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
May 23, 2017
• 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
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

- Community Concerns & Public Input
- Air Monitoring Data
- Density of Operations
- Community Proximity to Facilities
- Local Air District Input
- CalEnviroScreen
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$_2$S)
- 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
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
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
• 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

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