California Air Resources Board Air Monitoring Near Oil and Gas Operations

Climate Action Team
Public Health Workgroup
Cal EPA Headquarters - Sierra Hearing Room
Sacramento, California
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California Environmental Protection Agency
Air Resources Board

Outline

- Community monitoring
- Well stimulation treatment (WST)

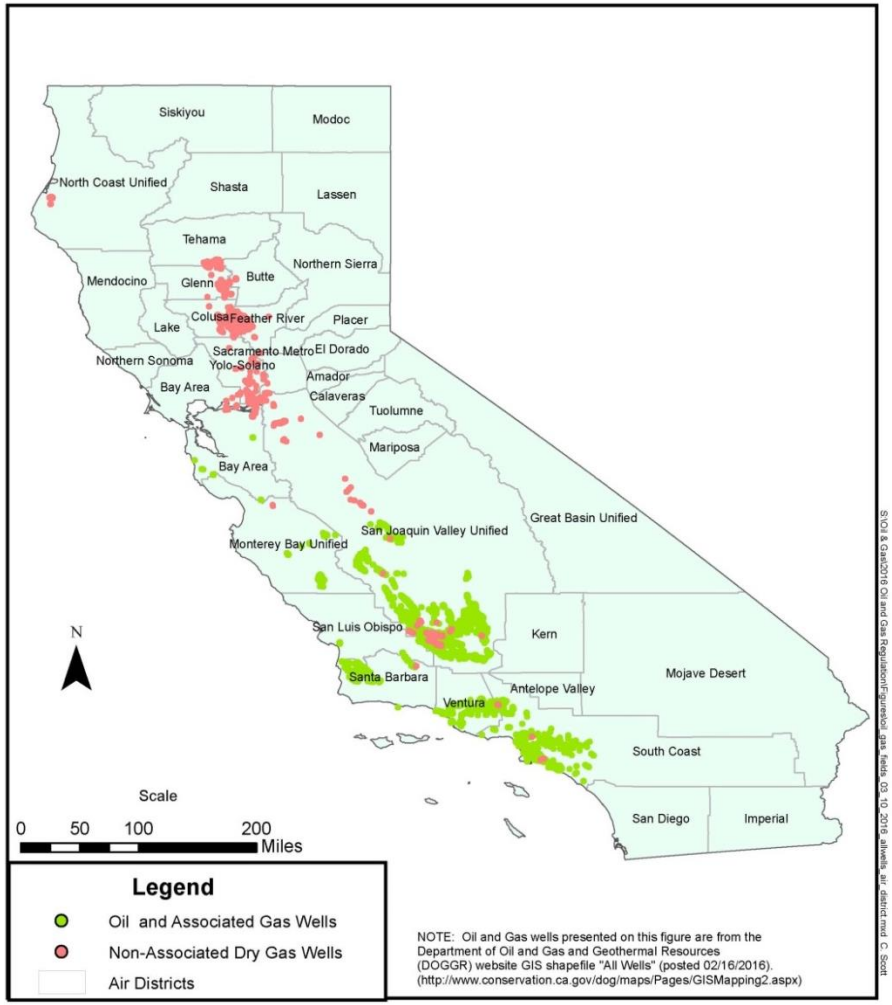
Community Monitoring
Near Oil and Gas Facilities

Motivation to Monitor Near Oil and Gas Facilities

- Exposure concerns raised by communities
- Public awareness raised as a result of Aliso Canyon underground natural gas leak, particularly aging infrastructure
- California Council on Science and Technology (CCST) independent review of well stimulation recommendations:
    - Production generally a concern
    - Measure toxic emissions near production wells
    - Assess public health near all wells
    - Develop policies to limit exposures

California Oil and Gas Operations

- Third largest oil producer, 15th largest natural gas producer in US
- Generally, gas wells are found in northern California, oil wells further south
- Gas produced with crude oil is called associated gas

