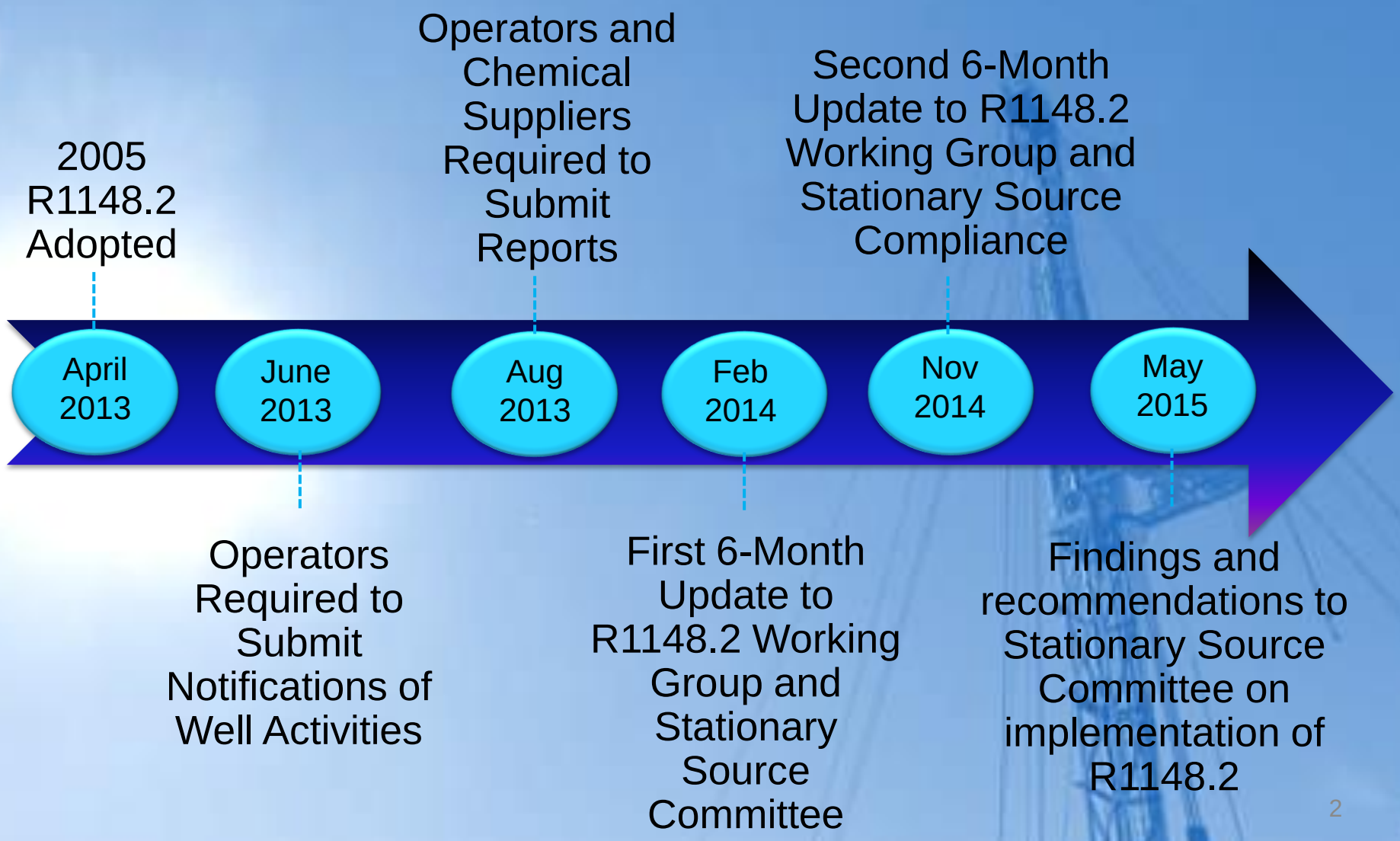
Update on Implementation of Rule 1148.2

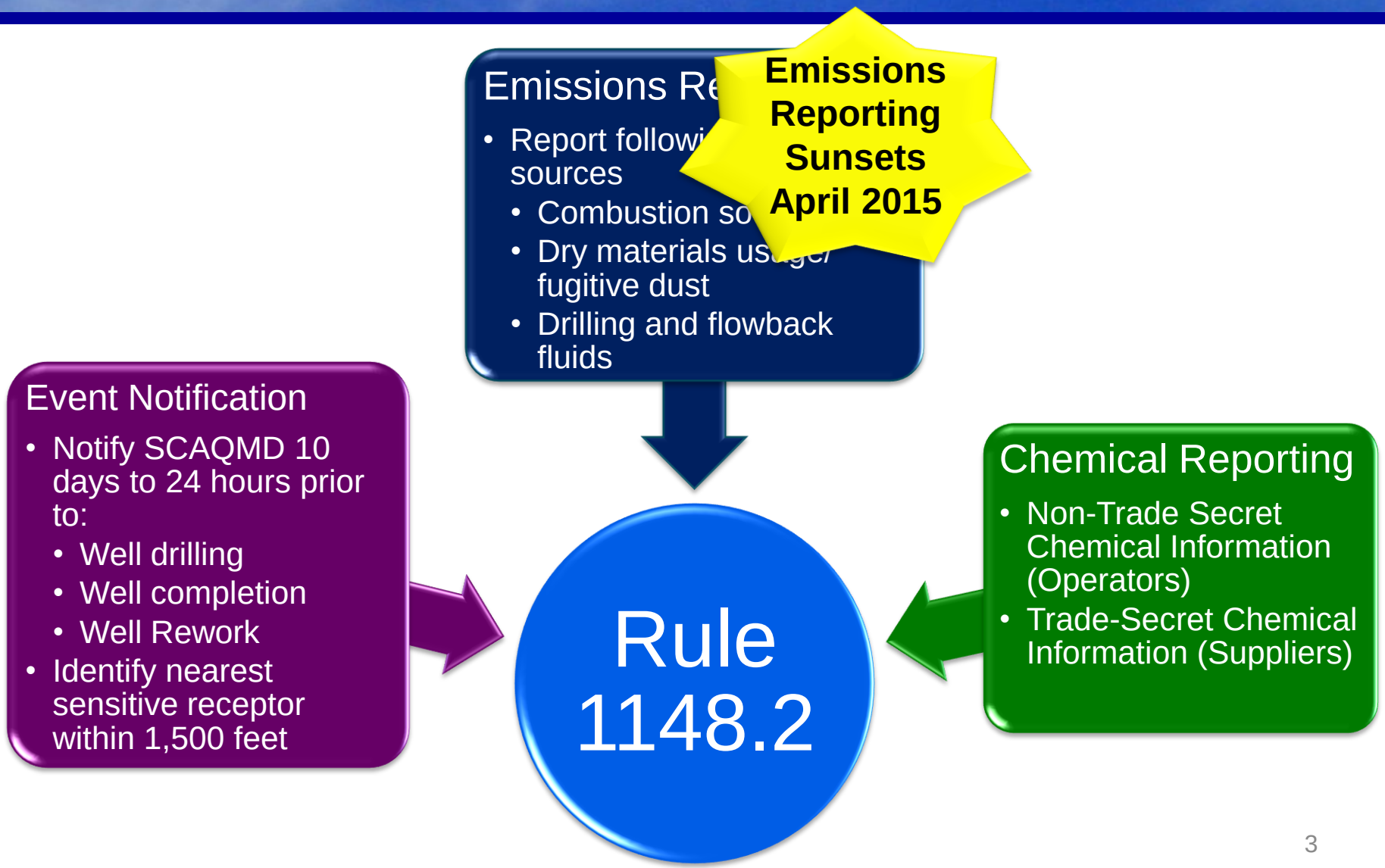
Stationary Source Committee

November 2014

R1148.2 Implementation



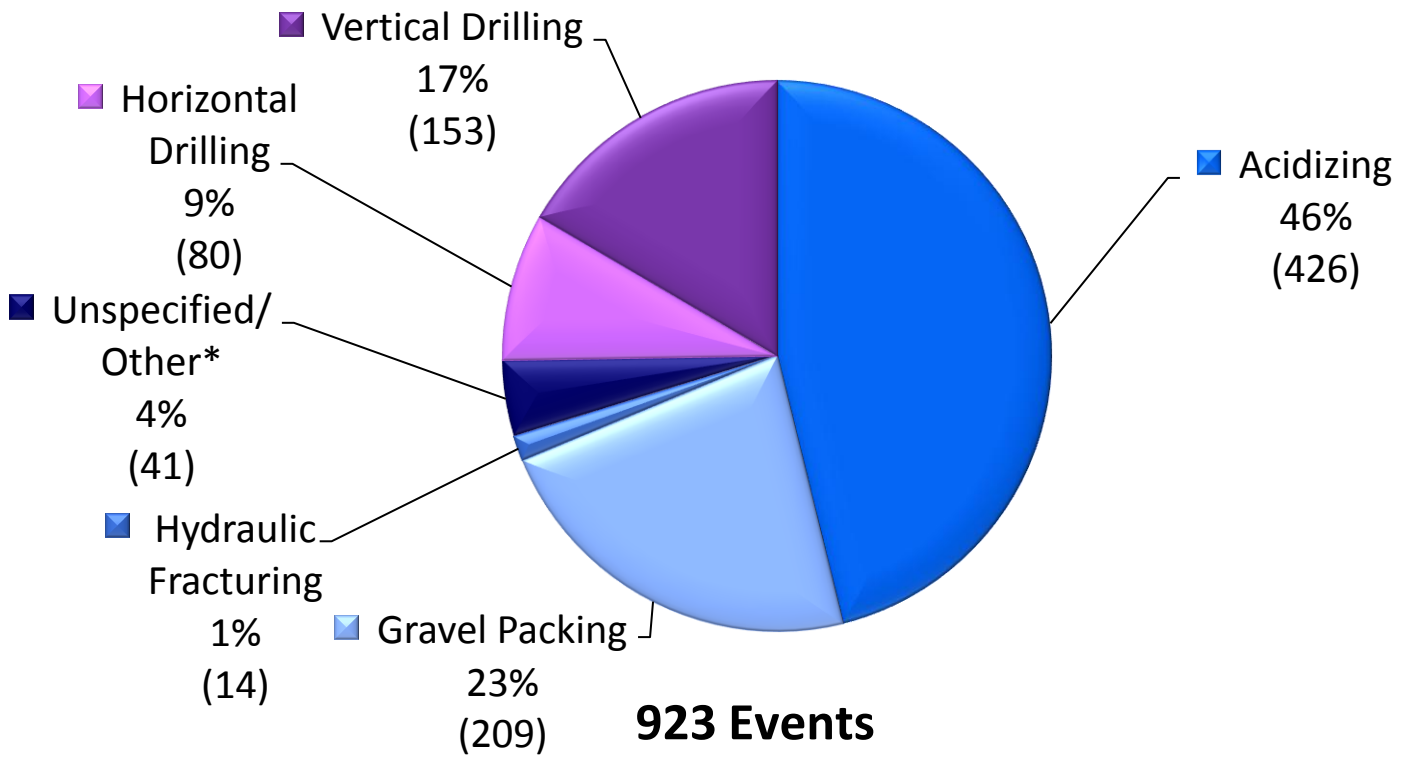
Key Elements of Rule 1148.2



