# BACKGROUND AND RESOURCE MATERIALS FOR THE MEDIA Aliso Canyon Gas Leak

Media Hotline Number Media inquiries should be directed to our media hotline at (877) 643-2331 or to www.alisoupdates.com

Friday, January 8, 2016

## Introduction

SoCalGas has assembled the following information for journalists covering the Aliso Canyon gas leak to have a source of background information as they continue their coverage of this incident.

Most of the resources below are from third parties, including prior news coverage and public documents from agencies inclusive of the Los Angeles County Public Health Department, the state Office of Environmental Health Hazard Assessment (OEHHA), the Division of Oil Gas and Geothermal Resources (DOGGR), the United States Environmental Protection Agency (U.S. EPA), and the National Aeronautics and Space Administration (NASA).

Hundreds of stories have been written and broadcast since the leak was first detected. This story has been multi-faceted and technically complex. There have been many voices, including a host of regulatory agencies, elected officials, residents, pundits, and bloggers.

The safety of the community and the prompt resolution of the incident are our highest priorities. We are relying on the media to keep the public fully and accurately informed of our efforts in this regard.

We know reporters on this story have had a lot to sift through and quite a volume of background information to marshal and organize as reliable references. It is our hope that the following documentation, again mostly from third parties, will be helpful to you going forward.

This resource is divided into the following categories:

- 1. General Timeline of Events SoCalGas
- 2. Media Update SoCalGas
- 3. Relief Well Project Background SoCalGas
- 4. Links to Prior News Coverage for Background
- 5. Links to Third Party Documentation and Resources
- 6. Public Health Assessments
- 7. Environmental Resources
- 8. Community and Customer Support Efforts SoCalGas

With the availability of wi-fi or internet, the entire document has embedded links (underlined in blue font) to hyperlink the reader to source documents and websites for additional information. For additional or up-to-the-minute information, reporters can call our media hotline 877-643-2331

## Background

On October 23, SoCalGas crews discovered a leak at one of the natural gas storage wells at its Aliso Canyon storage field. In response, we activated the appropriate procedures to begin to address the leak.

We regret that the smell of the odorant in natural gas is unpleasant and that some people are sensitive to the odor, and we sincerely apologize for the annoyance and concern this odor is causing the neighboring communities. The well is located in an isolated, mountain area more than a mile away from and more than 1,200 feet higher than the closest home or public area. In outdoor locations such as this, natural gas quickly dissipates into the air, greatly reducing the possibility for ignition and further diluting the gas as it

reaches the public. The human nose is amazingly sensitive and can detect the smell of the odorant at levels much lower than available detection technology.

We have assembled a world-class team of experts, and we are working as quickly as safety will allow us to stop the leak. In addition, we are in regular communication with L.A. City and County Fire and Hazmat Departments, the L.A. County Department of Health, the California Division of Oil, Gas & Geothermal Resources, California Air Resources Board, California Public Utilities Commission, and the South Coast Air Quality Management District.

## Aliso Canyon Gas Leak Timeline Oct 2015 - Jan 2016



### 12/08/15 Website Launch

SoCalGas launches a dedicated website for residents.

#### 12/23/15 **ARB GHG Report**

ARB issues a report, "Aliso Canyon Natural Gas Leak," with periodic measurements from 11/07/15 through 12/22/15.

## 01/03/16 **OEHHA Air Sampling**

January 2016

Most recent OEHHA air sampling published, illustrating 7 weeks of sampled data from 8 monitoring points throughout Porter Ranch.

## 12/12-12/21/15 **Community Resource Center**

12/12/15: Launched a Mobile Community Resource Center (temporary until a storefront could be finalized) to provide Aliso Canyon storage well information, relocation services, and air purification information to residents.

12/21/15: Opening of the Community Resource Center (the storefront).

12/31/15: Expanded the Community Resource Center with additional square footage, staff, and resources to further enhance the customer experience.

## Aliso Canyon Media Update

Relief Well Operations Progressing On-Schedule Efforts to Alleviate Community Concerns and to Reduce Emissions Continue

SoCalGas is working as quickly and safely as possible to stop the natural gas leak at its Aliso Canyon Storage Facility, and we are redoubling our efforts to aggressively address its impact on the community and the environment. The update below covers key events and activities. More information on the topics below is available by calling 877-643-2331 or visiting www.AlisoUpdates.com.

**Stopping the Leak:** The relief well is being drilled to intercept the leaking well, SS-25, and to pump cement into its base where it enters the reservoir of natural gas. This will stop the flow of gas at its source and permanently seal SS-25. As a result, natural gas will no longer be able to enter the well or reach the leak. A new relief well fact sheet can be found on our newsroom: https://www.socalgas.com/newsroom.

- The work remains on schedule to be in position to stop the leak in the late-February-to-late-March timeframe.
- The drilling operation is progressing and has five phases. The five phases are described in the next following pages in this document, but can also be found on our website at <u>www.AlisoUpdates.com</u>.
- Media advisory on relief well drilling efforts and its progress can be found on our newsroom: <u>https://www.socalgas.com/newsroom</u>.

**Relocation Process:** We are continuing to implement the relocation plan for impacted customers, which is part of the December 24 agreement reached with the Los Angeles City Attorney, to which the city and other parties previously had the opportunity to contribute. The agreement also provides for a mediated dispute resolution process for any resident who is dissatisfied with the relocation process.

- Our aim is to offer temporary accommodations to those affected by the odor as soon as possible. We offer to place residents in hotels as we work with them to review the options we have developed to meet their needs for more suitable accommodations.
- If any resident feels the need to relocate before one of our representatives can reach out to them with options, they are free to make their own arrangements, and we will reimburse them if they are within the parameters of our program.

Attempts to Reduce Emission: Reducing the level of the emission of natural gas and its odorant from the leak is one way SoCalGas is addressing the impact on both the community and environment.

- SoCalGas is withdrawing gas from Aliso Canyon to decrease the pressure pushing gas up from the reservoir and out through the leak.
- For several weeks, in consultation with the CPUC, SoCalGas has been withdrawing natural gas from the storage field at almost double the typical rate for this time of the year by prioritizing the use of natural gas from Aliso Canyon to supply customer demand.
- Along with trying to reduce emissions through withdrawals, SoCalGas is also working with some of the world's most experienced engineering firms to evaluate and design innovative solutions to capture the leaking gas and reduce the odor reaching the community.

**Reducing Exposure to the Odorant:** SoCalGas is providing residents with both weatherization services to help reduce the odor from entering their homes and a range of filtration solutions to filter out the odor and other compounds related to the leak.

- The California Air Resources Board (ARB) has determined certain activated carbon/charcoal HVAC filters, in-line HVAC purification, and plug-in air purifiers should be effective in reducing indoor odors associated with the leak. The agency is currently reviewing a range of models and has so far listed two plug-in models and one in-line HAVC model on its website: <u>http://www.arb.ca.gov/research/indoor/aircleaners/air\_cleaners\_gas\_leak.htm</u>
- SoCalGas is receiving favorable responses, and some residents are choosing to postpone relocation in order to determine whether the filtration solution meets their needs. We are currently providing activated carbon/charcoal filters, whole-house air purification, and plugin air purifiers.
- We have also created a separate, pre-approval reimbursement process for residents who wish to purchase their own air purifiers that meet ARB's specifications.

**Health Impact:** We continue to conduct twice daily air sampling both at the leak site and within the community. Results are posted on our website at: <u>https://www.alisoupdates.com/acu-aliso-canyon-air-sample-results</u>.