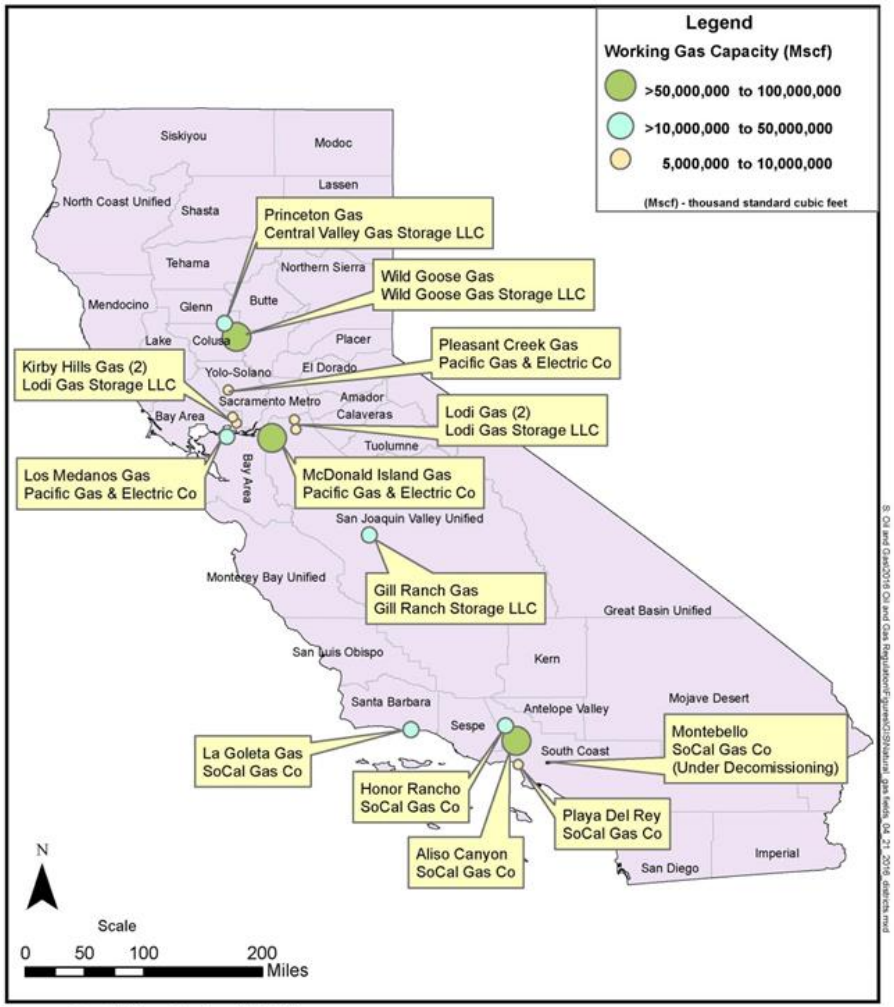


California Oil and Gas Operations

- Oil & Gas Production
  - ~ 82,000 active production wells statewide
  - ~ 122,000 plugged wells statewide
  - Production equipment
- Wastewater percolation ponds
  - Central Coast - 3
  - Los Angeles - 1
  - Central Valley ~ 1,000
- Transmission and compressor stations
- Natural gas underground storage facilities

Natural Gas
Underground Storage Facilities

- Thirteen facilities located throughout California



Capacity Information from EIA, 2014.
http://www.eia.gov/cfapps/ngqs/ngqs.cfm?f_report=RP7

Community Air Monitoring Scope

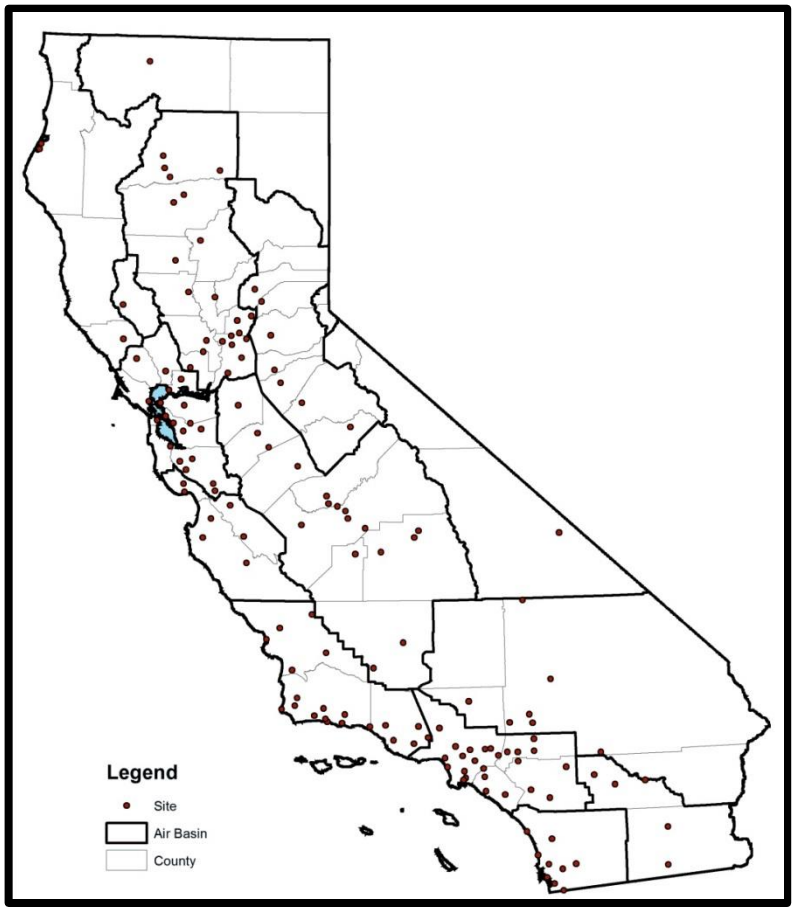
- Characterize emissions from oil and gas operations
  - Toxics and particulate matter
  - Methane and other volatile organic compounds
- Source testing as necessary
- Health risk assessment if supported by data