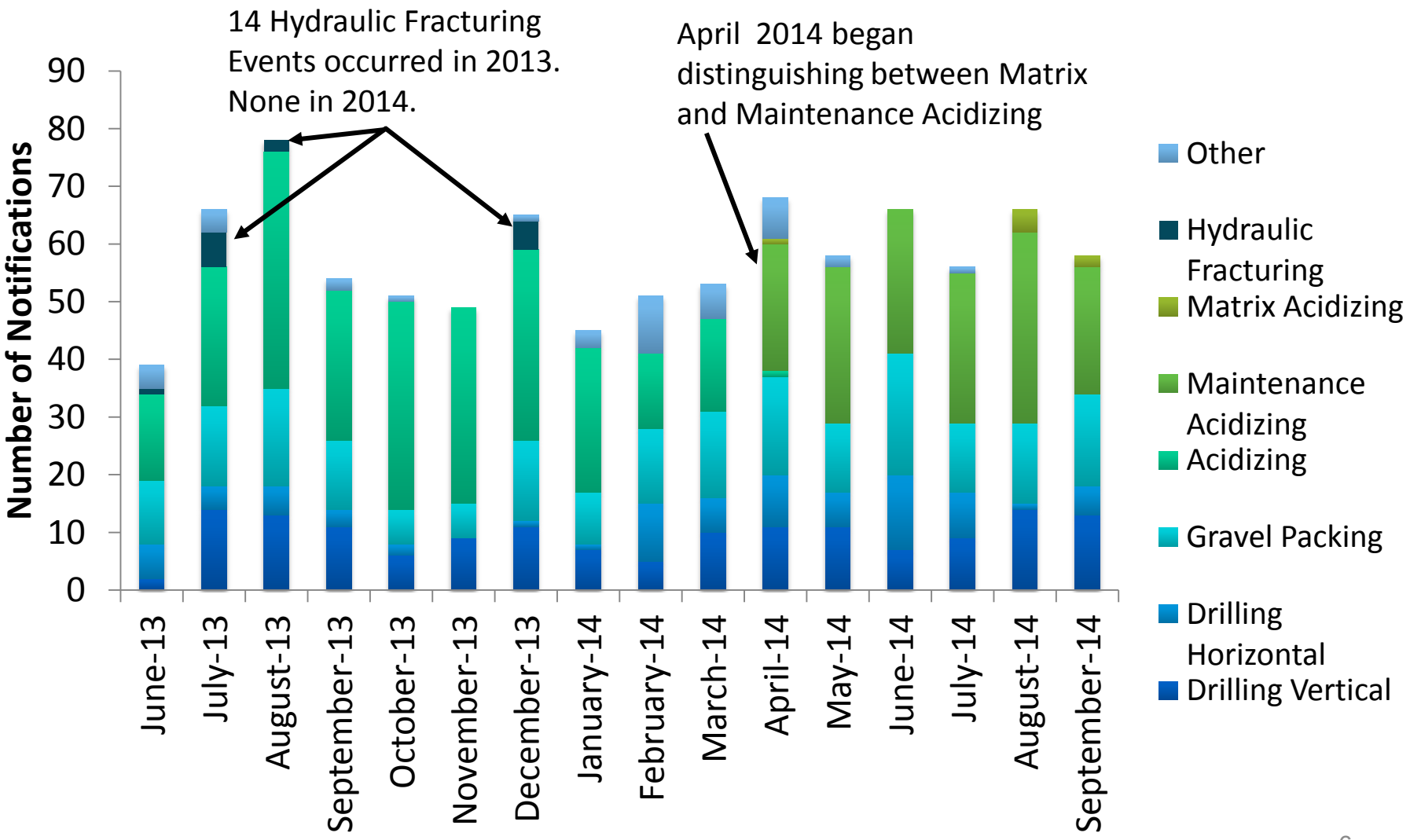
Summary of Event Notifications

Summary of Rule 1148.2 - Notification Data (June 2013 - Sep 2014)

- Approximately 821 Notifications representing 923 events (Some notifications have multiple events)
- >99% oil wells and <1% gas wells



