



Order Instituting Investigation into the November ) Investigation 19-11-010  
2019 Submission of Southern California Gas )  
Company's Risk Assessment and Mitigation Phase. )

**RISK ASSESSMENT MITGATION PHASE**

**WORKPAPERS TO**

**CHAPTER SCG-7**

**THIRD PARTY DIG-IN ON HIGH PRESSURE PIPELINE**

**November 27, 2019**

Chapter	SCG-7		
Risk	Third Party Dig-in on a High Pressure Pipeline		

PHMSA Incident Rate

National

Type	Number of Incidents_3rd party dig-in		
	Transmission	Distribution_Main	Distribution_Service
MAOP > 60 psig	91	40	6

SCG

Type	Miles			
	Transmission	Distribution_Main	Distribution_Service	Total
MAOP > 60 psig	3448	3269	125	6842

National

Miles

Type	Miles		
	Transmission	Distribution_Main	Distribution_Service
MAOP > 60 psig	297553	83618	2288

SCG\_3rd party digin

Type	Incident Rate		
	Transmission	Distribution_Main	Distribution_Service
MAOP > 60 psig	0.12	0.21	

Chapter	SCG-7
Risk	Third Party Dig-in on a High Pressure Pipeline

Single Point

ID	Activity	Project Life In Years	Cost Forecast (O&M, \$M)				Pre-Mitigation		% risk reduction (use if % risk addressed not available) (%)	% Risk Reduction			RSE		Post-Mitigation	
			2022	2020	2021	2022	LORE	CORE		Safety	Reliability	nancial (\$)	Single Point	Single Point		
			2020	2021	2022	LORE								CORE		
SCG-7-M2	Establish a program to address the area of continual excavation	1	0.22	0.00	0.00	0.00	3	24		0.3%	0.3%	0.3%	1.10	3.24	24.14	
SCG-7-C17	Prevention and Improvements - Fiber Optics	60	0.00	6.52	6.52	6.52	3	24		0.3%	0.3%	0.3%	0.34	3.26	24.14	
SCG-7-M3	Recording photographs for each locate and mark ticket visited by locator	1	0.24	0.00	0.00	0.00	3	24		0.1%	0.1%	0.1%	0.24	3.25	24.14	
SCG-7-M4	Utilize electronic positive response	1	0.03	0.00	0.00	0.00	3	24		0.0%	0.0%	0.0%	0.44	3.25	24.14	
SCG-7-M5	Enhance process to leverage excavation technology to help with difficult locates (vacuum excavation technology)	1	0.73	0.00	0.00	0.00	3	24		1.3%	1.3%	1.3%	1.29	3.21	24.14	
SCG-7-C16	Install warning mesh above buried company facilities	50	0.06	0.00	0.00	0.00	3	24		0.1%	0.1%	0.1%	26.14	3.25	24.14	
SCG-7-C7	Prevention and Improvements - Refreshed Laptops	5	0.09	0.11	0.11	0.11	3	24		0.1%	0.1%	0.1%	0.38	3.25	24.14	
SCG-7-C6	Damage Prevention Analysts Program	1	0.12	0.00	0.00	0.00	3	24		6.6%	6.6%	6.6%	39.50	3.46	24.14	
SCG-7-M1	Automate Third Party Excavation Incident Reporting	5	0.00	0.31	0.31	0.31	3	24		0.0%	0.0%	0.0%	0.02	3.25	24.14	
SCG-7-M6	Promote process and system improvements in USA ticket routing and monitoring	1	0.05	0.00	0.00	0.00	3	24		0.2%	0.2%	0.2%	2.85	3.24	24.14	
SCG-7-C5	Locate and Mark Quality Assurance Program	1	0.03	0.00	0.00	0.00	3	24		0.4%	0.4%	0.4%	8.43	3.26	24.14	
SCG-7-C8-T1	Public Awareness Compliance - Tranche 1: The Affected Public	1	0.08	0.00	0.00	0.00	3	24		0.5%	0.5%	0.5%	4.01	3.26	24.14	
SCG-7-C8-T2	Public Awareness Compliance - Tranche 2: Emergency Officials	1	0.01	0.00	0.00	0.00	3	24		0.0%	0.0%	0.0%	1.15	3.25	24.14	
SCG-7-C8-T3	Public Awareness Compliance - Tranche 3: Local Public Officials	1	0.03	0.00	0.00	0.00	3	24		0.1%	0.1%	0.1%	2.69	3.25	24.14	
SCG-7-C8-T4	Public Awareness Compliance - Tranche 4: Excavators	1	0.05	0.00	0.00	0.00	3	24		0.8%	0.8%	0.8%	11.88	3.28	24.14	
SCG-7-C9	Increase Reporting of Unsafe Excavation	1	0.02	0.00	0.00	0.00	3	24		0.1%	0.1%	0.1%	6.99	3.25	24.14	
SCG-7-C11	Public Awareness - Meet with Cities with Highest Damage Rates	1	0.01	0.00	0.00	0.00	3	24		0.0%	0.0%	0.0%	1.92	3.25	24.14	
SCG-7-C12	Public Awareness - Remain Active Members of the California Regional Common Ground Alliance	1	0.01	0.00	0.00	0.00	3	24		0.0%	0.0%	0.0%	1.85	3.25	24.14	
SCG-7-M7	Leverage data gathered by locating equipment	5	0.02	0.00	0.00	0.00	3	24		0.0%	0.0%	0.0%	0.01	3.25	24.14	
SCG-7-A1	Alternative: Virtual reality training / simulation to improve locator proficiency	1	0.03	0.00	0.00	0.00	3	24		0.0%	0.0%	0.0%	0.02	3.25	24.14	
SCG-7-A2	Alternative: GPS Tracking of Excavation Equipment	1	0.09	0.00	0.00	0.00	3	24		0.0%	0.0%	0.0%	0.00	3.25	24.14	

