



Aliso Canyon Disaster
Health Research Study

Goals and Priorities

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Background:

On October 23, 2015, the largest gas blowout in the history of the United States was discovered by the Southern California Gas Company (SoCal Gas) at well SS-25 in the Aliso Canyon gas storage facility in Los Angeles, California.¹ An estimated total of 109,000 metric tons of methane (1) and natural gas constituents flowed uncontrolled from Aliso Canyon well SS-25 for nearly four months. The leak was exacerbated by seven surface well-control attempts over the course of the first two months of the disaster. A relief well was drilled and intercepted the leaking well, stopping the flow of escaping gas on February 12, 2016. The well was subsequently cemented and sealed.²

During the blowout, residents in nearby communities experienced foul odors, oily mists, and a range of health symptoms - including irritations of the eyes/nose/throat, nausea, abdominal discomfort, headaches/migraines, dizziness/light-headedness, nose bleeds, shortness of breath, skin rashes/irritations and other mucous membrane irritations - most of which were consistent with, and were attributed to, low-level exposure to natural gas odorants.³

SoCal Gas was [directed](#) by the Los Angeles County Department of Public Health (Public Health) on November 19, 2015 to expedite efforts to stop the blowout and in the interim, offer free, temporary relocation to any area residents affected by odors from the Aliso Canyon gas storage facility. Over 8,000 households were relocated. In addition, on December 16, 2015, SoCal Gas was [directed](#) to assist the Los Angeles Unified School District (LAUSD) in the temporary relocation of affected students and staff of Porter Ranch Community School and Castlebay Lane Charter School to alternative school facilities.

After Well SS-25 was sealed and outdoor air contaminants returned to background levels (2), symptoms continued to persist. A Community Assessment for Public Health Emergency Response (CASPER) found that 63% of surveyed households reported health symptoms in the month after the well was sealed - only a modest improvement from the 81% of households that reported experiencing health symptoms during the blowout (3). In addition, household dust samples found trace amounts of a consistent combination of metals that may have been emitted from well SS-25 during the blowout and may have contributed to the persistent symptoms (4). In response, SoCal Gas was [directed](#) by Public Health and ordered by the Los Angeles Superior Court to pay for professional, comprehensive cleaning of homes.

In addition to the potential exposure to natural gas, odorants, constituents of crude oil and other combinations of chemical compounds, many nearby residents experienced economic hardship including business and income loss, disruption of their daily lives from school and

¹ SoCal Gas, a subsidiary of Sempra Energy, is the owner and operator of the Aliso Canyon gas storage facility.

² The California Public Utilities Commission (CPUC) and the Geologic Energy Management Division (GalGem) contracted Blade Energy Partners (Blade) to conduct an independent root cause analysis of the SS-25 well blowout. The final report and video provide detailed information on the root causes of the well failure and the well-kill attempts and can be found on the CPUC website: <https://www.cpuc.ca.gov/aliso/>.

³ Refer to the Office of Environmental Health Hazard Assessment (OEHHA) website for more information: <https://oehha.ca.gov/air/general-info/aliso-canyon-underground-storage-field-los-angeles-county>



household relocation, and other consequential impacts of the disaster possibly leading to psychological distress. The combination of these stressors may all adversely impact health and quality of life.

The Aliso Canyon Disaster Health Research Study (ACDHRS) is a supplemental environmental project (SEP) agreement in [The People of the State of California v. Southern California Gas Company's Consent Decree](#) (Appendix D) approved by the Los Angeles Superior Court on February 25, 2019. Funding for the ACDHRS was allocated to Public Health in March 2019 to oversee the development and implementation of the study with the guidance of a Scientific Oversight Committee (SOC). The ACDHRS will be a multi-year investigation of health impacts in communities affected by the Aliso Canyon blowout.

Due in part to the unprecedented scale and length of the Aliso Canyon blowout, there is limited extant research that can provide insight on potential health impacts of this gas storage facility disaster. Few epidemiologic studies of populations living near oil and gas operations have been conducted and provide limited or mixed evidence of the possibility for harmful health effects (5; 6). However, other experimental, toxicological and epidemiological research suggests that chemicals of potential concern associated with the Aliso Canyon blowout and well-control operations - including volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), heavy metals, particulate matter, and aldehydes - may have harmful long-term health effects. Additionally, there is a growing body of research on the unexpected, mental health, and social consequences of human-made environmental disasters and their aftermath (7; 8; 9; 10; 11). The ACDHRS is needed to increase the collective understanding of potential short- and long-term health impacts and advance the scientific body of knowledge on human-made environmental disasters of this nature.