Summary of Notifications

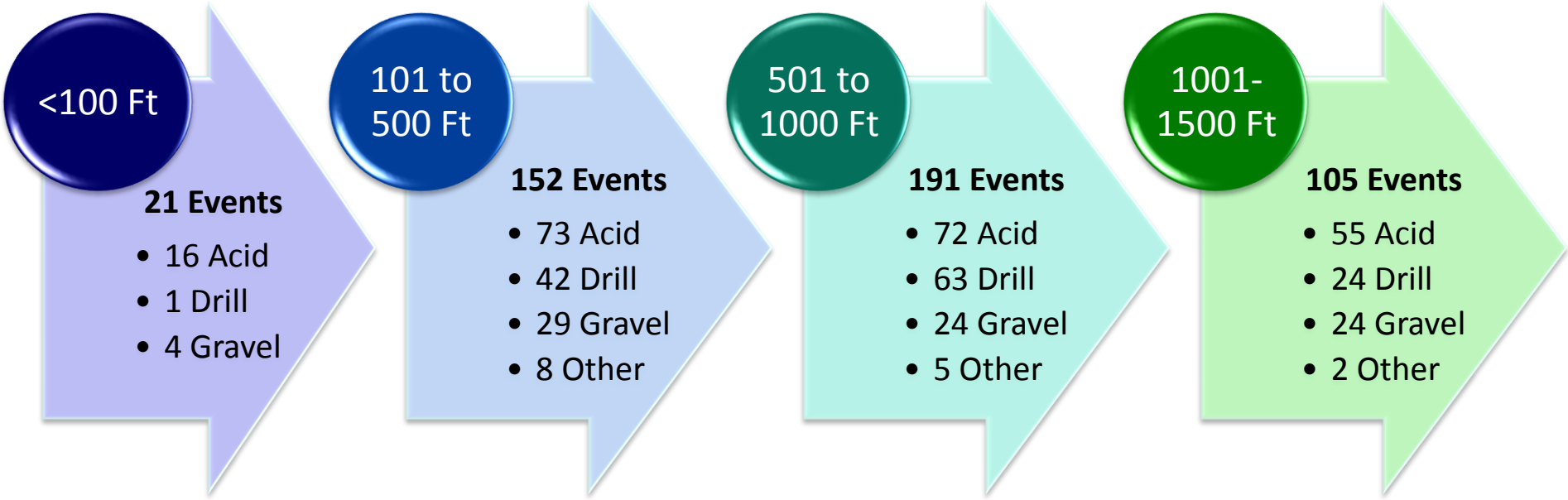


R 1148.2 – Well Activity by Location

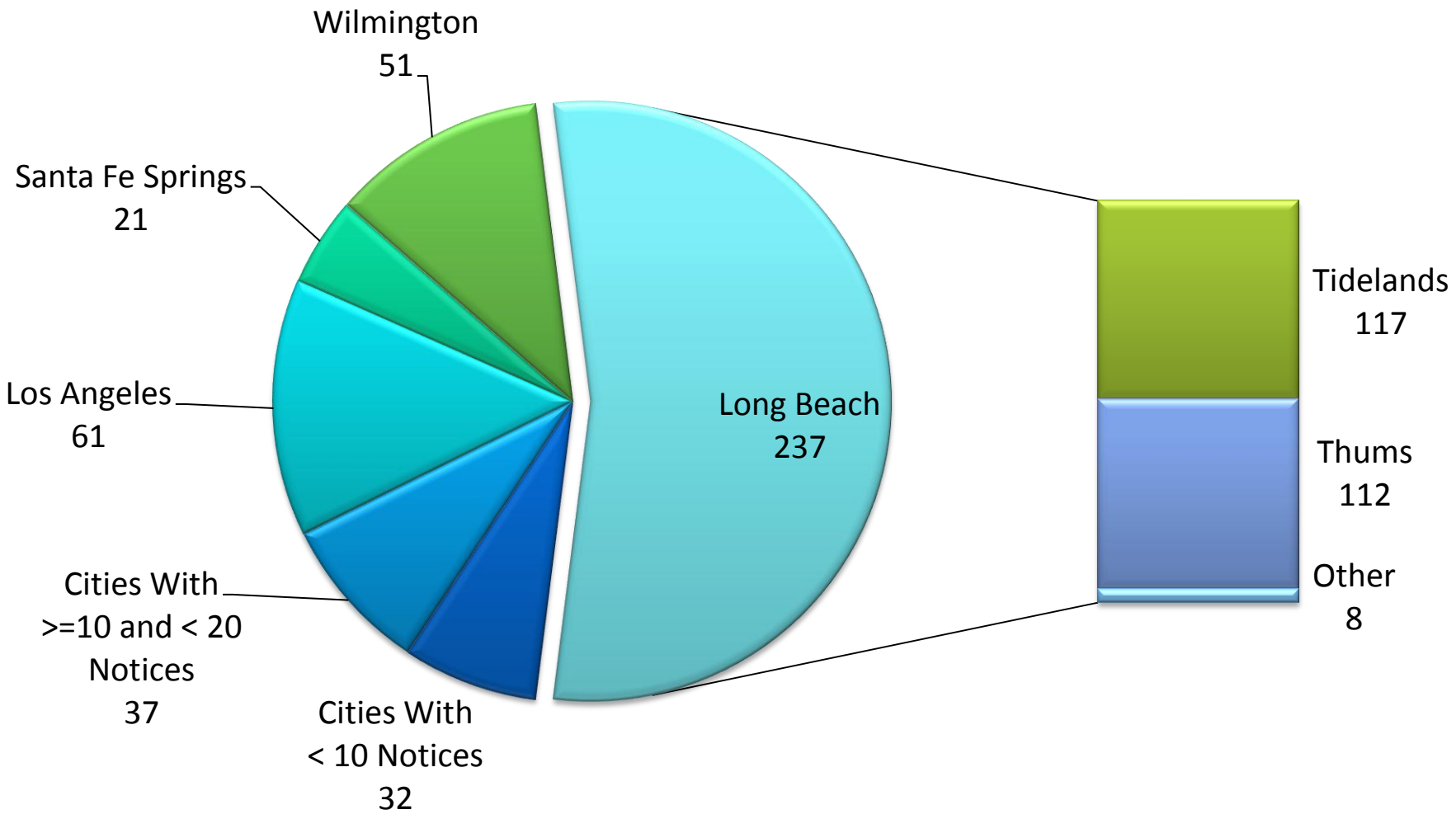
- 93% of notifications in Los Angeles County
- 7% of notifications in Orange County
- No notifications in Riverside or San Bernardino County