Low Alternative

ID	Activity	Project Life In Years	Cost Forecast (O&M, \$M)				Pre-Mitigation		% risk reduction (use if % risk addressed not available) (%)	% Risk Reduction			RSE		Post-Mitigation	
			2022	2020	2021	2022	LORE	CORE		Safety	Reliability	nancial (\$)	Low Alternative	Low Alternative		
			2020	2021	2022	LORE								CORE		
SCG-7-M2	Establish a program to address the area of continual excavation	1	0.22	0.00	0.00	0.00	3	3		0.3%	0.3%	0.3%	0.13	3.24	2.87	
SCG-7-C17	Prevention and Improvements - Fiber Optics	60	0.00	6.52	6.52	6.52	3	3		0.3%	0.3%	0.3%	0.04	3.26	2.87	
SCG-7-M3	Recording photographs for each locate and mark ticket visited by locator	1	0.24	0.00	0.00	0.00	3	3		0.1%	0.1%	0.1%	0.03	3.25	2.87	
SCG-7-M4	Utilize electronic positive response	1	0.03	0.00	0.00	0.00	3	3		0.0%	0.0%	0.0%	0.05	3.25	2.87	
SCG-7-M5	Enhance process to leverage excavation technology to help with difficult locates (vacuum excavation technology)	1	0.73	0.00	0.00	0.00	3	3		1.3%	1.3%	1.3%	0.15	3.21	2.87	
SCG-7-C16	Install warning mesh above buried company facilities	50	0.06	0.00	0.00	0.00	3	3		0.1%	0.1%	0.1%	3.11	3.25	2.87	
SCG-7-C7	Prevention and Improvements - Refreshed Laptops	5	0.09	0.11	0.11	0.11	3	3		0.1%	0.1%	0.1%	0.05	3.25	2.87	
SCG-7-C6	Damage Prevention Analysts Program	1	0.12	0.00	0.00	0.00	3	3		6.6%	6.6%	6.6%	4.69	3.46	2.87	
SCG-7-M1	Automate Third Party Excavation Incident Reporting	5	0.00	0.31	0.31	0.31	3	3		0.0%	0.0%	0.0%	0.00	3.25	2.87	
SCG-7-M6	Promote process and system improvements in USA ticket routing and monitoring	1	0.05	0.00	0.00	0.00	3	3		0.2%	0.2%	0.2%	0.34	3.24	2.87	
SCG-7-C5	Locate and Mark Quality Assurance Program	1	0.03	0.00	0.00	0.00	3	3		0.4%	0.4%	0.4%	1.00	3.26	2.87	
SCG-7-C8-T1	Public Awareness Compliance - Tranche 1: The Affected Public	1	0.08	0.00	0.00	0.00	3	3		0.5%	0.5%	0.5%	0.48	3.26	2.87	
SCG-7-C8-T2	Public Awareness Compliance - Tranche 2: Emergency Officials	1	0.01	0.00	0.00	0.00	3	3		0.0%	0.0%	0.0%	0.14	3.25	2.87	
SCG-7-C8-T3	Public Awareness Compliance - Tranche 3: Local Public Officials	1	0.03	0.00	0.00	0.00	3	3		0.1%	0.1%	0.1%	0.32	3.25	2.87	
SCG-7-C8-T4	Public Awareness Compliance - Tranche 4: Excavators	1	0.05	0.00	0.00	0.00	3	3		0.8%	0.8%	0.8%	1.41	3.28	2.87	
SCG-7-C9	Increase Reporting of Unsafe Excavation	1	0.02	0.00	0.00	0.00	3	3		0.1%	0.1%	0.1%	0.83	3.25	2.87	
SCG-7-C11	Public Awareness - Meet with Cities with Highest Damage Rates	1	0.01	0.00	0.00	0.00	3	3		0.0%	0.0%	0.0%	0.23	3.25	2.87	
SCG-7-C12	Public Awareness - Remain Active Members of the California Regional Common Ground Alliance	1	0.01	0.00	0.00	0.00	3	3		0.0%	0.0%	0.0%	0.22	3.25	2.87	
SCG-7-M7	Leverage data gathered by locating equipment	5	0.02	0.00	0.00	0.00	3	3		0.0%	0.0%	0.0%	0.00	3.25	2.87	
SCG-7-A1	Alternative: Virtual reality training / simulation to improve locator proficiency	1	0.03	0.00	0.00	0.00	3	3		0.0%	0.0%	0.0%	0.00	3.25	2.87	
SCG-7-A2	Alternative: GPS Tracking of Excavation Equipment	1	0.09	0.00	0.00	0.00	3	3		0.0%	0.0%	0.0%	0.00	3.25	2.87	