Related ARB Efforts

- Statewide air quality and greenhouse gas monitoring network
- Recently adopted regulation - *Greenhouse Gas Emissions Standards for Crude Oil and Natural Gas Facilities*
- Well stimulation air sampling and analysis
- Oil and gas wastewater pond research
- California aerial methane hotspots survey

Existing Statewide Monitoring Networks

Air Quality Monitoring Sites

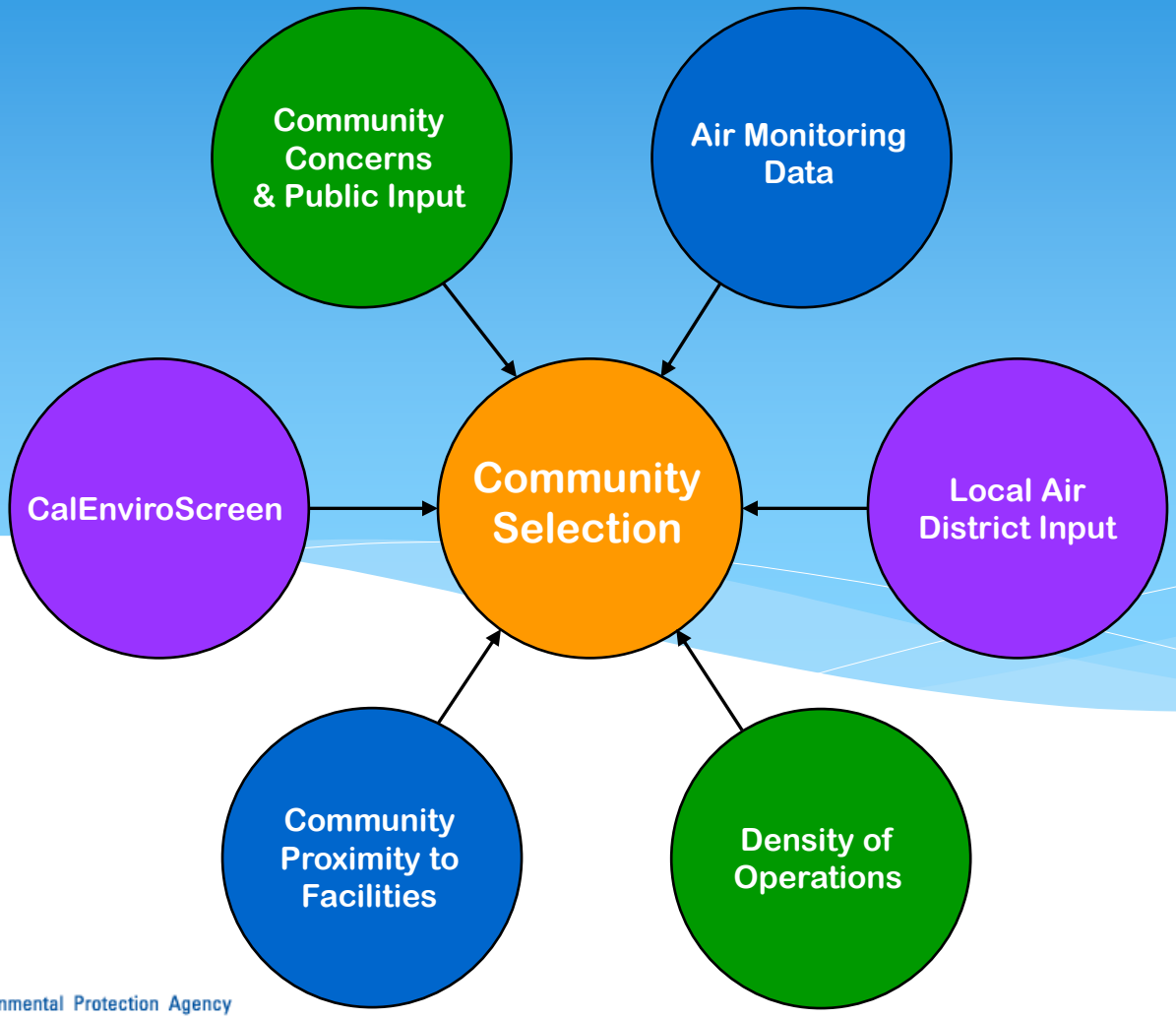


Greenhouse Gas Monitoring Sites

Public Outreach

- Actively solicit input from stakeholders
  - Community members and organizations
  - Environmental organizations
  - Local air districts and other government agencies
  - Other (e.g., academia, research organizations, etc.)
- Regional and local community meetings
- ARB webpage including schedules, progress, results
- E-mail listserv notifications

Community Selection Criteria



Methods and Resources

- Air monitoring methods
  - Mobile vehicle monitoring (screening)
  - Trailer mounted stationary monitoring
  - Collection of air samples in canisters for analysis
- Data analysis methods
  - Source attribution analysis
  - Health risk assessment if supported by data

Mobile Vehicle Monitoring

- Mobile screening to identify areas for investigation
- Supplementary monitoring to fill data gaps among stationary trailers or to pinpoint sources
- Low emission hybrid-electric fueled vehicle
- State-of-the-art monitors for instant measurements of methane, carbon dioxide, carbon monoxide, black carbon and BTEX (benzene, toluene, ethylbenzene, and xylenes)
- Discrete samples for analysis of toxic VOCs and aldehydes

Mobile Monitoring Stations

- Real time monitoring of methane, carbon dioxide, carbon monoxide, black carbon, particulate matter (PM), ozone, sulfur compounds (SO_2/H_2S)
- Hourly VOC speciation using gas chromatograph
- Particle-bound metals with a X-ray fluorescence
- 24-hour integrated canisters and filter based media for laboratory analyses of toxic VOCs, aldehydes, mercaptan, toxic metals, and PAHs/SVOC

Well Stimulation Treatment (WST) Operations

Well Stimulation Treatment Operations in California

- Enhances oil production by making reservoir more permeable, allowing oil to flow
  - Includes hydraulic fracturing, acid fracturing, matrix acidizing
- Vast majority in four fields in the San Joaquin Valley
- California WST is unique
  - Shallow wells, reservoirs more permeable, less water use, duration ~<1 day

Well Stimulation Treatment Operations in California

- Hydraulic fracturing
  - Fluid injection increases pressure in an isolated section of the well until nearby rock fractures
