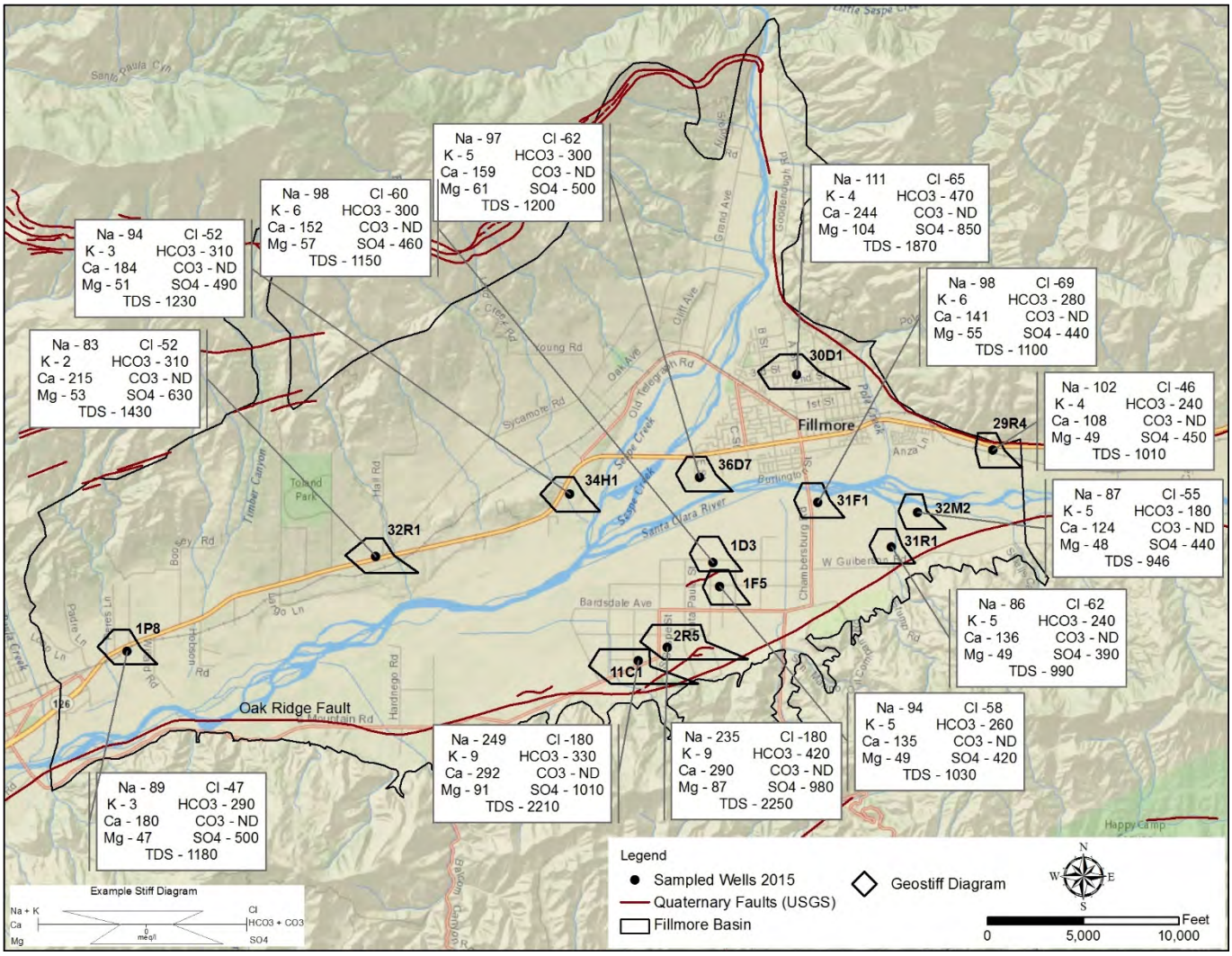
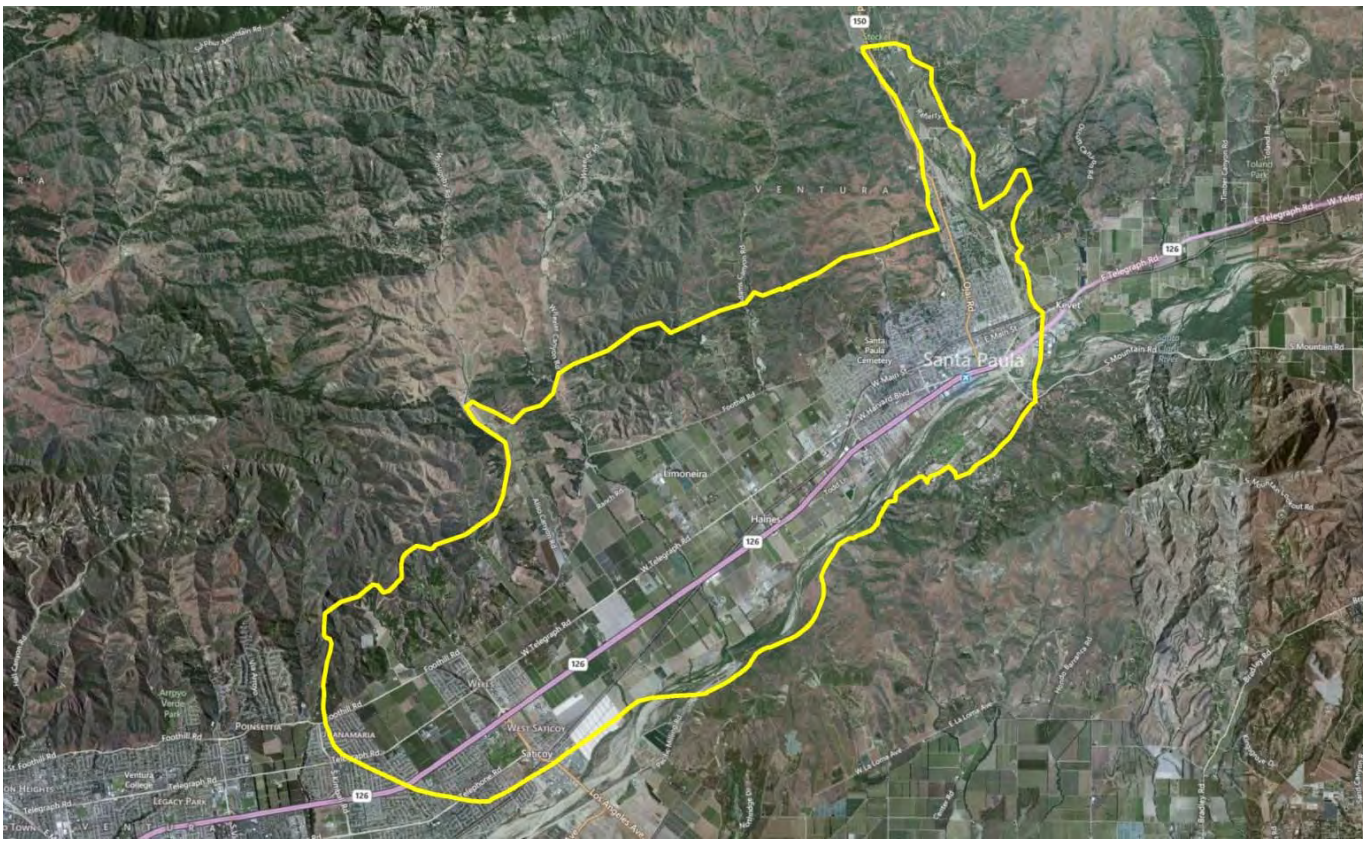


Figure 3-11: Map showing approximate location of sampled wells with concentrations (mg/l) of selected inorganic constituents and piper diagrams.

3.2.3 - Santa Paula Basin

The Santa Paula Basin is a court adjudicated groundwater basin. In an effort to prevent overdraft, a June 1991 judgment ordered the creation of the Santa Paula Basin Pumpers Association (SPBPA). The SPBPA regulates extractions in the Santa Paula Basin. The judgment stipulated an allotment of 27,000 acre-feet per year could be pumped from the basin. Water quality in the basin has not changed substantially since 2007. The depth to the water bearing material is 65 to 160 feet. There are approximately 283 water supply wells in the Santa Paula Basin; 152 are active. Figure E-13, piper diagram, shows no significant change in the water quality since the previous sampling round. Calcium is the dominant cation in one sample; the remainder have no dominant cation. Sulfate is the dominant anion. The water is calcium sulfate type. TDS concentrations range from 1010 mg/l to 2610 mg/l; all above the current secondary MCL for drinking water. Six water samples have concentrations above the secondary MCL for sulfate, five have manganese above the secondary MCL and one is above the secondary MCL for iron. Two water samples were analyzed for Title 22 metals. All Title 22 metals are below the primary MCL for drinking water. Figure 3-12 shows approximate well location and concentrations of total dissolved solids (TDS), sodium (Na^{+}), potassium (K^{+}), calcium (Ca^{2+}), magnesium (Mg^{2+}), chloride (Cl^{-}), bicarbonate (HCO_3^{-}), carbonate (CO_3^{2-}) and sulfate (SO_4^{2-}) for the well sampled in the Santa Paula Basin.

Figure E-15, piper diagram, compares water samples from the up-gradient Piru and Fillmore Basins to the Santa Paula Basin. The water chemistry is similar.



Aerial photo showing the extent of the Santa Paula groundwater basin.

SANTA PAULA BASIN

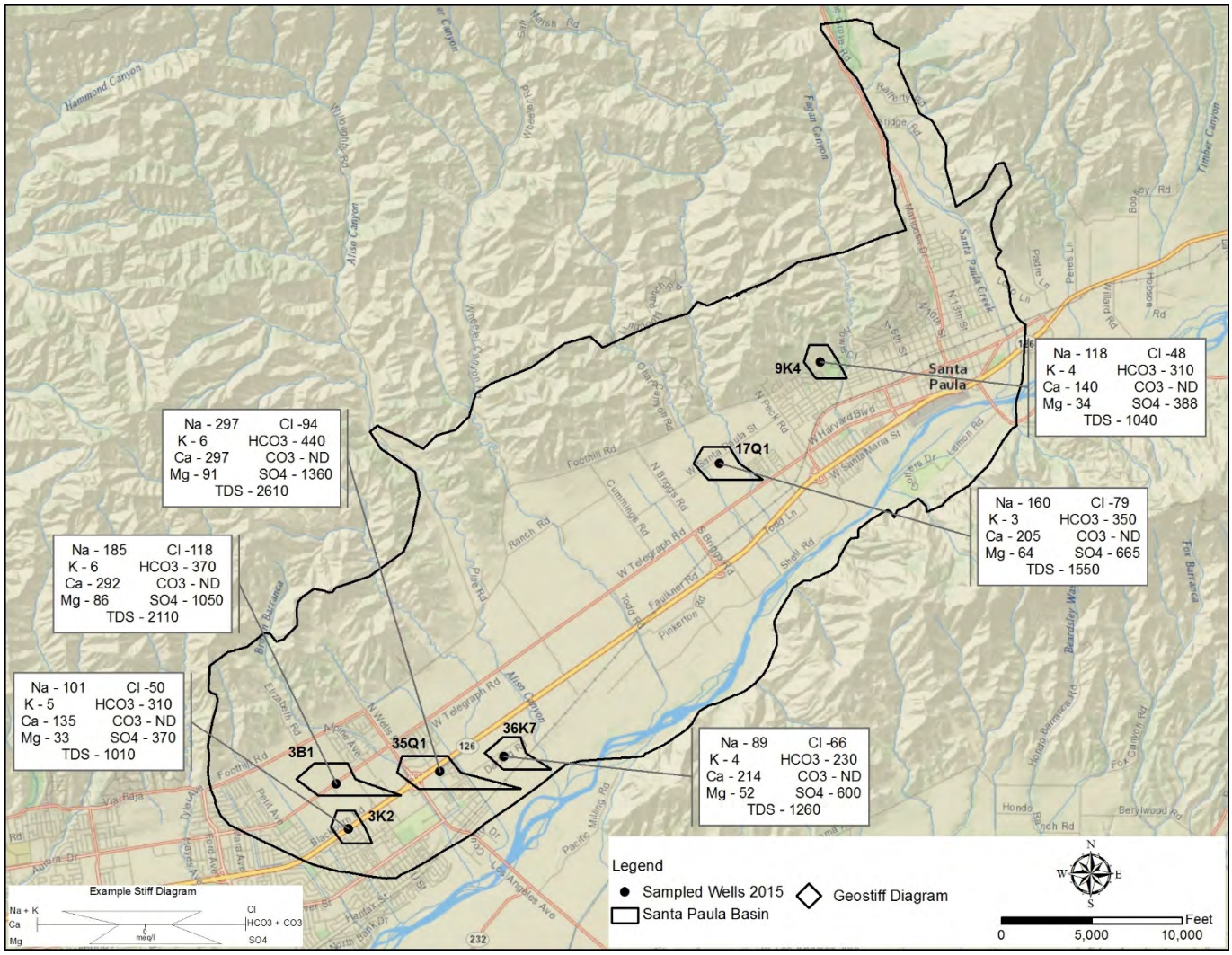


Figure 3-12: Map showing approximate location of sampled wells with concentrations (mg/l) of selected inorganic constituents and piper diagrams.

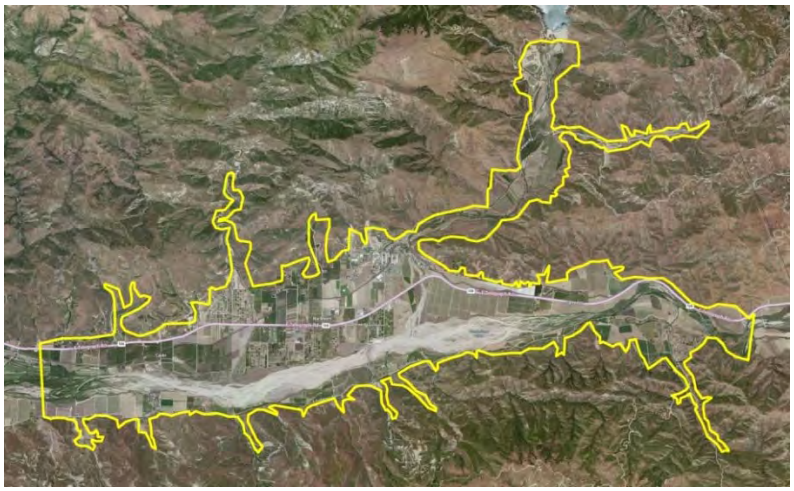
3.2.4 – Piru Basin

The Piru Basin groundwater recharge is principally from precipitation, releases of water by United Water Conservation District from Lake Piru, and the Santa Clara River. Flow from the Santa Clara River enters the basin from the east and carries discharges from wastewater treatment plants and urban and stormwater runoff from Los Angeles County. There are approximately 190 water supply wells in the Piru Basin; 151 are active. Depth to the main water bearing material is approximately 30 to 90 feet. The Los Angeles Regional Water Quality Control Board (LARWQCB) has adopted a Basin Plan Amendment that includes a Total Maximum Daily Load (TMDL) of 117 mg/l for chloride (Cl^-) in surface water and 150 mg/l in groundwater for the stretch of the Santa Clara River in Ventura County east of Piru Creek.

Fifteen wells were sampled in the Piru Basin during this round of sampling. None of the groundwater sampled has a chloride (Cl^-) concentration above the chloride TMDL. The piper diagram, Figure E-14, shows moderate variability in water quality of the wells sampled this year. There is no dominant cation for 14 samples; calcium is the dominant cation for the remaining sample and the data plots closest to the calcium cation type. There is no dominant anion for three of the samples; sulfate is the dominant anion for the remainder. The water is calcium sulfate type. The TDS concentration of the water sampled this season varies from 894 to 2820 mg/l; all wells above the secondary MCL for drinking water; three wells have concentrations significantly above 2000 mg/l. Water samples from all fifteen wells have sulfate (SO_4^{-2}) concentrations greater than the secondary MCL for drinking water, five have manganese (Mn) concentrations greater than the secondary MCL, and one sample has an iron (Fe^+) concentration above the MCL. Figure 3-13 shows approximate well locations and concentrations of total dissolved solids (TDS), sodium (Na^+), potassium (K^+), calcium (Ca^{2+}), magnesium (Mg^{2+}), chloride (Cl^-), bicarbonate (HCO_3^-), carbonate (CO_3^{2-}) and sulfate (SO_4^{2-}).

Water samples from six wells were analyzed for Title 22 metals. One well has lead (Pb) above the Primary MCL for drinking water. One well located south of Highway 126 has consistently been found to have selenium levels that exceed the primary MCL for drinking water of 0.05 mg/l (50 µg/l). Elevated selenium concentrations occur in those wells perforated in the interval between approximately 125 to 250 feet below ground surface. A well located north of Highway 126 and perforated at a similar elevation does not have high selenium. Owners of the wells have been notified by Ventura County Environmental Health Department about possible adverse health effects from ingestion of water containing selenium.

Radiochemistry analysis was completed on water from one of the wells. Gross alpha was below the primary MCL for drinking water.



Aerial photo showing the extent of the Piru groundwater basin.

PIRU BASIN

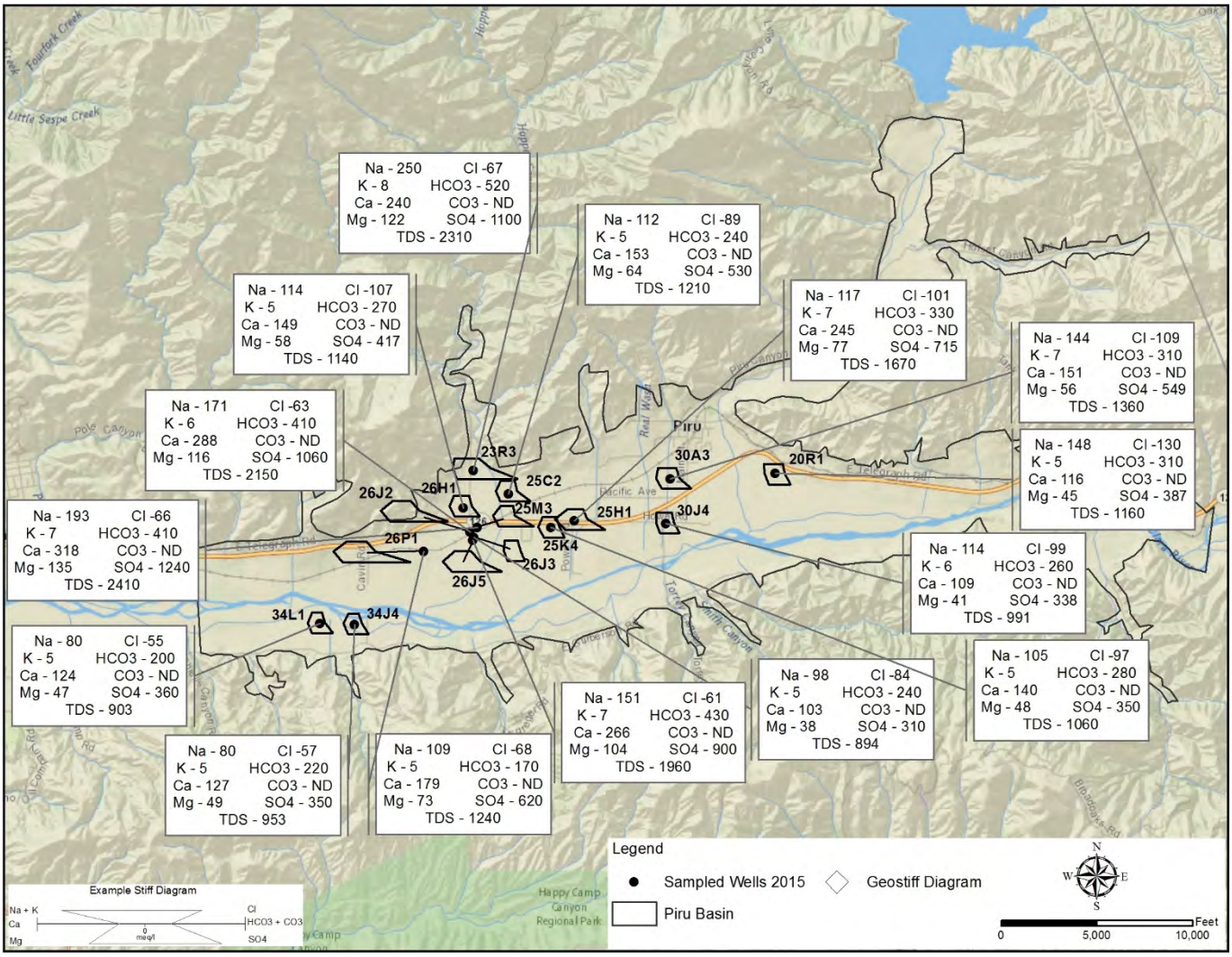


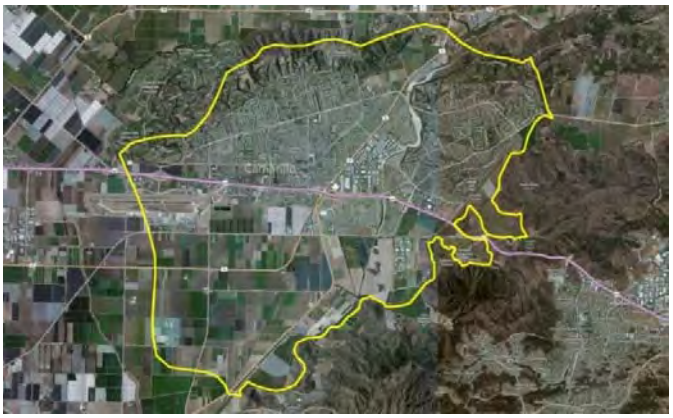
Figure 3-13: Map showing approximate location of sampled wells with concentrations (mg/l) of selected inorganic constituents and piper diagrams.

3.2.5 - Pleasant Valley Basin

In the Pleasant Valley Basin groundwater quality can vary greatly throughout the basin. The upper-most groundwater bearing unit at 35 to 60 feet is not used because the water quality is very poor. Permeable lenses of alluvial sands, gravels, silts, and clays of recent to Upper Pleistocene age that vary in thickness from a few feet to several hundred feet are equivalent to but not connected with the Oxnard Aquifer and are referred to here as the Upper zone. Depth to the main water bearing unit is approximately 400 to 500 feet. This deeper zone is referred to in this section as the Lower Zone. It is made up of marine sands and gravels of the lower-most member of the early Pleistocene San Pedro Formation and is known as the Fox Canyon Aquifer. The Grimes Canyon aquifer underlies the Fox Canyon aquifer at depths below 1000 feet and is penetrated by only the deepest wells. There are approximately 332 water supply wells in the Pleasant Valley Basin; 91 are active. Eighteen wells were sampled during this round of sampling; three perforated in the Upper zone and 15 perforated in the Lower zone.

The piper diagram, Figure E-16, shows a comparison of the wells based on whether the well is perforated in the upper zone or lower zone. Wells perforated in the upper zone tend to have higher concentrations of sulfate (SO_4^{2-}) than those in the lower zone. The piper diagram shows moderate variability in water quality of the wells in the lower zone and low variability for the wells in the upper zone. Water from the Upper zone wells show calcium (Ca^{+}) is the dominant cation for one of the samples and the remaining two samples have no dominant cation but plot very close to the calcium (Ca^{+}). Sulfate (SO_4^{2-}) is the dominant anion. The water in the Upper zone is calcium sulfate type. Water from the lower zone wells show sodium (Na^{+}) is the dominant anion for one well, and there is no dominant anion for the remainder. Sulfate (SO_4^{2-}) is the dominant anion for five samples and there is no dominant anion for the remaining ten samples but the data plots close to the sulfate (SO_4^{2-}) type. The water in one sample is sodium sulfate type; the remainder are calcium sulfate type.

TDS concentrations for all water samples (upper and lower zones) vary from 698 to 4340 mg/l. All nineteen wells sampled have TDS concentrations above the secondary MCL for drinking water. Fourteen of the wells have sulfate (SO_4^{2-}) concentrations above the secondary MCL for drinking water. Five water samples have iron (Fe) concentrations above the secondary MCL for drinking water and six have manganese (Mn) concentrations above the secondary MCL. Chloride (Cl^{-}) concentrations are above 117 mg/l in water samples from fifteen wells. Samples from three wells have Cl^{-} concentrations above the secondary MCL for drinking water, but the LARWQCB Basin Plan indicates that agricultural beneficial uses are impaired when the concentration is above 117 mg/l. Water samples from seven wells were analyzed for Title 22 metals. Five wells have lead (Pb) above the primary MCL for drinking water. No other Title 22 metal was above the primary MCL. Figure 3-14 shows approximate well locations and concentrations of total dissolved solids (TDS), sodium (Na^{+}), potassium (K^{+}), calcium (Ca^{2+}), magnesium (Mg^{2+}), chloride (Cl^{-}), bicarbonate (HCO_3^{-}), carbonate (CO_3^{2-}) and sulfate (SO_4^{2-}).



Aerial photo showing the extent of the Pleasant Valley groundwater basin.

PLEASANT VALLEY BASIN

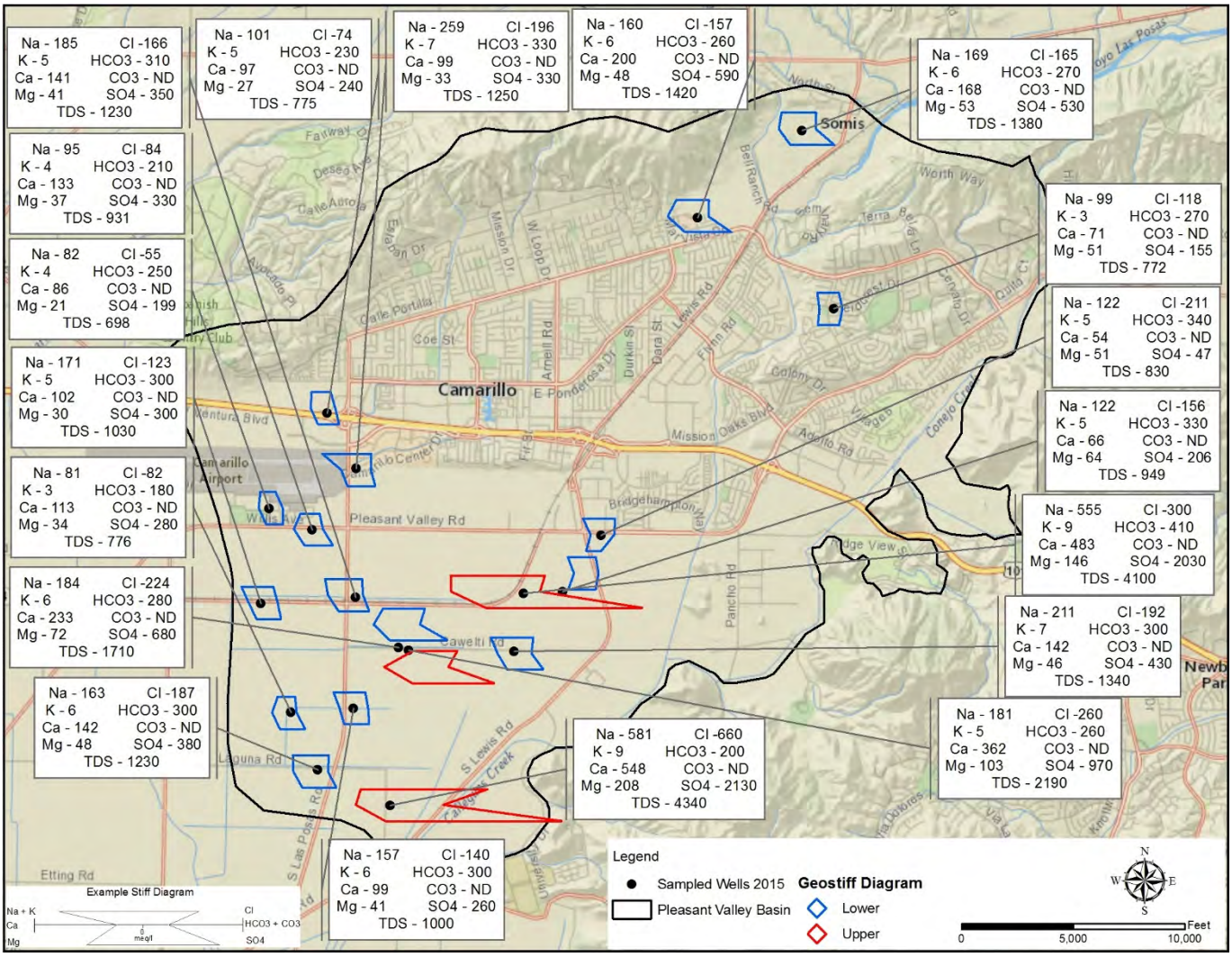


Figure 3-14: Map showing approximate location of sampled wells with concentrations (mg/l) of selected inorganic constituents and piper diagrams.

3.2.6 - Mound Basin

The Mound Basin water bearing units consist of Quaternary alluvium and the San Pedro Formation. These formations are divided into the Upper Aquifer System (UAS) and the Lower Aquifer System (LAS). The UAS consists of undifferentiated Holocene alluvium that make up the Oxnard aquifer and older Pleistocene alluvium that makes up the Mugu Aquifer. The alluvium consists of silts and clays with lenses of sand and gravel and reaches a maximum thickness of about 500 feet. The LAS consists dominantly of fine sands and gravels of the San Pedro Formation and extends as deep as 4,000 feet. The upper part of the San Pedro formation consists of variable amounts of clay, silty clay and sand. A series of inter-bedded water-bearing sands in this section are time equivalent to the Hueneme aquifer of the Oxnard Basin. The lower part of the San Pedro formation consists primarily of sand and gravel zones with layers of clay and silt and is known as the Fox Canyon aquifer in the Oxnard plain and extends into the Mound Basin. Groundwater is generally unconfined in the alluvium and confined in the San Pedro Formation. Historic water quality data for the basin shows that water quality is generally better in the lower zone but our data does not show that this year. Three of the five wells sampled this year are perforated in the LAS, much deeper than the other two. One of those wells has water quality that is significantly better than the other LAS wells. One of the shallow UAS wells has water quality that is similar to the deep wells and one well has significantly worse water quality.

There are approximately 78 water supply wells in the Mound Basin; 29 are active water supply wells. Figure E-17, piper diagram, shows low to moderate variability in water quality of all the wells sampled this year, LAS and UAS. Sodium is the dominant cation for one water sample and one sample plots close to the calcium type; there is no dominant cation for the remaining three water samples. Sulfate (SO_4^{2-}) is the dominant anion for all samples. One sample is sodium sulfate type and the remaining samples are calcium sulfate type.

TDS concentration for the wells sampled this year ranges from 1070 to 3000 mg/l; all above the secondary MCL for drinking water. Sulfate (SO_4^{2-}) concentration and manganese are greater than the secondary MCL for drinking water in all five wells sampled; iron is above the secondary MCL in three of the wells. Figure 3-15 shows approximate well locations and concentrations of total dissolved solids (TDS), sodium (Na^+), potassium (K^+), calcium (Ca^{2+}), magnesium (Mg^{2+}), chloride (Cl^-), bicarbonate (HCO_3^-), carbonate (CO_3^{2-}) and sulfate (SO_4^{2-}).

Aerial photo showing the extent of the Mound groundwater basin.

MOUND BASIN

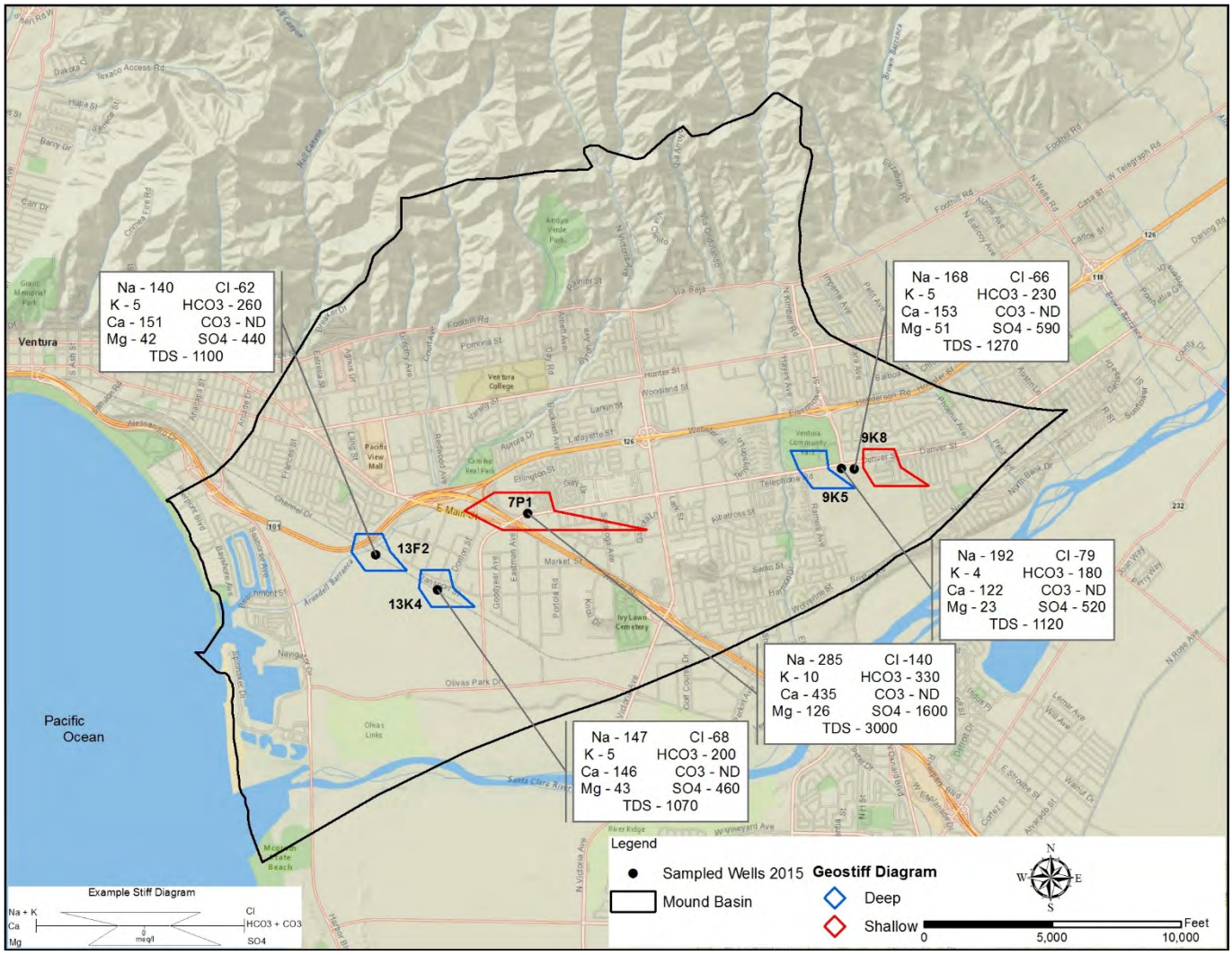


Figure 3-15: Map showing approximate location of sampled wells with concentrations (mg/l) of selected inorganic constituents and piper diagram.

3.2.7 - East Las Posas Basin

Water bearing material of the East Las Posas Basin consists of Recent and Pleistocene alluvial deposits of varying thickness. Water bearing material consists primarily of sand or a mixture of sand and gravel identified as the Fox Canyon Aquifer in this basin and is the basal member of the Pleistocene age, San Pedro Formation (Stokes, 1971). The Fox Canyon aquifer is generally considered to be confined in the East Las Posas Basin. However data indicates the Fox Canyon Aquifer receives recharge from leakage from aquifers located above it (FCGMA 2007 Basin Management Plan). The exact hydrogeologic connectivity is not well understood. Depth to the upper water bearing unit is approximately 120 to 150 feet and to the lower unit is approximately 530 to 580 feet. There are approximately 248 water supply wells in the East Las Posas Basin; 155 are active water supply wells.

Figure E-18, piper diagram, shows moderate variability in water quality of the wells sampled this year. Calcium is the dominant cation for nine of the wells sampled; there is no dominant cation for the remaining four wells. Sulfate (SO_4^{2-}) is the dominant anion for five of the wells; bicarbonate is the dominant anion for six of the wells sampled; and two wells have no dominant anion. The water in seven of the wells sampled is calcium sulfate type, six of the wells are calcium bicarbonate type. Of the thirteen wells sampled in the East Las Posas Basin, the three wells located in the southwest portion of the basin near the Arroyo Las Posas, have very different water chemistry from the other nine. TDS and sulfate are above the secondary MCL for drinking water in all three southwestern wells and they all have elevated chloride (Cl^-), not above the drinking water MCL but above the level that could be harmful to crops. The remainder of the wells have good water quality with TDS ranging between 261 and 805 mg/l. Water from three wells was analyzed for Title 22 metals. Lead (Pb) concentration is above the primary MCL for drinking water in one sample. No other Title 22 metal was above the primary MCL for drinking water.

Figure E-21, piper diagram, shows a comparison of East, West, and South Las Posas water chemistry. There is moderate variability in the water quality of the combined basins. The South Las Posas basin has less variability but fewer wells were sampled in that basin. The majority of the water samples from all three basins is in two main groups, those with sulfate (SO_4^{2-}) as the dominant anion, calcium sulfate type and those with no dominant anion but which plot near the bicarbonate type, calcium bicarbonate type. The water chemistry of East and West Las Posas Basins is fairly similar, even though, based on the sharp change in water level between the East Las Posas and West Las Posas basins, the degree of hydrologic connection appears to be limited. Figure 3-16 shows approximate well locations and concentrations of total dissolved solids (TDS), sodium (Na^+), potassium (K^+), calcium (Ca^{2+}), magnesium (Mg^{2+}), chloride (Cl^-), bicarbonate (HCO_3^-), carbonate (CO_3^{2-}) and sulfate (SO_4^{2-}).

Aerial photo showing the extent of the East Las Posas groundwater basin.

EAST LAS POSAS BASIN

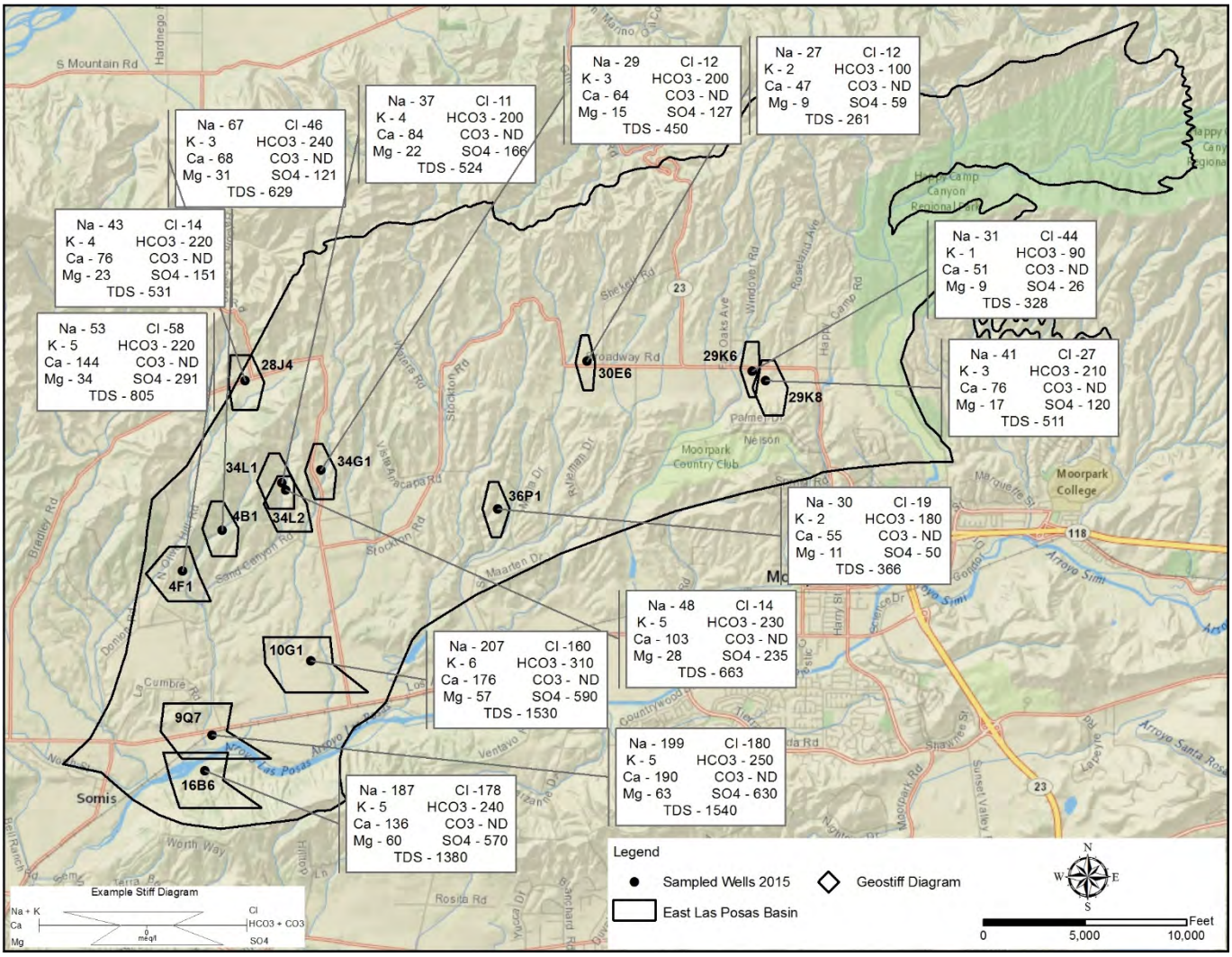


Figure 3-16: Map showing approximate location of sampled wells with concentrations (mg/l) of selected inorganic constituents.

3.2.8 - West Las Posas Basin

There are approximately 114 water supply wells in the West Las Posas Basin; 63 of those are active wells. Figure E-19, piper diagram, shows moderate variability in water quality of the wells sampled this year. Calcium (Ca^{2+}) is the dominant cation for two of the samples and there is no dominant cation for the remainder. Bicarbonate (HCO_3^-) is the dominant anion for two of the wells sampled; sulfate (SO_4^{2-}) is the dominant anion for six of the wells and four wells have no dominant anion but plot close to the bicarbonate (HCO_3^-) anion type. The water in ten wells is calcium sulfate type and the remaining two wells are calcium bicarbonate type.

TDS is above the secondary MCL for drinking water in eleven of the wells sampled in the West Las Posas Basin this year; ranging from 300 to 1380 mg/L. One well has a nitrate concentration above the primary MCL for drinking water. Five wells have sulfate (SO_4^{2-}) above the secondary MCL; six have manganese concentrations above the MCL. Four wells have iron concentration above the MCL for drinking water, one over 28 times the MCL. The piper diagram also shows water quality data for one well, 13A1, that is just outside the mapped basin boundary. The chemistry of this well is very similar to that of the wells inside the mapped boundary. It is most similar to the well to the northwest, 36Q1, which has a water level at approximately the same elevation. Water from four wells was analyzed for Title 22 metals. Lead (Pb) concentration is above the primary MCL for drinking water in two samples. No other Title 22 metal was above the primary MCL for drinking water. Figure 3-17 shows approximate well locations and concentrations of total dissolved solids (TDS), sodium (Na^+), potassium (K^+), calcium (Ca^{2+}), magnesium (Mg^{2+}), chloride (Cl^-), bicarbonate (HCO_3^-), carbonate (CO_3^{2-}) and sulfate (SO_4^{2-}) for the wells sampled in the West Las Posas Basin.

Aerial photo showing the extent of the West Las Posas groundwater basin.

WEST LAS POSAS BASIN

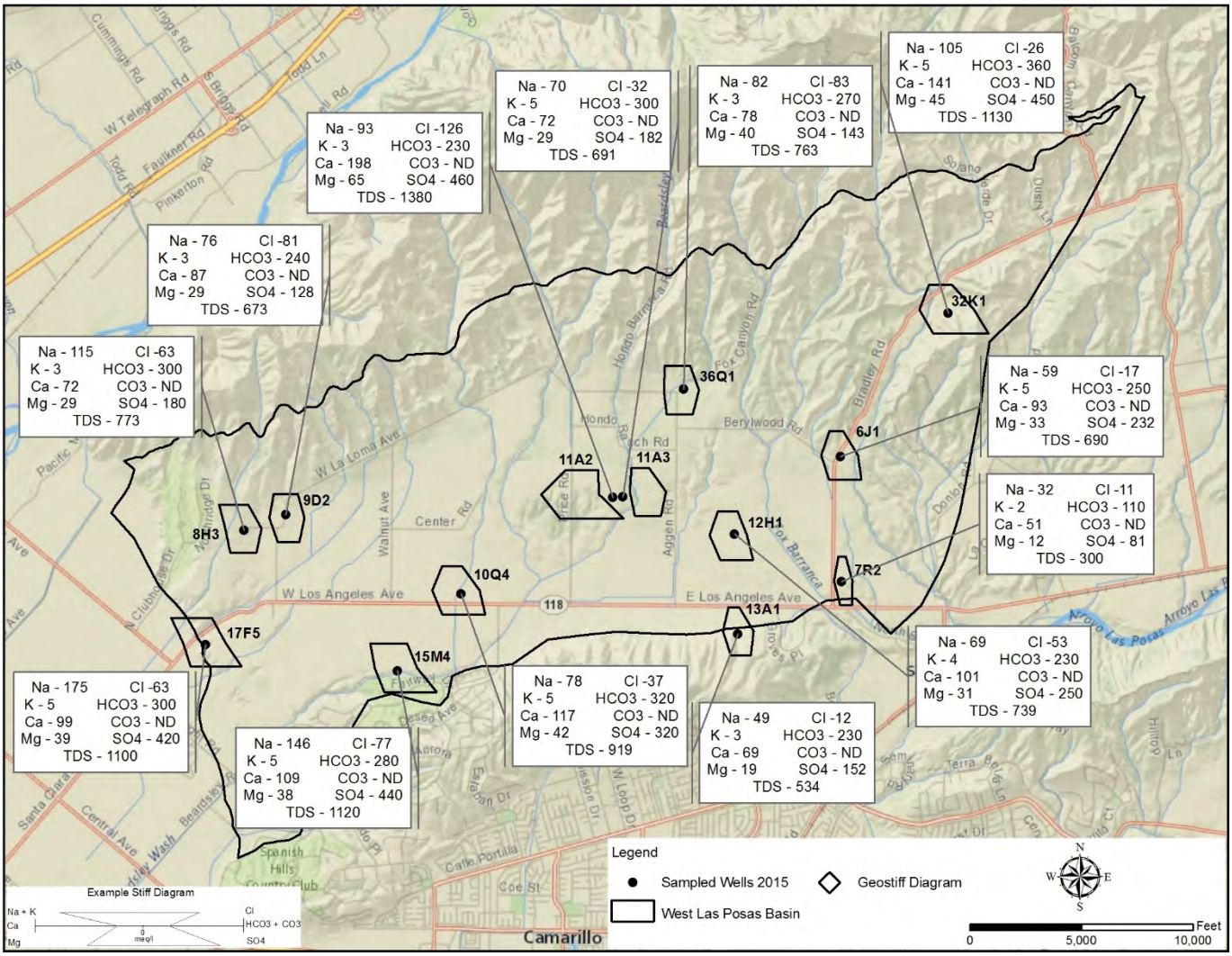
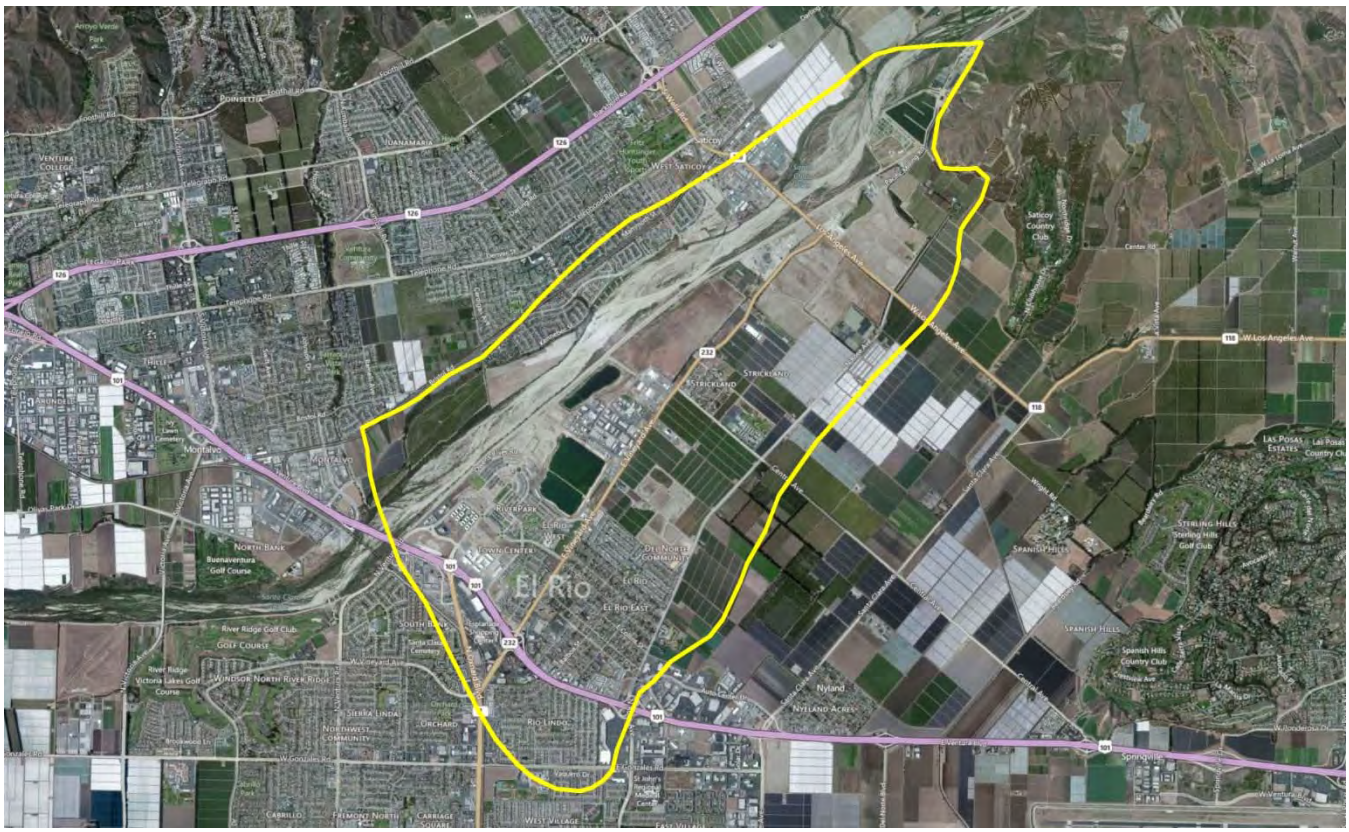


Figure 3-17: Map showing approximate location of sampled wells with concentrations (mg/l) of selected inorganic constituents and piper diagrams.

3.2.9 – Oxnard Plain Forebay Basin

The Oxnard Plain Forebay Basin is the principal recharge area for the Upper and Lower Aquifer Systems of the Oxnard Plain Pressure Basin. Approximate depth to the water bearing unit is 25 to 50 feet. There are approximately 304 water supply wells in the Oxnard Plain Forebay Basin; 105 are active wells. The Oxnard Plain Forebay generally has acceptable water quality except for the southern portion where high nitrate concentrations are common. The area to the north is predominantly agricultural with a few residential areas that still rely on individual septic systems. Three wells in the Oxnard Plain Forebay Basin were sampled this season; two in the Upper Aquifer System and one in the Lower Aquifer System. Figure E-22, piper diagram, shows low variability in water quality of all three wells sampled this year. The piper diagram shows there is a small difference between the upper and lower Forebay aquifers. There is no dominant cation type but the three samples plot close to the calcium type; sulfate (SO_4^{2-}) is the dominant anion. The water in all three samples is calcium sulfate type. The piper diagram, Figure E-23, shows that the wells sampled have very similar chemistry to that of the UAS of the Oxnard Plain Pressure Basin.

All three wells sampled have TDS and sulfate concentrations above the secondary MCL for drinking water and one had manganese (Mn^{+}) concentration above the MCL. One of the wells sampled this year has a nitrate concentration above the MCL for drinking water. Water from one well was analyzed for Title 22 metals. None of the Title 22 metals was above the primary MCL for drinking water. Figure 3-18 shows approximate well locations and concentrations of total dissolved solids (TDS), sodium (Na^{+}), potassium (K^{+}), calcium (Ca^{2+}), magnesium (Mg^{2+}), chloride (Cl^{-}), bicarbonate (HCO_3^{-}), carbonate (CO_3^{2-}) and sulfate (SO_4^{2-}) for the wells sampled in the Oxnard Forebay Basin.



Aerial photo showing the extent of the Oxnard Plain Forebay groundwater basin.

OXNARD FOREBAY BASIN

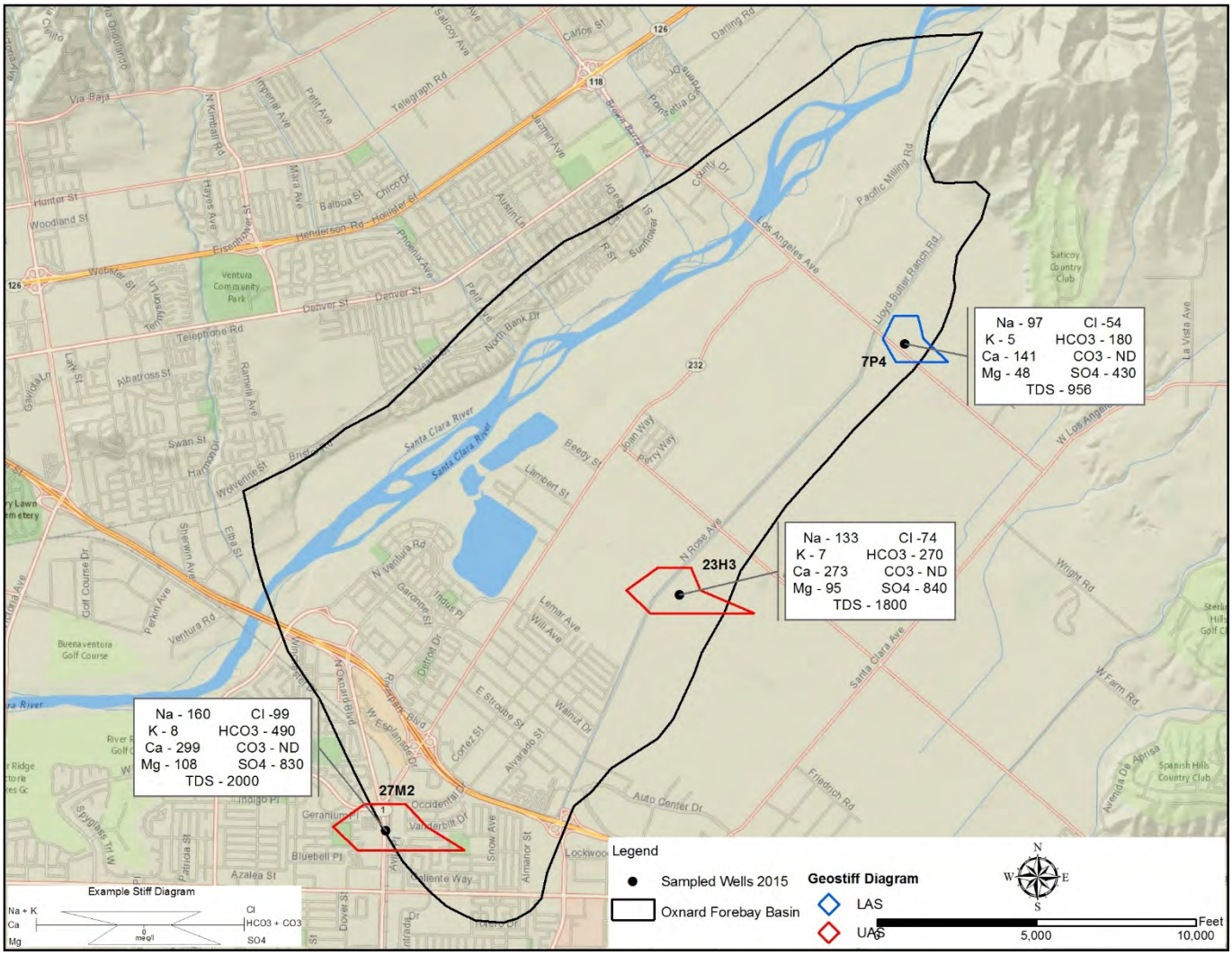
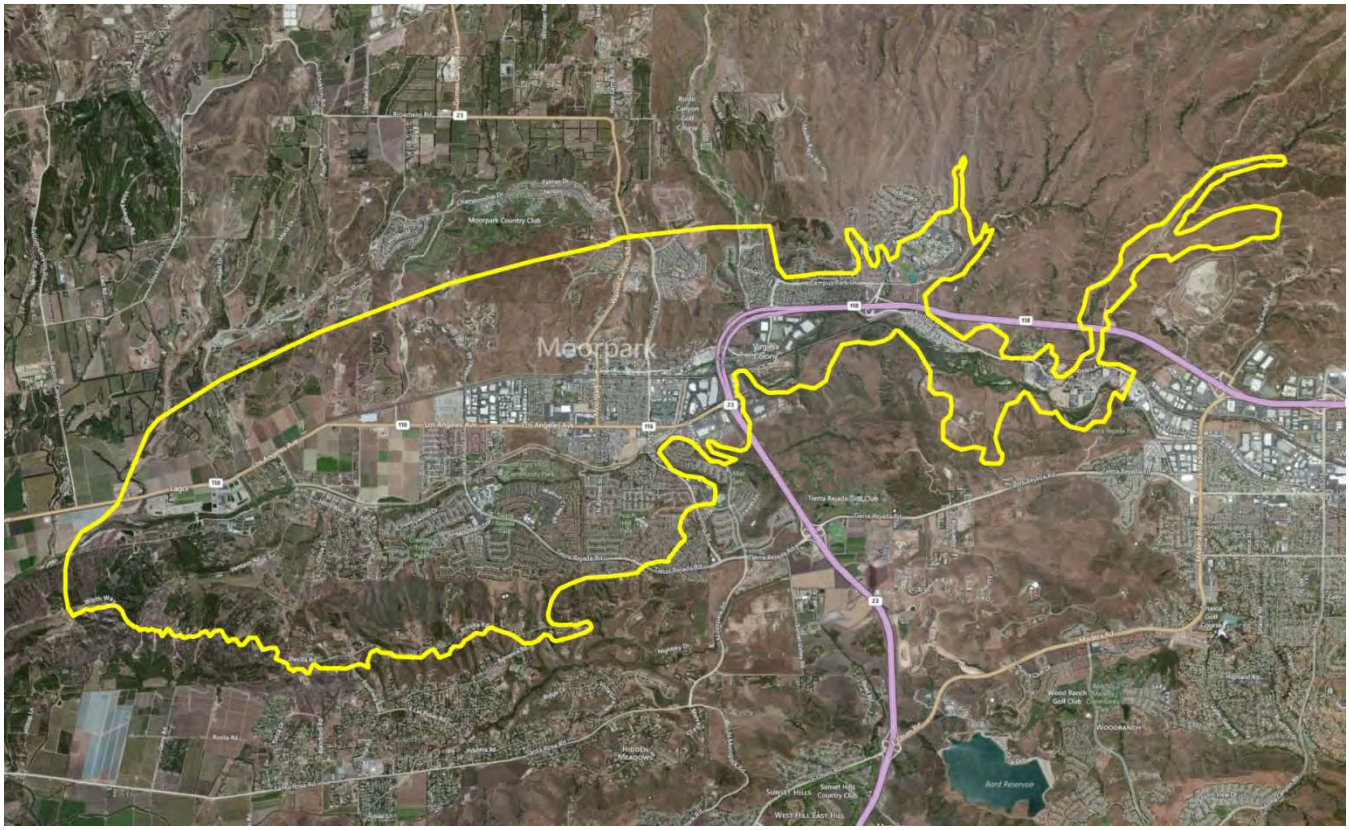


Figure 3-18: Map showing approximate location of sampled wells with concentrations (mg/l) of selected inorganic constituents and piper diagrams.

3.2.10 - South Las Posas Basin

The upper water bearing unit in the South Las Posas Basin is approximately 25 to 50 feet below ground surface and the lower is at approximately 350 to 500 feet below ground surface. Generally, deeper wells perforated in the Fox Canyon aquifer tend to have better water quality than the upper unit, however that has changed some over the years. Well 07B02 is perforated much deeper than the other three wells sampled but the water chemistry is similar. There are approximately 171 water supply wells in the South Las Posas Basin; 28 are active. Figure E-20, piper diagram, shows low variability in water quality of the wells sampled this year. The dominant cation for one well is sodium; the remaining three samples have no dominant cation. Sulfate (SO_4^{2-}) is the dominant anion in all three samples. The water type of one well is sodium sulfate; the remainder of the wells are calcium sulfate type. The South Las Posas Basin has had no significant change in water quality over the past year. Water from all four wells sampled has TDS and sulfate SO_4^{2-} concentrations above the secondary MCL for drinking water and elevated chloride; not above the secondary MCL for drinking water (but high enough to be detrimental for some agricultural uses). No sample was analyzed for Title 22 metals. Water chemistry in the South Las Posas Basin is fairly consistent across the basin. A comparison of the East, West, and South Las Posas Basins is shown in the piper diagram, Figure E-21. Figure 3-19 shows approximate well locations and concentrations of total dissolved solids (TDS), sodium (Na^+), potassium (K^+), calcium (Ca^{2+}), magnesium (Mg^{2+}), chloride (Cl^-), bicarbonate (HCO_3^-), carbonate (CO_3^{2-}) and sulfate (SO_4^{2-}) for the wells sampled in the South Las Posas Basin.



Aerial photo showing the extent of the South Las Posas groundwater basin.

SOUTH LAS POSAS BASIN

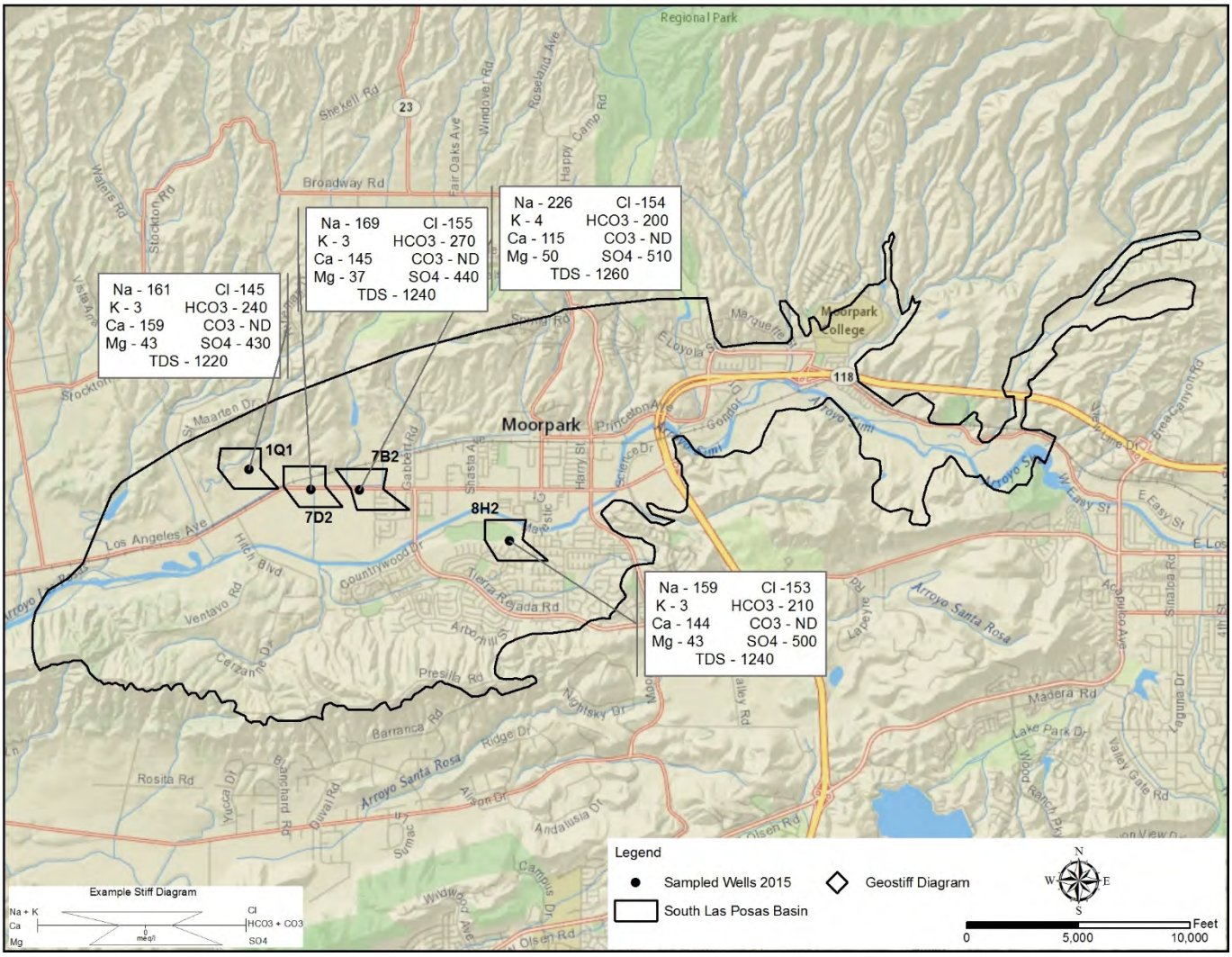


Figure 3-19: Map showing approximate location of sampled wells with concentrations (mg/l) of selected inorganic constituents and piper diagrams.

3.2.11 - Lower Ventura River Basin

The Lower Ventura River Basin has few remaining active water wells available for sampling. Depth to the water bearing unit is 3 to 13 feet below ground surface in the floodplain and deeper as the ground surface elevation increases towards the edges of the basin. There are approximately 32 water supply wells in the Lower Ventura River Basin; 17 are active wells. The piper diagram, Figure E-24, shows the water quality of the three wells sampled this year. There is no dominant cation or anion. The water type is calcium sulfate type. The wells sampled this year are located in river alluvium near the coast. Total dissolved solids and sulfate concentrations in all three wells are above the secondary MCL. Iron (Fe^{+}) is above the secondary MCL in one well and manganese (Mn^{+}) and chloride (Cl^{-}) are above the secondary MCL in two wells. Figure 3-20 shows the approximate well location and concentrations of total dissolved solids (TDS), sodium (Na^{+}), potassium (K^{+}), calcium (Ca^{2+}), magnesium (Mg^{2+}), chloride (Cl^{-}), bicarbonate (HCO_3^{-}), carbonate (CO_3^{2-}) and sulfate (SO_4^{2-}) for the wells sampled in the Lower Ventura River basin. Piper diagram Figure E-26 shows a comparison of the chemistry between Upper and Lower Ventura River Basins.

Aerial photo showing the extent of the Lower Ventura River groundwater basin.

LOWER VENTURA RIVER BASIN

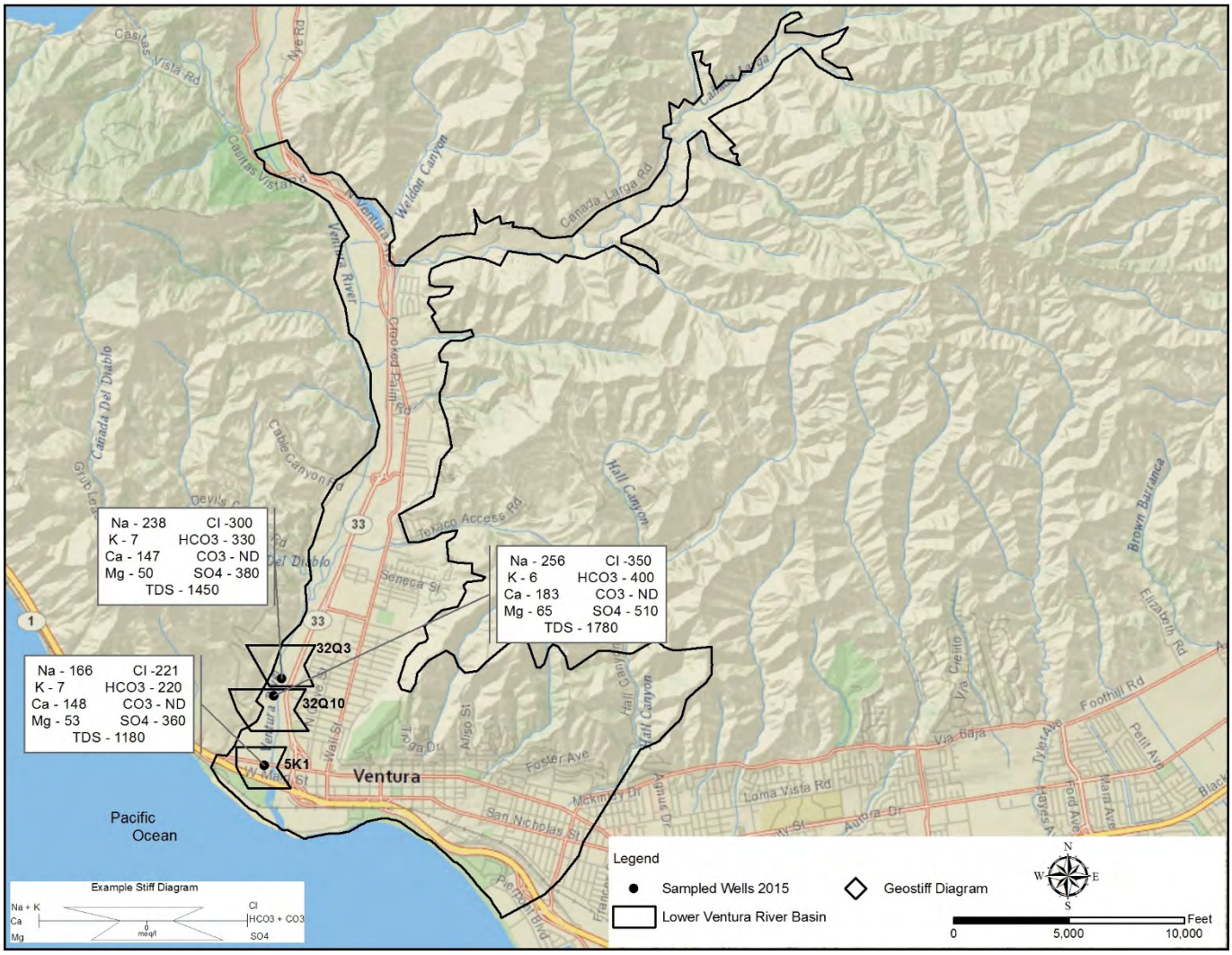
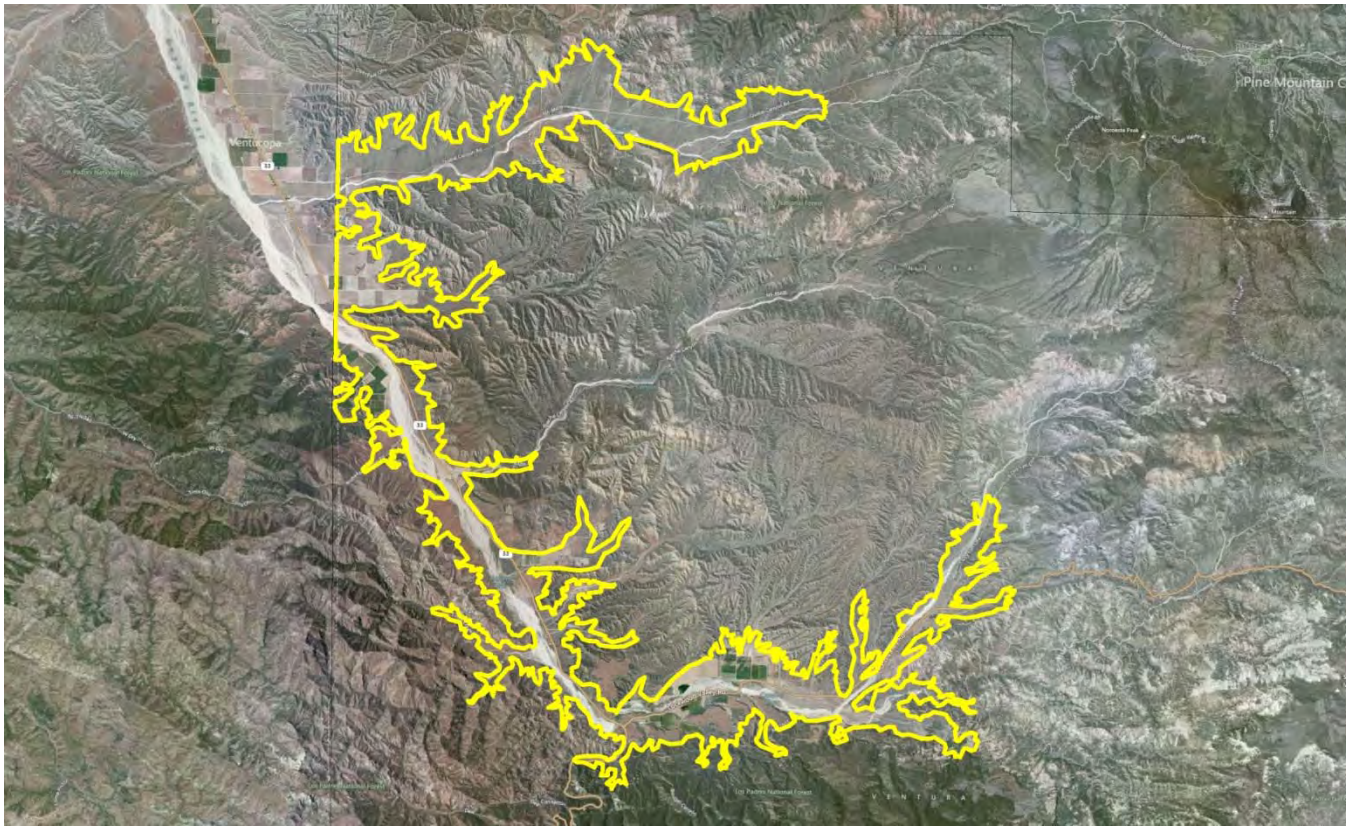


Figure 3-20: Map showing approximate location of sampled wells with concentrations (mg/l) of selected inorganic constituents and piper diagrams.