High Alternative

ID	Activity	Project Life In Years	Cost Forecast (O&M, \$M)				Pre-Mitigation		% risk reduction (use if % risk addressed not available) (%)	% Risk Reduction			RSE		Post-Mitigation	
			2022	2020	2021	2022	LORE	CORE		Safety	Reliability	nancial (\$)	High Alternative	High Alternative		
			2020	2021	2022	LORE								CORE		
SCG-7-M2	Establish a program to address the area of continual excavation	1	0.22	0.00	0.00	0.00	3	60		0.3%	0.3%	0.3%	2.72	3.24	59.58	
SCG-7-C17	Prevention and Improvements - Fiber Optics	60	0.00	6.52	6.52	6.52	3	60		0.3%	0.3%	0.3%	0.85	3.26	59.58	
SCG-7-M3	Recording photographs for each locate and mark ticket visited by locator	1	0.24	0.00	0.00	0.00	3	60		0.1%	0.1%	0.1%	0.60	3.25	59.58	
SCG-7-M4	Utilize electronic positive response	1	0.03	0.00	0.00	0.00	3	60		0.0%	0.0%	0.0%	1.07	3.25	59.58	
SCG-7-M5	Enhance process to leverage excavation technology to help with difficult locates (vacuum excavation technology)	1	0.73	0.00	0.00	0.00	3	60		1.3%	1.3%	1.3%	3.18	3.21	59.58	
SCG-7-C16	Install warning mesh above buried company facilities	50	0.06	0.00	0.00	0.00	3	60		0.1%	0.1%	0.1%	64.53	3.25	59.58	
SCG-7-C7	Prevention and Improvements - Refreshed Laptops	5	0.09	0.11	0.11	0.11	3	60		0.1%	0.1%	0.1%	0.94	3.25	59.58	
SCG-7-C6	Damage Prevention Analysts Program	1	0.12	0.00	0.00	0.00	3	60		6.6%	6.6%	6.6%	97.50	3.46	59.58	
SCG-7-M1	Automate Third Party Excavation Incident Reporting	5	0.00	0.31	0.31	0.31	3	60		0.0%	0.0%	0.0%	0.05	3.25	59.58	
SCG-7-M6	Promote process and system improvements in USA ticket routing and monitoring	1	0.05	0.00	0.00	0.00	3	60		0.2%	0.2%	0.2%	7.03	3.24	59.58	
SCG-7-C5	Locate and Mark Quality Assurance Program	1	0.03	0.00	0.00	0.00	3	60		0.4%	0.4%	0.4%	20.80	3.26	59.58	
SCG-7-C8-T1	Public Awareness Compliance - Tranche 1: The Affected Public	1	0.08	0.00	0.00	0.00	3	60		0.5%	0.5%	0.5%	9.89	3.26	59.58	
SCG-7-C8-T2	Public Awareness Compliance - Tranche 2: Emergency Officials	1	0.01	0.00	0.00	0.00	3	60		0.0%	0.0%	0.0%	2.84	3.25	59.58	
SCG-7-C8-T3	Public Awareness Compliance - Tranche 3: Local Public Officials	1	0.03	0.00	0.00	0.00	3	60		0.1%	0.1%	0.1%	6.65	3.25	59.58	
SCG-7-C8-T4	Public Awareness Compliance - Tranche 4: Excavators	1	0.05	0.00	0.00	0.00	3	60		0.8%	0.8%	0.8%	29.32	3.28	59.58	
SCG-7-C9	Increase Reporting of Unsafe Excavation	1	0.02	0.00	0.00	0.00	3	60		0.1%	0.1%	0.1%	17.25	3.25	59.58	
SCG-7-C11	Public Awareness - Meet with Cities with Highest Damage Rates	1	0.01	0.00	0.00	0.00	3	60		0.0%	0.0%	0.0%	4.75	3.25	59.58	
SCG-7-C12	Public Awareness - Remain Active Members of the California Regional Common Ground Alliance	1	0.01	0.00	0.00	0.00	3	60		0.0%	0.0%	0.0%	4.56	3.25	59.58	
SCG-7-M7	Leverage data gathered by locating equipment	5	0.02	0.00	0.00	0.00	3	60		0.0%	0.0%	0.0%	0.03	3.25	59.58	
SCG-7-A1	Alternative: Virtual reality training / simulation to improve locator proficiency	1	0.03	0.00	0.00	0.00	3	60		0.0%	0.0%	0.0%	0.04	3.25	59.58	
SCG-7-A2	Alternative: GPS Tracking of Excavation Equipment	1	0.09	0.00	0.00	0.00	3	60		0.0%	0.0%	0.0%	0.00	3.25	59.58	