Distance to Sensitive Receptor

- ~ 50% of events ≤1,500 feet from sensitive receptor
- All 14 hydraulic fracturing events >1,500 from sensitive receptor



Distribution of Well Activities Near Sensitive Receptors by City



469 Notices for Well Events <1,500 Feet from a Sensitive Receptor

Summary of Emissions Reporting

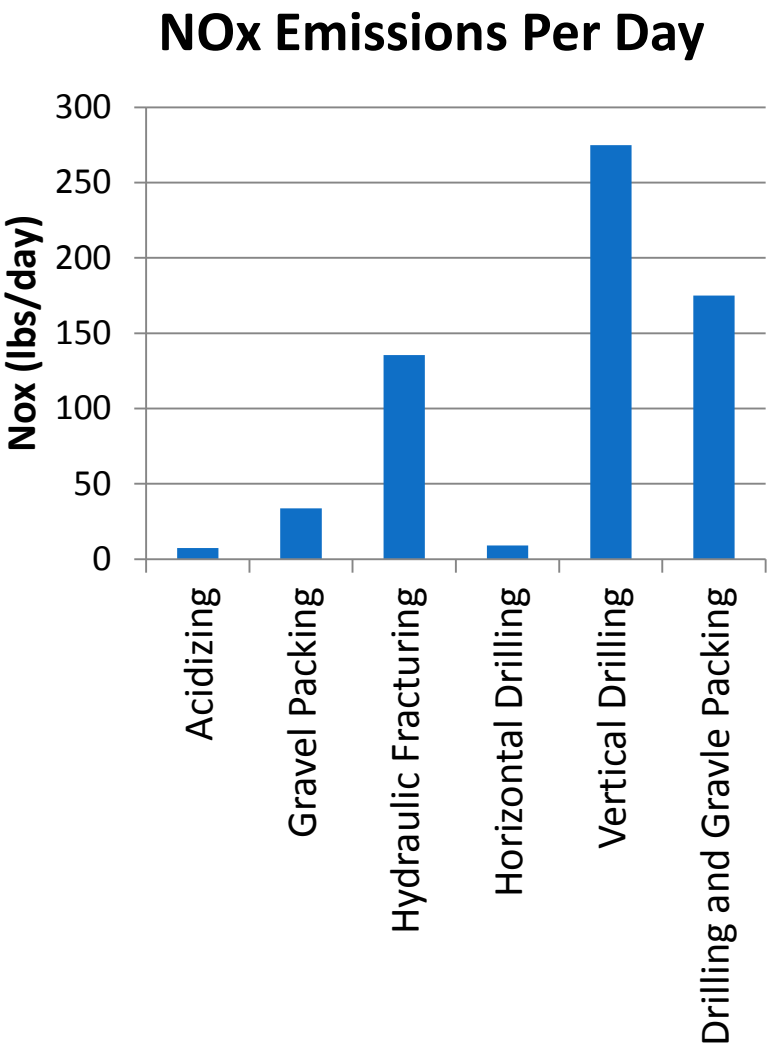
Emissions Reporting

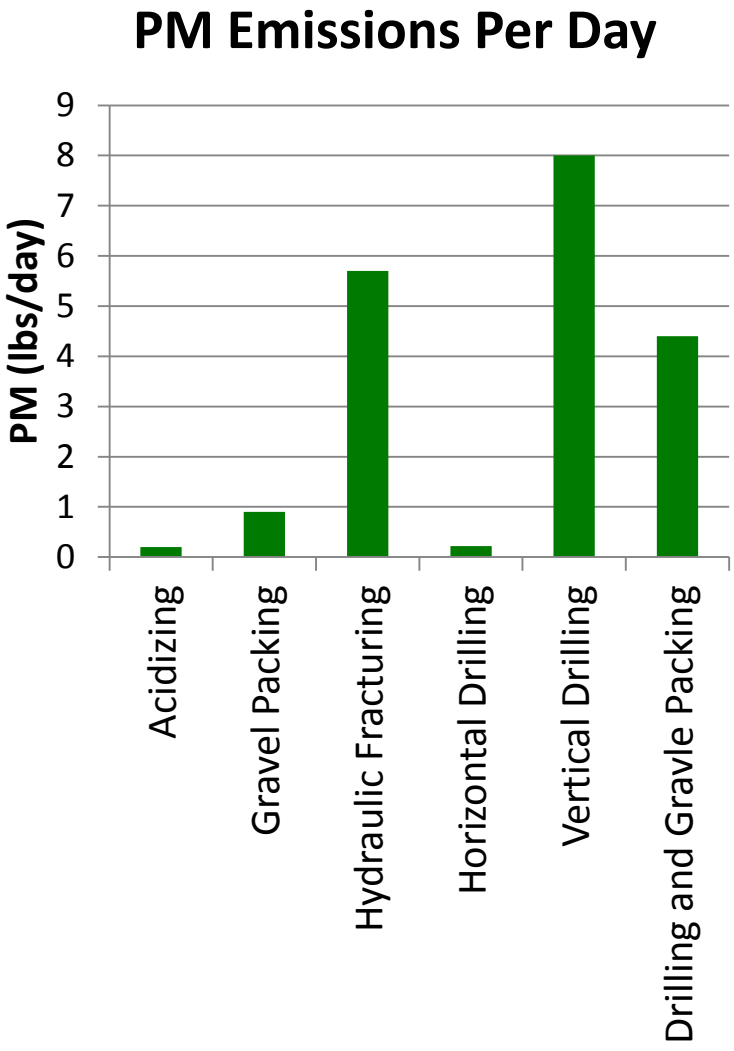
Calculated and analyzed combustion emissions