Regarding the data, the State Office of Environmental Health Hazard Assessment (OEHHA) has recently made the following observation: "Based on the air sample data from the Porter Ranch neighborhood and measured levels of Volatile Organic Compounds found, there does not appear to be an acute toxicity health hazard from Volatile Organic Compounds in the Porter Ranch neighborhood as a result of the Aliso Canyon natural gas leak." (<u>http://www.caloes.ca.gov/ICESite/Pages/Aliso-Canyon.aspx?utm\_source=Aliso+Canyon+Teleconference+12.15.15&utm\_campaign=Aliso+Canyon&utm\_medium=email</u>)

#### **Community Resources**

 To better accommodate visitors to our Community Resource Center, we have expanded the Center into the store immediately next door at 19731 Rinaldi Street in the Porter Ranch Town Center. The center will be open from 10 a.m. to 8 p.m., Monday through Friday, and from 10 a.m. to 4 p.m. on weekends.

###



SoCalGas<sup>®</sup> will drill a pair of relief wells in order to stop the flow of gas leaking from a well at its Aliso Canyon Natural Gas Storage Facility. Historically relief wells were drilled into the reservoir close to a leaking well to relieve the gas pressure entering it, thus making it easier to control. However, modern locating and drilling technology has enabled relief wells to be directionally drilled to intercept and directly plug a leaking well.

SoCalGas began planning relief well operations in early-November, started drilling the first relief well on December 4, 2015, and is currently preparing the site and plans to begin drilling the second relief well as a backup in late-January. The first relief well is being drilled from around 1,500 feet away and will intercept the leaking well at more than 8,500 feet below ground. After intercepting it, SoCalGas will pump cement into the bottom of the leaking well to permanently cut it off from the natural gas reservoir. This operation is expected to take until late-February or March to complete.

#### **DRILLING PROCESS**

The relief well drilling operation is being conducted 24/7 by some of the world's most experienced relief well drilling experts in collaboration with a team from SoCalGas. It is being monitored by the California Division of Oil, Gas and Geothermal Resources (DOGGR) and will proceed in five general phases.

#### Phase 1 - Set Foundation:

A well is composed of several segments of pipe, each with a smaller diameter than the section above it and each encased in cement. The first segment of pipe, called the surface casing, is the widest and has the important job of providing a strong foundation for the well and providing an extra layer of protection for the subsurface environment. To install the surface casing, SoCalGas will drill a 17 1/2-inch hole to about 1,200 feet of measured depth\* (MD) and insert a 13 3/8-inch pipe all the way down the hole. This approximately 1,200-foot segment and all the others are put

together by screwing 40-foot sections of pipe together as the string of pipe progresses deeper into the hole.

Additionally, at the beginning of each phase, SoCalGas will install a blowout preventer, which is a set of valves and pipes designed to prevent the force of any gas or fluid that could unexpectedly run up the relief well, for the safety of the work crew.

\*Measured depth (MD) represents the distance drilled, as opposed to the actual vertical depth below the surface.



#### Phase 2 - Approach: The

objective of Phase 2 is to drill to a designated location closer to the leaking well and within the effective range of the equipment that will be used in the next phase to locate the well. The drilling crew will directionally drill an approximately 12-inch hole toward the target well to about 3,800 feet MD and install a 9 5/8-inch pipe, typically called the production casing, inside.

Phase 3 - Locate: During Phase 3, progress, in terms of feet-per-day, will slow; however, the objective in this phase is less to drill for distance and more to positively identify the target well and others nearby. An active magnetic ranging tool, called Well Spot<sup>™</sup>, will be used to "range" for the leaking well. The tool includes two components, one to generate an electromagnetic field and another to detect changes in that magnetic field that would indicate the locations of the wells. As this phase progresses, the drilling crew will alternate between drilling and ranging, requiring the drill bit to be retracted and exchanged with the ranging tool, which could take up to a day each time. Once the leaking well has been located, the crew will drill past it at a relatively close distance and then wind back to it at around 4,500 feet MD in order to confirm the location of the leaking well and to properly position the drill bit for the next phase of drilling. To avoid the other wells nearby, rare earth magnets will be placed inside those wells so sensors in the drill bit can steer clear of them.



Phased planning may change as drilling progresses.

Illustration is for informational purposes only. Drawings are not technically accurate or to scale

**Phase 4 - Follow:** Because the leaking well does not go straight down, the crew will have to continue ranging so the relief well follows the leaking well while maintaining the proper distance and angle. This phase will be one of the longer phases in terms of time because the drilling crew has to work its way down to below 8,000 feet MD by alternating between drilling and ranging. Importantly, at the end of this phase, the relief well will need to be in the proper orientation and angle, less than five degrees, to the leaking well in order to properly intercept it in the next phase.

**Phase 5 - Intercept & "Kill" the Well:** In Phase 5, SoCalGas will continue drilling another 500 feet to install the casing to about 50 feet from the target well. While this is a relatively short distance, this phase will also be one of the longer phases because this 500 feet will be drilled in progressively shorter intervals with ranging and surveying being conducted at each interval to ensure the drill maintains the proper position. The last 50 feet of pipe will be installed just short of the leaking well at about 8,600 MD. After preparations for the "kill" attempt have concluded, the team will cut through one side of it and begin pumping heavy fluids and drilling mud to outweigh the gas pressure flowing up from the reservoir. As soon as the flow of gas has been stopped, SoCalGas will pump enough cement to displace the fluids and mud and leave a thick seal of cement to effectively shut off the target well from the reservoir, stopping the leak at its source.

**Permanent Sealing:** After an investigation of the circumstances surrounding the leak, SoCalGas will pump more cement into the well, leaving it permanently sealed.

For more information, please call the SoCalGas Aliso Canyon hotline at 818-435-7707 or email us at AlisoCanyon@SoCalGas.com.

socalgas.com

1-800-427-2200



## **Previous News Coverage for Background**

This section lists some notable and informational news coverage of the Aliso Canyon Gas Leak. This document has embedded links to source documents and websites for reference and additional information.

- This LA Times story provides a thorough description of the relief well process describes the complex engineering involved in plugging the leak. <u>http://www.latimes.com/local/california/la-me-porter-ranch-delay-20160102-story.html</u>
   Why the Porter Ranch gas leak could take months to fix
   By Thomas Curwen, Los Angeles Times, January 2, 2016
   As the relief wells are drilled, SoCalGas has succeeded in cutting the escaping fumes in half by reducing the pressure in the underground reservoir.
- 2. This LA Times story describes the safety reasons behind the mercaptan, the natural gas odorant causing some Porter Ranch residents short-term symptoms. Also includes insightful commentary from LA County public health officials, emphasizing "there is no evidence the mercaptans pose long-term health risks, even in workplace and industrial settings, where people are chronically exposed to elevated levels of the odor-causing chemicals." Also cites the one known study on mercaptans in 2012 by the CDC where residents within a 2-mile radius of a six-month leak of mercaptans experienced short-term symptoms, similar to those reported in Porter Ranch, but no lasting health consequences.

http://www.latimes.com/local/california/la-me-adv-gas-leak-health-20151220-story.html Odors from Porter Ranch gas leak are just doing their jobs — too well By Tony Barboza—Los Angeles Times, December 19, 2015 The sulfur-like compounds it contains, called mercantans, are not toxic or damaging to the

The sulfur-like compounds it contains, called mercaptans, are not toxic or damaging to the body and do not post long-term risks, public health officials and environmental experts say.

- This KNBC interview with SoCalGas' Aliso Canyon Incident Commander Jimmie Cho explains SoCalGas' efforts to stop the leak, its initial notifications and its odor mitigation efforts. <u>https://www.youtube.com/watch?v=UIX4sjMAvSI</u> KNBC Channel 4 interviews Jimmie Cho, Senior Vice President, Gas Operations and System Integrity.
- 4. This KCBS interview accurately captures the LA County Health Department's position on the short-and long-term health concerns of the natural gas leak as well as clear and specific guidance on whether people should stay in their homes. https://www.youtube.com/watch?y=Shn7sWZd-yk

KCBS Channel 2 interview with Dr. Cyrus Rangan, Director, Bureau of Toxicology & Environmental Assessment, L.A. County Health Department.