As mandated by the [Consent Decree](#), the SOC will determine the goals of the study. The feedback community members have provided at open houses, Community Advisory Group (CAG) meetings, Neighborhood Council meetings, a virtual town hall, and via surveys and the ACDHRS website has helped identify the draft Study Goals and Priorities developed by the SOC and outlined below.

For more background information on the Aliso Canyon disaster and the ACDHRS, please visit the [Aliso Canyon Disaster Health Research Study website](#). Also, to learn more about what a health study is, please refer to the 'What is a Health Study?' [fact sheet](#) and [video](#).



Health Study Goals:

The ACDHRS will be a multi-faceted and multi-disciplinary study of basic and applied research that is scientifically promising and will investigate multiple potential health impacts of concern to the residents affected by the Aliso Canyon disaster. The study will take a participatory approach to engaging members of the impacted communities.⁴

The overarching goal of the ACDHRS is to contribute to the understanding of the potential short-, and long-term physical, mental, community, and social health impacts of exposure to the Aliso Canyon disaster.⁵

Specifically, the ACDHRS project(s) will:

- Evaluate the relationship between the exposures to air pollutants, chemicals, and other potential pollutants during and/or following the disaster and adverse health impacts of priority to the community, which could include, but is not limited to, physical and mental health.
- Investigate the impact of the stressors related to the Aliso Canyon disaster⁵ on the quality of life and functioning of residents in the impacted communities during and following the disaster
- Include susceptible populations, such as children and older adults, in the impacted communities.

Health Study Priorities:

Feedback from people who lived near and experienced the Aliso Canyon disaster and expert guidance from the SOC are the basis for the identification of the priority research and study elements for the ACDHRS outlined below.

Study Outcomes

The ACDHRS seeks to have independent researchers examine the health and quality of life impacts resulting from the Aliso Canyon disaster. Health impacts of concern to the community and raised by the SOC include:

- *Acute Health Impacts*
These include acute symptoms and worsening pre-existing conditions experienced by residents in the communities surrounding the gas storage facility during the well blowout and after the well was sealed. Physical health symptoms include, but are not limited to, skin and mucous membrane irritations, headaches/migraines, and gastrointestinal, cardiovascular, and respiratory outcomes. Emotional and mental

⁴ Community engagement may take several forms including but not limited to soliciting community input on research progress and participation in research as survey respondents or study subjects.

⁵ Including subsequent remediation efforts, ongoing and current operations and regular activities, and disturbance to the community.



health symptoms include but are not limited to stress and possible psychological trauma.

- *Intermediate Term Health Impacts*

These include but are not limited to birth outcomes such as pre-term birth or reduced birth weight, possible harms to the health of pregnant women, and developing fetuses, and possible impacts on child development.

- *Chronic Health Impacts*

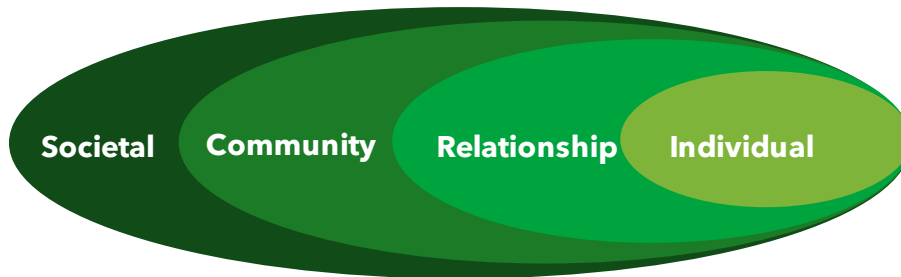
These include but are not limited to cancers, lung disease, psychological or mental health conditions, harm to immune system function, nervous system disorders, cardiovascular disease, and worsening pre-existing conditions. Of these long-term health impacts, the community is most concerned about cancers and respiratory health.

Some aspects of overall quality of life can affect physical and/or mental health. Changes in quality of life can be acute, chronic, or in-between. Aspects of quality of life that may be affected by a disaster include social health, behavioral health, and community health and resilience. **Social health** is the ability to interact and form meaningful relationships and support networks with others. Relationships that are nurturing and supportive are especially important when recovering from stressful or traumatic situations such as environmental disasters. **Behavioral health** is the connection between behaviors and health/well-being. Behaviors such as eating habits, substance use, and exercise can affect physical and/or mental health. **Community health** is the overall health status and functioning of a defined group of people with common characteristics and includes conditions and activities that promote, protect, and preserve health (12). **Community resilience** is the sustained ability of communities to withstand, adapt to, and recover from adversity. Health and quality of life are influenced by interactions of characteristics at the individual, interpersonal, community and societal levels. Therefore, the ACDHRS will prioritize a *social-ecological*⁶ approach to the study of health and quality of life impacts of the Aliso Canyon disaster - meaning that it will seek to analyze impacts on health at various levels of influence (refer to Figure 1 below of CDC's 4-level socio-ecological model).

