

ALISO CANYON DISASTER: EXISTING DATA AND INFORMATION

Existing data related to the Aliso Canyon blowout and gas storage facility is summarized in the tables below. The Los Angeles County Department of Public Health updates the tables as additional data and information becomes available and as needed. Where publicly available, links to data sources are provided. Researchers may need to obtain agreement from agencies and organizations to obtain and use their respective data for research purposes.

Contents:

Table 1 lists compounds and chemicals of potential concern (COPC) that are associated with Well SS-25 gas blowout and well-control activities based on existing information and data including but not limited to soil and air samples and material safety data sheets (refer to the supporting information column). The COPC are listed by compound category and include carcinogens, chemicals that can pose a risk to health at elevated levels of exposure, and chemicals for which there is a lack of information on their respective toxicities (e.g., mercaptans). The information presented in table 1 may be supplemented or revised based on additional sampling, testing, and research. The Aliso Canyon Disaster Health Research Study (Health Study) is needed to further assess potential community exposure to these chemicals and associated health effects. **Table 2** provides a list of technical reports related to the Aliso Canyon disaster published to date. **Table 3** lists air sampling data sources organized by sampling method (continuous fixed site monitoring, integrated samples at fixed sites, other longer-term sampling, short-term samples, other short-term samples, and other). **Table 4** provides a list of other environmental data sources. **Table 5** lists data sources related to health outcomes. **Figure 1** is a map of fixed air monitoring locations in the community surrounding the Aliso Canyon Gas Storage Facility during and following the blowout. **Figure 2** is a map of the density of symptom reporting by resident address in the communities surrounding the Aliso Canyon Gas Storage Facility during the blowout. **Table 6** lists acronyms that are used throughout this document.

Table 1. Summary of compounds and chemicals of potential concern (COPC) by compound category that are associated with Well SS-25 Gas Leak and Well-Control Activities.^{1,2}

Compound Categories	Potential Source	Supporting Data
Sulfur compounds: Sulfur Dioxide, Tert-Butyl mercaptan, Thiophene, Tetra-Hydro Thiophene	Odorants & reservoir	Soil near SS-25, air downwind of SS-25, ambient air, samples taken from natural gas wells on the Southern California Gas Company (SCG) Aliso Canyon site
Metals: Barium, Zinc, Copper, Nickel, Antimony, Arsenic, Vanadium, Cadmium, Mercury, Molybdenum, Cobalt, Chromium, Lead	Well kill materials (mud and fluids)	Material safety data sheets, soil near SS-25, air downwind of SS-25, SCG laboratory reports of 4 waste fluid samples and 1 solid waste sample from on-site storage tanks, solid and fluid waste bin samples from onsite
Polycyclic Aromatic Hydrocarbons (PAHs): Naphthalene and others	Reservoir	Soil near SS-25, air downwind of SS-25
Minerals: Crystalline Silica, Mica, Illite	Well kill materials (solids)	Material Safety Data Sheets, Data files on chemicals and products used in well-control operations
Aldehydes: Glutaraldehyde	Well kill materials (fluids)	Data files on chemicals and products used in well-control operations
Volatile Organic Compounds (VOCs): Benzene, Toluene, Ethylbenzene, Xylenes, 1,2,4 Trimethylbenzene.	Reservoir	Soil near SS-25, air downwind of SS-25, ambient air, samples taken from natural gas wells onsite

¹ Air dispersion modeling of continuous and periodic emission is needed to further refine Table 1.

² Various data sources were used to identify chemicals of potential concern: Soil near Well SS-25 (7 samples collected on April 20, 2016 and are in [LACDPH's Time Critical Indoor Environmental Sampling Summary Report](#)); Air downwind of Well SS-25 (3 air samples collected downwind of Well SS-25 during the gas leak in January 2015 and results are reported in LACDPH's Expanded Air Monitoring Report); [Material safety data sheets](#) (list compounds used in drilling materials during attempts to seal the well); and ambient air data (outdoor air data collected during the gas leak incident in the community and from the facility by air agencies and SCG).

Compound Categories	Potential Source	Supporting Data
Particulate Matter (PM): Ultrafine, PM 2.5, PM 10	Reservoir/Well kill materials (solids)	Community air monitoring, data files on chemicals and products used in well-control operations
Sulfonated Tannin Esters	Well kill materials (fluids)	Data files on chemicals and products used in well-control operations

Table 2. Technical summary reports of data published to date from regulatory and response agencies related to the SS-25 well failure and assessments done after it, including the independent root cause analysis of the SS-25 well failure.

Title	Author(s)/Contributor(s)	Published	Notes
Results of Air Monitoring and Assessments of Health - Four Volumes	LACDPH	Jan - Feb 2016	<p>Expanded Air Monitoring Report (Jan 31, 2016) - Overview of onsite and community sampling from Oct 30 to Jan 23. Figure 1 below (and on p. 6 of the report) shows the location of 6 real-time methane monitors in the community.</p> <p>Air Monitoring and Assessments of Health (Feb 5, 2016) - Summary data and map of reported symptoms (Table 6 on pg. 17 and Figure 5 on pg. 21). Figure 2 below (and on p. 22 in the report) provides a visual of symptom report density.</p> <p>Supplemental Report (Feb 13, 2016) - Air sample results upwind and downwind of SS-25, Table 3 on pg. 14</p> <p>Second Supplemental Report (Feb 19, 2016) - Syndromic surveillance analysis and pet health summary</p>
Public Health Assessment, Indoor Environmental Study and Community Assessment for Public Health Response (CASPER)	LACDPH	Apr 2016	LACDPH Indoor Environmental Study (source soil samples, indoor air samples, indoor wipe samples). Sampling focused on the possibility of the intrusion of pollutants (especially metals) from outdoors to indoors, including the drill mud that was sprayed out of the well in early attempts to plug the leak.
Determination of Total Methane Emissions from the Aliso Canyon Natural Gas Incident	CARB	Oct 2016	Documents CARB's determination of the total methane emissions from the Aliso Canyon natural gas incident using data collected from ambient air sampling collected in late 2015 and early 2016. Also includes inventory method for calculating leak and tracer release method.
Ensuring Safe and Reliable Underground Natural Gas Storage	Interagency Task Force, co-chaired by Department of Energy and Pipeline Hazardous Materials and Safety Administration	Oct 2016	Chapter 2 (pg. 18) - The Aliso Canyon Incident, provides a comprehensive summary of incident events, observations and available data.
Aliso Canyon Natural Gas Leak: Air Monitoring Results	SCAQMD	Jan 2018	Compilation of SCAQMD air monitoring efforts during and after the Aliso Canyon gas blowout, including stationary and mobile air measurements in and around the Facility, the Porter Ranch residential neighborhood and other nearby communities. For background information on SCAQMD air monitoring efforts, refer to the SCAQMD Aliso Canyon Facility Monitoring Network Plan .
Long-term Viability of Underground Natural Gas Storage in California	California Council on Science and Technology	Feb 2018	An independent technical assessment answering 3 key questions about: 1) the risks of California's underground gas storage facilities pose to health, safety, environment, and infrastructure; whether California needs underground gas storage to provide for energy reliability through 2020; and how implementation of California's climate policies changes the future need for underground gas storage. Chapter 1.4 focuses on human health hazards, risks, and impacts associated with underground gas storage in California and looks into key events during the Aliso CanyonSS-25 well blowout.