3.2.12 - Cuyama Valley Basin

The Cuyama Valley Basin is in a remote area in northwestern Ventura County. The aerial photo and the map in Figure 3-18 show only the portion of the basin that is in Ventura County. There are approximately 149 wells in the Cuyama Valley Basin; 112 are active water supply wells. Depth to the main water bearing unit varies between 40 to 170 feet below ground surface. Figure E-27, piper diagram, shows low variability in water quality of the wells sampled this year. Sodium (Na^+) is the dominant cation in the three samples; there is no dominant anion. All three samples are sodium bicarbonate type. The wells sampled this year have TDS above the secondary MCL for drinking water; no other constituent was elevated. Water samples from all three wells were analyzed for Title 22 metals. None of the Title 22 metals was above the primary MCL for drinking water. California Department of Water Resources Groundwater Bulletin No. 118 indicates groundwater quality has been deteriorating in some areas because of cycling and evaporation of irrigation water. All three wells sampled have good water quality but are located in the northern part of the basin where there is not as much irrigation. Figure 3-21 shows approximate well locations and concentrations of total dissolved solids (TDS), sodium (Na^+), potassium (K^+), calcium (Ca^{2+}), magnesium (Mg^{2+}), chloride (Cl^-), bicarbonate (HCO_3^-), carbonate (CO_3^{2-}) and sulfate (SO_4^{2-}) for the wells sampled in the Cuyama Valley basin.



Aerial photo showing the extent of the Cuyama Valley groundwater basin.

CUYAMA VALLEY BASIN

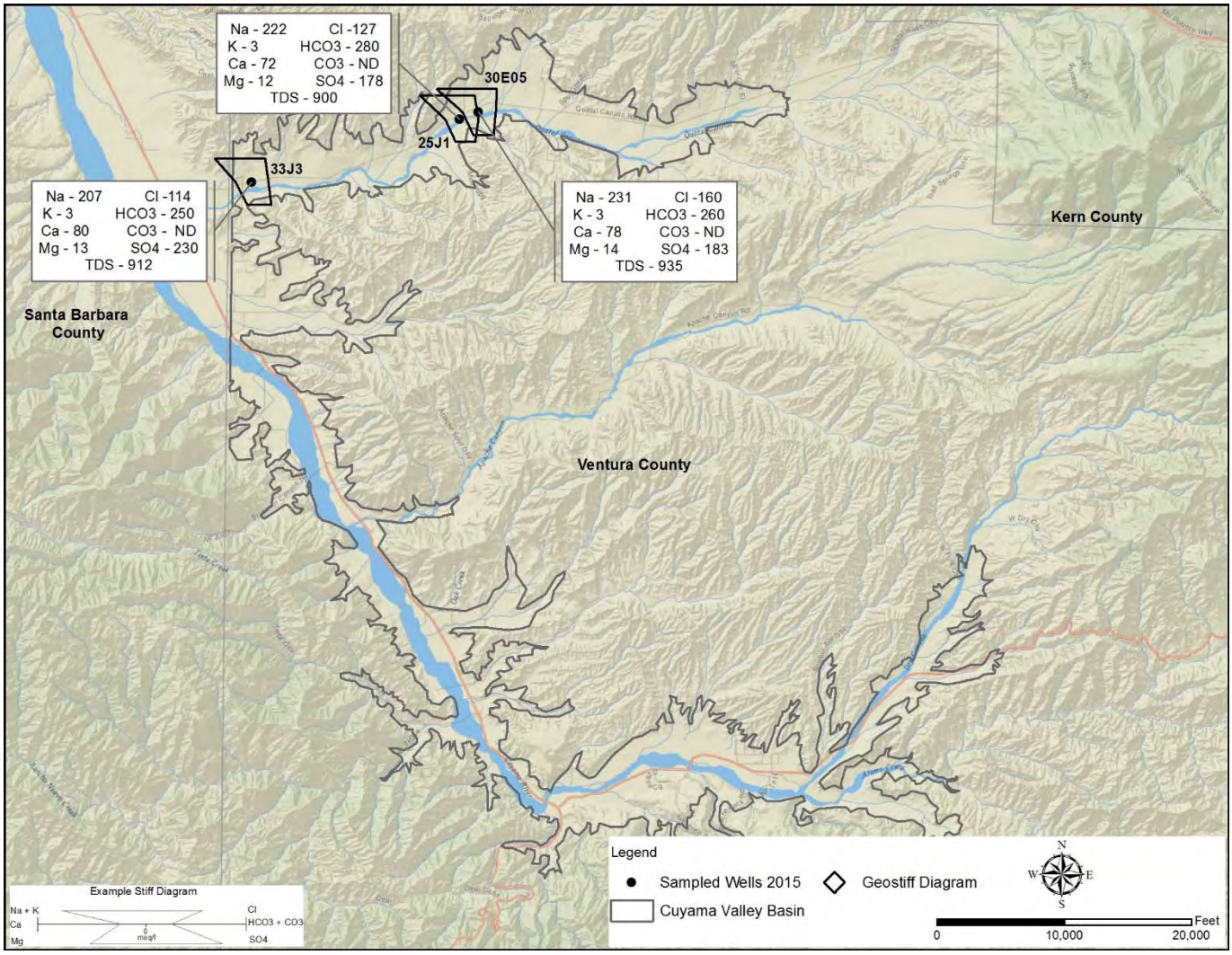
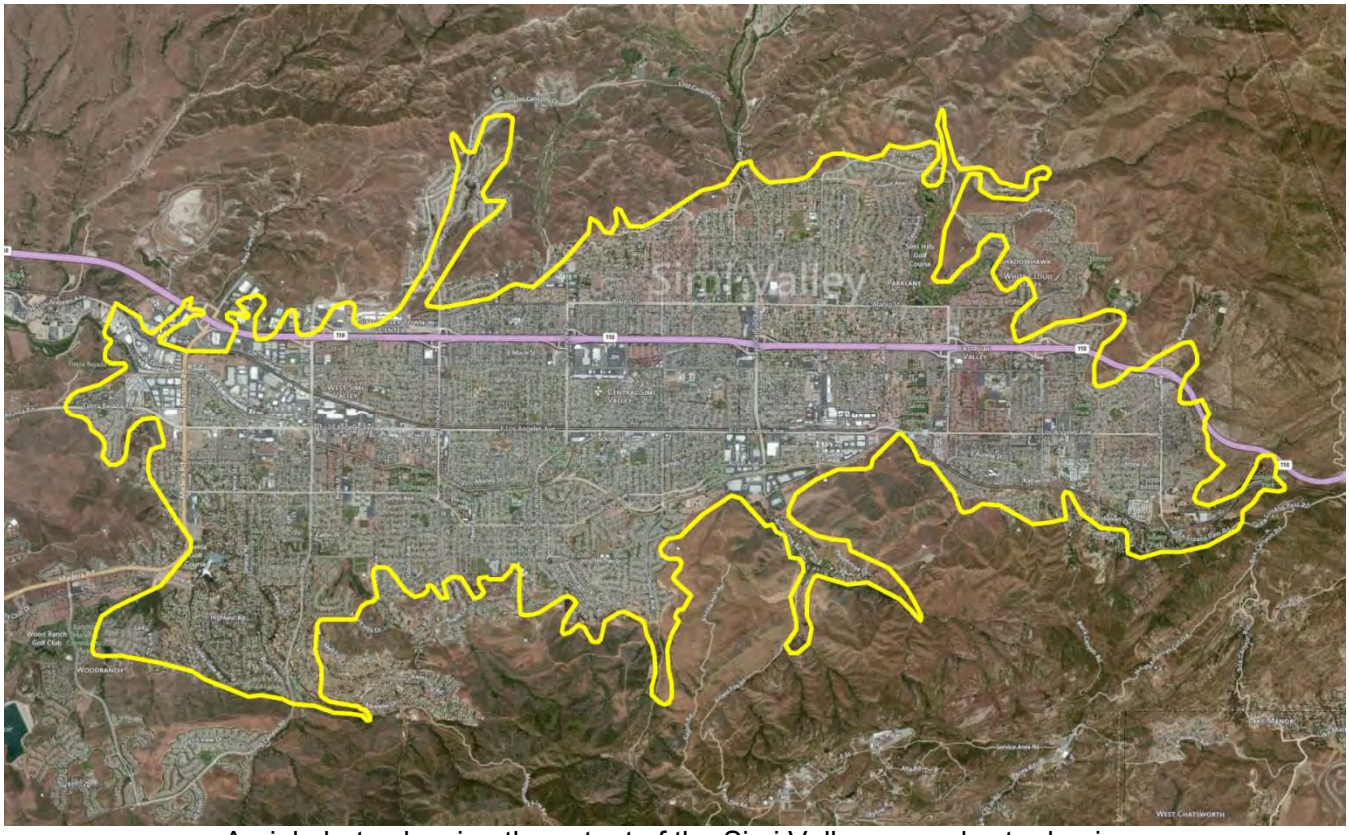


Figure 3-21: Map showing approximate location of sampled wells with concentrations (mg/l) of selected inorganic constituents and piper diagram.

3.2.13 - Simi Valley Basin

The Simi Valley Basin drains to the west and, historically, water quality becomes more enriched in salts farther west in the basin. There are approximately 191 water supply wells in the Simi Valley Basin; 43 are active wells. Depth to water bearing material is approximately 5 to 25 feet below ground surface. The City of Simi Valley has a high water table at the west end of the valley and several extraction wells have been installed to pump down the water table when groundwater gets too high. Figure E-28, piper diagram, shows low variability in water quality of the wells sampled this year. There is no dominant cation but all three samples plot close to the calcium cation type; sulfate (SO_4^{2-}) is the dominant anion. The water is calcium sulfate type. The three wells sampled this year, all dewatering wells, located in the western half of the basin, have sulfate (SO_4^{2-}), and TDS concentrations above the secondary MCL for drinking water and one well has manganese (Mn^{+}) above the MCL and one has iron concentration that is about ten times the secondary MCL for drinking water. All three samples also have concentrations of boron and two have chloride that exceed agricultural beneficial uses, but neither constituent is above the primary MCL for drinking water. A water sample from one well was analyzed for Title 22 metals. None of the Title 22 metals was above the primary MCL for drinking water. Figure 3-22 shows approximate well locations and concentrations of total dissolved solids (TDS), sodium (Na^{+}), potassium (K^{+}), calcium (Ca^{2+}), magnesium (Mg^{2+}), chloride (Cl^{-}), bicarbonate (HCO_3^{-}), carbonate (CO_3^{2-}) and sulfate (SO_4^{2-}) for the wells sampled in the Simi Valley basin.



Aerial photo showing the extent of the Simi Valley groundwater basin.

SIMI VALLEY BASIN

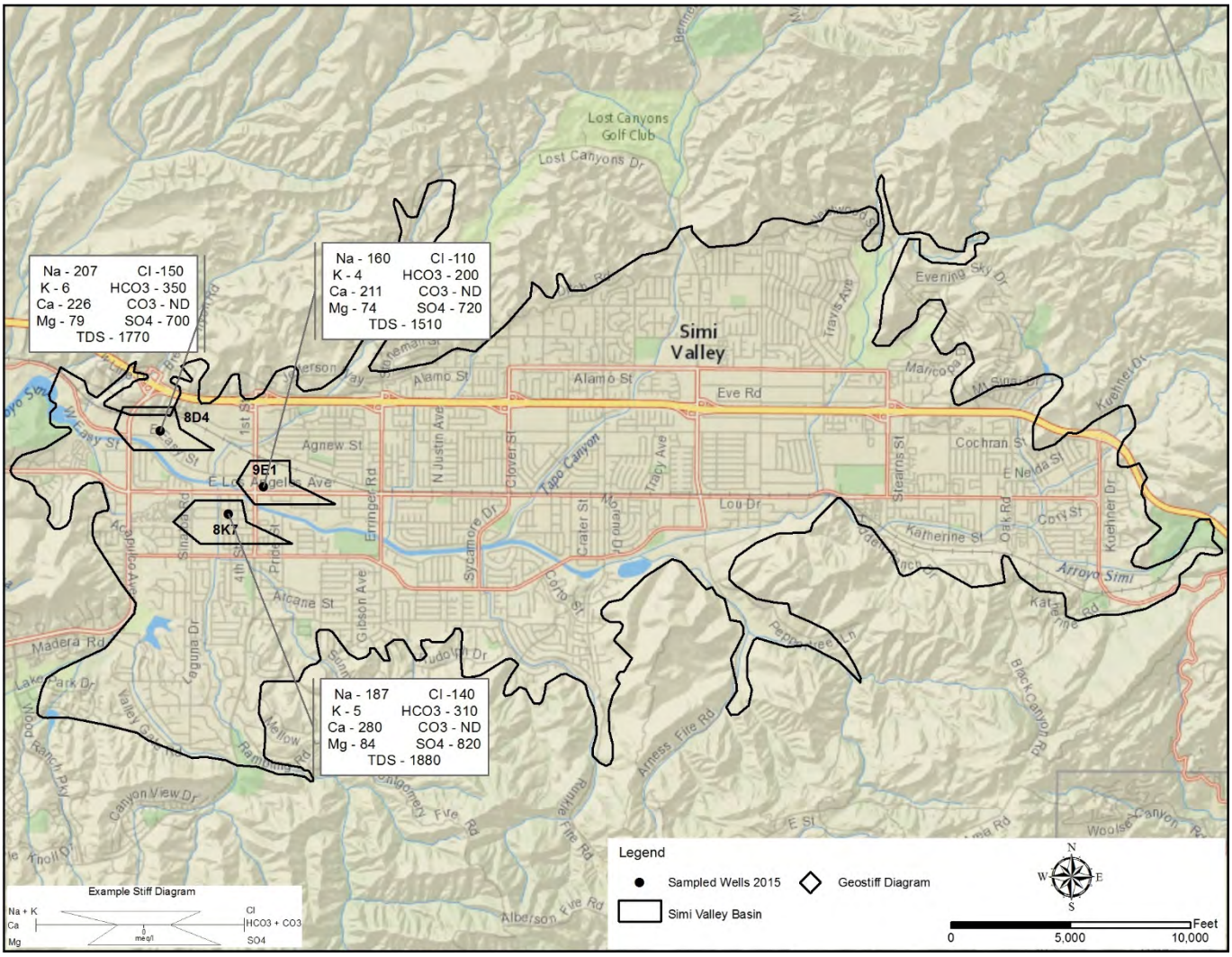
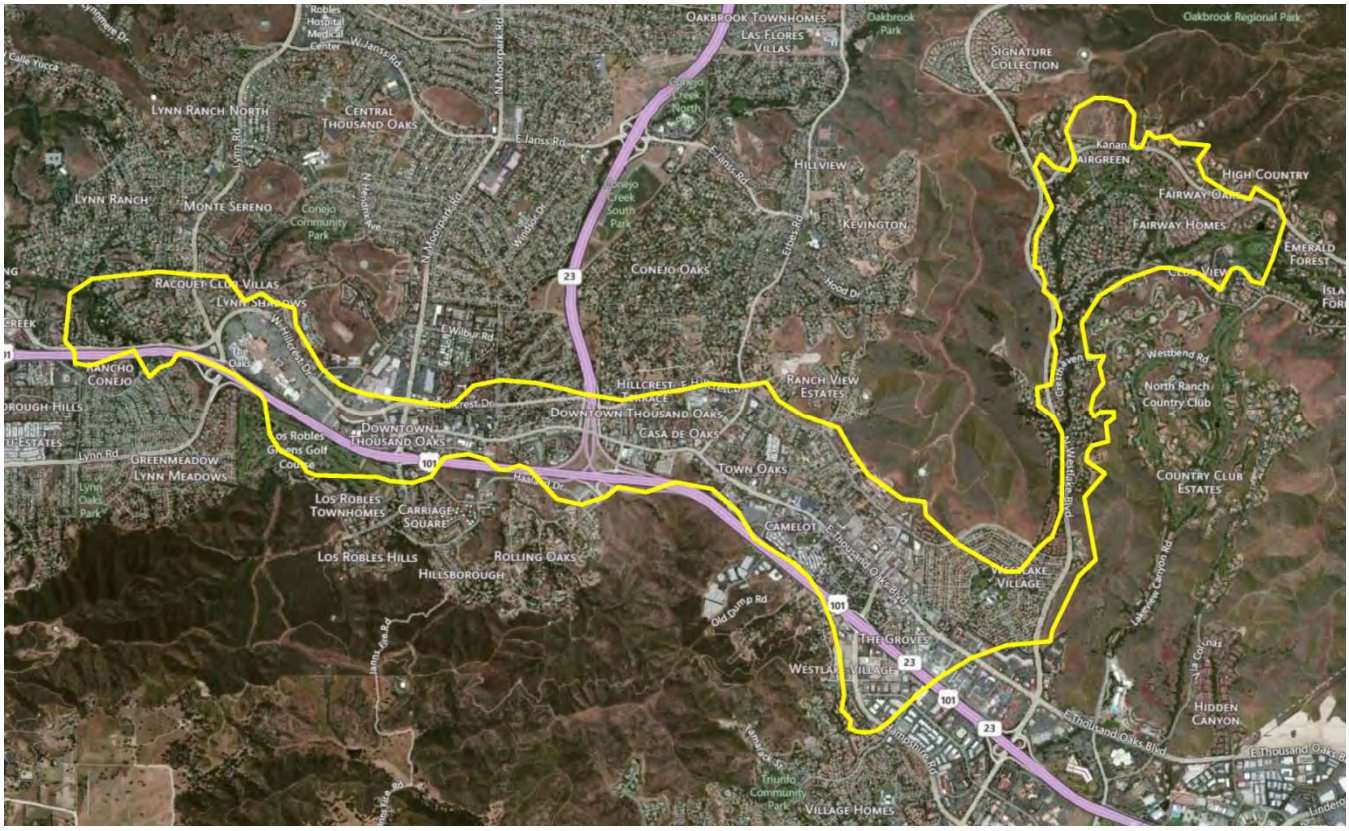


Figure 3-22: Map showing approximate location of sampled wells with concentrations (mg/l) of selected inorganic constituents and piper diagram.

3.2.14 - Thousand Oaks Basin

The Thousand Oaks Basin has very few active water wells available for sampling. The depth to the water bearing unit is approximately 25 to 30 feet. There are approximately 194 water supply wells in the Thousand Oaks Basin; 18 are active wells. Two wells at the west end of the basin were sampled this year. Figure E-29, piper diagram, shows the water quality of the wells sampled this year. There is no dominant cation but the water plots close to the magnesium type (Mg^{2+}); sulfate (SO_4^{2-}) is the dominant anion in one sample and there is no dominant cation for the other well. The water is magnesium sulfate type. Concentrations of iron, sulfate (SO_4^{2-}) and TDS are above the secondary MCL for drinking water and manganese (Mn^{+}) is above the MCL in one sample. Neither sample was analyzed for Title 22 metals. Figure 3-23 shows approximate well location and concentrations of total dissolved solids (TDS), sodium (Na^{+}), potassium (K^{+}), calcium (Ca^{2+}), magnesium (Mg^{2+}), chloride (Cl^{-}), bicarbonate (HCO_3^{-}), carbonate (CO_3^{2-}) and sulfate (SO_4^{2-}) for the wells sampled in Thousand Oaks basin.



Aerial photo showing the extent of the Thousand Oaks groundwater basin.

THOUSAND OAKS BASIN

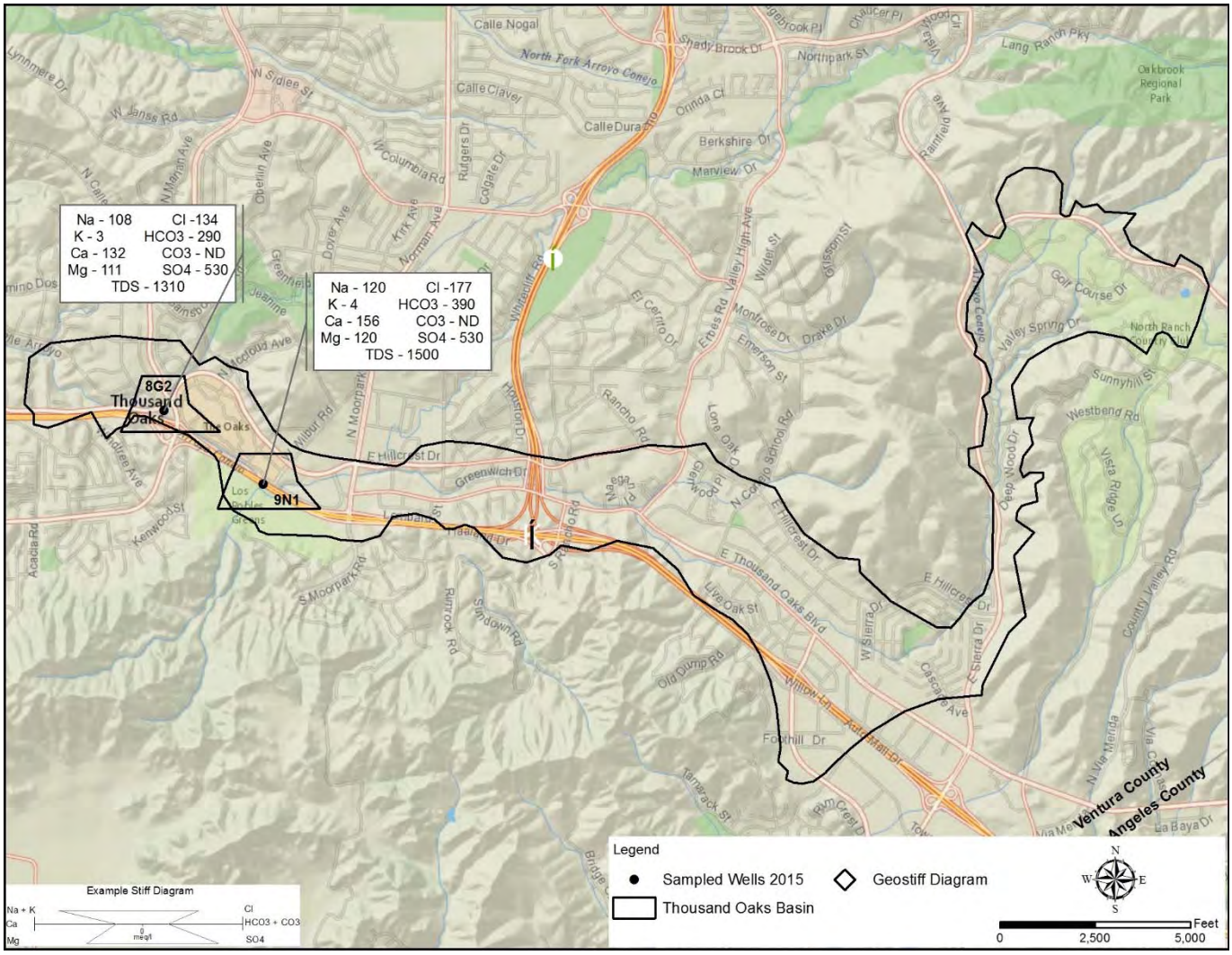
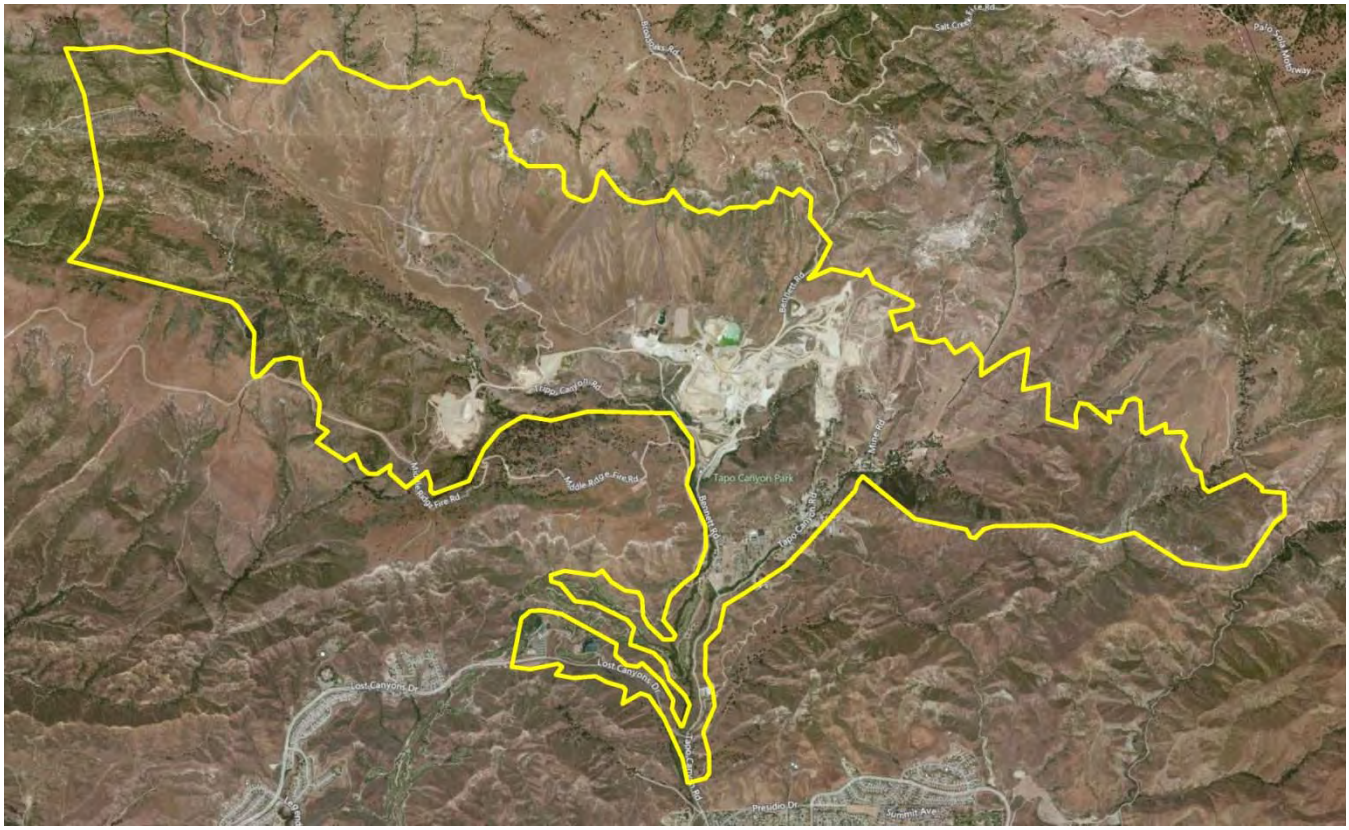


Figure 3-23: Map showing approximate location of sampled wells with concentrations (mg/l) of selected inorganic constituents and piper diagram.

3.2.15 - Tapo/Gillibrand Basin

The Tapo/Gillibrand Basin is located to the north of Simi Valley. There are approximately 46 water supply wells in the Tapo/Gillibrand Basin; 42 are active wells. The City of Simi Valley operates several wells in the basin as a backup water supply. Two wells were sampled this year. Figure E-30, piper diagram, shows water quality of the wells sampled this year. Calcium is the dominant cation in both wells and sulfate (SO_4^{2-}) is the dominant anion in one of the wells sampled. The water is calcium sulfate type. TDS and SO_4^{2-} concentrations are above the secondary MCL for drinking water in both wells; iron (Fe) and manganese (Mn) are above the secondary MCL in one well. Neither well was analyzed for Title 22 metals. Figure 3-24 shows approximate well location and concentration of total dissolved solids (TDS), sodium (Na^+), potassium (K^+), calcium (Ca^{2+}), magnesium (Mg^{2+}), chloride (Cl^-), bicarbonate (HCO_3^-), carbonate (CO_3^{2-}) and sulfate (SO_4^{2-}) for the well sampled in Tapo/Gillibrand basin.



Aerial photo showing the extent of the Tapo/Gillibrand groundwater basin.

TAPO/GILLIBRAND BASIN

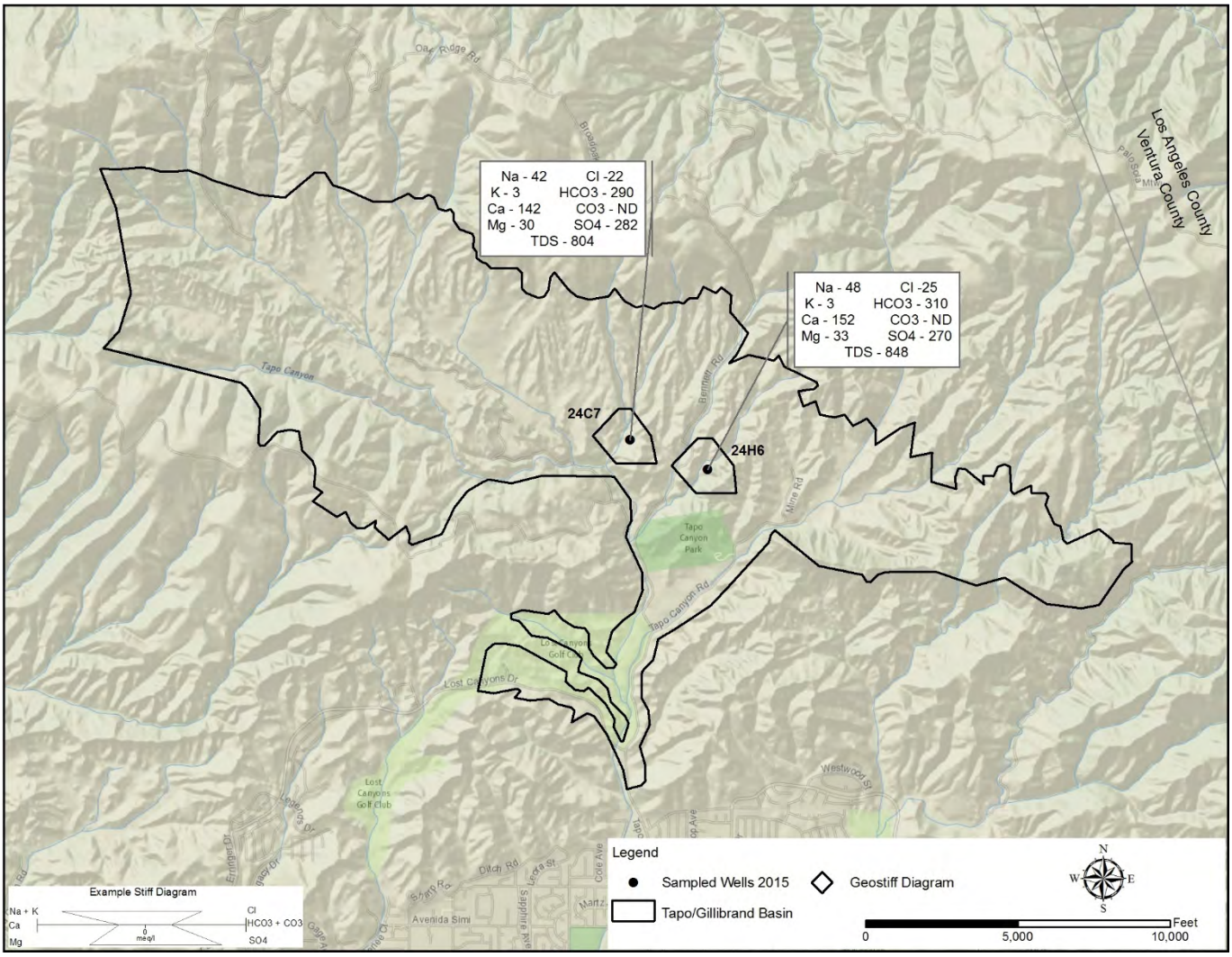


Figure 3-24: Map showing approximate location of sampled wells with concentrations (mg/l) of selected inorganic constituents and piper diagram.

3.2.16 - Arroyo Santa Rosa Basin

The water bearing units of the Arroyo Santa Rosa Basin occupy almost the entire area beneath the Santa Rosa Valley, but the area west of the Bailey Fault is generally considered to be hydrogeologically separate from the area east of the fault (1997 Santa Rosa Basin Groundwater Management Plan) although some leakage across the fault does occur (CMWD, 2013). Depth to water bearing material is approximately 50 feet. The water bearing units west of the fault are confined and those located east of the fault are unconfined. The degree of groundwater movement across the fault is not clearly understood. The Arroyo Santa Rosa Basin has a large area dedicated to agricultural use and a high number of individual septic systems; two main sources of nitrate to the groundwater. A large portion of recharge to the basin is discharge from the Thousand Oaks Hill Canyon Wastewater Treatment Plant. There are approximately 87 water supply wells in the Arroyo Santa Rosa Basin; 40 are active wells. Figure E-32, piper diagram, shows moderate variation in water quality of the wells sampled this year. Magnesium (Mg^{2+}) is the dominant cation in one sample and the remainder of the samples plot close to the magnesium cation type. Bicarbonate is the dominant anion for one of the samples; there is no dominant anion for the remainder. One of the water samples is magnesium bicarbonate type and the remainder are magnesium sulfate type. Water from seven of the nine wells sampled this year have nitrate (NO_3^-) concentrations higher than the primary MCL for drinking water. All nine wells have TDS concentrations above the secondary MCL; ranging from 775 to 1120 mg/l. Chloride (Cl^-) concentrations in eight of the wells are above the level that can cause agricultural beneficial uses for sensitive plants to be impaired, but are not above the primary MCL for drinking water. Two water samples were analyzed for Title 22 metals. Lead (Pb) was above the primary MCL for drinking water in one sample. None of the other Title 22 metals was above the primary MCL for drinking water. Figure E-34, piper diagram, shows a comparison of water chemistry between Tierra Rejada Basin and Arroyo Santa Rosa Basin groundwater. The water chemistry is similar but with more variation in the Tierra Rejada Samples. Figure 3-25 shows approximate well locations and concentrations of total dissolved solids (TDS), sodium (Na^+), potassium (K^+), calcium (Ca^{2+}), magnesium (Mg^{2+}), chloride (Cl^-), bicarbonate (HCO_3^-), carbonate (CO_3^{2-}) and sulfate (SO_4^{2-}) for the wells sampled in the Arroyo Santa Rosa basin.

Aerial photo showing the extent of the Arroyo Santa Rosa groundwater basin.

ARROYO SANTA ROSA BASIN

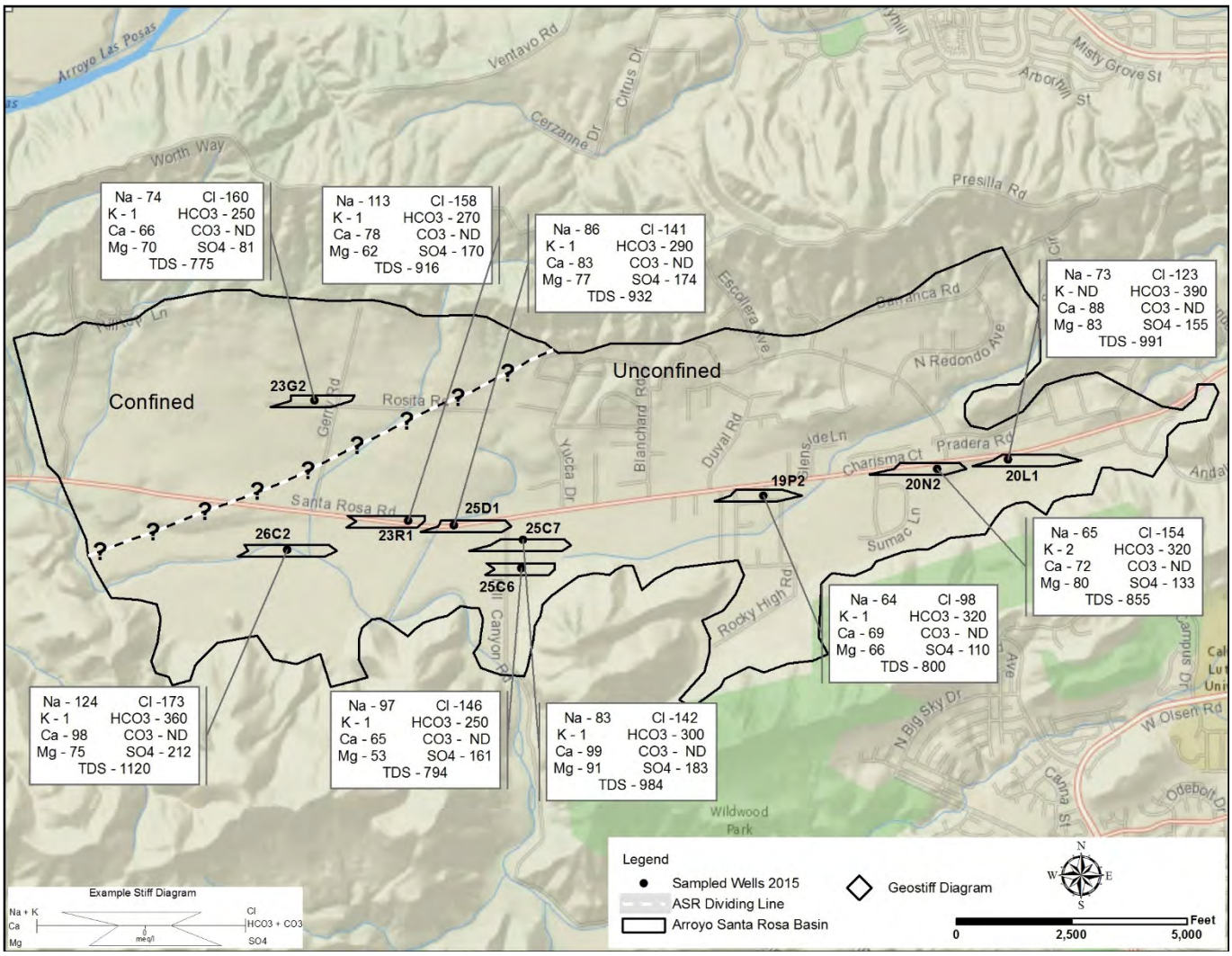


Figure 3-25: Map showing approximate location of sampled wells with concentrations (mg/l) of selected inorganic constituents and piper diagrams.

Figure 3-26 shows the geographic distribution of the wells sampled, with graduated symbols representing nitrate concentration for 2015. Figure 3-27 shows nitrate results for 2006 through 2015 in the same manner. The Groundwater Section has used three or more wells with nitrate concentrations above the state primary MCL in a given year as the criteria to classify the basin as nitrate-impacted. Comparison of the two shows that the Arroyo Santa Rosa Basin has remained nitrate impacted for many years. Management practices now in place include limiting the number of large animals and generally restricting septic systems to lots greater than 2.875 acres. It is not clear that the management practices are having the desired effect of reducing nitrate but no groundwater samples collected this year had nitrate (NO_3^-) concentration above 108 mg/l and in previous years some wells have been as high as 292 mg/l.

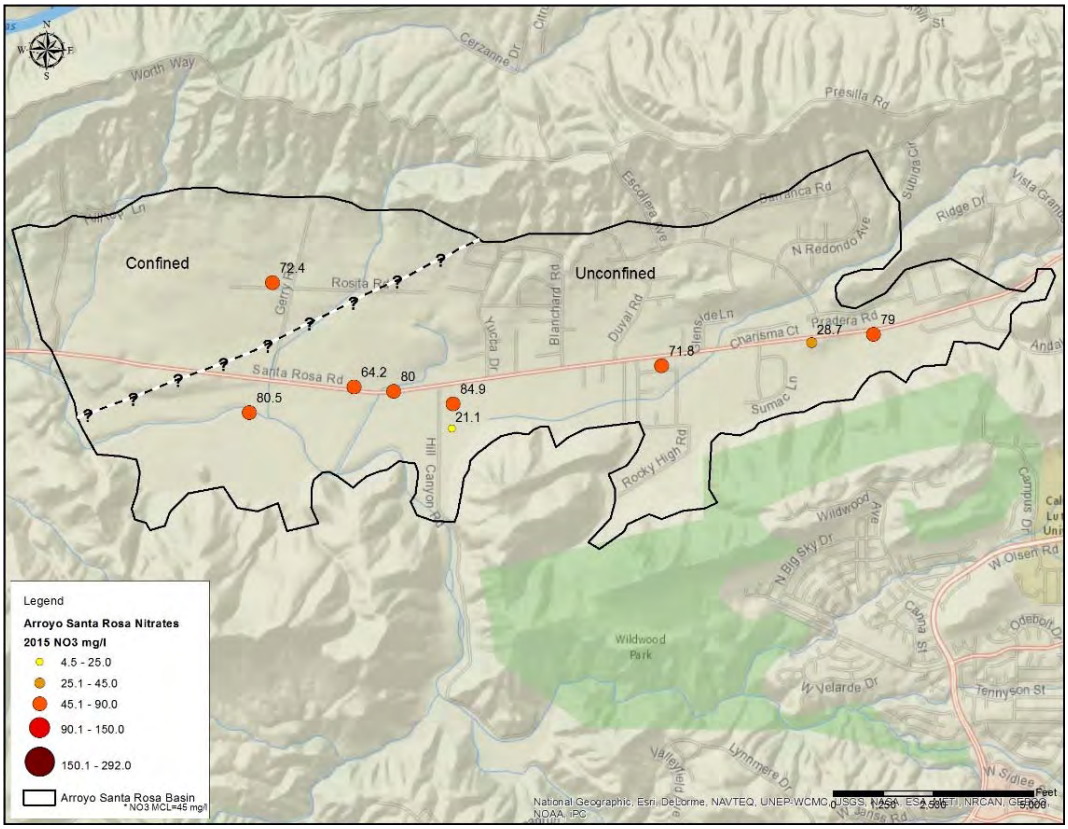


Figure 3-26: Map showing Nitrate results in mg/l for the year 2015.

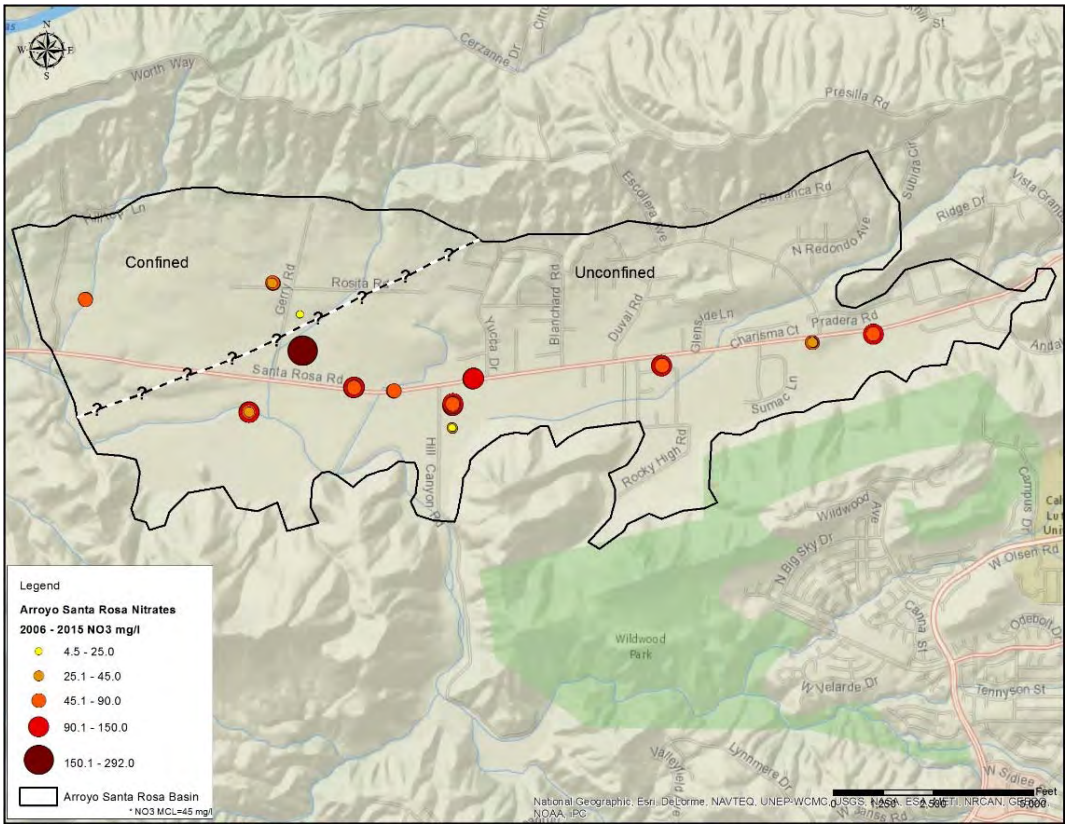
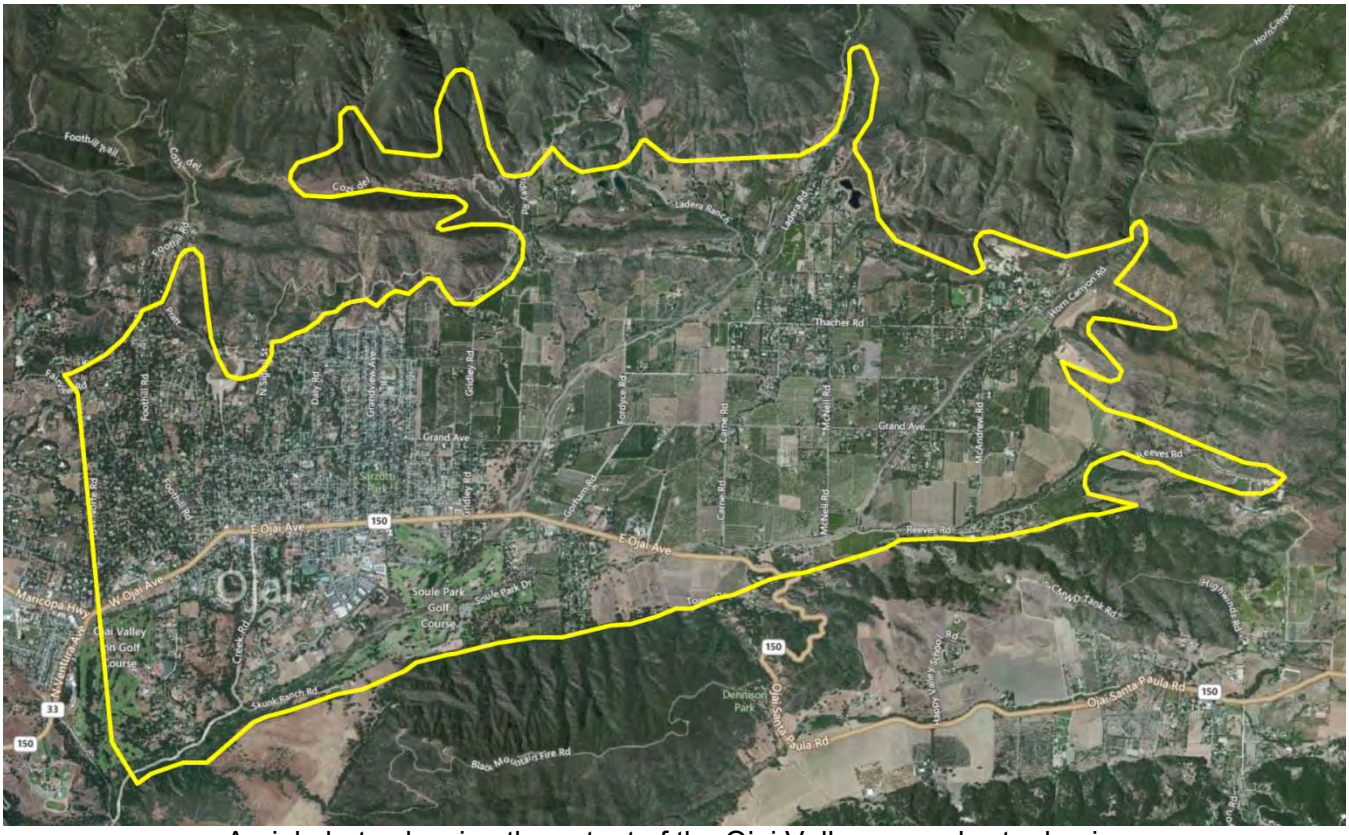


Figure 3-27: Map showing nitrate results for 2006 to 2015.

3.2.17 - Ojai Valley Basin

The aquifer system of the Ojai Valley Basin is considered unconfined except in the western end of the basin where a semi-confining to confining clay layer is present. The Ojai Valley Basin water quality is considered good. There are approximately 341 water supply wells in the Ojai Valley Basin; 191 are active wells. Depth to water bearing material is generally between 25 to 30 feet below ground surface. Figure E-36, piper diagram, shows high variation in water quality of the wells sampled this year. Calcium is the dominant cation group for eleven of the samples; sodium is the dominant cation group for one sample and the remaining three samples have no dominant cation. Sulfate (SO_4^{2-}) is the dominant anion for four samples; bicarbonate is the dominant anion for five of the samples, chloride (Cl^-) is the dominant anion for one sample and there is no dominant anion for the remaining five samples but they plot close to the bicarbonate anion type. Four samples are calcium bicarbonate type; one sample is sodium bicarbonate type; the remaining samples are calcium sulfate type.

Fourteen of the fifteen wells sampled have TDS concentrations above the secondary MCL for drinking water. TDS ranges from 421 to 1520 mg/l. Two wells have iron (Fe), four wells have manganese (Mn), one well has sulfate (SO_4^{2-}), one has chloride (Cl^-) and one has nitrate (NO_3^{2-}) concentrations above the secondary MCL for drinking water. Water samples from three wells were analyzed for Title 22 metals. One well has lead (Pb) above the primary MCL for drinking water. None of the remaining Title 22 metals were above the primary MCL for drinking water. Figure 3-28 shows approximate well locations and concentrations of total dissolved solids (TDS), sodium (Na^+), potassium (K^+), calcium (Ca^{2+}), magnesium (Mg^{2+}), chloride (Cl^-), bicarbonate (HCO_3^-), carbonate (CO_3^{2-}) and sulfate (SO_4^{2-}) for the wells sampled in the Ojai Valley basin.



Aerial photo showing the extent of the Ojai Valley groundwater basin.

OJAI VALLEY BASIN

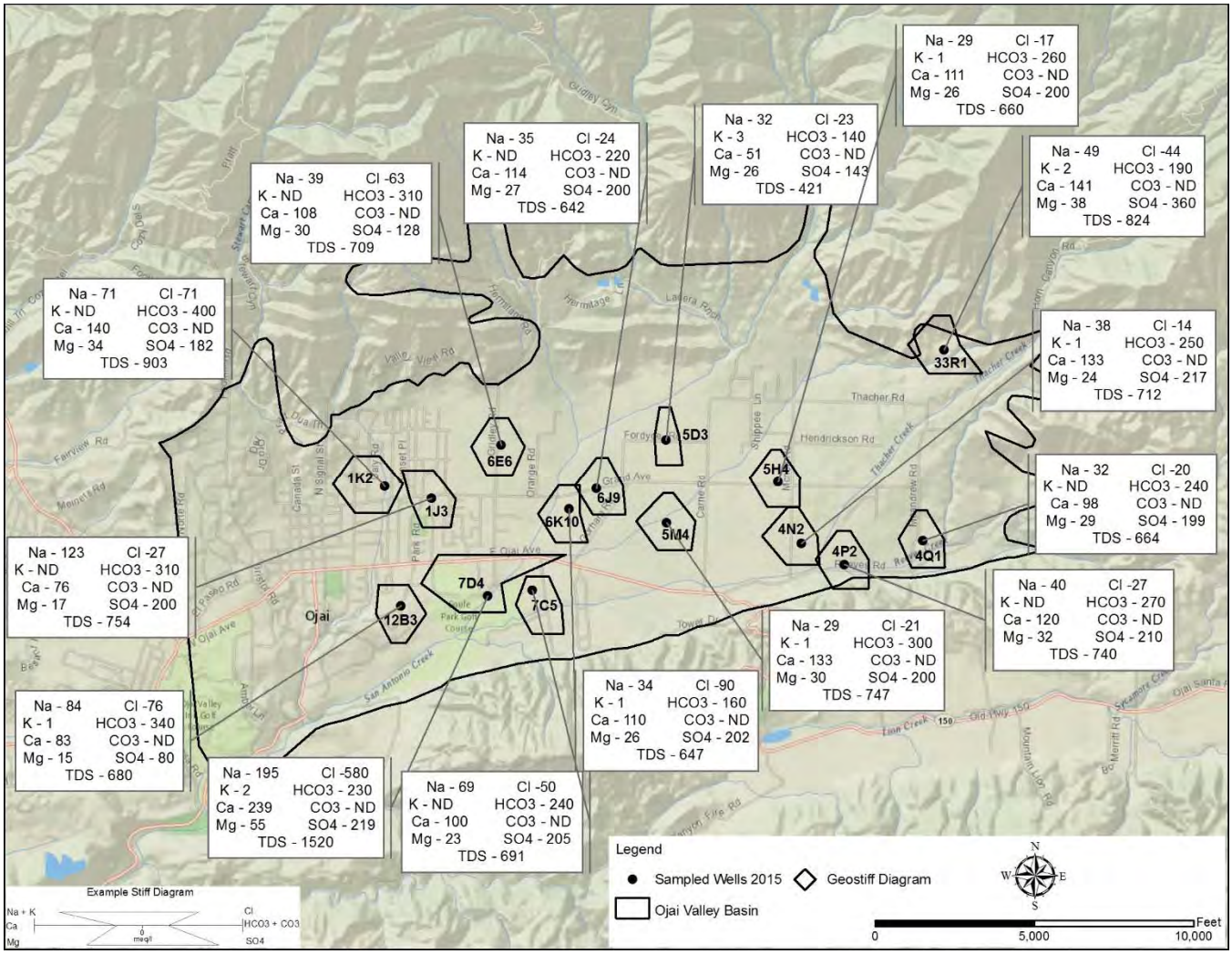
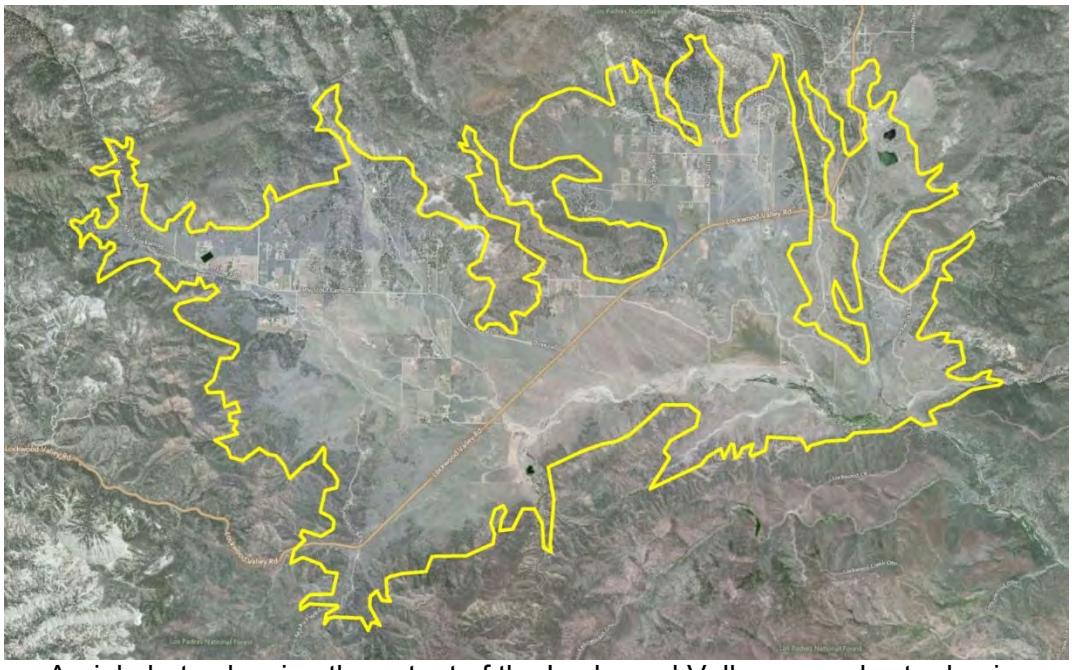


Figure 3-28: Map showing approximate location of sampled wells with concentrations (mg/l) of selected inorganic constituents and piper diagrams.

3.2.18 - Lockwood Valley Basin

The Lockwood Valley Basin groundwater quality ranges from good to unhealthful. The basin covers a large geographic area, approximately 34.1 square miles. Depth to water bearing material is approximately 55 to 60 feet. There are approximately 260 water supply wells in the Lockwood Valley Basin; 216 are active wells. Figure E-31, piper diagram, shows moderate variation in groundwater chemistry of the wells sampled this year. Calcium is the dominant cation and bicarbonate is the dominant anion. The two samples are calcium bicarbonate type. Two wells were sampled this year and both have TDS concentrations above the secondary MCL for drinking water and five have sulfate (SO_4^{2-}) above the secondary MCL. Samples from all six wells were also analyzed for Title 22 metals and radionuclides. One has arsenic above the California MCL for Title 22 metals, but four are above the EPA standards for drinking water. None of the remaining Title 22 metals were above the primary MCL for drinking water.

The result for gross alpha on five of the samples was above 5 pCi/L; that level requires the sample to be analyzed for uranium. In 2004, the Drinking Water Branch of the California Department of Public Health issued an Initial Monitoring and MCL Compliance Determination flow chart. The flow chart is used to determine the source of gross alpha for determining compliance in community water systems. Based on the flow chart, naturally occurring uranium was determined to be the source of the gross alpha in these samples. The geologic source(s) of the radionuclides have not been investigated. Following the additional uranium testing, radionuclides were determined to be above the MCL for drinking water in only one of the samples. Figure 3-29 shows approximate well locations and concentrations of total dissolved solids (TDS), sodium (Na^+), potassium (K^+), calcium (Ca^{2+}), magnesium (Mg^{2+}), chloride (Cl^-), bicarbonate (HCO_3^-), carbonate (CO_3^{2-}) and sulfate (SO_4^{2-}) for the wells sampled in the Lockwood Valley basin.



Aerial photo showing the extent of the Lockwood Valley groundwater basin.

LOCKWOOD VALLEY BASIN

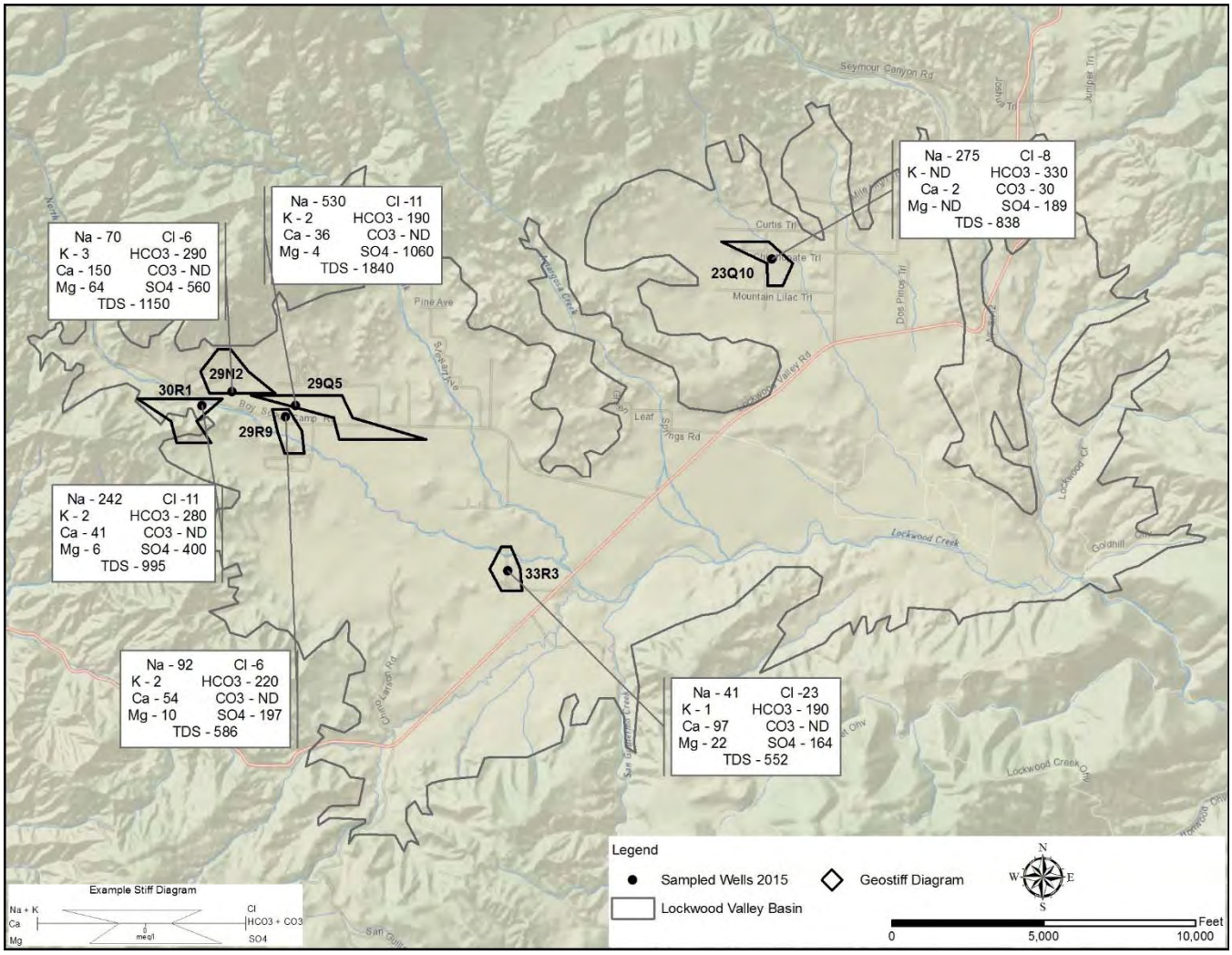


Figure 3-29: Map showing approximate location of sampled wells with concentrations (mg/l) of selected inorganic constituents and piper diagram.

3.2.19 - Tierra Rejada Valley Basin

Depth to water bearing materials varies between 20 to 80 feet. There are approximately 51 water supply wells in the Tierra Rejada Valley Basin; 31 are active. Eight wells were sampled this year. Figure E-33, piper diagram, shows high variation in water quality. The dominant cation for two wells is magnesium (Mg^{2+}); the remainder have no dominant cation but plot close to the magnesium type. The dominant anion for two samples is bicarbonate; the remainder have no dominant anion. One well is calcium bicarbonate, type, one is magnesium bicarbonate type and the remaining six are calcium sulfate type. All eight wells have concentrations above the secondary MCL for TDS; ranging from 503 to 1000 mg/l. One well is above the MCL for iron, one above the MCL for manganese and nitrate was above the MCL for drinking water in two samples this year. Samples from two wells were also analyzed for Title 22 metals. No Title 22 metal was above the primary MCL for drinking water. Figure E-34, piper diagram, shows a comparison of water chemistry between Tierra Rejada and Arroyo Santa Rosa Basins.

Chemistry in the two basins is similar but there is more variation in Tierra Rejada with slightly higher bicarbonate and sulfate. Figure 3-30 shows approximate well locations and concentrations of total dissolved solids (TDS), sodium (Na^{+}), potassium (K^{+}), calcium (Ca^{2+}), magnesium (Mg^{2+}), chloride (Cl^{-}), bicarbonate (HCO_3^{-}), carbonate (CO_3^{2-}) and sulfate (SO_4^{2-}) for the wells sampled in the Tierra Rejada basin.

Aerial photo showing the extent of the Tierra Rejada Valley groundwater basin.

TIERRA REJADA BASIN

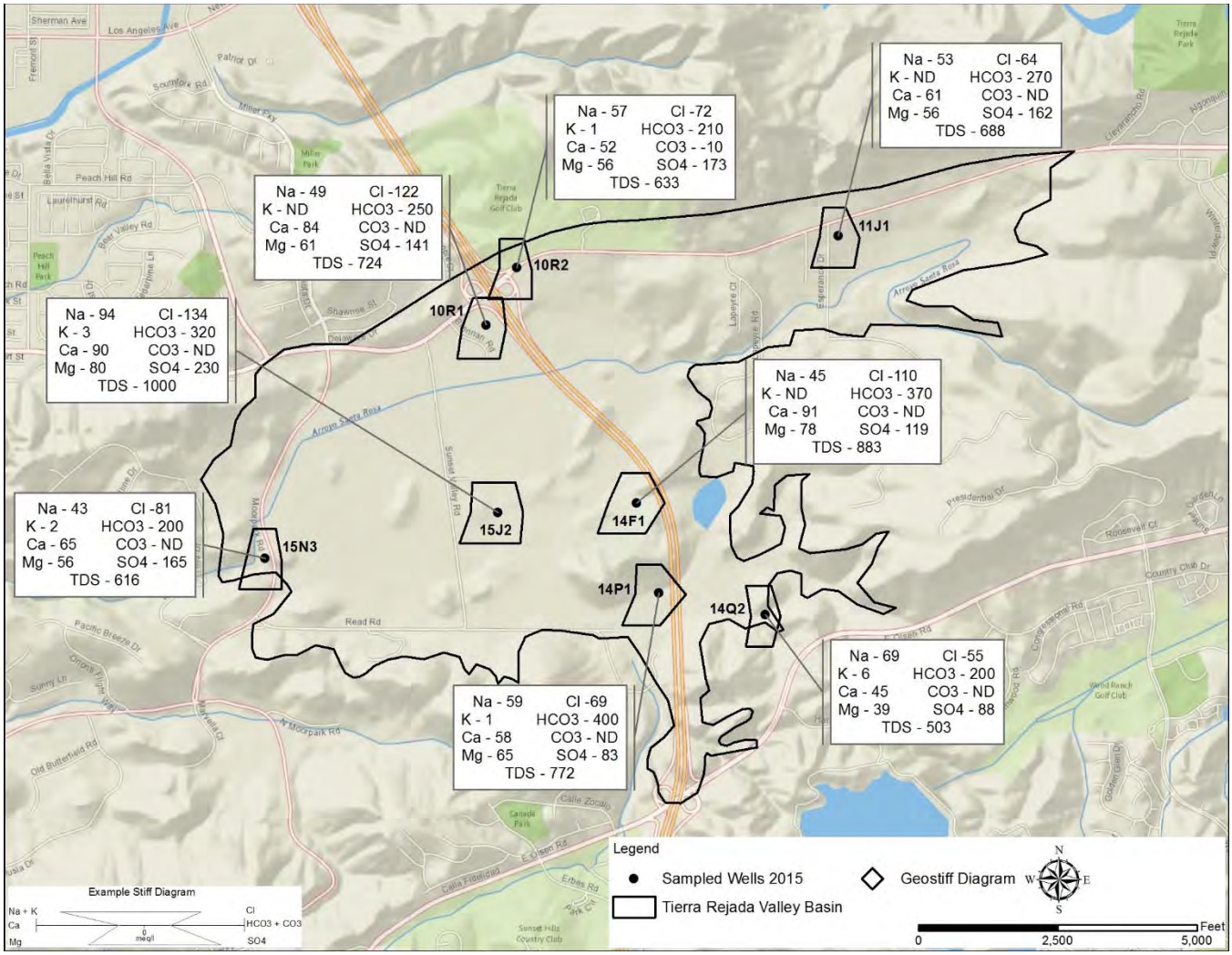


Figure 3-30: Map showing approximate location of sampled wells with concentrations (mg/l) of selected inorganic constituents and piper diagrams.

Figure 3-31 below shows nitrate concentrations for wells sampled in Tierra Rejada Basin in 2015. Groundwater from two of the wells sampled this year has a nitrate concentration that exceeds the primary MCL for drinking water. Other wells sampled in the past that had elevated nitrate concentrations were not available for sampling this year.

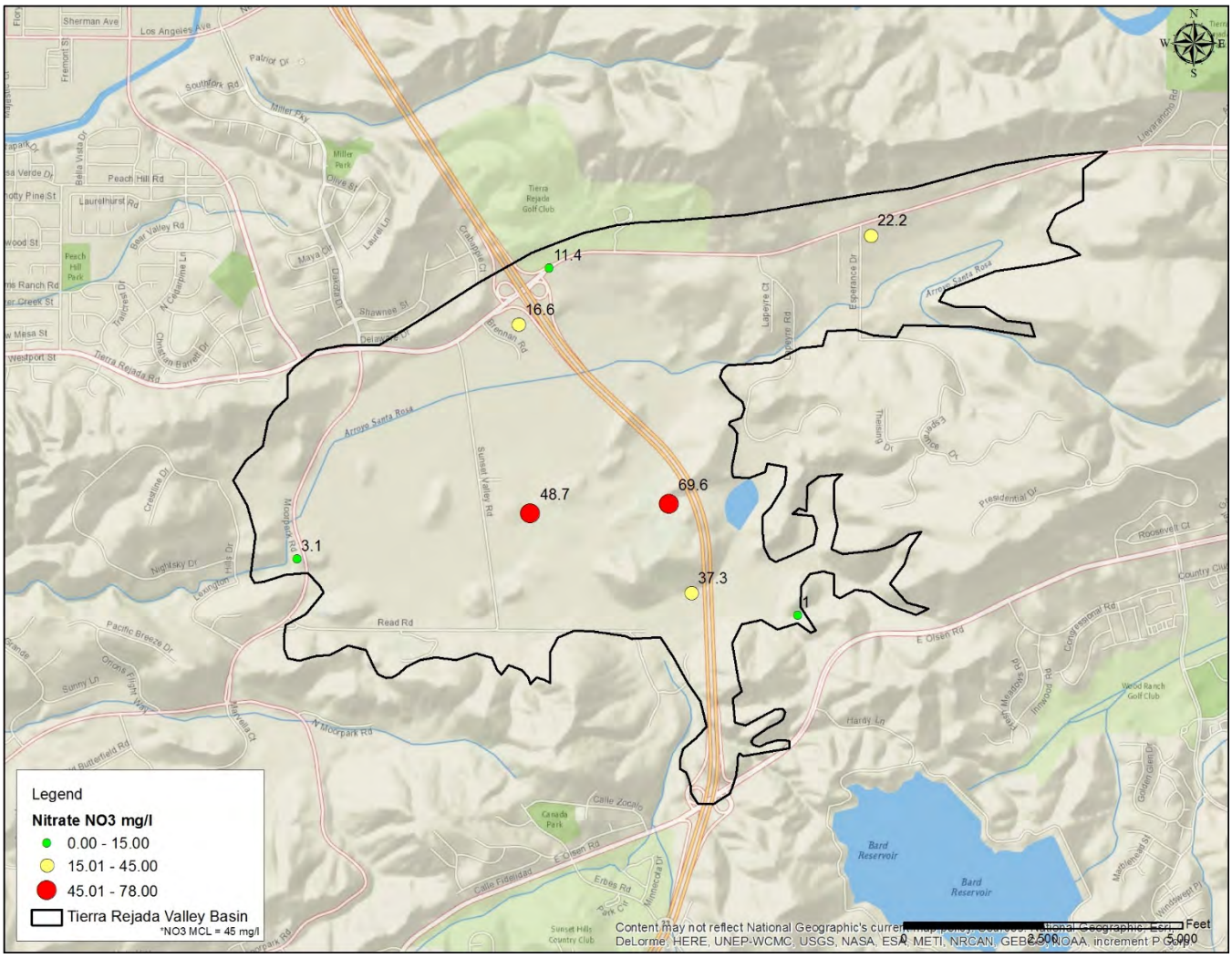


Figure 3-31: Map showing nitrate concentrations (mg/l). Two of the eight wells sampled this year have a nitrate concentration above the MCL for drinking water.