## Links to Useful Background Information and Resources

This section lists some useful links to various resources and their websites for reference and additional information.

- This state website provides comprehensive information on the Aliso Canyon natural gas leak, including: latest news, background, efforts to stop the leak, public health concerns, methane emissions, environmental impact, investigations into the leak, worker safety, and more. <u>http://www.caloes.ca.gov/ICESite/Pages/Aliso-Canyon.aspx</u>
   California Office of Emergency Services web pages on the Aliso Canyon gas leak.
- This website by the California Office of Environmental Health Hazard Assessment (OEHHA) serves as an excellent resource for air sampling and monitoring. OEHHA has analyzed air sampling results since November 1 and has posted a chart – updated through Dec. 29 – showing peak benzene levels since 11/1 are well below the regulatory threshold for concern. http://oehha.ca.gov/public\_info/emergency/alisocanyon.html
   Office of Environmental Health Hazard Assessment (OEHHA) emergency response information. http://www.oehha.ca.gov/public\_info/emergency/pdf/SoCalGaspeakbenzenetoDec172015.pdf
   Office of Environmental Health Hazard Assessment (OEHHA) graph showing peak benzene levels.
- 3. This site by the California Air Resources Board describes the agency's air quality monitoring at Aliso Canyon. ARB emphasizes its estimates are "preliminary" and "initial." The agency also notes: "final results based on these measurements will take time to process and will not be available until several months after the leak has been plugged." <a href="http://www.arb.ca.gov/research/reports/aliso\_canyon\_natural\_gas\_leak\_updates-sa\_flights\_thru\_dec\_12\_2015.pdf">http://www.arb.ca.gov/research/reports/aliso\_canyon\_natural\_gas\_leak\_updates-sa\_flights\_thru\_dec\_12\_2015.pdf</a>
- 4. LA County Public Health Fact Sheet on Aliso Canyon which states: "Methane level readings in Porter Ranch are substantially lower than flammable limits, and do not pose a health concern to residents in the area." Regarding the mercaptans, the fact sheet indicates: "Symptoms vary depending on the frequency and duration of the odor and will generally go away once the odor exposure has stopped. Odors are not associated with long-term health effects, but they may cause recurrent symptoms on a daily basis in some individuals as long as the odors remain." <a href="http://publichealth.lacounty.gov/eh/docs/AlisoCanyonFactSheet.pdf">http://publichealth.lacounty.gov/eh/docs/AlisoCanyonFactSheet.pdf</a>
- 5. This December 1 report from the LA County Health Department to the LA County Board of Supervisors December 1 assesses the health risks of methane and mercaptans. According to LA County Public Health, "inhalation [of methane] in this setting at the measured levels does not pose a significant health risk" and "mercaptans at the levels detected to date are general not expected to lead to long-term health effects."

http://publichealth.lacounty.gov/eh/docs/AlisoCanyonBoard.pdf

Los Angeles County Health Department's report to the county Board of Supervisors assessing exposure to methane and mercaptans.

# ALISO CANYON GAS LEAK

## Health Fact Sheet



## **Overview**

This fact sheet provides information about the natural gas leak at the Aliso Canyon Storage Facility and its related health impacts to Porter Ranch residents. The natural gas leak began on October 23. The Department of Public Health (Public Health) determined that the emissions from this facility are causing health effects in some individuals in the Porter Ranch community. Exposures to these chemicals are generally not expected to lead to permanent or long-term health problems. However, short-term, recurrent symptoms may occur with these exposures as long as the odors persist, and some individuals may be more sensitive than others. Outdoor air is being monitored and, Public Health will continue to assess air quality until the gas leak is resolved.

## Natural Gas

Natural gas in California is primarily composed of methane. Because natural gas is odorless by itself, trace amounts of odorants called Mercaptans are added so that a gas leak is easy to detect. Southern California Gas Company uses an odorant called Scentinel<sup>®</sup> T-50, which contains two ingredients, tetrahydrothiophene (THT) and t-butyl mercaptan. These gases have strong odors, even at very low air concentrations.

## Health Effects

**Methane:** Methane is an odorless gas, and the primary health hazard associated with methane is its flammability. Methane inhalation in this setting generally does not lead to health effects. Methane level readings in Porter Ranch are substantially lower than flammable limits, and do not pose a health concern to residents in the area.

**Mercaptans:** At this time, the natural gas leak is releasing very low levels of mercaptans into the air. Mercaptans have a strong "rotten-egg," "garlicky," or "skunk-like" odor and can be irritating to the eyes, skin, and respiratory system at low levels. In this incident, the levels are so low they can escape detection by most monitoring equipment, however individuals are capable of detecting these odors. These low level exposures may cause eye, nose and throat irritation, coughing and nasal congestion, shortness of breath, nausea, stomach discomfort, dizziness, and headaches. Symptoms vary depending on the frequency and duration of the odor and will generally go away once the odor exposure has stopped. Odors are not associated with long-term health effects, but they may cause recurrent symptoms on a daily basis in some individuals as long as the odors remain.

## Public Health Directive to Southern California Gas Company

If you are experiencing odors and symptoms AND you wish to be temporarily relocated from your home, Southern California Gas Company is offering free temporary relocation for any individuals, families, and pets.

**Relocation is not mandatory.** To learn more about relocation assistance, call **404-497-6808**. If you or your health care provider have health-related questions, please call Dr. Cyrus Rangan, Director of the Bureau of Toxicology and Environmental Assessment, at 213-738-3220.

## For More Information

Los Angeles County Department of Public Health, 888-700-9995 South Coast Air Quality Management District, 800-CUT-SMOG Los Angeles County Fire Department, 323-881-2411 Southern California Gas Company, 800-427-2000



CYNTHIA A. HARDING, M.P.H. Interim Director

JEFFREY D. GUNZENHAUSER, M.D., M.P.H. Interim Health Officer

313 North Figueroa Street, Room 708 Los Angeles, California 90012 TEL (213) 240-8156 • FAX (213) 481-2739

www.publichealth.lacounty.gov

December 1, 2015

TO: Each Supervisor

FROM:

Cynthia A. Harding, M.P.H. Cynlug X. Herd

## SUBJECT: ALISO CANYON GAS LEAK INCIDENT AND POTENTIAL PUBLIC HEALTH IMPLICATIONS

This is in response to Mayor Antononvich's request for the Department of Public Health to report on health effects related to the natural gas leak at the Aliso Canyon Storage Facility at the November 24, 2015 meeting of the Board of Supervisors.

#### Background

The natural gas leak at the Aliso Canyon Storage Facility began on October 23, 2015. Initial estimates suggested the repairs would be made within a few days. However, efforts to characterize and stop the leak are moving into their sixth week. Estimates are that it may take several months to complete the repairs and restore the community to prior conditions. The Department of Public Health (DPH) determined in a Preliminary Environmental Health Assessment (PEHA) (Attachment 1) that mercaptan emissions from the gas leak are causing health effects in some residents of the Porter Ranch community. On November 24, 2015, DPH summarized this assessment in a presentation to your Board. This memorandum provides a summary of the PEHA and emerging data from multi-agency efforts to monitor the natural gas leak.

#### **Preliminary Environmental Health Assessment**

From the onset of the incident, two primary chemicals of concern have been extensively evaluated: methane and mercaptans.

Methane is the primary ingredient in natural gas, and its levels are being monitored at the facility and in the Porter Ranch neighborhood. Methane is an odorless, flammable gas, but measurements to date in Porter Ranch have been substantially below flammability limits. Additionally, inhalation in this setting at the measured levels does not pose a significant health risk.