Title	Author(s)/Contributor(s)	Published	Notes
Potential Chemical Hazards Associated with the Well SS-25 Well-Control Materials at the Aliso Canyon Natural Gas Storage Facility	OEHHA	May 2018	Evaluation of potential health hazards to nearby residents arising from well-control materials, including a review of onsite environmental sampling data to further understand the potential for exposure from air emissions of these materials.
Aliso Canyon Natural Gas Disaster Air Quality Monitoring and Modeling Technical Report: Exposure Modeling, Ambient Monitoring and Identification of Fugitive Emissions	GIS HEAL Labs and academic partners	Oct 2018	An air dispersion model was developed to support future study of exposures and related health impacts that occurred during the blowout at Well SS-25. Data was collected when the natural gas field was not in operation for future comparative analyses on ambient background levels of airborne particulates and organic compounds. Analyses were conducted to identify whether the community may have been impacted by hazardous airborne exposures from the oil and gas industry that are not attributable to normal operations (e.g. residual off-gassing, abandoned wells).
Blade Root Cause Analysis Report, Video, and Natural Gas Analyses Report	Blade Energy Partners	May 2019	Independent analysis of the root cause of the SS-25 well failure, including timeline of associated events.

Table 3. Air sampling data related to the Aliso Canyon Gas Facility and the surrounding community, including non-recurring sampling, conducted during and after the SS-25 well failure.

Target Chemical(s)	Data Source	Location	Dates	Notes
Continuous fixed site monitoring:				
Methane	CARB	Community, sites 1, 2, 5, 7, and 8	Dec 2015 (staggered start-up) – July 2016	Continuous methane monitoring provided near real-time data in the community. Refer to Figure 1 below for fixed monitoring locations. See Aliso Canyon Monitoring Plan for more information. Results: see Aliso Canyon Natural Gas Leak: Air Monitoring Results .
Methane	SCAQMD	Community sites 3, 4, 6, and Reseda Air Monitoring Station (background)	Dec 2015 (staggered start-up) – July 2017	Continuous methane monitoring provided near real-time data in the community. Historical methane monitoring data are available on the SCAQMD Aliso Canyon Update webpage. Refer to Figure 1 below for fixed monitoring locations. See Aliso Canyon Monitoring Plan for more information. Results: see Aliso Canyon Natural Gas Leak: Air Monitoring Results .
CO ₂ , nitrogen, hydrocarbon compounds	SCG	Aliso Canyon facility: upstream and downstream of the reservoir	Ongoing	In line sampling systems with gas chromatographs.
Hydrogen sulfide	SCAQMD	Community site 3	Dec 2015 - Feb 2017	Continuous hydrogen sulfide monitor. Refer to Figure 1 below for fixed monitoring locations. Results: Values mostly non-detect, highest levels observed were lower than 5 ppb. See Aliso Canyon Monitoring Plan for more information. Results: see Aliso Canyon Natural Gas Leak: Air Monitoring Results .
Total sulfur	SCAQMD	Community site 4	Mar 2016 – Apr 2017	Total sulfur concentrations were continuously measured to detect concentrations of sulfur containing compounds including THT and t-Butyl mercaptan. Refer to Figure 1 below for fixed monitoring locations. See Aliso Canyon Monitoring Plan for more information. Results: hourly average concentrations were consistently low throughout the measurement period. Also, see Aliso Canyon Natural Gas Leak: Air Monitoring Results .

Target Chemical(s)	Data Source	Location	Dates	Notes
Benzene	CARB, SCAQMD	Community, sites 4, 5 and 7	Feb 2016 – Jul 2016	Near real-time benzene levels were measured by CARB at community sites 5 and 7 from early Feb 2016 to late June 2016 and by SCAQMD at community site 4 starting mid Oct 2016. Refer to Figure 1 below for fixed monitoring locations. See Aliso Canyon Monitoring Plan for more information. Results: see Aliso Canyon Natural Gas Leak: Air Monitoring Results .
Methane	Argos Scientific	Community (Highland Estates)	Feb 2016 – present	Real time air monitoring at the fence line between the Aliso Canyon gas storage facility and the community of Porter Ranch. The system monitors for methane gas. Information from the monitoring system is regularly updated on the Porter Ranch Real-time Community Air Monitoring Data website.
Integrated Samples, fixed sites:				
Methane, VOCs (including BTEX), sulfur compounds (including H ₂ S)	SCG	Aliso Canyon facility (3 locations), Fence-line (6 locations), Community (3 locations in southern section of Porter Ranch)	Jan 12, 2016 – July 2016	Started with 12-hour samples but transitioned to 24-hour samples on March 3, 2016. 12-hour samples were collected twice per day. On June 18, facility, fence-line, and community monitoring were reduced to 1, 3, and 1 location respectively.
TCA, Methane, CO, VOCs (including BTEX and styrene), TNMNEOC	SCAQMD	Community sites 3, 4, 6, and Reseda Air Monitoring Station (background)	Dec 21, 2015 (staggered start-up) – July 2017	24-hour time-integrated sampling. Sample collection began at Porter Ranch Elementary School. Sampling at the other three community locations began on Jan 16, 2016 (Castlebay Elementary School), Jan 28, 2016 (Highlands Community Pool Parking Lot), and February 21, 2016 (Reseda Station). Results: see laboratory reports available on the SCAQMD Aliso Canyon Update website and see SCAQMD's final report on Aliso Canyon Natural Gas Leak: Air Monitoring Results .
Carbonyl compounds (formaldehyde, acetone, acetaldehyde)	SCAQMD	Community sites 3 and 4	Feb 2016 (site 3), Apr 2017 – May 2017 (site 4)	Site 3: Samples taken outdoors at the Porter Ranch Elementary School on 6 different days. Results: all measured concentrations were well below chronic REL standards for acetaldehyde and formaldehyde. For more information, see Aliso Canyon Natural Gas Leak: Air Monitoring Results
Other longer-term sampling				
Methane, Ethane, Ethylene, other hydrocarbon speciation, BTEX, H ₂ S, sulfide compounds, mercaptans.	LAUSD	Schools (20, but focused on 2 Porter Ranch schools)	Nov 30, 2015 – Dec 18, 2015	Results: see the laboratory reports of the 8-hour integrated samples, indoors and outdoors posted on the LAUSD website.
Radon gas	LAUSD	Schools (2 sites)	Dec 4 – 10, 2015	Radon measured at several locations at the 2 Porter Ranch elementary schools.
VOCs, gaseous contaminants, and size-fractionated particles	GIS HEAL Labs and academic partners	Community (23 sites) and background (1 site)	Jan 2016	2-week samples.
Radon gas	SCG	Aliso Canyon facility (1 location)	Jan 19, 2016	12-hour sample. Results: outdoor air radon concentration level of 1.7 pCi/L. See LACDPH report dated February 13, 2016 .
Radon gas	SCG	Aliso Canyon facility: downwind of SS-25	Jan 22-29, 2016	7-day radon test using sampling devices called electrets.