3.2.20 - Upper Ventura River Basin

The Upper Ventura River Basin is mainly composed of thin alluvial deposits. There are approximately 293 water supply wells in the Upper Ventura River Basin; 164 are active wells. Figure E-25, piper diagram, shows moderate variation in water quality. The dominant cation for one well is calcium and the dominant cation for one well is sodium type. There is no dominant anion for either well. One well is sodium sulfate type and one well is calcium sulfate type. Both samples have TDS concentrations that exceed the secondary MCL for drinking water; ranging from 548 to 815 mg/l. One well has manganese (Mn^{+}) above the secondary MCL for drinking water. A sample from one well was also analyzed for Title 22 metals. Lead (Pb) was above the primary MCL for drinking water but no other Title 22 metal was above the MCL. Figure E-26, piper diagram, shows a comparison of the water chemistry for the Upper and Lower Ventura River Basins. Water chemistry type is similar except the Upper Ventura River basin has a higher calcium concentration and lower sulfate. Figure 3-32 shows approximate well locations and concentrations of total dissolved solids (TDS), sodium (Na^{+}), potassium (K^{+}), calcium (Ca^{2+}), magnesium (Mg^{2+}), chloride (Cl^{-}), bicarbonate (HCO_3^{-}), carbonate (CO_3^{2-}) and sulfate (SO_4^{2-}) for the wells sampled in the Upper Ventura River basin.

Aerial photo showing the extent of the Upper Ventura River groundwater basin.

UPPER VENTURA RIVER BASIN

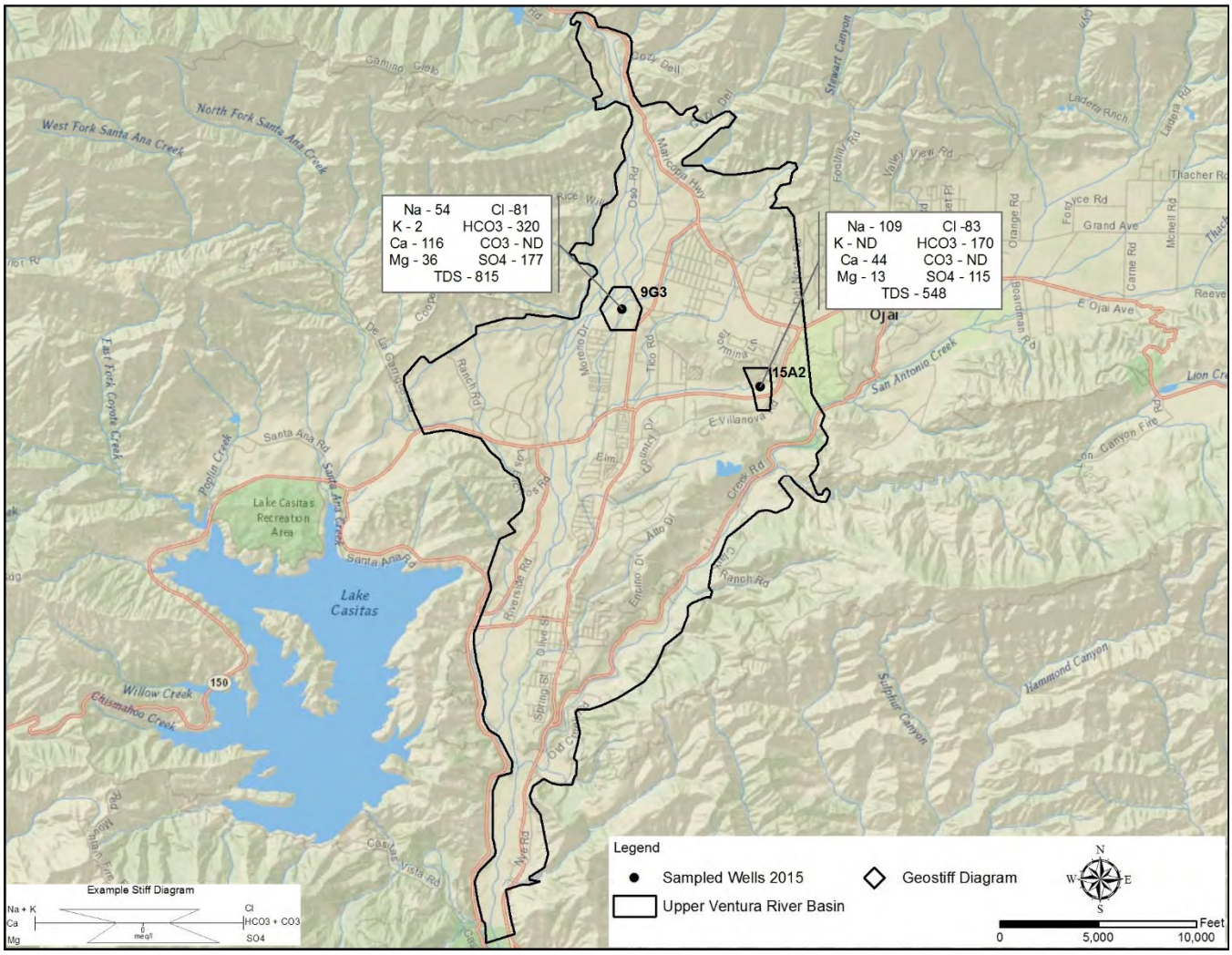
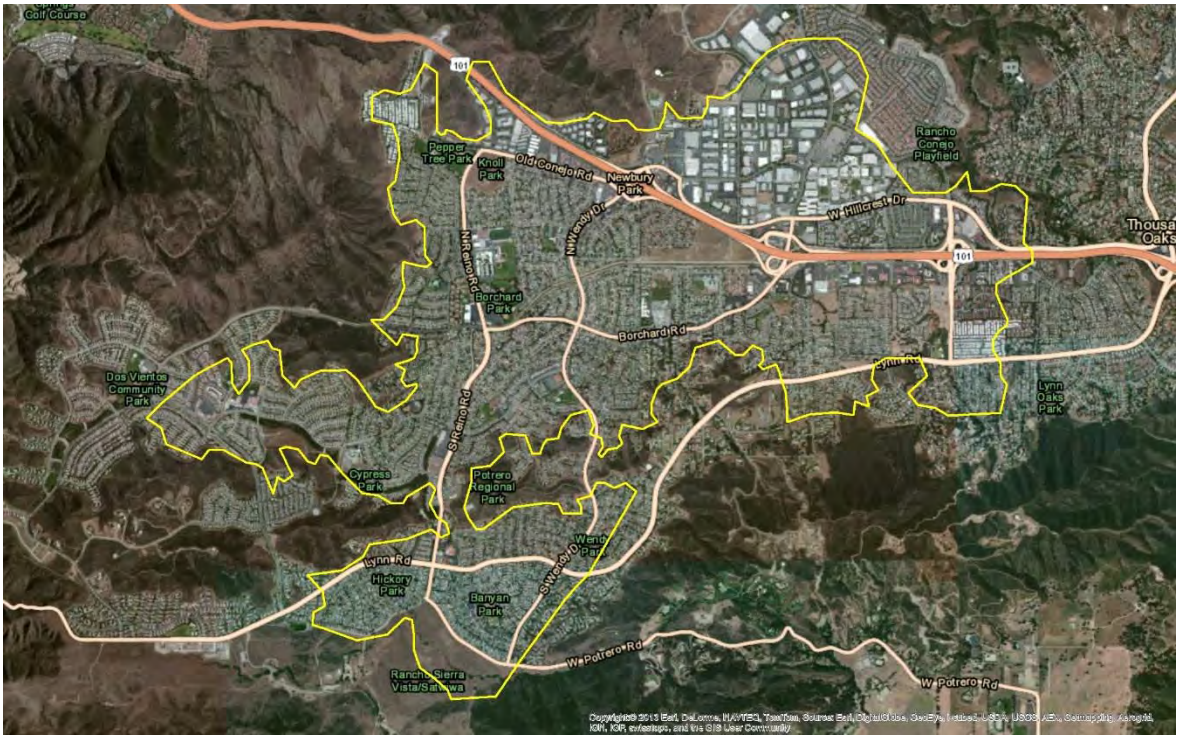


Figure 3-32: Map showing approximate location of sampled wells with concentrations (mg/l) of selected inorganic constituents and piper diagrams.

3.2.21 – Conejo Valley Basin

The Conejo Valley Basin has very few active water wells available for sampling. The depth to groundwater averages about 50 feet. There are approximately 167 wells in the Conejo Valley Basin; 11 are active water supply wells. One well located at the northwest corner of the basin was sampled this year. Figure E-38, piper diagram, shows water quality of the well sampled this year. Magnesium is the dominant cation; there is no dominant anion. The water is magnesium bicarbonate type. TDS concentration is above the secondary MCL for drinking water. The sample was analyzed for Title 22 metals. Lead was above the MCL but no other Title 22 metal was above the MCL for drinking water.

Figure 3-33 shows approximate well locations and concentrations of total dissolved solids (TDS), sodium (Na^+), potassium (K^+), calcium (Ca^{2+}), magnesium (Mg^{2+}), chloride (Cl^-), bicarbonate (HCO_3^-), carbonate (CO_3^{2-}) and sulfate (SO_4^{2-}) for the wells sampled in the Upper Ventura River basin.



Aerial photo showing the extent of the Conejo Valley groundwater basin.

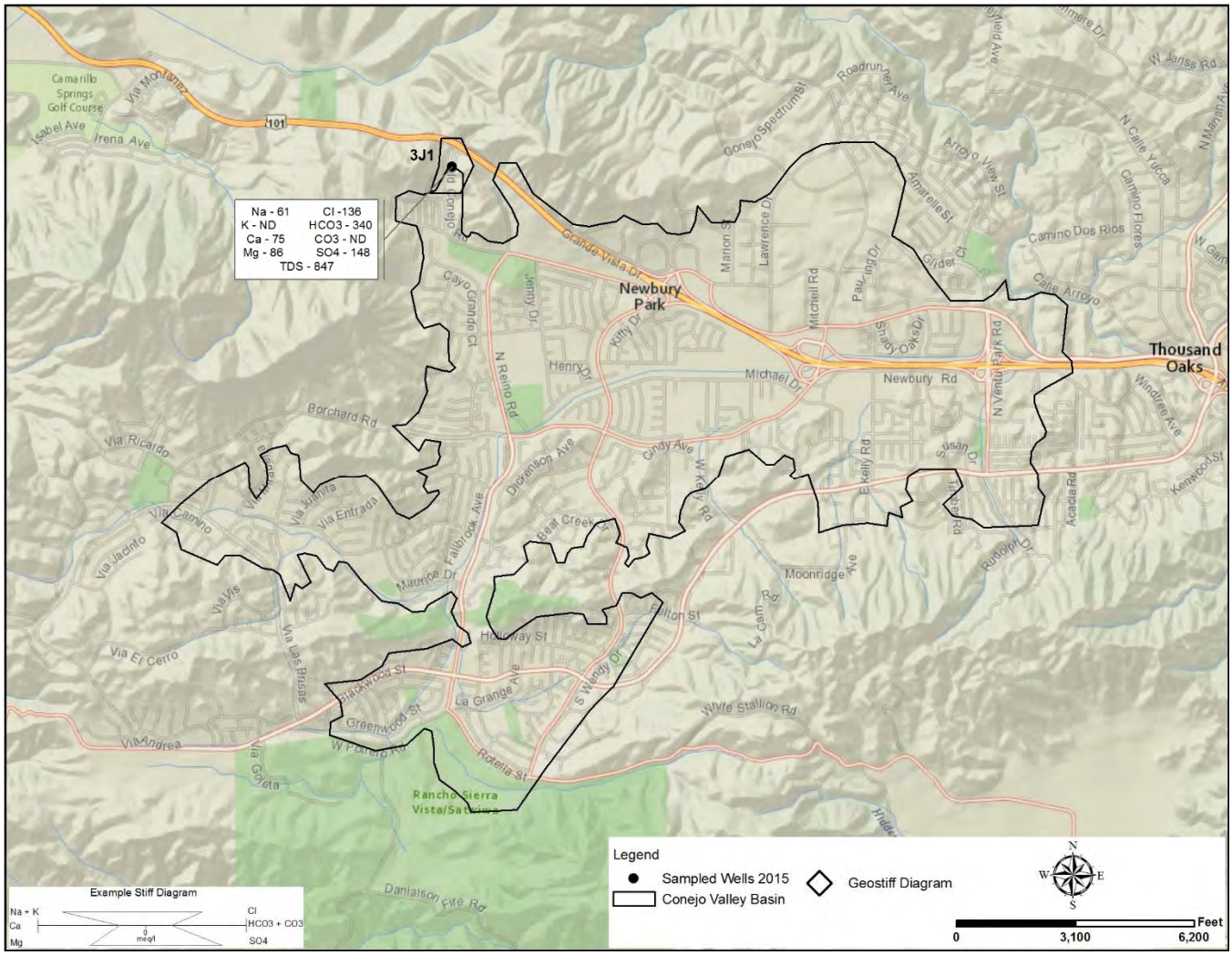


Figure 3-33: Map showing approximate location of sampled wells with concentrations (mg/l) of selected inorganic constituents and piper diagrams.

3.2.22 - North Coast Basin

The North Coast Basin does not fit the definition of a basin based solely on the Glossary of Geology definition that defines a basin as an aquifer or aquifer system having well defined boundaries and more or less definite areas of recharge and discharge. The North Coast Basin consists of narrow, thin strips of permeable sediments and marine terrace deposits along the coastline from Rincon Creek to just north west of the Ventura River. There are 26 water supply wells in the North Coast Basin; only 8 are active wells with the majority in the northwest portion along Rincon Creek. Water samples were collected from two wells at the northwest end of the basin. Figure E-39, piper diagram, shows moderate variation in the water quality of the wells sampled this year. There is no dominant cation and no dominant anion. The water in both wells is calcium sulfate type. Both samples have TDS above the secondary MCL, and one sample has sulfate (SO_4^{2-}) concentration above the secondary MCL. Figure 3-34 shows approximate well locations and concentrations of total dissolved solids (TDS), sodium (Na^+), potassium (K^+), calcium (Ca^{2+}), magnesium (Mg^{2+}), chloride (Cl^-), bicarbonate (HCO_3^-), carbonate (CO_3^{2-}) and sulfate (SO_4^{2-}) for the wells sampled in the North Coast basin.

Aerial photo showing the extent of the North Coast groundwater basin.

NORTH COAST BASIN

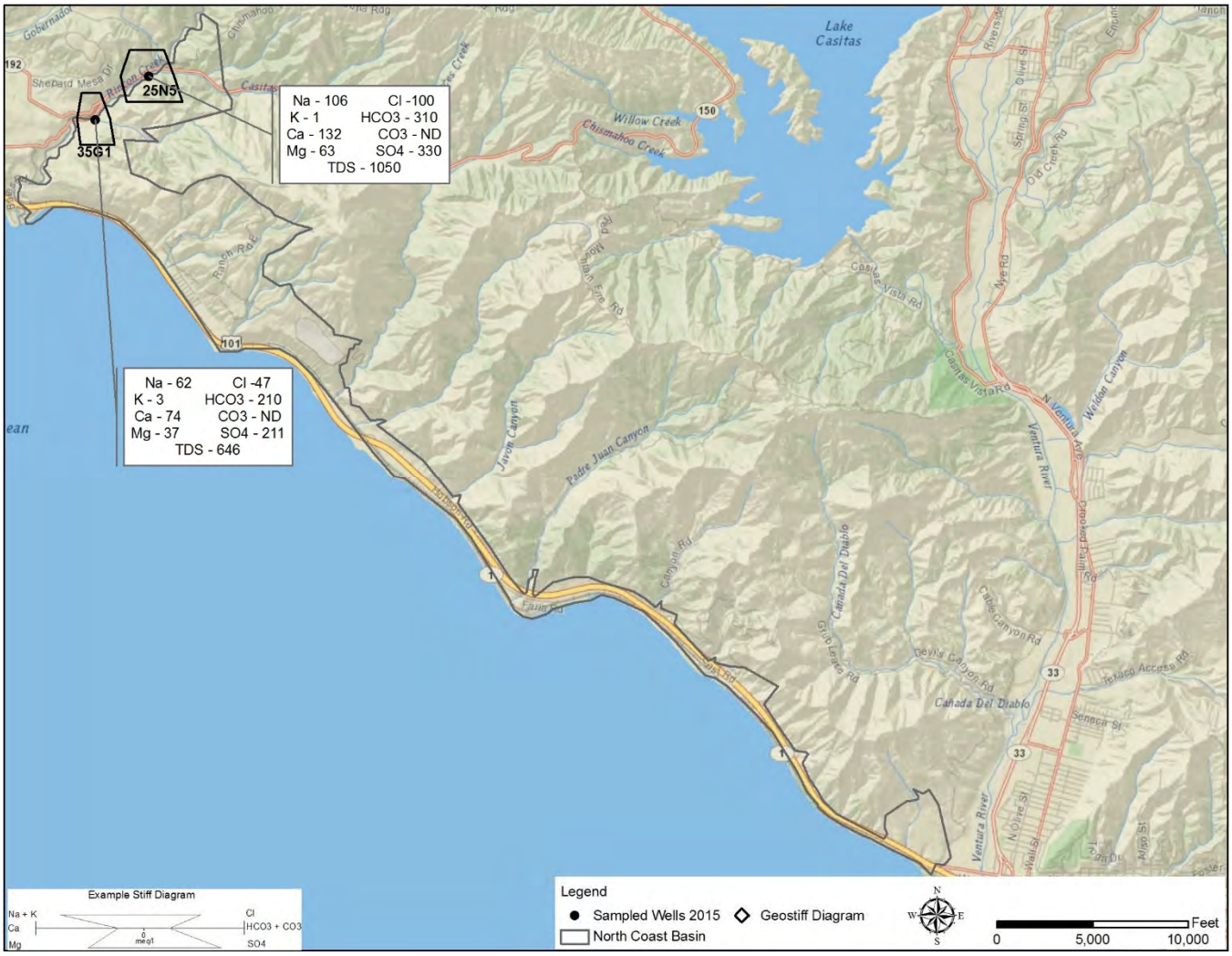


Figure 3-34: Map showing approximate location of sampled wells with concentrations (mg/l) of selected inorganic constituents and piper diagram.

3.2.23 - Upper Ojai Basin

The Upper Ojai Basin is a small, linear valley southeast of and at a higher elevation than the Ojai Valley Basin. The average thickness of water bearing deposits is approximately 60 feet and is encountered approximately 45 to 60 feet below ground surface. Groundwater quality is considered good, but varies seasonally and usually has better quality during winter months. There are approximately 149 water supply wells in the Upper Ojai Basin; 106 are active wells. Three wells were sampled this year. Figure E-35, piper diagram, shows high variation in the water quality of the wells sampled this year. Calcium is the dominant cation in one sample and there is no dominant cation in the remaining two samples but they plot close to the calcium cation type. Bicarbonate is the dominant anion in two samples, and sulfate is the dominant anion in the remaining sample. The water is calcium sulfate type in one sample and calcium bicarbonate type in the other two samples. TDS for the wells sampled this year ranged from 341 to 595 mg/l and is above the secondary MCL for drinking water in one of the wells. One well has iron (Fe) above the MCL for drinking water and two have manganese (Mn^{+}) concentrations above the MCL for drinking water. No water sample was analyzed for Title 22 metals. Figure 3-35 shows approximate well locations and concentrations of total dissolved solids (TDS), sodium (Na^{+}), potassium (K^{+}), calcium (Ca^{2+}), magnesium (Mg^{2+}), chloride (Cl^{-}), bicarbonate (HCO_3^{-}), carbonate (CO_3^{2-}) and sulfate (SO_4^{2-}) for the wells sampled.

Aerial photo showing the extent of the Upper Ojai groundwater basin.

UPPER OJAI BASIN

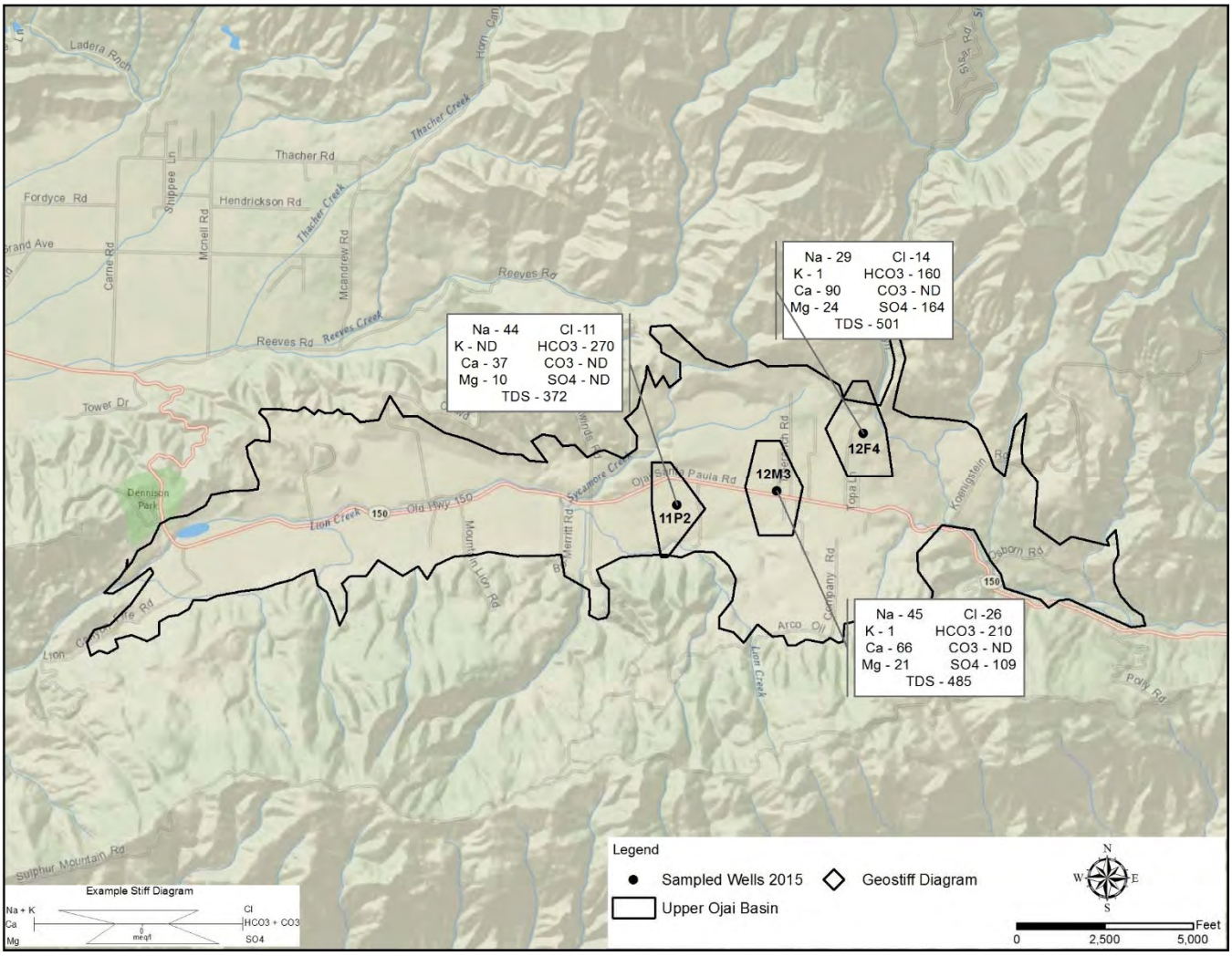
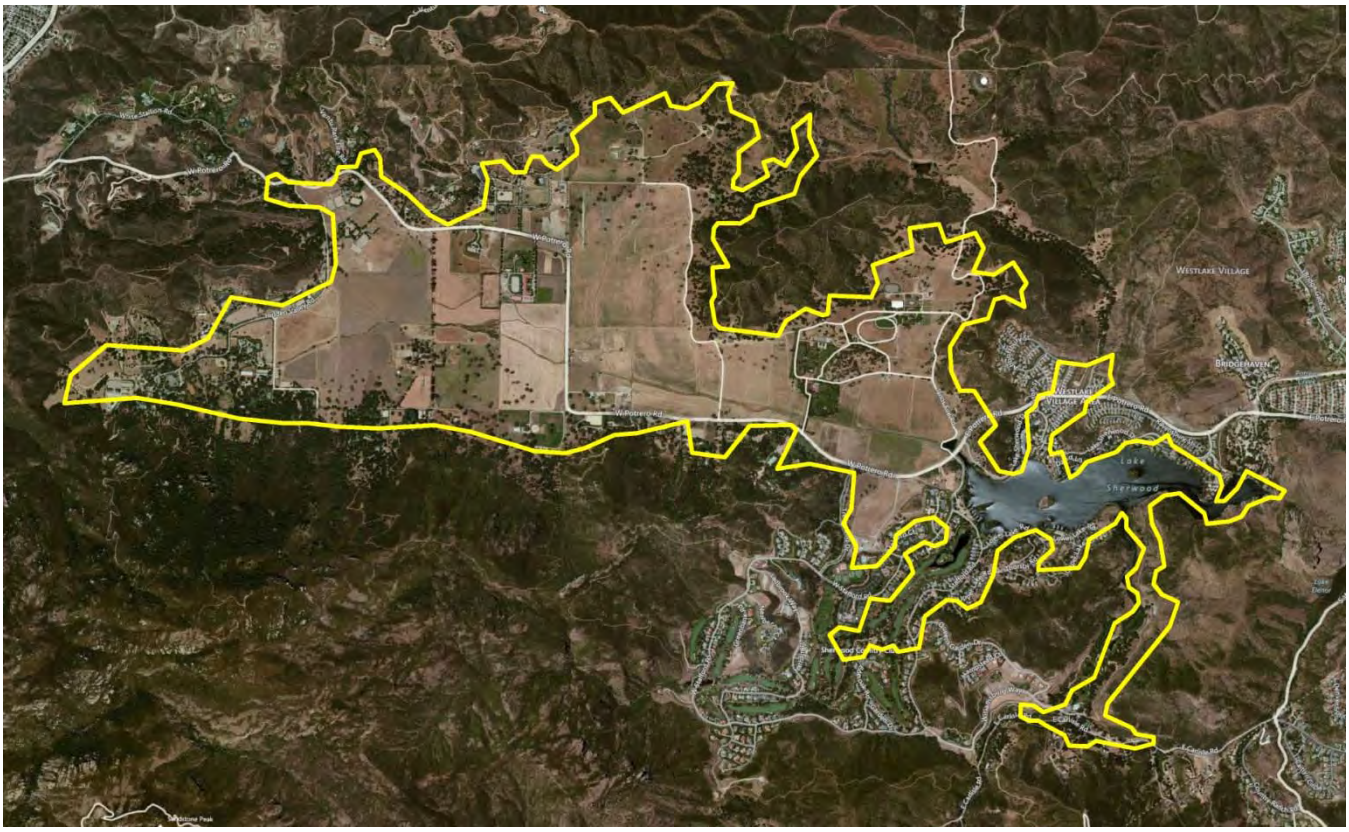


Figure 3-35: Map showing approximate location of sampled wells with concentrations (mg/l) of selected inorganic constituents.

3.2.24 - Sherwood Basin

The Sherwood Basin consists mainly of fractured volcanic rock providing inconsistent groundwater supply throughout the basin because much of the water is stored in fractures. The water quality varies because of the heterogeneous nature of the aquifer. There are approximately 156 water supply wells in the Sherwood Basin; 100 are active. Four wells were sampled and analyzed this year. Figure E-40, piper diagram, shows moderate variation in the water quality of the wells sampled this year. Calcium is the dominant cation in two samples; sodium potassium group in one sample and there is no dominant cation in the remaining sample. Bicarbonate is the dominant anion in two samples, and two samples have no dominant anion. The water is calcium sulfate type in two samples, calcium bicarbonate type in one sample, and sodium bicarbonate in the remaining sample.

Iron (Fe) is above the secondary MCL in two wells; manganese (Mn^{+}) and sulfate (SO_4^{2-}) are above the secondary MCL in one well; and TDS is above the secondary MCL in three wells. TDS concentrations range from 374 to 1060 mg/l for wells sampled this season. Water samples from two wells were analyzed for Title 22 metals. Lead concentration in one well was above the primary MCL for drinking water. No other Title 22 metal was above the primary MCL for drinking water. Figure 3-36 shows approximate well locations and concentrations of total dissolved solids (TDS), sodium (Na^{+}), potassium (K^{+}), calcium (Ca^{2+}), magnesium (Mg^{2+}), chloride (Cl^{-}), bicarbonate (HCO_3^{-}), carbonate (CO_3^{2-}) and sulfate (SO_4^{2-}) for the wells sampled in the Sherwood basin.



Aerial photo showing the extent of the Lake Sherwood groundwater basin.

SHERWOOD BASIN

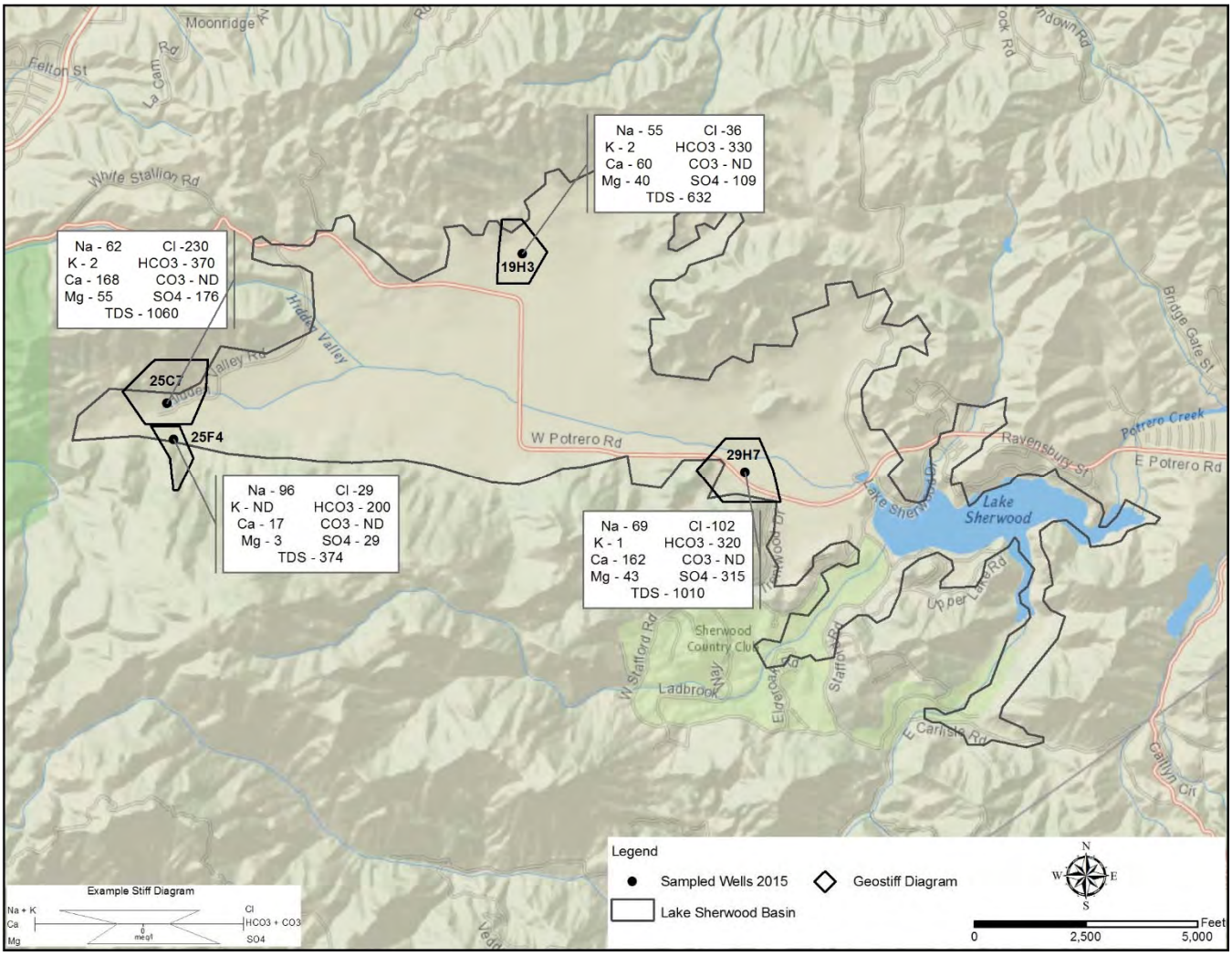
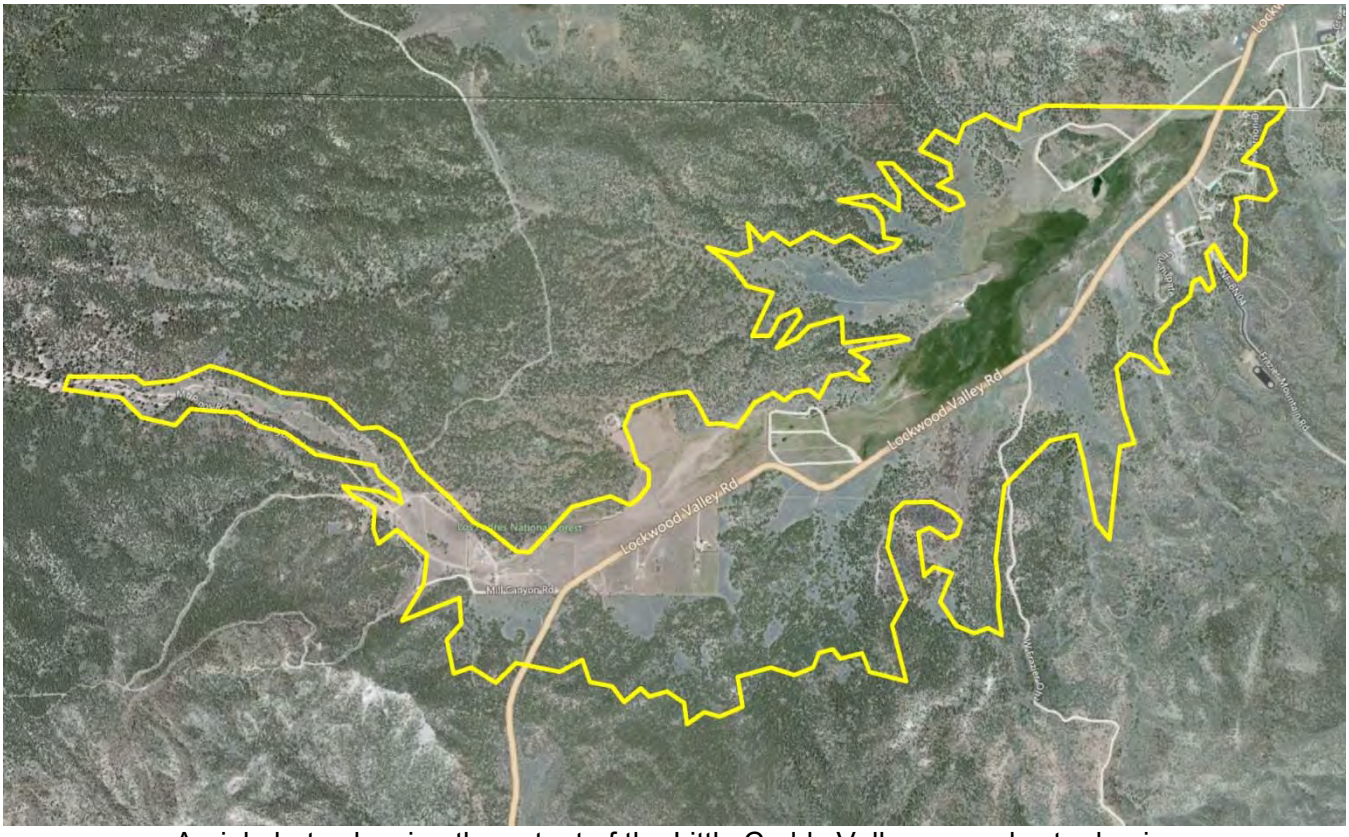


Figure 3-36: Map showing approximate location of sampled wells with concentrations (mg/l) of selected inorganic constituents.

3.2.25 - Little Cuddy Valley Basin

The Little Cuddy Valley Basin is located in the northeastern part of Ventura County near the Kern County Line. Groundwater bearing layers consist of permeable sediment lenses in the Quaternary and Tertiary rocks and Holocene shallow alluvium with the syncline that makes up the valley floor. Depth to water bearing material is approximately 20 to 30 feet. Historically groundwater quality has been considered very good. There are approximately 29 water supply wells in the Little Cuddy Valley Basin; 27 are active wells. One well was sampled in the basin this year. Figure E-41, piper diagram, shows the water quality of the well sampled this year. Calcium is the dominant cation and bicarbonate is the dominant anion in the sample. The water is calcium bicarbonate type. No chemical constituent is above the MCL for drinking water. The sample was analyzed for Title 22 metals and gross alpha. Lead is above the MCL for drinking water. No other Title 22 metal or radionuclide was above the MCL for drinking water. Figure 3-37 shows approximate well locations and concentrations of total dissolved solids (TDS), sodium (Na^{+}), potassium (K^{+}), calcium (Ca^{2+}), magnesium (Mg^{2+}), chloride (Cl^{-}), bicarbonate (HCO_3^{-}), carbonate (CO_3^{2-}) and sulfate (SO_4^{2-}) for the well sampled in the Little Cuddy Valley basin.



Aerial photo showing the extent of the Little Cuddy Valley groundwater basin.

LITTLE CUDDY VALLEY BASIN

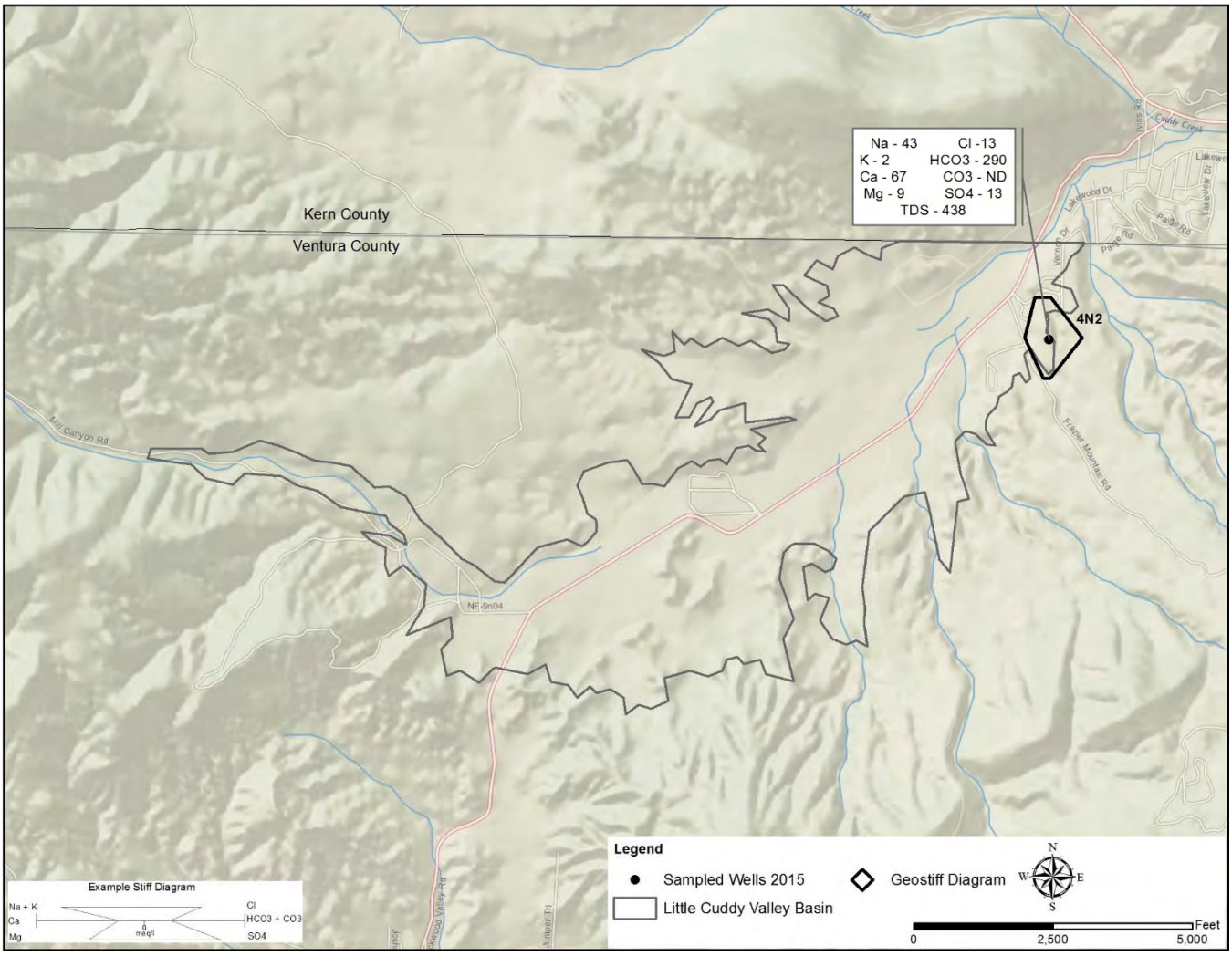


Figure 3-37: Map showing approximate location of sampled wells with concentrations (mg/l) of selected inorganic constituents.

Section 4.0
Water Quantity

4.1 – Groundwater

The Groundwater Section collects groundwater elevation data in order to determine the general groundwater elevations and to determine if water in storage is increasing or decreasing. We also collaborate and share groundwater elevation data with other data collecting organizations in the County. The data is also used in certain basins to generate generalized potentiometric surface maps to determine the direction of groundwater movement. This groundwater elevation monitoring program is very important as there is no other systematic county wide groundwater elevation monitoring program in place. Without the data, groundwater elevations may not be known. Collected data is publically available and is also used by stakeholders, consultants, and other professionals.

In 2015, Groundwater staff gauged approximately 200 wells throughout the County. The County's standard well gauging procedures include:

- Contacting well owners to get approval to gauge wells,
- Verifying well pumps are off for at least 24 hours prior to gauging,
- Using a measuring device to obtain groundwater elevation data,
- Recording field data on a log sheet and any data qualifiers, and
- Entering water quality data in the database.

The County does not own or operate any of the wells gauged, except with very limited exceptions, and relies on well owner permission to access wells. The gauged wells include abandoned wells that are not in operation, and active wells that were off for at least 24 hours prior to water level gauging. The County strives to gauge many of the same wells each year, but because the County does not own the wells, it is not always able to control the wells availability for gauging. For example, wells may not be available due to temporary inaccessibility, pumping, or the well may have been destroyed. When a preferred well cannot be gauged, County staff will seek to find an alternative well to gauge. The process is flexible, but also limited because gauging the same well year after year is not always possible.

The following sub-sections describe the Groundwater Section's annual groundwater level monitoring program, involvement in the California Statewide Groundwater Elevation Monitoring (CASGEM) program, as well as, a general overview of water use in the County for 2015.

4.1.1 – CASGEM Program

The CASGEM Program was developed by the Department of Water Resources (DWR) in response to the passing of Senate Bill Number 6 in November 2009. The law directs that groundwater elevations in all basins and subbasins in California be regularly and systematically monitored, preferably by local entities, with the goal of demonstrating seasonal and long-term trends in groundwater elevations. DWR is directed to make the resulting information readily and widely available. The CASGEM program established a permanent, locally-managed system to monitor groundwater elevation in California's alluvial groundwater basins and subbasins identified in DWR Bulletin No. 118. The CASGEM program relies and builds on the many, established local long-term groundwater monitoring and management programs.

The Ventura County Watershed Protection District (VCWPD) acts as the Umbrella Monitoring Entity for Ventura County. The Groundwater Section staff collect water level data quarterly or semi-annually. The County compiles data it collects along with water level measurements taken by other agencies and uploads it to the CASGEM website a minimum of two times per year.

4.1.2 – Water Level Measurements

Groundwater Section staff, and several water districts and purveyors measure water levels in production and monitoring wells throughout the County. Changes in water levels are tracked and help determine change in storage, and to track trends in groundwater extraction and recharge. Last year, water levels were measured, by Groundwater Staff, quarterly in approximately 200 wells throughout the County. In the southern half of the County, water levels are measured four times, while in the more remote northern half, wells are monitored twice each year. “Key” wells for seventeen of the largest groundwater basins in the County have been established. A key well is a well selected as one giving the most representative data for the basin, or for a specific aquifer in a basin. Key wells are chosen based on their location in the basin, and availability of construction information and historical water level data.

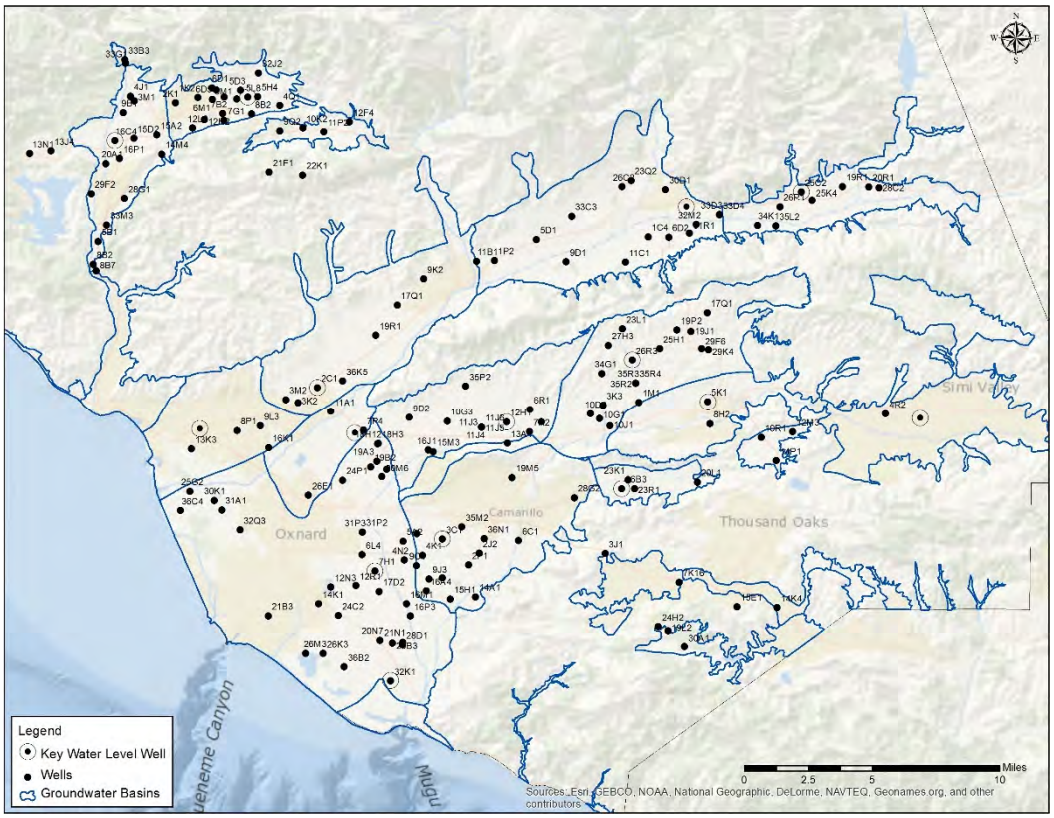


Figure 4-1: Water level wells measured in the southern half of the County.

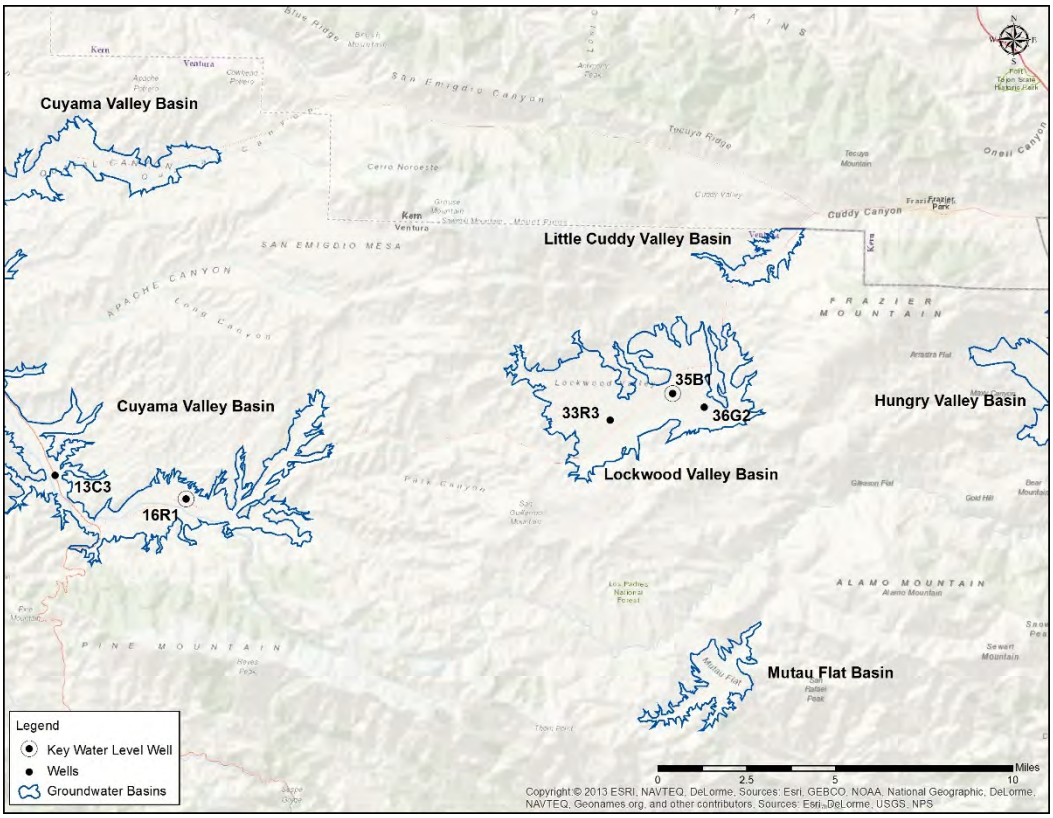


Figure 4-2: Water level wells measured in the northern half of the County.

4.1.3 – Water Level Hydrographs

The Groundwater Section maintains a database of groundwater elevations from gauged wells throughout the County. The database produces hydrographs for wells displaying groundwater elevations over time, in some cases over decades. This data along with climate, stream flow, groundwater recharge, groundwater quality and pumping data can be used to evaluate groundwater conditions in the County. Hydrographs for all "key" water level wells are shown in Appendix B. An example hydrograph for Well No. 01N21W02J02S is shown in (Figure 4-3).

Key wells are special wells the County gauges year after year to provide the most consistent data set. The Key wells were established by the County decades ago as monitoring points considered to represent groundwater elevations over a broad area of the groundwater basin.

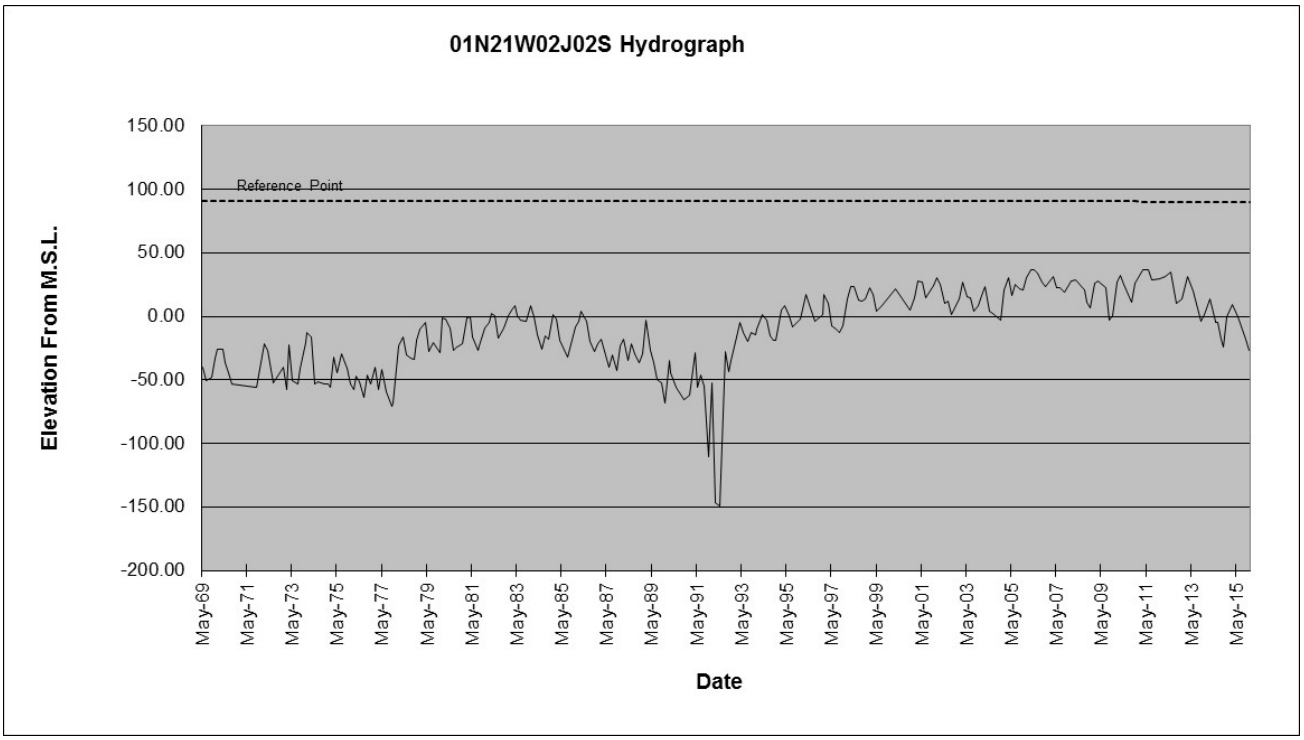


Figure 4-3: Water level hydrograph for Well No. 01N21W02J02S located in the Pleasant Valley basin.
*reference point – the elevation of the measuring point of the well.

4.1.4 – Summary of Changes to Spring Depth to Groundwater in Key Wells

The following summary is based on information gathered from key wells from major groundwater basins as shown in Table B-2 in Appendix B. The changes in water level and the water level data for the year, refer to the spring measurement (first measurement) of the year for those wells measured biannually. In general, groundwater levels in Ventura County show a downward trend due to exceptional drought conditions California is currently experiencing, and with increased reliance on groundwater resources.

The Forebay area of the Oxnard Plain, responds quickly to seasonal and annual changes in precipitation and recharge. The Forebay area key Well No. 02N22W12R01S (UWCD) is dry, meaning the water level elevation is now below the bottom most portion of the well screen. The water level elevation in the Oxnard aquifer key Well No. 01N21W07H01S was down 12.7 feet from the previous spring. The water level elevation in the Oxnard Plain Fox Canyon aquifer key Well No. 01N21W32K01S was up 7.3 feet from the 2014 spring measurement.

In the Pleasant Valley Grimes Canyon aquifer the water level elevation in key Well No. 01N21W03C01S was down 8.8 feet from the 2014 measurement.

In the Las Posas valley, the East Las Posas basin key Well No. 03N20W26R03S water level elevation was up 10.2 feet from the 2014 measurement. The water levels in this well had been declining over the previous ten year period, with the exception 2007. The water level elevation in the South Las Posas key Well No. 02N19W05K01S continued its slight upward trend of the past several years rising 3.0 feet in 2015. The depth to water in this well has risen from 136 feet to as high as 27 feet below ground surface since 1975. This trend is attributed to groundwater recharge from treated effluent from upstream waste water treatment plant discharges and groundwater discharge to surface from the Simi Valley basin. The key well for the West Las Posas basin was not measured in 2015.

In the Santa Rosa Valley the water level elevation in key Well No. 02N20W26B03S was up 3.8 feet from the 2014 measurement. The water level elevation in the Simi Valley Basin key Well No. 02N18W10A02S was up 1.2 feet from the 2014 measurement. This well has seen only slight changes in depth over the past ten years (less than plus or minus 10 feet).

In the Ojai Valley, the water level elevation in key Well No. 04N22W05L08S was down 5.1 feet from the 2014 measurement after having been down 50.2 feet from the 2013 measurement. The Ojai Valley basin responds quickly to rainfall or the lack of rainfall, and it is not uncommon to see large drops in water level during dry periods and recovery to at or above normal levels during wet periods (see Hydrograph in Appendix B). In the northern end of the Upper Ventura River Basin, the water level elevation in key Well No. 04N23W16C04S was up 13.1 feet from the measurement in 2014.

The basins that underlie the Santa Clara River valley are other areas that respond quickly to fluctuations in annual rainfall. The water level elevation in the Piru basin key well was down 14.1 feet in 2015 from 2014. The water level elevation in the Fillmore basin key well was down 3.7 feet after being down 1.9 feet the previous spring, and in the Santa Paula basin the water level elevation in the key well was down 2.7 feet from the 2014 measurement. In the Mound basin the water level elevation in key Well No. 02N22W07M02S was down 6.7 feet from the 2014 spring measurement.

In the north half of the County the Lockwood Valley basin key Well No. 08N21W35B01S was unable to be measured in the spring of 2015. The water level elevation in the Cuyama Valley basin key Well No. 07N23W16R01S was down 7.0 feet from the 2014 measurement.

4.1.5 – Groundwater Extractions

Groundwater is extracted for domestic, municipal and industrial uses, with the majority of reported groundwater extractions in the Fox Canyon Groundwater Management Agency (FCGMA) used for agricultural irrigation purposes. The FCGMA reports that approximately 60% of groundwater is extracted for agricultural purposes with the remaining 40% for municipal, industrial and domestic uses. The owners and operators of wells within the boundaries of any of the three Groundwater Management Agencies, Fox Canyon Groundwater Management Agency, Ojai Basin Groundwater Management Agency and United Water Conservation District, are required to report their groundwater extractions 2 to 4 times each year to the respective agency. Approximately 2,000 of the 3,500 plus active wells in the County are within one or more of these agency boundaries. Owners of wells located outside of these agencies are not required to report their extractions but are asked to report the status of their well to the County each year. Table 4-1 compares extractions reported to the three agencies for the years 2005 to 2015. Note: the boundaries of the FCGMA and UWCD overlap.

Table 4-1: Groundwater extractions within reporting agencies 2005-2015[3,1,2]

	Agency		
Reported Extractions (AF)	UWCD	FCGMA	OBGMA
2005-1	58,045.00	42,133.62	1,748.07
2005-2	95,174.00	64,688.76	2,880.39
Annual Total 2005	**153,219.00**	**106,822.38**	**4,628.46**
2006-1	65,469.00	43,659.82	1,722.17
2006-2	101,684.00	70,011.27	2,234.77
Annual Total 2006	**167,153.00**	**113,671.09**	**3,956.94**
2007-1	90,701.00	59,711.06	2,708.68
2007-2	108,289.70	77,666.25	2,759.06
Annual Total 2007	**198,990.70**	**137,377.32**	**5,467.74**
2008-1	90,997.65	64,582.83	2,650.38
2008-2	102,106.68	75,655.54	2,590.30
Annual Total 2008	**193,104.33**	**140,238.36**	**5,240.68**
2009-1	82,505.37	63,066.07	2,553.48
2009-2	104,049.64	83,007.28	2,871.94
Annual Total 2009	**186,555.01**	**146,073.36**	**5,425.42**
2010-1	69,541.85	54,876.68	2,004.86
2010-2	89,558.90	71,518.05	3,001.11
Annual Total 2010	**159,100.75**	**126,394.73**	**5,005.97**
2011-1	72,940.07	54,357.81	2,050.00
2011-2	86,560.99	65,877.62	3,099.00
Annual Total 2011	**159,501.06**	**120,235.43**	**5,149.00**
2012-1*	78,716.61	59,904.02	2,845.56
2012-2*	99,285.26	75,327.91	2,559.40
Annual Total 2012	**178,001.87**	**135,231.94**	**5,404.96**
2013-1*	87,336.86	64,736.60	2,805.76
2013-2*	116,708.94	88,897.64	2663.216
Annual Total 2013	**204,045.80**	**153,634.24**	**5,468.97**
2014-1*	101,577.29	85,037.29	2,232.15
2014-2*	101,468.80	65,333.37	2,144.20
Annual Total 2014	**203,046.09**	**150,370.65**	**4,376.35**
2015-1**	85,905.46	70,829.16	1,815.92
2015-2**	105,269.83	70,532.78	1,826.66
Annual Total 2015* **	**191,175.29**	**141,361.94**	**3,642.58**

*Reflects revised values for all agencies.

**Values are subject to change. *FCGMA as of 04/04/2016, UWCD as 04/01/2016.*

***Preliminary - Values do not reflect full reporting.

4.2 – Surface and Imported Water

The following subsections focus on water supplied and imported by the three wholesale water districts in the County: United Water Conservation District (UWCD), Casitas Municipal Water District (Casitas) and Calleguas Municipal Water District (Calleguas).

[1] Data courtesy of FCGMA.

[2] Data courtesy of OBGMA.

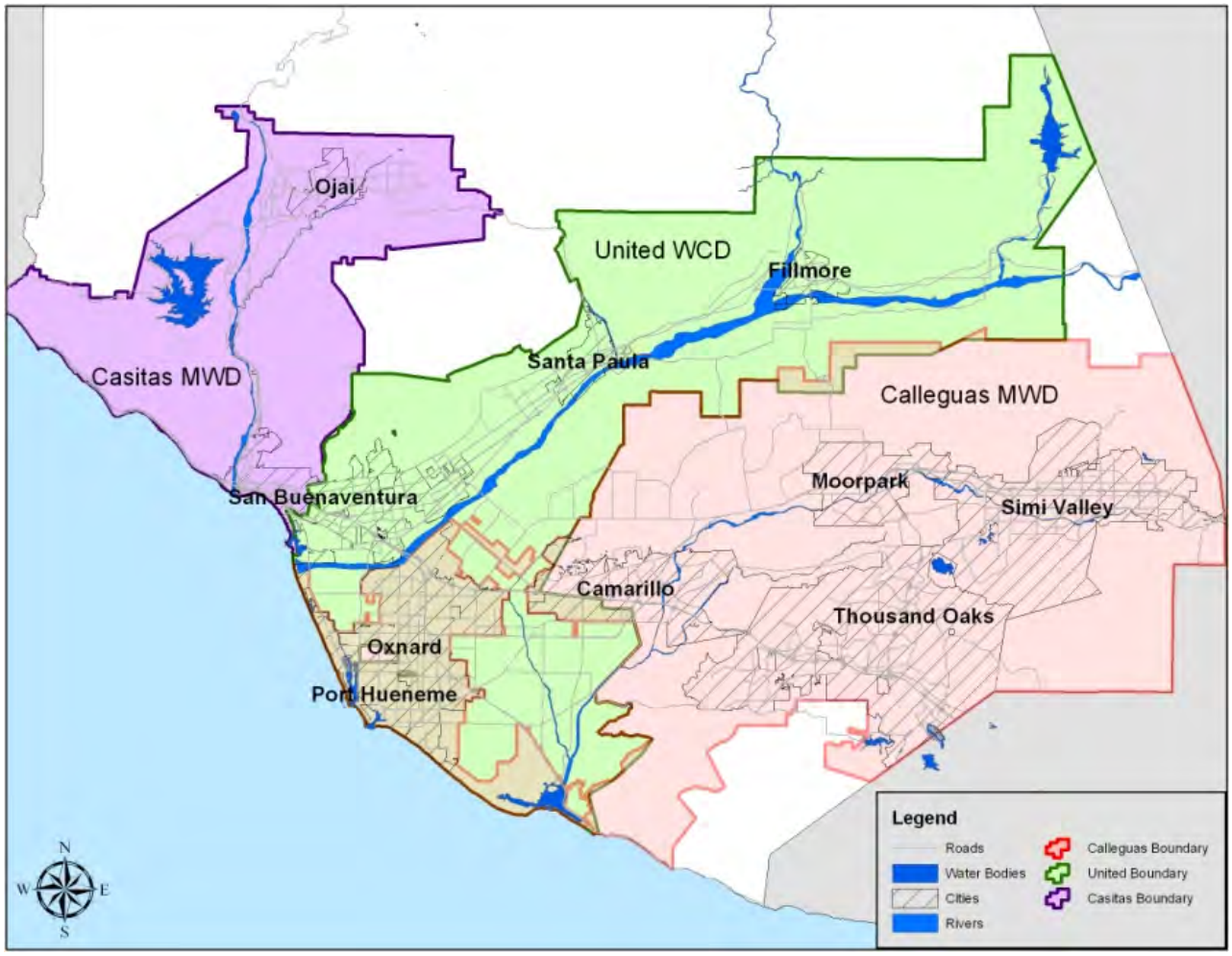


Figure 4-4: Map of the boundaries of the three wholesale water districts within the County.

4.2.1 – Surface & Imported Water Background

Of the ten incorporated cities within Ventura County only two, Santa Paula and Fillmore do not rely on water supplied by any of the three major wholesale districts (Casitas Municipal Water District, Calleguas Municipal Water District and United Water Conservation District).

Two cities (Ventura and Oxnard) use a blend of imported water, groundwater and treated surface water to meet demands. The City of Ventura's water supply comes from treated water diverted from the Ventura River, groundwater extracted from City wells, and surface water from Lake Casitas delivered by Casitas MWD. The City of Oxnard receives water from UWCD, imported water from Calleguas Municipal Water District and groundwater from City well fields.

In the south half of the County, the cities of Simi Valley, Moorpark and Thousand Oaks as well as the Communities of Bell Canyon, Newbury Park, Hidden Valley, Lake Sherwood, Oak Park and part of Westlake Village rely mainly on water imported from Calleguas.

The City of Simi Valley residents receive water from Ventura County Water Works District 8 (VCWWD8). The District extracts groundwater currently used for agricultural purposes, from three wells in the Tapo

Canyon area. Also, groundwater is extracted from several wells at the west end of the city for de-watering purposes. The water from these wells is discharged to the Arroyo Simi. The City is currently nearing completion of the Tapo Canyon Water Treatment Plant, a 1 MGD treatment plant, which will utilize the three Tapo Canyon wells to provide water to approximately 500 homes. Golden State Water Company (GSWC) in Simi Valley extracts groundwater from one well and blends it with imported water from Calleguas (10% groundwater, 90% imported water)[3]. VCWWD8 serves 68% of demand or approximately 23,000 AF of water while GSWC serves the remaining 32%, approximately 8,500 AF[4]. In 2015 Calleguas delivered 17,866[6] AF to VCWWD8 and 5,245.9[6] AF to GSWC.

The City of Moorpark residents receive water from Ventura County Water Works District 1 (VCWWD1). Approximately 75-80% of VCWWD1's water is imported from Calleguas. In 2015 Calleguas delivered 7,704.85[6] AF to VCWWD1. The City also extracts groundwater from two wells used for park irrigation.

The City of Thousand Oaks extracts groundwater using it for median irrigation on Hillcrest Ave and golf course irrigation at the Los Robles Golf Course. California Water Service and California American Water along with the City of Thousand Oaks Water Department provide water imported from Calleguas in the Thousand Oaks, Newbury Park and Westlake Village area. According to the City of Thousand Oaks 2010 Urban Water Management Plan, the City supplies water to approximately 36% of water users, California American Water 48%, and California Water Service Company 16%. In 2015 these three water purveyors received 30,966.6[6] AF of water from Calleguas.

The City of Camarillo relies on groundwater and imported water from Calleguas. The city extracts groundwater from four wells, supplying approximately 40-50% of the city's water demand with the remaining demand supplied by imported water. The city must keep its groundwater extraction volume below the groundwater extraction allocation from the Fox Canyon Groundwater Management Agency. In 2015 Calleguas delivered 4,550.43[6] AF of water to the City of Camarillo. Water for some residents is supplied by Pleasant Valley Mutual (groundwater and imported water), Crestview Mutual (groundwater and imported water), California American Water Co. (imported water), and Camrosa Water District (groundwater and imported water).

The Port Hueneme Water Agency receives and treats water from UWCD and blends it with water from Calleguas for the City of Port Hueneme, Channel Islands Beach Services Community District and Naval Base Ventura County.

In the Ojai Valley the City of Ojai and the communities of Casitas Springs, Meiners Oaks and Oak View rely on a mixture of groundwater extracted by local purveyors, and wholesale water from Lake Casitas delivered by the Casitas Municipal Water District to local water purveyors.

In the Santa Clara River Valley area, the City of Santa Paula relies on local groundwater (approximately 5,000 to 7,000 AF/yr based on reporting to UWCD). In addition, some surface water is diverted from Santa Paula Creek (approximately 500 AF/yr)[5] and is sent to Canyon Irrigation Company in exchange for extraction credits for the Santa Paula Basin. The City of Fillmore relies solely on groundwater extracted from City water wells (approximately 2,600 to 2,800 AF/yr based on reporting to UWCD). The community of Piru relies on groundwater delivered by local water purveyors.

Residents of the Lockwood Valley area and the Santa Monica Mountains area, as well as, residents living in areas not served by a water company rely on private domestic water wells. Water is extracted from groundwater basins, or from fractured volcanic rock and bedrock in areas outside of groundwater basins.

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[3] Golden State Water Company, 2010 Urban Water Management Plan – Simi Valley.

[4] Ventura County Waterworks District No. 8, City of Simi Valley, 2010 Urban Water Management Plan.

[5] Data from City of Santa Paula 2010 Urban Water Management Plan

4.2.2 – Wholesale Districts

Of the three water wholesalers in the County, Calleguas delivers the largest volume of water to retailers. Approximately 75% of the population in the County receives water imported by Calleguas. Calleguas, a member agency of the Metropolitan Water District (MWD), imports State Water Project (SWP) water from northern California. The Calleguas Municipal Water District imported a total of 87,794.6[6] AF of treated SWP water in 2015. Calleguas delivered 89,044.6[6] AF of water to retailers in 2015 compared to 106,293[6] AF in 2014 and 111,283[6] AF in 2013. Production from the District's ASR wellfield was 4384.18 AF in 2015. Some imported water is also injected in the East Las Posas groundwater basin through the Las Posas Aquifer Storage and Recovery (ASR) Project. In the ASR wellfield 5,372.63[6] AF of water was injected in 2015. Up to 11,000 AF of water can be stored by Calleguas in Lake Bard and can supply all of the District's needs for short periods of time. The end of year volume of water in storage in Lake Bard was 9,360[6] AF. The Las Posas Basin ASR wellfield currently has 18 wells, operated by Calleguas. The wells are 800 to 1,200 feet deep and perforate the Fox Canyon Aquifer (Calleguas 2007).

UWCD delivered 16,293[4] AF of water to retailers and end-users in 2015 down from 17,492[4] AF in 2014. UWCD can store up to 87,000 AF of water in Lake Piru. At the end of 2015 there was 11,534[4] AF of water in storage in Lake Piru. UWCD released 6,533[4] *(preliminary data)* AF of water from the lake in 2015. UWCD imported 630 AF of State Project water into Ventura County from Lake Pyramid in 2015. Water released from Lake Piru flows down Piru Creek to the Santa Clara River where it is ultimately diverted downstream at the Freeman Diversion Dam. UWCD operates spreading basins in the Oxnard Forebay Groundwater Basin for the purpose of groundwater recharge. Some of the water diverted from the Santa Clara River at the Freeman diversion is sent to the spreading basins in Saticoy and El Rio, the remainder is sent through the Pleasant Valley Pipeline (PVP) and the Pumping Trough Pipeline (PTP). Table 4-2 and Figure 4-3 compare the volume of water diverted and sent to spreading grounds by UWCD. Annual precipitation for the period of 1997 to 2015 is also shown, however recharge to basins is also a function of State Water Project deliveries and restrictions from other agencies.