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Hilda L. Solis First District Mark Ridley-Thomas Second District Sheila Kuehl Third District Don Knabe Fourth District

Michael D. Antonovich Fifth District Each Supervisor December 1, 2015 Page 2

Mercaptans are odorants added to natural gas in small amounts to enable detection of leaks by smell. Reported health effects from Porter Ranch residents are consistent with low-level, acute exposure to mercaptans. As of December 1, 2015, DPH has received over 60 reports from Porter Ranch residents describing recurrent, short-term symptoms such as headaches, nausea, abdominal discomfort, dizziness, and respiratory irritation.

Due to continuing mercaptan odors in Porter Ranch, some residents have raised questions regarding the long-term health effects of exposure. Mercaptans at the levels detected to date are generally not expected to lead to long-term health effects. Known health effects of mercaptan exposures are based on data from occupational and industrial settings. Even in these settings, where mercaptan levels are often elevated, long-term health effects are generally not observed. Studies beyond the occupational and industrial settings are limited. However, a study conducted by the Centers for Disease Control and Prevention (CDC) in 2012 chronicled a 6-month leak of natural gas containing mercaptans in a residential setting.<sup>1</sup> Residents in a 2-mile zone reported similar symptoms to those in Porter Ranch. The CDC researchers noted recurrent short-term health effects, but did not observe long-term effects.

Evidence supports that the mercaptan odors in Porter Ranch will cause recurrent, short-term health effects in some residents as long as the odors persist. In addition, people with certain health conditions may be more vulnerable to these effects, or may experience an exacerbation of their conditions. As a result, DPH issued a directive (Attachment 2) to the Southern California Gas Company (SCGC) on November 19, 2015 to expedite their work to repair the leak and to provide temporary relocation for affected residents in the interim. As of December 1, 2015, approximately 998 households have inquired about relocation, with 282 households already relocated and 496 residents in the process of relocation.

#### Supplemental Assessment

Chemical exposures are typically classified as short-term or long-term. The risks associated with short-term exposures to trace levels of toxic emissions are typically low. As the duration of exposure increases, these trace levels can produce significant long-term health effects. As this incident has moved from a short-term exposure event resolved within days, to now a long-term event potentially lasting months, supplemental monitoring of potentially harmful trace chemicals is warranted.

Natural gas contains not only methane and mercaptans, but also small amounts of other compounds, including hydrogen sulfide, sulfur dioxide, benzene, toluene, ethylbenzene, and xylenes. DPH is working with the regulatory agencies to assess exposure to these other chemicals. The chemical of greatest concern is benzene, as it is a known human carcinogen. Further, radon gas naturally occurs in geologic formations and may potentially be released as a result of current repair operations. Radon is also a known human carcinogen, and a leading cause of lung cancer in

<sup>&</sup>lt;sup>1</sup> Behrooz Behbod, MB, ChB, MSc, ScD; Erin M. Parker, MA, PhD; Erin A. Jones, BS, MD; et al. Community Health Assessment Following Community Health Assessment Following Mercaptan Spill: EightMile, Mobile County, Alabama, September 2012. J Public Health Management Practice, 2013, 00(00), 1–8.

Each Supervisor December 1, 2015 Page 3

non-smokers. Monitoring will need to be expanded to include these chemicals at both the Aliso facility and in the Porter Ranch community. DPH will continue to work closely with the regulatory agencies to characterize the levels of benzene, radon, and other trace gases in the Porter Ranch community.

#### Summary

Efforts to evaluate the nature and extent of the chemicals released by the natural gas leak at the Aliso Canyon facility are ongoing. As the repair efforts will take months to complete, expanded monitoring of emissions is necessary. DPH will continue to work with the regulatory agencies to assess both short-term and potential long-term health effects from these exposures. Further, DPH will use its authority to bring public health considerations to the forefront of decision-making. As significant new information comes to light, DPH will keep your Board informed.

If you have questions or need additional information, please let me know.

CAH:cr

Attachments

cc: Chief Executive Officer County Counsel Acting Executive Officer, Board of Supervisors



COUNTY OF LOS ANGELES DEPARTMENT PUBLIC HEALTH BUREAU OF HEALTH PROTECTION 5050 Commerce Drive, Baldwin Park, CA 91706 Phone: (626) 430-5100 Website: www.publichealth.lacounty.gov/eh



#### PRELIMINARY ENVIRONMENTAL HEALTH ASSESSMENT Natural Gas Leak from Aliso Canyon Storage Field, Southern California Gas Company

#### 11-19-15

Note: On October 28, 2015, Los Angeles County Department of Public Health (DPH) was asked by the Office of Emergency Management to assess whether conditions at the subject site could be adversely affecting the health of nearby residents. Based on review of available environmental and health data, DPH has prepared this Preliminary Environmental Health Assessment.

**Background:** On October 23, 2015, a natural gas leak was discovered by Southern California Gas Company (SoCal Gas) at the Aliso Canyon Storage Field. The Los Angeles County Department of Public Health (LADPH) was notified on 10.28.2015. Odors have been affecting residents in the Porter Ranch area. LADPH attended a community meeting hosted by SoCal Gas. LA County Fire Department was also in attendance. The community meeting focused on exposure to methane gas, and mercaptans which are odorants added to natural gas. LADPH advised that methane gas itself poses little direct health threat upon inhalation in an outdoor space. Mercaptans, however, do pose a health threat to the community, including short-term neurological, gastrointestinal, and respiratory symptoms that may result from inhalation.

**Problem Identification:** Daily complaints are being received by LADPH from neighboring Porter Ranch residents regarding strong odors from the Aliso Canyon site. Over 200 odor complaints have also been logged by the South Coast Air Quality Management District. Common health complaints include nausea, dizziness, vomiting, shortness of breath, and headaches. Complaints are associated with the detection of sulfur-type odors. These health complaints are consistent with inhalational exposure to mercaptans. It should be understood that odors alone can be directly responsible for health effects, and that these health effects currently reported by area residents are consistent with exposure to mercaptans at the odor threshold. Correspondence from SoCal Gas on 11.18.15 indicates that the process to cap and repair this leak may take several months.

#### Potential Other Sources of Exposure: None.

**Potentially Affected Population:** The site is adjacent to residential properties in the Porter Ranch neighborhood. These exposures do not constitute an immediate danger to life, and permanent or long-term health effects are not expected. Daily, short-term symptoms are expected to continue, as long as the odors remain.

**Assessment:** SoCal Gas has been addressing the problem from a technological standpoint since its inception. SoCal Gas has indicated that the problem is very complex, and requires a complex solution.

SoCal Gas is not able to provide a timeline for the amelioration of odors in the residential areas. Odors are causing significant symptoms in some area residents. These symptoms are expected to persist as long as the odors persist. Solutions to protect the public's health include eliminating the odorous emissions, or offering temporary relocation assistance to affected persons in the area.

#### **Recommendations:**

- (1) SoCal Gas should continue the abatement process to repair the leak. Odor elimination and public protection should be the highest priorities in the development of all mitigation plans.
- (2) LADPH will issue a directive to SoCal Gas to continue the abatement of odorous emissions in the area on an expedited basis, and, in the interim, to offer free, temporary relocation to any area residents affected by odors from the Aliso Canyon site.
- (3) The regulatory agencies should continue to explore appropriate interventions to expedite the characterization and repair the leak.