Target Chemical(s)	Data Source	Location	Dates	Notes
VOCs (including BTEX), SVOCs, PAHs, Metals	SCG	Aliso Canyon facility (4 locations). Downwind: SS-3H, SF-2/5, SF-1. Upwind: SS-1.	Jan 21 – 22, 2016	Supplemental Sampling Program. One 12-hour sampling event. Reason for sampling: to confirm that the chemicals included in the analytical program for the Air Monitoring Program (AMP), were adequate to assess natural gas constituents in ambient air. See LACDPH report dated February 13, 2016 for results.
Short-term samples				
Methane, other hydrocarbons, VOCs (including BTEX and styrene), sulfur compounds (including H ₂ S), TNMNEOC	SCG	Aliso Canyon facility (9 locations) and Community (11 locations)	Oct 30, 2015 – Jan 11, 2016 (Facility) Oct 30, 2015 – Mar 11, 2016 (Community)	10-minute grab samples, fixed sites and times. Collected twice per day, in the morning and evening.
Methane, VOCs (including BTEX), carbonyl sulfide, TRS, t-butyl mercaptan, THT, TCA	SCAQMD	Community sites 3, 4, and 6.	Dec 16, 2015 – Nov 14, 2016	Triggered short term sampling. 5 min grab samples collected when elevated levels of methane detected by continuous methane monitors. Collection sites: Porter Ranch Elementary School, Highlands Community Pool Parking Lot, and Castlebay Elementary School. Results: are available on the SCAQMD Aliso Canyon Update webpage. For more information, see Aliso Canyon Natural Gas Leak: Air Monitoring Results .
BTEX, VOCs, sulfur compounds (including mercaptans and H ₂ S), methane (as indicated by %LEL)	LAUSD	Schools (20, but focused on 2 Porter Ranch schools)	Nov 30, 2015 – Feb 22, 2015	“Real-time” samples, indoor and outdoor.
Other short-term samples				
Methane, Ethane, TNMNEOC, other hydrocarbons, CO, CO ₂ , BTEX	SCAQMD	Aliso Canyon facility: near SS-25	Dec 17, 2015	Gas samples collected 10 feet downwind (Southwest) of the SS-25 well site during the blowout. Three samples collected in total: 2 by SCAQMD and 1 by SCG (see row below). Results and laboratory reports are available on SCAQMD's Aliso Canyon Update website .
VOCs, sulfur compounds (including t-butyl mercaptan, THT, and H ₂ S), methane, ethane, TNMNEOC, other hydrocarbons, CO, CO ₂ , ammonia.	SCG	Aliso Canyon facility: near SS-25	Dec 17, 2015	Gas samples collected 5-10 feet downwind (Southwest) of the SS-25 well site during the blowout. Three samples collected in total: 2 by SCAQMD (see row above) and 1 by SCG. Summary of results are available on SCAQMD's Aliso Canyon Update website . Facility sampling lab report (Eurofins) of air sampling for VOCs at SS-25 (one sample). Results: Butane-6,300 ppb, Benzene-140 ppb, Toluene-230 ppb.
VOCs (including BTEX and styrene), TCA, methane, ethane, NMNEOC, other hydrocarbons, CO, CO ₂ , TRS	SCAQMD	Community	Oct 26, 2015 – Feb 4, 2016	Grab samples as part of odor complaint response activities. Results: BTEX and styrene - concentrations consistently below their corresponding acute RELs, even during the period of the leak. More information and laboratory results of air samples are available at the SCAQMD Aliso Canyon Update webpage . Also, see Aliso Canyon Natural Gas Leak: Air Monitoring Results .
Fixed gases, VOCs, methane and light hydrocarbons (C1-C6)	SCG	Aliso Canyon facility: SS-31 Tubing	Feb 3, 2016	Facility air sampling (tubing) lab report (Eurofins). Collect one air sample from SS-31 Tubing and analysis for fixed gases, VOCs, and methane/light hydrocarbons. Grab air sample (~20 min).
Fixed gases, VOCs, methane and light hydrocarbons (C1-C6)	SCG	Aliso Canyon facility: SS-9	Feb 4, 2016	Facility air sampling - lab report (Eurofins). Collect one air sample from SS-9 and analysis for fixed gases, VOCs, and methane/light hydrocarbons. Grab sample.

Target Chemical(s)	Data Source	Location	Dates	Notes
Other				
BTEX, Mercaptans, LEL, H ₂ S	SCG	Aliso Canyon facility: Sesnon 9, Sesnon 5, SF-2 and SF-3, Sesnon 3H, Holleigh Bernson Park, Background (Southeast of SS-25).	Oct 29, 2015 Oct 30, 2015	Industrial hygiene air sampling for airborne concentrations of chemical contaminants at various locations downwind of the well and explosivity related to the SS-25 during the blowout.
LEL%, oxygen %; H ₂ S, CO	SCG	Aliso Canyon Facility: various locations (see notes)	Nov 11-19, 2015	Field air monitoring logs for SS-25 well area, associated with the Aliso Canyon SS-25 Well Area Air Monitoring Plan. Monitoring conducted with Altair 5X Multi-Gas Detector. Reason for sampling: industrial hygiene air monitoring. Sample locations and corresponding dates: Partial access road to P66 (Nov 17); Access road to SS-25 (Nov 11-13, 16, & 17); East road to P66 (Nov 11, 16-18); SS9 towards P66 (Nov 12, & 13); Blow down at E. Rd (Nov 12); Rd from SS9 to SS1 (Nov 19); SS3 (Nov 11, 12, 16 - 19); Rd between SS9 & SS29 (Nov 11-13, & 16); Staging Area SS-9 (Nov 11-13, 16-18); Rd to SS29 (Nov 18); West Rd (Nov 18); SS-9 (Nov 19); SS25 (Nov 11-16, 19).
Benzene, Oil Mist	SCG	Aliso Canyon facility: 4 sample locations 20-70 feet from SS-25 leaking wellhead	Dec 13, 2015 (sampling); Dec 17, 2015 (report).	Four-hour integrated outdoor air samples were collected by Industrial Hygiene Management, Inc. Four samples collected and submitted to EMSL Analytical, Inc. for analysis of benzene and oil mist and results compared to Cal/OSHA occupational standards. No detectable levels of the chemicals monitored were identified in the samples analyzed and it was concluded that it does not appear employees working on or near SS-25 would be exposed to a hazardous environment for the parameters evaluated. Reason for sampling: Industrial hygiene air monitoring around SS-25 to confirm concentrations were not a threat to employees working on or near the well.
Methane	SCAQMD	Community (in and around Porter Ranch including 15 schools) and the Aliso Canyon facility	Dec 21, 2015 – Sep 13, 2017	Mobile survey measurements, using a methane analyzer (LI-COR 7700) and a GPS mounted on top of a hybrid vehicle, were conducted to characterize methane concentration levels and concentration gradients. Monitoring was conducted during different times of the day and under different meteorological conditions. Results for community monitoring: highest methane concentrations (up to 70 ppm) were recorded at night in Sesnon Blvd, south of the Aliso Canyon Facility. More information is available on SCAQMD's Aliso Canyon Updates webpage. Also, see Aliso Canyon Natural Gas Leak: Air Monitoring Results .
Methane, H ₂ S, NMOCs (including VOCs, BTEX, and styrene)	SCAQMD/ CalGEM	Aliso Canyon facility: within 100 meters west of SS-25,	Jan 24, 2016	A joint SCAQMD-CalGEM inspection. Survey measurements were taken of remote wells at the Aliso Canyon gas storage facility including 14 wells that were previously unavailable for inspection. Results: Forward-Looking Infra-Red (FLIR) camera observed emissions from a single location; mobile LI-COR methane open path analyzer measurements of up to 63 ppm; Jerome H ₂ S analyzer readings below detection limit. The inspection resulted in the identification of a leaking oil production well operated by the Termo Company. A canister sample was taken near this source of emissions and tested for NMOCs. More information is available on the SCAQMD Aliso Canyon Update website .