Table 4-2: Comparison of precipitation versus recharge water volume by Calendar Year for UWCD[4].

CY Year	Precipitation El Rio Spreading Grounds Gage 239(in.)	Saticoy Recharge (AF)	El Rio Recharge (AF)	Noble Pit (AF)
1997	13.3	22,323.03	25,271.00	4,412.00
1998	30.88	56,934.95	43,027.00	18,710.00
1999	9.39	16,538.51	17,992.00	1,285.00
2000	15.59	28,620.11	23,173.00	0.00
2001	22.4	26,918.00	39,434.00	8,824.00
2002	8.97	5,291.00	14,886.00	32.00
2003	14.79	7,158.00	26,909.00	44.00
2004	16.13	8,105.00	15,061.00	0.00
2005	24.43	46,872.00	52,267.00	19,490.00
2006	15.29	29,005.00	40,840.00	10,709.00
2007	7.77	11,404.00	18,200.00	99.00
2008	14.07	28,631.00	19,631.00	8,562.00
2009	10.86	9,215.00	13,223.00	0.00
2010	22.07	15,108	30,125.00	995.00
2011	10.95	23,435.00	37,845.00	10,679.00
2012	8.79	3,985.00	16,293.00	538.00
2013	2.97	34.00	2,389.00	263
2014	9.5	387.00	1,935.00	578
2015	5.09	1,231.00	1,285.00	0.00

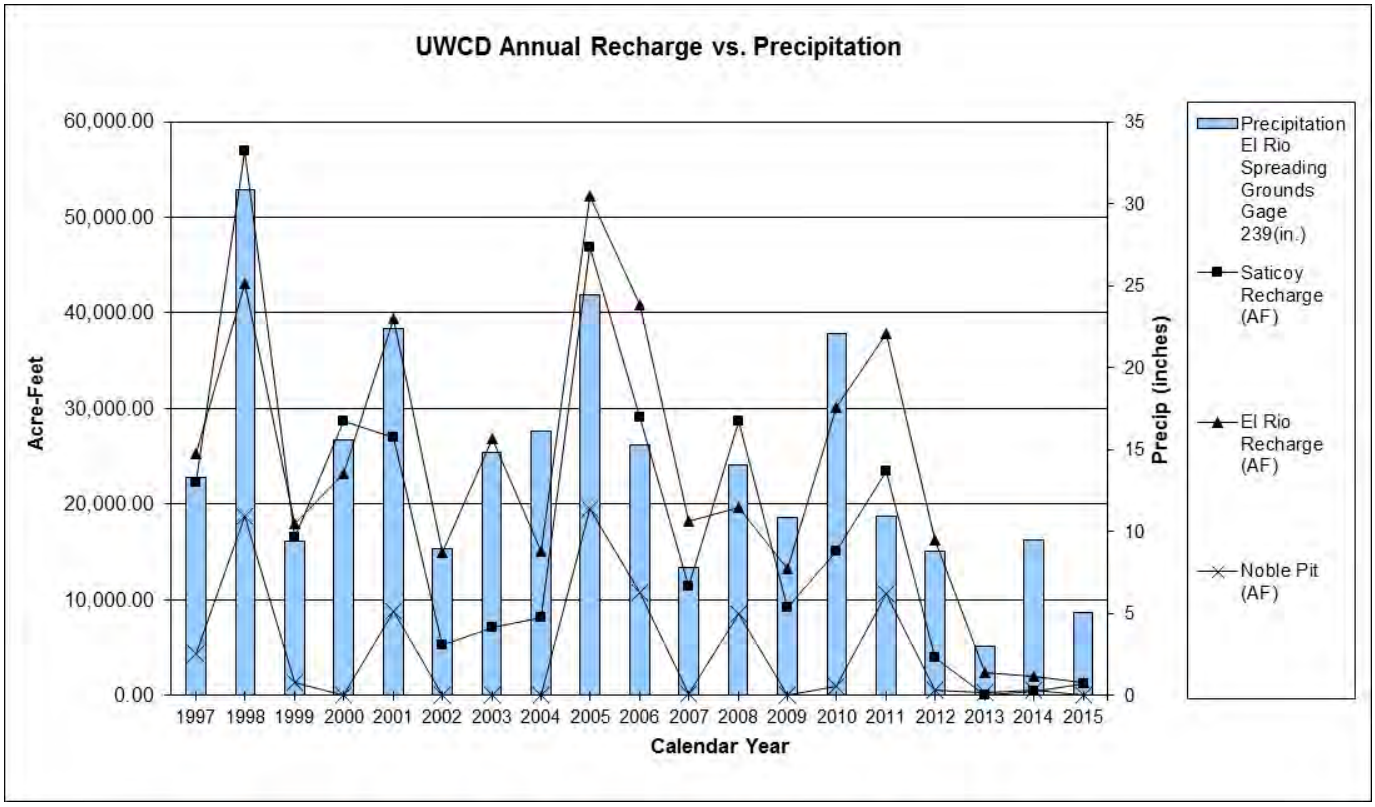

Figure 4-5: Graph depicting precipitation versus recharge for UWCD[4].

The Casitas Municipal Water District delivered 16,272[5] AF in 2015, with approximately 5,773[5] AF sold to retail water purveyors. The district provides water to residential and agricultural customers, and some of the 23 water purveyors located within the district's boundaries. Annual water deliveries can vary from 13,000 to 23,000 AF. Casitas provides a blend of groundwater and surface water to its customers. Surface water is stored in Lake Casitas which has an overall capacity of 254,000 AF. At the end of 2015 there was 103,886[5] AF of water stored in the lake. Water from the Ventura River is diverted at the Robles Diversion facility. The facility diverts high flows from rainstorms and operates on average only 53 days[5] per year. Casitas diverts, on average 31% of the Ventura River flow, with 10% of that volume being redirected downstream through the Robles Diversion Fish Passage for the endangered steelhead trout and to enhance recovery of the Ventura River habitat.

Table 4-3 below compares the volume of water delivered by the three major water districts in the County for the period of 2005 to 2015.

Table 4-3: Comparison of Wholesale District water deliveries 2005-2015.

	Total Water Deliveries in Acre Feet (AF)			
Year	**Casitas MWD**	**Calleguas MWD**	**United WCD**	**Annual Total**
2005	16,526.50	116,431.80	30,271.46	163,229.76
2006	15,873.80	120,736.30	30,627.87	167,237.97
2007	20,080.90	131,206.10	41,387.64	192,674.64
2008	16,497.70	125,367.50	39,903.80	181,769.00
2009	15,736.10	108,726.00	41,478.00	165,940.10
2010	13,497.48	94,863.70	34,075.80	142,436.98
2011	13,439.25	97,218.00	31,868.00	142,525.25
2012	15,268.49	104,104.00	32,638.00	152,010.49
2013	18,270.00	111,283.00	24,358.10	153,911.10
2014	18,336.00	106,293.00	17,491.94	142,120.94
2015	16,272.00	89,044.60	16292.62	121,609.22
Period Total	**179,798.22**	**1,205,274.00**	**340,393.23**	**1,461,735.29**

Section 5.0
Potentiometric Surface Maps

5.1 – Mapping

Potentiometric surface maps are used to visually represent groundwater elevations over broad areas. County staff develops these maps for the Santa Clara and Calleguas Creek watersheds by assembling groundwater elevation data (from both County gauged wells and wells gauged by other organizations within the County) for spring and fall periods, inputting the data into a database and using ESRI's ArcMap GIS software, and the 3D Analyst Extension to generate potentiometric contours. The map development process is iterative. The software is used to develop the initial potentiometric surface maps. After the maps are created they are reviewed by County staff. Initial draft maps are circulated to staff, the data reviewed, adjustments made, and the maps finalized. Human input into the maps is especially important as it relates to edge of basin flowlines, selection of data, and in some cases removal of erroneous or misleading data.

5.1.1 –Maps

The following pages contain a series of potentiometric surface maps created from 2015 groundwater level data for the a) Santa Clara River Valley, b) the upper aquifer system of the Oxnard Plain and Pleasant Valley, and c) the lower aquifer system of the Oxnard Plain, Pleasant Valley, and Las Posas Valley Basins.

Figures 5-1 thru 5-2 on pages 81-82 are generalized potentiometric surface maps for 2015 for the Santa Clara River Valley area encompassing the Mound, Santa Paula, Fillmore, and Piru groundwater basins. The contours were created using data collected by County staff, United Water Conservation District staff, and the staff of other agencies, cities and water companies. For this exercise the basin area was truncated to include only the extent of the alluvial area of the valley, instead of using the full area of the basin as depicted by the groundwater basin lines on the maps.

Figures 5-3 thru 5-4 on pages 83-84 are generalized potentiometric surface maps for 2015 for the upper aquifer system of the Oxnard Plain and Pleasant Valley area. Note that the Forebay area has no confining clay cap as there is overlying the Oxnard Plain Pressure Basin, therefore the Oxnard aquifer is not recognized as being present here. In the Pleasant Valley area the upper aquifer system is not typically present, but there are areas of shallow alluvial sediments similar to Oxnard and Mugu aquifer units from which wells are extracting groundwater. Well data from the perched or semi-perched zone of the Oxnard Plain was not used to generate these contours. Some water levels represent confined conditions.

Figures 5-5 thru 5-6 on pages 85-86 are generalized groundwater potentiometric surface maps for the lower aquifer system for 2015 of the Oxnard Plain, Pleasant Valley and Las Posas Valley area. In previous reports we have used the Moorpark anticline as a boundary between the East and South Las Posas Basins to map the potentiometric surface. DWR Bulletin 118 does not divide the Las Posas Basin, but maps it as one large basin. That plus additional reports, indicate there may not be a significant groundwater flow barrier in that location. This technical issue will benefit from additional research in the future. In this report the potentiometric surface is mapped to reflect no barrier to flow between the East Las Posas Basin and the South Las Posas Basin. Data points for wells perforated in the shallow sand and gravel zones of the Las Posas Valley were not used to generate these contours.

The Groundwater Section welcomes comments and suggestions concerning the potentiometric surface maps presented on the following pages or the report in general. Please contact Jeff Dorrington at jeff.dorrington@ventura.org

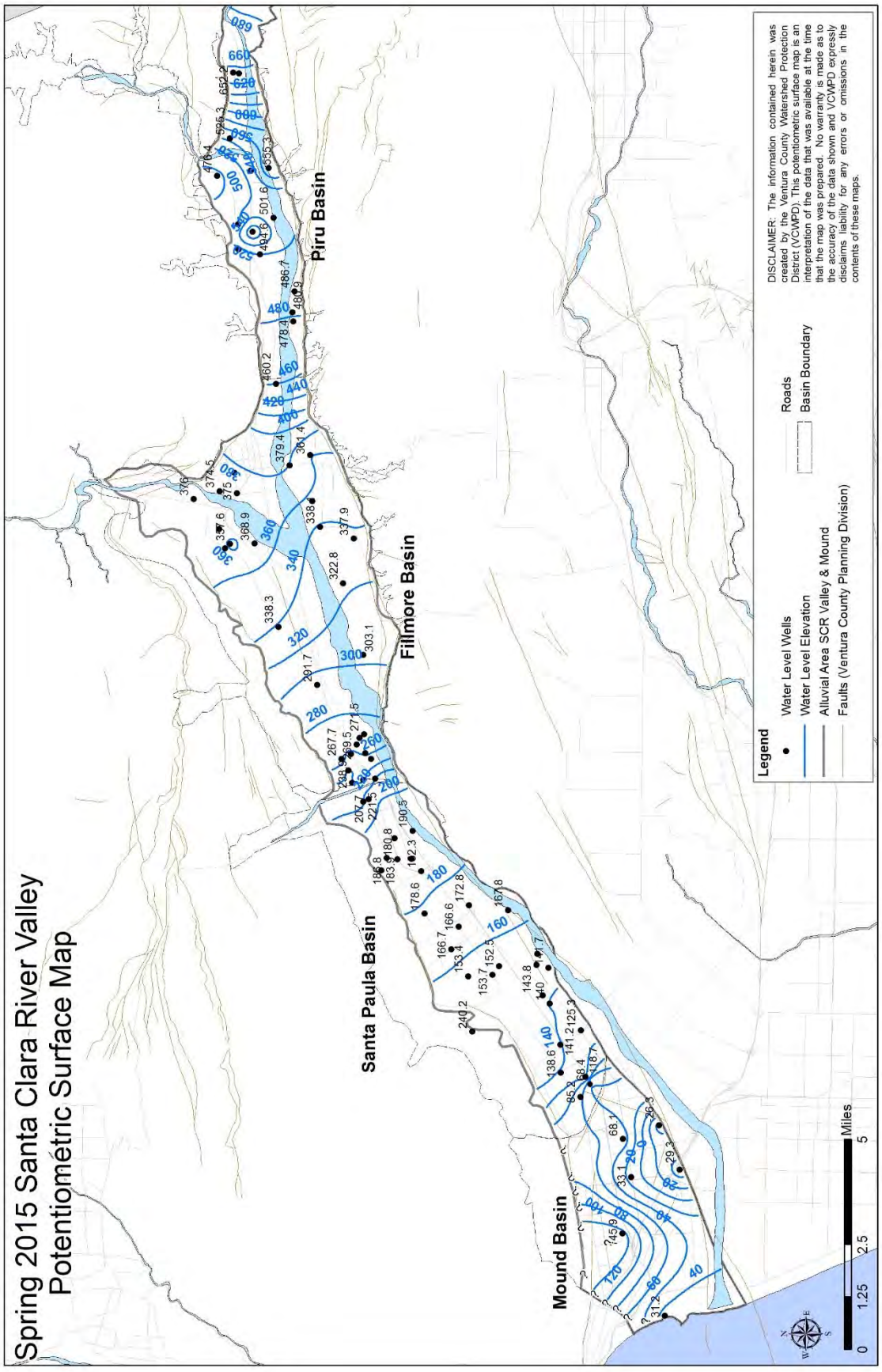

Figure 5-1: The map above depicts water level surface elevation contours for the Santa Clara River Valley area for spring 2015.

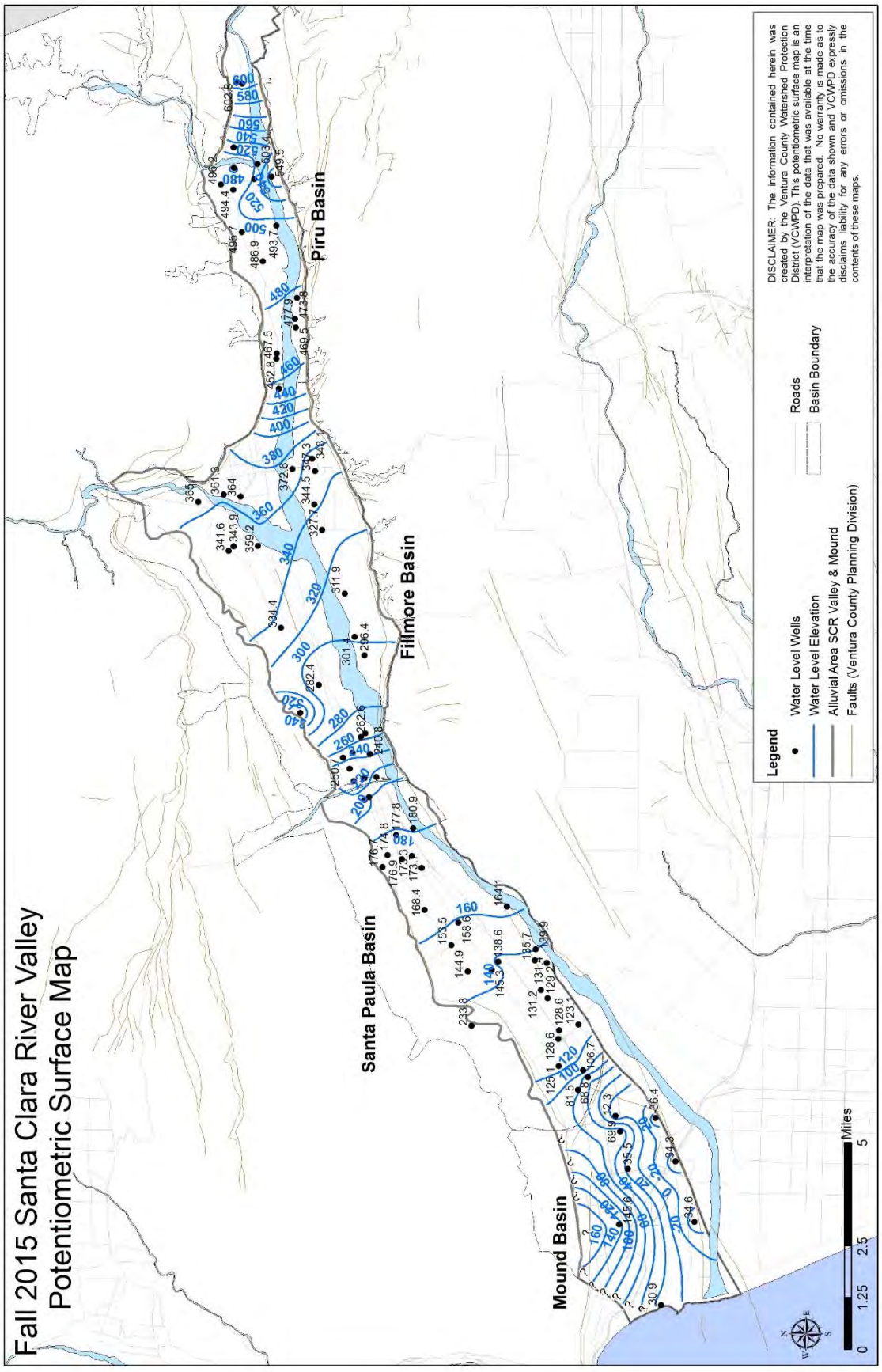

Figure 5-2: The map above depicts water level surface elevation contours for the Santa Clara River Valley area for fall 2015.

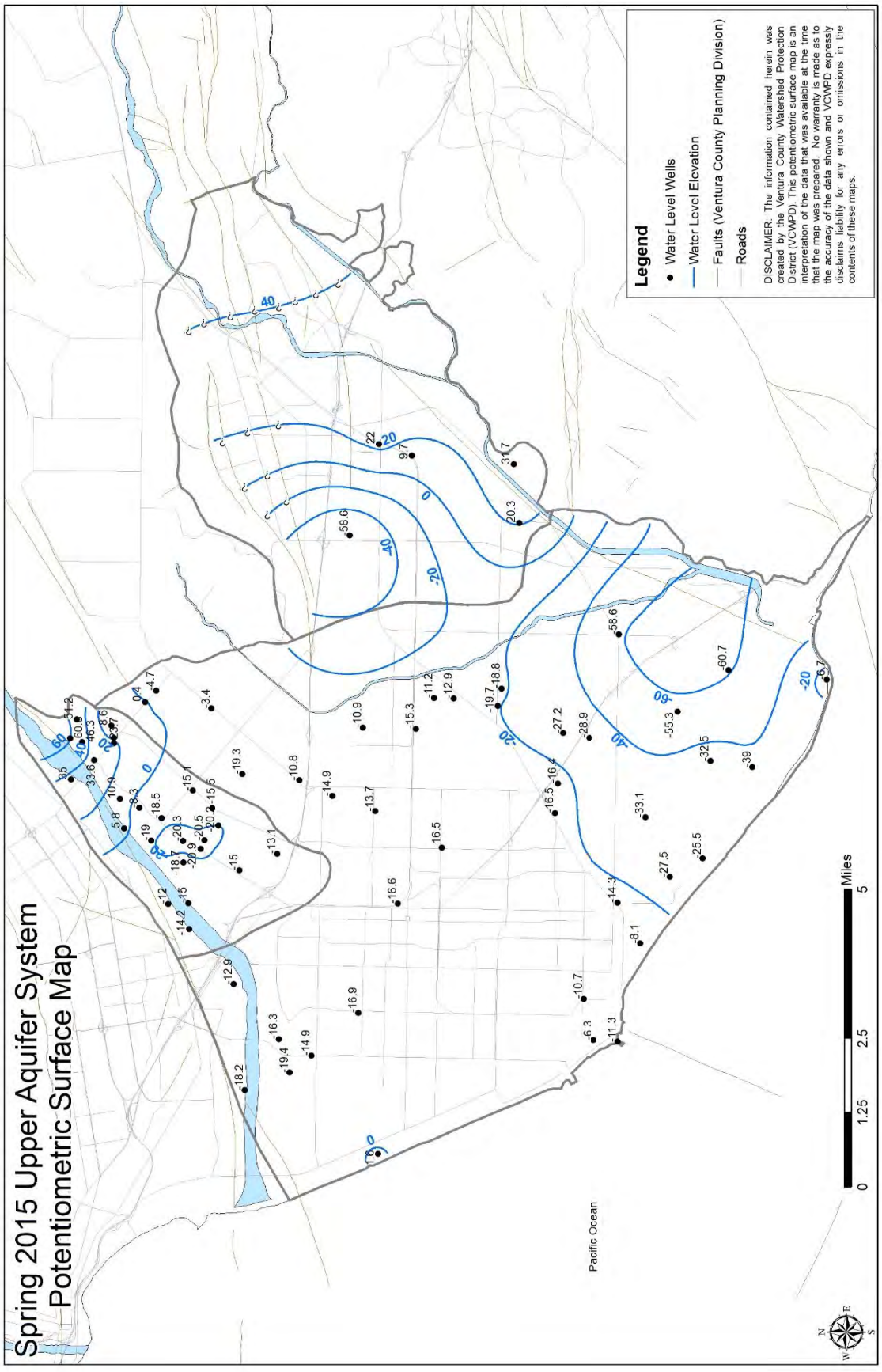

Figure 5-3: The map above depicts water level surface elevation contours for the Upper Aquifer System for spring 2015.

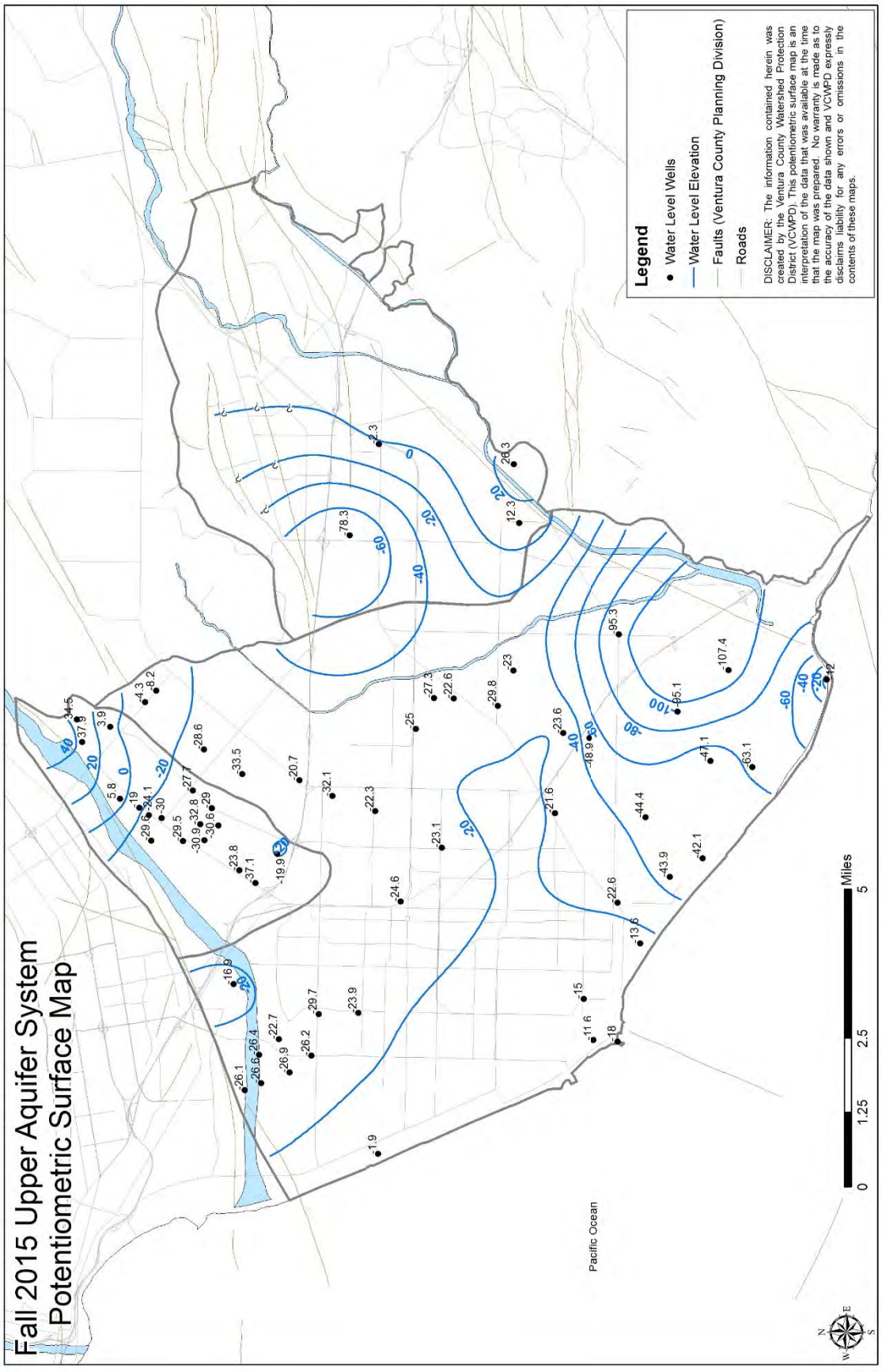

Figure 5-4: The map above depicts water level surface elevation contours for the Upper Aquifer System for fall 2015.

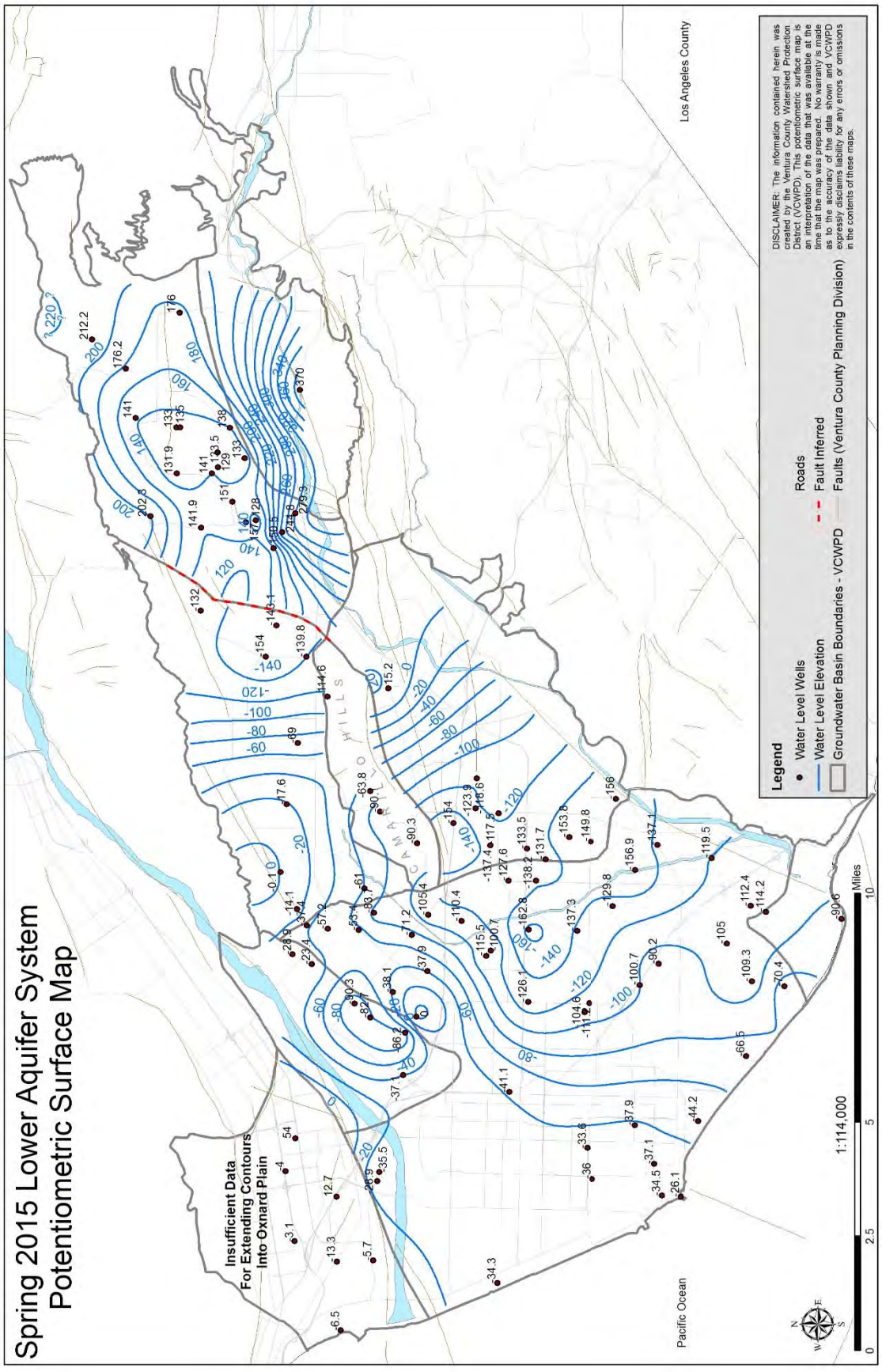

Figure 5-5: The map above depicts water level surface elevation contours for the Lower Aquifer System for spring 2015.

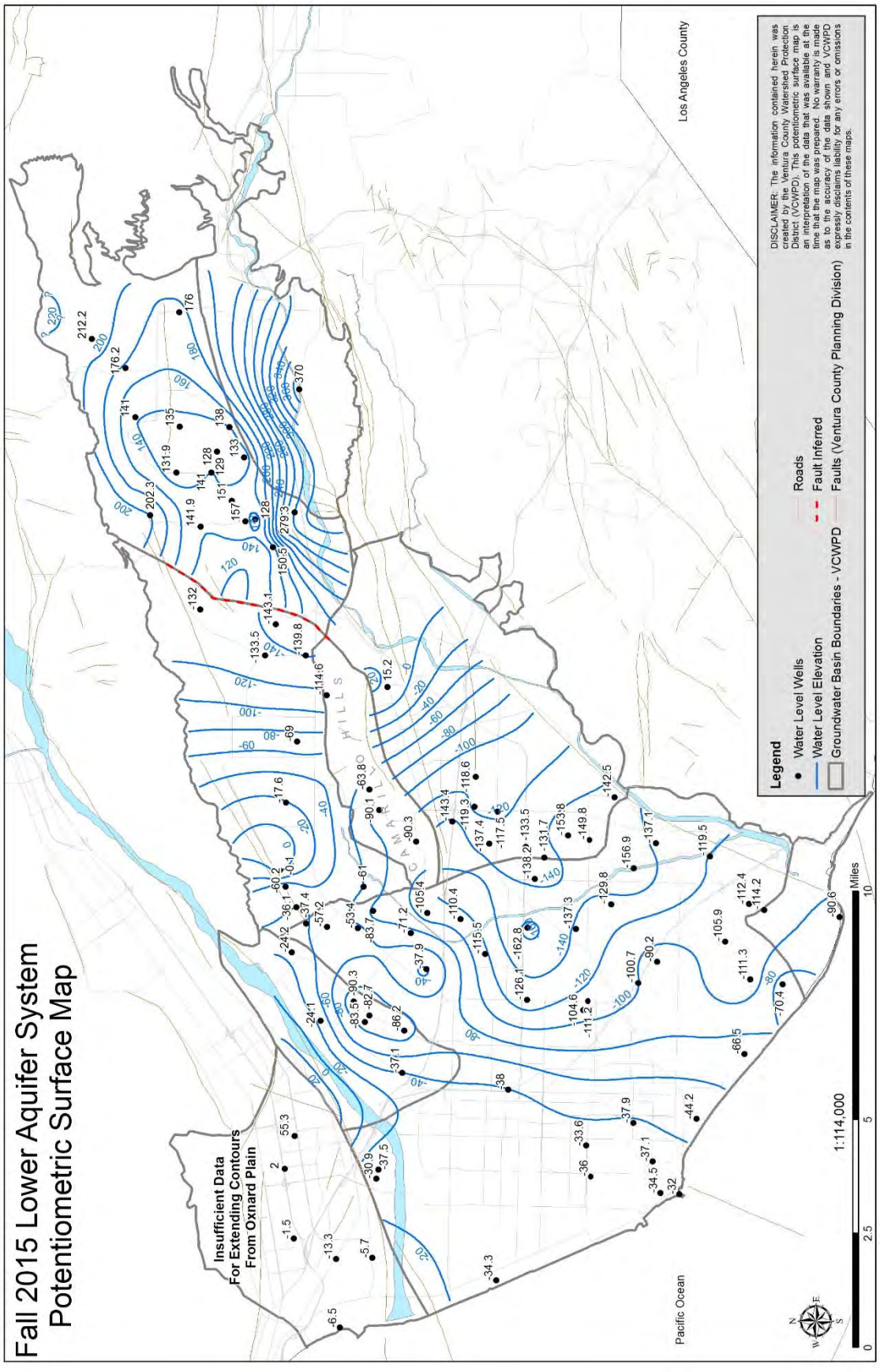

Figure 5-6: The map above depicts water level surface elevation contours for the Lower Aquifer System area for fall 2015.

References

American Geological Institute, Alexandria Virginia, Robert L. Bates & Julia A. Jackson, 1987, Glossary of Geology

Calleguas Municipal Water District, Las Posas Basin Aquifer Storage and Recovery Project, http://www.calleguas.com/projects/lpbroc.pdf, 2007

California Department of Water Resources, August 1978, Water Well Standards Ventura County Bulletin No. 74-9

California Department of Water Resources, October 2003, California's Groundwater, Bulletin 118

Camrosa Water District, Santa Rosa Mutual Water Company, Property Owners, April 1997, Santa Rosa Basin Management Plan, For areas within the Arroyo Santa Rosa Portion of the Santa Rosa Groundwater Basin not within the boundaries of the Fox Canyon Groundwater Management Agency

City of Thousand Oaks 2010 Urban Water Management Plan, Ventura County, California, June 2011, RBF Consulting County of Ventura Public Works Agency, Flood Control and Water Resources, December 1986, Quadrennial Report of Hydrologic Data 1981-84

County of Ventura Public Works Agency, Flood Control District, June 1971, Hydrologic Analysis Zone 4 1971

County of Ventura Public Works Agency, Flood Control and Water Resources Department, April 1978, North Half Area Hydrologic Balance Study

Fetter, C.W., 1988, Applied Hydrogeology, Second Edition

Fox Canyon Groundwater Management Agency, May 2007, 2007 Update to the Fox Canyon Groundwater Management Agency Groundwater Management Plan

Fox Canyon Groundwater Management Agency, 2013, Calendar Year 2012 Annual Report

Ventura County Watershed Protection District, Water & Environmental Resources Division, Groundwater Section, January 2007, Groundwater Quality Report 2005-2006

County of Ventura Board of Supervisors, December 16, 2014, County of Ventura Ordinance 4468, An ordinance of the County of Ventura repealing and reenacting Ventura County Ordinance Code Section 4811 et seq. relating to groundwater conservation.

Ventura County Department of Public Works, Flood Control District, Las Posas Area Groundwater Quality and Quantity Investigation, August 1971

Ventura County Watershed Protection District, Water & Environmental Resources Division, Groundwater Section, Hydrologic and Geologic Data, (Field and other data in Groundwater Section files).

United Water Conservation District, Santa Paula Basin 2005 Annual Report, Ventura County, California. November 2007.

References

United Water Conservation District, Hydrogeologic Assessment of the Mound Basin, Open File Report 2012-01, May 2012

(Footnotes)

1 – Hydrology Section, Ventura County Watershed Protection District, Historic Rainfall & Hydrologic Data, http://www.vcwatershed.org/hydrodata/htdocs/static/, 2012.

2 - Water Year defined as: October 1 to September 30 of the following year. VCWPD precipitation data is *preliminary* and subject to change.

3 - Based on data from all active Ventura County rain gages. Data is *preliminary* and subject to change.

4 - United Water Conservation District, Water Extraction, Production & Delivery Data, Dan Detmer; Murray McEachron - Personal Communication, February 2015.

5 - Casitas Municipal Water District, Production & Delivery Data, Chelbi Kelley - Personal Communication, February 2015.

6 - Calleguas Municipal Water District, Imported Water Volume & Delivery Data, Tony Goff - Personal Communication, February 2015.

7 - Fox Canyon Groundwater Management Agency, Groundwater Extraction Data, February 2015.

8 - Ojai Basin Groundwater Management Agency, Groundwater Extraction Data, Cece Van Der Meer - Personal Communication, February 2015.

9 - Golden State Water Company, 2010 Urban Water Management Plan – Simi Valley, Ventura County, California, August 2011, Kennedy/Jenks Consultants.

10 - Ventura County Waterworks District No. 8, City of Simi Valley, 2010 Urban Water Management Plan, Ventura County, California, June 2011, RBF Consulting

11 - City of Santa Paula 2010 Urban Water Management Plan Update, Ventura County, California, June 2011, Miller-Villa Consulting

Appendix A – Glossary of Groundwater Terms

Aquifer: A geologic formation or structure that yields water in sufficient quantities to supply pumping wells or springs.

Abandoned Well: Means any of the following:

(1) A water well used less than 8 hours in any twelve-month period. Failure to submit reports of well usage will result in a well being classified as abandoned.
(2) A monitoring well from which no monitoring data has been taken for a period of two years.
(3) A well which is in such a state of disrepair that it cannot be made functional for its original use or any other use.
(4) An open engineering test hole after 24 hours has elapsed after construction and testing work has been completed on the site.
(5) A cathodic protection well which is no longer used for its intended purpose.

Confined Aquifer: An aquifer separated from the surface by an aquiclude or an aquitard to the extent that pressure can be created in the lower reaches of the aquifer.

Contamination: Alteration of waters by waste, salt-water intrusion or other materials to a degree which creates a hazard to the public health through actual or potential poisoning or through actual or potential spreading of disease.

Department of Water Resources: (DWR) operates and maintains the State Water Project, including the California Aqueduct. The department also provides dam safety and flood control services, assists local water districts in water management and conservation activities, promotes recreational opportunities, and plans for future statewide water needs.

Fox Canyon Groundwater Management Agency (FCGMA): The Agency created when the California State Legislature enacted and passed State Assembly Bill No. 2995 on Sept. 13, 1982 creating the *Fox Canyon Groundwater Management Agency (GMA)*. This law, also referred to as AB2995, granted jurisdiction over all lands overlying the Fox Canyon aquifer zone to control seawater intrusion, protect water quality, and manage water resources.

Groundwater: Water beneath the surface of the earth within the zone below the water table in which the soil is completely saturated with water.

Groundwater Basin: A geologically and hydrologically defined area containing one or more aquifers, which store and transmit water yielding significant quantities of water to extraction facilities.

Lower Aquifer System (LAS): The area underlying the Oxnard Pressure Basin, which contains the Hueneme aquifer, the Fox Canyon Aquifer and the Grimes Canyon aquifer. The LAS is recharged from the Fox Canyon and Grimes Canyon Outcrops, the areas where the aquifers come to the surface exposing the permeable sands and gravels to recharge from rainfall and surface runoff.

Overdraft: The condition of a groundwater basin or aquifer where the average annual amount of water extracted exceeds the average annual supply of water to a basin or aquifer.

Perched or Semi-Perched Aquifer: The water bearing area that is located between the earth's surface and clay deposits that exist above an Aquifer.

Appendix A – Glossary of Groundwater Terms

Receiving Waters: All waters that are "Waters of the State" within the scope of the State Water Code, including but not limited to, natural streams, creeks, rivers, reservoirs, lakes, ponds, water in vernal pools, lagoons, estuaries, bays, the Pacific Ocean, and ground water.

Seawater Intrusion: The overdrafting of aquifers, which results in, the depletion of water supplies, lowering of water levels and degradation from seawater intrusion. Seawater intrusion results from the reversal of hydrostatic pressure allowing water flow to be onshore rather than offshore.

Total Dissolved Solids: (TDS) is a term that represents the amount of all of our natural minerals that is dissolved in water.

Total Maximum Daily Load (TMDL) is a number that represents the assimilative capacity of a receiving water to absorb a pollutant. The TMDL is the sum of the individual waste-load allocations for point sources, load allocations for nonpoint sources plus an allotment for natural background loading, and a margin of safety. TMDL's can be expressed in terms of mass per time (the traditional approach) or in other ways such as toxicity or a percentage reduction or other appropriate measure relating to a state water quality objective. A TMDL is implemented by reallocating the total allowable pollution among the different pollutant sources (through the permitting process or other regulatory means) to ensure that the water quality objectives are achieved.

United Water Conservation District (UWCD): The District administers a "basin management" program for the Santa Clara Valley and Oxnard Plain, utilizing the surface flow of the Santa Clara River and its tributaries for replenishment of groundwater. Originally established as the Santa Clara River Water Conservation District in 1927.

Upper Aquifer System (UAS): The area underlying the Oxnard Pressure Basin, which contains the perched and semi-perched zones, the Oxnard aquifer zone, and the Mugu aquifer. The UAS is recharged via the twenty-three square mile unconfined Oxnard Forebay Basin near El Rio.

Water Quality Standards: Defined as the beneficial uses (e.g., swimming, fishing, municipal drinking water supply, etc.) of water and the water quality objectives adopted by the State or the United States Environmental Protection Agency to protect those uses.

Water Well Ordinance No. 4468: The Ventura County Groundwater Conservation Ordinance which was originally adopted by the Board of Supervisors in October 1970 and revised in 1979, 1984, 1985, 1987, 1991, 1999 and most recently in December 2014. The purpose of the ordinance is to ensure that all new or modified water wells, cathodic protection wells and monitoring wells are drilled by licensed water well contractors and are properly sealed so that they cannot serve as conduits for the movement of poor quality or polluted waters into useable aquifers or be hazardous to people or animals.

Well Destruction: To fill a well (including both interior and annular spaces if the well is cased) completely in such a manner that it will not produce water or act as a conduit for the transmission of water between any water-bearing formations penetrated.

Well Owner: The owner of the land on which a well is located.

Appendix B – Key Water Level Wells

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Appendix B – Key Water Level Wells

Key water levels for the most significant groundwater basins are depicted on the following pages to provide visual representations of groundwater conditions over time. Note that the time duration of data may vary.

Each of the following pages is organized to describe the key water level well measured by staff. Each well listed includes a line graph (hydrograph) of groundwater levels measured in relation to the ground surface or some specific reference point (RP) which is usually the top of the well casing or the concrete slab at the wellhead. The hydrographs are accompanied by an up-down graph to track change from the previous spring.

The following summary sheet for 2015 is used by Groundwater Section Staff to track long-term trends. Spring season measurements are used for comparison since this time period is typically at the end of the seasonal and annual rainfall year when groundwater basins should be at their fullest.

Key wells were selected many years ago as representative data points based on a centralized location within any particular groundwater basin, a sufficient penetration (depth) or perforation interval within the target aquifer, proper structural or sanitary seals, adequate well construction and site access, and potential for long-term use (measurement).

These data are static water level measurements. Standard operating procedure for County Groundwater Staff is to have well pumps off for 24 hours prior to gauging.

Appendix B – Key Water Level Wells

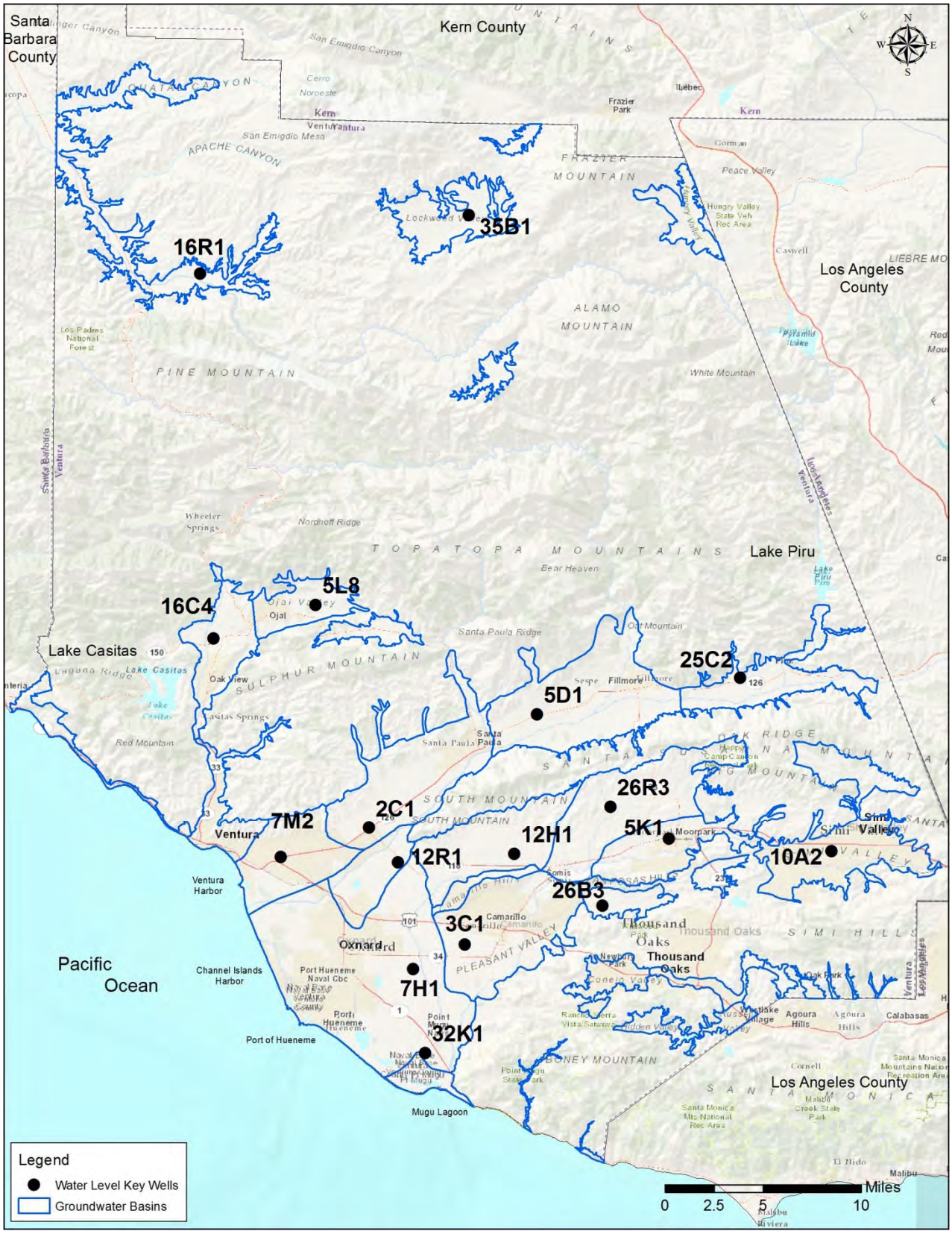

Figure B-1: Map showing key water level wells in Ventura County.

Appendix B– Key Water Level Wells
SPRING WATER LEVELS – (Depth to groundwater)

BASIN	WELL NUMBER	RECORD HIGH	RECORD LOW	WATER LEVEL	WATER LEVEL	WATER LEVEL	Change From Previous Year
	(RECORD)	(DATE)	(DATE)	(YEAR 2013)	(YEAR 2014)	(YEAR 2015)	(UP/DOWN)
OXNARD PLAIN							
Oxnard Aquifer	01N21W07H01S	3.4 ft.	88.4 ft.	25.0 ft.	41.1 ft.	53.8 ft.	DOWN 12.7 ft.
	(1/31-present)	(3/1999)	(9/1964)	(3/5)	(3/11)	(3/17)	
Forebay Area	02N22W12R01S	14.6 ft.	Dry	93.7 ft.	122.76	Dry	
(UWCD)	(5/31-present)	(6/1998)	(3/2016)	(4/9)	(3/26)		
Fox Canyon	01N21W32K01S	18.0 ft.	129.0 ft.	49 ft.	85.5 ft.	78.2 ft.	UP 7.3 ft.
Aquifer	(12/72-present)	(4/1983)	(12/1990)	(3/4)	(3/13)	(3/9)	
PLEASANT VALLEY							
Fox Canyon							
Aquifer							
Grimes Canyon	01N21W03C01S	87.5 ft.	253.9 ft.	107.3 ft.	147.1 ft.	155.9 ft.	DOWN 8.8 ft.
Aquifer	(2/73-present)	(8/1995)	(11/1991)	(3/6)	(3/11)	(3/18)	
WEST LAS POSAS	02N21W12H01S	422.2 ft.	501.8 ft.	453.9 ft.	459.8 ft.	No Reading	
	(10/72-present)	(3/1975)	(12/1991)	(3/4)	(3/10)		
EAST LAS POSAS	03N20W26R03S	503.0 ft.	619.3 ft.	576.6 ft.	581.5 ft.	571.3 ft.	UP 10.2 ft.
	(1985-present)	(4/1986)	(9/2009)	(3/14)	(3/10)	(3/10)	
SOUTH LAS POSAS	02N19W05K01S	27.5 ft.	136.2 ft.	30.0 ft.	31.1 ft.	28.1 ft.	UP 3.0 ft.
	(6/75-present)	(7/2006)	(6/1975)	(3/20)	(3/10)	(3/13)	
SANTA ROSA	02N20W26B03S	13.2 ft.	60.3 ft.	39.4 ft.	58.9 ft.	55.1 .ft	UP 3.8 ft.
VALLEY	(10/72-present)	(4/1979)	(11/2004)	(3/7)	(3/12)	(3/18)	
SIMI VALLEY	02N18W10A02S	45.0 ft.	92.0 ft.	79.7 ft.	82.1 ft.	80.9 ft.	UP 1.2 ft.
	(12/84-present)	(2/1998)	(6/1992)	(3/15)	(3/1)	(3/2)	
VENTURA RIVER	04N23W16C04S	3.9 ft.	101.0 ft.	64.8 ft.	83.0 ft.	69.9 ft.	UP 13.1 ft.
	(7/49-present)	(3/1983)	(2/1991)	(3/5)	(3/11)	(3/4)	
OJAI VALLEY	04N22W05L08S	38.2 ft.	312.0 ft.	176 ft.	226.2	231.3 ft.	DOWN 5.1 ft.
	(10/49-present)	(4/1978)	(9/1951)	(3/12)	(6/13)	(3/5)	
MOUND	02N22W07M02S	126.6 ft.	176.2 ft.	148.7 ft.	160.6	167.3	DOWN 6.7 ft.
	(4/96-present)	(4/1998)	(4/1996)	(3/28)	(4/15)	(3/18)	
SANTA PAULA	02N22W02C01S	20.7 ft.	51.9 ft.	36.8 ft.	40.5 ft.	43.2 ft.	DOWN 3.7 ft.
	(10/72-present)	(4/1983)	(12/1991)	(3/4)	(3/10)	(3/16)	
FILLMORE	03N20W05D01S	107.8 ft.	163.7 ft.	137.7 ft.	139.6 ft.	143.3 ft.	DOWN 3.7 ft.
	(10/72-present)	(2/1979)	(1219/77)	(3/4)	(3/10)	(3/16)	
PIRU	04N19W25C02S	43.1 ft.	183.2 ft.	79.9 ft.	102.2 ft.	116.3 ft.	DOWN 14.1 ft.
	(9/61-present)	(3/1993)	(10/1965)	(3/4)	(3/10)	(3/16)	
LOCKWOOD VALLEY	08N21W35B01S	19.3 ft.	52.9 ft.	No Reading	No Reading	No Reading	
	(6/56-present)	(05/2010)	(10/1991)				
CUYAMA VALLEY	07N23W16R01S	15.0 ft.	47.5 ft.	39.4	49.1 ft.	56.1	DOWN 7.0 ft.
	(3/72-present)	(4/1993)	(9/1990)	(3/26)	(4/17)	(3/27)	

Data prepared:
2/11/2016

Table B-1: Key Well Water Level Changes for 2015.

Appendix B – Key Water Level Wells

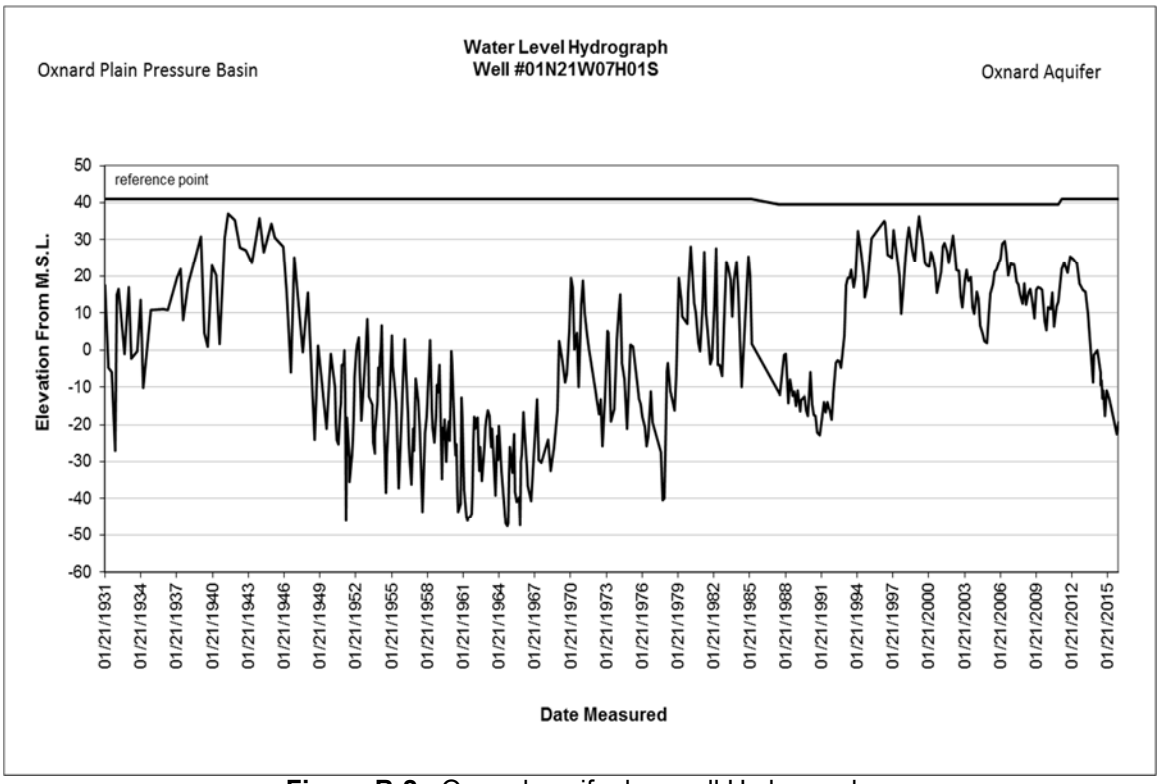

Figure B-2: Oxnard aquifer key well Hydrograph.

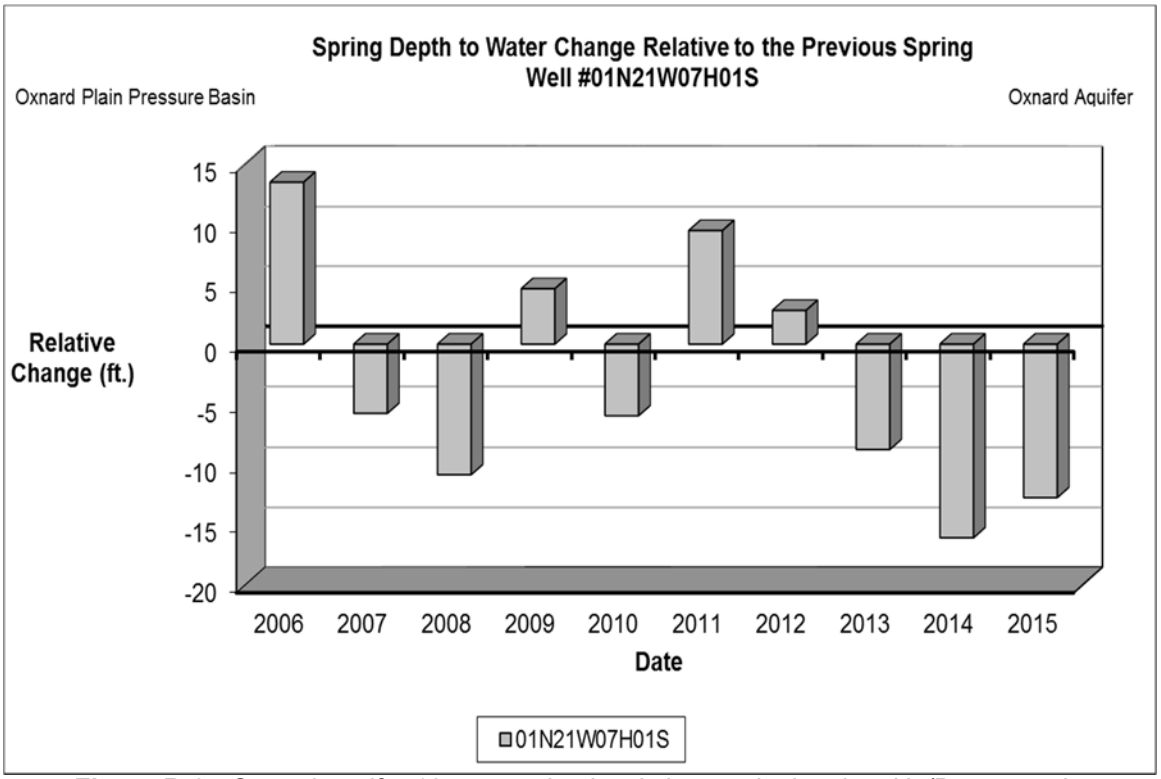

Figure B-3: Oxnard aquifer 10 year spring level change depicted on Up/Down graph.

Appendix B – Key Water Level Wells

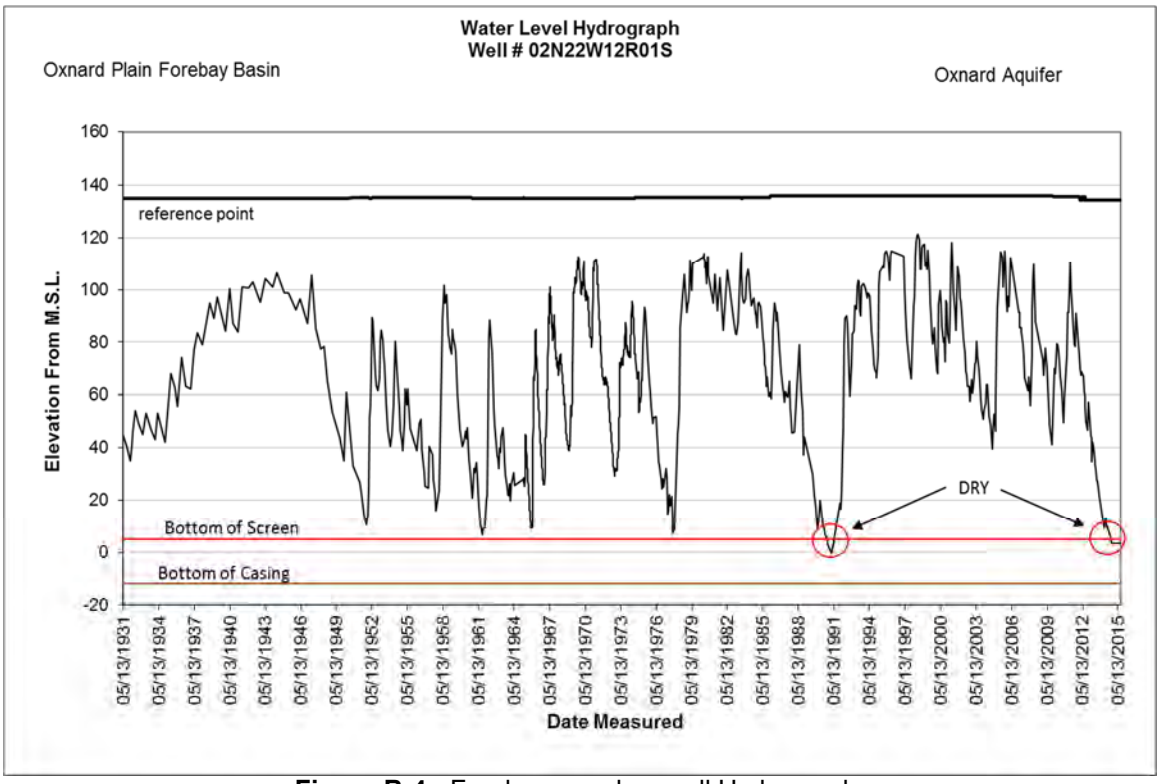

Figure B-4: Forebay area key well Hydrograph.

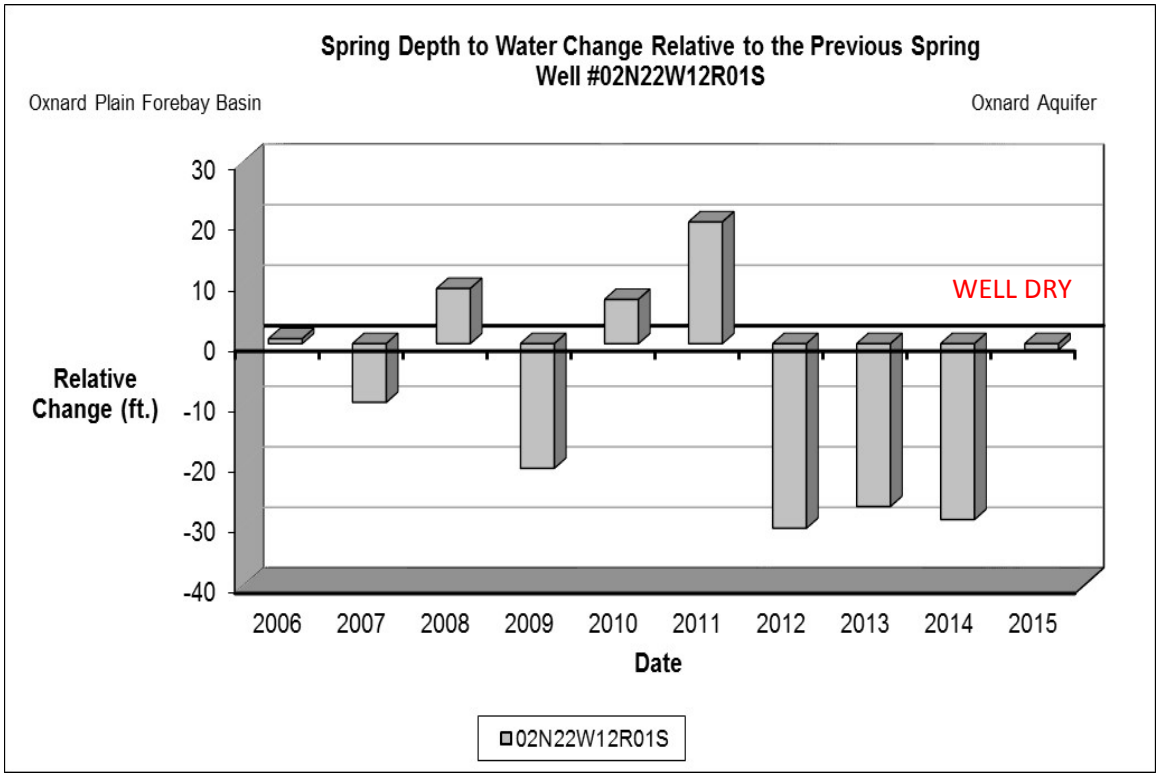

Figure B-5: Forebay Basin 10 year spring level change depicted on Up/Down graph.

Appendix B – Key Water Level Wells

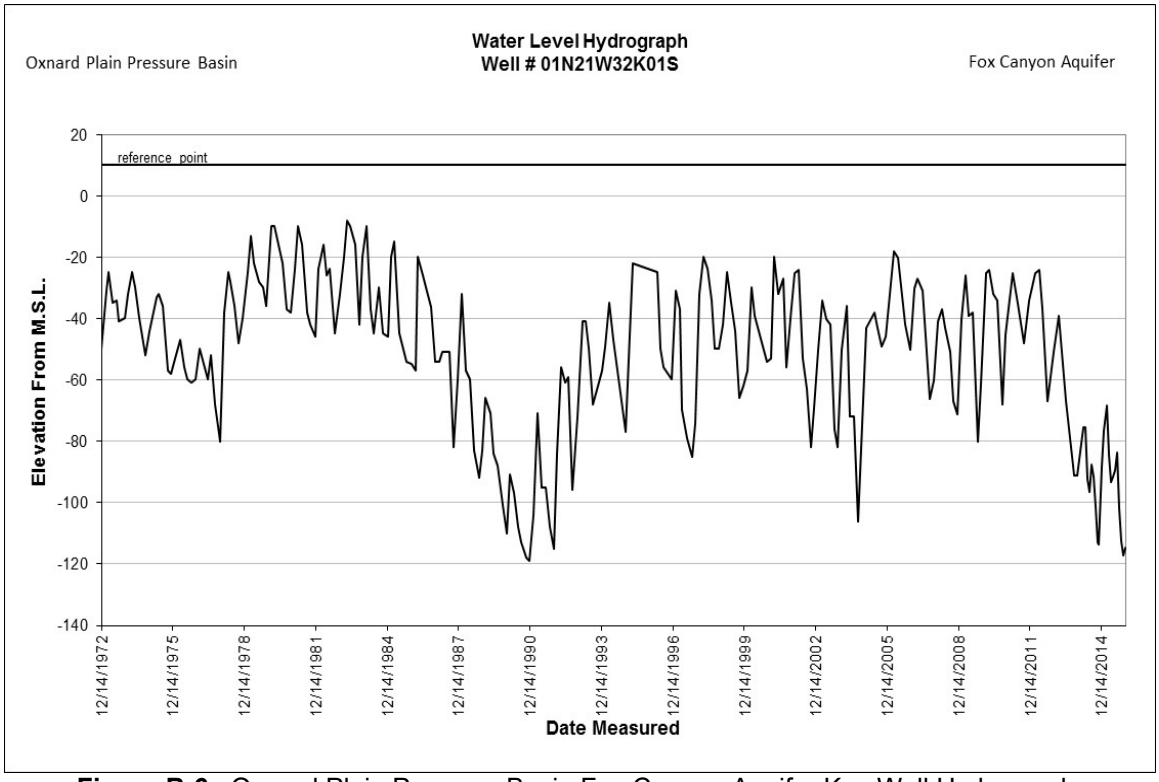

Figure B-6: Oxnard Plain Pressure Basin Fox Canyon Aquifer Key Well Hydrograph.

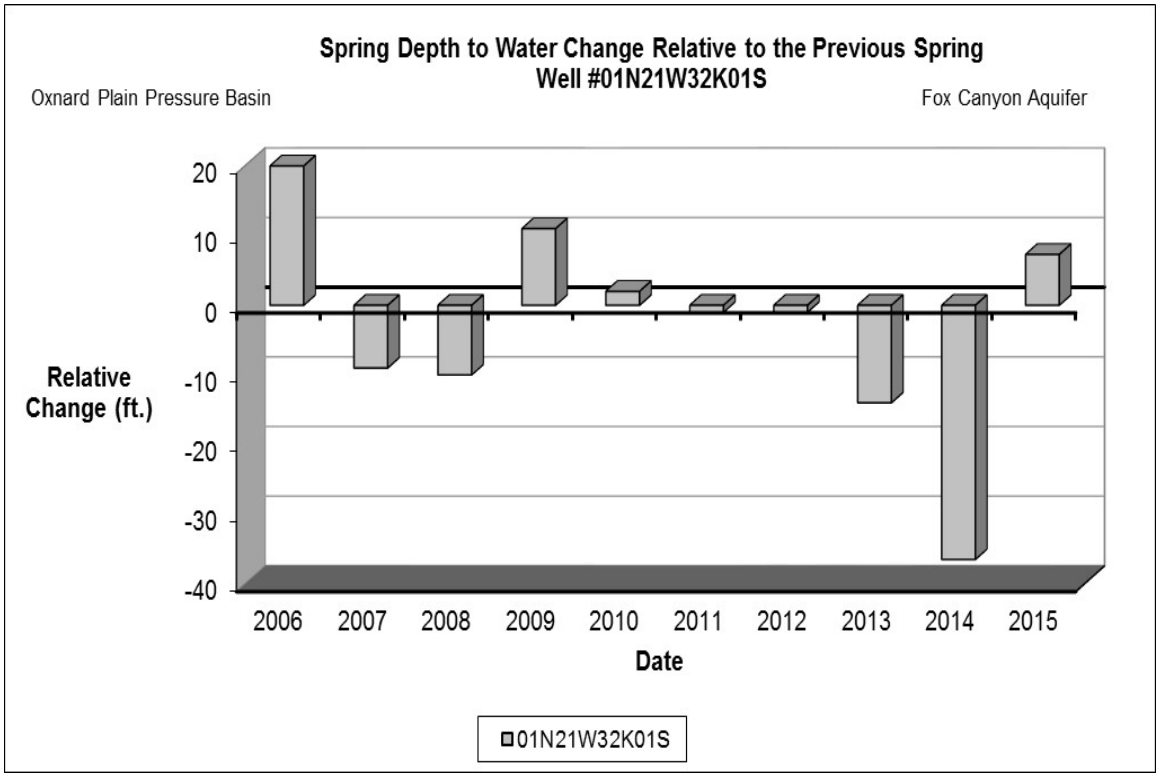

Figure B-7: Oxnard Plain Pressure Basin Fox Canyon Aquifer 10 year spring level change depicted on Up/Down graph.

Appendix B – Key Water Level Wells

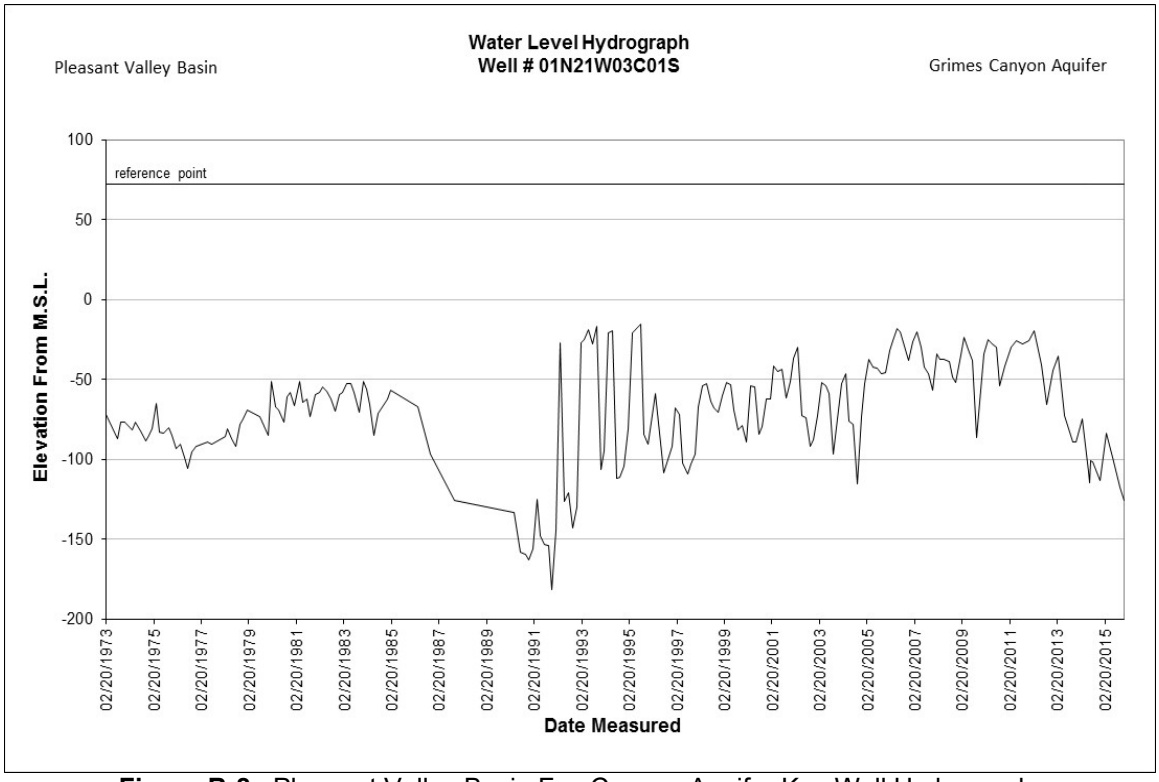

Figure B-8: Pleasant Valley Basin Fox Canyon Aquifer Key Well Hydrograph.