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Dr. Cyrus Rangan, M.D., F.A.A.P., F.A.C.M.T. Director, Bureau of Toxicology and Environmental Assessment

Angelo J. Bellomo, REHS, QEP Deputy Director for Health Protection

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November 19, 2015

Bret Lane, Chief Operating Officer Southern California Gas Company 555 West 5<sup>th</sup> Street Los Angeles, California 90013

#### RE: NATURAL GAS LEAK AT ALISO CANYON STORAGE FIELD

Dear Mr. Lane:

The Los Angeles County Department of Public Health is issuing the following Public Health Directive to the Southern California Gas Company:

Southern California Gas Company should continue the abatement process to characterize and repair the subject gas leak, and eliminate odorous emissions, on an expedited basis in consultation with the appropriate regulatory agencies. All mitigation plans should cite public health protection as the highest priority.

In the interim, Southern California Gas Company is to offer free, temporary relocation to any area residents affected by odors from the Aliso Canyon site. Please find attached our Preliminary Environmental Assessment on this matter. If you have any questions, or need additional information, please let me know.

Sincerely

Angelo J. Bellomo, REHS, QEP Deputy Director for Health Protection Los Angeles County Department of Public Health

AJB/

## Aliso Canyon Natural Gas Leak <u>Preliminary</u> Estimate of Greenhouse Gas Emissions (As of December 23, 2015)

On October 23, Southern California Gas informed the State of a natural gas leak at its Aliso Canyon natural gas storage facility. The Air Resources Board released an <u>initial estimate</u> of the leak rate on November 20. The leak rate from Aliso Canyon is expected to vary as attempts are made to stop the leak and as gas is withdrawn from the reservoir. It is therefore necessary to have ongoing measurements to ensure a robust estimate of the total emissions of the gas to the atmosphere can be made.

Periodic measurements are planned to be taken weekly with small planes equipped with monitors to measure methane. This measurement approach is described in more detail in the report from November 20. These periodic measurements provide an emission rate at the time the flights are conducted and may vary considerably. They do however provide a sense of what is happening with the leak and can be used to develop a very rough estimate of the total methane leaked to date.

Continuous measurements are also being collected as part of the State's Greenhouse Gas Monitoring network and through other complimentary measurement efforts. Final results based on these measurements will take time to process and will not be available until several months after the leak has been plugged. Once completed, the estimate calculated from these data will be the most robust quantification of the overall leak.

The table below provides the up-to-date history of estimates based on the measurements made from the plane flights. The estimate of the amount of methane that has leaked since the last flight and the cumulative amounts are calculated assuming that the leak rate is constant between flights. As a result, it is only a preliminary estimate at this time. It will be replaced with a more refined estimate once the leak is plugged and the computer models needed to process the continuous measurements described above are used.

Date of Flight	Leak Rate Measured	Expected Error in	Number of days Estimate of leaked methane		Verv Rouah Estimate of
	[kilogram methane per	Measurement	since start of leak or	since start of leak or since last	Cumulative Leak**
	hour]	[kilogram methane per hour]	since last flight	flight* [kilogram methane]	[MMTCO <sub>2</sub> e]
November 7th	44,000	±5,000	16	16,896,000	0.4
November 10th	50,000	±16,000	3	3,600,000	0.5
November 28th	58,000	±12,000	18	25,056,000	1.1
December 4th	43,000	±5,400	6	6,192,000	1.3
December 12th	36,000	±6,800	8	6,912,000	1.5
December 22nd	30.300	±6.100	10	7.272.000	1.6

\* This assumes a constant leak rate since the last measurement.

\*\* Using the 100 year global warming potential for methane of 25. From the date of the leak through the day of the flight. This number will be updated based on continuous measurements once the leak is plugged



## **OEHHA** Office of Environmental Health Hazard Assessment

On October 23, 2015, a natural gas leak was discovered at a well within the Aliso Canyon Underground Storage Field in Los Angeles County. The Southern California Gas Company (SoCalGas), which owns and maintains the natural gas storage facility and is responsible for its wells, has been attempting since that time to stop the leak. The Los Angeles neighborhood of Porter Ranch is located downwind from the Aliso Canyon natural gas storage facility.

The Office of Environmental Health Hazard Assessment (OEHHA) is providing assistance to the South Coast Air Quality Management District (SCAQMD) and the Los Angeles County Department of Public Health (LAPH) in evaluating potential health impacts of emissions from the gas leak in the Porter Ranch neighborhood. LAPH has received a substantial number of reports from Porter Ranch residents describing recurrent, short-term symptoms such as headaches, nausea, abdominal discomfort, dizziness, and respiratory irritation.

The natural gas stored in the Aliso Canyon facility, like natural gas provided for domestic use, contains added chemicals to enable detection of leaks by smell. The odorants in the Aliso Canyon natural gas are primarily tert-butyl mercaptan and tetrahydrothiophene, which are added to the natural gas in small amounts.

The Porter Ranch neighborhood air sampling data released by SoCalGas has not generally indicated that detectable levels of tert-butyl mercaptan or tetrahydrothiophene are present in those samples.

However, this does not mean that the symptoms reported by many Porter Ranch neighborhood residents are not real. Tert-butyl mercaptan and tetrahydrothiophene have strong odors which can be perceived at concentrations below the levels that can be detected in air samples. These odors can evoke responses such as nausea and, headaches, but the chemicals can cause these responses at levels much lower than those that would cause health effects such as irritation to the eyes or the respiratory system. The reported health effects from Porter Ranch residents are consistent with low-level, acute exposure to mercaptans.

OEHHA has also evaluated approximately seven weeks of Porter Ranch neighborhood air sample data posted on the SoCalGas Web site for peak levels of benzene, a toxic chemical in natural gas that is also present in gasoline and motor vehicle emissions. The results of that evaluation (latest update 01/03/16) is attached on the following page and posted at the following at the following address:

http://www.oehha.ca.gov/public\_info/emergency/alisocanyon.html

## Peak Benzene Air Levels in the Porter Ranch Community benzene acute REL = 8 parts per billion (ppb) \*\*\*The air sampling data used to generate the Porter Ranch community peak benzene levels graph were obtained from the SoCalGas Web site. The analyzed air monitoring data covers the period 11/1/2015 – 1/3/2016. Benzene air level data from all of the available Porter Ranch community air monitoring sites (generally eight different locations) was evaluated, and the highest concentration reported was listed as the peak benzene level for that monitoring day. Some monitoring days had several data sets available for that day (e.g. morning and afternoon). The highest benzene concentration listed in all data sets available for a given monitoring day was listed as the peak benzene concentration for that day. Monitoring days without bars indicating benzene levels indicate days where samples were not taken, or where all the benzene air concentrations in the several air samples were below the level of detection for the analytical chemistry lab that analyzed the air samples.

11/29

12/6

Monitoring Day

12/13

12/20

11/22

10

8

6

4

2

11/1

11/8

11/15

Benzene Levels (ppb)

1/3

12/27

\*\*\*The following background on global emissions of methane and other greenhouse gases is public information provided by the U.S. Environmental Protection Agency and the National Aeronautics and Space Administration.





• Agriculture. Domestic livestock such as cattle, buffalo, sheep, goats, and camels produce large amounts of CH4 as part of their normal digestive process. Also, when animals' manure is stored or managed in lagoons or holding tanks, CH4 is produced. Because humans raise these animals for food, the emissions are considered human-related. Globally, the Agriculture sector is the primary source of CH4 emissions. For more information,



Note: All emission estimates from the Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2013.

see the Inventory of U.S. Greenhouse Gas Emissions and Sinks Agriculture chapter.

• Waste from Homes and Businesses. Methane is generated in landfills as waste decomposes and in the treatment of wastewater. Landfills are the third largest source of CH4 emissions in the United States. For more information see the U.S. Inventory's Waste chapter.

Methane is also emitted from a number of natural sources. Wetlands are the largest source, emitting CH4 from bacteria that decompose organic materials in the absence of oxygen. Smaller sources include termites, oceans, sediments, volcanoes, and wildfires.