**SCG-7-C5: Locate and Mark Quality Assurance Program**

Attribute	Risk Reduction		Formula	Basis			Reference	Project Life
		Total		Scope	Effectiveness	Risk Addressed		
Safety	% Scope	100.00%	0.40%	100% of activities will benefit	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 8% of the risk sources	1
	% Effectiveness	5.00%		Above-marginal impact on reducing mismarks				
	% Risk Addressed	8%		Mapping of the 2018 DIRT data causes				
Reliability	% Scope	100.00%	0.40%	100% of activities will benefit	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 8% of the risk sources	1
	% Effectiveness	5.00%		Above-marginal impact on reducing mismarks				
	% Risk Addressed	8%		Mapping of the 2018 DIRT data causes				
Financial	% Scope	100.00%	0.40%	100% of activities will benefit	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 8% of the risk sources	2018 DIRT database
	% Effectiveness	5.00%		Above-marginal impact on reducing mismarks				
	% Risk Addressed	8%		Mapping of the 2018 DIRT data causes				

**SCG-7-C6: Damage Prevention Analyst Program**

Attribute	Risk Reduction		Formula	Basis			Reference	Project Life	
		Total		Scope	Effectiveness	Risk Addressed			
Safety	% Scope	100.00%	6.50%	100% of the excavation tickets	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 26% of the risk sources	1	
	% Effectiveness	25.00%							Numerous impacted activities
	% Risk Addressed	26%							Mapping of the 2018 DIRT data causes
Reliability	% Scope	100.00%	6.50%	100% of the excavation tickets	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 26% of the risk sources	1	
	% Effectiveness	25.00%							Numerous impacted activities
	% Risk Addressed	26%							Mapping of the 2018 DIRT data causes
Financial	% Scope	100.00%	6.50%	100% of the excavation tickets	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 26% of the risk sources	1	
	% Effectiveness	25.00%							Numerous impacted activities
	% Risk Addressed	26%							Mapping of the 2018 DIRT data causes

**SCG-7-C7: Prevention and Improvements - Refreshed Laptops**

Attribute	Risk Reduction		Total	Formula	Basis			Reference	Project Life
					Scope	Effectiveness	Risk Addressed		
Safety	% Scope	100.00%	0.07%	100% of laptops refreshed	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 26% of the risk sources		5
	% Effectiveness	0.25%		Negligible improvement					
	% Risk Addressed	26%		Mapping of the 2018 DIRT data causes					
Reliability	% Scope	100.00%	0.07%	100% of laptops refreshed	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 26% of the risk sources		5
	% Effectiveness	0.25%		Negligible improvement					
	% Risk Addressed	26%		Mapping of the 2018 DIRT data causes					
Financial	% Scope	100.00%	0.07%	100% of laptops refreshed	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 26% of the risk sources	2018 DIRT database	5
	% Effectiveness	0.25%		Negligible improvement					
	% Risk Addressed	26%		Mapping of the 2018 DIRT data causes					

**SCG-7-C8 - T1: Public Awareness Compliance - The Affected Public**

Attribute	Risk Reduction		Total	Formula	Basis			Reference	Project Life
					Scope	Effectiveness	Risk Addressed		
Safety	% Scope	50.00%	0.46%	<i>Impacted population</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 91% of the risk sources		1
	% Effectiveness	1.00%		<i>Marginal effectiveness</i>					
	% Risk Addressed	91%		<i>Mapping of the 2018 DIRT data causes</i>					
Reliability	% Scope	50.00%	0.46%	<i>Impacted population</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 91% of the risk sources		1
	% Effectiveness	1.00%		<i>Marginal effectiveness</i>					
	% Risk Addressed	91%		<i>Mapping of the 2018 DIRT data causes</i>					
Financial	% Scope	50.00%	0.46%	<i>Impacted population</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 91% of the risk sources	2018 DIRT database	1
	% Effectiveness	1.00%		<i>Marginal effectiveness</i>					
	% Risk Addressed	91%		<i>Mapping of the 2018 DIRT data causes</i>					