Target Chemical(s)	Data Source	Location	Dates	Notes
Fixed gases, VOCs, methane and light hydrocarbons (C1-C6)	SCG	P69-S, P47, SS-25, SS-5	Feb 5, 2016	Facility air sampling - lab report (Eurofins). Collect one air sample from 4 separate locations at facility and analysis for fixed gases, VOCs, and methane/light hydrocarbons.
Methane, H ₂ S	SCAQMD	Facility: near well SS-25	Feb 11, 2016 – Sep 13, 2017	After the control of the SS-25 well on Feb 11, 2016, SCAQMD began conducting measurements near the well and elsewhere in the facility to monitor for potential fugitive emissions. Measurements included instantaneous methane (LI-COR mobile monitoring), Hydrogen Sulfide (Jerome), methane imaging (FLIR camera), grab canister samples, and source methane (TVA). LI-COR mobile methane monitoring results and FLIR videos are available on the SCAQMD Aliso Canyon Update webpage .
Methane (leak rates)	CARB/NASA-JPL	Aliso Canyon facility flyovers	Nov 7, 2015 – Mar 24, 2016	Flyovers of the Aliso Canyon facility. Weekly, then every 2 weeks, then as needed. Flight measurements provided an emissions rate at the time the flights were conducted. See archived reports on CARB's Aliso Canyon Natural Gas Leak website for gas leak estimates and the final report on total methane emissions . NASA-JPL flyover information can also be found on the methane source finder website .

Table 4. Other environmental data (e.g., soil and water samples) and relevant information related to the Aliso Canyon Gas Facility and the surrounding community prior to, during and after the SS-25 well failure.

Target Chemicals	Data element	Data Source	Location	Dates	Notes
Hazardous materials and wastes	CERS submittals	SCG	Aliso Canyon facility	2013 – present	Submittals include site maps, hazardous materials and wastes inventory reports, and business activities reports. The LACFD HHMD is the local regulatory agency that ensures businesses in Los Angeles County are compliant with CERS requirements.
<u>Well fluids and additives:</u> Lost circulation material, nut plug, water based mud, Amberguard 215, barite slurry, calcium carbonate, calcium chloride, sodium hydroxide, Potassium Chloride, Desco CF, Drillpac Super Lo, Geo gel (sodium bentonite), Geo Zan, Polytek+, sawdust, walnut hulls	Well Control Fluids and Additives	SCG	Aliso Canyon facility	Oct 2015 – Feb 2016	Information on the types and amounts of well control materials/fluids and additives used during each of the well-control attempts and the MSDS of the material/fluids and their additives. Refer to Table 2 in the OEHHA report on Potential Chemical Hazards Associated with the Well SS-25 Well Control Materials at the Aliso Canyon Natural Gas Storage Facility Near Porter Ranch, California for a percent compositions of well control materials/fluids products.
N ₂ , CO ₂ , Methane, C ₆ +, i-Butane, n-Butane, i-Pentane, n-Pentane, Neo-Pentane.	Gas Analysis Report	SCG	Aliso Canyon facility: Dehy1 Width (Stream 1)	Nov 11-16, 2015	Gas analysis report of the gas composition of the Aliso Canyon reservoir. SCG Measurement Collection System Gas Analysis Report, Full Composition (mole %) Daily (from November 11 – 16, 2015). Result: gas content reported daily (6 days) in mole%.
TPH-cc (C6-C44), VOCs, Title 22 metals, pH, Flash Point, total, total cyanide, chloride	Facility well fluid and sludge sampling - lab	SCG	Aliso Canyon facility: Well fluid & Junction of SS-25 and SS-9	Nov 13, 2015	One sample collected each of well fluid and sludge from SS-25 & SS-9 Junction and analyzed for TPH, VOCs, metals, etc. Reason for sampling appears to be waste characterization.

Target Chemicals	Data element	Data Source	Location	Dates	Notes
	report (Eurofins).				
TPH-cc (C6-C44), VOCs, Title 22 metals + potassium, pH, Flash Point, total sulfide, total cyanide, chloride	Facility liquid sampling - lab report (Eurofins)	SCG	Aliso Canyon facility: Patriot 909	Nov 13, 2015	Collected one liquid sample (grab aqueous sample) from Aliso Canyon and analyzed for TPH, VOCs, metals, etc. Reason for sampling appears to be waste characterization.
<u>Water Samples (02-B & 04-B):</u> metals: As, Cr, Cu, Pb, Ni, Zn <u>Solid Samples (01-B & 03-B):</u> TPH-cc (C6-C44), VOCs, total sulfide, and metals: AS, CR, Cu, Pb, Ni, Zn	Facility liquid & solids sampling - lab report (Eurofins)	SCG / LACFD	Aliso Canyon facility: V-Ditch downstream SS-25: 01-A & 01-B (Solid-mud/rocks), Patriot Truck #905: 02-A & 02-B (gray wastewater), Doby Hagar Truck #SS24: 03-A & 03-B (white opaque liquid, noted to be sludge by lab), 25' from SS24 (brown liquid): 04-A & 04-B	Nov 14, 2015	Samples 01-B, 02-B, and 03-B were acquired by LACFD. Samples were collected in unpreserved glass jars. Solid samples analyzed for TPH, VOCs, and select metals. Around 150 mL of water sample collected in a soil jar for samples 2 and 4. Water samples tested for metals.
TPH-cc (C6-C44)	Residential pool sampling – lab report	SCG	Residential, Porter Ranch	Nov 29, 2015	Two pool water samples collected and analyzed. Result: 1st sample 125 mg/kg in C29-C36 range and 130 mg/kg in C6-C44 range; 2nd sample <100 mg/kg. Reason for sampling appears to be residential exposure.
Gasoline range organics, VOCs (including BTEX), SVOCs, PAHs, particulates, metals	Residential residue sampling – lab reports (Eurofins and subcontracted labs)	SCG	Community	Dec 2015 – Apr 2016	Laboratory reports of residue sampling. Reason for sampling appears to be residential exposure.
TPH-cc (C8-C44), VOCs, Title 22 metals, pH, flash point, total sulfide, total cyanide, fish bioassay	Facility well control fluid sampling - lab reports (BC Labs and subcontracted labs)	SCG	<u>Aliso Canyon facility tanks:</u> TK 196, TK 130, TK 144, Frac Tank Wash Water. <u>Aliso Canyon facility tanks:</u> TK JJ-5, Frac Tank Wash Water A3079	Dec 4, 2015 Dec 18, 2015	Two laboratory reports of captured well control fluid samples analyzed for TPH, VOCs, metals, etc. Reason for sampling: waste characterization. Samples collected on Dec 18, 2015 analyzed for fish bioassay. Samples collected on Dec 4, 2015 analyzed for all other analyses. TCLP test for TK 130.
<u>Dec 4, 2015:</u> TPH-cc (C6-C44)	Residential Indoor wipe	SCG	Residential, Porter Ranch area	Dec 4, 2015 Dec 9, 2015	<u>Dec 4, 2015:</u> Two wipe samples collected and analyzed for TPH. Results: both ND/below lab detection limits