Analyzed reports for amount of dry materials used

Analyzed reports for flowback fluids

Average NOx and PM Emissions





Combustion Equipment Summary

	Average Engine Size (HP)	Average Operating Hours/ Event	Average Maximum Operating Hours/ Event*	Average Event Duration	Average Number of Engines
Vertical Drilling	566 HP	102 Hours	198 Hours	19 Days	11
Horizontal Drilling	451 HP	38 Hours	310 Hours	10 Days	7
Gravel Packing	495 HP	10 Hours	31 Hours	4 Days	6
Acidizing	460 HP	4 Hours	12 Hours	1 Day	2
Hydraulic Fracturing	960 HP	13 Hours	32 Hours	6 Days	8

* Individual engine maximum

Estimated Cancer Risk from Single Drilling Event

DRAFT Cancer Risk (Current Risk Assessment Methodology) (in a million)

	Distance to Receptor 100 Feet	Distance to Receptor 500 Feet	Distance to Receptor 1,500 Feet
Cancer Risk (90 lbs/event)	0.07	0.04	0.02
Cancer Risk (423 lbs/event)	0.26	0.14	0.08

DRAFT Cancer Risk (Revised Risk Assessment Methodology) (in a million)

	Distance to Receptor 100 Feet		Distance to Receptor 500 Feet		Distance to Receptor 1,500 Feet	
Age	<2 yrs	Adult	<2 yrs	Adult	<2 yrs	Adult
Cancer Risk (90 lbs/event)	1.65	0.03	0.82	0.02	0.50	0.01
Cancer Risk (423 lbs/event)	7.12	0.15	3.83	0.08	2.33	0.05

Flowback Fluids and Dry Materials Reporting

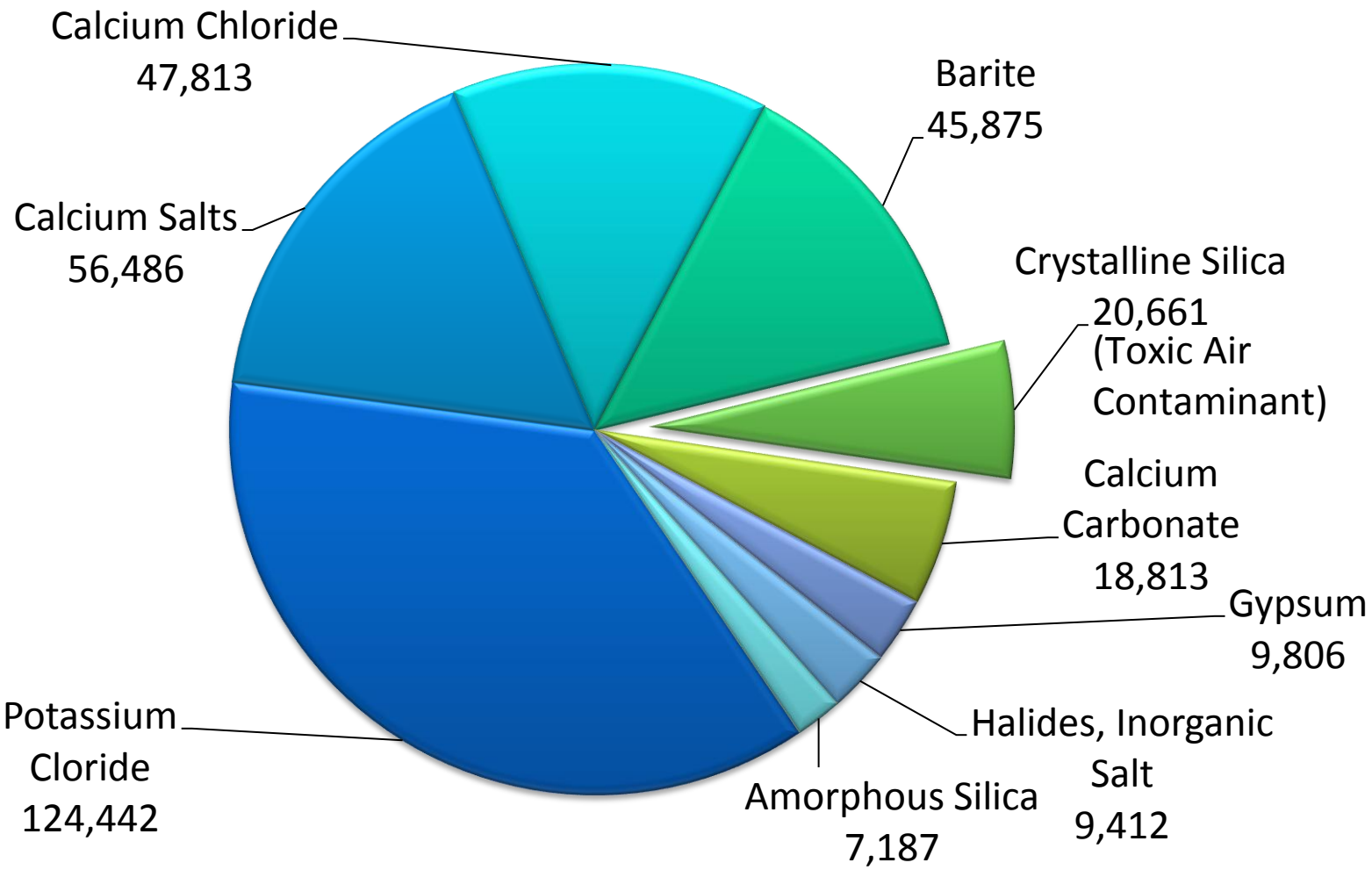
- Received 626 emission reports
- 9 events reported flowback fluid
  - Gravel packing and acidizing does not have flowback immediately after well treatments/stimulations
  - Low pressure in the formations found in the Basin
- 342 events reported dry materials
  - On average 140,000 lb of dry material
    - Alpine spotting beads
    - Bicarbonate of soda
    - Cement
    - Drilling Mud
    - Gravel Pack Sand
    - Magma Fiber
    - Potassium Chloride
    - Walnut Shells
    - Sawdust