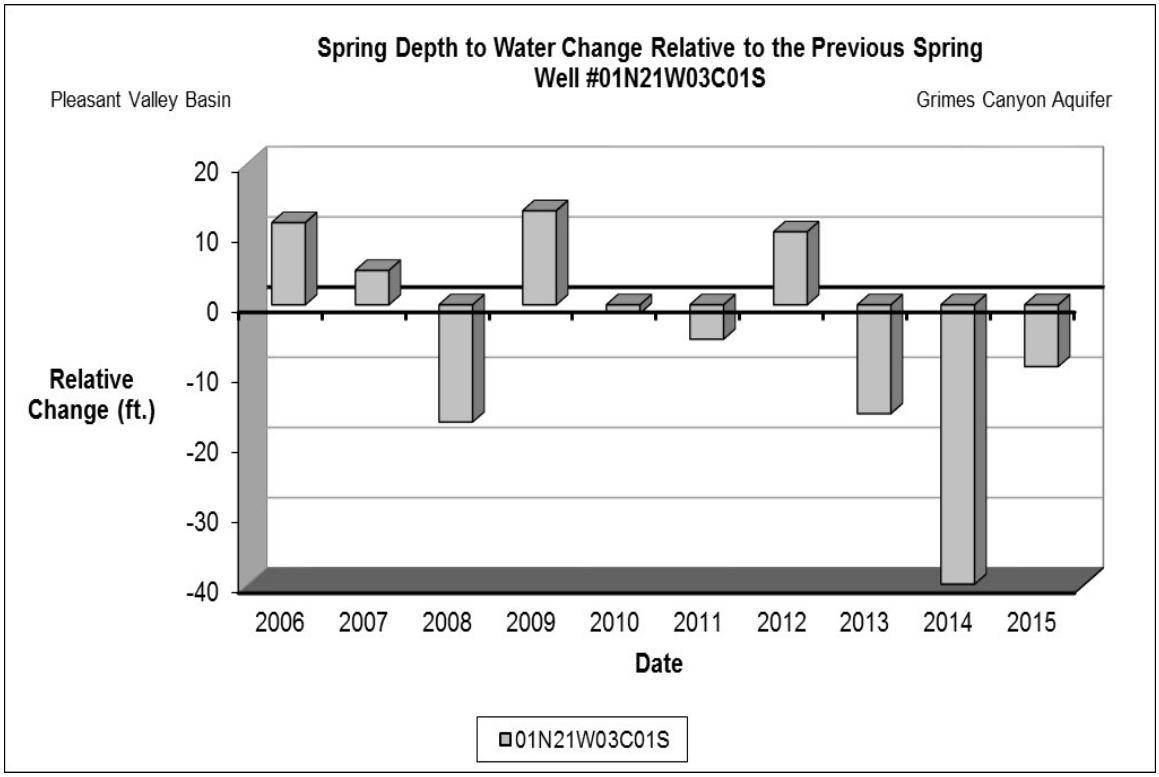

Figure B-9: Pleasant Valley Basin Fox Canyon Aquifer 10 year spring level change depicted on Up/Down graph.

Appendix B – Key Water Level Wells

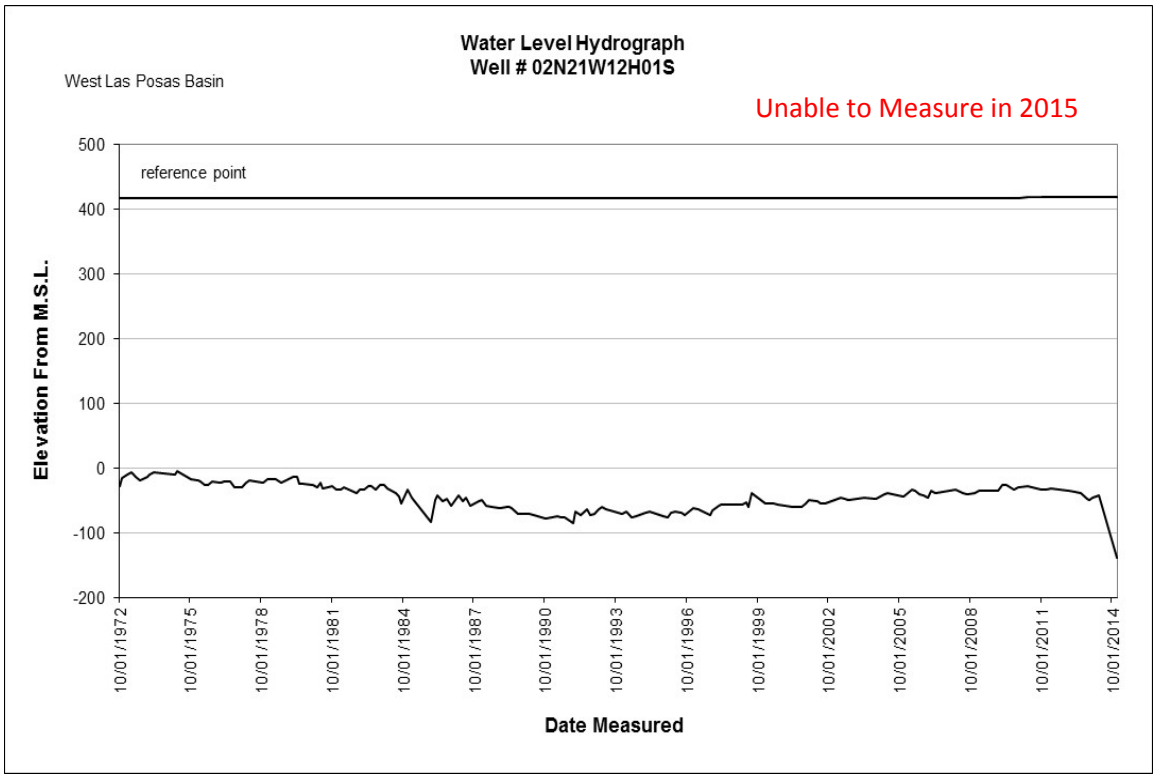

Figure B-10: West Las Posas Basin Key Well Hydrograph.

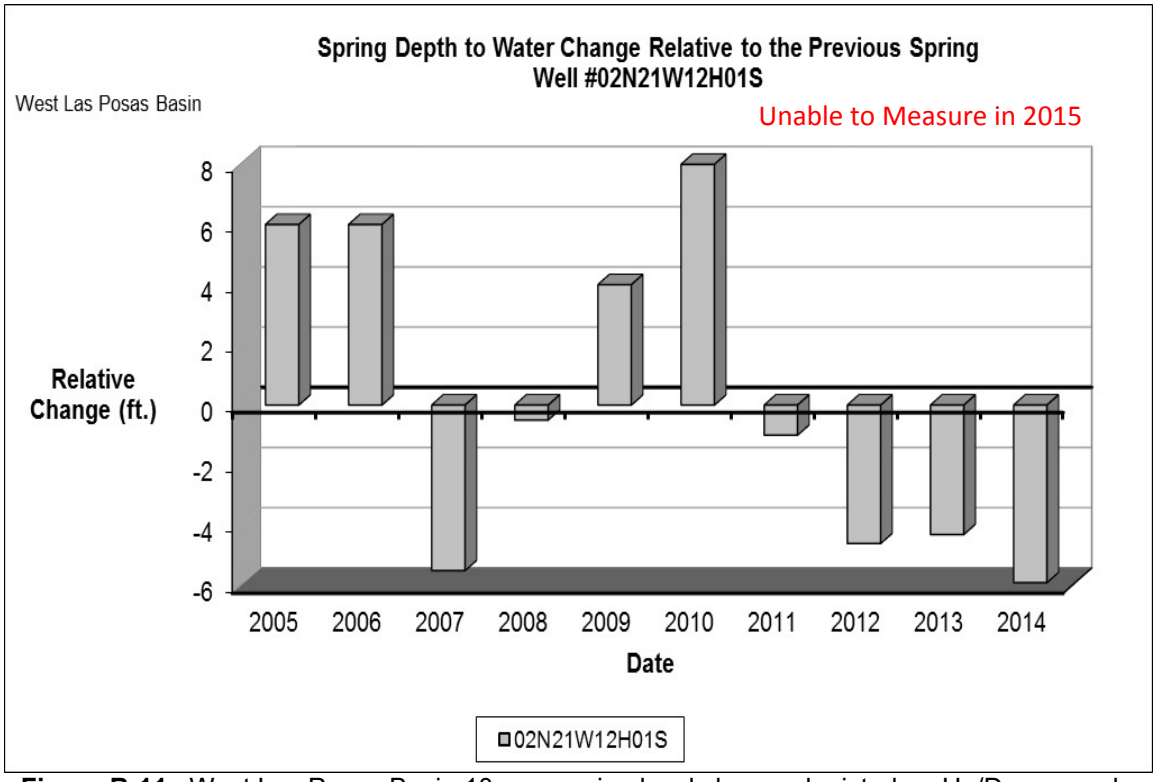

Figure B-11: West Las Posas Basin 10 year spring level change depicted on Up/Down graph.

Appendix B – Key Water Level Wells

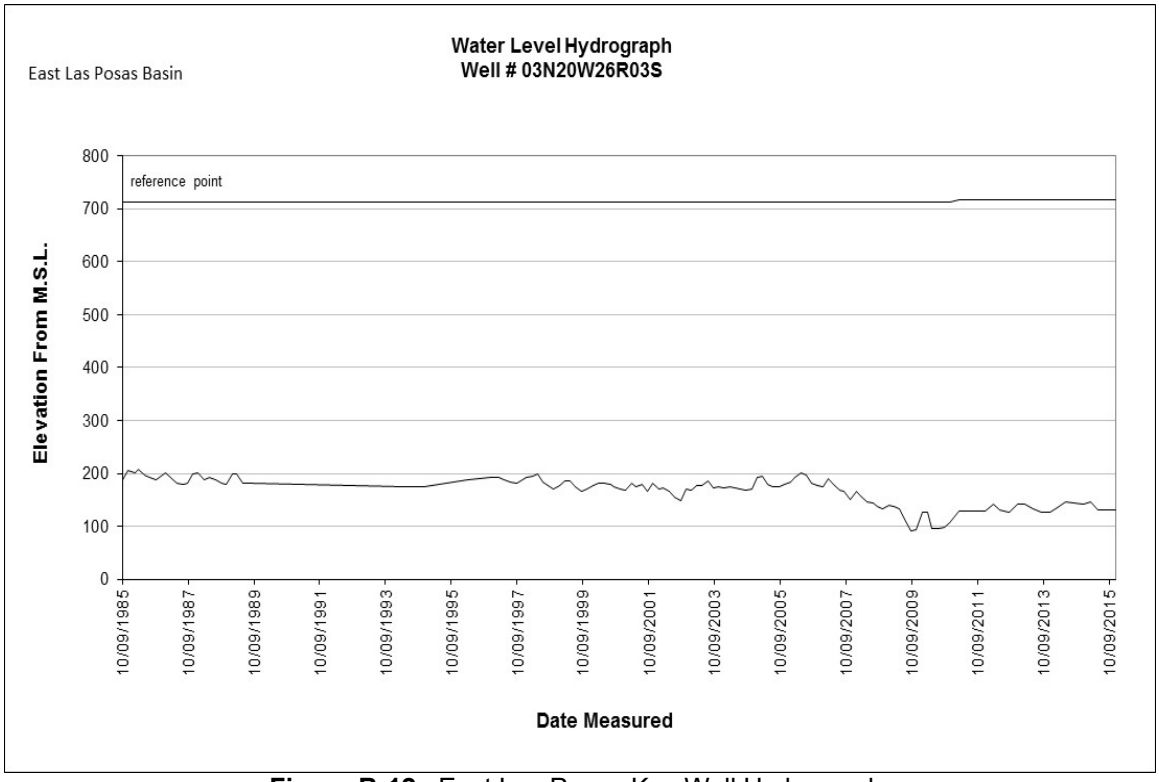

Figure B-12: East Las Posas Key Well Hydrograph.

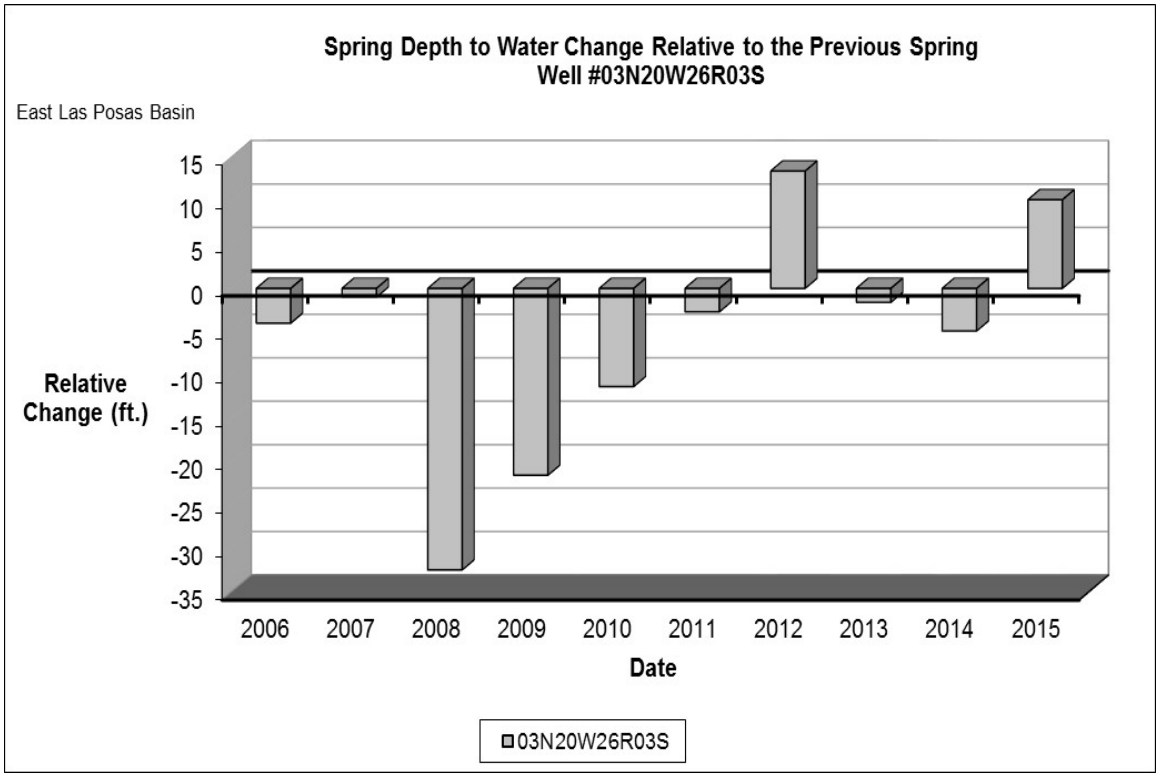

Figure B-13: East Las Posas Basin 10 year spring level change depicted on Up/Down graph.

Appendix B – Key Water Level Wells

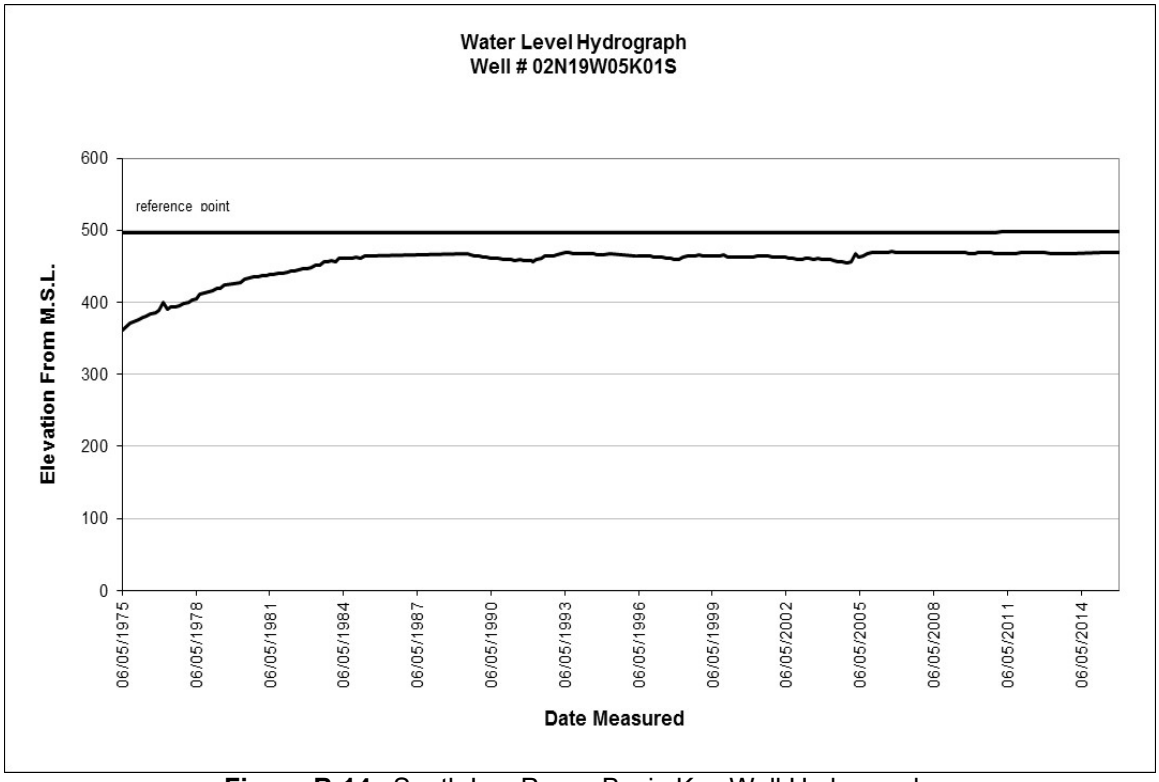

Figure B-14: South Las Posas Basin Key Well Hydrograph.

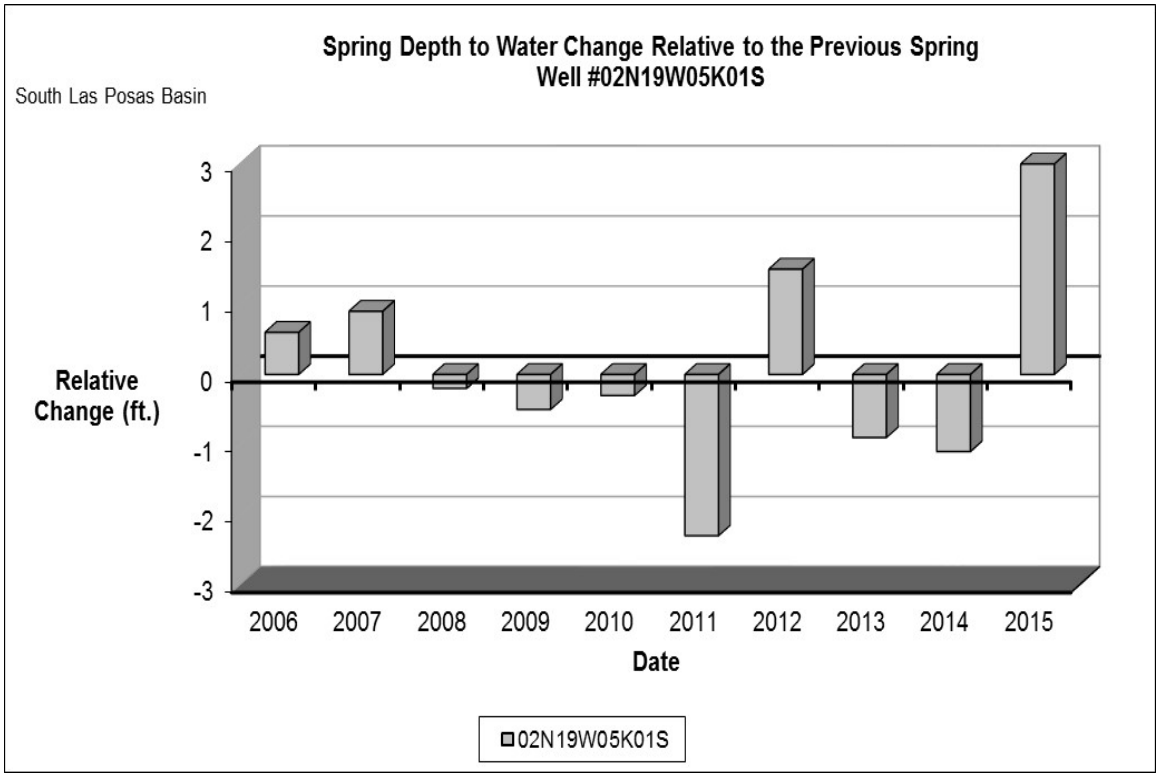

Figure B-15: South Las Posas Basin 10 year spring level change depicted on Up/Down graph.

Appendix B – Key Water Level Wells

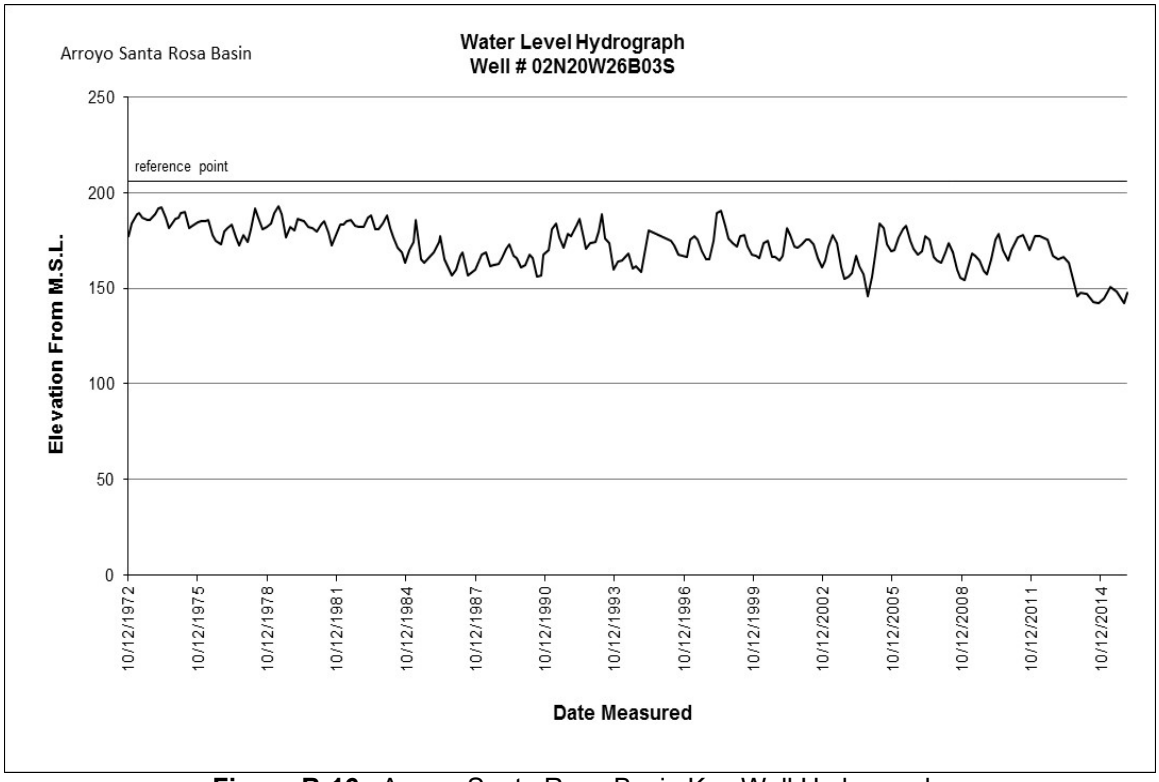

Figure B-16: Arroyo Santa Rosa Basin Key Well Hydrograph.

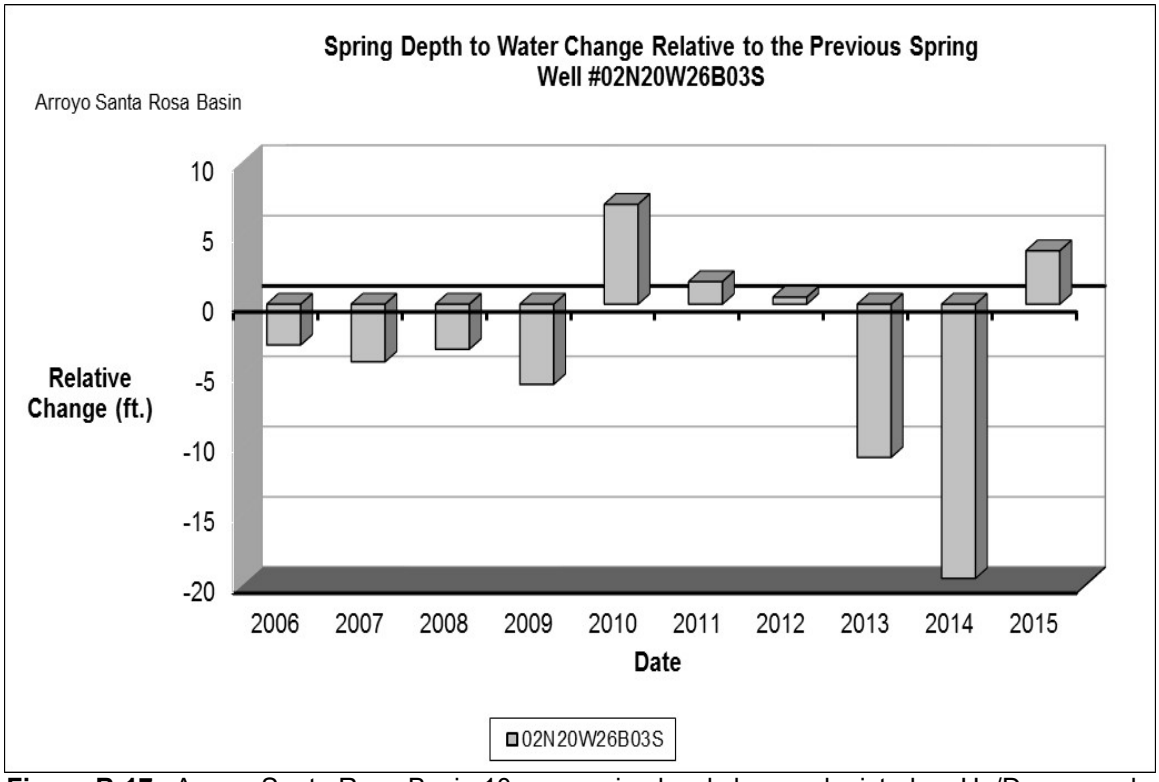

Figure B-17: Arroyo Santa Rosa Basin 10 year spring level change depicted on Up/Down graph.

Appendix B – Key Water Level Wells

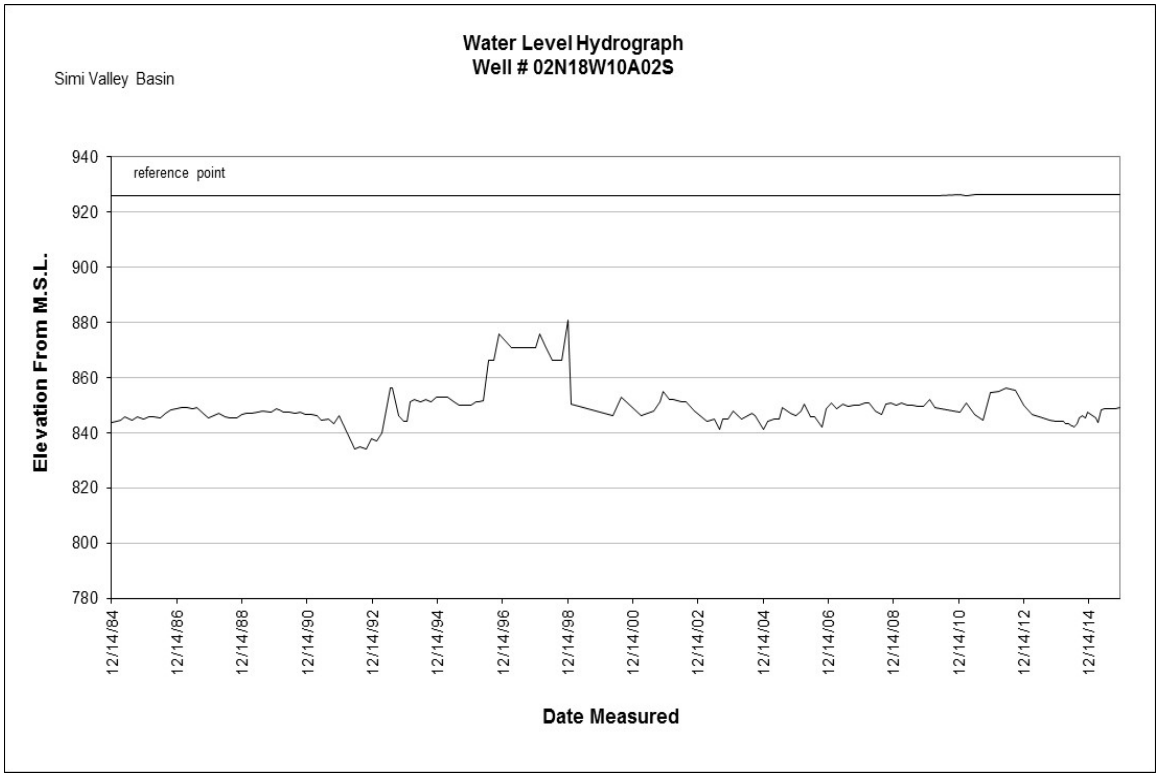

Figure B-18: Simi Valley Basin Key Well Hydrograph.

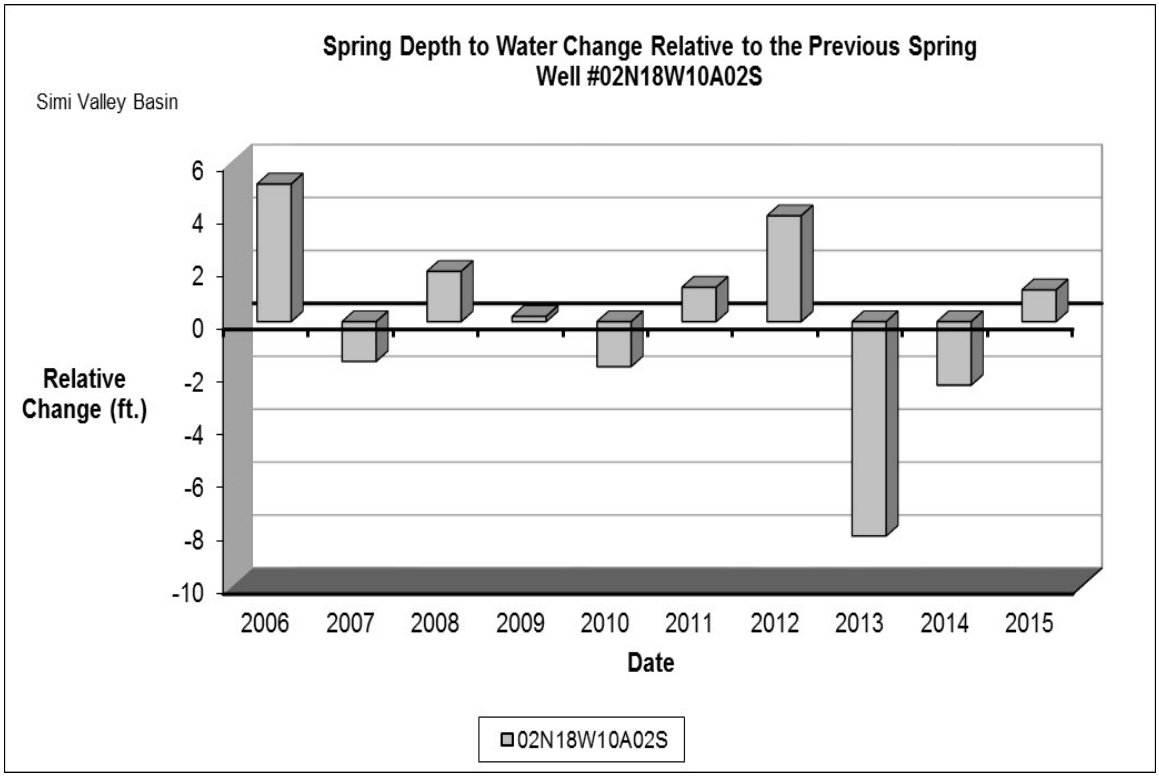

Figure B-19: Simi Basin 10 year spring level change depicted on Up/Down graph.

Appendix B – Key Water Level Wells

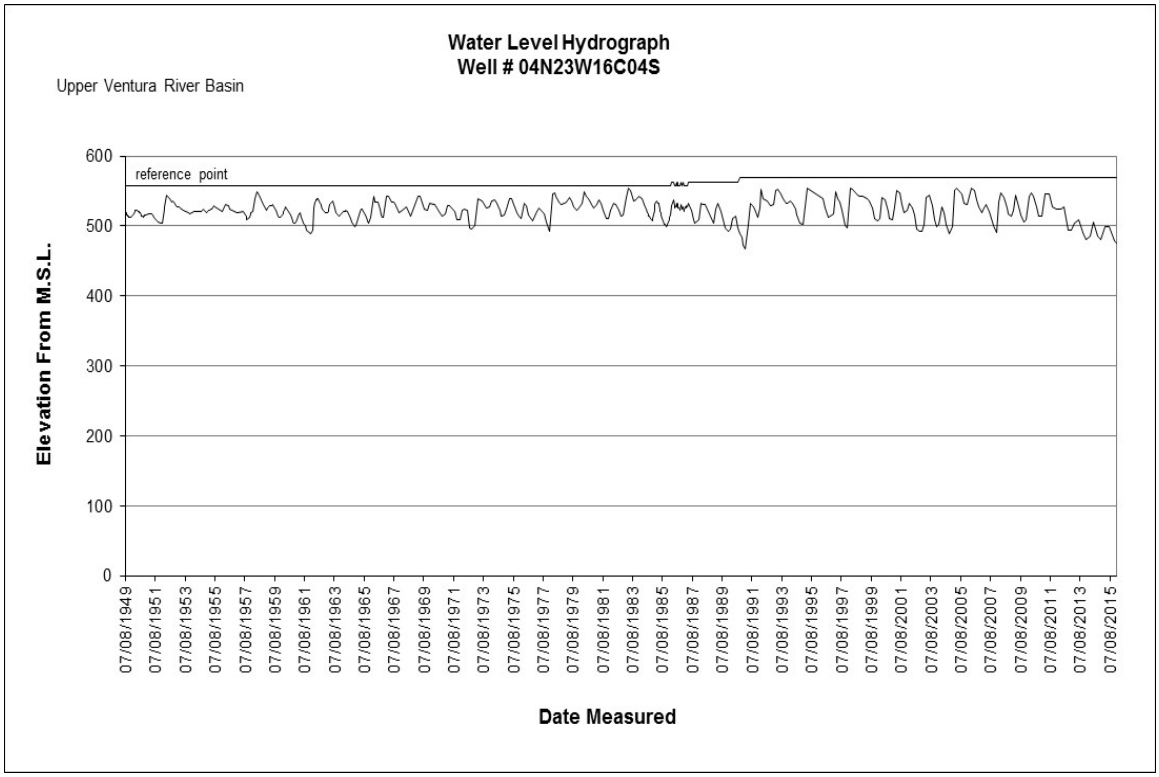

Figure B-20: Ventura River Basin Key Well Hydrograph.

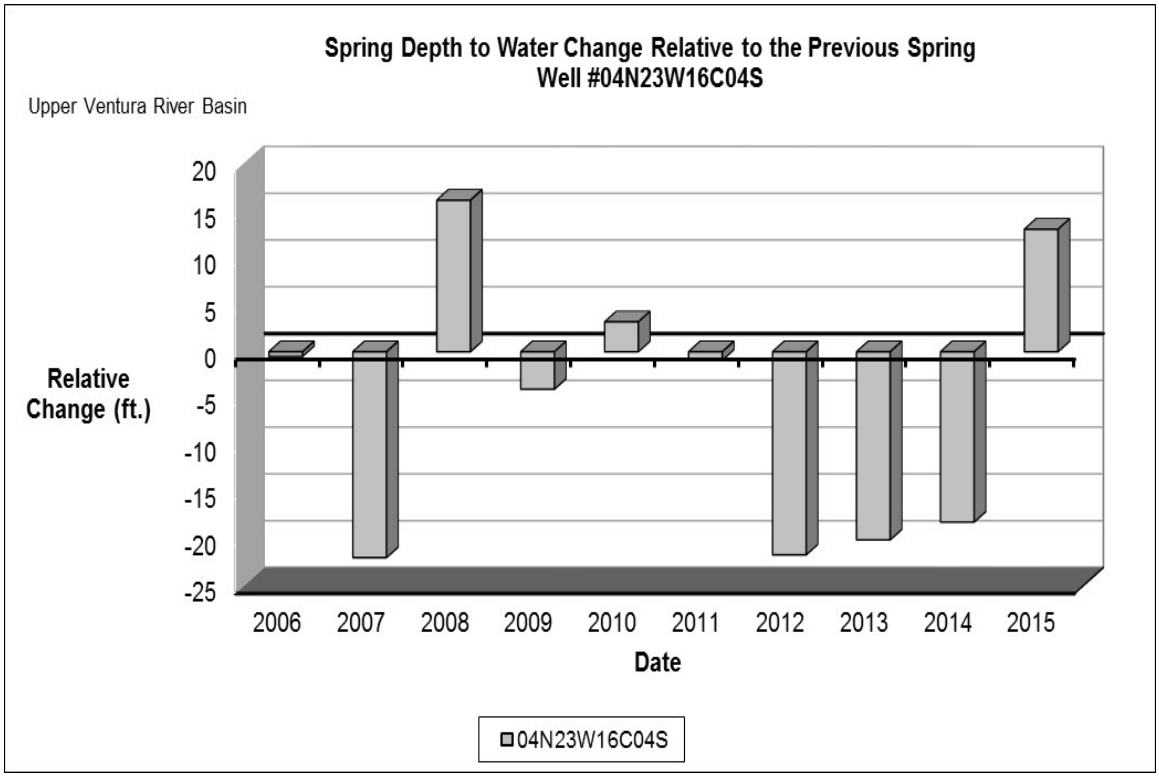

Figure B-21: Ventura River Basin 10 year spring level change depicted on Up/Down graph.

Appendix B – Key Water Level Wells

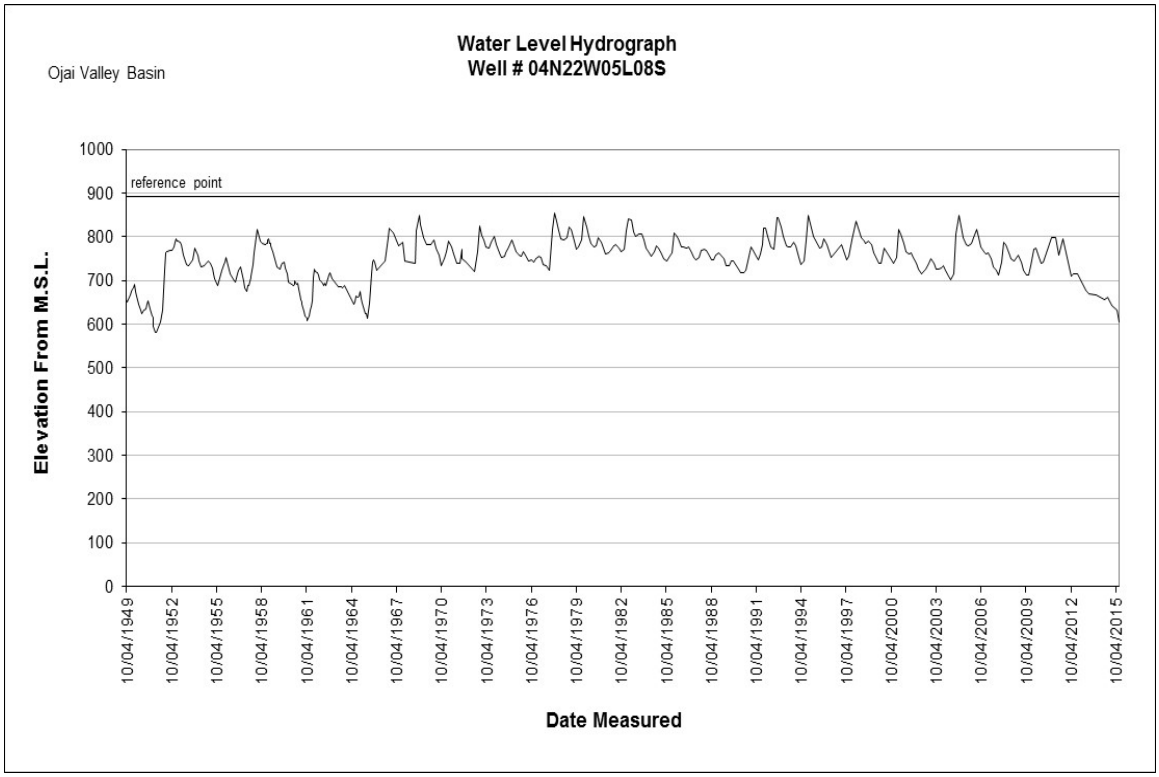

Figure B-22: Ojai Valley Basin Key Well Hydrograph.

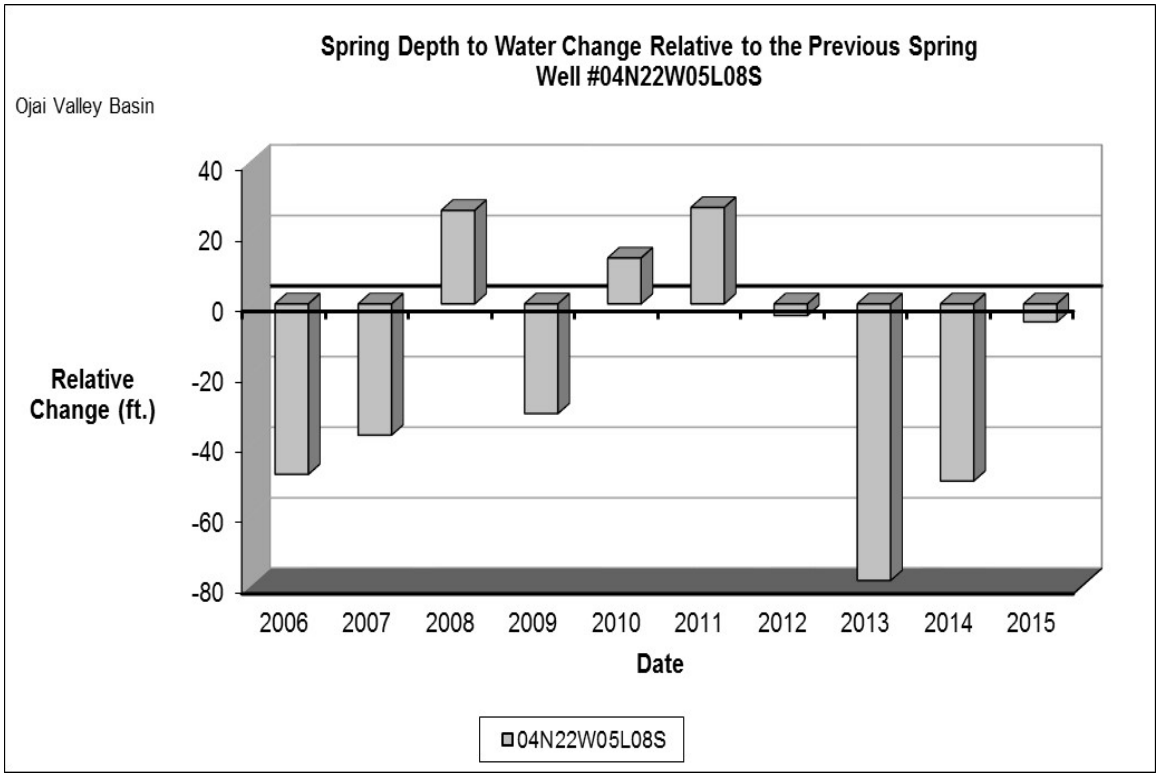

Figure B-23: Ojai Valley Basin 10 year spring level change depicted on Up/Down graph.

Appendix B – Key Water Level Wells

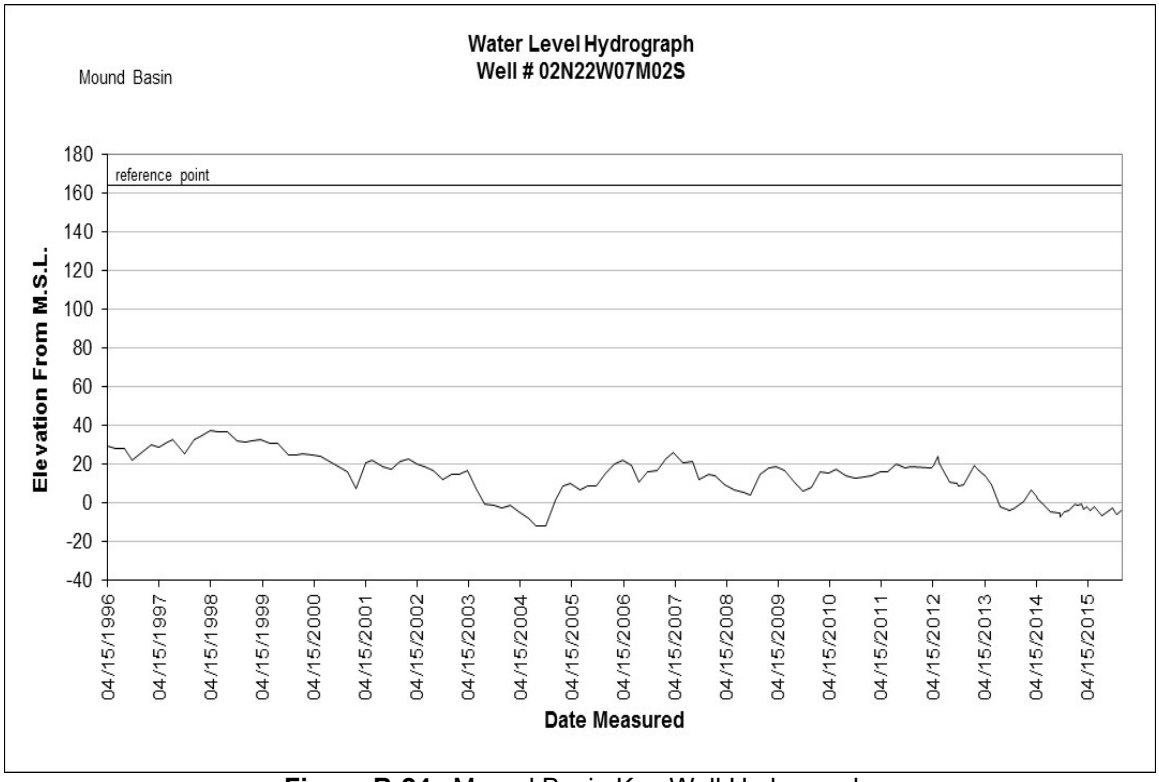

Figure B-24: Mound Basin Key Well Hydrograph.

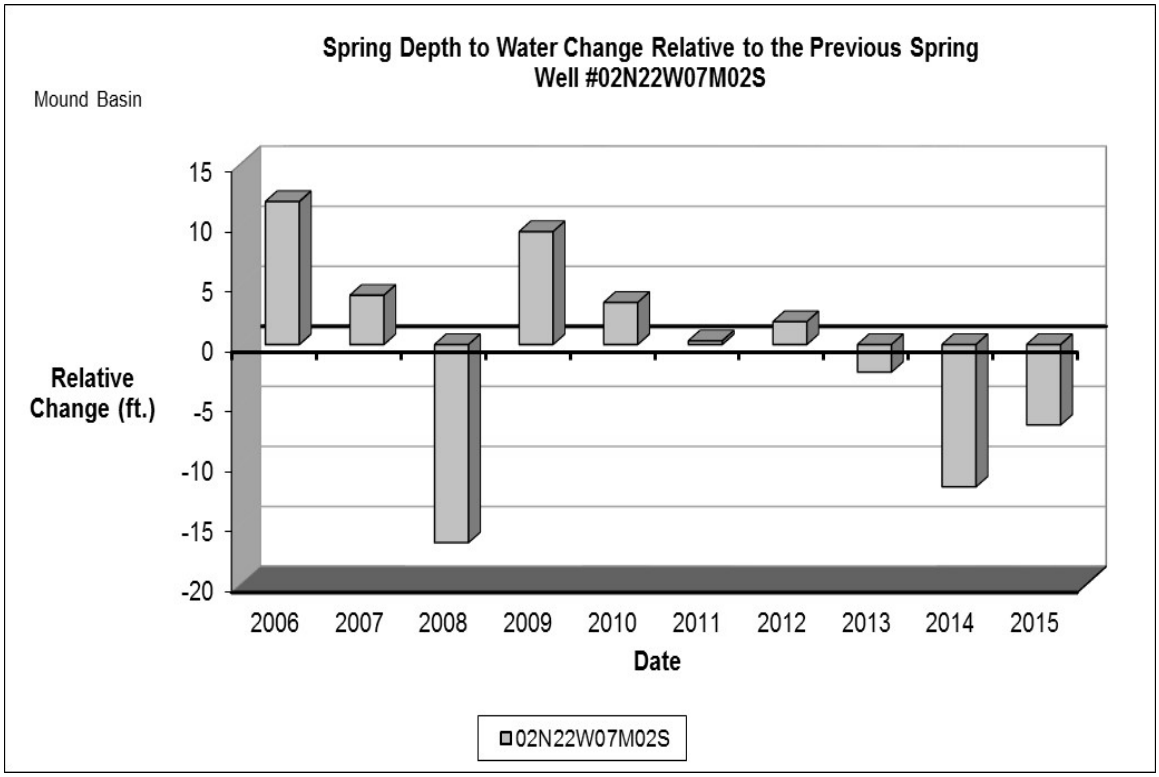

Figure B-25: Mound Basin 10 year spring level change depicted on Up/Down graph.

Appendix B – Key Water Level Wells

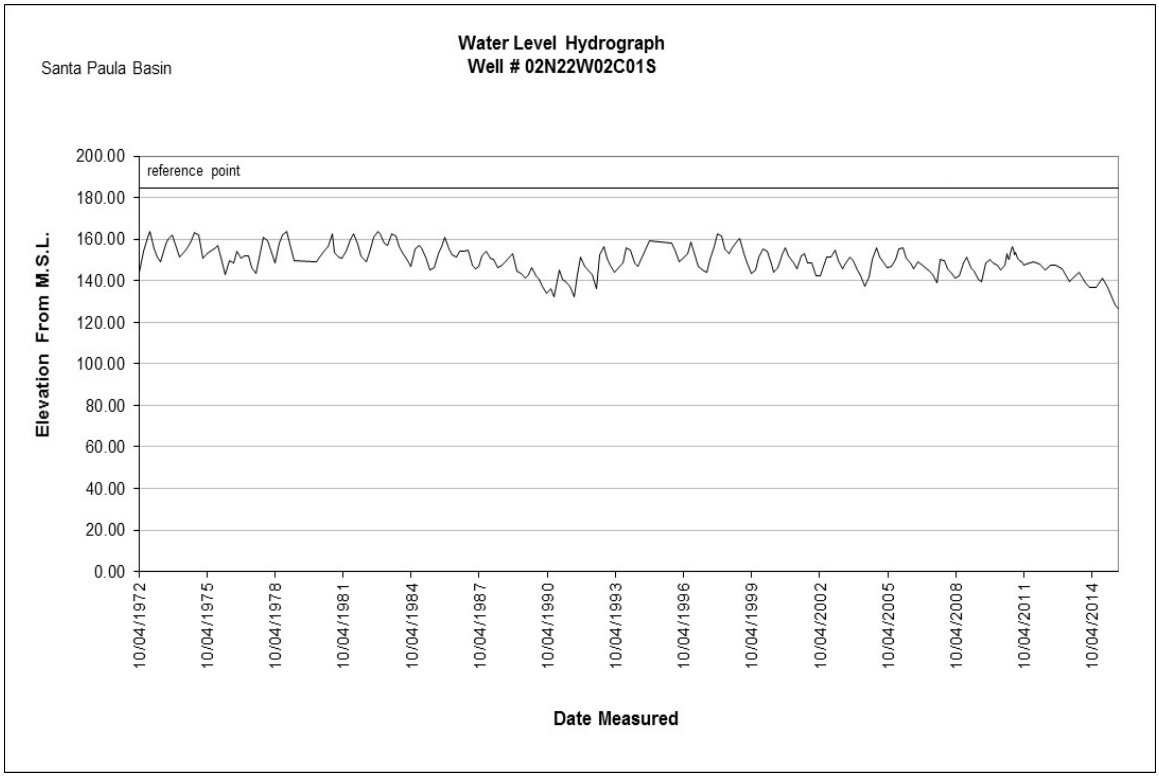

Figure B-26: Santa Paula Basin Key Well Hydrograph.

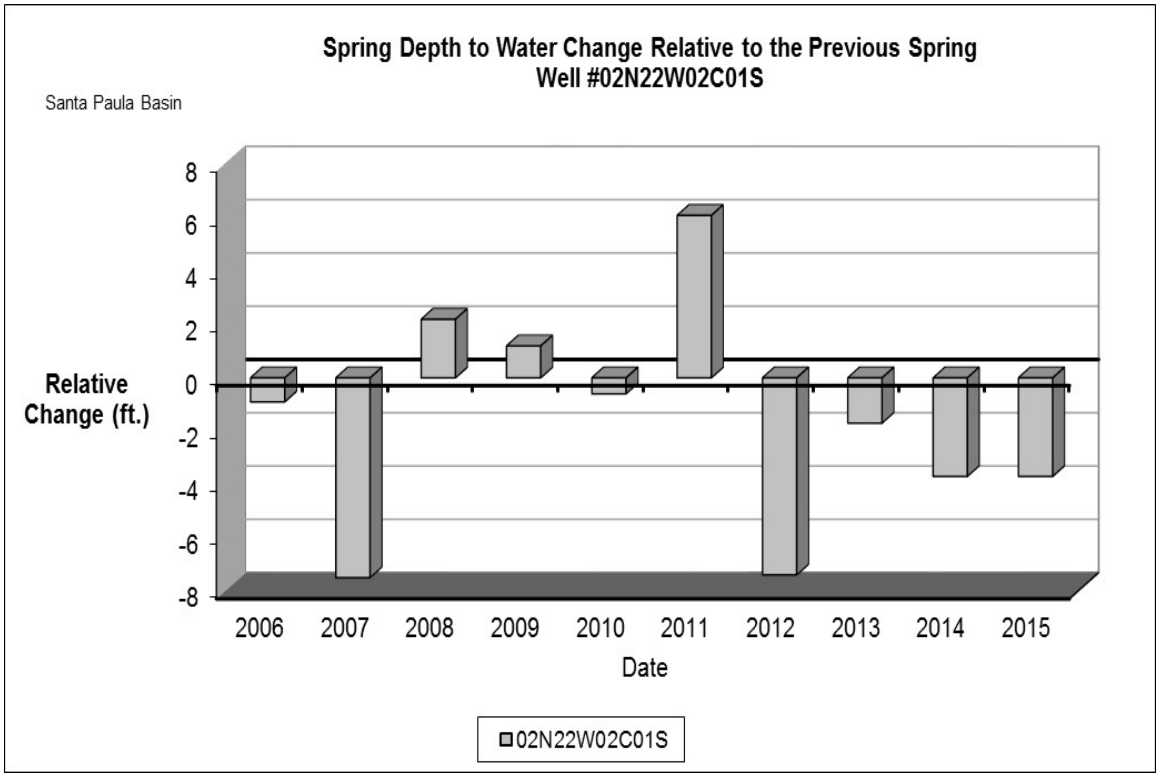

Figure B-27: Santa Paula Basin 10 year spring level change depicted on Up/Down graph.

Appendix B – Key Water Level Wells

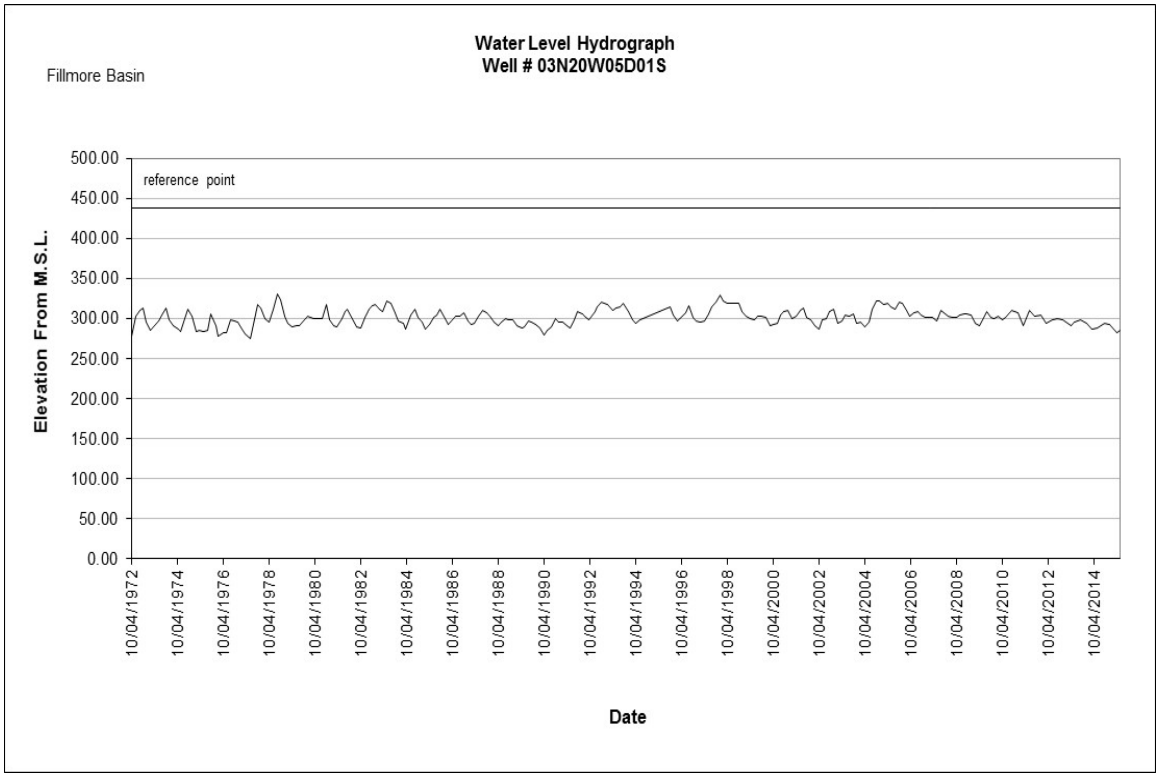

Figure B-28: Fillmore Basin Key Well Hydrograph.

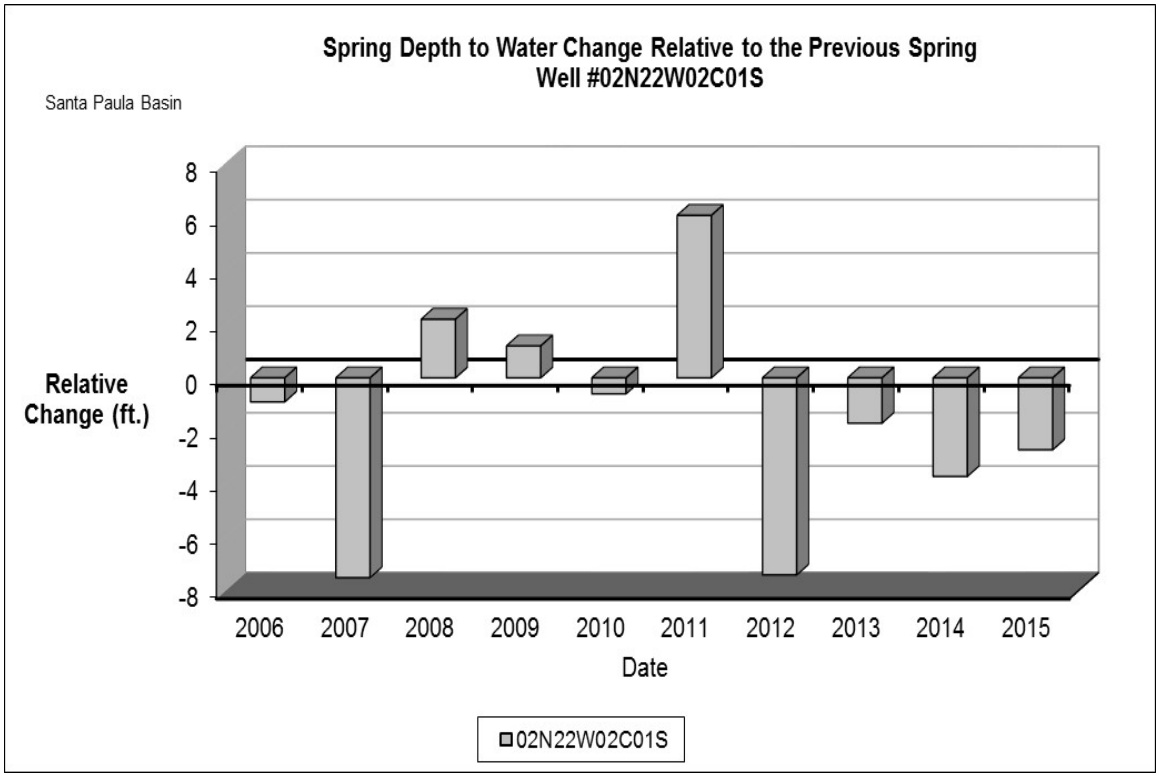

Figure B-29: Fillmore Basin 10 year spring level change depicted on Up/Down graph.

Appendix B – Key Water Level Wells

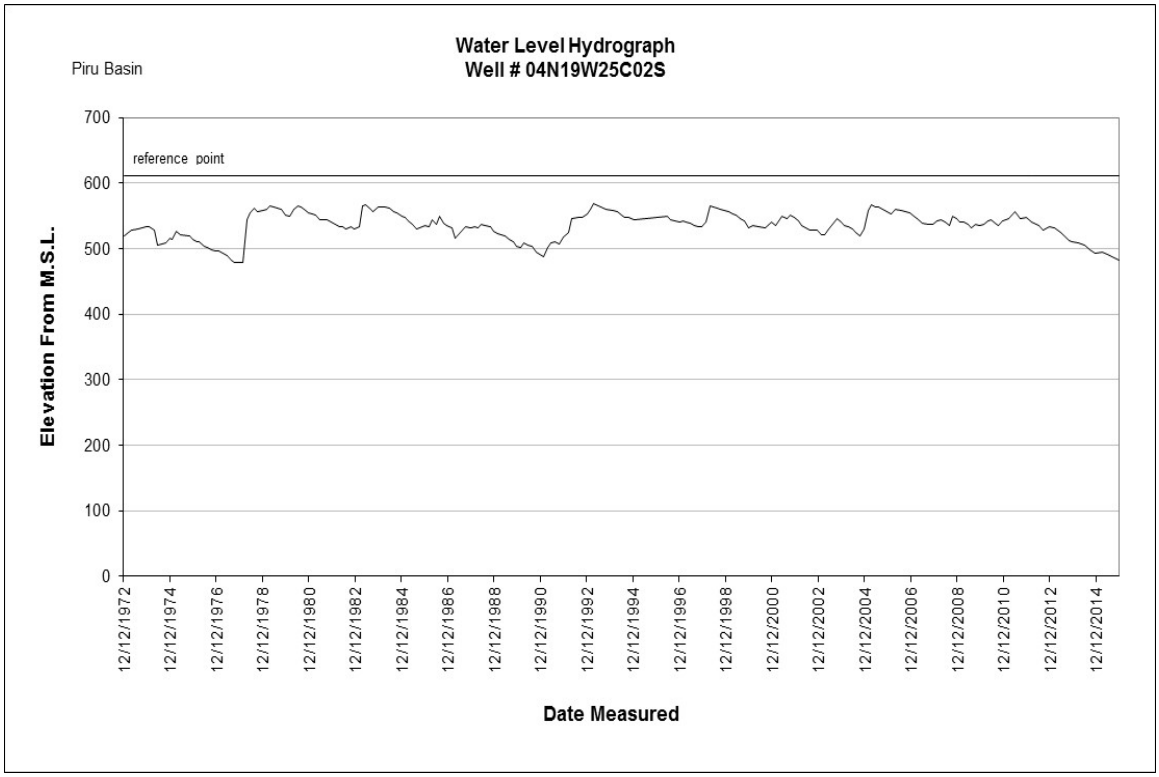

Figure B-30: Piru Basin Key Well Hydrograph.

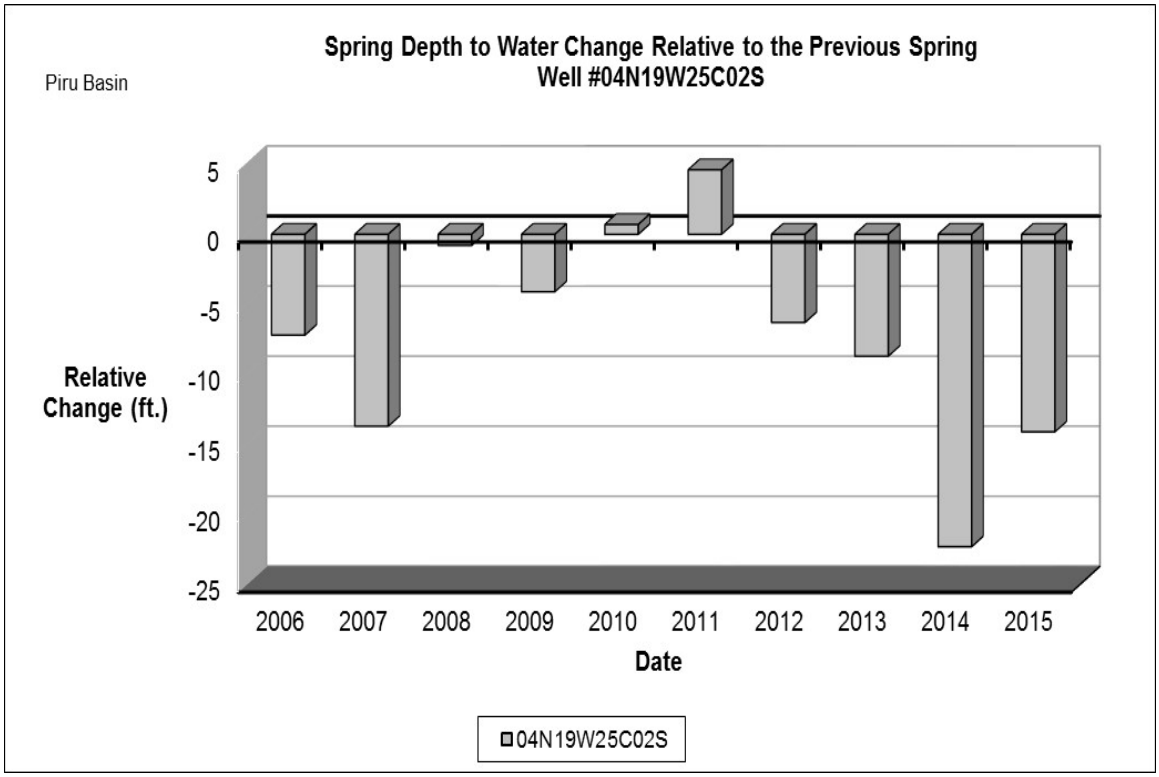

Figure B-31: Piru Basin 10 year spring level change depicted on Up/Down graph.

Appendix B – Key Water Level Wells

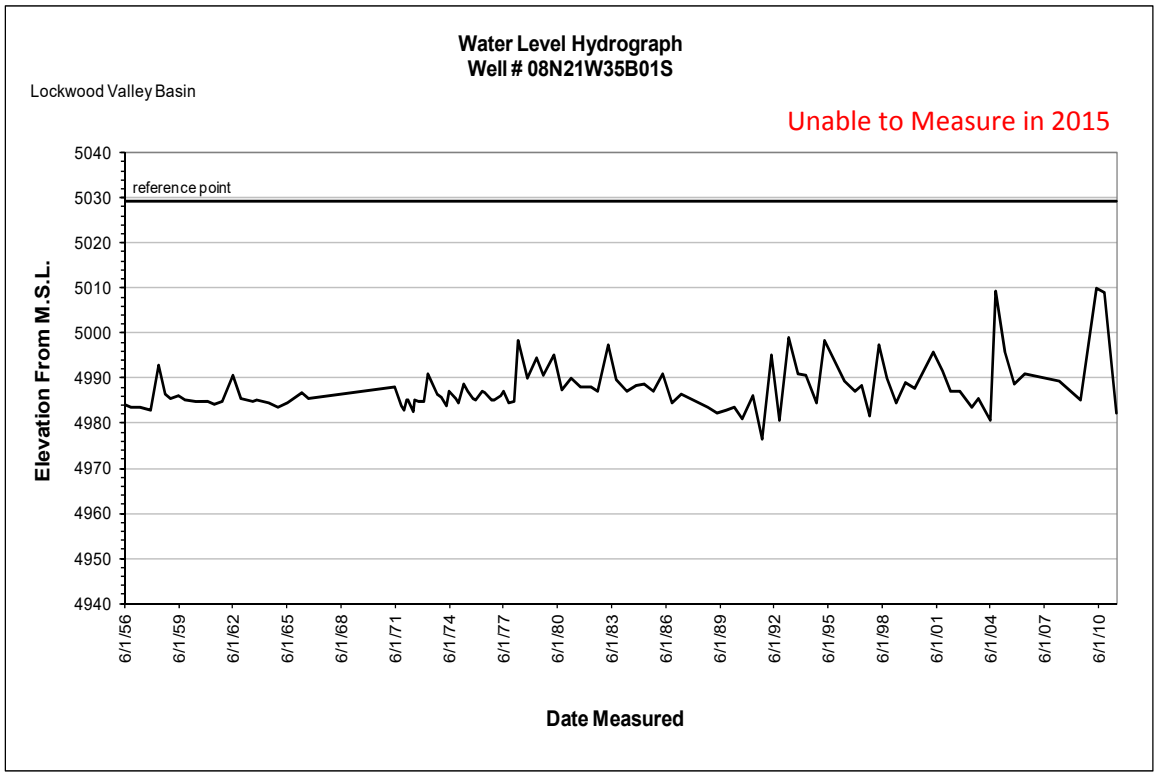

Figure B-32: Lockwood Valley Basin Key Well Hydrograph.