Target Chemicals	Data element	Data Source	Location	Dates	Notes
Dec 9 and Dec 17, 2015: TPH-cc (C6-C44), BTEX - EPA 8260B Jan 14, Jan 14, Mar 7, Mar 9, and Mar 29, 2016: TPH-cc (C6-C44), PAHs, BTEX	sampling – lab report (Eurofins)			Dec 17, 2015 Jan 14, 2016 Jan 14, 2016 Mar 7, 2016 Mar 9, 2016 Mar 29, 2016	Dec 9, 2015: Two wipe samples collected and analyzed for TPH and BTEX. Results: both ND/below lab detection limits. Dec 17, 2015: Four wipe samples collected and analyzed for TPH and BTEX. Jan 14, 2016: Two wipe samples collected and analyzed for TPH, BTEX, and PAHs. Results: all ND/below lab detection limits. Jan 14, 2016: Two wipe samples collected and analyzed for TPH, BTEX, and PAHs. Mar 7, 2016: Two wipe samples collected and analyzed for TPH, BTEX, and PAHs. Results: detection of C25-C28 (0.53 & 0.51 mg/sample) and C6-C44 (0.60 & 0.65 mg/sample) in both wipe samples; Naphthalene (0.22 µg/sample) in one sample. Remainder ND/below lab detection limits. Mar 9, 2016: Three wipe samples collected and analyzed for TPH, BTEX, and PAHs. Results: all ND/below lab detection limits. Mar 29, 2016: Two wipe samples collected and analyzed for TPH, BTEX, and PAHs. Results: both samples contained TPH: C37-C44 range (0.115 mg/sample) C6-C44 range (0.19 mg/sample). Remaining ND/below lab detection limits.
TPH-cc (C6-C44)	Facility solids tank sampling - lab report (Eurofins)	SCG	Aliso Canyon facility: Sesnon Gathering Plant, Tank H-6	Dec 21, 2015	Collected one sample (grab solid sample) from Tank H-6 and analyzed for TPH. Results: C6-C44: 370,000 mg/kg. See lab report for TPH breakdown results.
TPH-cc (C6-C44), VOCs, Title 22 metals, pH, flash point, total sulfide, total cyanide	Facility composite soil sampling - lab report (Eurofins)	SCG	Aliso Canyon facility: Bin Anterra #054 and Two Drums	Dec 29, 2015	Collected one composite soil sample from Bin Anterra #054 and two drums (dated Sep 17, 2015) and analyze for TPH, VOCs, metals, etc. Reason for sampling assumed to be waste characterization.
TSS, oil and grease	Facility stormwater monitoring - lab report (Eurofins)	SCG	Aliso Canyon facility: Monitoring Point #1, Dehy 2, Sesnon Gathering Plant	Jan 5, 2016	Collected one liquid sample (grab aqueous sample) from stormwater Monitoring Pt#1 and analyzed for total suspended solids and oil and grease. Liquid samples also collected from two other locations (Dehy 2 and Sesnon Gathering Plant). Purpose of sampling assumed to be stormwater sampling. Results TSS: MP#1 - 107 mg/L, Dehy 2 - 4.6 mg/L, Sesnon - 4.5 mg/L. Results Oil & Grease: MP#1 - 1.8 mg/L, Dehy/Sesnon - <1.0 mg/L.
TSS, oil and grease, TPH (C6-C44), VOCs, Title 22 metals, Turbidity, pH	Facility liquid tank sampling - lab report (Eurofins)	SCG	Aliso Canyon facility: SS-13 - Tank A2290 and Tank A3134	Jan 7, 2016	Collected liquid samples (grab aqueous sample) from two tanks analyzed for total suspended solids, oil and grease, TPH, VOCs, metals, turbidity, and pH. Purpose of sampling assumed to be waste characterization and/or stormwater monitoring.
TSS, oil and grease	Facility liquid tank sampling	SCG	Aliso Canyon facility: B-Tank	Jan 8, 2016	Collected one liquid sample (grab aqueous sample) from B-tank and analyzed for total suspended solids and oil and grease. Purpose assumed to be stormwater sampling. Results: TSS - 2.5 mg/L, Oil & Grease - <0.8 mg/L.

Target Chemicals	Data element	Data Source	Location	Dates	Notes
	- lab report (Eurofins)				
TSS, oil and grease	Facility stormwater monitoring - lab report (Eurofins)	SCG	Aliso Canyon facility: Monitoring Point #1	Jan 19, 2016	Collected one liquid sample (grab aqueous sample) from stormwater Monitoring Pt#1 and analyzed for total suspended solids and oil and grease. Purpose of sampling assumed to be for stormwater monitoring. Results: TSS - 94 mg/L, Oil & Grease - <0.8 mg/L.
TPH-cc (C6-C44), BTEX, PAHs	Hydrocarbon Mist Testing	SCG	Community (2 locations)	Jan 14, 2016	Two lab reports of two wipe samples (4 samples total) taken at two community locations tested for TPH, BTEX and PAHs. Results for lab report #1: TPH-cc(C6-C44) – ND, PAHs – ND, BTEX – ND. Results for lab report #2: TPH-cc(C6-C44) – 0.071mg/sample, PAHs – ND, BTEX – ND.
TSS, oil and grease	Facility stormwater monitoring - lab report (Eurofins)	SCG	Aliso Canyon facility: SS-25 Monitoring Point drainage south of SS-5	Jan 31, 2016	Collected one liquid sample (grab aqueous sample) from an SS-25 monitoring point located in the drainage south of SS-5 and analyzed for TSS and oil and grease. Reason for sampling assumed to be stormwater monitoring. Results: TSS - 286 mg/L, Oil & Grease - 6.1 mg/L.
TSS, oil and grease, TPH-cc (C6-C44)	Facility liquid tank sampling - lab report (Eurofins)	SCG	Aliso Canyon facility: SS-13 - Tank A2499	Feb 12, 2016	Collected one sample (grab aqueous sample) from Tank A2499 and analyzed for TSS, oil and grease, and TPH. Purpose of sampling assumed to be stormwater monitoring and/or waste characterization. Results: C6-C44: 950 mg/kg Oil & Grease: 1.2 mg/L, TSS: <1.0 mg/L. See lab report for TPH breakdown results.
Anions, Cations (Ca, Mg, Na, K)	Facility liquid sampling - lab report (Eurofins)	SCG	Aliso Canyon facility: SS-3 Check Point, SS-9 Tank 169, and SS-22 (Old Well)	Feb 19, 2016	Collected one sample (grab aqueous sample) from three locations (SS-3, SS-9, and SS-22) and analyzed for cations (Ca, Mg, Na, K) and Anions.
Oily residue (visual inspections)	Oily residue testing	LACDPH	Holleigh Bernson Memorial Park, Northridge	Mar 2016	LACDPH Environmental Health Strike team investigated a complaint of oily residue on playground equipment. This investigation had null findings and led to several follow-up investigations including the collection and testing of 3 side-by-side surface samples from three locations by SCG (see row below).
Oily residue (density)	Exterior home cleaning database	SCG	Residences in nearby neighborhoods including Porter Ranch, Northridge, Granada Hills, Chatsworth, Reseda, Sylmar, and Winnetka	Mar – Sep 2016	Two Excel spreadsheets of exterior home cleaning information including home addresses, dates of exterior home cleaning, observed degree of residue, and other pertinent information on the exterior home cleaning program.
TPH-cc (C6-C44), PAHs, BTEX	Oily residue testing	SCG	Holleigh Bernson Memorial Park, Northridge	Mar 9, 2016	Reason for sampling: determine possibility of direct-contact transferability of substance to human hands. With LACDPH oversight of sampling procedures, Geosyntec collected 3 side-by-side samples from three locations: white fence running along the perimeter of the parking area, playground equipment, and peripheral landmarks. Results: TPH-cc (C6-C44) – ND, PAHs – ND, BTEX – ND.