**SCG-7-C8 - T2: Public Awareness Compliance - Emergency Officials**

Attribute	Risk Reduction		Formula	Basis			Reference	Project Life	
		Total		Scope	Effectiveness	Risk Addressed			
Safety	% Scope	5.00%	0.01%	<i>Impacted population</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 28% of the risk sources	1	
	% Effectiveness	1.00%							<i>Same effectiveness as Affected Public Tranche</i>
	% Risk Addressed	28%							<i>Mapping of the 2018 DIRT data causes</i>
Reliability	% Scope	5.00%	0.01%	<i>Impacted population</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 28% of the risk sources		
	% Effectiveness	1.00%							<i>Same effectiveness as Affected Public Tranche</i>
	% Risk Addressed	28%							<i>Mapping of the 2018 DIRT data causes</i>
Financial	% Scope	5.00%	0.01%	<i>Impacted population</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 28% of the risk sources		
	% Effectiveness	1.00%							<i>Same effectiveness as Affected Public Tranche</i>
	% Risk Addressed	28%							<i>Mapping of the 2018 DIRT data causes</i>



**SCG-7-C8 - T3: Public Awareness Compliance - Local Public Officials**

Attribute	Risk Reduction		Total	Formula	Basis			Reference	Project Life
					Scope	Effectiveness	Risk Addressed		
Safety	% Scope	15.00%	0.09%	<i>Impacted population</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 61% of the risk sources		1
	% Effectiveness	1.00%		<i>Minimal impact</i>					
	% Risk Addressed	61%		<i>Mapping of the 2018 DIRT data causes</i>					
Reliability	% Scope	15.00%	0.09%	<i>Impacted population</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 61% of the risk sources		1
	% Effectiveness	1.00%		<i>Minimal impact</i>					
	% Risk Addressed	61%		<i>Mapping of the 2018 DIRT data causes</i>					
Financial	% Scope	15.00%	0.09%	<i>Impacted population</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 61% of the risk sources	2018 DIRT database	1
	% Effectiveness	1.00%		<i>Minimal impact</i>					
	% Risk Addressed	61%		<i>Mapping of the 2018 DIRT data causes</i>					

**SCG-7-C8 - T4: Public Awareness Compliance - Excavators**

Attribute	Risk Reduction		Formula	Basis			Reference	Project Life	
		Total		Scope	Effectiveness	Risk Addressed			
Safety	% Scope	30.00%	0.82%	<i>Impacted population</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 91% of the risk sources	1	
	% Effectiveness	3.00%							<i>More effective than other diggers (expected)</i>
	% Risk Addressed	91%							<i>Mapping of the 2018 DIRT data causes</i>
Reliability	% Scope	30.00%	0.82%	<i>Impacted population</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 91% of the risk sources		
	% Effectiveness	3.00%							<i>More effective than other diggers (expected)</i>
	% Risk Addressed	91%							<i>Mapping of the 2018 DIRT data causes</i>
Financial	% Scope	30.00%	0.82%	<i>Impacted population</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 91% of the risk sources		
	% Effectiveness	3.00%							<i>More effective than other diggers (expected)</i>
	% Risk Addressed	91%							<i>Mapping of the 2018 DIRT data causes</i>

**SCG-7-C9: Increase Reporting of Unsafe Excavation**

Attribute	Risk Reduction		Formula	Basis			Reference	Project Life
		Total		Scope	Effectiveness	Risk Addressed		
Safety	% Scope	1.00%	0.14%	<i>Reported problematic excavators</i> <i>Observed increase in excavator notifications</i> <i>Mapping of the 2018 DIRT data causes</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 47% of the risk sources	1
	% Effectiveness	30.00%						
	% Risk Addressed	47%						
Reliability	% Scope	1.00%	0.14%	<i>Reported problematic excavators</i> <i>Observed increase in excavator notifications</i> <i>Mapping of the 2018 DIRT data causes</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 47% of the risk sources	
	% Effectiveness	30.00%						
	% Risk Addressed	47%						
Financial	% Scope	1.00%	0.14%	<i>Reported problematic excavators</i> <i>Observed increase in excavator notifications</i> <i>Mapping of the 2018 DIRT data causes</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 47% of the risk sources	
	% Effectiveness	30.00%						
	% Risk Addressed	47%						
							2018 DIRT database	