To find out more about the role of CH4 in warming the atmosphere, and its sources, visit the Causes of Climate Change page and the Greenhouse Gas Indicators page in the Science section.

#### **Emissions and Trends**

Methane (CH4) emissions in the United States decreased by almost 15% between 1990 and 2013. During this time period, emissions increased from sources associated with agricultural activities, while emissions decreased from sources associated with the exploration and production of natural gas and petroleum products.

U.S. Methane Emissions, 1990-2013





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#### **Reducing Methane Emissions**

There are a number of ways to reduce methane (CH4) emissions. Some examples are discussed below. To learn more about opportunities to reduce non-CO2 greenhouse gases, and the costs of reduction technologies, see the EPA report Global Mitigation of Non-CO2 Greenhouse Gases: 2010–2030 and Mitigation of Non-CO2 Greenhouse Gases in the United States: 2010–2030 (PDF, 46pp, 9.47MB)

EPA has a series of voluntary programs for reducing CH4 emissions, and is supporting the President's Strategy to Reduce Methane Emissions (PDF) (15 pp, 1.88MB). EPA has proposed oil and natural gas air pollution standards that will reduce emissions of methane and other air pollutants.

xamples of Reduction Opportunities for Methane				
Emissions Source	How Emissions Can be Reduced			
Industry	Upgrading the equipment used to produce, store, and transport oil and gas can reduce many of the leaks that contribute to CH4 emissions. Methane from coal mines can also be captured and used for energy. Learn more about the EPA's Natural Gas STAR Program and Coalbed Methane Outreach Program.			
Agriculture	ethane can be reduced and captured by altering manure management trategies at livestock operations or animal feeding practices. Learn more bout these strategies and EPA's AgSTAR Program.			

## http://www3.epa.gov/climatechange/ghgemissions/gases/ch4.html[12/31/2015 7:29:22 PM]

	Waste from Homes and Businesses	Because CH4 emissions fro the United States, emission reduction strategy. Learn Methane Outreach Progra	om landfill gas are a major s on controls that capture land more about these opportun am.	ource of CH4 emissions in Ifill CH4 are an effective ities and the EPA's Landfill
	<ul> <li>ŶTop of page</li> <li>References</li> <li>1. EPA (2010). Methane and Nitrous of Washington, DC, USA.</li> <li>2. U.S. Department of State (2007). Peramework Convention on Climate Convention on Climate Convention on Climate Convention on Climate Convention of Page</li> </ul>	<i>Oxide Emissions from Natura</i> Projected Greenhouse Gas Em <i>Change</i> . U.S. Department of	al Sources . U.S. Environment hissions. In: <i>Fourth Climate A</i> State, Washington, DC, USA.	al Protection Agency, Action Report to the UN
<ul> <li>Basic Information</li> <li>Newsroom</li> <li>Related Links</li> <li>Glossary</li> <li>Students' Site</li> </ul>	<ul> <li>Greenhouse Gas Emissions</li> <li>Overview of Gases</li> <li>Sources of Emissions</li> <li>Global Data</li> <li>Individual Data</li> <li>Facility Data</li> <li>Individual Calculator</li> </ul>	cience Overview Gauses of Climate Change Indicators of Climate Change uture Climate Change xtreme Weather	What EPA is Doing Evaluating Policy Options, Costs, and Benefits Regulatory Initiatives Voluntary Programs State, Local, and Tribal Partnerships International Partnerships	What You Can Do At Home On the Road In the Office At School Climate Connections Clean Energy Climate and Transportation Climate and Water Climate and Waste EPA Climate Science Research
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#### EDUCATION: GLOBAL METHANE INVENTORY

#### The Global Methane Cycle

By Harvey Augenbraun, Elaine Matthews, and David Sarma

(Note: This article was originally written in conjunction with the 1997 Global Methane Inventory.

#### 1. Introduction to the Methane Cycle

Measurements of methane from Greenland and Antarctic ice cores indicate atmospheric concentrations of ~350 ppbv (parts per billion by volume) during the Last Glacial Maximum about 18,000 years ago, rising to 650 ppbv by about 200 years ago

(Chappellaz et al., 1990). Researchers have estimated that natural methane sources totaled about ~180-380 Tg  $(10^{12} \text{ g})$  methane per year (Chappellaz et al., 1993). Wetlands were the dominant source with small contributions from wild fires, animals and oceans.

Since methane is chemically as well as radiatively active, atmospheric concentrations can increase because the terrestrial sources are increasing and/or because the sinks are declining. An important atmospheric sink for methane is the OH (hydroxyl) radical. The reaction of methane with OH radicals is the first step in a series of reactions which eventually leads to compounds that are readily removed from the atmosphere by precipitation or uptake at the surface. OH radicals also act as a chemical sink for other trace gases. For this reason, OH radicals are known as "the detergent of the atmosphere" (Crutzen, 1995).

During the last two hundred years, atmospheric methane concentrations have more than doubled to ~1800 ppbv and are still increasing. During the same period, the total annual emission of methane has increased to ~450-500 Tg (see Table above), about two times what it was during the pre-industrial period when natural sources dominated. Most of this increase in sources is due to the anthropogenic perturbation to the methane cycle, though climate variations may also contribute to changes in emission from wetlands and from wildfires.

The following sections provide a brief overview of the major methane sources -- background on what we know about them, the processes that produce methane, and what we still do not know (based on Matthews, 1993, 1994).

#### 2. Natural Sources

Figure 2-1 below shows current estimates for individual sources. Although some uncertainties remain, the largest sources are natural wetlands, irrigated rice paddies, and domestic animals.



Figure 2-1: Global sources of methane

#### 2.1 Wetlands What we know:

- Wetlands are most likely the largest natural source of methane to the atmosphere; their emissions are estimated to be about 100 Tg annually.
- About 50% of the wetlands are peat-rich, temperature regulated northern wetlands and the remainder are low latitude systems dominated by precipitation and flood cycles.
- Both flux measurements and large-scale modeling studies confirm the dominance of low-latitude wetlands and the smaller role of northern ecosystems in methane emissions under current climate conditions. Only about 30% of emissions are from peat-rich northern wetlands.

#### Processes that produce methane:

- Methanogenic bacteria produce methane by anaerobic decomposition of organic materials.
- Methane produced in the sediments is transported to the surface either through the water column (diffusion), through gas bubbles that rise from the sediments (ebullition) or via transport through the plants themselves.
- Highly local controls such as temperature, topography, water table, and organic content as well as episodic events such as ebullition, degassing, hydrostatic pressure changes and wind have a large effect on methane fluxes.
- Methane that is produced in water-logged soil sometimes moves upward through a drier surface soil and is oxidized, resulting in no methane emission.

#### Uncertainties:

- There is general agreement concerning the global area and distribution of wetlands although uncertainties remain as to seasonal variations of wetland environments and dynamics of methane production periods.
- The response particularly of high-latitude wetlands under a changing climate is highly uncertain; they may become larger or smaller methane sources or methane sinks.
- Methane characteristics of most major wetland environments have been studied; measurements are still scarce for the wetlands of Russia which occupy about 25% of the global total, and for non-riverine tropical grasslands such as the Pantanal in Brazil.

#### 2.2 Termites

What we know:

- The source strength of termites has been estimated with a very large range, but recent estimates suggest emissions of 15-20 Tg/year.
- The habitat distribution of the termite source is similar among several studies; termites are concentrated in tropical grasslands and forests.

#### Processes that produce methane:

• Methane is produced by the activity of methane-oxidizing bacteria on the organic material consumed by the termites.

#### **Uncertainties:**

• The source strength has been estimated with a very large range of 0-200 Tg methane per year.