Target Chemicals	Data element	Data Source	Location	Dates	Notes
TPH-cc (C6-C44)	Residential water sampling – lab report (Eurofins)	SCG	Residential, Porter Ranch area	Mar 16, 2016 April 4, 2016	<u>Mar 16, 2016:</u> Three water samples collected and analyzed for TPH. Results: all ND/below lab detection limits. <u>April 4, 2016:</u> Three water samples collected and analyzed for TPH. Results: One sample TPH: C11-C12 range (260 µg/L) C6-C44 range (490 µg/L). Remaining two ND/below lab detection limits.
<u>Air samples:</u> VOCs, methane and light hydrocarbons, PAHs/SVOCs, particulates (total dust), metals, sulfur compounds <u>Wipe samples:</u> VOCs, hydrocarbons, TPH-cc (C6-C44), SVOCs, PAHs, particulates, total dust, metals, total hydrocarbons/organic vapors	Residential indoor/outdoor air sampling - Summary memo from Geosyntec and lab reports (Eurofins & subcontracted labs)	SCG	Residential, Porter Ranch area	Apr 8-9, 2016	One indoor air and one outdoor air sample was collected over a 24-hour period, and one set of wipe samples were collected. Samples analyzed for hydrocarbons, VOCs, metals, etc. Geosyntec concluded no constituents were detected in indoor air and wipe samples at concentrations that would represent a threat to human health. Indoor air noted to be below health-based screening levels and similar to outdoor air or within background ranges. Results: See summary letter and lab report. Select VOCs, SVOCs, methane, and total particulates detected in indoor air. Hydrocarbons, particulates, and zinc detected in wipe sample. Qualitative discussion of hydrocarbon fingerprint (C26-C30). Zinc detected in both indoor wipe and trip blank indicating zinc likely associated with sampling material. Reason for sampling: residential exposure.
Metals, SVOCs, VOCs, PAHs, TPHs, hydrocarbons, sulfur compounds, particulates	Public Health Assessment	LACDPH	Aliso Canyon facility: source soil Residential: indoors (103 Porter Ranch residences, 11 residences 6 miles southeast of well SS-25, Porter Ranch Community School, Castlebay Lane Elementary School)	Source: Apr 20, 2016, Indoor: Mar – Apr, 2016	Soil and bulk material sampling in and around SS-25 well location. Samples consisted of surficial soils and particulates including contact tape samples from various surfaces and upwind at well SS-1. Indoor community wipe and air samples. Results for surface wipe samples: detection of 13 metals (out of 16 metals tested). Barium most frequently detected with concentration range of 0.05 – 1.0 ug/cm ² . 4 SVOCs detected (out of 67 tested). Results for indoor air samples: 143 chemicals detected (out of 250 tested) with levels within normal ranges for indoor home environments. For more information on sampling results, see the following Public Health Assessment attachment: Time Critical Indoor Environmental Sampling Summary Report .
TSS, oil and grease	Facility stormwater monitoring - lab report (Eurofins)	SCG	Aliso Canyon facility: SS-11	Apr 29, 2016	Collected one sample (grab aqueous sample) from SS-11 and analyzed for total suspended solids and oil and grease for stormwater monitoring. Results: TSS - 1.5 mg/L, Oil & Grease - <0.8 mg/L.
Metals	Air and surface soil screening	SCAQMD	Surface Soils (7 locations in Porter Ranch, 1 location in Granada Hills, 3 at the Aliso Canyon facility)	May 2016	SCAQMD took outdoor air samples and 13 surface soil samples to assess whether the metals found in the LACDPH indoor environmental study/public health assessment were present in the outside air or surface soil. Results: see the report on air and soil samples at Aliso Canyon and Porter Ranch .

Target Chemicals	Data element	Data Source	Location	Dates	Notes
VOCs (concentration)	SCAQMD Rule 1166 Soil Monitoring Records	SCG	Aliso Canyon facility	Jun 27 – Jul 23, 2016	Logs of VOC readings taken in 15 minute increments during soil excavation in accordance with SCAQMD Rule 1166 and manifests of the VOC-contaminated soils.
TPH-cc (C6-C44), metals, mercury	Community pool water sampling	LACDPH	3 Porter Ranch community pools	Jun 22, 2016 Jul 9, 2016	LACDPH sampled three community pools and analyzed samples for petroleum hydrocarbons and metals. See the community pool water sampling protocol and results .
N/A	Interior Home Cleaning Performance Review	LACDPH	Community	Jul 2016	LACDPH reviewed the SCG's compliance with the court mandated cleaning protocol. Performance review logs for home cleanings include information on ventilation, cleaning of HVAC systems/ducts, deep cleaning of the home interior and quality assurance measures.
VOCs (concentration)	SCAQMD Rule 1166 Soil Monitoring Records	SCG	Aliso Canyon facility	Oct 6 – 8, 2016	Logs of VOC readings taken in 15 minute increments during soil excavation in accordance with SCAQMD Rule 1166 and manifests of the VOC-contaminated soils.
VOCs, TCA, methane, ethane, NMNEOC, CO, CO ₂ , TRS, mercaptans, THT, carbonyl sulfide/sulfur dioxide	Air quality reports	SCAQMD	Community	Ongoing	Air quality reports regarding odors filed with SCAQMD. The first air quality report was received on Oct 24, 2015 and through Feb 11, 2016, 2340 reports were received. A log of these reports are available on the SCAQMD Responding to Odor Complaints webpage. Air sampling data associated with air quality reporting are reflected in the complaint air sampling data table .
VOCs (including BTEX), sulfur compounds	Storage gas reservoir sample	SCAQMD	Fernando Fee Well	Nov 6, 2019	During an investigation of ground fire source contamination at the Catch Basins 3 location of the Aliso Canyon facility, SCAQMD secured and sampled gas from the storage reservoir. Results: see the laboratory analysis .
Metals, mercury, hexavalent chromium, soluble hexavalent chromium STLC, soluble hexavalent chromium TCLP, TPH-cc (C6-C44), gasoline range organics (C4-C12), VOC super list + TICs, SVCs – super list + TICs, PAHs, PCBs, chloride, carbonyl compounds (aldehydes), mercaptans, alkalinity, pH, crystalline silica, Po-210 isotopes, Pb-210 isotopes	SS-25 Units Sampling and Analysis Report	LACDPH	Hazardous waste bins of materials from the SS-25 well blowout	Aug 4, 2020	Bins (units) of waste materials from the well blowout and well-kill attempts (well-control fluids and materials) were sampled on August 4, 2020. Twenty units were selected, and priority was given to those that contained sludge or water from SS-25 that was considered to have the highest potential of dispersing through the air and reaching the community during failed well-kill attempts. Results: see the SS-25 Units Sampling and Analysis Report .
VOCs, TPHs, metals, mercury, sulfur, gasoline range organics (C4-C12) Po-210 Isotopes, Pb-210 Isotopes	Supplemental SS-25 Units Sampling and Analysis Report	LACDPH	Hazardous waste bins of materials from the SS-25 well blowout	Oct 29, 2020	Waste bins of waste materials from the well blowout and well-kill attempts were sampled on October 29, 2020. The samples are being held for potential further testing as part of the ACDHRS.