Summary of Non-Trade Secret Chemical Reporting

Non-Trade Secret Air Toxic Chemicals Used in Well Activities

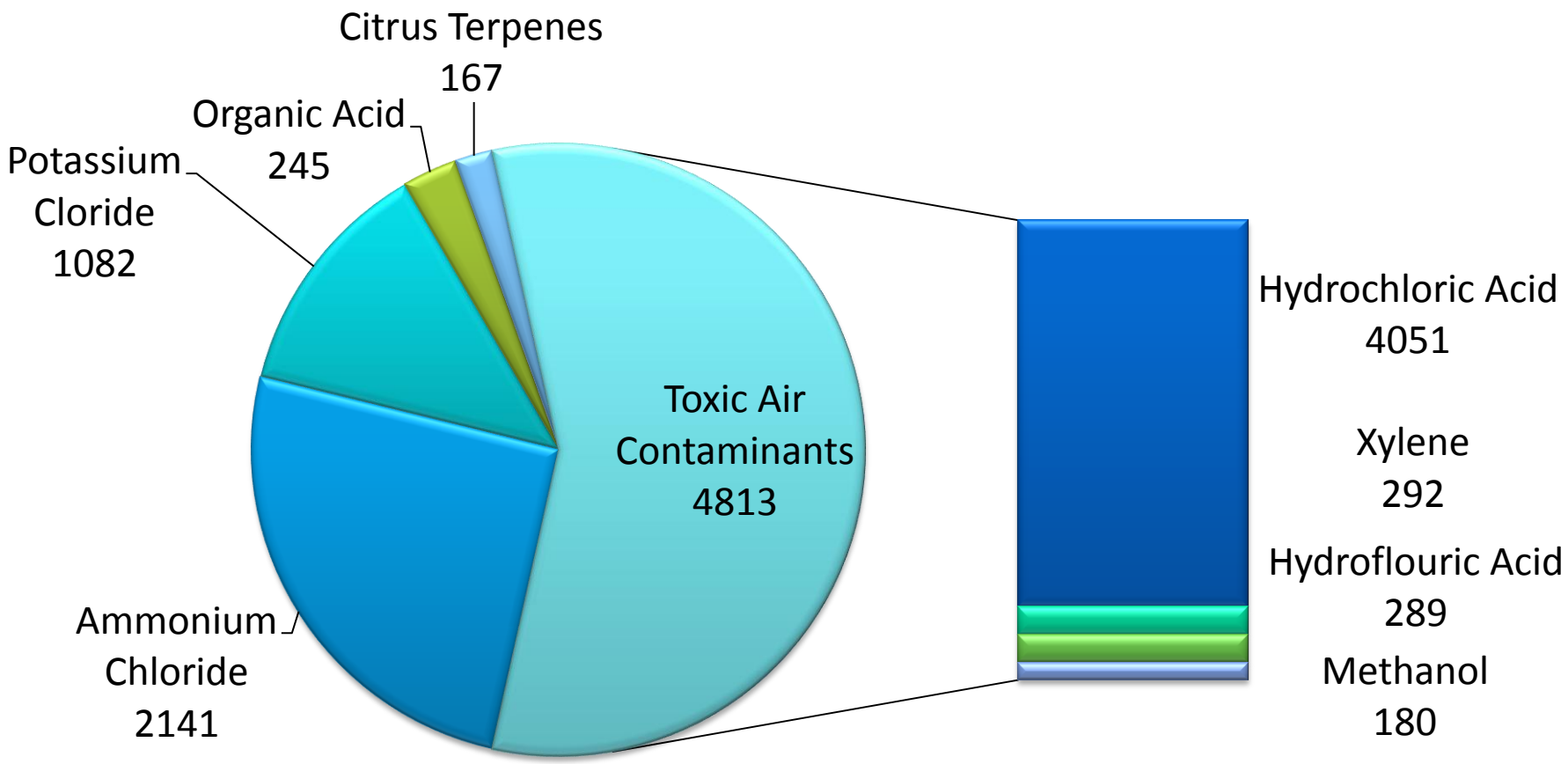
Chemical Ingredient	Acidizing	Drilling	Gravel Packing	Hydraulic Fracturing
Crystalline Silica		✓	✓	✓
Ethylbenzene	✓			
Ethylene Glycol	✓	✓	✓	✓
Formaldehyde	✓	✓	✓	
Glutaral		✓	✓	
Hydrochloric Acid	✓			
Hydrofluoric Acid	✓			
Methanol	✓	✓	✓	✓
Naphthalene	✓	✓	✓	
Phosphoric Acid		✓		
Sodium Hydroxide			✓	✓
Toluene	✓			
Xylene	✓			

Drilling
(Top 9 Chemicals Used (lbs))



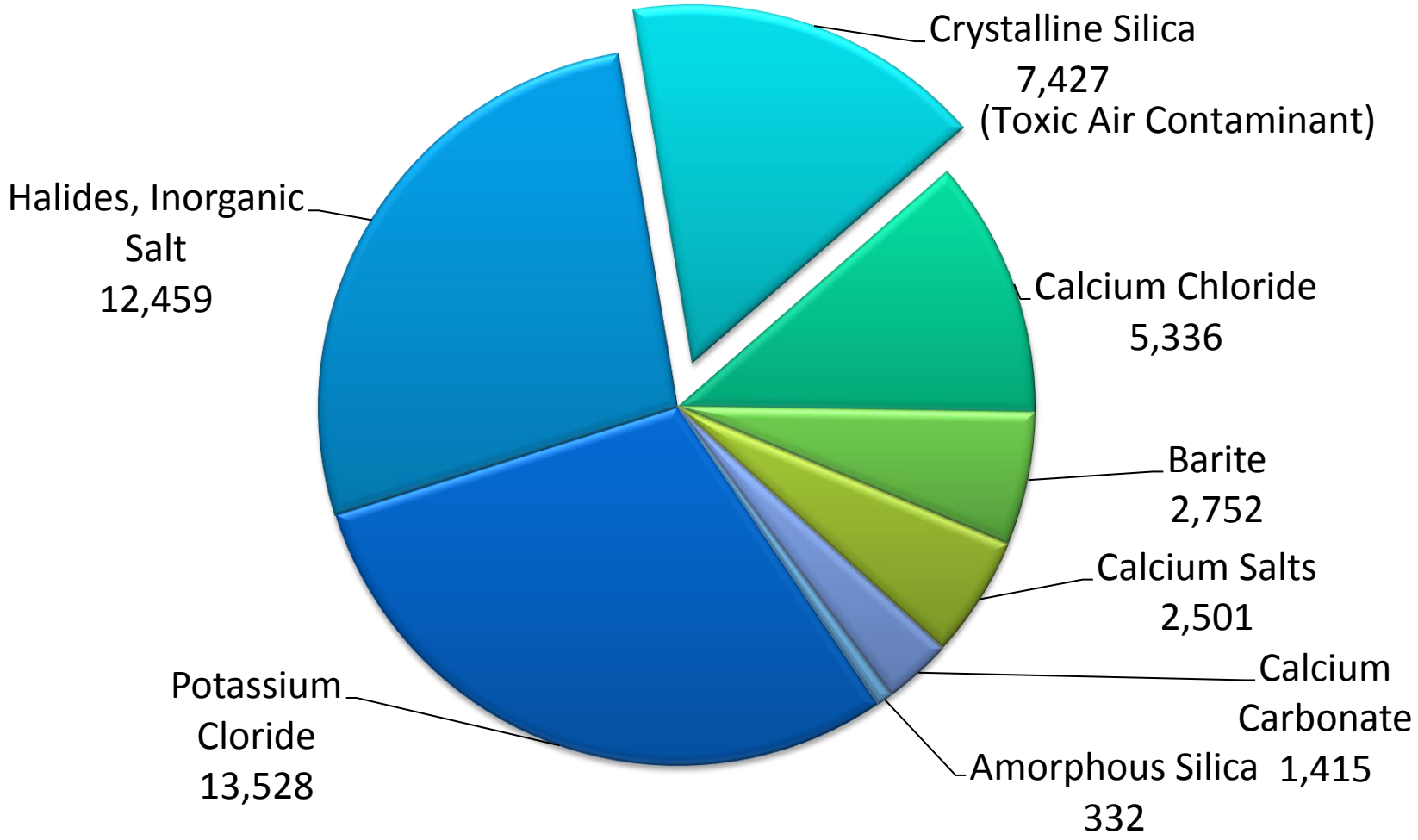
Average Non-Trade Secret Chemical Use
741,451 lbs of Water Used