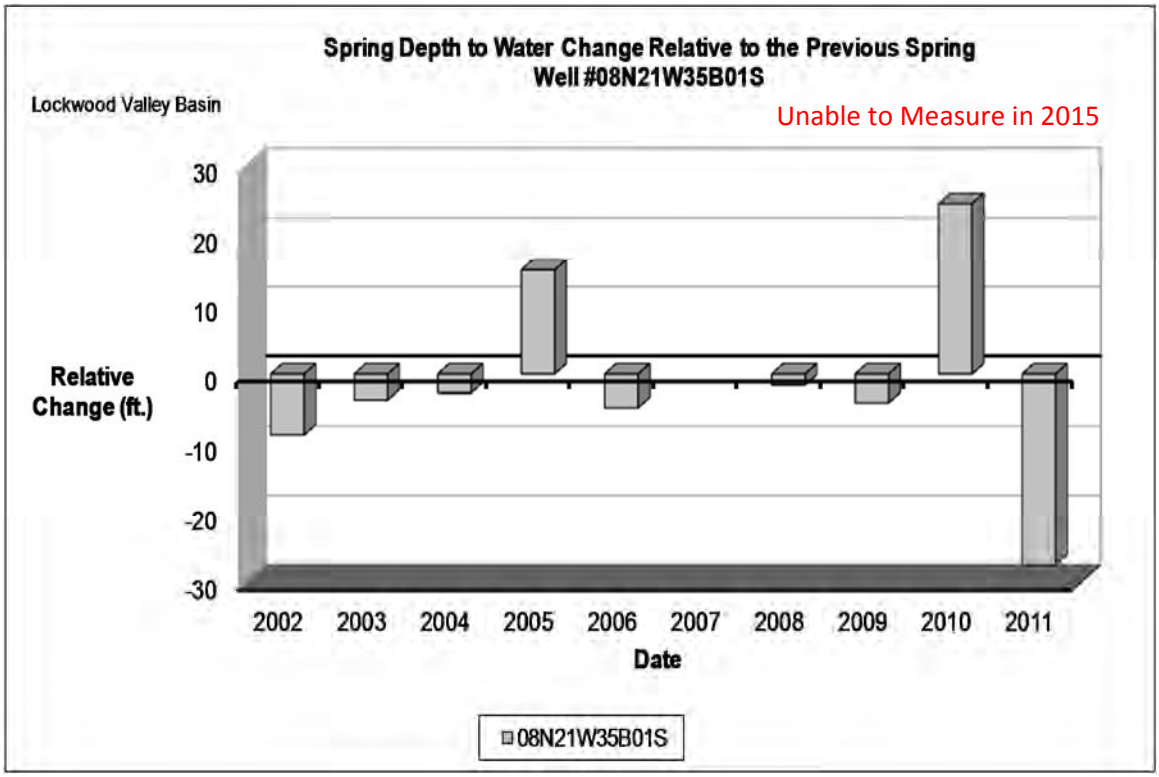

Figure B-33: Lockwood Valley Basin 10 year spring level change depicted on Up/Down graph.

Appendix B – Key Water Level Wells

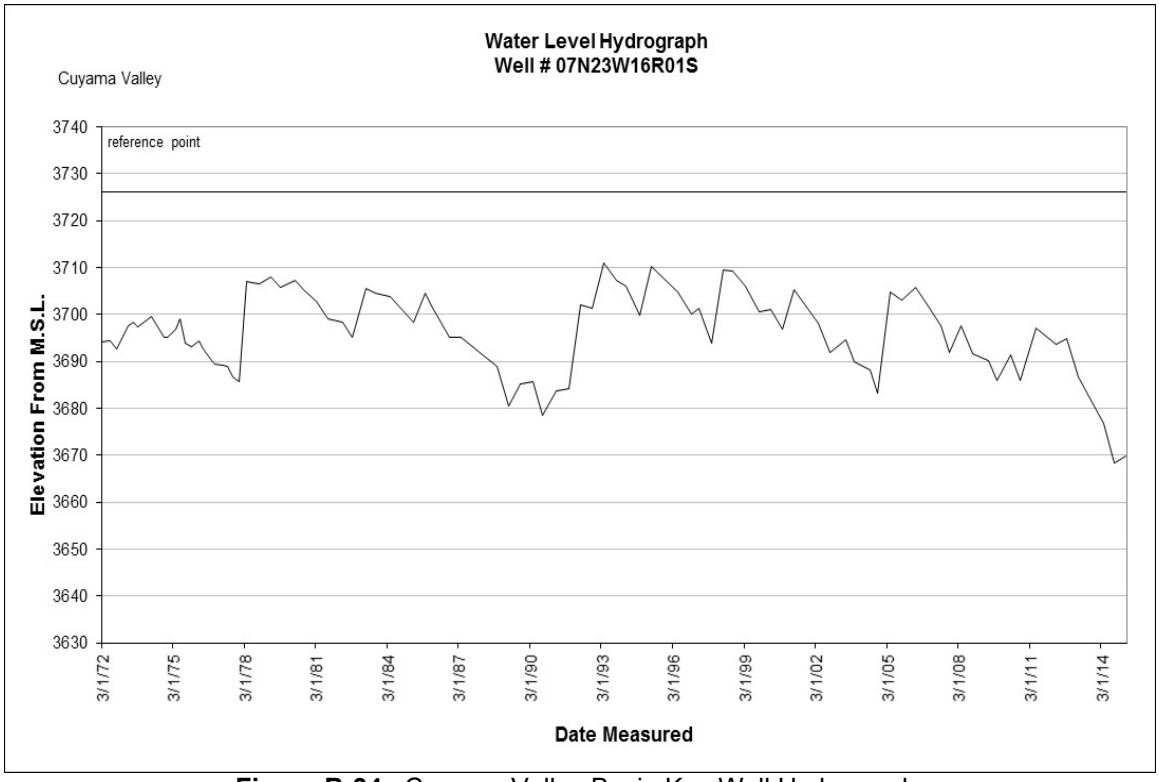

Figure B-34: Cuyama Valley Basin Key Well Hydrograph.

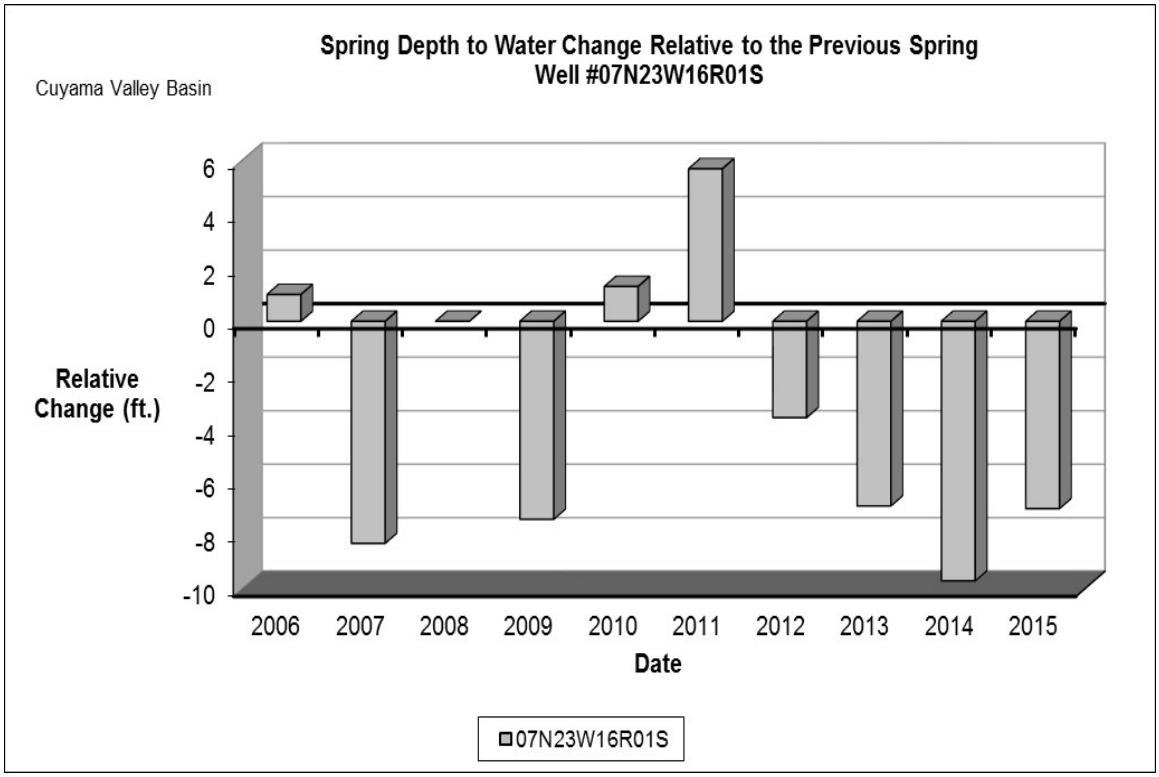

Figure B-35: Cuyama Valley Basin 10 year spring level change depicted on Up/Down graph.

Appendix C – Groundwater Level Measurement Data

Basin	SWN	Date	RP	Depth Below RP	Elev. Above MSL	Note
Arroyo Santa Rosa	02N19W20L01S	03/18/2015	307.66	63.30	244.36	
		06/17/2015	307.66	63.30	244.36	
		10/13/2015	307.66	NM	-----	Pumping
		12/07/2015	307.66	NM	-----	Pumping
	02N20W23G01S	03/18/2015	370.80	283.75	87.05	
		06/17/2015	370.80	287.85	82.95	
		10/13/2015	370.80	288.50	82.30	
		12/07/2015	370.80	289.50	81.30	
	02N20W23K01S	03/18/2015	274.11	201.86	72.25	
		06/17/2015	274.11	205.25	68.86	
		10/13/2015	274.11	213.00	61.11	
		12/07/2015	274.11	214.20	59.91	
	02N20W23R01S	03/18/2015	235.21	NM	-----	Pumping
		06/17/2015	235.21	89.65	145.56	
		10/13/2015	235.21	NM	-----	Pumping
		12/07/2015	235.21	NM	-----	Pumping
	02N20W26B03S*	03/18/2015	205.87	55.08	150.79	
		06/17/2015	205.87	57.30	148.57	
		10/13/2015	205.87	63.70	142.17	
		12/07/2015	205.87	58.10	147.77	
Conejo Valley	01N19W07K16S	03/12/2015	635.46	9.30	626.16	
		06/10/2015	635.46	10.70	624.76	
		10/23/2015	635.46	12.60	622.86	
		12/29/2015	635.46	12.80	622.66	
	01N20W03J01S	03/12/2015	764.40	47.70	716.70	
		06/10/2015	764.40	52.10	712.30	
		11/04/2015	764.40	56.90	707.50	
		12/29/2015	764.40	58.40	706.00	
Cuyama Valley	07N23W16R01S*	03/27/2015	3,726.00	56.10	3,669.90	
		09/16/2015	3,726.00	NM	-----	Special
		11/05/2015	3,726.00	59.20	3,666.80	
	07N23W16R02S	03/27/2015	3,726.00	NM	-----	Pumping
		11/05/2015	3,726.00	NM	-----	Special
	07N24W13C03S	03/27/2015	3,435.00	46.30	3,388.70	
		09/16/2015	3,435.00	NM	-----	Special
		11/05/2015	3,435.00	50.00	3,385.00	
	09N24W33J03S	03/27/2015	3,130.00	NM	-----	Pumping
		11/05/2015	3,130.00	161.70	2,968.30	
Fillmore	03N19W06D02S	03/16/2015	434.60	NM	-----	Pumping
		06/15/2015	434.60	79.20	355.40	
		10/12/2015	434.60	87.33	347.27	
		12/02/2015	434.60	90.30	344.30	
	03N20W01C04S	03/16/2015	404.58	49.08	355.50	
		06/15/2015	404.58	53.50	351.08	
		10/12/2015	404.58	60.10	344.48	
		12/02/2015	404.58	61.55	343.03	

* - Denotes basin key water level well.

Appendix C – Groundwater Level Measurement Data

Basin	SWN	Date	RP	Depth Below RP	Elev. Above MSL	Note
Fillmore	03N20W05D01S*	03/16/2015	437.12	143.27	293.85	
		06/15/2015	437.12	144.30	292.82	
		10/14/2015	437.12	154.77	282.35	
		12/02/2015	437.12	151.58	285.54	
	03N20W09D01S	03/16/2015	325.20	NM	-----	Pumping
		06/15/2015	325.20	NM	-----	Pumping
		10/12/2015	325.20	23.80	301.40	
		12/02/2015	325.20	25.53	299.67	
	03N20W11C01S	03/16/2015	397.11	59.20	337.91	
		06/15/2015	397.11	64.00	333.11	
		10/12/2015	397.11	NM	-----	Pumping
		12/02/2015	397.11	72.70	324.41	
	03N21W01P02S	03/16/2015	301.85	48.10	253.75	
		06/15/2015	301.85	51.30	250.55	
		10/12/2015	301.85	54.60	247.25	
		12/02/2015	301.85	57.40	244.45	
	03N21W11B01S	03/16/2015	336.24	96.00	240.24	
		06/15/2015	336.24	98.20	238.04	
		10/14/2015	336.24	105.90	230.34	
		12/03/2015	336.24	105.40	230.84	
	04N19W30D01S	03/16/2015	434.43	62.50	371.93	
		06/15/2015	434.43	NM	-----	Pumping
		10/12/2015	434.43	NM	-----	Tape Hung Up
		12/02/2015	434.43	NM	-----	Pumping
	04N19W31R01S	03/16/2015	448.85	NM	-----	Pumping
		06/15/2015	448.85	NM	-----	Pumping
		10/12/2015	448.85	NM	-----	Pumping
		12/02/2015	448.85	NM	-----	Pumping
	04N19W32M02S	03/16/2015	449.46	NM	-----	Pumping
		06/15/2015	449.46	NM	-----	Pumping
		10/12/2015	449.46	NM	-----	Pumping
		12/02/2015	449.46	NM	-----	Pumping
	04N19W33D03S	03/16/2015	477.43	18.40	459.03	
		06/15/2015	477.43	NM	-----	Pumping
		10/12/2015	477.43	NM	-----	Pumping
		12/02/2015	477.43	NM	-----	Pumping
	04N19W33D04S	03/16/2015	477.90	NM	-----	Pumping
		06/15/2015	477.90	20.95	456.95	
		10/12/2015	477.90	25.15	452.75	
		12/02/2015	477.90	26.50	451.40	
	04N20W23Q02S	03/16/2015	513.88	141.57	372.31	
		06/15/2015	513.88	149.40	364.48	
		10/14/2015	513.88	NM	-----	Pumping
		12/02/2015	513.88	160.32	353.56	

* - Denotes basin key water level well.

Appendix C – Groundwater Level Measurement Data

Basin	SWN	Date	RP	Depth Below RP	Elev. Above MSL	Note
Fillmore	04N20W26C02S	03/16/2015	505.35	147.80	357.55	
		06/15/2015	505.35	123.70	381.65	
		10/14/2015	505.35	161.40	343.95	
		12/02/2015	505.35	163.00	342.35	
	04N20W33C03S	03/16/2015	526.87	NM	-----	Special
		06/15/2015	526.87	NM	-----	Pumping
		10/14/2015	526.87	NM	-----	Pumping
		12/02/2015	526.87	NM	-----	Pumping
Las Posas - East	02N20W01M01S	03/10/2015	470.05	NM	-----	Inaccessible
		10/22/2015	470.05	NM	-----	Special
		12/22/2015	470.05	NM	-----	Special
	02N20W03K03S	03/10/2015	485.50	NM	-----	Special
		10/22/2015	485.50	NM	-----	Special
		12/22/2015	485.50	NM	-----	Special
	02N20W10D02S	03/10/2015	459.53	294.00	165.53	
		06/08/2015	459.53	309.10	150.43	
		10/27/2015	459.53	309.00	150.53	
		12/22/2015	459.53	112.80	346.73	
	02N20W10G01S	03/10/2015	415.47	155.90	259.57	
		06/08/2015	415.47	160.90	254.57	
		10/27/2015	415.47	170.70	244.77	
		12/24/2015	415.47	167.90	247.57	
	02N20W10J01S	03/10/2015	406.87	121.10	285.77	
		06/04/2015	406.87	123.70	283.17	
		10/27/2015	406.87	127.60	279.27	
		12/22/2015	406.87	127.80	279.07	
	03N19W17Q01S	10/15/2015	1,311.06	1,098.90	212.16	
		12/22/2015	1,311.06	NM	-----	Inaccessible
	03N19W19J01S	03/09/2015	1,026.90	847.20	179.70	
		06/05/2015	1,026.90	845.80	181.10	
		10/21/2015	1,026.90	850.70	176.20	
		12/21/2015	1,026.90	854.10	172.80	
	03N19W19P02S	03/09/2015	1,057.94	NM	-----	Special
		10/21/2015	1,057.94	NM	-----	Special
		12/21/2015	1,057.94	NM	-----	Inaccessible
	03N19W29F06S	03/09/2015	855.20	253.70	601.50	
		06/05/2015	855.20	256.80	598.40	
		10/21/2015	855.20	275.20	580.00	
		12/21/2015	855.20	273.20	582.00	
	03N19W29K04S	03/13/2015	843.32	NM	-----	Special
		10/29/2015	843.32	NM	-----	Special
		12/22/2015	843.32	NM	-----	Inaccessible
	03N20W23L01S	03/10/2015	970.30	NM	-----	Special
		10/21/2015	970.30	NM	-----	Special
		12/21/2015	970.30	NM	-----	Inaccessible

* - Denotes basin key water level well.

Appendix C – Groundwater Level Measurement Data

Basin	SWN	Date	RP	Depth Below RP	Elev. Above MSL	Note
Las Posas - East	03N20W25H01S	03/10/2015	823.84	NM	-----	Pumping
		06/08/2015	823.84	217.90	605.94	
		10/21/2015	823.84	NM	-----	Pumping
		12/21/2015	823.84	218.40	605.44	
	03N20W26R03S*	03/10/2015	717.81	571.30	146.51	
		06/05/2015	717.81	587.00	130.81	
		11/02/2015	717.81	585.90	131.91	
		12/21/2015	717.81	586.80	131.01	
	03N20W27H03S	03/09/2015	840.25	631.90	208.35	
		06/05/2015	840.25	632.30	207.95	
		10/27/2015	840.25	637.90	202.35	
		12/21/2015	840.25	640.30	199.95	
	03N20W34G01S	03/09/2015	680.48	535.40	145.08	
		06/05/2015	680.48	NM	-----	Pumping
		10/29/2015	680.48	538.60	141.88	
		12/21/2015	680.48	538.70	141.78	
	03N20W35R02S	03/09/2015	572.67	416.10	156.57	
		10/29/2015	572.67	444.70	127.97	
		12/21/2015	572.67	NM	-----	Special
	03N20W35R03S	03/09/2015	572.67	417.10	155.57	
		06/04/2015	572.67	431.30	141.37	
		10/29/2015	572.67	436.10	136.57	
		12/21/2015	572.67	430.30	142.37	
	03N20W35R04S	03/09/2015	572.67	301.50	271.17	
		10/29/2015	572.67	308.00	264.67	
		12/21/2015	572.67	NM	-----	Special
Las Posas - South	02N19W05K01S*	03/13/2015	497.80	28.10	469.70	
		10/29/2015	497.80	28.10	469.70	
		12/22/2015	497.80	28.75	469.05	
	02N19W08H02S	03/13/2015	494.87	23.80	471.07	
		10/29/2015	494.87	24.10	470.77	
		12/22/2015	494.87	23.80	471.07	
Las Posas - West	02N20W05D01S	12/21/2015	569.00	693.10	-124.10	
	02N20W06R01S	03/09/2015	461.19	585.40	-124.21	
		06/04/2015	461.19	585.70	-124.51	
		10/27/2015	461.19	594.70	-133.51	
		12/24/2015	461.19	592.70	-131.51	
	02N20W07R02S	03/16/2015	395.00	533.70	-138.70	
		10/22/2015	395.00	534.80	-139.80	
		12/22/2015	395.00	536.10	-141.10	
	02N21W08H03S	12/21/2015	334.21	397.90	-63.69	
	02N21W09D02S	03/09/2015	323.75	323.80	-0.05	
		06/01/2015	323.75	314.60	9.15	
		10/27/2015	323.75	323.80	-0.05	
		12/14/2015	323.75	309.96	13.79	

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Appendix C – Groundwater Level Measurement Data

Basin	SWN	Date	RP	Depth Below RP	Elev. Above MSL	Note
Las Posas - West	02N21W10G03S	03/09/2015	381.01	375.50	5.51	
		06/23/2015	381.01	390.50	-9.49	
		10/28/2015	381.01	398.60	-17.59	
		12/24/2015	381.01	397.60	-16.59	
	02N21W11J03S	03/16/2015	379.39	430.40	-51.01	
		06/04/2015	379.39	443.70	-64.31	
		10/22/2015	379.39	448.40	-69.01	
		12/24/2015	379.39	448.80	-69.41	
	02N21W11J04S	03/16/2015	379.39	388.00	-8.61	
		06/04/2015	379.39	391.20	-11.81	
		10/22/2015	379.39	395.70	-16.31	
		12/24/2015	379.39	395.60	-16.21	
	02N21W11J05S	03/16/2015	379.39	206.70	172.69	
		06/04/2015	379.39	206.50	172.89	
		10/22/2015	379.39	209.90	169.49	
		12/24/2015	379.39	210.40	168.99	
	02N21W11J06S	03/16/2015	379.39	177.90	201.49	
		06/04/2015	379.39	177.40	201.99	
		10/22/2015	379.39	178.40	200.99	
		12/24/2015	379.39	179.50	199.89	
	02N21W12H01S*	03/16/2015	417.89	NM	-----	Pumping
		10/22/2015	417.89	NM	-----	Pumping
		12/24/2015	417.89	NM	-----	Pumping
	02N21W15M03S	03/09/2015	263.87	287.70	-23.83	
		06/05/2015	263.87	324.60	-60.73	
		10/22/2015	263.87	317.50	-53.63	
		12/21/2015	263.87	315.50	-51.63	
	02N21W16J01S	03/09/2015	259.90	15.50	244.40	
		06/04/2015	259.90	16.60	243.30	
		10/22/2015	259.90	17.20	242.70	
		12/21/2015	259.90	17.40	242.50	
	03N20W32H03S	03/09/2015	673.00	0.00	673.00	
		06/05/2015	673.00	725.10	-52.10	
		10/21/2015	673.00	783.80	-110.80	
		12/21/2015	673.00	807.50	-134.50	
	03N21W35P02S	03/09/2015	564.11	498.50	65.61	
		06/04/2015	564.11	506.50	57.61	
		10/27/2015	564.11	517.90	46.21	
		12/21/2015	564.11	523.20	40.91	
Little Cuddy Valley	08N20W08B01S	03/27/2015	5,300.00	15.70	5,284.30	
		11/05/2015	5,300.00	18.10	5,281.90	
Lockwood Valley	08N21W33R03S	03/27/2015	5,150.00	45.10	5,104.90	
		11/05/2015	5,150.00	46.30	5,103.70	
	08N21W35B01S*	03/27/2015	5,029.20	NM	-----	Tape Hung Up
		11/05/2015	5,029.20	NM	-----	Tape Hung Up
	08N21W36G02S	03/27/2015	4,922.00	27.40	4,894.60	
		11/05/2015	4,922.00	30.50	4,891.50	

* - Denotes basin key water level well.

Appendix C – Groundwater Level Measurement Data

Basin	SWN	Date	RP	Depth Below RP	Elev. Above MSL	Note
Mound	02N22W08P01S	03/18/2015	213.79	180.65	33.14	
		06/15/2015	213.79	180.65	33.14	
		10/14/2015	213.79	178.34	35.45	
		12/03/2015	213.79	173.72	40.07	
	02N22W09L03S	03/16/2015	251.25	197.75	53.50	
		06/15/2015	251.25	195.60	55.65	
		10/14/2015	251.25	196.00	55.25	
		12/03/2015	251.25	196.67	54.58	
	02N22W09L04S	03/16/2015	251.25	180.67	70.58	
		06/15/2015	251.25	182.85	68.40	
		10/14/2015	251.25	181.74	69.51	
		12/03/2015	251.25	182.45	68.80	
	02N22W16K01S	03/16/2015	149.37	175.66	-26.29	
		06/15/2015	149.37	178.20	-28.83	
		10/14/2015	149.37	185.80	-36.43	
		12/03/2015	149.37	185.25	-35.88	
	02N23W13K03S	03/17/2015	68.71	79.50	-10.79	
		06/15/2015	68.71	NM	-----	Pumping
		10/16/2015	68.71	82.00	-13.29	
		12/08/2015	68.71	NM	-----	Pumping
Ojai Valley	04N22W04Q01S	03/05/2015	1,045.50	99.10	946.40	
		06/24/2015	1,045.50	NM	-----	Pumping
		11/06/2015	1,045.50	114.00	931.50	
		12/18/2015	1,045.50	115.20	930.30	
	04N22W05D03S	03/05/2015	895.97	NM	-----	Tape Hung Up
		10/27/2015	895.97	NM	-----	Tape Hung Up
		12/18/2015	895.97	NM	-----	Tape Hung Up
	04N22W05H04S	03/05/2015	950.22	342.20	608.02	
		06/24/2015	950.22	NM	-----	Pumping
		11/06/2015	950.22	NM	-----	Pumping
		12/18/2015	950.22	NM	-----	Pumping
	04N22W05L08S*	03/05/2015	892.09	231.30	660.79	
		06/24/2015	892.09	248.60	643.49	
		11/06/2015	892.09	260.70	631.39	
		12/17/2015	892.09	287.10	604.99	
	04N22W05M01S	03/04/2015	843.47	195.20	648.27	
		06/11/2015	843.47	197.50	645.97	
		10/26/2015	843.47	NM	-----	Tape Hung Up
		12/16/2015	843.47	NM	-----	Pumping
	04N22W06D01S	03/04/2015	846.66	147.30	699.36	
		06/11/2015	846.66	150.60	696.06	
		11/03/2015	846.66	152.20	694.46	
		12/16/2015	846.66	152.50	694.16	
	04N22W06D05S	03/04/2015	853.21	166.60	686.61	
		06/11/2015	853.21	165.50	687.71	
		11/03/2015	853.21	177.40	675.81	
		12/16/2015	853.21	177.30	675.91	

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Appendix C – Groundwater Level Measurement Data

Basin	SWN	Date	RP	Depth Below RP	Elev. Above MSL	Note
Ojai Valley	04N22W06K03S	02/28/2015	801.80	172.00	629.80	
		06/19/2015	801.80	204.00	597.80	
		11/03/2015	801.80	NM	-----	Special
		11/23/2015	801.80	223.00	578.80	
	04N22W06K12S	03/04/2015	812.70	180.50	632.20	
		06/03/2015	812.70	207.70	605.00	
		10/27/2015	812.70	224.80	587.90	
		12/17/2015	812.70	231.90	580.80	
	04N22W06M01S	03/04/2015	794.78	97.80	696.98	
		06/03/2015	794.78	97.60	697.18	
		10/28/2015	794.78	97.80	696.98	
		12/16/2015	794.78	99.60	695.18	
	04N22W07B02S	03/04/2015	773.77	122.00	651.77	
		06/02/2015	773.77	156.40	617.37	
		10/26/2015	773.77	160.70	613.07	
		12/16/2015	773.77	161.70	612.07	
	04N22W07G01S	03/04/2015	771.20	NM	-----	Tape Hung Up
		06/02/2015	771.20	98.80	672.40	
		11/03/2015	771.20	0.00	771.20	
		12/16/2015	771.20	NM	-----	Tape Hung Up
	04N22W08B02S	03/11/2015	870.57	207.10	663.47	
		06/24/2015	870.57	NM	-----	Pumping
		11/06/2015	870.57	248.80	621.77	
		12/18/2015	870.57	235.20	635.37	
	04N23W01K02S	03/04/2015	786.38	58.00	728.38	
		06/03/2015	786.38	75.80	710.58	
		10/28/2015	786.38	64.90	721.48	
		12/16/2015	786.38	62.90	723.48	
	04N23W02K01S	03/05/2015	869.49	2.75	866.74	
		10/28/2015	869.49	9.70	859.79	
		12/16/2015	869.49	9.40	860.09	
	04N23W12H02S	03/13/2015	716.61	48.50	668.11	
		06/02/2015	716.61	52.20	664.41	
		11/03/2015	716.61	54.80	661.81	
		12/16/2015	716.61	55.20	661.41	
	04N23W12L02S	03/05/2015	682.50	NM	-----	Tape Hung Up
		06/11/2015	682.50	NM	-----	Tape Hung Up
		11/03/2015	682.50	21.70	660.80	
		12/15/2015	682.50	NM	-----	Inaccessible
	05N22W32J02S	03/11/2015	1,139.80	58.10	1,081.70	
		06/24/2015	1,139.80	59.70	1,080.10	
		10/27/2015	1,139.80	59.00	1,080.80	
		12/17/2015	1,139.80	58.80	1,081.00	

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Appendix C – Groundwater Level Measurement Data

Basin	SWN	Date	RP	Depth Below RP	Elev. Above MSL	Note
Oxnard Plain Forebay	02N21W07P04S	03/09/2015	138.78	NM	-----	Pumping
		06/04/2015	138.78	NM	-----	Pumping
		10/27/2015	138.78	NM	-----	Pumping
		12/21/2015	138.78	NM	-----	Special
	02N22W11A01S	03/16/2015	133.44	100.36	33.08	
		06/15/2015	133.44	105.35	28.09	
		10/14/2015	133.44	109.00	24.44	
		12/03/2015	133.44	111.36	22.08	
	02N22W26E01S	03/18/2015	86.96	100.05	-13.09	
		06/17/2015	86.96	103.20	-16.24	
		10/14/2015	86.96	106.83	-19.87	
		12/09/2015	86.96	108.96	-22.00	
Oxnard Plain Pressure	01N21W04N02S	03/17/2015	43.33	139.78	-96.45	
		06/16/2015	43.33	155.67	-112.34	
		10/15/2015	43.33	181.55	-138.22	
		12/09/2015	43.33	190.65	-147.32	
	01N21W05A02S	03/18/2015	51.54	NM	-----	Destroyed
	01N21W06L04S	03/17/2015	47.85	63.15	-15.30	
		06/17/2015	47.85	66.70	-18.85	
		10/15/2015	47.85	72.85	-25.00	
		12/09/2015	47.85	70.70	-22.85	
	01N21W07H01S*	03/17/2015	40.87	53.82	-12.95	
		06/17/2015	40.87	58.00	-17.13	
		10/15/2015	40.87	63.45	-22.58	
		12/09/2015	40.87	60.33	-19.46	
	01N21W09C04S	03/17/2015	39.96	132.60	-92.64	
		06/16/2015	39.96	144.32	-104.36	
		10/15/2015	39.96	171.67	-131.71	
		12/09/2015	39.96	183.45	-143.49	
	01N21W16M01S	03/17/2015	22.79	127.42	-104.63	
		06/16/2015	22.79	134.83	-112.04	
		10/15/2015	22.79	175.50	-152.71	
		12/08/2015	22.79	179.20	-156.41	
	01N21W16P03S	03/17/2015	19.39	126.36	-106.97	
		06/16/2015	19.39	140.83	-121.44	
		10/15/2015	19.39	176.25	-156.86	
		12/08/2015	19.39	174.20	-154.81	
	01N21W17D02S	03/17/2015	28.21	47.00	-18.79	
		06/16/2015	28.21	47.05	-18.84	
		10/15/2015	28.21	NM	-----	Pumping
		12/09/2015	28.21	49.20	-20.99	
	01N21W20N07S	03/19/2015	16.98	NM	-----	Special
		06/16/2015	16.98	NM	-----	Special
		10/16/2015	16.98	NM	-----	Special
		12/08/2015	16.98	NM	-----	Special

* - Denotes basin key water level well.

Appendix C – Groundwater Level Measurement Data

Basin	SWN	Date	RP	Depth Below RP	Elev. Above MSL	Note
Oxnard Plain Pressure	01N21W21N01S	03/17/2015	15.74	74.30	-58.56	
		06/16/2015	15.74	91.80	-76.06	
		10/15/2015	15.74	111.00	-95.26	
		12/08/2015	15.74	117.00	-101.26	
	01N21W28D01S	03/17/2015	14.75	97.88	-83.13	
		06/16/2015	14.75	116.60	-101.85	
		10/15/2015	14.75	NM	-----	Pumping
		12/08/2015	14.75	NM	-----	Pumping
	01N21W29B03S	03/17/2015	18.19	36.36	-18.17	
		06/16/2015	18.19	NM	-----	Pumping
		10/16/2015	18.19	NM	-----	Pumping
		12/08/2015	18.19	47.04	-28.85	
	01N21W32K01S*	03/09/2015	10.00	78.20	-68.20	
		06/15/2015	10.00	101.50	-91.50	
		10/19/2015	10.00	122.40	-112.40	
		12/14/2015	10.00	124.70	-114.70	
	01N22W12N03S	03/18/2015	38.46	108.36	-69.90	
		06/18/2015	38.46	122.89	-84.43	
		10/13/2015	38.46	143.05	-104.59	
		12/09/2015	38.46	147.10	-108.64	
	01N22W12R01S	03/18/2015	34.00	NM	-----	Special
		06/17/2015	34.00	NM	-----	Special
		10/13/2015	34.00	NM	-----	Special
		12/09/2015	34.00	117.17	-83.17	
	01N22W14K01S	03/17/2015	33.97	NM	-----	Tape Hung Up
		06/16/2015	33.97	NM	-----	Tape Hung Up
		10/16/2015	33.97	86.80	-52.83	
		12/08/2015	33.97	55.65	-21.68	
	01N22W21B03S	03/17/2015	15.28	43.33	-28.05	
		06/16/2015	15.28	47.52	-32.24	
		10/16/2015	15.28	53.14	-37.86	
		12/08/2015	15.28	54.00	-38.72	
	01N22W24C02S	03/17/2015	29.10	45.47	-16.37	
		06/16/2015	29.10	47.52	-18.42	
		10/16/2015	29.10	38.28	-9.18	
		12/08/2015	29.10	30.60	-1.50	
	01N22W26K03S	03/17/2015	13.06	78.70	-65.64	
		06/16/2015	13.06	84.90	-71.84	
		10/16/2015	13.06	NM	-----	Pumping
		12/08/2015	13.06	NM	-----	Pumping
	01N22W26M03S	03/17/2015	13.00	NM	-----	Pumping
		06/18/2015	13.00	78.90	-65.90	
		10/16/2015	13.00	NM	-----	Pumping
		12/08/2015	13.00	NM	-----	Pumping
	01N22W36B02S	03/17/2015	11.50	NM	-----	Pumping
		06/18/2015	11.50	82.20	-70.70	
		10/16/2015	11.50	NM	-----	Pumping
		12/08/2015	11.50	NM	-----	Pumping

* - Denotes basin key water level well.

Appendix C – Groundwater Level Measurement Data

Basin	SWN	Date	RP	Depth Below RP	Elev. Above MSL	Note
Oxnard Plain Pressure	02N21W18H03S	03/23/2015	118.41	123.10	-4.69	
		06/22/2015	118.41	137.25	-18.84	
		10/26/2015	118.41	126.60	-8.19	
		12/14/2015	118.41	124.00	-5.59	
	02N21W18H12S	03/09/2015	117.88	150.60	-32.72	
		06/01/2015	117.88	164.50	-46.62	
		10/26/2015	117.88	175.10	-57.22	
		12/14/2015	117.88	169.40	-51.52	
	02N21W19A03S	03/09/2015	102.70	122.70	-20.00	
		06/04/2015	102.70	137.40	-34.70	
		10/21/2015	102.70	156.10	-53.40	
		12/22/2015	102.70	138.50	-35.80	
	02N21W19B02S	03/18/2015	101.80	105.17	-3.37	
		06/17/2015	101.80	108.80	-7.00	
		10/14/2015	101.80	112.20	-10.40	
		12/09/2015	101.80	114.10	-12.30	
	02N21W20F02S	03/10/2015	113.36	159.30	-45.94	
		06/04/2015	113.36	172.80	-59.44	
		10/27/2015	113.36	197.10	-83.74	
		12/22/2015	113.36	178.20	-64.84	
	02N21W20M06S	03/18/2015	92.09	NM	-----	Pumping
		06/17/2015	92.09	NM	-----	Pumping
		10/14/2015	92.09	NM	-----	Pumping
		12/07/2015	92.09	160.90	-68.81	
	02N21W31P02S	03/17/2015	57.75	68.62	-10.87	
		06/17/2015	57.75	72.42	-14.67	
		10/15/2015	57.75	NM	-----	Pumping
		12/09/2015	57.75	77.00	-19.25	
	02N21W31P03S	03/17/2015	55.17	140.92	-85.75	
		06/17/2015	55.17	148.70	-93.53	
		10/15/2015	55.17	170.68	-115.51	
		12/09/2015	55.17	171.15	-115.98	
	02N22W24P01S	03/19/2015	94.30	113.64	-19.34	
		06/17/2015	94.30	NM	-----	Pumping
		10/14/2015	94.30	127.83	-33.53	
		12/09/2015	94.30	124.75	-30.45	
	02N22W30K01S	03/17/2015	42.38	60.67	-18.29	
		06/16/2015	42.38	62.70	-20.32	
		10/20/2015	42.38	68.25	-25.87	
		12/08/2015	42.38	69.20	-26.82	
	02N22W31A01S	03/17/2015	42.30	57.20	-14.90	
		06/16/2015	42.30	59.15	-16.85	
		10/20/2015	42.30	65.00	-22.70	
		12/08/2015	42.30	65.49	-23.19	
	02N22W32Q03S	03/17/2015	40.10	57.00	-16.90	
		06/16/2015	40.10	58.20	-18.10	
		10/20/2015	40.10	64.00	-23.90	
		12/08/2015	40.10	NM	-----	Pumping

* - Denotes basin key water level well.

Appendix C – Groundwater Level Measurement Data

Basin	SWN	Date	RP	Depth Below RP	Elev. Above MSL	Note
Oxnard Plain Pressure	02N23W25G02S	03/17/2015	23.22	NM	-----	Special
		06/16/2015	23.22	NM	-----	Special
		10/20/2015	23.22	NM	-----	Special
		12/08/2015	23.22	NM	-----	Special
	02N23W36C04S	03/17/2015	27.73	NM	-----	Tape Hung Up
		06/16/2015	27.73	NM	-----	Tape Hung Up
		10/16/2015	27.73	NM	-----	Tape Hung Up
		12/08/2015	27.73	52.00	-24.27	
Piru	04N18W19R01S	03/16/2015	655.63	NM	-----	Pumping
		06/15/2015	655.63	150.00	505.63	
		10/12/2015	655.63	161.24	494.39	
		12/02/2015	655.63	163.80	491.83	
	04N18W20R01S	03/16/2015	661.29	NM	-----	Pumping
		06/15/2015	661.29	NM	-----	Pumping
		10/12/2015	661.29	NM	-----	Pumping
		12/02/2015	661.29	NM	-----	Pumping
	04N18W28C02S	03/16/2015	676.44	NM	-----	Pumping
		06/15/2015	676.44	NM	-----	Pumping
		10/12/2015	676.44	NM	-----	Pumping
		12/02/2015	676.44	177.10	499.34	
	04N19W25C02S*	03/16/2015	611.09	116.33	494.76	
		06/15/2015	611.09	119.60	491.49	
		10/12/2015	611.09	NM	-----	Pumping
		12/02/2015	611.09	128.30	482.79	
	04N19W25K04S	03/16/2015	593.97	41.45	552.52	
		06/15/2015	593.97	NM	-----	Pumping
		10/12/2015	593.97	42.45	551.52	
		12/02/2015	593.97	NM	-----	Pumping
	04N19W26P01S	03/16/2015	563.00	NM	-----	Pumping
		06/15/2015	563.00	77.00	486.00	
		10/12/2015	563.00	NM	-----	Pumping
		12/02/2015	563.00	NM	-----	Pumping
	04N19W34K01S	03/16/2015	519.51	41.12	478.39	
		06/15/2015	519.51	44.75	474.76	
		10/12/2015	519.51	50.00	469.51	
		12/02/2015	519.51	51.10	468.41	
	04N19W35L02S	03/16/2015	541.08	54.42	486.66	
		06/15/2015	541.08	58.35	482.73	
		10/12/2015	541.08	63.20	477.88	
		12/02/2015	541.08	64.80	476.28	
Pleasant Valley	01N21W02J02S	03/17/2015	89.51	79.83	9.68	
		06/16/2015	89.51	89.85	-0.34	
		10/13/2015	89.51	107.27	-17.76	
		12/08/2015	89.51	116.42	-26.91	
	01N21W02P01S	03/17/2015	67.98	121.43	-53.45	
		06/16/2015	67.98	140.47	-72.49	
		10/13/2015	67.98	159.75	-91.77	
		12/08/2015	67.98	174.30	-106.32	

* - Denotes basin key water level well.

Appendix C – Groundwater Level Measurement Data

Basin	SWN	Date	RP	Depth Below RP	Elev. Above MSL	Note
Pleasant Valley	01N21W03C01S	03/18/2015	72.28	155.92	-83.64	
		06/17/2015	72.28	171.05	-98.77	
		10/15/2015	72.28	189.80	-117.52	
		12/07/2015	72.28	197.80	-125.52	
	01N21W04K01S	03/17/2015	47.52	137.60	-90.08	
		06/16/2015	47.52	150.85	-103.33	
		10/15/2015	47.52	NM	-----	Pumping
		12/08/2015	47.52	NM	-----	Pumping
	01N21W09J03S	03/19/2015	30.56	152.10	-121.54	
		06/25/2015	30.56	139.40	-108.84	
		10/16/2015	30.56	184.40	-153.84	
		12/16/2015	30.56	180.70	-150.14	
	01N21W10G01S	03/17/2015	38.72	NM	-----	Pumping
		06/16/2015	38.72	149.55	-110.83	
		10/15/2015	38.72	NM	-----	Pumping
		12/08/2015	38.72	NM	-----	Pumping
	01N21W14A01S	03/17/2015	50.11	18.40	31.71	
		06/16/2015	50.11	20.75	29.36	
		10/13/2015	50.11	23.95	26.16	
		12/08/2015	50.11	26.57	23.54	
	01N21W15H01S	03/17/2015	33.17	12.83	20.34	
		06/16/2015	33.17	15.53	17.64	
		10/13/2015	33.17	20.83	12.34	
		12/08/2015	33.17	22.65	10.52	
	01N21W16A04S	03/17/2015	25.69	132.17	-106.48	
		06/16/2015	25.69	147.48	-121.79	
		10/15/2015	25.69	175.49	-149.80	
		12/08/2015	25.69	182.00	-156.31	
	02N20W19M05S	03/18/2015	200.47	161.85	38.62	
		06/17/2015	200.47	176.40	24.07	
		10/13/2015	200.47	185.30	15.17	
		12/07/2015	200.47	171.30	29.17	
	02N20W28G02S	03/18/2015	170.60	NM	-----	Special
		06/17/2015	170.60	NM	-----	Special
		10/13/2015	170.60	NM	-----	Special
		12/08/2015	170.60	NM	-----	Special
	02N21W33P02S	03/18/2015	64.63	106.80	-42.17	
		06/16/2015	64.63	124.60	-59.97	
		10/15/2015	64.63	136.00	-71.37	
		12/09/2015	64.63	154.25	-89.62	
	02N21W35M02S	03/17/2015	90.60	175.10	-84.50	
		06/16/2015	90.60	190.60	-100.00	
		10/13/2015	90.60	209.16	-118.56	
		12/08/2015	90.60	216.57	-125.97	
	02N21W36N01S	03/17/2015	111.18	89.19	21.99	
		06/16/2015	111.18	96.76	14.42	
		10/13/2015	111.18	113.45	-2.27	
		12/08/2015	111.18	121.67	-10.49	

* - Denotes basin key water level well.

Appendix C – Groundwater Level Measurement Data

Basin	SWN	Date	RP	Depth Below RP	Elev. Above MSL	Note
Santa Paula	02N22W02C01S*	03/16/2015	184.38	43.23	141.15	
		06/15/2015	184.38	47.85	136.53	
		10/14/2015	184.38	55.83	128.55	
		12/03/2015	184.38	57.85	126.53	
	02N22W03K02S	03/16/2015	248.75	132.75	116.00	
		06/16/2015	248.75	134.40	114.35	
		10/14/2015	248.75	142.10	106.65	
		12/03/2015	248.75	143.40	105.35	
	02N22W03M02S	03/16/2015	291.50	206.38	85.12	
		06/16/2015	291.50	207.30	84.20	
		10/14/2015	291.50	210.00	81.50	
		12/03/2015	291.50	212.45	79.05	
	03N21W09K02S	03/16/2015	362.18	NM	-----	Special
		06/15/2015	362.18	NM	-----	Special
		10/14/2015	362.18	187.55	174.63	
		12/03/2015	362.18	189.00	173.18	
	03N21W17Q01S	03/16/2015	283.35	104.80	178.55	
		06/15/2015	283.35	NM	-----	Pumping
		10/14/2015	283.35	NM	-----	Pumping
		12/03/2015	283.35	116.70	166.65	
	03N21W19R01S	03/16/2015	235.39	NM	-----	Pumping
		06/15/2015	235.39	NM	-----	Pumping
		10/14/2015	235.39	NM	-----	Pumping
		12/03/2015	235.39	NM	-----	Pumping
	03N21W30F01S	03/16/2015	221.21	NM	-----	Pumping
		06/15/2015	221.21	NM	-----	Pumping
		10/14/2015	221.21	NM	-----	Pumping
		12/03/2015	221.21	NM	-----	Pumping
	03N22W34R01S	03/16/2015	266.61	NM	-----	Pumping
		06/16/2015	266.61	133.85	132.76	
		10/14/2015	266.61	141.54	125.07	
		12/03/2015	266.61	147.75	118.86	
	03N22W36K05S	03/16/2015	180.89	43.80	137.09	
		06/15/2015	180.89	42.90	137.99	
		10/14/2015	180.89	51.70	129.19	
		12/03/2015	180.89	53.50	127.39	
Sherwood	01N19W19L02S	03/12/2015	1,082.00	343.40	738.60	
		06/10/2015	1,082.00	346.80	735.20	
		11/04/2015	1,082.00	208.60	873.40	
		12/29/2015	1,082.00	NM	-----	Casing Wet
	01N19W30A01S	03/12/2015	999.98	59.90	940.08	
		06/10/2015	999.98	58.60	941.38	
		10/23/2015	999.98	80.90	919.08	
		12/29/2015	999.98	57.90	942.08	
Simi Valley	02N18W04R02S	03/18/2015	870.00	50.60	819.40	
		06/17/2015	870.00	49.30	820.70	
		10/13/2015	870.00	49.33	820.67	
		12/07/2015	870.00	49.60	820.40	

* - Denotes basin key water level well.

Appendix C – Groundwater Level Measurement Data

Basin	SWN	Date	RP	Depth Below RP	Elev. Above MSL	Note
Simi Valley	02N18W10A02S	03/02/2015	926.40	80.90	845.50	
		06/01/2015	926.40	77.60	848.80	
		10/01/2015	926.40	77.70	848.70	
		12/01/2015	926.40	77.50	848.90	
Thousand Oaks	01N19W14K04S	03/12/2015	908.79	23.80	884.99	
		06/10/2015	908.79	24.10	884.69	
		11/04/2015	908.79	26.20	882.59	
		12/29/2015	908.79	26.10	882.69	
Tierra Rejada Valley	02N19W10R01S	03/18/2015	619.29	123.70	495.59	
		06/17/2015	619.29	126.40	492.89	
		10/13/2015	619.29	131.80	487.49	
		12/07/2015	619.29	135.50	483.79	
	02N19W12M03S	03/18/2015	718.95	91.60	627.35	
		06/17/2015	718.95	94.90	624.05	
		10/13/2015	718.95	93.25	625.70	
		12/07/2015	718.95	93.60	625.35	
	02N19W14P01S	03/18/2015	678.12	31.50	646.62	
		06/17/2015	678.12	31.72	646.40	
		10/13/2015	678.12	33.33	644.79	
		12/07/2015	678.12	NM	-----	Pumping
U N D E F I N E D	01N19W02L01S	03/12/2015	945.42	48.80	896.62	
		06/10/2015	945.42	47.60	897.82	
		11/04/2015	945.42	NM	-----	Inaccessible
		12/29/2015	945.42	50.80	894.62	
	01N19W15E01S	03/12/2015	903.53	25.60	877.93	
		06/10/2015	903.53	27.50	876.03	
		10/23/2015	903.53	28.90	874.63	
		12/29/2015	903.53	29.30	874.23	
	01N20W24H02S	03/12/2015	1,126.54	NM	-----	Inaccessible
		06/10/2015	1,126.54	NM	-----	Tape Hung Up
		11/04/2015	1,126.54	NM	-----	Tape Hung Up
		12/29/2015	1,126.54	NM	-----	Tape Hung Up
	02N21W13A01S	03/16/2015	440.00	545.30	-105.30	
		06/23/2015	440.00	549.90	-109.90	
		10/29/2015	440.00	554.60	-114.60	
		12/21/2015	440.00	807.50	-367.50	
Upper Ojai	04N22W09Q02S	03/11/2015	1,278.80	30.00	1,248.80	
		06/03/2015	1,278.80	NM	-----	Pumping
		11/03/2015	1,278.80	86.40	1,192.40	
		12/18/2015	1,278.80	NM	-----	Pumping
	04N22W10K02S	03/16/2015	1,325.90	32.30	1,293.60	
		06/03/2015	1,325.90	57.30	1,268.60	
		11/02/2015	1,325.90	39.60	1,286.30	
		12/18/2015	1,325.90	37.40	1,288.50	
	04N22W11P02S	03/11/2015	1,420.60	27.20	1,393.40	
		06/03/2015	1,420.60	33.60	1,387.00	
		11/02/2015	1,420.60	35.50	1,385.10	
		12/18/2015	1,420.60	28.90	1,391.70	

* - Denotes basin key water level well.

Appendix C – Groundwater Level Measurement Data

Basin	SWN	Date	RP	Depth Below RP	Elev. Above MSL	Note
Upper Ojai	04N22W12F04S	03/16/2015	1,616.90	NM	-----	Pumping
		06/24/2015	1,616.90	NM	-----	Pumping
		10/29/2015	1,616.90	175.20	1,441.70	
		12/18/2015	1,616.90	175.70	1,441.20	
Ventura River - Lower	03N23W08B07S	03/04/2015	239.19	14.25	224.94	
		06/22/2015	239.19	14.10	225.09	
		10/26/2015	239.19	21.70	217.49	
		12/14/2015	239.19	24.20	214.99	
	03N23W32Q03S	03/13/2015	50.86	32.50	18.36	
		11/06/2015	50.86	NM	-----	Pumping
		12/31/2015	50.86	31.00	19.86	
	03N23W32Q07S	03/13/2015	46.10	26.80	19.30	
		11/06/2015	46.10	NM	-----	Pumping
		12/31/2015	46.10	NM	-----	Pumping
Ventura River - Upper	03N23W05B01S	03/04/2015	293.20	34.90	258.30	
		06/22/2015	293.20	32.60	260.60	
		10/26/2015	293.20	45.50	247.70	
		12/14/2015	293.20	48.40	244.80	
	03N23W08B02S	03/04/2015	249.30	NM	-----	Inaccessible
		10/26/2015	249.30	NM	-----	Special
		12/14/2015	249.30	NM	-----	Inaccessible
	04N23W03M01S	03/11/2015	760.85	97.90	662.95	
		06/11/2015	760.85	101.80	659.05	
		10/27/2015	760.85	104.80	656.05	
		12/15/2015	760.85	105.60	655.25	
	04N23W04J01S	03/11/2015	713.04	59.20	653.84	
		06/11/2015	713.04	69.40	643.64	
		10/27/2015	713.04	NM	-----	Tape Hung Up
		12/15/2015	713.04	76.90	636.14	
	04N23W09B01S	03/11/2015	662.30	38.10	624.20	
		06/11/2015	662.30	61.80	600.50	
		10/27/2015	662.30	71.10	591.20	
		12/15/2015	662.30	89.20	573.10	
	04N23W14M04S	03/11/2015	554.50	NM	-----	Flowing
		06/11/2015	554.50	NM	-----	Flowing
		11/03/2015	554.50	NM	-----	Flowing
		12/17/2015	554.50	NM	-----	Flowing
	04N23W15A02S	03/05/2015	680.90	89.70	591.20	
		06/11/2015	680.90	90.60	590.30	
		11/03/2015	680.90	97.20	583.70	
		12/15/2015	680.90	92.30	588.60	
	04N23W15D02S	03/05/2015	634.30	155.70	478.60	
		06/22/2015	634.30	145.40	488.90	
		10/26/2015	634.30	154.50	479.80	
		12/15/2015	634.30	157.20	477.10	

* - Denotes basin key water level well.

Appendix C – Groundwater Level Measurement Data

Basin	SWN	Date	RP	Depth Below RP	Elev. Above MSL	Note
Ventura River - Upper	04N23W16C04S	03/04/2015	569.10	69.90	499.20	
		06/22/2015	569.10	69.80	499.30	
		11/06/2015	569.10	90.10	479.00	
		12/14/2015	569.10	92.90	476.20	
	04N23W16P01S	03/04/2015	619.89	71.30	548.59	
		06/22/2015	619.89	71.50	548.39	
		10/26/2015	619.89	73.10	546.79	
		12/14/2015	619.89	73.40	546.49	
	04N23W20A01S	03/04/2015	488.89	28.10	460.79	
		06/22/2015	488.89	29.00	459.89	
		10/26/2015	488.89	32.20	456.69	
		12/14/2015	488.89	32.70	456.19	
	04N23W28G01S	03/11/2015	402.37	21.10	381.27	
		06/11/2015	402.37	28.60	373.77	
		11/03/2015	402.37	NM	-----	Dry
		12/17/2015	402.37	NM	-----	Dry
	04N23W29F02S	03/04/2015	396.58	40.60	355.98	
		06/22/2015	396.58	41.20	355.38	
		10/26/2015	396.58	58.50	338.08	
		12/14/2015	396.58	57.10	339.48	
	04N23W33M03S	03/05/2015	331.80	14.90	316.90	
		06/22/2015	331.80	20.40	311.40	
		10/26/2015	331.80	23.90	307.90	
		12/14/2015	331.80	24.00	307.80	
	04N24W13J04S	03/04/2015	626.45	6.70	619.75	
		06/22/2015	626.45	12.40	614.05	
		11/06/2015	626.45	16.30	610.15	
		12/15/2015	626.45	15.90	610.55	
	04N24W13N01S	03/04/2015	642.12	7.80	634.32	
		11/06/2015	642.12	10.90	631.22	
		12/15/2015	642.12	11.10	631.02	
	05N23W33B03S	03/11/2015	829.00	23.40	805.60	
		06/11/2015	829.00	30.20	798.80	
		10/27/2015	829.00	34.80	794.20	
		12/15/2015	829.00	30.10	798.90	
	05N23W33G01S	03/11/2015	816.21	21.20	795.01	
		06/11/2015	816.21	NM	-----	Pumping
		10/27/2015	816.21	NM	-----	Pumping
		12/15/2015	816.21	NM	-----	Pumping

* - Denotes basin key water level well.

Appendix D – Water Quality Section

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Table D-3: Radiochemistry..... 144

General Minerals Table D-1			
Mineral	Abbreviation	Reported Units	Laboratory Analytical Method
Boron	B	mg/l	EPA 200.7
Bicarbonate	HCO_3^-	mg/l	SM23320B
Calcium	Ca	mg/l	EPA 200.7
Copper	Cu	µg/l	EPA 200.7
Carbonate	CO_3^{2-}	mg/l	SM23320B
Chloride	Cl^-	mg/l	EPA 300.0
Electrical Conductivity	eC	µmhos/cm	SM2510B
Fluoride	F^-	mg/l	EPA 300.0
Iron	Fe	µg/l	EPA 200.7
Potassium	K	mg/l	EPA 200.7
Magnesium	Mg	mg/l	EPA 200.7
Manganese	Mn	µg/l	EPA 200.7
Nitrate	NO_3^-	mg/l	SM4500NO3F
Sodium	Na	mg/l	EPA 200.7
Sulfate	SO_4^{2-}	mg/l	EPA 300.0
Total Dissolved Solids	TDS	mg/l	EPA 200.7
Zinc	Zn	µg/l	EPA 200.7
pH	pH	units	SM4500-H B

Table D-1 General Minerals

GW Basin	SWN	Date	B	HCO_3^-	Ca	CO_3^{2-}	Cl^-	Cu	E C	F^-	Fe	K	Mg	Mn	NO_3^-	Na	SO_4^{2-}	TDS	ZN	pH
Arroyo Santa Rosa	02N19W19P02S	09/21/2015	0.3	320	69	ND	98	ND	1140	0.4	ND	1	66	ND	71.8	64	110	800	ND	7.3
Arroyo Santa Rosa	02N19W20L01S	08/13/2015	0.2	390	88	ND	123	20	1390	0.2	ND	ND	83	ND	79	73	155	991	50	7.4
Arroyo Santa Rosa	02N19W20N02S	08/13/2015	0.2	320	72	ND	154	ND	1300	0.3	110	2	80	ND	28.7	65	133	855	40	7.8
Arroyo Santa Rosa	02N20W23G03S	08/13/2015	0.2	250	66	ND	160	ND	1280	0.2	ND	1	70	ND	72.4	74	81	775	ND	7.5
Arroyo Santa Rosa	02N20W23R01S	08/13/2015	0.3	270	78	ND	158	ND	1420	0.3	ND	1	62	ND	64.2	113	170	916	ND	7.5
Arroyo Santa Rosa	02N20W25C06S	09/21/2015	0.4	250	65	ND	146	ND	1200	0.4	ND	1	53	ND	21.1	97	161	794	ND	7.3
Arroyo Santa Rosa	02N20W25C07S	09/21/2015	0.3	300	99	ND	142	ND	1500	0.3	ND	1	91	10	84.9	83	183	984	ND	7.3
Arroyo Santa Rosa	02N20W25D01S	09/21/2015	0.3	290	83	ND	141	10	1400	0.3	ND	1	77	ND	80	86	174	932	ND	7.2
Arroyo Santa Rosa	02N20W26C02S	08/13/2015	0.4	360	98	ND	173	ND	1630	0.3	ND	1	75	ND	80.5	124	212	1120	ND	7.3
Conejo Valley	01N20W03J01S	11/04/2015	0.2	340	75	ND	136	ND	1240	0.2	60	ND	86	ND	0.8	61	148	847	130	7
Cuyama Valley	09N23W30E05S	11/05/2015	0.5	260	78	ND	160	ND	1450	1	50	3	14	ND	4.74	231	183	935	ND	7
Cuyama Valley	09N24W25J01S	11/05/2015	0.4	280	72	ND	127	ND	1350	1.1	50	3	12	ND	4.7	222	178	900	ND	6.8
Cuyama Valley	09N24W33J03S	11/05/2015	0.4	250	80	ND	114	ND	1330	0.7	40	3	13	ND	14.4	207	230	912	ND	6.5
Fillmore	03N20W01D03S	09/09/2015	0.6	300	152	ND	60	ND	1480	0.6	40	6	57	ND	18	98	460	1150	40	7.4
Fillmore	03N20W01F05S	09/09/2015	0.6	260	135	ND	58	40	1370	0.8	ND	5	49	ND	10.2	94	420	1030	190	7.5
Fillmore	03N20W02R05S	12/09/2015	1.2	420	290	ND	180	ND	2980	0.6	ND	9	87	30	43.5	235	980	2250	ND	6.9
Fillmore	03N20W11C01S	10/12/2015	1.4	330	292	ND	180	ND	2840	0.5	ND	9	91	30	51.6	249	1010	2210	ND	7.3
Fillmore	03N21W01P08S	09/09/2015	0.6	290	180	ND	47	ND	1510	0.6	ND	3	47	320	27	89	500	1180	ND	7.2
Fillmore	04N19W29R04S	12/02/2015	0.4	240	108	ND	46	ND	1410	0.7	ND	4	49	ND	7.4	102	450	1010	ND	7
Fillmore	04N19W30D01S	12/02/2015	0.6	470	244	ND	65	ND	2320	0.6	ND	4	104	720	23	111	850	1870	ND	6.7
Fillmore	04N19W31F01S	09/09/2015	0.7	280	141	ND	69	ND	1440	0.8	40	6	55	ND	6.4	98	440	1100	100	7.1
Fillmore	04N19W31R01S	10/12/2015	0.6	240	136	ND	62	ND	1380	0.8	ND	5	49	30	21.6	86	390	990	ND	7.3
Fillmore	04N19W32M02S	10/12/2015	0.6	180	124	ND	55	ND	1320	0.7	50	5	48	50	6.2	87	440	946	ND	7.4
Fillmore	04N20W32R01S	12/09/2015	0.2	310	215	ND	52	ND	1720	0.5	ND	2	53	20	82.8	83	630	1430	ND	7.1
Fillmore	04N20W34H01S	12/09/2015	0.5	310	184	ND	52	ND	1580	0.6	90	3	51	ND	44.1	94	490	1230	ND	7.1
Fillmore	04N20W36D07S	09/09/2015	0.7	300	159	ND	62	ND	1550	0.8	ND	5	61	10	10.7	97	500	1200	50	7.3
Gillibrand/Tapo	03N18W24C07S	09/01/2015	0.2	290	142	ND	22	10	1050	0.2	ND	3	30	ND	4	42	282	804	ND	7.1
Gillibrand/Tapo	03N18W24H07S	09/01/2015	0.2	310	152	ND	25	ND	1160	0.3	840	3	33	80	6.3	48	270	848	ND	7.1
Las Posas - East	02N20W04B01S	12/07/2015	ND	220	76	ND	14	ND	373	0.3	390	4	23	140	ND	43	151	531	ND	7.3
Las Posas - East	02N20W04F01S	12/07/2015	ND	220	144	ND	58	ND	1100	0.3	700	5	34	400	ND	53	291	805	ND	7.1
Las Posas - East	02N20W09Q07S	09/01/2015	0.7	250	190	ND	180	ND	2140	0.4	ND	5	63	225	27.3	199	630	1540	ND	7.3
Las Posas - East	02N20W10G01S	09/01/2015	0.8	310	176	ND	160	ND	2070	0.2	90	6	57	20	55.1	207	590	1530	ND	7.4
Las Posas - East	02N20W16B06S	12/22/2015	0.7	240	136	ND	178	ND	1940	0.5	110	5	60	50	ND	187	570	1380	ND	7.6
Las Posas - East	03N19W29K06S	12/07/2015	ND	90	51	ND	44	ND	508	0.2	ND	1	9	ND	76.1	31	26	328	ND	6.7
Las Posas - East	03N19W29K08S	09/01/2015	0.1	210	76	ND	27	ND	706	0.4	ND	3	17	ND	16.2	41	120	511	ND	7.3
Las Posas - East	03N19W30E06S	09/01/2015	ND	100	47	ND	12	50	437	0.3	140	2	9	10	5	27	59	261	40	7.3
Las Posas - East	03N20W28J04S	09/01/2015	0.2	240	68	ND	46	ND	890	0.6	ND	3	31	ND	52.2	67	121	629	ND	7.4
Las Posas - East	03N20W34G01S	08/21/2015	ND	200	64	ND	12	ND	599	0.3	560	3	15	140	ND	29	127	450	ND	7.3
Las Posas - East	03N20W34L01S	12/07/2015	ND	200	84	ND	11	ND	705	0.4	490	4	22	240	ND	37	166	524	ND	7.1
Las Posas - East	03N20W34L02S	12/07/2015	ND	230	103	ND	14	ND	864	0.2	640	5	28	190	ND	48	235	663	ND	7.1
Las Posas - East	03N20W36P01S	12/07/2015	ND	180	55	ND	19	ND	489	0.2	50	2	11	ND	18.9	30	50	366	50	7.3

Table D-1 General Minerals

GW Basin	SWN	Date	B	HCO_3^-	Ca	CO_3^{2-}	Cl^-	Cu	E C	F^-	Fe	K	Mg	Mn	NO_3^-	Na	SO_4^{2-}	TDS	ZN	pH
Las Posas - South	02N19W07B02S	09/01/2015	0.9	200	115	ND	154	ND	1860	0.7	40	4	50	10	4.1	226	510	1260	ND	7.1
Las Posas - South	02N19W07D02S	08/21/2015	0.8	270	145	ND	155	ND	1740	0.4	ND	3	37	ND	16.3	169	440	1240	ND	7
Las Posas - South	02N19W08H02S	12/22/2015	0.7	210	144	ND	153	ND	1770	0.5	40	3	43	ND	23.5	159	500	1240	120	7.4
Las Posas - South	02N20W01Q01S	09/01/2015	0.7	240	159	ND	145	ND	1750	0.3	ND	3	43	ND	36	161	430	1220	ND	7.1
Las Posas - West	02N20W06J01S	09/01/2015	0.1	250	93	ND	17	ND	951	0.3	410	5	33	180	0.5	59	232	690	ND	7.4
Las Posas - West	02N20W07R02S	09/01/2015	ND	110	51	ND	11	ND	498	0.3	190	2	12	70	0.7	32	81	300	ND	7.6
Las Posas - West	02N21W08H03S	09/08/2015	0.3	300	72	ND	63	10	1110	0.4	70	3	29	40	10.6	115	180	773	20	7.2
Las Posas - West	02N21W09D02S	09/08/2015	0.2	240	87	ND	81	120	1000	0.3	8610	3	29	110	28.6	76	128	673	180	6.9
Las Posas - West	02N21W10Q04S	10/06/2015	0.2	320	117	ND	37	ND	1160	0.3	510	5	42	90	ND	78	320	919	ND	7.3
Las Posas - West	02N21W11A02S	09/24/2015	0.2	230	198	ND	126	ND	1890	0.3	30	3	65	ND	208	93	460	1380	ND	7.4
Las Posas - West	02N21W11A03S	09/24/2015	0.2	300	72	ND	32	ND	925	0.3	160	5	29	50	0.7	70	182	691	ND	7.7
Las Posas - West	02N21W12H01S	09/10/2015	0.2	230	101	ND	53	20	1010	0.3	210	4	31	80	1	69	250	739	30	7.5
Las Posas - West	02N21W15M04S	08/21/2015	0.4	280	109	ND	77	ND	1480	0.2	40	5	38	60	24.3	146	440	1120	ND	7.4
Las Posas - West	02N21W17F05S	09/08/2015	0.6	300	99	ND	63	ND	1520	0.2	190	5	39	50	0.9	175	420	1100	ND	7.2
Las Posas - West	03N20W32K01S	12/22/2015	0.2	360	141	ND	26	30	1440	0.4	570	5	45	270	0.4	105	450	1130	60	7.6
Las Posas - West	03N21W36Q01S	09/10/2015	0.2	270	78	ND	83	ND	1080	0.4	ND	3	40	ND	63.5	82	143	763	70	7.3
Little Cuddy Valley	08N20W04N02S	12/30/2015	ND	290	67	ND	13	40	567	0.3	ND	2	9	ND	1.1	43	13	438	70	7.3
Lockwood Valley	08N21W23Q10S	12/30/2015	11	330	2	30	8	ND	1160	2	ND	ND	ND	ND	2.5	275	189	838	ND	8.8
Lockwood Valley	08N21W29N02S	12/30/2015	2.7	290	150	ND	6	ND	1400	7	370	3	64	20	1.7	70	560	1150	140	7.6
Lockwood Valley	08N21W29Q05S	12/30/2015	6.2	190	36	ND	11	ND	2680	1.3	70	2	4	ND	1.1	530	1060	1840	ND	8
Lockwood Valley	08N21W29R09S	12/30/2015	0.7	220	54	ND	6	ND	827	1.1	ND	2	10	ND	4.1	92	197	586	140	7.8
Lockwood Valley	08N21W30R01S	12/30/2015	1.1	280	41	ND	11	60	1300	0.6	900	2	6	20	12.3	242	400	995	20	8
Lockwood Valley	08N21W33R03S	12/30/2015	0.8	190	97	ND	23	20	836	0.5	70	1	22	ND	13.5	41	164	552	90	7.4
Mound	02N22W07P01S	08/21/2015	0.7	330	435	ND	140	ND	3670	0.3	150	10	126	180	71	285	1600	3000	ND	6.7
Mound	02N22W09K05S	08/21/2015	0.6	180	122	ND	79	30	1610	0.2	690	4	23	240	2.1	192	520	1120	180	7.1
Mound	02N22W09K08S	08/21/2015	0.6	230	153	ND	66	ND	1810	0.4	50	5	51	570	2.9	168	590	1270	ND	7.1
Mound	02N23W13F02S	10/16/2015	0.6	260	151	ND	62	ND	1610	0.4	830	5	42	280	ND	140	440	1100	60	7.1
Mound	02N23W13K04S	10/16/2015	0.7	200	146	ND	68	ND	1620	0.4	720	5	43	300	0.7	147	460	1070	ND	7.1
North Coast	04N25W25N06S	09/29/2015	0.3	310	132	ND	100	ND	1670	0.6	ND	1	63	ND	8.5	106	330	1050	ND	7.6
North Coast	04N25W35G01S	09/29/2015	0.3	210	74	ND	47	460	992	0.4	ND	3	37	ND	1.8	62	211	646	320	7.5
Ojai Valley	04N22W04N02S	12/10/2015	ND	250	133	ND	14	220	921	0.3	50	1	24	40	34.8	38	217	712	ND	7.2
Ojai Valley	04N22W04P05S	12/10/2015	0.1	270	120	ND	27	ND	980	0.3	70	ND	32	ND	41	40	210	740	80	6.9
Ojai Valley	04N22W04Q01S	09/29/2015	ND	240	98	ND	20	40	916	0.3	150	ND	29	ND	46.2	32	199	664	120	7.8
Ojai Valley	04N22W05D03S	12/10/2015	0.2	140	51	ND	23	20	598	0.4	810	3	26	90	2.2	32	143	421	590	7.2
Ojai Valley	04N22W05H04S	09/29/2015	ND	260	111	ND	17	50	916	0.3	180	1	26	ND	15.7	29	200	660	120	7.2
Ojai Valley	04N22W05M04S	12/10/2015	ND	300	133	ND	21	ND	962	0.2	320	1	30	10	32.4	29	200	747	ND	7
Ojai Valley	04N22W06E06S	09/29/2015	ND	310	108	ND	63	ND	979	0.3	ND	ND	30	ND	30.4	39	128	709	20	7.2
Ojai Valley	04N22W06J09S	09/29/2015	ND	220	114	ND	24	ND	959	0.3	ND	ND	27	ND	21.3	35	200	642	ND	7.3
Ojai Valley	04N22W06K10S	09/29/2015	ND	160	110	ND	90	ND	1220	0.3	ND	1	26	ND	23.4	34	202	647	ND	7.5
Ojai Valley	04N22W07C05S	09/29/2015	ND	240	100	ND	50	ND	1040	0.5	ND	ND	23	30	3.6	69	205	691	ND	7.4
Ojai Valley	04N22W07D04S	09/29/2015	0.3	230	239	ND	580	ND	2810	0.4	ND	2	55	1100	ND	195	219	1520	ND	7.4

Table D-1 General Minerals (cont.)