Target Chemicals	Data element	Data Source	Location	Dates	Notes
Alpha, beta, and gamma radiation	SS-25 Units Radiation Monitoring	LACDPH	Hazardous waste bins of materials from the SS-25 well blowout	Nov 12, 2020	Radiation readings of waste materials from the well blowout and well-kill attempts were taken on November 12, 2020 using radiation meters to detect alpha, beta, and gamma radiation. Results: the min, max, and avg alpha survey readings were 0 dpm, 120 dpm, and 28 dpm respectively.

Table 5. Data sources related to health outcomes (e.g., acute symptoms) experienced by the community during and after the SS-25 well failure.

Data element	Taken By	Location or Source	Dates	Notes
Health symptom reports	LACDPH	Community	Oct 23, 2015 – Feb 18, 2020	Health-related reports filed with LACDPH. Results of Air Monitoring and Assessments of Health , Feb 19, 2016 - pgs. 6-8, Human, animal and wildlife health summaries. Refer to Figure 2 for the locations of the households where symptoms were reported. In anticipation that symptoms would stop as soon as the well was sealed and odors were gone, reports were not recorded in the log between the date the well was sealed (Feb 11, 2016) and March 1, 2016.
Health symptoms survey (CASPER study)	LACDPH	Community	Mar 10-12, 2016	Survey of community members on their health symptoms during the leak and soon after the well was sealed. Survey also collected information on healthcare sought after the well was sealed, odors and oily residue, methods to improve indoor air quality, activities of relocated households upon returning home, and households' greatest needs.

Figure 1. Map of fixed air monitoring locations in the community surrounding the Aliso Canyon Gas Storage Facility during and following the blowout.

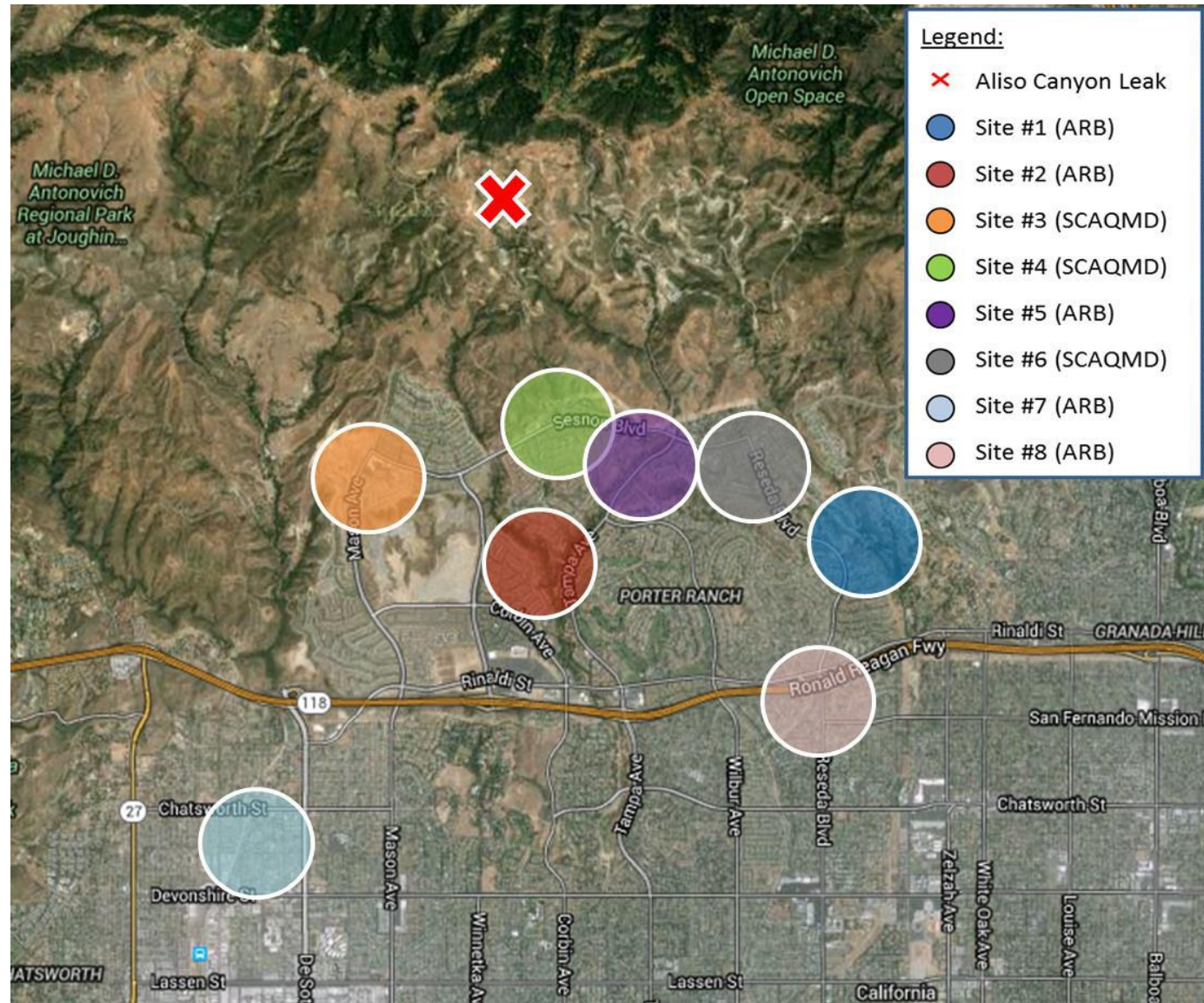
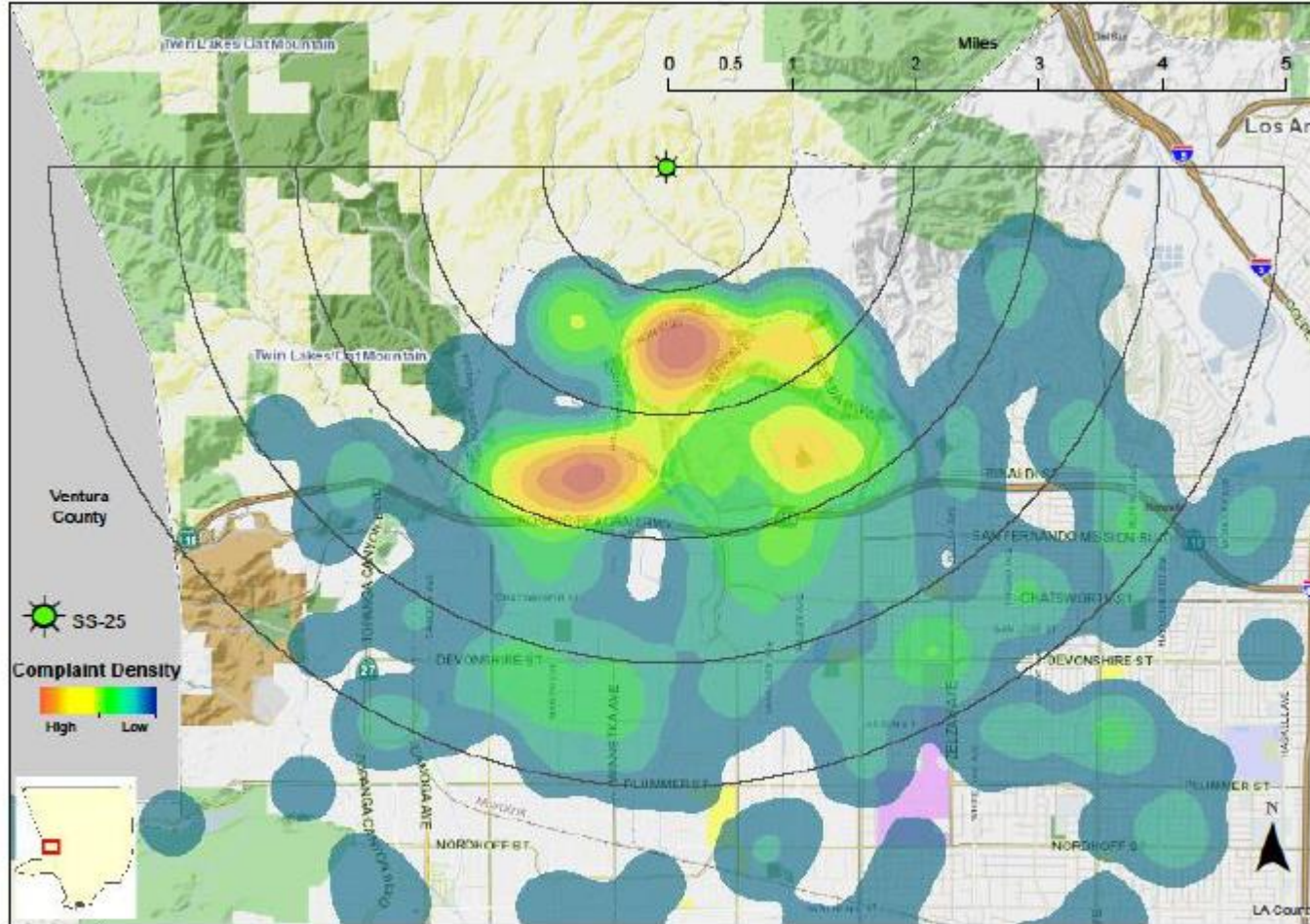