Acidizing
(Top 8 Chemicals Used (lbs))



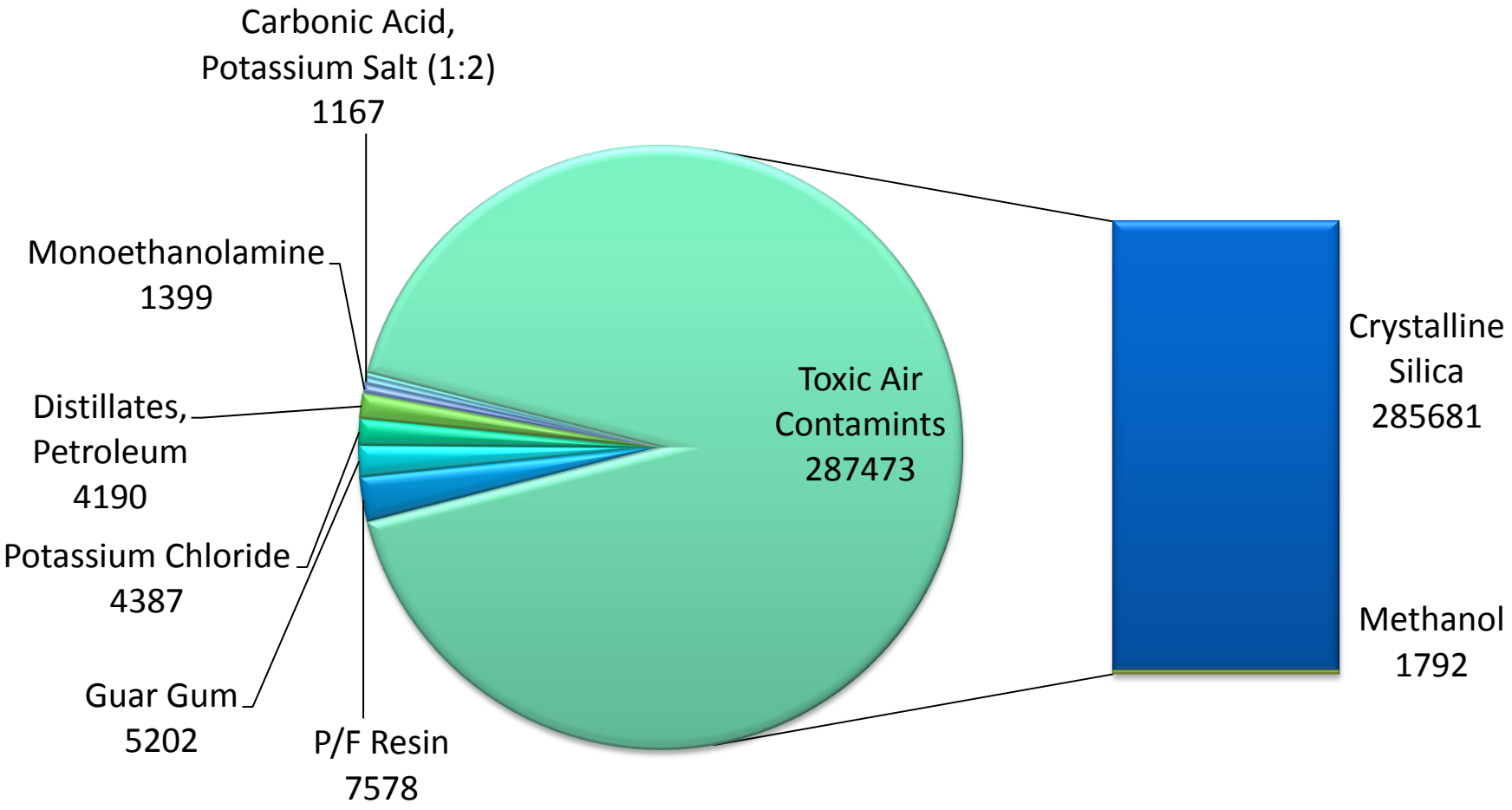
Average Non-Trade Secret Chemical Use
109,389 lbs of Water Used

Gravel Packing (Top 8 Chemicals Used (lbs))



Average Non-Trade Secret Chemical Use
62,582 lbs of Water Used

Hydraulic Fracturing (Top 11 Chemicals Used (lbs))



Average Non-Trade Secret Chemical Use Reported 2,044,054 lbs of Water Used

Summary of Observations, Monitoring, and Sampling

R1148.2 – Well Inspection Summary

- Since June 2013, SCAQMD staff conducted 104 inspections
  - 21 well drilling events
  - 14 hydraulic fracturing events
  - 44 acidizing events
  - 11 gravel packing events
  - 4 Misc. events
- Observations
  - Visible smoke at 13 inspections (13%)
  - Visible dust at 13 inspections (13%)
  - Noticeable odors at 10 inspections (10%)