  - Sand injected into fractures to prop them open
- Acid fracturing
  - High pressure acidic fluid injection fractures nearby rock, acid etches fracture walls to create permeability
- Matrix acidizing
  - Acid pumped into well at low pressure dissolves rock, creating permeability

Senate Bill 4 (2013)

- Set the regulatory framework for WST activities in CA
- Required the Division of Oil, Gas, and Geothermal Resources (DOGGR) to prepare regulations to ensure WST is done safely
- Requires DOGGR to issue permits to conduct WST
  - Permit application must include detailed information about fluids used, groundwater monitoring plan, water management plan
- Requires public disclosure of WST operation details

SB4: Independent Scientific Review of WST in CA

- Assessment of WST practices, impacts, gaps in data, potential risks, and alternative practices
- Conducted by California Council on Science and Technology (CCST) and published in 2015
- Conclusions:
  - WST is a potential source of air quality impacts in California and emissions can be concentrated near production wells
  - Emissions from oil production generally is a concern
- Recommendations:
  - Additional analysis, measurement and control of toxic air contaminants (TACs), and assessment of public health near all wells

DOGGR Permit Application Process

- Oil and gas operators submit detailed application to DOGGR
- DOGGR forwards application to ARB and local air district, among others, for comments
- ARB and district may recommend provisions to add to permit to address air quality concerns

ARB Permit Application Comments

- No studies have measured emissions from WST operations in California
- Operators generally include several TACs in their proposed WST fluid (e.g. distillates, ethylene glycol, methanol, phthalic anhydride, vinylidene chloride-methylacrylate polymer)
- Therefore, ARB has recommended air monitoring for selected WST operations

Air Sampling and Analysis During WST Operations

- Requires operators to obtain air samples before and during WST and analyze the samples for toxics, aldehydes, PAHs, and methane
- Air sampling typically over 8-12 hour operation
- ARB will coordinate with OEHHA for health risk assessment if supported by data

Air Sampling and Analysis During WST Operations

- Air sampling began in December 2016
- Limited sampling has been completed in three oil fields in Kern County
- More data will be collected and analyzed prior to reporting results

Contact Information

WST Permit Sampling and Analysis

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