**SCG-7-C11: Public Awareness - Meet with Cities with Highest Damage Rates**

Attribute	Risk Reduction		Formula	Basis			Reference	Project Life			
		Total		Scope	Effectiveness	Risk Addressed					
Safety	% Scope	3.00%	0.03%	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 89% of the risk sources		1			
	% Effectiveness	1.00%							<i>Top 3% of cities (7 cities out of 240 total)</i>		
	% Risk Addressed	89%							<i>Some effectiveness as Affected Public Tranche</i>		
Reliability	% Scope	3.00%	0.03%	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 89% of the risk sources			1		
	% Effectiveness	1.00%								<i>Top 3% of cities (7 cities out of 240 total)</i>	
	% Risk Addressed	89%								<i>Some effectiveness as Affected Public Tranche</i>	
Financial	% Scope	3.00%	0.03%	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 89% of the risk sources	2018 DIRT database			1	
	% Effectiveness	1.00%									<i>Top 3% of cities (7 cities out of 240 total)</i>
	% Risk Addressed	89%									<i>Some effectiveness as Affected Public Tranche</i>

**SCG-7-C12: Public Awareness - Remain Active Members of the California Regional Common Ground Alliance**

Attribute	Risk Reduction		Total	Formula	Basis			Reference	Project Life
					Scope	Effectiveness	Risk Addressed		
Safety	% Scope	50.00%	0.03%	<i>Affected policies</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 100% of the risk sources		1
	% Effectiveness	0.05%		<i>Marginal improvement</i>					
	% Risk Addressed	100%		<i>Mapping of the 2018 DIRT data causes</i>					
Reliability	% Scope	50.00%	0.03%	<i>Affected policies</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 100% of the risk sources		1
	% Effectiveness	0.05%		<i>Marginal improvement</i>					
	% Risk Addressed	100%		<i>Mapping of the 2018 DIRT data causes</i>					
Financial	% Scope	50.00%	0.03%	<i>Affected policies</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 100% of the risk sources	2018 DIRT database	1
	% Effectiveness	0.05%		<i>Marginal improvement</i>					
	% Risk Addressed	100%		<i>Mapping of the 2018 DIRT data causes</i>					

**SCG-7-C17: Prevention & Improvements - Fiber Optics**

Attribute	Risk Reduction		Total	Formula	Basis			Reference	Project Life
					Scope	Effectiveness	Risk Addressed		
Safety	% Scope	3.00%	0.38%	<i>Targeted miles of transmission pipeline/total</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 25% of the risk sources		60
	% Effectiveness	50.00%		<i>High effectiveness</i>					
	% Risk Addressed	25%		<i>Mapping of the 2018 DIRT data causes</i>					
Reliability	% Scope	3.00%	0.38%	<i>Targeted miles of transmission pipeline/total</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 25% of the risk sources		60
	% Effectiveness	50.00%		<i>High effectiveness</i>					
	% Risk Addressed	25%		<i>Mapping of the 2018 DIRT data causes</i>					
Financial	% Scope	3.00%	0.38%	<i>Targeted miles of transmission pipeline/total</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 25% of the risk sources	2018 DIRT database	60
	% Effectiveness	50.00%		<i>High effectiveness</i>					
	% Risk Addressed	25%		<i>Mapping of the 2018 DIRT data causes</i>					

**SCG-7-M1: Automate Third Party Excavation Incident Reporting**

Attribute	Risk Reduction		Formula	Basis			Reference	Project Life	
		Total		Scope	Effectiveness	Risk Addressed			
Safety	% Scope	100.00%	0.005%	100% as it applies to all stakeholder groups	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 1% of the risk sources	5	
	% Effectiveness	0.5%							Marginal improvement
	% Risk Addressed	1%							Mapping of the 2018 DIRT data causes
Reliability	% Scope	100.00%	0.005%	100% as it applies to all stakeholder groups	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 1% of the risk sources	5	
	% Effectiveness	0.5%							Marginal improvement
	% Risk Addressed	1%							Mapping of the 2018 DIRT data causes
Financial	% Scope	100.00%	0.005%	100% as it applies to all stakeholder groups	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 1% of the risk sources	5	
	% Effectiveness	0.5%							Marginal improvement
	% Risk Addressed	1%							Mapping of the 2018 DIRT data causes