GW Basin	SWN	Date	B	HCO_3^-	Ca	CO_3^{2-}	Cl^-	Cu	E C	F^-	Fe	K	Mg	Mn	NO_3^-	Na	SO_4^{2-}	TDS	ZN	pH
Ojai Valley	04N23W01J03S	12/10/2015	0.1	310	76	ND	27	10	979	0.6	30	ND	17	100	ND	123	200	754	ND	7.4
Ojai Valley	04N23W01K02S	12/10/2015	0.1	400	140	ND	71	ND	1150	0.5	40	ND	34	ND	4.4	71	182	903	ND	7
Ojai Valley	04N23W12B03S	12/10/2015	ND	340	83	ND	76	ND	935	0.8	ND	1	15	590	ND	84	80	680	260	7.2
Ojai Valley	05N22W33J01S	09/29/2015	ND	190	141	ND	44	ND	1240	0.5	90	2	38	30	ND	49	360	824	ND	7.6
Oxnard Plain Forebay	02N21W07P04S	09/08/2015	0.6	180	141	ND	54	ND	1420	0.5	630	5	48	110	0.5	97	430	956	ND	7.1
Oxnard Plain Forebay	02N22W23H03S	09/08/2015	0.8	270	273	ND	74	ND	2330	0.5	ND	7	95	ND	112	133	840	1800	ND	6.9
Oxnard Plain Forebay	02N22W27M02S	09/02/2015	1.1	490	299	ND	99	ND	2470	0.4	440	8	108	20	0.6	160	830	2000	ND	7
Oxnard Plain Pressure	01N21W04D04S	09/09/2015	0.6	380	59	ND	126	ND	1370	0.3	60	10	25	30	0.5	192	186	979	ND	7.3
Oxnard Plain Pressure	01N21W06L05S	10/06/2015	0.4	260	82	ND	45	ND	1180	0.2	230	6	29	80	1.1	129	330	882	40	7.5
Oxnard Plain Pressure	01N21W08R01S	09/09/2015	0.4	250	76	ND	58	ND	1090	0.3	300	6	27	40	0.5	114	240	772	ND	7.4
Oxnard Plain Pressure	01N21W16M03S	09/10/2015	0.6	310	66	ND	122	ND	1380	0.3	ND	6	27	20	ND	194	250	975	ND	7.4
Oxnard Plain Pressure	01N21W16P04S	09/24/2015	0.5	320	73	ND	144	ND	1360	0.4	420	5	25	10	ND	169	197	933	ND	7.4
Oxnard Plain Pressure	01N21W17B02S	09/10/2015	0.5	260	86	ND	37	ND	1120	0.2	760	8	34	100	ND	114	320	859	190	7.4
Oxnard Plain Pressure	01N21W19J05S	09/02/2015	0.6	220	39	ND	41	ND	700	0.3	ND	5	22	ND	0.4	76	45	449	ND	7.4
Oxnard Plain Pressure	01N21W20K03S	09/24/2015	0.5	170	73	ND	39	ND	976	0.2	220	5	26	20	1.9	85	230	630	ND	7.9
Oxnard Plain Pressure	01N21W21H01S	09/24/2015	0.5	390	198	ND	330	ND	2270	0.2	330	4	67	450	ND	178	390	1560	ND	7.6
Oxnard Plain Pressure	01N21W21H02S	10/16/2015	0.5	240	67	ND	107	ND	1330	0.2	110	5	34	20	ND	154	260	867	ND	7.3
Oxnard Plain Pressure	01N21W21H03S	09/24/2015	0.4	310	41	ND	44	ND	885	0.2	490	3	27	50	ND	99	126	650	ND	8
Oxnard Plain Pressure	01N21W21K03S	09/02/2015	0.5	290	70	ND	125	ND	1260	0.2	60	5	40	30	0.4	152	230	913	ND	7.4
Oxnard Plain Pressure	01N21W22C01S	09/09/2015	0.5	300	59	ND	103	ND	1220	0.2	250	5	39	30	0.5	135	188	830	60	7.5
Oxnard Plain Pressure	01N21W28D01S	09/09/2015	0.5	270	79	ND	135	ND	1300	0.3	370	6	28	20	0.5	154	213	886	50	7.4
Oxnard Plain Pressure	01N21W28G01S	09/02/2015	0.5	240	291	ND	510	ND	2970	0.2	990	6	100	1600	0.5	230	540	1920	ND	7.2
Oxnard Plain Pressure	01N21W28H03S	09/02/2015	0.4	260	90	ND	137	ND	1340	0.3	90	5	39	80	0.4	144	216	892	ND	7.9
Oxnard Plain Pressure	01N21W28M01S	09/30/2015	0.5	310	83	ND	269	ND	1790	0.2	650	6	47	40	0.4	180	220	1120	ND	7.3
Oxnard Plain Pressure	01N21W29B03S	09/30/2015	0.5	270	112	ND	84	ND	1350	0.4	50	4	42	790	0.6	100	340	953	ND	7.2
Oxnard Plain Pressure	01N21W29K02S	09/24/2015	0.6	180	115	ND	51	ND	1250	0.3	210	4	37	680	ND	92	350	829	ND	7.5
Oxnard Plain Pressure	01N21W30C04S	10/16/2015	0.7	150	119	ND	58	ND	1240	0.5	1100	4	36	460	ND	84	320	772	ND	7.3
Oxnard Plain Pressure	01N21W33A01S	09/30/2015	0.4	310	78	ND	200	ND	1580	0.1	40	4	51	170	ND	148	180	971	ND	7.7
Oxnard Plain Pressure	01N22W03F05S	09/02/2015	0.7	150	142	ND	48	ND	1380	0.6	40	5	46	20	18.4	100	450	960	ND	7.1
Oxnard Plain Pressure	01N22W03F07S	09/02/2015	0.7	260	177	ND	70	ND	1620	0.5	80	5	60	30	22.5	106	520	1220	ND	7.2
Oxnard Plain Pressure	01N22W06B01S	08/24/2015	0.8	280	150	ND	55	ND	1510	0.7	90	5	51	ND	16.6	100	510	1170	ND	7.3
Oxnard Plain Pressure	01N22W06R02S	08/24/2015	0.8	280	163	ND	56	ND	1670	0.6	ND	5	56	10	7.4	115	630	1310	ND	7.2
Oxnard Plain Pressure	01N22W12M01S	09/10/2015	0.7	200	151	ND	46	ND	1530	0.3	350	6	48	250	ND	124	530	1110	ND	7.1
Oxnard Plain Pressure	01N22W12N03S	12/10/2015	0.5	250	107	ND	36	ND	1220	0.2	410	6	37	130	ND	106	370	912	ND	7.5
Oxnard Plain Pressure	01N22W16D04S	09/30/2015	0.6	230	110	ND	39	ND	1190	0.7	2300	4	38	90	0.6	77	360	859	30	7.4
Oxnard Plain Pressure	01N22W19A01S	09/30/2015	0.6	130	51	ND	36	ND	875	0.5	40	5	28	20	0.5	77	272	600	900	8
Oxnard Plain Pressure	01N22W23R02S	10/16/2015	0.6	190	150	ND	55	ND	1500	0.5	40	5	51	30	22.1	97	480	1050	ND	7.3
Oxnard Plain Pressure	01N22W24B04S	09/02/2015	0.6	210	125	ND	39	ND	1170	0.4	130	4	34	180	1	85	380	878	ND	7.4
Oxnard Plain Pressure	01N22W24C02S	09/10/2015	0.7	280	153	ND	48	ND	1400	0.6	740	5	45	350	ND	95	440	1070	ND	7.3
Oxnard Plain Pressure	01N22W24C03S	09/10/2015	0.7	210	131	ND	40	ND	1210	0.6	630	4	37	190	ND	85	390	898	20	7.2
Oxnard Plain Pressure	01N22W24M03S	09/10/2015	0.6	230	148	ND	124	ND	1390	0.5	550	4	43	220	ND	88	340	978	ND	7.2

Table D-1 General Minerals (cont.)

GW Basin	SWN	Date	B	HCO_3^-	Ca	CO_3^{2-}	Cl^-	Cu	E C	F^-	Fe	K	Mg	Mn	NO_3^-	Na	SO_4^{2-}	TDS	ZN	pH
Oxnard Plain Pressure	01N22W25K01S	09/10/2015	0.9	240	593	ND	1650	ND	6740	0.2	9200	22	234	2000	ND	586	950	4280	40	7
Oxnard Plain Pressure	01N22W25K02S	09/10/2015	0.6	220	94	ND	35	ND	1080	0.4	680	4	38	120	ND	81	290	762	ND	7.4
Oxnard Plain Pressure	01N22W26D05S	09/10/2015	0.5	240	136	ND	48	380	1280	0.3	14000	7	43	480	15	92	390	971	80	7.4
Oxnard Plain Pressure	01N22W26K03S	08/24/2015	0.5	250	101	ND	43	ND	1200	0.2	450	6	34	90	ND	89	360	883	ND	7.5
Oxnard Plain Pressure	01N22W26M03S	09/10/2015	0.5	240	118	ND	37	ND	1200	0.2	290	6	35	190	5.2	91	370	902	ND	7.5
Oxnard Plain Pressure	01N22W26P02S	09/10/2015	0.4	260	91	ND	36	ND	1100	0.2	50	6	36	10	ND	94	280	803	ND	7.6
Oxnard Plain Pressure	01N22W26Q01S	08/24/2015	0.6	250	135	ND	106	ND	1340	0.6	490	4	38	290	ND	84	349	967	ND	7.2
Oxnard Plain Pressure	01N22W27H02S	09/24/2015	0.5	240	116	ND	37	ND	1200	0.2	370	6	33	170	0.5	85	370	888	ND	7.8
Oxnard Plain Pressure	01N22W36B02S	09/30/2015	0.5	240	87	ND	103	ND	1260	0.4	460	6	33	90	0.4	109	230	809	ND	7.4
Oxnard Plain Pressure	02N21W17N03S	09/24/2015	0.4	290	85	ND	57	ND	1070	0.3	60	3	26	140	8.3	97	209	776	ND	7.7
Oxnard Plain Pressure	02N21W18H01S	09/08/2015	0.5	310	265	ND	160	20	2460	0.4	90	7	96	ND	130	152	790	1910	30	6.9
Oxnard Plain Pressure	02N21W18H12S	09/08/2015	0.6	260	128	ND	51	ND	1400	0.4	340	4	45	120	1.6	108	450	1050	ND	7.2
Oxnard Plain Pressure	02N21W18H14S	09/24/2015	0.4	310	83	ND	46	ND	1320	0.2	340	6	36	50	0.4	146	380	1010	ND	7.8
Oxnard Plain Pressure	02N21W19G03S	10/06/2015	0.6	230	109	ND	45	ND	1250	0.3	1800	4	40	130	ND	100	420	948	ND	7.6
Oxnard Plain Pressure	02N21W20M03S	09/08/2015	1.2	390	548	ND	349	ND	4660	0.2	90	12	200	440	127	351	2050	4030	ND	6.8
Oxnard Plain Pressure	02N21W20M06S	09/08/2015	0.6	260	103	ND	50	ND	1320	0.2	260	4	39	100	ND	120	390	966	ND	7.4
Oxnard Plain Pressure	02N21W20Q05S	09/08/2015	0.6	280	102	ND	60	ND	1320	0.3	640	6	35	80	0.6	128	360	972	ND	7.2
Oxnard Plain Pressure	02N22W19P01S	09/02/2015	0.6	270	219	ND	97	ND	2100	0.4	ND	6	64	190	33.1	196	820	1710	ND	7.1
Oxnard Plain Pressure	02N22W24P02S	09/21/2015	0.7	240	132	ND	47	ND	1290	0.7	30	4	43	ND	7.1	91	430	995	ND	7.4
Oxnard Plain Pressure	02N22W24R02S	09/21/2015	0.8	200	182	ND	67	ND	1700	0.7	50	5	62	ND	19.2	119	650	1300	30	7.3
Oxnard Plain Pressure	02N22W25A02S	09/21/2015	1	250	223	ND	108	ND	2200	0.5	140	7	76	10	7.7	180	860	1710	110	7.4
Oxnard Plain Pressure	02N22W25F01S	09/21/2015	1	280	296	ND	86	20	2520	0.4	1900	8	104	70	1	172	1170	2120	30	7.3
Oxnard Plain Pressure	02N22W30F03S	09/02/2015	0.6	240	130	ND	42	ND	1230	0.5	1000	5	37	140	0.5	99	390	944	ND	7.3
Oxnard Plain Pressure	02N22W31B01S	09/02/2015	0.7	220	147	ND	53	ND	1420	0.6	ND	5	48	ND	18.5	110	490	1090	ND	7.4
Oxnard Plain Pressure	02N22W31D02S	09/02/2015	0.7	230	148	ND	53	ND	1430	0.6	50	4	46	260	17.9	103	490	1090	ND	7.2
Oxnard Plain Pressure	02N22W32C04S	08/24/2015	0.6	240	140	ND	54	ND	1420	0.7	ND	4	48	ND	22.9	92	500	1100	ND	7.3
Oxnard Plain Pressure	02N22W36E02S	09/02/2015	0.7	100	137	ND	48	ND	1310	0.6	ND	5	44	ND	9.2	97	460	901	ND	7.3
Oxnard Plain Pressure	02N22W36E03S	09/02/2015	0.7	190	142	ND	46	ND	1370	0.6	140	5	47	50	0.6	105	480	1020	ND	7.2
Oxnard Plain Pressure	02N22W36E04S	09/02/2015	0.9	230	215	ND	60	ND	1950	0.5	ND	6	72	ND	71.3	151	750	1560	30	7.2
Oxnard Plain Pressure	02N22W36F01S	09/02/2015	0.9	240	178	ND	58	ND	1700	0.5	280	6	64	30	0.7	135	670	1350	50	7.4
Oxnard Plain Pressure	02N22W36F02S	09/02/2015	0.8	210	179	ND	58	ND	1750	0.6	ND	6	63	50	7.9	138	680	1340	ND	7.4
Oxnard Plain Pressure	02N23W25M01S	09/02/2015	0.6	270	161	ND	63	ND	1540	0.4	ND	5	45	430	11.1	137	540	1230	30	7.3
Piru	04N18W20R01S	12/02/2015	0.6	310	116	ND	130	ND	1650	0.6	ND	5	45	ND	22.6	148	387	1160	ND	6.7
Piru	04N18W30A03S	12/09/2015	0.6	310	151	ND	109	ND	1940	0.6	310	7	56	ND	38.5	144	549	1360	120	7
Piru	04N18W30J04S	12/09/2015	0.5	260	109	ND	99	ND	1430	0.6	110	6	41	ND	23.7	114	338	991	170	7.1
Piru	04N19W23R03S	12/09/2015	0.5	520	240	ND	67	ND	2780	0.7	210	8	122	440	0.5	250	1100	2310	ND	7.2
Piru	04N19W25C02S	10/12/2015	0.7	240	153	ND	89	ND	1620	0.9	ND	5	64	ND	15.1	112	530	1210	ND	7
Piru	04N19W25H01S	12/09/2015	0.6	330	245	ND	101	ND	2120	0.6	60	7	77	ND	74	117	715	1670	ND	7.2
Piru	04N19W25K04S	09/11/2015	0.6	280	140	ND	97	ND	1490	0.7	ND	5	48	ND	39.1	105	350	1060	ND	7.4
Piru	04N19W25M03S	09/09/2015	0.9	410	318	ND	66	20	2790	0.9	ND	7	135	720	42.2	193	1240	2410	ND	7
Piru	04N19W25M03S	12/09/2015	0.9	440	311	ND	58	30	2820	0.6	ND	6	129	690	49.8	179	1160	2330	ND	7

Table D-1 General Minerals (cont.)

GW Basin	SWN	Date	B	HCO_3^-	Ca	CO_3^{2-}	Cl^-	Cu	E C	F^-	Fe	K	Mg	Mn	NO_3^-	Na	SO_4^{2-}	TDS	ZN	pH
Piru	04N19W26H01S	12/09/2015	0.7	270	149	ND	107	ND	1610	0.7	ND	5	58	ND	22.2	114	417	1140	ND	7.3
Piru	04N19W26J02S	09/09/2015	0.9	410	288	ND	63	ND	2510	0.8	40	6	116	480	32.2	171	1060	2150	ND	7
Piru	04N19W26J03S	12/09/2015	0.5	240	103	ND	84	ND	1260	0.7	ND	5	38	ND	15	98	310	894	ND	7.3
Piru	04N19W26J05S	09/09/2015	0.8	430	266	ND	61	ND	2330	0.7	ND	7	104	790	35.6	151	900	1960	40	7.1
Piru	04N19W26P01S	10/12/2015	0.7	170	179	ND	68	ND	1690	0.7	ND	5	73	60	16.9	109	620	1240	ND	7.3
Piru	04N19W34J04S	09/11/2015	0.6	220	127	ND	57	ND	1330	0.7	ND	5	49	ND	64.1	80	350	953	ND	7.4
Piru	04N19W34L01S	09/11/2015	0.6	200	124	ND	55	ND	1280	0.8	ND	5	47	ND	30.8	80	360	903	ND	7.3
Pleasant Valley	01N21W01B05S	09/30/2015	0.3	340	54	ND	211	ND	1370	0.1	50	5	51	60	ND	122	47	830	ND	7.3
Pleasant Valley	01N21W01M02S	09/30/2015	0.3	330	66	ND	156	120	1450	0.2	111	5	64	50	ND	122	206	949	700	7.6
Pleasant Valley	01N21W02J01S	09/10/2015	2	410	483	ND	300	60	4710	0.2	80	9	146	40	171	555	2030	4100	220	7
Pleasant Valley	01N21W03D01S	09/09/2015	0.5	210	133	ND	84	20	1330	0.3	190	4	37	20	37.9	95	330	931	30	7.3
Pleasant Valley	01N21W03K01S	09/09/2015	0.7	310	141	ND	166	ND	1780	0.3	ND	5	41	ND	32.8	185	350	1230	ND	7.3
Pleasant Valley	01N21W03R01S	09/09/2015	0.6	280	233	ND	224	ND	2330	0.2	ND	6	72	20	31.1	184	680	1710	ND	7
Pleasant Valley	01N21W04K01S	09/09/2015	0.6	300	102	ND	123	ND	1470	0.4	320	5	30	50	0.6	171	300	1030	30	7.4
Pleasant Valley	01N21W09J03S	10/16/2015	0.3	180	113	ND	82	ND	1200	0.3	70	3	34	ND	2.8	81	280	776	ND	7.2
Pleasant Valley	01N21W10A02S	09/02/2015	0.5	260	362	ND	260	ND	2840	0.2	40	5	103	1500	52	181	970	2190	1100	7.3
Pleasant Valley	01N21W10G01S	09/09/2015	0.5	300	99	ND	140	ND	1510	0.3	70	6	41	40	1.1	157	260	1000	ND	7.4
Pleasant Valley	01N21W12D02S	09/10/2015	0.7	300	142	ND	192	ND	1870	0.3	40	7	46	ND	14.6	211	430	1340	ND	7.3
Pleasant Valley	01N21W15D02S	09/09/2015	0.6	300	142	ND	187	ND	1740	0.2	ND	6	48	160	1.1	163	380	1230	20	7.2
Pleasant Valley	01N21W15H01S	09/02/2015	1.8	200	548	ND	660	ND	5550	ND	2000	9	208	1900	0.5	581	2130	4340	ND	7.1
Pleasant Valley	02N20W17L01S	09/09/2015	0.7	270	168	ND	165	ND	1880	0.4	840	6	53	280	17.2	169	530	1380	20	7.2
Pleasant Valley	02N20W19F04S	09/09/2015	0.7	260	200	ND	157	ND	1920	0.2	140	6	48	140	0.6	160	590	1420	20	7.1
Pleasant Valley	02N20W29B02S	09/21/2015	0.3	270	71	ND	118	ND	1190	0.5	ND	3	51	50	4.8	99	155	772	ND	7.3
Pleasant Valley	02N21W33R02S	09/09/2015	0.3	250	86	ND	55	ND	962	0.4	470	4	21	40	0.6	82	199	698	ND	7.3
Pleasant Valley	02N21W34C01S	09/09/2015	0.3	230	97	ND	74	ND	1150	0.4	510	5	27	50	0.5	101	240	775	ND	7.3
Pleasant Valley	02N21W34G01S	09/09/2015	0.9	330	99	ND	196	ND	1880	0.3	100	7	33	30	0.5	259	330	1250	20	7.4
Santa Paula	02N22W03B01S	12/31/2015	0.6	370	292	ND	118	ND	2500	0.4	900	6	86	530	0.7	185	1050	2110	ND	7
Santa Paula	02N22W03K02S	10/06/2015	0.5	310	135	ND	50	ND	1290	0.4	60	5	33	30	1.7	101	370	1010	ND	7.2
Santa Paula	03N21W09K04S	12/10/2015	0.4	310	140	ND	48	ND	1350	0.3	300	4	34	440	ND	118	388	1040	ND	7.2
Santa Paula	03N21W17Q01S	12/02/2015	0.8	350	205	ND	79	ND	2070	0.4	ND	3	64	80	27.8	160	665	1550	ND	6.8
Santa Paula	03N22W35Q01S	08/21/2015	1	440	297	ND	94	ND	3000	0.3	60	6	91	760	28	297	1360	2610	20	7
Santa Paula	03N22W36K07S	10/16/2015	0.4	230	214	ND	66	ND	1730	0.3	120	4	52	140	ND	89	600	1260	ND	7.2
Sherwood	01N19W19H03S	12/29/2015	0.1	330	60	ND	36	ND	871	0.1	ND	2	40	20	ND	55	109	632	40	7.3
Sherwood	01N19W29H07S	12/29/2015	ND	320	162	ND	102	40	1470	ND	3400	1	43	320	ND	69	315	1010	920	6.9
Sherwood	01N20W25C07S	12/29/2015	0.1	370	168	ND	230	ND	1710	0.1	30	2	55	ND	0.9	62	176	1060	1500	6.8
Sherwood	01N20W25F04S	12/29/2015	ND	200	17	ND	29	ND	570	ND	3100	ND	3	50	ND	96	29	374	170	7.7
Simi Valley	02N18W08D04S	09/01/2015	1.1	350	226	ND	150	ND	2360	0.4	190	6	79	400	26.9	207	700	1770	ND	6.9
Simi Valley	02N18W08K07S	09/01/2015	1	310	280	ND	140	10	2500	0.4	3000	5	84	ND	52.4	187	820	1880	80	7.1
Simi Valley	02N18W09E01S	09/01/2015	0.8	200	211	ND	110	ND	2100	0.6	ND	4	74	ND	26.6	160	720	1510	ND	7
Thousand Oaks	01N19W08G02S	11/04/2015	0.1	290	132	ND	134	10	1790	ND	7700	3	111	180	ND	108	530	1310	80	7.1
Thousand Oaks	01N19W09N01S	11/04/2015	0.2	390	156	ND	177	ND	1970	ND	1300	4	120	40	ND	120	530	1500	ND	7.2

Table D-1 General Minerals (cont.)

GW Basin	SWN	Date	B	HCO_3^-	Ca	CO_3^{2-}	Cl^-	Cu	E C	F^-	Fe	K	Mg	Mn	NO_3^-	Na	SO_4^{2-}	TDS	ZN	pH
Tierra Rejada Valley	02N19W10R01S	08/13/2015	ND	250	84	ND	122	ND	1130	0.3	ND	ND	61	30	16.6	49	141	724	ND	7.3
Tierra Rejada Valley	02N19W10R02S	08/13/2015	0.2	210	52	ND	72	ND	970	0.4	ND	1	56	ND	11.4	57	173	633	ND	7.3
Tierra Rejada Valley	02N19W11J03S	08/13/2015	0.2	270	61	ND	64	ND	983	0.2	80	ND	56	ND	22.2	53	162	688	110	7.6
Tierra Rejada Valley	02N19W14F01S	08/13/2015	0.1	370	91	ND	110	ND	1270	0.2	ND	ND	78	ND	69.6	45	119	883	ND	7.2
Tierra Rejada Valley	02N19W14P01S	08/13/2015	0.1	400	58	ND	69	20	1060	0.2	220	1	65	20	37.3	59	83	772	120	7.8
Tierra Rejada Valley	02N19W14Q02S	08/13/2015	0.1	200	45	ND	55	ND	886	0.2	80	6	39	80	1	69	88	503	40	8
Tierra Rejada Valley	02N19W15J02S	08/13/2015	0.2	320	90	ND	134	ND	1480	0.2	ND	3	80	ND	48.7	94	230	1000	20	7.4
Tierra Rejada Valley	02N19W15N03S	09/21/2015	0.2	200	65	ND	81	ND	943	0.4	620	2	56	30	3.1	43	165	616	ND	7
U N D E F I N E D	02N21W13A01S	10/06/2015	0.1	230	69	ND	12	ND	705	0.4	150	3	19	70	ND	49	152	534	ND	7.5
Upper Ojai	04N22W11P02S	09/11/2015	0.1	270	37	ND	11	ND	467	ND	2000	ND	10	170	0.5	44	ND	372	ND	7.4
Upper Ojai	04N22W12F04S	09/11/2015	ND	160	90	ND	14	ND	752	0.3	ND	1	24	ND	18.9	29	164	501	ND	7
Upper Ojai	04N22W12M03S	09/11/2015	ND	210	66	ND	26	ND	706	0.4	ND	1	21	70	6.6	45	109	485	ND	7.1
Ventura River - Lower	02N23W05K01S	09/29/2015	0.8	220	148	ND	221	ND	2000	0.4	380	7	53	200	1.3	166	360	1180	ND	7.6
Ventura River - Lower	03N23W32Q03S	12/31/2015	1.1	330	147	ND	300	ND	2110	0.5	60	7	50	250	ND	238	380	1450	ND	7.2
Ventura River - Lower	03N23W32Q10S	12/31/2015	1.1	400	183	ND	350	ND	2450	0.6	100	6	65	50	6.2	256	510	1780	ND	7.1
Ventura River - Upper	04N23W09G03S	09/29/2015	0.4	320	116	ND	81	ND	1180	0.3	ND	2	36	ND	29	54	177	815	30	7.4
Ventura River - Upper	04N23W15A02S	11/03/2015	0.3	170	44	ND	83	ND	807	0.8	30	ND	13	140	12.9	109	115	548	20	7.5

* Undefined – This well is outside of known groundwater basin boundaries.

California Title 22 Metals

Metals Table D-2			
Element Name	Element Symbol	Reported Units	Laboratory Analytical Method
Aluminum	Al	µg/l	EPA 200.8
Antimony	Sb	µg/l	EPA 200.8
Arsenic	As	µg/l	EPA 200.8
Barium	Ba	µg/l	EPA 200.8
Beryllium	Be	µg/l	EPA 200.8
Cadmium	Cd	µg/l	EPA 200.8
Chromium	Cr	µg/l	EPA 200.8
Lead	Pb	µg/l	EPA 200.8
Mercury	Hg	µg/l	EPA 245.1
Nickel	Ni	µg/l	EPA 200.8
Selenium	Se	µg/l	EPA 200.8
Silver	Ag	µg/l	EPA 200.8
Thallium	Tl	µg/l	EPA 200.8
Vanadium	V	µg/l	EPA 200.8

Radio Chemistry

Radio Chemistry Table D-3			
Name	Element Symbol	Reported Units	Laboratory Analytical Method
Gross Alpha		pCi/l	EPA 900.0
Uranium	U	pCi/l	EPA 908.0

Table D-2 Metals

GW Basin	SWN	Date	Al	Sb	As	Ba	Be	Cd	Cr	Pb	Hg	Ni	Se	Ag	Tl	V
Arroyo Santa Rosa	02N19W19P02S	09/21/2015	ND	ND	3	16.5	ND	ND	19	ND	ND	1	3	ND	ND	60
Arroyo Santa Rosa	02N20W25D01S	09/21/2015	ND	ND	4	16.4	ND	ND	7	1.8	ND	4	6	ND	ND	64
Conejo Valley	01N20W03J01S	11/04/2015	ND	ND	ND	0.6	ND	ND	5	0.9	ND	ND	1	ND	ND	23
Cuyama Valley	09N23W30E05S	11/05/2015	ND	ND	ND	30.2	ND	ND	4	ND	ND	ND	7	ND	ND	2
Cuyama Valley	09N24W33J03S	11/05/2015	ND	ND	ND	31.2	ND	ND	4	ND	ND	ND	9	ND	ND	3
Fillmore	04N20W32R01S	12/09/2015	ND	ND	ND	53	ND	ND	2	ND	ND	ND	6	ND	ND	ND
Gillibrand/Tapo	03N18W24C07S	09/01/2015	ND	ND	3	39.2	ND	ND	3	1.6	ND	ND	19	ND	ND	10
Las Posas - East	02N20W04B01S	12/07/2015	ND	ND	ND	31.5	ND	ND	2	1.2	ND	ND	ND	ND	ND	ND
Las Posas - East	02N20W10G01S	09/01/2015	ND	ND	ND	29.6	ND	ND	3	ND	ND	5	15	ND	ND	ND
Las Posas - East	03N20W36P01S	12/07/2015	ND	ND	2	60.8	ND	ND	7	ND	ND	ND	4	ND	ND	14
Las Posas - West	02N21W08H03S	09/08/2015	ND	ND	ND	59.5	ND	ND	3	1.3	ND	ND	13	ND	ND	5
Las Posas - West	02N21W09D02S	09/08/2015	ND	ND	2	63.6	ND	ND	4	7.3	ND	2	17	ND	ND	9
Las Posas - West	02N21W10Q04S	10/06/2015	ND	ND	ND	39	ND	ND	4	ND	0.03	ND	ND	ND	ND	ND
Las Posas - West	02N21W15M04S	08/21/2015	ND	ND	2	40.7	ND	ND	2	ND	0.02	ND	20	ND	ND	ND
Little Cuddy Valley	08N20W04N02S	12/30/2015	ND	ND	ND	131	ND	0.2	5	0.9	ND	1	ND	ND	ND	3
Lockwood Valley	08N21W23Q10S	12/30/2015	10	ND	68	21.3	ND	ND	6	ND	ND	ND	14	ND	ND	111
Lockwood Valley	08N21W29N02S	12/30/2015	ND	ND	ND	31.8	ND	ND	5	0.5	ND	2	1	ND	ND	2
Lockwood Valley	08N21W29Q05S	12/30/2015	ND	ND	8	10.9	ND	ND	3	ND	ND	ND	11	ND	ND	15
Lockwood Valley	08N21W29R09S	12/30/2015	ND	ND	6	12.5	ND	ND	3	0.7	0.07	ND	2	ND	ND	16
Lockwood Valley	08N21W30R01S	12/30/2015	390	ND	4	28.6	ND	ND	6	4.1	ND	1	4	ND	ND	14
Lockwood Valley	08N21W33R03S	12/30/2015	ND	ND	ND	25.5	ND	ND	5	ND	ND	ND	10	ND	ND	5
Mound	02N23W13F02S	10/16/2015	ND	ND	7	24	ND	ND	3	ND	ND	ND	2	ND	ND	ND
North Coast	04N25W25N06S	09/29/2015	ND	ND	ND	23.1	ND	ND	6	ND	ND	ND	7	ND	ND	3
Ojai Valley	04N22W04Q01S	09/29/2015	60	ND	ND	31.7	ND	ND	3	3.1	ND	5	ND	ND	ND	ND
Ojai Valley	04N22W07C05S	09/29/2015	ND	ND	ND	18.1	ND	ND	2	ND	ND	ND	ND	ND	ND	ND
Ojai Valley	04N22W07D04S	09/29/2015	ND	ND	ND	49.5	ND	0.4	4	ND	0.02	ND	6	ND	ND	ND
Oxnard Plain Forebay	02N21W07P04S	09/08/2015	ND	ND	ND	22.3	ND	ND	2	ND	ND	ND	1	ND	ND	ND
Oxnard Plain Pressure	01N21W08R01S	09/09/2015	20	ND	5	101	ND	ND	ND	ND	ND	ND	1	ND	ND	ND
Oxnard Plain Pressure	01N21W16M03S	09/10/2015	ND	ND	ND	77.8	ND	ND	5	ND	ND	ND	1	ND	ND	14
Oxnard Plain Pressure	01N21W16P04S	09/24/2015	ND	ND	ND	46.6	ND	ND	3	0.7	ND	ND	3	ND	ND	ND
Oxnard Plain Pressure	01N21W28G01S	09/02/2015	10	ND	5	79.4	ND	ND	4	ND	ND	2	7	ND	ND	ND
Oxnard Plain Pressure	01N21W29K02S	09/24/2015	ND	ND	3	21.7	ND	ND	2	ND	ND	ND	1	ND	ND	ND
Oxnard Plain Pressure	01N21W33A01S	09/30/2015	ND	ND	ND	81.2	ND	ND	3	ND	ND	ND	5	ND	ND	2
Oxnard Plain Pressure	01N22W03F05S	09/02/2015	ND	ND	ND	21.4	ND	ND	3	ND	ND	1	13	ND	ND	3

Table D-2 Metals (cont.)

GW Basin	SWN	Date	Al	Sb	As	Ba	Be	Cd	Cr	Pb	Hg	Ni	Se	Ag	Tl	V
Oxnard Plain Pressure	01N22W03F07S	09/02/2015	ND	ND	2	41.6	ND	0.3	3	ND	ND	2	18	ND	ND	3
Oxnard Plain Pressure	01N22W06B01S	08/24/2015	ND	ND	ND	19.2	ND	ND	3	1	ND	ND	19	ND	ND	4
Oxnard Plain Pressure	01N22W19A01S	09/30/2015	ND	ND	ND	21.9	ND	ND	1	1.2	ND	ND	1	ND	ND	ND
Oxnard Plain Pressure	01N22W23R02S	10/16/2015	ND	ND	4	24.1	ND	ND	2	ND	ND	ND	15	ND	ND	2
Oxnard Plain Pressure	01N22W25K02S	09/10/2015	50	ND	7	50.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Oxnard Plain Pressure	01N22W26Q01S	08/24/2015	30	ND	ND	43.2	ND	ND	2	ND	ND	ND	1	ND	ND	ND
Oxnard Plain Pressure	02N21W18H12S	09/08/2015	ND	ND	ND	24.6	ND	ND	2	ND	ND	ND	7	ND	ND	ND
Oxnard Plain Pressure	02N21W18H14S	09/24/2015	ND	ND	ND	40.4	ND	ND	2	ND	ND	ND	ND	ND	ND	ND
Oxnard Plain Pressure	02N22W24P02S	09/21/2015	ND	ND	ND	16.4	ND	ND	3	ND	ND	ND	5	ND	ND	3
Oxnard Plain Pressure	02N22W30F03S	09/02/2015	ND	ND	ND	20.2	ND	ND	3	ND	ND	ND	1	ND	ND	ND
Oxnard Plain Pressure	02N22W36E02S	09/02/2015	ND	ND	ND	20.5	ND	ND	3	ND	ND	2	15	ND	ND	3
Oxnard Plain Pressure	02N22W36F02S	09/02/2015	ND	ND	ND	23.5	ND	0.3	2	ND	ND	1	24	ND	ND	12
Piru	04N18W30A03S	12/09/2015	ND	ND	ND	39.5	ND	0.3	4	ND	ND	3	5	ND	ND	4
Piru	04N18W30J04S	12/09/2015	ND	ND	ND	30.9	ND	ND	3	1.2	ND	2	4	ND	ND	2
Piru	04N19W23R03S	12/09/2015	70	ND	ND	23.3	ND	1.2	5	ND	ND	13	5	ND	ND	4
Piru	04N19W25M03S	12/09/2015	ND	ND	6	24.6	ND	1.3	4	ND	ND	7	339	ND	ND	4
Piru	04N19W26H01S	12/09/2015	ND	ND	ND	21.8	ND	ND	3	ND	ND	2	4	ND	ND	3
Piru	04N19W26J03S	12/09/2015	ND	ND	ND	21	ND	ND	3	ND	ND	2	3	ND	ND	3
Pleasant Valley	01N21W01M02S	09/30/2015	ND	ND	ND	144	ND	1.5	3	77.1	ND	45	3	ND	ND	ND
Pleasant Valley	01N21W04K01S	09/09/2015	140	ND	ND	52.6	ND	ND	ND	0.9	ND	ND	2	ND	ND	ND
Pleasant Valley	01N21W12D02S	09/10/2015	1350	ND	ND	264	ND	ND	4	0.9	ND	5	ND	ND	ND	4
Pleasant Valley	01N21W15D02S	09/09/2015	ND	ND	2	40.4	ND	ND	ND	ND	ND	ND	4	ND	ND	3
Pleasant Valley	02N20W19F04S	09/09/2015	ND	ND	ND	46.1	ND	ND	ND	0.6	ND	4	2	ND	ND	ND
Pleasant Valley	02N21W33R02S	09/09/2015	ND	ND	ND	52.2	ND	ND	ND	ND	ND	1	ND	ND	ND	ND
Pleasant Valley	02N21W34G01S	09/09/2015	ND	ND	ND	42.8	ND	ND	2	4.2	ND	ND	3	ND	ND	ND
Santa Paula	02N22W03B01S	12/31/2015	ND	ND	3	25.7	ND	ND	5	ND	ND	4	6	ND	ND	ND
Santa Paula	03N21W09K04S	12/10/2015	ND	ND	4	26.9	ND	ND	2	ND	ND	ND	1	ND	ND	ND
Sherwood	01N19W19H03S	12/29/2015	ND	6	9	11.8	ND	ND	3	ND	ND	4	ND	ND	ND	ND
Sherwood	01N20W25C07S	12/29/2015	ND	ND	ND	58.7	ND	0.7	4	0.6	ND	1	2	ND	ND	ND
Simi Valley	02N18W08D04S	09/01/2015	ND	ND	2	14.6	ND	ND	4	ND	ND	2	16	ND	ND	4
Tierra Rejada Valley	02N19W10R01S	08/13/2015	ND	ND	ND	66.8	ND	ND	6	ND	ND	ND	5	ND	ND	51
Ventura River - Lower	02N23W05K01S	09/29/2015	ND	ND	4	30.5	ND	ND	4	ND	ND	3	6	ND	ND	ND
Ventura River - Lower	03N23W32Q10S	12/31/2015	ND	ND	4	31.9	ND	0.2	5	ND	ND	5	12	ND	ND	2
Ventura River - Upper	04N23W15A02S	11/03/2015	ND	ND	ND	44.6	ND	ND	2	1.3	ND	ND	2	ND	ND	ND

Table D-3 Radiochemistry

GW Basin	SWN	Date	Alpha pCi/L	CE	Uranium pCi/L	CE
Little Cuddy Valley	08N20W04N02S	12/30/2015	4.32	1.52	1.61	0.93
Lockwood Valley	08N21W23Q10S	12/30/2015	16.5	3.41	15.7	2.44
Lockwood Valley	08N21W29N02S	12/30/2015	4.87	2.28	3.12	1.19
Lockwood Valley	08N21W29Q05S	12/30/2015	14	4.59	11.9	2.14
Lockwood Valley	08N21W29R09S	12/30/2015	11.2	2.49	8.41	1.82
Lockwood Valley	08N21W30R01S	12/30/2015	22.4	4.69	27	3.18
Lockwood Valley	08N21W33R03S	12/30/2015	5.12	1.75	3.31	1.21
Ojai Valley	04N23W12B03S	12/10/2015	5.78	2.26		
Oxnard Plain Pressure	01N21W21H02S	10/16/2015	0.15	0.966		
Piru	04N19W23R03S	12/09/2015	6.15	3.3		
U N D E F I N E D	02N21W13A01S	10/06/2015	0.028	1.1		

* CE – Counting Error

Appendix E – Piper Diagrams

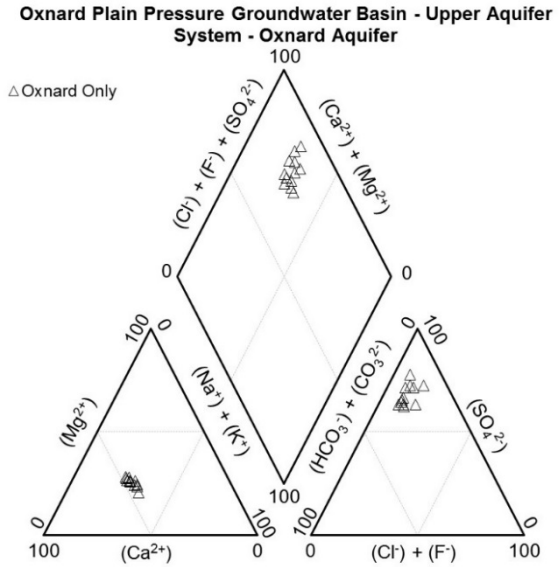

Figure E-1: Oxnard Aquifer piper diagram.

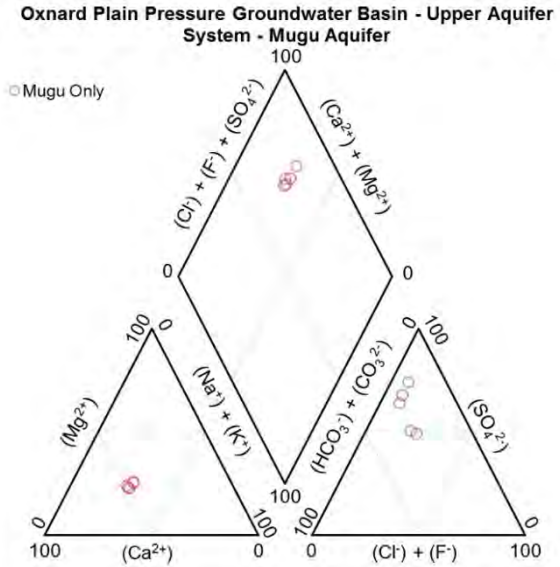

Figure E-2: Mugu Aquifer piper diagram.

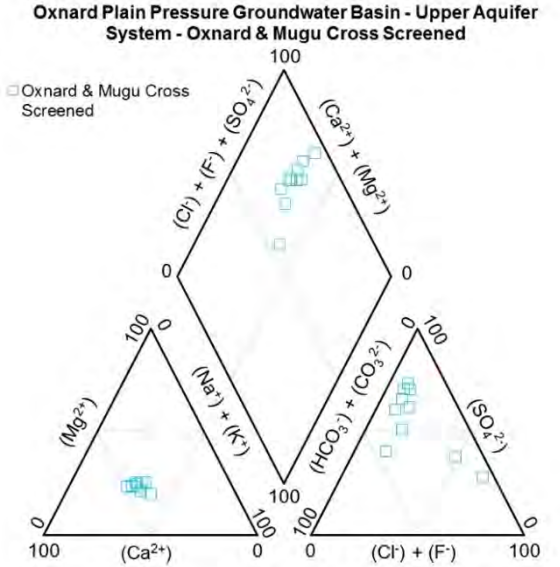

Figure E-3: Oxnard & Mugu Cross Screened piper diagram.

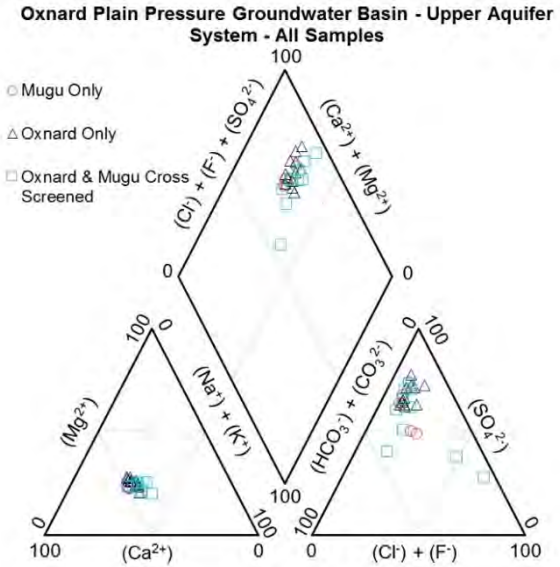

Figure E-4: All Upper Aquifer System piper diagram.

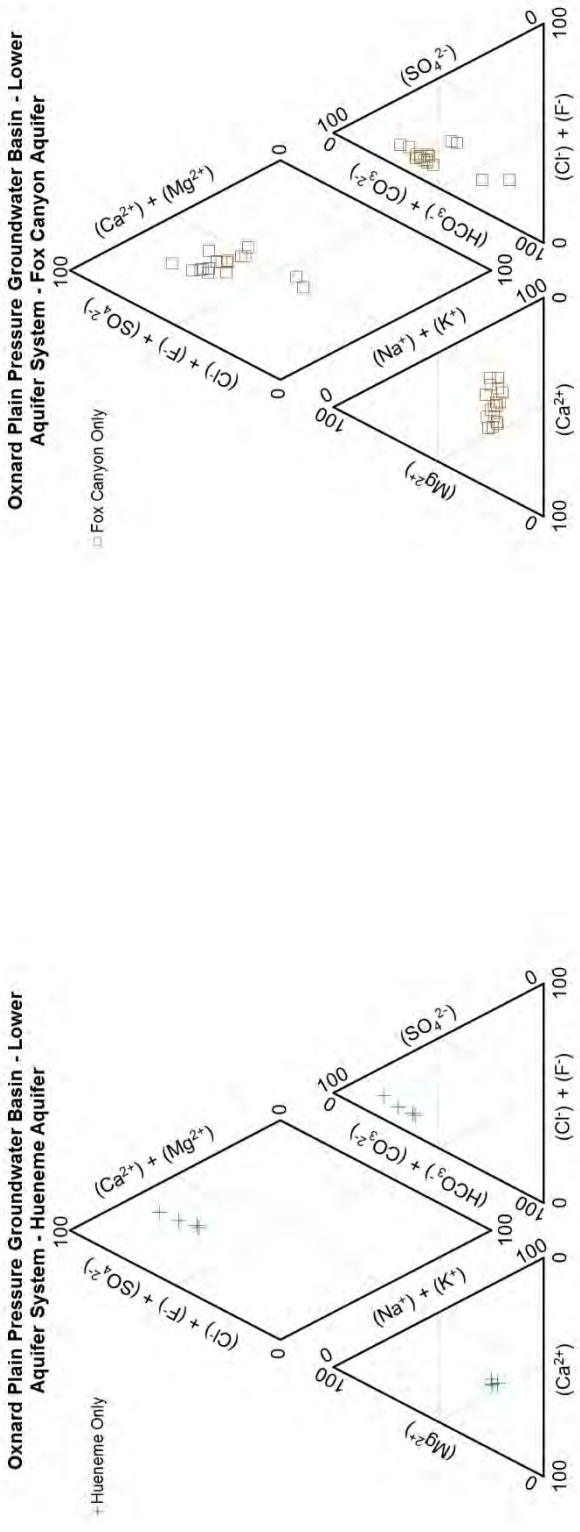

Figure E-5: Hueneme Aquifer piper diagram.

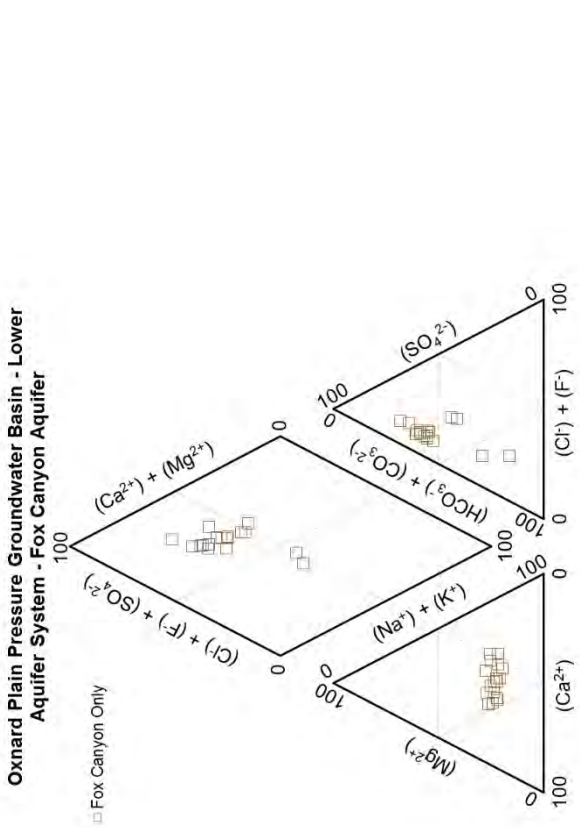

Figure E-6: Fox Canyon Aquifer piper diagram.

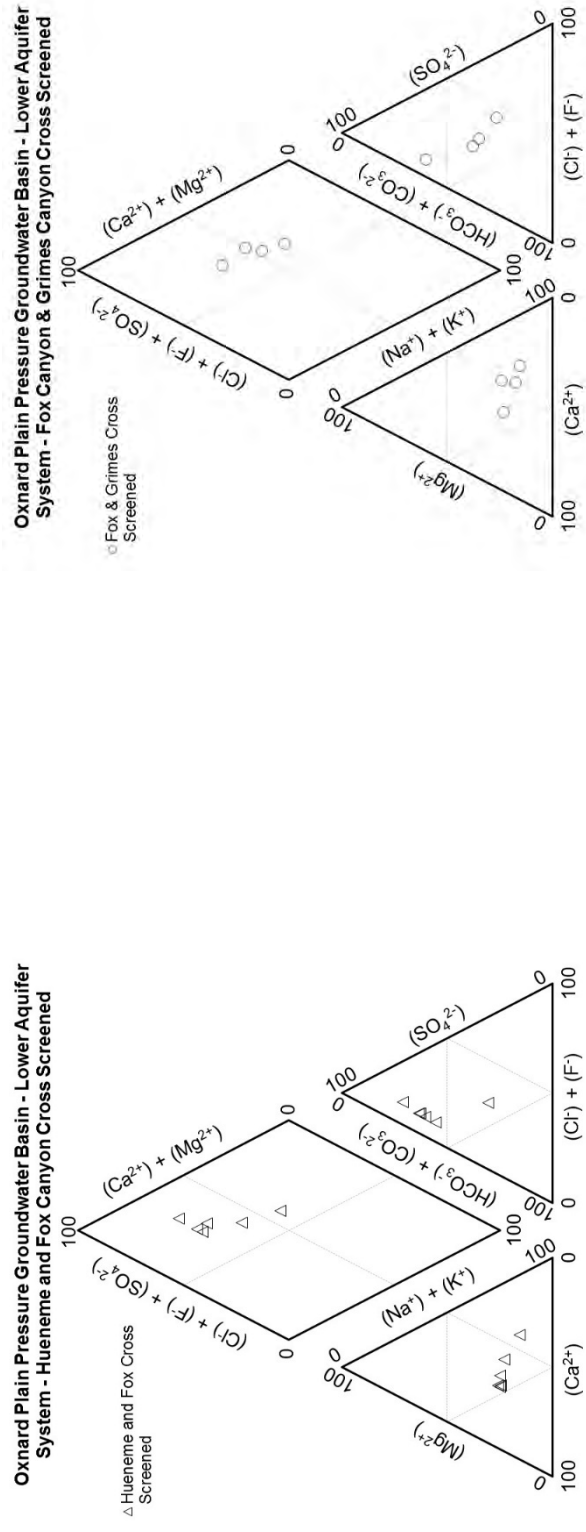

Figure E-7: Fox and Hueneme cross screened piper diagram.

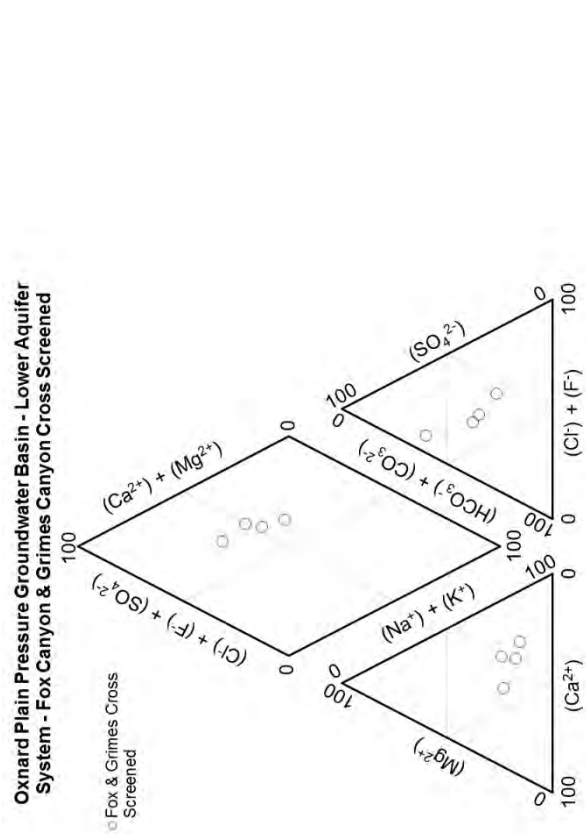

Figure E-8: Fox and Grimes cross screened piper diagram.

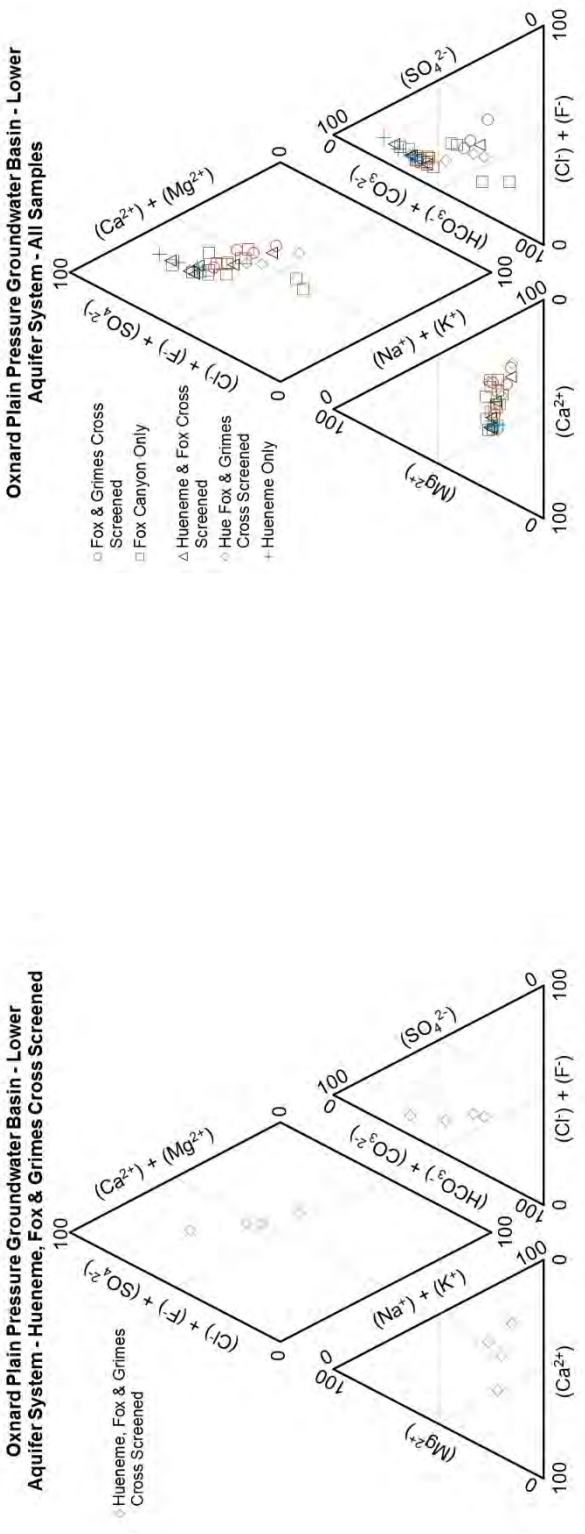

Figure E-9: Hueneme, Fox & Grimes cross screened piper diagram.

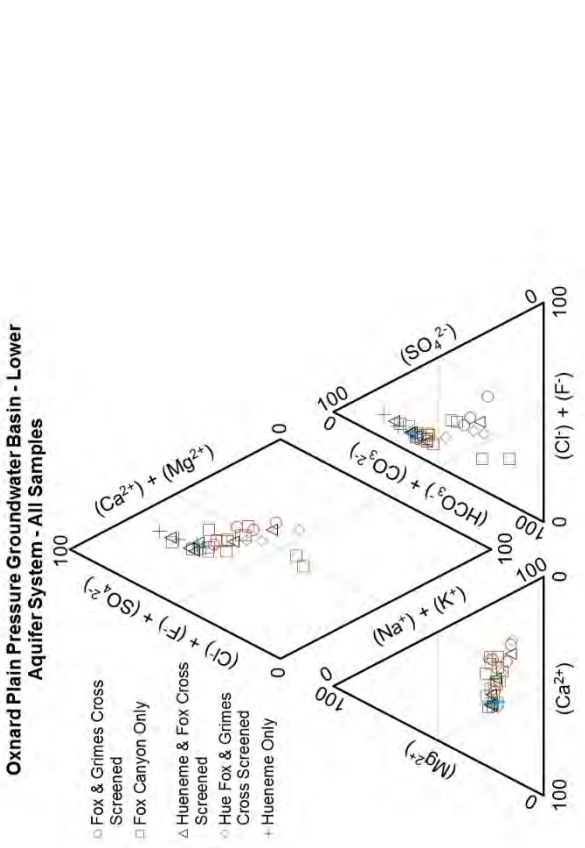

Figure E-10: All Lower Aquifer System piper diagram.

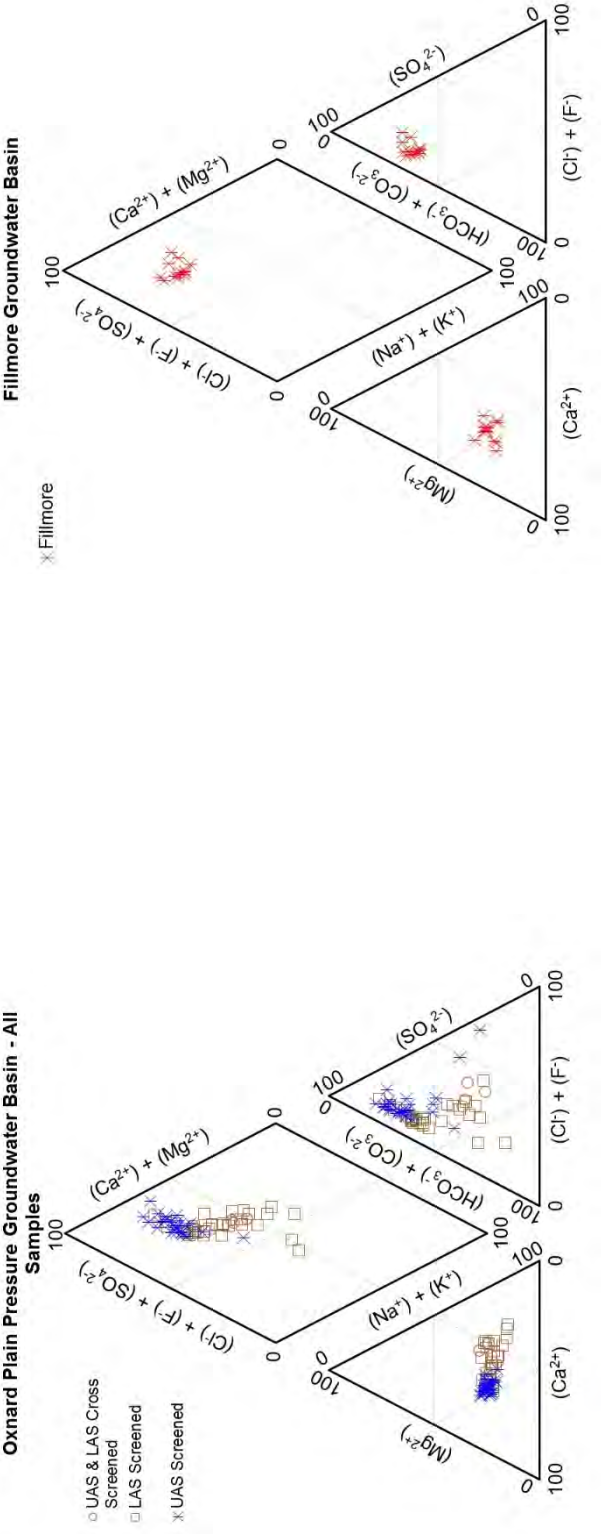

Figure E-11: Oxnard Plain Pressure Basin all samples piper diagram.

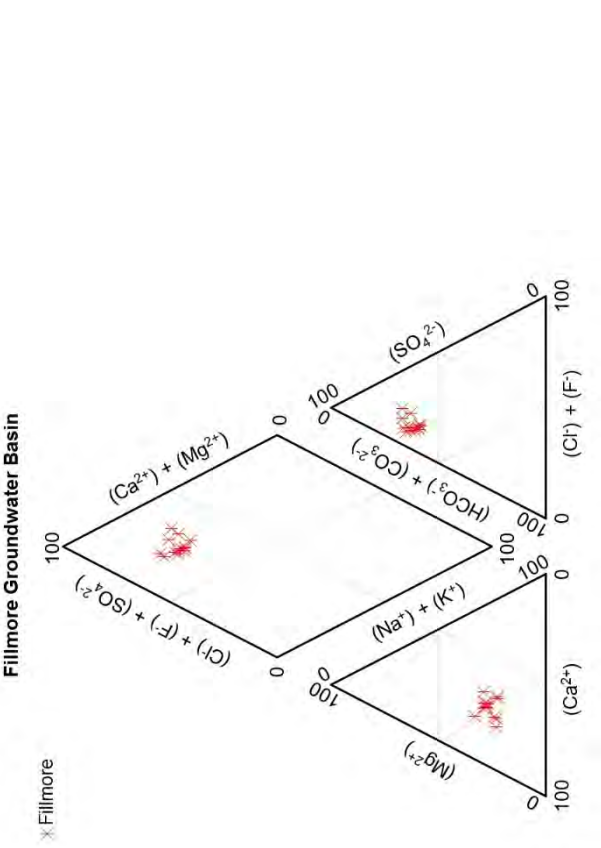

Figure E-12: Fillmore basin piper diagram.

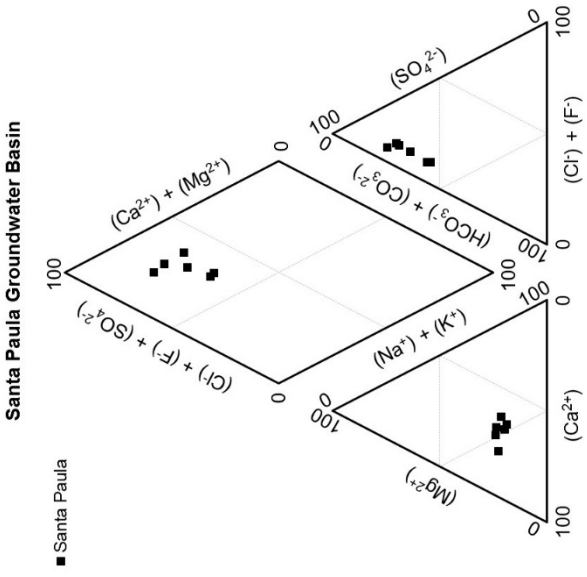

Figure E-13: Santa Paula basin piper diagram.

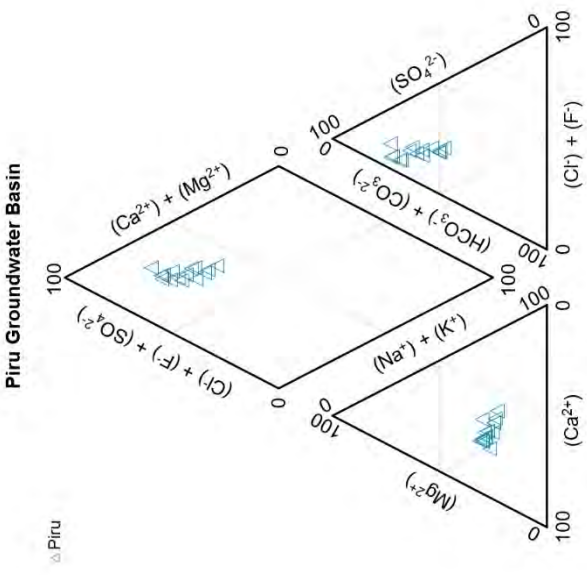

Figure E-14: Piru basin piper diagram.

Figure E-15: Fillmore, Piru, and Santa Paula comparison piper diagram.

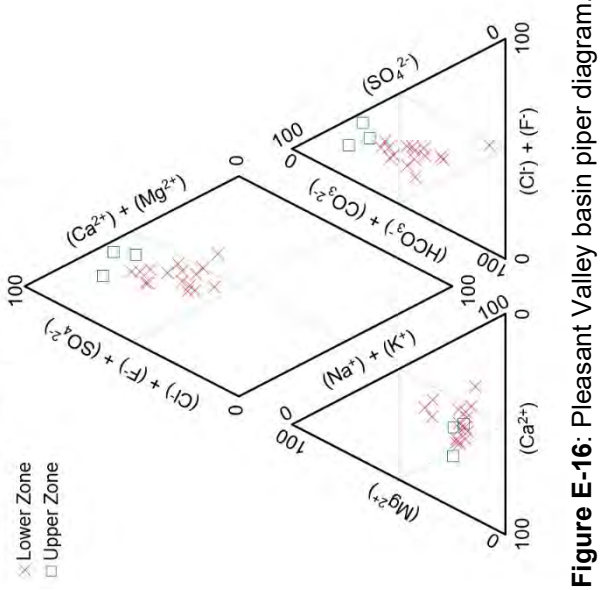

Figure E-16: Pleasant Valley basin piper diagram.

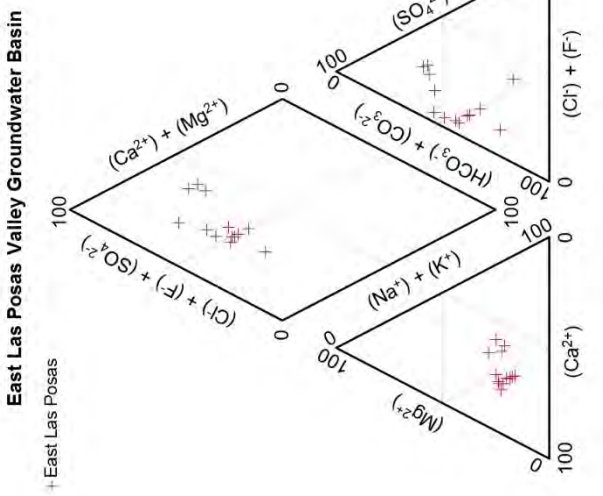

Figure E-18: East Las Posas basin piper diagram.

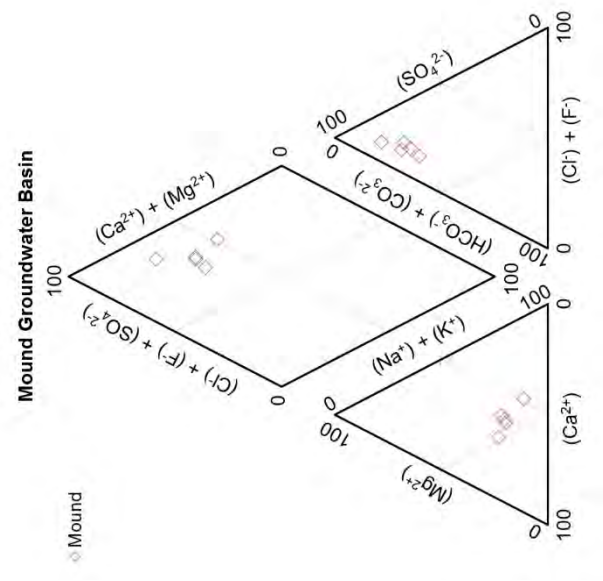

Figure E-17: Mound basin piper diagram.

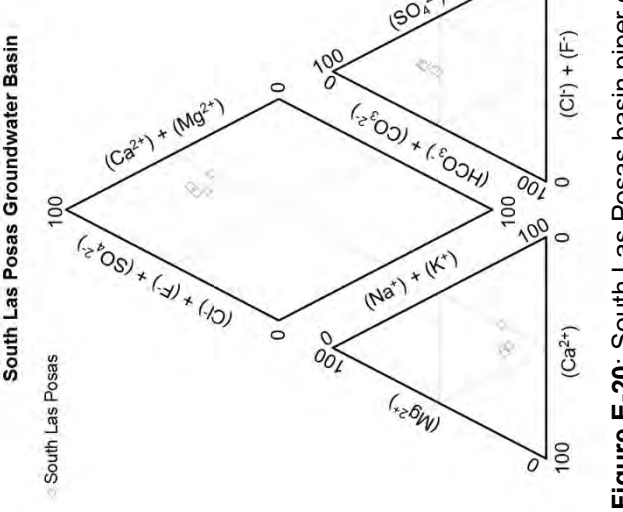

Figure E-20: South Las Posas basin piper diagram.

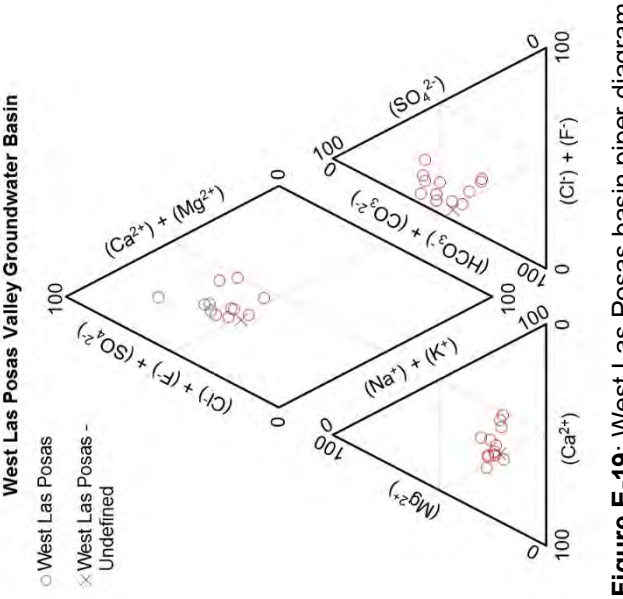

Figure E-19: West Las Posas basin piper diagram.

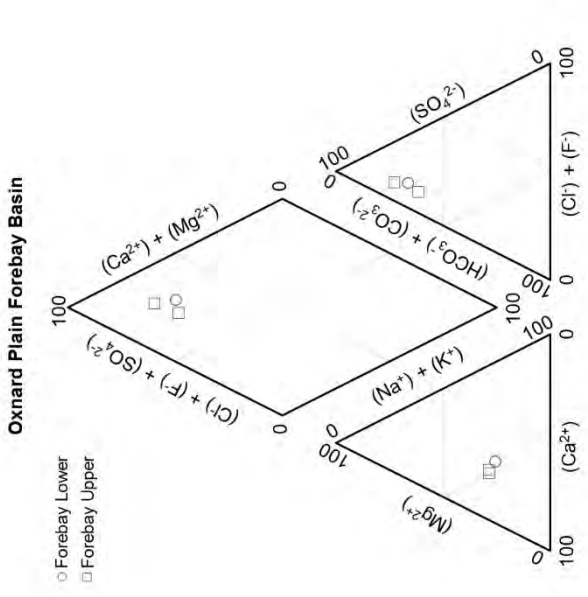

Figure E-22: Oxnard Forebay basin piper diagram.

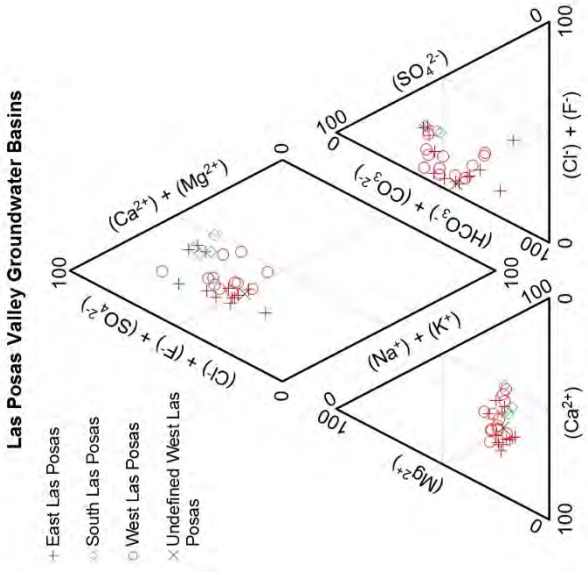

Figure E-21: All Las Posas basins comparison piper diagram.

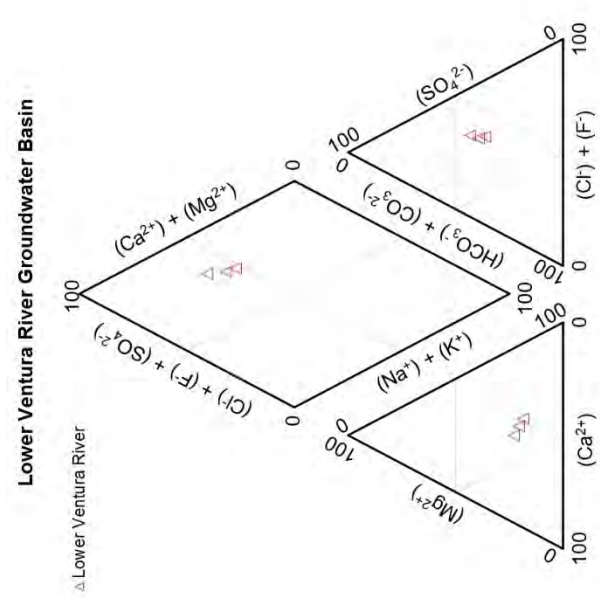

Figure E-24: Lower Ventura River basin piper diagram.

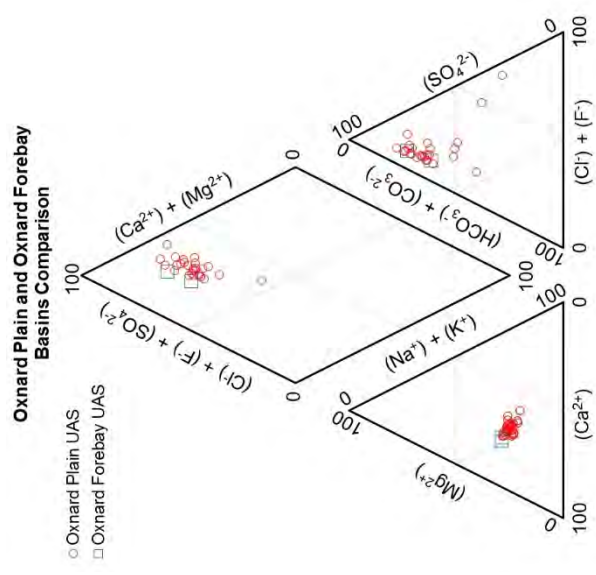

Figure E-23: Oxnard Plain Basins UAS comparison piper diagram.