Figure 2. Map of the density of symptom reporting by resident address in the communities surrounding the Aliso Canyon Gas Storage Facility.



Created by: Office of Health Assessment and Epidemiology, Epidemiology Unit. 02/03/16. Map shows the density of symptoms by respondent's addresses. 511 of 687 addresses were located (the rest were excluded due to incorrect or missing addresses).

Table 6. Acronyms and Notes

ACDHRS	Aliso Canyon Disaster Health Research Study
ASTM	ASTM International, formerly known as American Society for Testing and Materials
BTEX	Benzene, toluene, ethylbenzene, and xylenes
CalGEM	California Geologic Energy Management Division (formerly the California Department of Gas and Geothermal Resources)
CARB	California Air Resources Board
CERS	California Environmental Reporting System
CO	Carbon monoxide
CO ₂	Carbon dioxide
CPUC	California Public Utilities Commission
dpm	Disintegrations per minute
EPA	Environmental Protection Agency
e-RLM	epi-Reflected Light Microscopy
FLIR camera	Forward-looking infrared camera
GC-FID	Gas Chromatography with a flame ionization detector
GIS HEAL Labs	Geographical Information Systems Health Exposure Analysis Laboratories
GPS	Global Positioning System
LACDPH	Los Angeles County Department of Public Health
LACFD HHMD	Los Angeles County Fire Department Health Hazardous Materials Division
LAUSD	Los Angeles Unified School District
LEL	Lower Explosive Limit
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mL	milliliters
NASA-JPL	National Aeronautics and Space Administration's Jet Propulsion Laboratory
ND	Not detected, below laboratory detection limits
NH ₃	Ammonia
NIOSH	National Institute of Occupational Safety and Health
NMOCs	Non-methane organic compounds
TNMNEOCs	Total non-methane non-ethane organic carbon
TRS	Total reduce sulfur
N ₂	Nitrogen

OEHHA	Office of Environmental Health Hazard Assessment
PAHs	Polyaromatic hydrocarbons
PCBs	Polychlorinated Biphenyls
pH	Acidity/basicity
PLM	Polarized Light Microscopy
ppb	Parts per billion
ppm	Parts per million
QA/QC	Quality assurance, quality control.
SCAQMD	South Coast Air Quality Management District
SCG	Southern California Gas Company
SIM	Stability Indicating Method
SM	Standard Methods
SoCalGas	Southern California Gas Company
SS-#'	Standard Sesnon '# - refers to well pad area/number on the SCG Aliso facility
STLC	Soluble threshold limit concentration
SVOCs	Semi-volatile organic compounds
TCA	Total Carbon Analysis
TCLP	Toxicity characteristic leaching procedure
THT	Tetrahydrothiophene
TICs	Tentatively identified compounds
TK	Tank
TRS	Total Reduced Sulfur
TSS	Total Suspended Solids
TVA	Toxic Vapor Analyzer
µg	Micrograms
µg/L	Micrograms per liter
TPH	Total petroleum hydrocarbons
TPH-cc	Total petroleum hydrocarbons-carbon chain (C#-C# notes the range of carbon included)
VOCs	Volatile organic compounds

Notes:

Air, wipe, and water sampling: utilized various types of sampling equipment and media specific to the analytical method

Standard lab QA/QC: this generally includes a method blank, matrix spike, matrix spike duplicate, laboratory control sample, laboratory control sample duplicates, and/or a surrogate spike.