**SCG-7-M2: Establish a Program to Address the Area of Continual Excavation**

Attribute	Risk Reduction		Total	Formula	Basis			Reference	Project Life
	% Scope	% Effectiveness			Scope	Effectiveness	Risk Addressed		
Safety	% Scope	1.00%	0.324%	<i>Proportion of farmers to heavy machinery excavators</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 36% of the risk sources		1
	% Effectiveness	90.0%		<i>Percentage following procedure</i>					
	% Risk Addressed	36%		<i>Mapping of the 2018 DIRT data causes</i>					
Reliability	% Scope	1.00%	0.324%	<i>Proportion of farmers to heavy machinery excavators</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 36% of the risk sources		1
	% Effectiveness	90.0%		<i>Percentage following procedure</i>					
	% Risk Addressed	36%		<i>Mapping of the 2018 DIRT data causes</i>					
Financial	% Scope	1.00%	0.324%	<i>Proportion of farmers to heavy machinery excavators</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 36% of the risk sources	2018 DIRT database	1
	% Effectiveness	90.0%		<i>Percentage following procedure</i>					
	% Risk Addressed	36%		<i>Mapping of the 2018 DIRT data causes</i>					



**SCG-7-C16: Install Warning Mesh Above Buried Company Facilities**

Attribute	Risk Reduction		Total	Formula	Basis			Reference	Project Life
	% Scope	% Effectiveness			Scope	Effectiveness	Risk Addressed		
Safety	% Scope	0.62%	0.07%	<i>Procurement / System size</i>	Funding based	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 24% of the risk sources	2018 DIRT database	50
	% Effectiveness	50.00%		<i>High effectiveness</i>					
	% Risk Addressed	24%		<i>Mapping of the 2018 DIRT data causes</i>					
Reliability	% Scope	0.62%	0.07%	<i>Procurement / System size</i>					
	% Effectiveness	50.00%		<i>High effectiveness</i>					
	% Risk Addressed	24%		<i>Mapping of the 2018 DIRT data causes</i>					
Financial	% Scope	0.62%	0.07%	<i>Procurement / System size</i>					
	% Effectiveness	50.00%		<i>High effectiveness</i>					
	% Risk Addressed	24%		<i>Mapping of the 2018 DIRT data causes</i>					

**SCG-7-M3: Recording Photographs for Each Locate and Mark Ticket Visited by Locator**

Attribute	Risk Reduction		Formula	Basis			Reference	Project Life
		Total		Scope	Effectiveness	Risk Addressed		
Safety	% Scope	100.00%	0.080%	100% of tickets have associated photographs	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 8% of the risk sources	1
	% Effectiveness	1.0%		Marginal in nature				
	% Risk Addressed	8%		Mapping of the 2018 DIRT data causes				
Reliability	% Scope	100.00%	0.080%	100% of tickets have associated photographs	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 8% of the risk sources	
	% Effectiveness	1.0%		Marginal in nature				
	% Risk Addressed	8%		Mapping of the 2018 DIRT data causes				
Financial	% Scope	100.00%	0.080%	100% of tickets have associated photographs	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 8% of the risk sources	
	% Effectiveness	1.0%		Marginal in nature				
	% Risk Addressed	8%		Mapping of the 2018 DIRT data causes				

**SCG-7-M4: Utilize Electronic Positive Response**

Attribute	Risk Reduction		Total	Formula	Basis			Reference	Project Life
					Scope	Effectiveness	Risk Addressed		
Safety	% Scope	100.00%	0.020%	100% of tickets will have EPR available	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 2% of the risk sources		1
	% Effectiveness	1.0%		Marginal impact on excavator behavior					
	% Risk Addressed	2%		Mapping of the 2018 DIRT data causes					
Reliability	% Scope	100.00%	0.020%	100% of tickets will have EPR available	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 2% of the risk sources		1
	% Effectiveness	1.0%		Marginal impact on excavator behavior					
	% Risk Addressed	2%		Mapping of the 2018 DIRT data causes					
Financial	% Scope	100.00%	0.020%	100% of tickets will have EPR available	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 2% of the risk sources	2018 DIRT database	1
	% Effectiveness	1.0%		Marginal impact on excavator behavior					
	% Risk Addressed	2%		Mapping of the 2018 DIRT data causes					

**SCG-7-M5: Enhance Process to Leverage Excavation Technology to Help with Difficult Locates (Vacuum Excavation Technology)**

Attribute	Risk Reduction		Total	Formula	Basis			Reference	Project Life
					Scope	Effectiveness	Risk Addressed		
Safety	% Scope	15.00%	1.283%	<i>15% of targeted locations will be assisted</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 9% of the risk sources		1
	% Effectiveness	95.0%		<i>High effectiveness</i>					
	% Risk Addressed	9%		<i>Mapping of the 2018 DIRT data causes</i>					
Reliability	% Scope	15.00%	1.283%	<i>15% of targeted locations will be assisted</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 9% of the risk sources		1
	% Effectiveness	95.0%		<i>High effectiveness</i>					
	% Risk Addressed	9%		<i>Mapping of the 2018 DIRT data causes</i>					
Financial	% Scope	15.00%	1.283%	<i>15% of targeted locations will be assisted</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 9% of the risk sources	2018 DIRT database	1
	% Effectiveness	95.0%		<i>High effectiveness</i>					
	% Risk Addressed	9%		<i>Mapping of the 2018 DIRT data causes</i>					