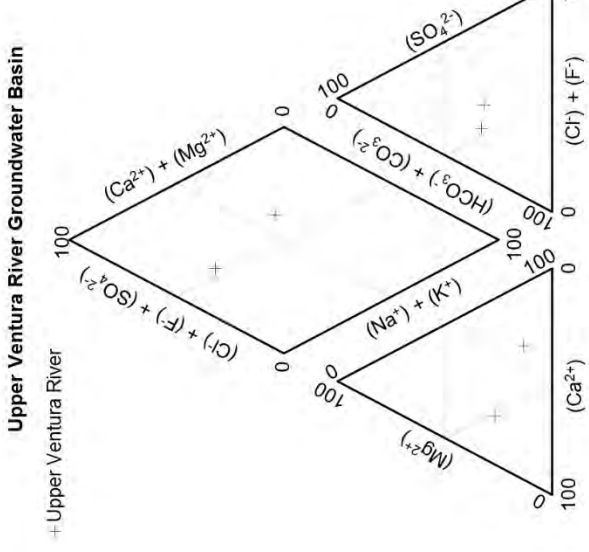

Figure E-25: Upper Ventura River basin piper diagram.

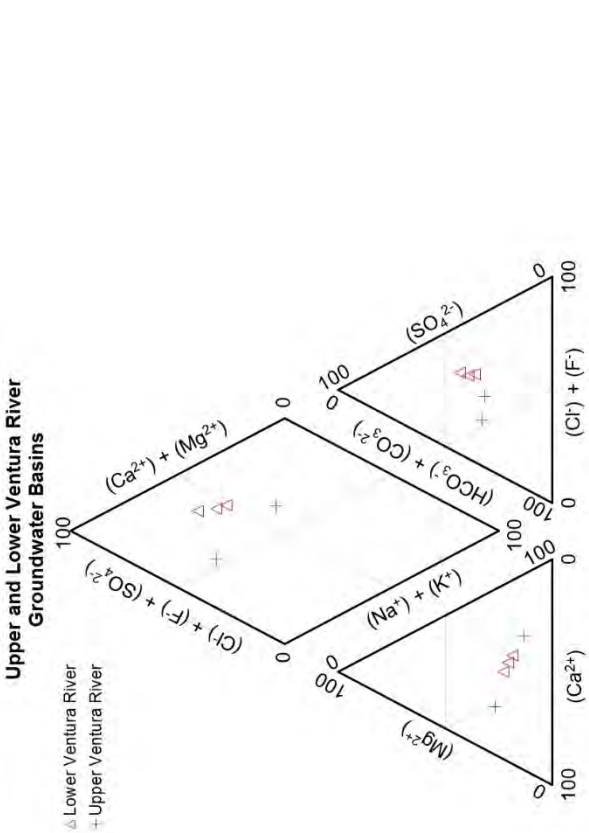

Figure E-26: Upper and Lower Ventura River basins piper diagram.

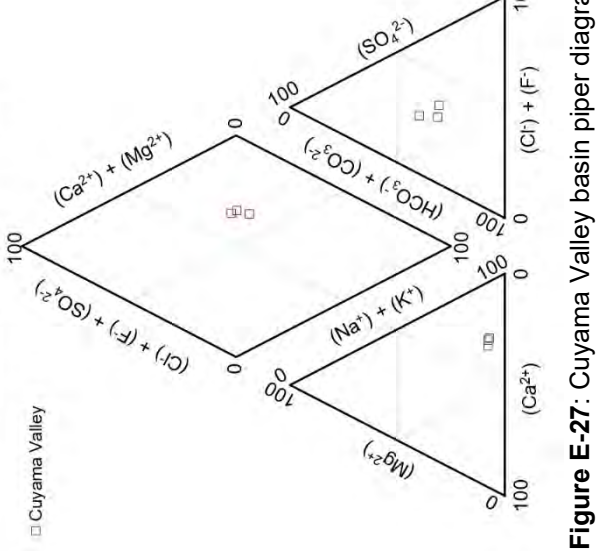

Figure E-27: Cuyama Valley basin piper diagram.

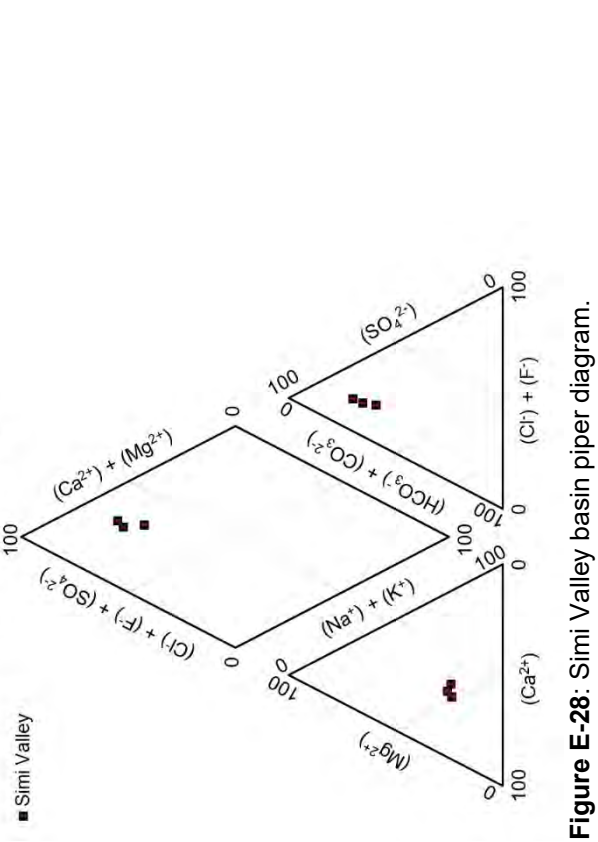

Figure E-28: Simi Valley basin piper diagram.

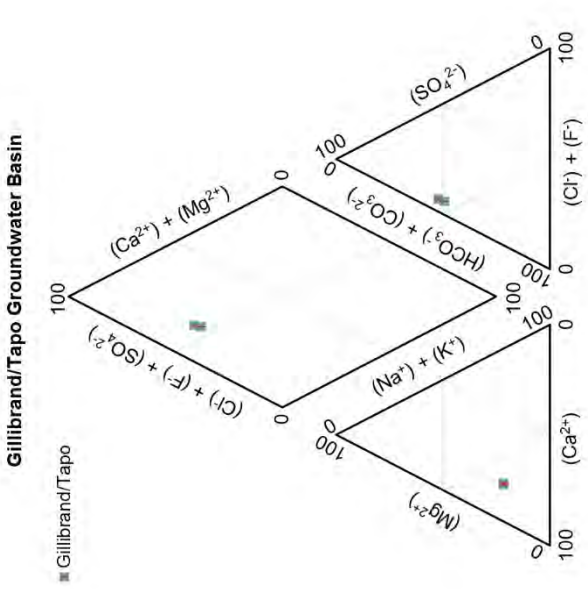

Figure E-30: Tapo/Gillibrand basin piper diagram.

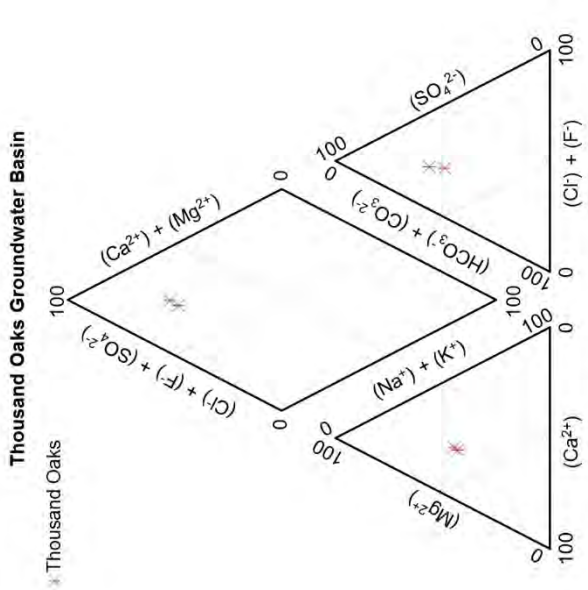

Figure E-29: Thousand Oaks basin piper diagram.

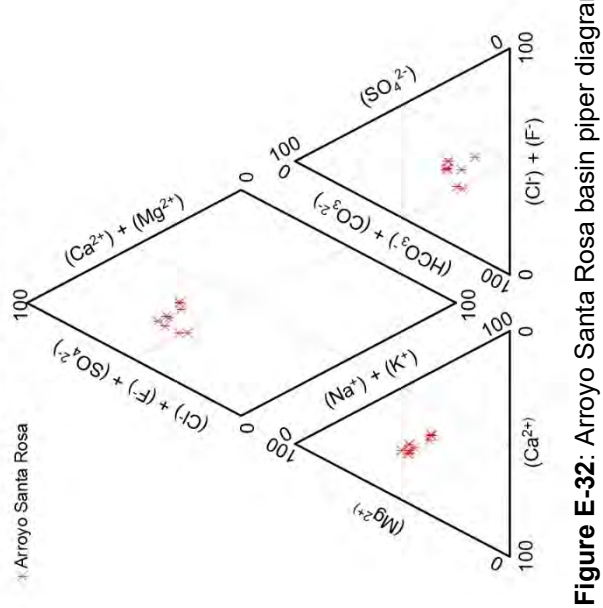

Figure E-32: Arroyo Santa Rosa basin piper diagram.

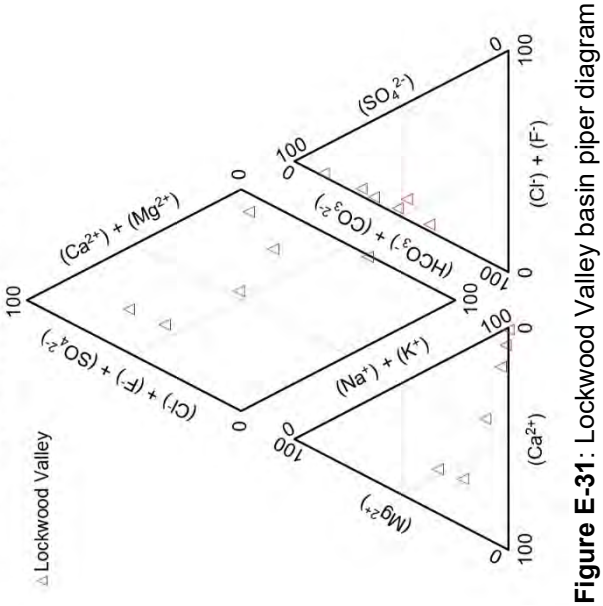

Figure E-31: Lockwood Valley basin piper diagram.

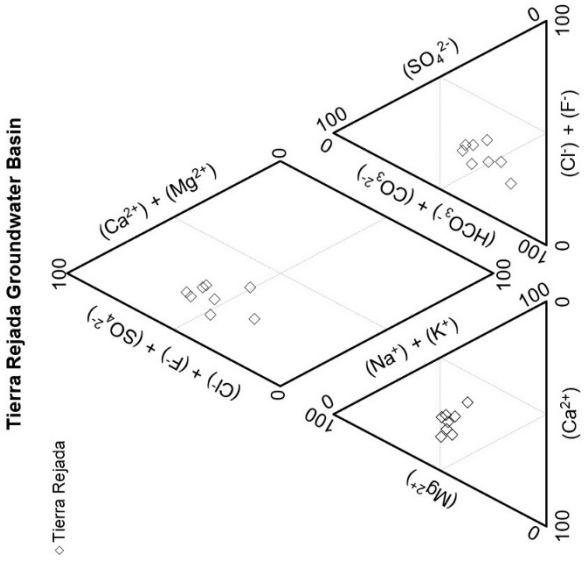

Figure E-33: Tierra Rejada basin piper diagram.

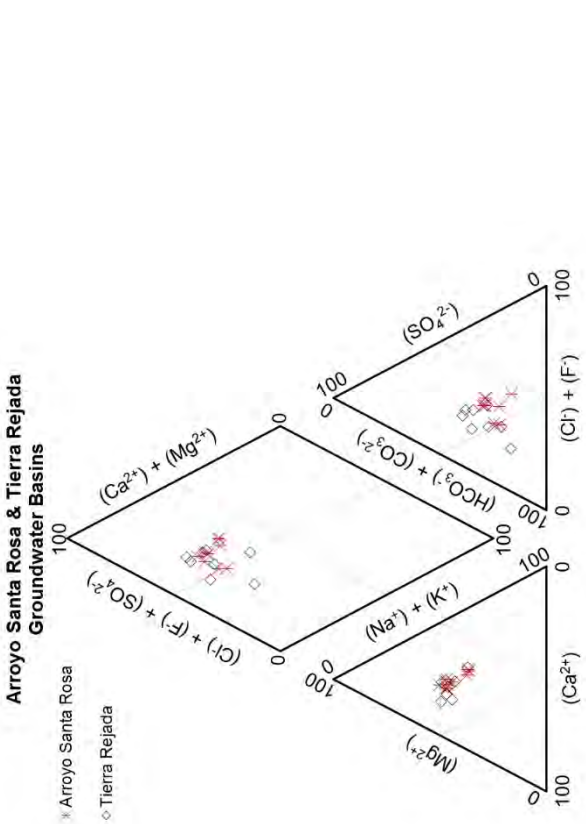

Figure E-34: Arroyo Santa Rosa & Tierra Rejada basins piper diagram.

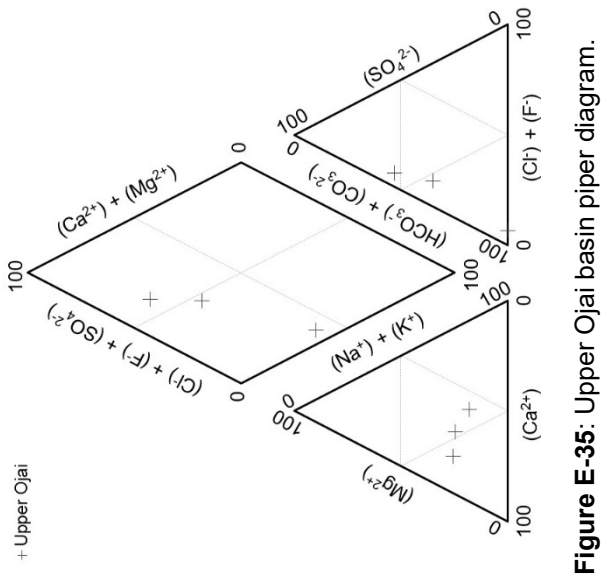

Figure E-35: Upper Ojai basin piper diagram.

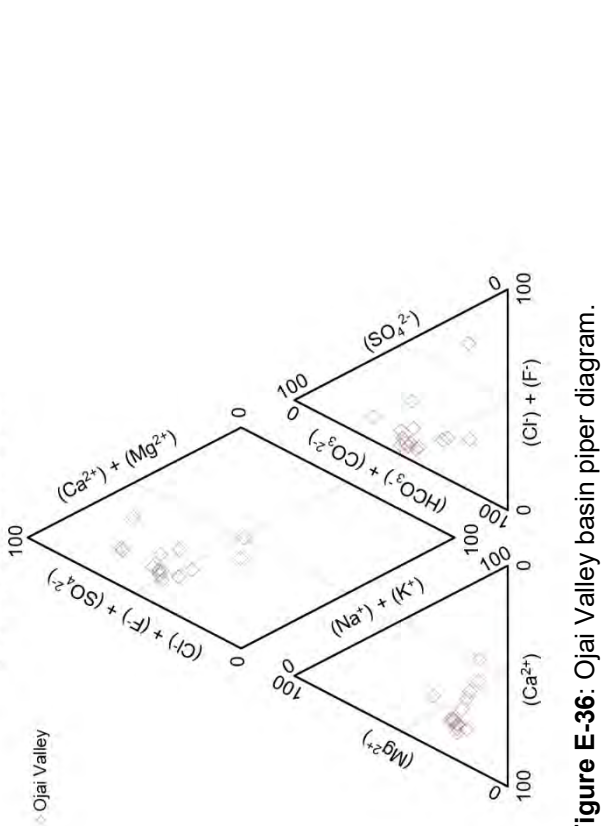

Figure E-36: Ojai Valley basin piper diagram.

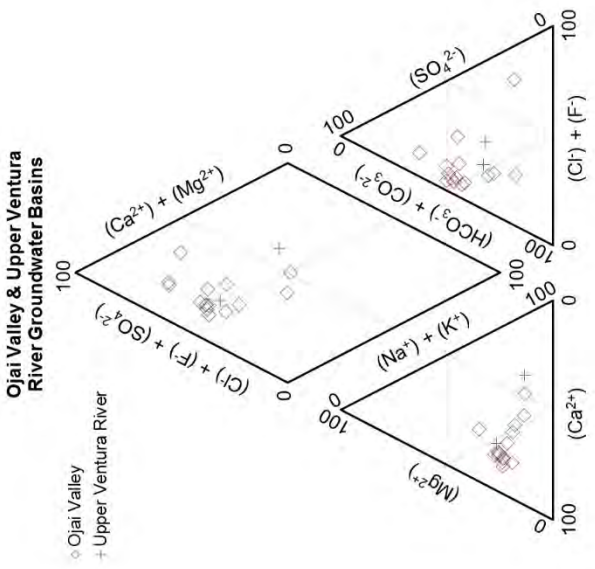

Figure E-37: Ojai Valley & Upper Ventura River comparison piper diagram.

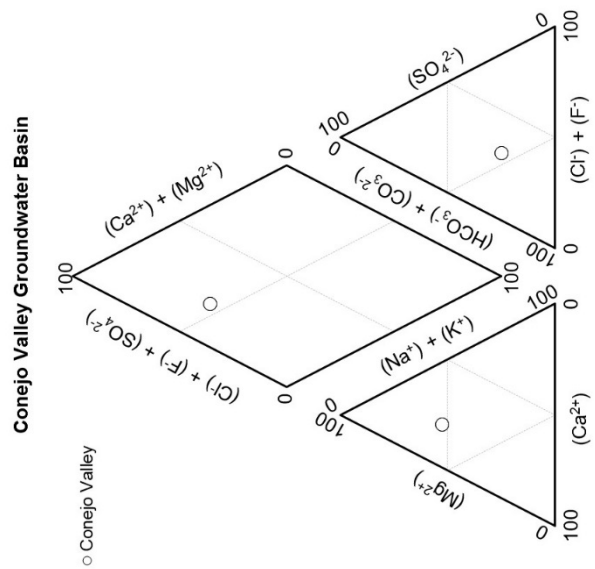

Figure E-38: Conejo Valley basin piper diagram.

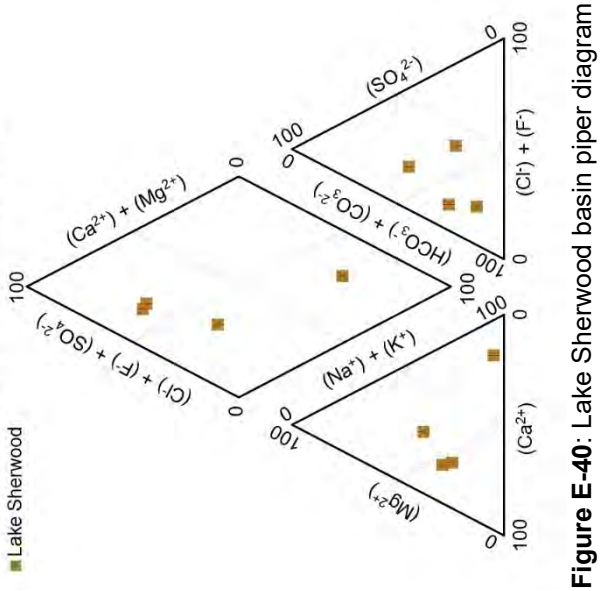

Figure E-40: Lake Sherwood basin piper diagram.

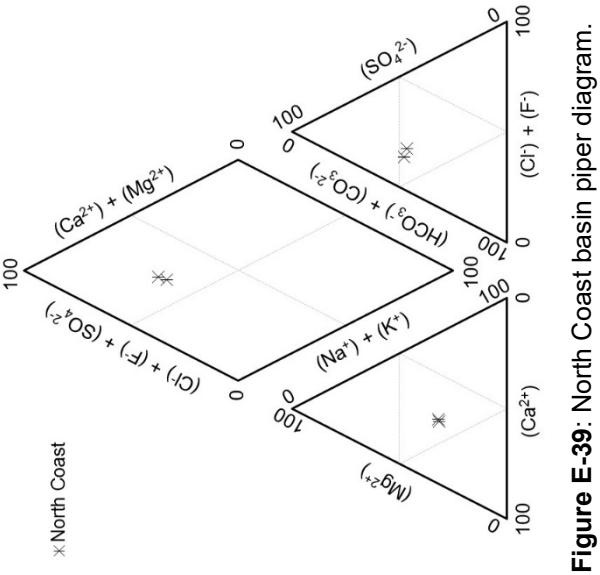

Figure E-39: North Coast basin piper diagram.

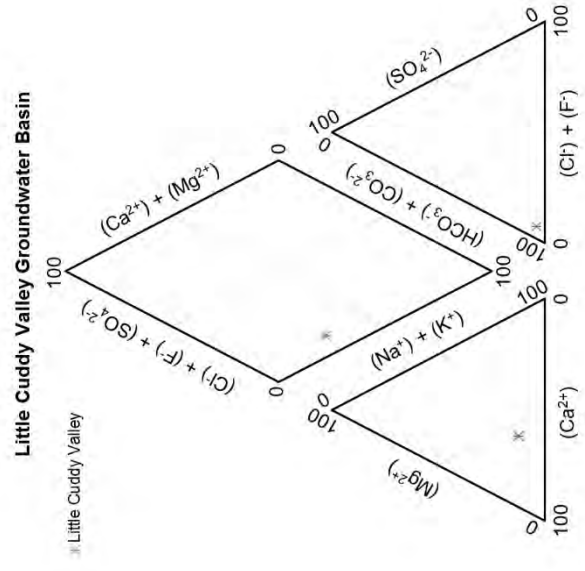

Figure E-41: Little Cuddy Valley basin piper diagram.

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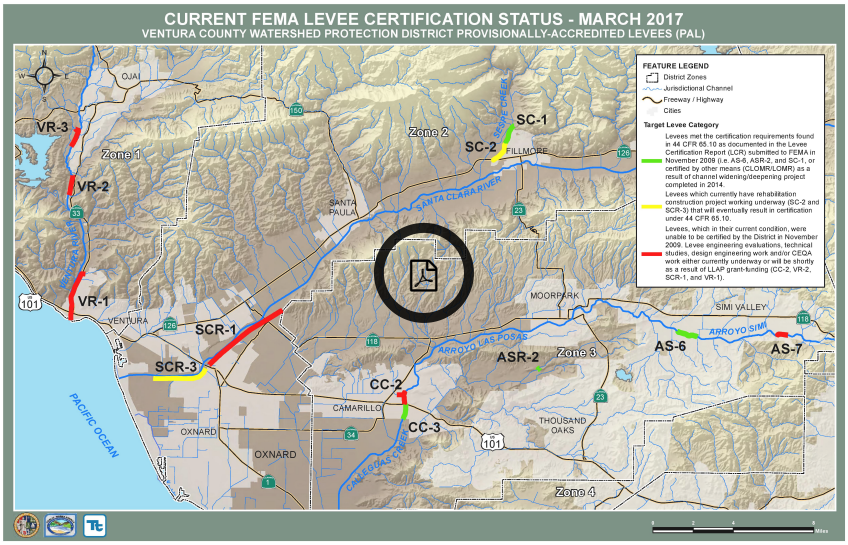
CURRENT FEMA LEVEE CERTIFICATION STATUS - MARCH 2017



FEMA Levee Certification Process Results Countywide

In November of 2009, the Ventura County Watershed Protection District completed Federally-mandated engineering evaluations of nine Provisionally Accredited Levees (PALs) located within the Calleguas Creek, Santa Clara River, and Ventura River watersheds. The maps shown above depict the most currentessential levee certification project status information regarding the aforementioned nine PAL levees.

The District submitted Levee Certification Report (LCR) compliance documentation packages to FEMA for three of the nine PAL-designated levees by November 30, 2009. They included: the ASR-2 Levee-Floodwall along Arroyo Santa Rosa in

the Unincorporated Santa Rosa Valley, the AS-6 Levee along Arroyo Simi in Simi Valley, and the SC-1 (north half of the Sespe Creek Levee) in Fillmore.

At that time, PAL-Response Reports (PRRs) were also submitted to FEMA for the remaining six PAL-designated levees. Those included: AS-7 along Arroyo Simi in Simi Valley, CC-2 and CC-3 along Calleguas Creek in Camarillo, SCR-1 along the Santa Clara River in Oxnard, VR-1 along the Ventura River in Ventura, and VR-3 in the Unincorporated Ventura River Valley. The PRRs indicated that in their then current condition, those six levees could not be certified by the District in time to meet FEMA's November 30, 2009 PAL- compliance submittal deadline date.

Subsequently, two additional levee systems, SC-2 (south half of the Sespe Creek levee in Fillmore) and the SCR-3 levee along the Santa Clara River in Oxnard, were added to the above list of levees requiring rehabilitation work to be fully compliant with Federal Levee Certification regulations [i.e. 44 CFR 65.10].

Construction of SC-2 levee improvements is concluding in September 2017, while SCR-3 levee Phase 1 construction is anticipated to end by December 2017. SCR-3 levee Phase 2 construction is anticipated to begin in September 2018 and end approximately two years later.

The cost of each of the above two levee projects has been partly offset by Proposition 84 State Local Levee Assistance Program (LLAP) Grant funding: $2.53 million for SC-2 and $5.3 million for SCR-3. The District is currently engaged in preliminary design engineering work in support of levee retrofit and/or enhancement projects required to certify the six remaining non-certified levees in full compliance with Federal Levee Certification Requirements found in 44 CFR 65.10.

In November of 2009 a planning-level estimate of the total costs required to complete the necessary levee construction rehabilitation work for all eight levees was estimated at upwards of $132 Million.. As of August 2017, VCWPD had completed approximately $40 Million of Levee Certification rehabilitation work on these levees, with an additional $20 Million programed by the end of 2020.

Currently, FEMA is engaged in the process of evaluating alternative flood-risk mapping methodologies for eventual use in the determination of Special Flood Hazard Areas (SFHA) behind non-certified levees, such as the eight mentioned above. FEMA has not yet released an official date when it plans to issue new Digital Flood Insurance Rate Maps (DFIRMs) for flood protection areas behind the Santa Clara River levees.

However, based on the latest information available to VCWPD, we believe that FEMA's projected release date for new DFIRMs for the areas behind the SCR-1 and SCR-3 levees might occur sometime during calendar year 2019 , at the earliest, possibly later.

The District is also working closely with the United States Army Corps of Engineers, as well as affected cities, residents and property owners throughout the county to marshal Federal, State and Local funding resources necessary to complete these very important levee retrofit public safety projects. Once these levee rehabilitation construction projects are completed, the District plans on submitting Conditional Letters of Map Revisions (CLOMRs) to FEMA documenting full compliance with applicable Federal Levee Certification requirements found in 44 CFR 65.10.

The District’s Levee Certification Program has been underway for ten years. At best, completion of construction rehabilitation and certification documentation for the remaining six non-certified levees will likely require at least five to ten additional years, depending on final design plans, environmental considerations, and project funding availability.

Questions regarding the District’s Levee Certification Program should be directed to Gerard Kapuscik, Manager, Strategic Resiliency Group, at (805) 648-9284 or at gerard.kapuscik@ventura.org (mailto:gerard.kapuscik@ventura.org).

POPULAR DOCUMENTS

Flood Insurance Facts (/)

Flood Smart.gov (https://www.floodsmart.gov/floodsmart/)

FEMA (/)

California Flood Safe (http://www.water.ca.gov/floodsafe/)

National Flood Risk Management Levee Safety Summit (/)

Library of Previously Released SCR-3 Documents (/levee-library)

(/)

SCR-1 Pre-Scoping Presentation October 19, 2017

Download Minutes (/doc/scr-1/CommMtg_2017-10-19_FINAL.pdf)

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VENTURA RIVER

Flood Zone 1

QUICK LINKS

Fox Canyon Groundwater Management

Major Watersheds

Rain and Stream Data

Current Storm Data

Disaster Preparedness

Hydrology, Hydrography, Technology

Debris Basin Manual

Policies and Ordinances

Community Rating System (CRS)

MSWRP Supplemental Input

Watershed Benefit Assessment

Water Purveyor Search

Storm Damage Assistance

VENTURA RIVER

The Ventura River and its tributaries comprise the major watershed in Flood Zone 1 comprising the west-center portion of Ventura County. Significant tributary creeks to the Ventura River include Matilija Creek, North Fork Matilija Creek, Coyote Creek, Senior Canyon, Reeves and Thacher Creeks, Lion Canyon, Coyote Creek, San Antonio Creek, and Cañada Larga. The Ventura River Watershed comprises an area of

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the City of Ventura.

Ventura River Watershed
Zone 1 (yellow)

Zone 1 boundaries incorporate two of the Supervisorial Districts for Ventura County (District 1 and District 3), with Supervisor District 1 covering a majority of the zone.

Annual weather conditions are characterized by warm summer daytime highs often tempered by ocean breezes and cool clear winter nights. Frosts are rare in the near coastal region but can be a problem for agricultural operations in inland valleys and elevated mountain portions of the watershed. Due to what is known as a "rainshadow effect", cloud systems moving inland off the Pacific Ocean soon encounter the steep mountains located only 1 to 2 miles from the coast and must discharge a majority of their contained weighted moisture before these clouds can rise to continue moving inland. This results in Zone 1 receiving the most rain in Ventura County with nearly twice the amount compared to any other area or zone.

Average annual rainfall for the drainage basin upstream of Matilija Dam is 23.9 inches per year while the average annual rainfall near the mouth of the Ventura River is approximately 16.9 inches per year. Overall average measured rain for the entire watershed is approximately 20 inches per year. Extreme seasonal variation in rainfall means over 90 percent of any given year measurement is recorded between the months of November and April. Peak historic rainfall intensity was over 4 inches per hour measured during a 15-minute period at the Wheeler Gorge rain gauge located in the mountains adjacent to Ojai Valley.

North-South crustal compression resulting from plate tectonic movements has contributed to once-horizontal rock layers being uplifted to near-vertical in many cases, and even overturned in some extreme folding or faulting situations. These highly folded mostly marine sedimentary rocks typify steep slopes in the upper portion of the watershed north of the Ojai Valley, and present significant barriers to the natural north-to-south flow direction of the Ventura River as it tries to reach the Pacific Ocean. Somewhat unique to stream systems, the Ventura River is what Geomorphologists call an "**antecedent stream"**. This is a stream that maintains its original course and pattern by downcutting at the same rate the underlying rocks are being uplifted. In this case, that's about 1/4 to 1/2 inch per year of erosion cancelling out the same amount of vertical crustal uplift.

Constant erosion rates therefore produce a large volume of sediment supplied to the Ventura River from upper-elevation tributary streams. Mass wasting from erodible, colluvial soils on hillsides, including slides, slumps, debris flows and earthflows, is a common mechanism by which sediment is transported to the river channels. Sediment production in the area is also impacted by the occurrence of more frequent than desired forest fires that burn off and clear the normally dense vegetation on slopes and flatter areas within the watershed. All that debris (rocks, boulders, sand and mud) greatly increases the erodibility and grinding of the creek bottoms and natural stream channels (US Army Corps of Engineers, 2004).

The watershed topography is characterized by rugged mountains in the upper basins transitioning to relatively flat valleys in the lower downstream areas. Over 75 percent of the Ventura River Watershed is classified as rangeland covered with shrub and brush and 20 percent of the basin is classified as forested. In general, the highest sediment-producing parts of the watershed are those covered in shrub and brush and are located in the upper parts of the watershed where slopes are greater and annual rainfall is larger. Nearly 45 percent of the watershed can be classified as mountainous, 40 percent as foothill, and 15 percent as valley area. Two major reservoirs lie within the

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There are five debris basins that collect sediment from drainages before they enter the mainstem Ventura River. Live Oak, McDonald and Dent Canyon basins are on direct tributaries of the Ventura River. There is one on Stewart Canyon, a tributary to San Antonio Creek, and another partially destroyed basin on upper San Antonio Creek. Major communities in Zone 1 include the City of Ojai, community of Oak View, and the western part of City of San Buenventura. Total population in these communities in year 2000 was approximately 22,988, excluding the western portion of the City of San Buenaventura and County inhabitants (USACE, 2004).

- VENTURA RIVER PROGRAMS AND PROJECTS
- INTEGRATED WATERSHED PROTECTION PLAN (IWPP)
- VENTURA RIVER WATERSHED BIODIGESTER FOCUSED FEASIBILITY STUDY
- HYDROLOGY REPORTS - PARTIAL LISTING

OUR WATERSHEDS

VENTURA RIVER

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SANTA CLARA RIVER

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FLOOD ZONE 4 SOUTH

FLOOD ZONE 4 NORTH (CUYAMA RIVER)

COASTAL CREEKS

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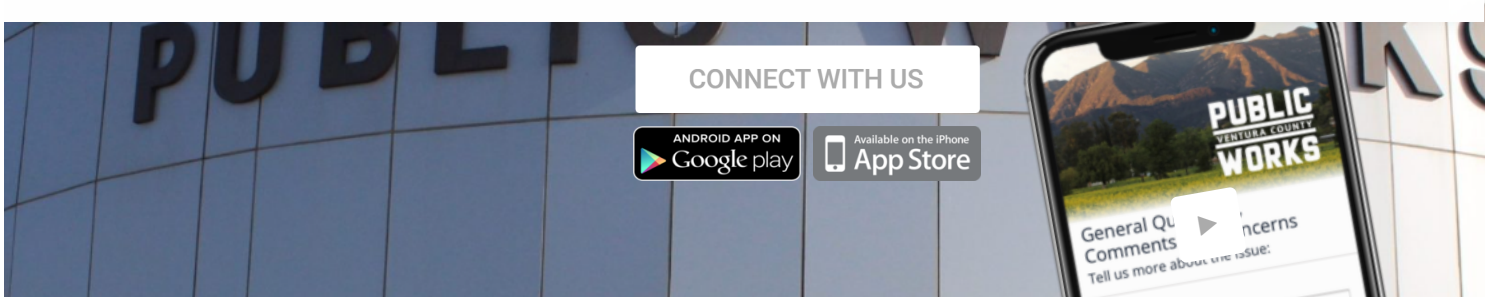

The Ventura County Public Works Agency aims to deliver efficient, responsive and cost effective regional services essential to the health, safety, natural resources protection, and economic vitality of Ventura County and its residents.

Contact

Address:

800 South Victoria Avenue
Ventura, CA 93009-1600

Hours of Operation:

8:00a.m. - 5:00p.m.

Phone Number:

805.654.2018

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PUBLIC WORKS VENTURA COUNTY

COUNTY of VENTURA

Jeff Pratt
Agency Director

David Fleisch
Assistant Director

Central Services **Joan Araujo**, Director | Engineering Services **Christopher Cooper**, Director | Roads & Transportation **Chris Hooke**, Acting Director | Water & Sanitation **Joseph Pope**, Director | Watershed Protection **Glenn Shephard**, Director

2021 PROGRESS REPORT – MULTI HAZARD MITIGATION PLAN (CRS ACTIVITY 510)

Date this Report was Prepared: July 20, 2021

Name of Community: County of Ventura, CA

Name of Plan: 2015 Ventura County Multi Hazard Mitigation Plan

Date of Adoption of Plan: August 2, 2016

5 Year CRS Expiration Date: August 2, 2016

Location where copies are available for review:

County of Ventura Public Works
800 S. Victoria Ave. Ventura, CA 93009
https://www.readyventuracounty.org/stay-informed/

DISCUSSION:
Communities in Ventura County face natural hazards such as earthquakes, wildfires, flooding, dam failures, landslides, debris flows, and tsunamis. The federal law known as the Disaster Mitigation Act of 2000 requires local hazard mitigation planning to reduce or eliminate the long-term risk to human life and property from natural hazards. The National Flood Insurance Program (NFIP) encourages local communities' participation in a Community Rating System (CRS) administrated by the Federal Emergency Management Agency (FEMA) to reduce or eliminate exposure to floods. Credit points are provided in CRS for the adoption and implementation of the Ventura County Multi-Hazard Mitigation Plan. Since May 1, 2016, Unincorporated County of Ventura has achieved a class 5 in the FEMA CRS rating system. The owners of floodplain properties in the unincorporated Ventura County have been receiving an annual policy premium discount of up to 25% on new and renewal policies.

The County of Ventura has adopted the FEMA-approved 2010 Multi-Hazard Mitigation Plan (MHMP) in 2011. The County, in partnership with cities, water, park and school districts, has developed a 5-year update to the 2010 MHMP in accordance with CRS requirements. The updated MHMP was completed in October 2015 and the Ventura County Board of Supervisors adopted the draft MHMP the same month. The revised MHMP went to the Board of Supervisors for re-adoption on September 13, 2016. Final approval from FEMA was received on April 10, 2017. A FEMA field verification visit was

completed on May 15, 2018, and FEMA confirmed the county's class 5 rating in the CRS program on April 1, 2021.

The next updates to the countywide MHMP is currently in progress. The Sheriff's Office of Emergency Services is managing the work with scheduled completion date of June 2022.

Per CRS requirements, the MHMP implementation progress report must be filed with FEMA on an annual basis. Since the filing of the 2020 progress report (http://bosagenda.countyofventura.org/sirepub/cache/2/utbdpeunknpilw2gnuuflh3q/15690780512202104305382 3.PDF), the following major progress has been made in the implementation of the Ventura County MHMP:

2021 Multi Hazard Mitigation Plan Annual Progress Report

1. Community Rating System
   - Prepared 2020 annual recertification and received FEMA approval in November 2020.
2. Post-Fire Flood Hazard Mapping and Debris Cleanout
   - Carried out post-fire debris flow treatments by cleaning out channels and debris basins.
3. Dam Safety and Planning for Dam Emergencies
   - Achieved approval of the remaining two (2) dam inundation mapping studies from DWR's Division of Safety of Dams (DSOD). All eight (8) state regulated dams maintained by Ventura County have approved dam break inundation maps.
   - Achieved approval of Matilija Dam Emergency Action Plan (EAP) from CalOES.
4. Hazard Mitigation Projects
   - Deploying the Flood Emergency Response grant from Department of Water Resources for upgrade to the ALERT2 flood warning systems. System update is 90% complete.
   - Conducted quarterly stakeholder meetings for Matilija Dam Ecosystem Restoration Project dam removal and levee design. Progressing towards 65% design of dam removal.
5. Levee Rehabilitation
   - Continued the design and construction of levee rehabilitation projects on Ventura River Levees (VR-1 and VR-2) and Santa Clara River Levees (SCR-1 and SCR-3).
   - Completed preliminary design for Calleguas Creek and Somis Drain Levee System (CC-2).
   - Progressed to the pre-award stage for $2.5 Million in CalOES and FEMA HMGP grant funding to support the construction of Phase II of the SCR-3 Levee Rehabilitation Project.

6. Floodplain Mapping, Flood Emergency Preparedness, and Coordination with FEMA
   - Continued cooperation and coordination with FEMA on Physical Map Revisions for Santa Clara River watershed.
   - Collaborated with FEMA to complete Physical Map Revisions for Ventura River watershed and Ventura County coast. Flood Insurance Rate Maps (FIRM) for those areas became effective on 1/29/2021.
   - Participated in California Flood Preparedness Week and conducted Storm Day emergency preparedness exercises.
   - Continued communication and coordination with FEMA to address floodplain management issues through scheduled floodplain managers' meetings.
7. Road, Bridge, and Drainage Facility Improvements
   - Awarded construction contract for Santa Ana Bridge Project.
   - Continued design of Camino Cielo Bridge replacement project.
   - Continued planning and design to rehabilitate Bridge Road Bridge (#442).
   - Completed replacement projects for bridges on Catalina Drive (Bridge #384) and Casitas Vista Road (Bridge #327).
   - Developing a Bridge Management Program to maintain County bridges.
8. Habitat Improvements
   - Continued the implementation of the Habitat Connectivity and Wildlife Corridor project.
9. Fire Hazard Reduction Program
   - Continued the implementation of Ventura County Fire Department's Fire Hazard Reduction Program.

Detailed 2021 MHMP implementation progress is reported as follows:

STATUS UPDATE OF THE MULTI-HAZARD MITIGATION PLAN

In Fiscal Year 2020-2021, the County of Ventura continued working closely with FEMA Region IX in implementing the recommended mitigation plan contained in Appendix G of the MHMP. MHMP recommendations focused primarily on flood risk mapping, levee rehabilitation with a goal to achieve FEMA levee certification, flood preparedness and storm day exercise, flood risk awareness and public outreach through annual Public Works Week, flood control channels and basins cleaning and debris removal, inspections for potential structural deficiencies and retrofitting of critical facilities and transportation systems in unincorporated Ventura County, project partnerships with FEMA, implementing vegetation management practices to protect properties from wildfires, and establishing hazard warning and public evacuation systems. Most of the recommendations are being implemented and are part of the normal business operation of the County. This demonstrates the County's ongoing commitment to providing community safety and protection from flooding and other hazards, which is a key goal of the CRS program.

The following is a list of the mitigation strategies as described in the 2015 Multi Hazard Mitigation Plan and the later section of the report will provide a detailed status update for 2021:

P1: **GIS-based Pre-application Program**
Create a GIS-based (Accela) pre-application review for new construction and major remodels in hazard areas, such as levee break, high and/or very high wildfire areas.

P2: **Integration of the 2010 HMP into Other Planning**
Integrate the 2010 HMP, in particular the hazard analysis and mitigation strategy sections, into local planning documents, including general plans, emergency operation plans, and capital improvement plans.

P3: **Seismic Retrofitting**
Seismic structural retrofit or replace County local bridges that are categorized as structurally deficient by Caltrans Bridge Inspection Report, located in an extreme ground shaking, and/or are necessary for first responders to use during an emergency. Currently in Design Phase: Bridge Road Replacement (#442).

P4: **Landslide Stabilization**
Stabilize landslide-prone areas through stability improvement measures, including interceptor drains, in situ soil piles, drained earth buttresses, sub drains, removal of slide areas, and dewatering ground.

P5: **Road, Bridge and Drainage Facility Improvements**
Reinforce and maintain County local roads, bridges, ditches and culverts from flooding through protection activities/measures.
Annual Maintenance Programs: Culvert Repair and Rehabilitation at various locations; maintenance of existing ditches and catch basins.
Improvement Projects: 1.) Mupu Road Bridge (#443) Improvements 2.) Wheeler Canyon Road Bridge (#109) Improvements 3.) Hueneme Road at Arnold Road Drainage Improvements

P6: **Address Floodplain Management Issues**
Work with FEMA Region IX to address any floodplain management issues that may have arisen/arise from the countywide DFIRM, Community Assessment Visits, and/or DWR.

P7: **CRS Participation**
Increase participation in the NFIP by entering the Community Rating System program which through enhanced floodplain management activities would allow property owners to receive a discount on their flood insurance.

P8: **Tsunami Ready Program**
Participate in the NOAA Tsunami Ready Program.

P9: **Fuel Reduction Program**
Implement a fuel reduction program, such as the collection and disposal of dead fuel, within open spaces and around critical facilities and residential structures located within a SRA or LRA high or very high wildfire zone.

P10: **Vegetation Management Program**
Create a vegetation management program that provides vegetation management services to elderly, disabled, or low-income property owners who lack the resources to remove flammable vegetation around their homes.

P11: **Post-Fire Debris Flow Treatments**
Implement post-fire debris flow hillslope and channel treatments, such as seeding, mulching, check dams, and debris racks, as needed.

P12: **Fuel Modification Program**
Implement a fuel modification program, which also includes residential maintenance requirements and enforcement, plan submittal and approval process, guidelines for planting, and a listing of undesirable plant species. Require builders and developers to submit their plans, complete with proposed fuel modification zones, to the local Fire Protection District for review and approval prior to beginning construction.

P13: **Habitat Improvements**
Work with Cooperating Agencies of Ventura River Multi-Species Habitat Conservation Plan to continue to implement mitigation measures identified in the Plan; i.e., improving habitat and/or access to habitat.

P14: **Levee Rehabilitation**
Rehabilitate eight major Ventura County levees countywide in order to document local compliance with the Federal Levee Certification regulatory requirements found in 44 CFR 65.10. Once rehabilitated and certified, these eight levees will be accredited by FEMA on Digital Flood Insurance Maps (DFIRMs) as provide flood protection from the 1% annual-chance flood event.

P15: **After Action Report and Improvement plan Development**
After every exercise or event, an After-Action Report should be completed. The After-Action Report has two components: (1) It captures observations and recommendations based on incident objects associated with the capabilities and tasks; and (2) an Improvement Plan which identifies corrective actions, assigning them to responsible parties, and establishes targets for their completion.

P16: **Life/Safety Warning/Evacuation Systems**
Implement appropriate life/safety warning/evacuation systems in Ventura County, including the Emergency Alert System, Flood Threat Recognition System, Reverse 911 System, and Tsunami Watch and Warning messages during an event or disaster.

The following are status report on each recommendation in the action plan:

P1: Create a GIS-based (Accela) pre-application

Status: The Accela Automation Land Records Management and Permit Processing/Tracking System is an interdependent electronic permit processing and tracking system that is currently being used by the Public Works Agency (PWA), Resource Management Agency (RMA), and the Ventura County Fire Protection District. It is a GIS system that integrates flood, wildfire, landslide, liquefaction, and other hazard information (mapping) with land- use planning, transportation, site grading, and other County permit processes. Accela enables County staff to access a single, common, and comprehensive information data base, thereby improving the delivery of permit-related services, including technical reviews and approvals, code enforcement, and issuance of land-use development entitlements.

P2: Integrate the 2010 HMP into other planning

Status: In 2020-2021, RMA completed the 2040 General Plan Update which integrates hazard mitigation plan recommendations into policy. PWA's 5-year Capital Improvement Plan continued to emphasize the integration of the HMP recommendations. The County Fire Protection District continued its implementation of the Fire Hazard Reduction Program (FHRP) which is the cornerstone of the Wildland Fire Action Plan.

P3: Seismic Retrofitting

Status: In 2011, the PWA Roads and Transportation (VCPWA-RT) received a $150,000 grant from the Federal Highway Bridge Program to prepare a scope of work for any repairs or replacements needed for three bridges that have been classified by Caltrans as structurally deficient (Bridge Road, Mupu Road, and Wheeler Canyon). The Scope of Work was completed in 2013. The recommended work is as follows: (1) Bridge Road Bridge (#442) rehabilitation/replacement; (2) Mupu Road Bridge and Wheeler Canyon Road rehabilitation. In 2020-2021, the Bridge Road Bridge Rehabilitation project continued moving forward with an estimated construction completion date in 2023. Mupu Road Bridge and Wheeler Canyon Road Bridge were completed in 2016 - 2017.

P4: Landslide Stabilization

Status: PWA Development and Inspection Services regularly receives private development projects relative to grading, soils, and geology (seismic, liquefaction). Plan checking, imposing conditions of development, construction compliance and enforcement are implemented as part of the grading and building permit application and approval process.

P5: Road, Bridge and Drainage Facility Improvements

Status: VCPWA-RT conducts annual ditch cleaning and culvert cleaning before winter storm season to maintain the capacity of ditches and proper drainage flow to mitigate roadway flooding in rural areas of the county. In addition to the annual cleaning of ditches and culverts, the VCPWA-RT is actively working to rehabilitate Bridge Road

Bridge (#442) which is currently in design and environmental permitting phase and is expected to be completed in 2023. Replacement of Catalina Drive Bridge (#384) was completed in May 2020 and replacement of Casitas Vista Road Bridge (#327) was completed in September 2020. Mupu Road Bridge and the Wheeler Canyon Road Bridge improvements projects were completed in 2016-2017. The VCPWA-RT is developing a Bridge Management Program to maintain County bridges. The program will identify and prioritize VCPWA-RT's 158 bridge structures which include 81 bridges on the National Bridge Inventory (NBI) and 77 non-NBI structures. This program will identify budget needs, and schedules for preventive maintenance as well as budget for required rehabilitation or replacement of VCPWA-RT maintained bridges for short and long-term planning needs. The Bridge Management Program is expected to be completed in calendar year 2021. In 2020-2021, the PWA-Watershed Protection (VCPWA-WP) continues to clean flood control channels and catch basins to prepare for winter storm seasons. The VCPWA-WP also secured Proposition 1 grant funding for Santa Ana Bridge and Camino Cielo Bridge replacement projects. The design of Camino Cielo Bridge is progressing towards 30% millstone. For Santa Ana Bridge, the construction contract was awarded in March 2021 with an estimated completion date of December 2022.

P6: Address Floodplain Management issues

Status: In 2020-2021, County staff worked closely with FEMA Region IX and CA Department of Water Resources (DWR) staff on a regular basis to address floodplain management issues. In coordination with FEMA Region IX, floodplain managers from the county and cities meet quarterly to discuss and address issues facing the floodplain management communities. The County continues to work with FEMA in moving forward with the Physical Map Revisions (PMR) for Santa Clara River watershed. The mapping projects for the Ventura River watershed and the Californian Coastal Analysis and Mapping Project (CCAMP) were completed with maps effective 1/29/2021. County staff worked closely with FEMA on the public outreach for the completed mapping projects ahead of the effective dates to inform residents and encourage flood insurance. In 2020-2021, County staff worked closely with FEMA and DWR on the dam break analysis and mapping and successfully achieved approval of the dam break floodplain mapping for the remaining two (2) the eight (8) state size dams. All eight (8) state sized dams Ventura County maintains have approved inundation maps. The County staff also responded to comments from DSOD on the draft Emergency Action Plans (EAPs) and are in the process of finalizing the plans. The Emergency Action Plan for Matilija Dam has been approved by Cal-OES.

P7: CRS Participation

Status: Active and increased participation in the NFIP has resulted in the unincorporated county of Ventura being elevated to Class 5 in the CRS rating since May 1, 2016. Owners of floodplain properties in the Unincorporated Ventura County have been receiving an annual policy premium discount of up to 25% on new and renewal policies since then.

P8: Tsunami Ready Program
Status: In 2012, the County of Ventura became certified by FEMA as a Tsunami Ready Community. Approximately 70 tsunami warning signs have been installed at specified locations along the county's coastline informing residents and visitors about the hazard.

P9: Fuel Reduction Program
Status: The Ventura County Fire Protection District annually implements fuel reduction and public outreach programs that benefit all residents through the unincorporated Ventura County. The fire department sends out a “Notice to Abate Fire Hazard” annually to affected property owners. Those property owners are expected to maintain their property free of hazards or nuisance vegetation year-round. Common requirements are 100-feet of vegetation clearance from structures and 10-feet for road access.

P10: Vegetation Management Program
Status: The Ventura County Fire Protection District utilizes a wide variety of methods and programs to reduce the effects of wildfires. The Fire Hazard Reduction Program is the cornerstone of the County’s Wildland Fire Action Plan. Property owners included in the program receive an annual "Notice to Abate Fire Hazard" and are expected to maintain their property free of fire hazards or nuisance vegetation year-round. The program has been used as a model by many jurisdictions throughout the nation.

P11: Post-Fire Debris Flow Treatments
Status: The Ventura County Fire Protection District annually implements fuel reduction and public outreach programs that benefit all residents through the unincorporated Ventura County. In 2020-2021, as watersheds continue to recover from recent fires, the VCPWA-WP continues to clean out channels, debris basins, and stop-log structures in anticipation of the next storm season.

P12: Fuel Modification Program
Status: The Ventura County Fire Protection District has established standards and guidelines, codes and ordinances to guide developments. Through the County's land-use entitlement process administered through the RMA Planning Division, the Ventura County Fire Protection District reviews, comments, and imposes conditions of approval on all development applications, including but not limited to, maintenance requirements, required plantings, and establishment of fuel modification zones.

P13: Habitat Improvements
Status: During 2020-2021, the County continued working on the giant reed (Arundo donax) and other target species removal in the Ventura River watershed with their grant partners. PWA-WP also conducted biological monitoring, water quality monitoring, and reporting. The RMA continues to enforce the Habitat Connectivity and Wildlife Corridors passed by the Board of Supervisors in 2019.

P14: Levee Rehabilitation

Status: During 2020-2021, the County of Ventura, working in close coordination with federal and state agencies, continued to advance progress in the design engineering and environmental permitting, and in some cases, the construction of projects required to rehabilitate levees owned by the County. A DWR Local Levee Assistance Program (LLAP) grant provided funding for the hydrologic and hydraulic analysis, geologic investigation, and alternative analysis for the preliminary design of the rehabilitation of the Calleguas Creek and Somis Drain Levee System (CC-2) in the City of Camarillo, and for the Ventura River Levee (VR-2) in the unincorporated community of Casitas Springs, which will ultimately lead to certification of these levees by the County, and accreditation of that certification by FEMA. The predesign study for CC-2 was completed in March 2021. That LLAP grant also provided funding to advance design engineering work, CEQA report preparation, and required environmental permitting approvals for both the Santa Clara River Levee (SCR-1) in Oxnard, and the Ventura River Levee (VR-1) in Ventura. Finally, the Sespe Creek Levee (SC-2) rehabilitation from HWY 126 to Old Telegraph Road was completed in the fall of 2017. Phase I levee rehabilitation construction work required to support the eventual certification of the Santa Clara River Levee (SCR-3) in Oxnard was completed by the County in June of 2018. The phase II of SCR-3 is planned to be constructed in 2021-2022 fiscal year. Ongoing coordination between the County and the USACE, under the Section 408 Permit envelope, is underway for both the SCR-1 and VR-1 levees. For VR-1, the County submitted 60% design plans to USACE for review in early 2021.

The County continues to work closely with the USACE, as well as affected cities, residents and property owners protected by County levees throughout Ventura County, in order to marshal federal, state and local funding resources necessary to complete local levee rehabilitation projects.

Once levee rehabilitation projects are successfully completed for the above-mentioned levees, the County will be able to document full compliance with all applicable federal levee certification requirements found in Title 44 CFR 65.10 for all of these County owned and operated levees.

P15: After Action Report and Improvement Plan Development

Status: The Sheriff's OES submits After Action Reports to state and federal agencies following all emergency occurrences. On October 8, 12, 14, and 15, 2020, the County's Public Works Agency in collaboration with County Sheriff's OES conducted its annual storm day exercise to test the overall effectiveness and efficiency of its flood warning and response procedures, technologies, communication networking, and other operational services associated with the County's Flood Warning & Response System. The exercise was modified and conducted over several days to limit gatherings while still providing valuable field training and system tests. A storm day exercise report was prepared to document observations and recommendations for future improvements.

P16: Life/Safety Warning/Evacuation Systems

Status: Ventura County uses various systems to communicate important life/safety information during an emergency. The two primary systems responsible for the bulk of emergency notifications are the Emergency Alert System (EAS) and the "Ventura County Emergency Alert Notification System."

The Emergency Alert Notification System is a joint effort among local radio and TV stations, the National Weather Service, and the Ventura County Sheriff's Office. Emergency managers can interrupt regular cable television and radio broadcast programming with important information. Locally, 100.7 KHAY FM, KMLA 103.7 FM (Spanish) and 1590 KVTA AM all carry emergency alert system broadcasts.

In addition to the Emergency Alert Notification System, the Sheriff's OES in conjunction with all Ventura County Cities operates and maintains the VC Alert Emergency Notification System. VC Alert is housed in various powerful data centers throughout the United States and is capable of sending out 100,000 text messages per hour and 100,000 e-mails per hour. The system contains listed and unlisted land lines telephone numbers, in addition to thousands of Ventura County residents who have provided their personal cell phone numbers and e-mail addresses for notification purposes.

IMPLEMENTATION:

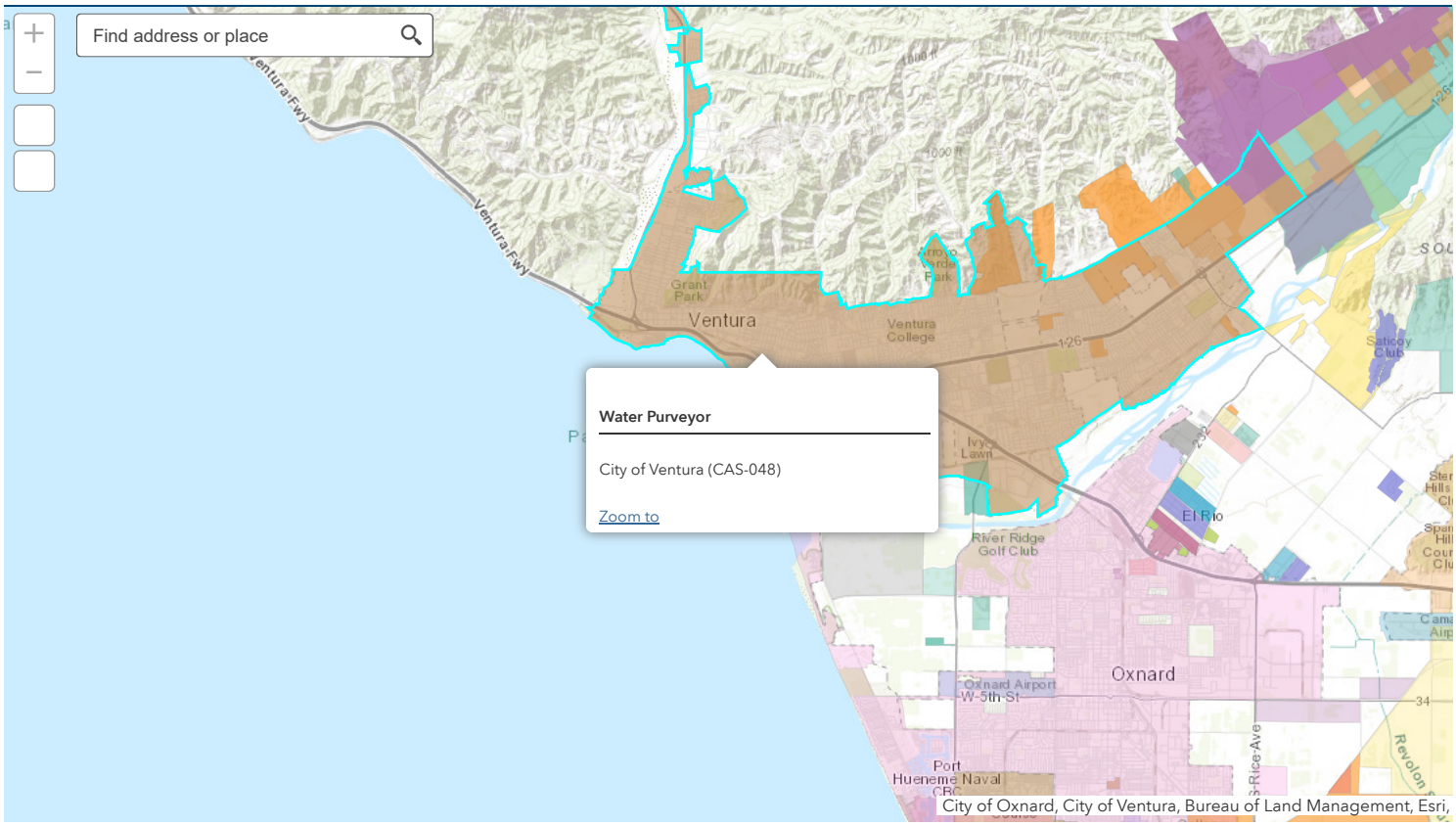
At this time all strategies for Ventura County listed in the 2015 Multi Hazard Mitigation Plan are on schedule.

RECOMMENDATIONS:

There are no recommendations for any new projects or revisions to the Plan. However, the plan is undergoing a regular update. Progress on new projects and recommendations will be reported in the 2022 Progress Report.

END OF TEXT

County of Ventura Water Purveyors



800 South Victoria Avenue Ventura, CA 93009-1600
805-654-2018
Monday – Friday 8:00a.m. - 5:00p.m.

VENTURA RIVER (VR-1) LEVEE REHABILITATION PROJECT

Environmental Review | Scoping | CEQA Compliance

QUICK LINKS

VR-1 Scoping Presentation Slides (English)

VR-1 Scoping Presentation Slides (Spanish)

Translate »

VR-1 Notice of Preparation Mailer (English)

VR-1 Notice of Preparation Mailer (Spanish)

VR-1 Detailed Notice of Preparation (English)

VR-1 Detailed Notice of Preparation (Spanish)

Contact VCPWA – WP

The Ventura County Public Works Agency – Watershed Protection (VCPWA – WP) is soliciting input from reviewing agencies and the public regarding the scope and content of the EIR. In accordance with CEQA, Watershed Protection requests that agencies review the Project Description provided in this NOP and provide comments on environmental issues related to the statutory responsibilities of the agency. The EIR will be used by Watershed Protection when considering approval of the proposed project and by other Responsible and Trustee Agencies to support their discretionary actions related to the proposed project. Watershed Protection is also seeking the views of residents, property owners, and the public regarding issues that should be addressed in the EIR.

The proposed project would involve structural improvements to the existing VR-1 levee, which would achieve compliance with the Federal Emergency Management Agency (FEMA) levee certification requirements and United States Army Corps of Engineers (Corps) levee permit requirements, address structural deficiencies, and extend the levee's capital service life. In 2008, FEMA determined that the VR-1 levee did not fully comply with all the federal levee certification regulatory requirements. Additionally, the Corps rated the levee as "minimally acceptable," meaning that the levee has multiple deficiencies. These deficiencies put the levee at risk of failing from a one percent annual chance (also known as the 100-year) flood event. The proposed project would improve flood protection to residents and businesses in the City of San Buenaventura (commonly known as Ventura) located within the one percent annual chance flood zone (a.k.a. FEMA flood zone) by achieving a one percent annual chance flood capacity with 3 feet of freeboard (i.e., the height of the levee above the flood water).

VR-1 SCOPING PRESENTATION (ENGLISH)

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VR-1 SCOPING PRESENTATION (SPANISH)

+ ENVIRONMENTAL REVIEW

+ SCOPING PROCESS AND SCOPING PERIOD

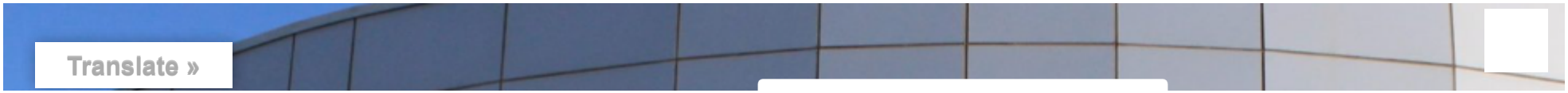
+ PUBLIC COMMENTS

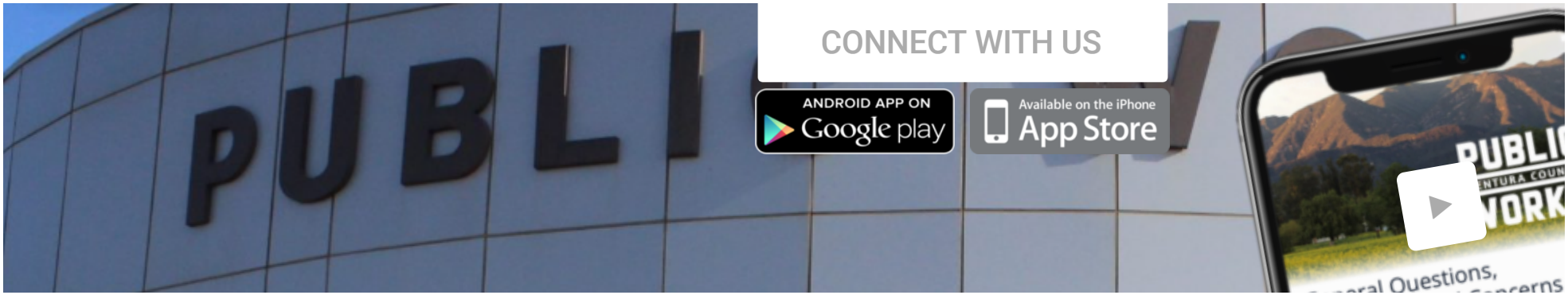
– INQUIRIES

For general questions, please contact the Project Environmental Planner, Angela Bonfigilio.

Ventura County Public Works Agency – Watershed Protection

Attn: Angela Bonfigilio
800 S. Victoria Ave., #1600
Ventura, CA 93009
(805) 477-7175





The Ventura County Public Works Agency aims to deliver efficient, responsive and cost effective regional services essential to the health, safety, natural resources protection, and economic vitality of Ventura County and its residents.

CONTACT

Address:

800 South Victoria Avenue
Ventura, CA 93009-1600

Hours of Operation:

8:00a.m. - 5:00p.m.

Phone Number:

805.654.2018

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Water Sources

Overview | Lake Casitas | Ventura River | Groundwater Basins | Recycled Water

The City of Ventura currently relies on 100% local water sources including surface and groundwater from Lake Casitas, Ventura River, three groundwater basins, and recycled water.

For an annual look at Ventura's water supply and demand status, see the Comprehensive Water Resources Reports (CWRRs). Council approved the first CWRR in June 2013, which was prepared to provide a short-term balance of water supply and demand, a predictable use of data to serve pending and projected development projects, and to provide recommendations for long term water supply and demand policy.

For long-term resource planning, see the Urban Water Management Plans (UWMPs). The UWMP addresses historic, current, and projected water demands, supplies and conservation programs. The UWMP is published every five years and is consistent with the Water Conservation Act of 2009 (Water Code sections 10608.12 to 10608.64) and the Urban Water Management Planning Act (Water Code sections 10610 to 10656).

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Select Language

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Lake Casitas

Casitas Municipal Water District serves customers in the Casitas district. This area includes Ventura's westside and midtown, generally west of Mills Road. Ventura Water customers who live in the Casitas District pay an assessment annually through their property taxes. For more information, visit the Casitas' website at https://www.casitaswater.org/.

Ventura River

Ventura Water operates groundwater wells and a subsurface diversion that draw water from the Ventura River.

On September 30, 2019, the City of San Buenaventura and Santa Barbara Channelkeeper entered into a settlement agreement in the lawsuit regarding the pumping and diversion of water from the Ventura River Watershed. As part of the settlement, the City agreed to begin a Pilot Program to reduce its pumping and diversion of water from the river when flows drop during dry times to help protect species that depend on the river. The City also agreed to install two monitoring gages (above and below its Foster Park facilities) to help better evaluate water levels in the river. VR1 is located upstream of the City's wellfield and VR2 is located in Foster Park just below the subsurface dam. The gages were installed in early September 2019 and calibration was completed in December 2019.

The stream gages measure depth directly, and then based on flow and depth curves, provide flow data for each depth measured. Air is pumped from the equipment box through a conduit placed in the river bottom, and sensors measure the pressure required for an air bubble to come out of the pipe. The greater the water depth over the pipe, the more pressure is required. Following installation, a team took discharge measurements in the river, and correlated those flow measurements with water surface elevation. Multiple measurements over a range of flows were used to create a curve which depicts the relationship between flow and depth for the site.

- Data collected from the gages since installation can be viewed at: https://www.picovale.com/
- Go to the "Field Station Access" button at the upper right side of the homepage and enter the following in the Users Login fields:
- Login: ventura
- Password: river

For more information on the Ventura River Watershed Adjudication visit: https://venturariver.com/

Groundwater Basins

In addition to wells located on the Ventura River, Ventura Water operates groundwater wells in three groundwater basins: the Oxnard Plain Basin, Mound Basin, and Santa Paula Basin. Our production is managed by existing agencies/agreements and future groundwater supply may be impacted by the Sustainable Groundwater Management Act (SGMA). SGMA was passed by the State in 2014 to improve management of groundwater resources in California. The legislation requires that groundwater sustainability agencies (GSAs) are established for groundwater basins ranked as medium- or high- priority, indicating that the basins are at risk of overdraft and/or a decline in water quality. Once GSAs are formed, Groundwater Sustainability Plans (GSPs) must be adopted and the groundwater basin must achieve sustainability by 2042.

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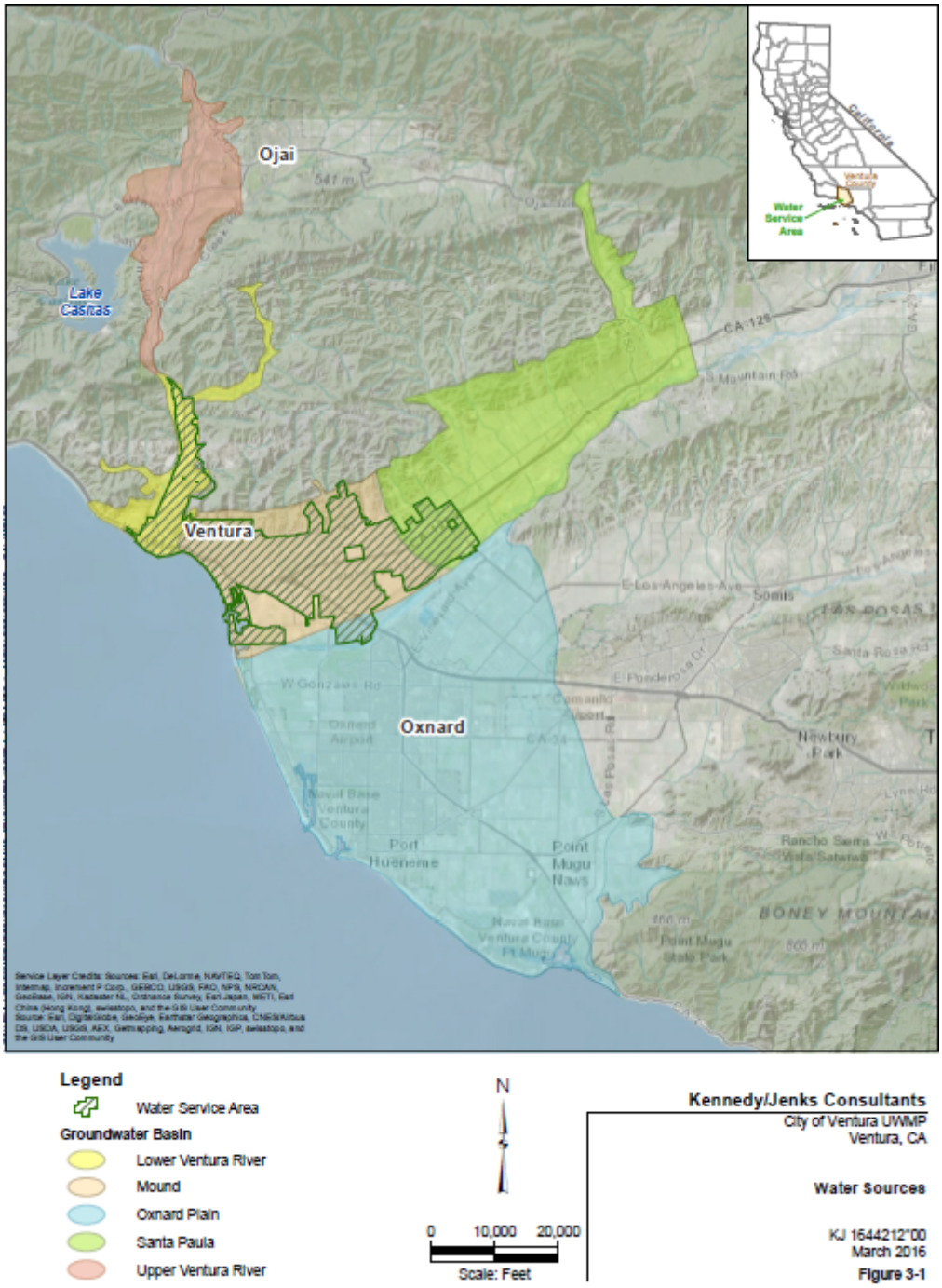
- The Fox Canyon Groundwater Management Agency is named as the GSA for the Oxnard Plain Basin (ranked as high-priority).
- The Mound Basin GSA (ranked medium-priority) meets the third Tuesday of each month. Additional information and meeting materials are available at moundbasingsa.org.
- The Santa Paula Basin is adjudicated and exempt from the GSA process.
- The Upper Ventura River Basin GSA (ranked medium-priority) meets the second Thursday of each month. For more information visit uvrgroundwater.org.



Source: 2015 Urban Water Management Plan

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Recycled Water

Ventura Water provides recycled water from the Ventura Water Reclamation Facility for golf courses, parks and similar landscape areas. Recycled water is also available to commercial and residential customers through the Mobile Reuse Program.

VENTURA WATER

Trusted life source for generations.

CONTACT US

Ventura Water

Email the Department

Physical Address
336 Sanjon Road
Ventura, CA 93002

Phone: : 805-667-6500

After-Hours (Emergency Only):
805-650-8010

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