2.3 Oceans What we know:

## http://icp.giss.nasa.gov/education/methane/intro/cycle.html[12/31/2015 7:29:00 PM]

- The ocean source is very poorly known but considered minor. The emissions estimate is 10 Tg.
- Coastal ocean regions exhibit higher and more variable concentrations.

#### Processes that produce methane:

• Methane is produced at seepage areas in the seabed with organic-rich sediments (Judd, 2000).

#### **Uncertainties:**

- Seabed flux rate estimates vary widely.
- Losses to solution as bubbles rise to the sea surface are not known well.

#### 2.4 Methane Hydrates

What we know:

- Methane hydrates are rigid water cages surrounding methane molecules.
- Hydrates are known or inferred to be found on the continental shelf at all latitudes.
- Stability of hydrates requires high pressure and cold temperatures, meaning that most occur at depths and in regions insulated from climate change.
- · Methane source from hydrates is considered minor at present.

#### Processes that produce methane:

• Hydrates are subject to destabilization from climate warming. Destabilization would lead to the release of the methane molecules.

#### **Uncertainties:**

- The dispersed nature of this source makes it especially difficult to evaluate.
- The large pool of methane in gas hydrates implies that a small perturbation under a changing climate could produce a considerable source of methane.

#### 3. Anthropogenic Sources

#### 3.1 Rice Cultivation

#### What we know:

- Rice production may account for 10% (~30-60 Tg) of the total annual methane emission.
- Since 1980, rice production has risen by over 40% through the combined effects of increased harvest areas and higher yields.
- Over 90% of the harvested area is confined to Asia.

#### Processes that produce methane:

- Methanogenic bacteria produce methane by anaerobic decomposition of organic materials.
- A large number of factors affect the production, transport, and efflux of methane in the flooded rice fields, among them temperature water status, fartilizer application
- the flooded rice fields, among them temperature, water status, fertilizer application, soil properties, and plant phenology.
  Methane that is produced in water-logged soil sometimes moves upward through a drier surface soil and is oxidized, resulting in no methane emission.
- As much as 90% of methane produced in sediments may oxidize during transport to the water surface.

#### **Uncertainties:**

- Information on local soil temperatures, type and application rate of fertilizers (especially non-commercial organics), seasonal and annual variations in water status, and soil chemistry is not readily available.
- Even with sufficient data on the factors mentioned above, considerable uncertainties remain in quantitative relationships between methane flux and these factors, though they have been significantly reduced recently.

#### **3.2 Domestic Animals**

#### What we know:

- Animals contribute about 80 Tg methane per year.
- About half of the global emission come from India, China, the former USSR, USA, and Brazil.
- Non-dairy cattle and dairy cows together contribute about 75% of the total methane source from animals; the remainder is from water buffalo, sheep, goats, pigs, camels, and horses.
- Emissions from animals may be one of the better known sources in the methane budget because statistics on animal populations in developed countries are reasonably reliable.

#### Processes that produce methane:



- Methane production from animals results from fermentation of carbohydrates in the rumen (stomach containing microbes capable of breaking down cellulose).
- Production is affected by factors such as quantity and quality of feed, body weight, age, and activity level; therefore, it varies among animal species as well as among individuals of the same species.

#### **Uncertainties:**

• Significant uncertainties exist with respect to population statistics for less developed countries.

#### 3.3 Fossil Fuel

What we know:

- Methane is the major component of coal gas and natural gas.
- Methane emissions associated with fossil fuel sources range from ~16 to 24% of the total source strength equal to about 80-120 Tg.

#### Processes that produce methane:

- Natural gas and coal gas both consist almost entirely of methane.
- Fossil fuel sources of methane include coal mining and processing, as well as gas exploration, production, transmission, and distribution.
- Methane released to the atmosphere during mining and processing of coal is associated directly with coal removed from mines as well as with releases from coal left in the mine in overlying and underlying seams.
- Methane emissions associated with natural gas production and consumption include losses during extraction, venting and flaring at oil and gas wells, and losses during processing, transmission and distribution.

#### **Uncertainties:**

- Most of the variation among estimates of methane released to the atmosphere during mining and processing of coal
  results from inclusion and/or exclusion of processes or particular coal products, and from differences in the emission
  factors used.
- Natural gas transmission losses are the difference between gas purchased for delivery and gas sold, differences which may be due to theft and metering errors as well as to actual leaks.
- The geographically- and sectorially-dispersed nature of the sources of methane emission from natural gas transmission makes direct estimates difficult.
- Time series estimates using constant emission factors do not take into account changes in technology which would affect the amount of methane emitted.
- Lack of data on venting and flaring of natural gas (collected by oil and gas companies but not available publicly) is a major source of uncertainty.

#### 3.4 Biomass Burning

What we know:

Recent estimates indicate annual methane releases of ~10-50 Tg from biomass burning.

#### Processes that produce methane:

• Methane is released when vegetation is burned. The amount is a function of burning technique and temperature, moisture and carbon content of the vegetation, amount and type of vegetation burned etc.

#### Uncertainties:

- The contribution of biomass burning to the global emission of methane is highly uncertain due to the innate variability of the process itself as well as to severe data limitations.
- A considerable portion of burning takes place in association with poorly documented agricultural activities in the tropics.

#### 3.5 Landfills

#### What we know:

 One early global estimate of methane emission from landfills gave a range of 30-70 Tg/year, although recent estimates suggest that the landfill methane source may be more in the range of ~25 Tg.

#### Processes that produce methane:

 Decomposition of biodegradable organic material in landfills produces both carbon dioxide and methane.

#### Uncertainties:

## http://icp.giss.nasa.gov/education/methane/intro/cycle.html[12/31/2015 7:29:00 PM]



- Uncertainties remain with respect to the
- magnitude and composition of waste production and the fraction of waste placed in landfills.
  There is very high variability in local factors such as climate, age of refuse, and landfill design, construction, and management which affect the amount of methane produced, consumed and emitted in these sites.

#### 4. Summary

Methane sources under anthropogenic control currently account for approximately 70% of the total annual emission. Several of these (e.g., animals, rice cultivation, energy-related sources) may be prone to future increases due to demands of increasing human populations. The magnitude of the remaining natural sources, dominated by wetlands, is relatively well known. Currently, northern wetlands contribute about one-third of the world's total wetland emissions while the tropics account for most of the remainder. However, wetland response to climate change predicted for the next century is highly uncertain. Depending on local interactions among temperature, water status, nutrients etc., wetland ecosystems may become larger or smaller methane sources, or even methane sinks. A varied collection of additional sources such as volcanoes, oceans, seabed seepage, gas hydrates, and peat mining are highly uncertain but considered minor, probably totaling of ~20 Tg.

Currently, we understand a great deal about the processes that produce methane from various sources as well as the distribution of many of the sources such as wetlands or animals. In addition, we now have a 15 year record of measurements of atmospheric methane from a growing network of ground stations. However, the atmospheric record shows large and variable patterns in annual increases in atmospheric concentrations and uncertainties remain with respect to year-to-year variations in methane emissions from various sources. For example, short-term variations in temperature and precipitation can affect emissions from biological sources such as rice paddies and wetlands; political and economic changes can affect levels of industrial activity and consumption of fossil fuels; management practices can affect emissions from landfills and from wastewater.

The challenge is to improve the collection of tools we have to understand the methane cycle and its variations over time. These include:

- 1. atmospheric chemistry models that simulate chemical reactions and transport in the atmosphere,
- 2. measurements of the atmospheric concentrations of methane and related gases,
- 3. field measurements that quantify the influence of various factors on emission from sources (for example, how do methane emission from a northern wetland change when the summer is hotter than usual? wetter than usual?)
- 4. inventories of the sources of methane and associated emissions at intervals of about 5 years beginning in the early 1980s and continuing in the future.