⁶ For more information on the socioecological model for health, visit:
https://www.atsdr.cdc.gov/communityengagement/pce_models.html



Figure 1. CDC Social-Ecological Model



Study Populations

The ACDHRS will include people in communities surrounding the Aliso Canyon gas storage facility. Environmental disasters, like the Aliso Canyon blowout, can have a greater negative impact on susceptible groups of people. Therefore, the ACDHRS project(s) must include susceptible groups, as well as the general population, and individuals who have moved away following the Aliso Canyon blowout where feasible. Susceptible populations of concern to the community include older adults, children, newborns, pregnant women, homeless or low income, minority groups, workers, and people with pre-existing conditions. Additionally, the community has expressed concern about the health of animals and pets.⁷

Study Exposures

The ACDHRS seeks to assess the health impacts of a broad range of exposures. For the purpose of the Study, exposures that may have led to health impacts, including an increased risk for adverse health outcomes, will be broadly defined as: exposures to chemicals released during the Aliso Canyon blowout and well-control attempts; potential exposures to chemicals released as part ongoing, current, and regular operations at the Aliso Canyon gas storage facility; and exposure to social and other stressors arising from the environmental disaster situation and remediation efforts. Studying the combined effects of multiple stressors on health and well-being is considered a high priority to the impacted community. Examples of priority exposures include but are not limited to:

- *Chemical Exposures*
These include natural gas and constituents released from Well SS-25 during the blowout and/or during ongoing operations (including but not limited to sulfur odorants, VOCs, semi-VOCs, PAHs, and particulate matter), constituents of well-control muds and fluids that were used during well-control operations and remediation efforts (such as select metals and minerals, aldehydes, and sulfonated tannin esters), and constituents of crude oil. Of particular interest is the concurrent exposure to multiple chemicals and their cumulative, and potential synergistic, impact.

⁷ Populations listed in no particular order of priority.



- *Social and Other Stressors*
These include but are not limited to changes in home/school environments, social networks, socioeconomic status, activity level, and stigmatization resulting from real and perceived community exposures.

Data Sources and Collection

Researchers can use data from a variety of sources. They may gather their own data (“primary data”), use existing data that was collected for other purposes (“secondary data”) and/or use proxy measures to make estimates. The researchers will determine what data sources will best support the research. A summary of existing data sources can be found on the ACDHRS website. Researchers may need to obtain agreement from agencies and organizations to use their respective data for research purposes.

Primary data refers to data gathered by the researchers specifically for the project. The researchers may use or develop data collection tools tailored to their research objectives (such as surveys and psychometric tools) or perform clinical evaluations to collect high-quality data on exposure and/or outcomes measures. In addition, they may collect high quality data through other means including but not limited to focus groups, interviews, participant observation, and community-based participatory research methods.

Secondary data refers to existing data (e.g., administrative, clinical etc.) that was collected by government institutions, healthcare facilities, nonprofits, religious groups, recreational, social, and cultural organizations etc., as part of their record-keeping that may or may not be specific to the researcher’s need. The ACDHRS researchers may utilize acceptable forms of secondary data including but not limited to patient health records, hospital and emergency department discharge data, prehospital care reports, poison control center data, surveillance and monitoring data, birth and death records, birth registries, cancer registries, veterinarian clinic records, and several of the indicators and/or proxies described below.

Measuring environmental exposures and health outcomes may, and often involve, the use of proxies. For example, predictions of ambient air pollutant concentrations have been used to study effects of air pollutants on an array of health outcomes including impacts to cardiovascular, respiratory, and neurological health, as well as cancer risk and overall mortality (13; 14). Odors have also been used as a proxy measure for ambient pollution exposures (15; 16). Additionally, a wide variety of indicators or proxies can be used to measure quality of life, social health, and community health and resilience such as trends in home sales, domestic violence, and self-reported well-being.

Study Types

The ACDHRS may consist of various types of research studies including but not limited to population-based studies, clinical studies, records-based epidemiological studies, toxicology studies, community-based participatory research projects, and risk assessments. Study types



and research methods will be proposed by independent third-party researchers recruited through a competitive bid process following the release of a Request for Proposals (RFP) later this year.

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