**SCG-7-M6: Promote Process and System Improvements in 811 USA Ticket Routing and Monitoring**

Attribute	Risk Reduction		Total	Formula	Basis			Reference	Project Life
					Scope	Effectiveness	Risk Addressed		
Safety	% Scope	100.00%	0.150%	100% of tickets, all stakeholder groups	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 1% of the risk sources		1
	% Effectiveness	15.0%		Closely tied to the Damage Prevention Analysts program					
	% Risk Addressed	1%		Mapping of the 2018 DIRT data causes					
Reliability	% Scope	100.00%	0.150%	100% of tickets, all stakeholder groups	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 1% of the risk sources		1
	% Effectiveness	15.0%		Closely tied to the Damage Prevention Analysts program					
	% Risk Addressed	1%		Mapping of the 2018 DIRT data causes					
Financial	% Scope	100.00%	0.150%	100% of tickets, all stakeholder groups	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 1% of the risk sources	2018 DIRT database	1
	% Effectiveness	15.0%		Closely tied to the Damage Prevention Analysts program					
	% Risk Addressed	1%		Mapping of the 2018 DIRT data causes					

**SCG-7-M7: Leverage Data Gathered by Locating Equipment**

Attribute	Risk Reduction		Total	Formula	Basis			Reference	Project Life
					Scope	Effectiveness	Risk Addressed		
Safety	% Scope	25.00%	0.000%	<i>Midpoint of range</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 3% of the risk sources		5
	% Effectiveness	0.01%		<i>Marginal effectiveness</i>					
	% Risk Addressed	3%		<i>Mapping of the 2018 DIRT data causes</i>					
Reliability	% Scope	25.00%	0.000%	<i>Midpoint of range</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 3% of the risk sources		5
	% Effectiveness	0.01%		<i>Marginal effectiveness</i>					
	% Risk Addressed	3%		<i>Mapping of the 2018 DIRT data causes</i>					
Financial	% Scope	25.00%	0.000%	<i>Midpoint of range</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 3% of the risk sources	2018 DIRT database	5
	% Effectiveness	0.01%		<i>Marginal effectiveness</i>					
	% Risk Addressed	3%		<i>Mapping of the 2018 DIRT data causes</i>					

**SCG-7-A1: Virtual Reality Training/Simulation to Improve Locator Proficiency**

Attribute	Risk Reduction		Formula	Basis			Reference	Project Life	
		Total		Scope	Effectiveness	Risk Addressed			
Safety	% Scope	100.00%	0.001%	100% of locations would receive UTTO VR Tools	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 6% of the risk sources	1	
	% Effectiveness	0.01%							Minimal impact
	% Risk Addressed	6%							Mapping of the 2018 DIRT data causes
Reliability	% Scope	100.00%	0.001%	100% of locations would receive UTTO VR Tools	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 6% of the risk sources		
	% Effectiveness	0.01%							Minimal impact
	% Risk Addressed	6%							Mapping of the 2018 DIRT data causes
Financial	% Scope	100.00%	0.001%	100% of locations would receive UTTO VR Tools	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 6% of the risk sources		
	% Effectiveness	0.01%							Minimal impact
	% Risk Addressed	6%							Mapping of the 2018 DIRT data causes

**SCG-7-A2: GPS Tracking of Excavation Equipment**

Attribute	Risk Reduction		Total	Formula	Basis			Reference	Project Life
					Scope	Effectiveness	Risk Addressed		
Safety	% Scope	25.00%	0.000%	<i>Average of available opportunities</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 3% of the risk sources		1
	% Effectiveness	0.01%		<i>Minimal impact</i>					
	% Risk Addressed	3%		<i>Mapping of the 2018 DIRT data causes</i>					
Reliability	% Scope	25.00%	0.000%	<i>Average of available opportunities</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 3% of the risk sources		1
	% Effectiveness	0.01%		<i>Minimal impact</i>					
	% Risk Addressed	3%		<i>Mapping of the 2018 DIRT data causes</i>					
Financial	% Scope	25.00%	0.000%	<i>Average of available opportunities</i>	SME Estimate	SME Estimate	Based on a mapping of the 2018 DIRT database causes, this mitigation addresses 3% of the risk sources	2018 DIRT database	1
	% Effectiveness	0.01%		<i>Minimal impact</i>					
	% Risk Addressed	3%		<i>Mapping of the 2018 DIRT data causes</i>					