The methane inventory project described in the following section is a contribution to the last goal listed above. These global inventories are developed in part using field measurements (2 above) and used in the atmospheric chemistry models (1 above). Results from the models are evaluated by comparing them to the measurements of atmospheric methane (2 above).

Methane Home, Intro, Lessons, Projects Previous Research, Reference, Feedback



NASA Official: Gavin A. Schmidt ICP Website Curator: Robert B. Schmunk Page updated: Aug 2, 2010 NASA Privacy Policy & Important Notices Contact Us

## SoCalGas Enhances Support for Residents Impacted by Aliso Canyon Natural Gas Leak

#### Company Simplifies Temporary Relocation Assistance, Improves Aliso Canyon Website and Announces Expansion of Community Resource Center

Jan 4, 2016

LOS ANGELES, Jan. 4, 2016 /<u>PRNewswire</u>/ -- <u>Southern California Gas Co.</u> (SoCalGas) today announced a series of new measures designed to better assist communities that have been impacted by the natural gas leak at its Aliso Canyon Storage facility.

"As we continue our relentless focus on stopping the leak, we are always looking for ways to mitigate the impact on our community," said Gillian Wright, SoCalGas vice president of Customer Services. "In addition to providing temporary housing accommodations to any Porter Ranch household who requests it, we have increased and simplified the relocation package, expanded our community resource center and updated our dedicated website as we continue to demonstrate our commitment to supporting our neighbors during this unfortunate situation."

#### **Relocation Package Enhancements**

Effective Jan. 2, 2016, SoCalGas has eliminated the requirement for eligible temporarily relocated residents to submit receipts for reimbursement of food-related expenses. In addition, the company has increased and simplified the daily meal reimbursement amount to \$45 per day per person, regardless of age. For more details, visit AlisoUpdates.com.

The relocation package provided by SoCalGas consists of the following:

- Monthly housing allowance
- For those staying in hotels without a full kitchen, daily payment for meals in the amount of \$45 per day per person, regardless of age
- Mileage reimbursement at the IRS-approved rate for extra mileage incurred in commuting to work
   or transporting children to school

SoCalGas is evaluating a variety of ways to streamline its reimbursement process, including a pre-paid spending card, and expects to announce further details within the next seven days.

#### New Dedicated Customer Service Number

For Porter Ranch residents seeking relocation information, SoCalGas has established a new dedicated tollfree relocation call center, 877-238-9555. This call center will expedite placing customers who wish to relocate and is accessible 24 hours a day, 7 days a week.

#### **Expanded Community Resource Center**

SoCalGas also today announced the expansion of its Community Resource Center (CRC) to an adjacent storefront next to its location in the Porter Ranch Town Center at 19731 Rinaldi St. Porter Ranch. The company is also increasing staff at the CRC to more efficiently handle claims, relocation requests and home air purification requests. The Center's hours of operation are 10 a.m. to 8 p.m. Monday through Friday, and 10 a.m. to 6 p.m. on weekends.

#### **On-Site Environmental Health Expert**

Dr. Mary McDaniel, board-certified in occupational and environmental medicine, is now available for consultations at the CRC where she can provide expert advice on health concerns related to the natural gas leak from 10 a.m. to 12 p.m., Monday through Friday, and from 10 a.m. to 2 p.m. on weekends.

#### Free Plug-In Air Purification

For residents remaining in Porter Ranch, SoCalGas is also providing free plug-in air purifiers that contain activated carbon, which is effective at removing the natural gas odorant from residents' homes. To sign up for installation or to receive free plug-in air purifiers, residents can call SoCalGas' Aliso Canyon hotline at 818-435-7707 or email <u>AlisoCanyon@socalgas.com.</u> Alternatively, SoCalGas will provide free whole-house air purification through a licensed Heating Ventilation and Air Conditioning (HVAC) contractor. The HVAC contractor will replace the standard air filter(s) in residents' HVAC systems with a specially designed activated carbon filter. These filters remove the compounds found in natural gas and its odorant from the air in homes.

#### **Enhanced Website**



## http://sempra.mediaroom.com/index.php?s=19080&item=137104[1/4/2016 11:27:54 AM]

SoCalGas Enhances Support for Residents Impacted by Aliso Canyon Natural Gas Leak - Jan 4, 2016

SoCalGas also unveiled enhancements to its dedicated website <u>AlisoUpdates.com</u>. The site is now easier to navigate and also organized by topics of primary interest to residents, from relocation to health and environment information, to the company's progress in stopping the leak.

#### About Southern California Gas Co.

Southern California Gas Co. has been delivering clean, safe and reliable natural gas to its customers for more than 140 years. It is the nation's largest natural gas distribution utility, providing service to 21.4 million consumers connected through 5.9 million meters in more than 500 communities. The company's service territory encompasses approximately 20,000 square miles throughout central and Southern California, from Visalia to the Mexican border. Southern California Gas Co. is a regulated subsidiary of sempra.com (NYSE: SRE), a Fortune 500 energy services holding company based in San Diego.

http://photos.prnewswire.com/prnh/20150126/171209LOGO

SOURCE Southern California Gas Co.

For further information: SoCalGas, Media Hotline: 877.643.2331 or 858-740-8121| socalgas.com/news-room | @SoCalGasNews

RSS 

### SoCalGas Opens New Community Resource Center In Porter Ranch Town Center

Dec 16, 2015

LOS ANGELES, Dec. 16, 2015 /<u>PRNewswire</u>/ -- Southern California Gas Company (SoCalGas) today opened a new Community Resource Center in the Porter Ranch Town Center, as work continues to stem the flow of natural gas from a leak at the Aliso Canyon Storage Field. The center will offer guidance on securing temporary accommodations, how to file a claim, and how to get free home air filtration and weather stripping to reduce odor.

The Community Resource Center will be open from 10 a.m. to 8 p.m. Monday through Friday and from 10 a.m. to 4 p.m. on weekends. It is located at 19731 Rinaldi St., just south of Ralphs grocery store in the Porter Ranch Town Center.

"We know that this situation has been frustrating and confusing for many families in the Porter Ranch community, and we apologize. Our new Community Resource Center will provide another way for them to get the information they need," said Gillian Wright, vice president of customer services for SoCalGas. "We share everyone's concerns about this leak's ongoing impact on



the community and the environment, and we are working as quickly and as safely as possible to stop it."

The opening of the center is one of several ways SoCalGas recently bolstered its communications efforts with the community. Those efforts include:

- A Community Advisory Committee is being established to serve as a channel for information and feedback from the community.
- A new dedicated website, <u>www.AlisoUpdates.com</u>, was launched to provide updates on the relief well progress, air quality monitoring, community resources and all other relevant information.
- New communications channels were established for regular updates, including email, phone, text, calls and social media.

Work continues to stem the flow of natural gas at the storage field. Work began Friday, Dec. 4, to drill a relief well that will enable SoCalGas to pump fluids and cement through the relief well into leaking well to stop the flow and permanently seal it. The relief well drilling process is expected to take three to four months.

Anyone with questions or concerns about the leak can contact the company via email at <u>alisocanyon@socalgas.com</u> or 818-435-7707.

**About SoCalGas:** <u>Southern California Gas Co.</u> has been delivering clean, safe and reliable natural gas to its customers for more than 140 years. It is the nation's largest natural gas distribution utility, providing service to 21.4 million consumers connected through 5.9 million meters in more than 500 communities. The company's service territory encompasses approximately 20,000 square miles throughout central and Southern California, from Visalia to the Mexican border. Southern California Gas Co. is a regulated subsidiary of <u>Sempra Energy</u> (NYSE: SRE), a Fortune 500 energy services holding company based in San Diego.

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