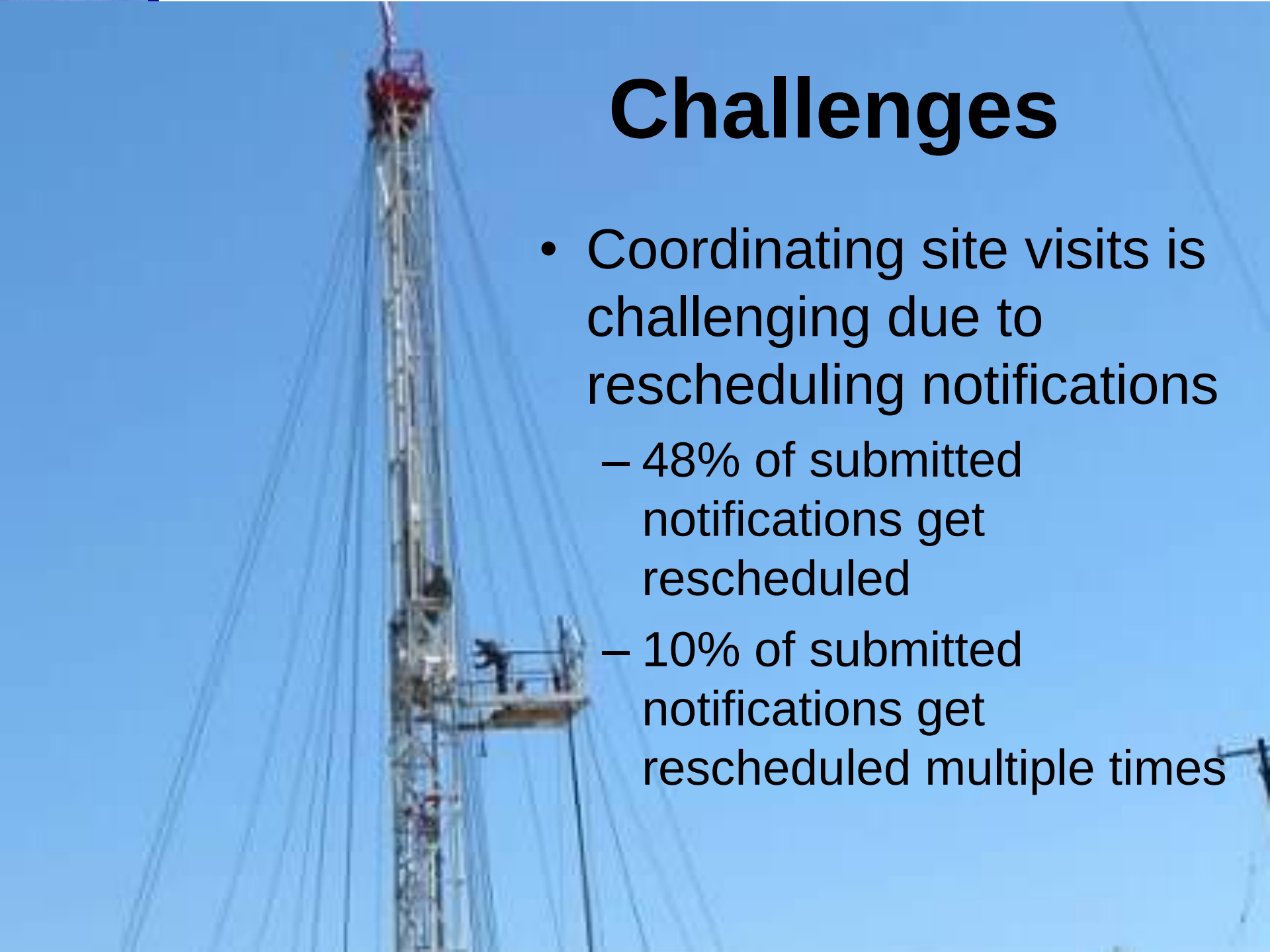
Sampling and Monitoring Equipment

Jerome Monitor (H_2S)

DustTrak Monitors (PM)

Summa canisters used to measure hydrocarbons

Sample vials and jars to test flowback fluids and drilling mud



Challenges

- Coordinating site visits is challenging due to rescheduling notifications
  - 48% of submitted notifications get rescheduled
  - 10% of submitted notifications get rescheduled multiple times

Monitoring and Sampling Results (July – October 2014)

Event	Event ID	Date	Handheld Results for PM and H_2S	Canister Results for Organics	Other Observations
Maintenance Acidizing	1934	7/15/14	• No elevated levels of PM10. • No elevated levels of H_2S.	No canister samples taken.	Diesel odors from engines used in well activities. Complaint reported to SCAQMD from the public.
Matrix Acidizing	2238	9/10/14	• No elevated levels of PM10. • No elevated levels of H_2S.	No elevated levels (typical ambient air range of 100-700 ppbc) of NMOCs.	Petroleum hydrocarbon odors 75 feet from subject well.
Gravel Packing	2329	9/25/14	• Slightly elevated levels of PM10 due to high wind speeds and dust from loose dirt roads. • No elevated levels of H_2S.	No elevated levels (typical ambient air range) of NMOCs.	Strong petroleum hydrocarbon odors at catch basin for return fluid (open to atmosphere).
Gravel Packing	2329	9/26/14	• No elevated levels of PM10. • No elevated levels of H_2S.	Elevated levels (900-2900 ppbc) of NMOC at catch basin.	Strong petroleum hydrocarbon odors at catch basin for return fluid (open to atmosphere).
Gravel Packing	2354	10/2/14	• No elevated levels of PM10, except for one short-term period of elevated levels due to road dust from vehicular traffic. • No elevated levels of H_2S.	Elevated levels (20 – 13,000 ppmvc) of NMOCs at open hatch of Adler tank for return fluids. Above thresholds for SCAQMD Rules 1148.1, 1166, 1173, 1176, and 1178.	Strong hydrocarbon odors from Adler tank for return fluids.
Drilling	2356	10/17/14	Pending	Pending	Pending

Sampling & Monitoring Return Fluids

- Sampled return fluids from two gravel packing events
  - Return fluid directly from well to Adler tank
  - Return fluid to interim open holding area prior to Adler tank
- Results:
  - Elevated levels of benzene, toluene, ethylbenzene, and xylene
  - Adler tank: NMOC 13,000 ppm
  - Interim holding area: NMOC 3,000 ppb
- Thresholds in SCAQMD Rules:
  - 500 ppm (R1148.1, R1176, R1178)
  - 1,000 ppm (R1166)
  - 50,000 ppm (R1173)

Observed Controls and Housekeeping Practices

Carbon canister drums connected to Adler tanks storing return fluid can reduce VOC emissions

Keeping hatches closed can reduce VOC emissions

Plastic sheet ground cover to capture liquid leaks and spills of gravel packing fluids and dry materials

Plastic tote instead of fabric tote for loading dry materials into hopper will minimize spillage of dry materials

Summary of Compliance Activities

Key Requirements for Operators and Chemical Suppliers

Operators

- Submit Emissions Reports within 60 days
- Submit Non-Trade Secret Chemical Report within 60 days
- Must provide specific non-trade secret chemical information

Primary Chemical Suppliers

- Submit Trade-Secret Chemical Report within 60 days
- Identified by Operator
- Must provide specific chemical information

Secondary Chemical Suppliers

- Submit Trade Secret Chemical Report within 60 days
- Identified by Primary Supplier
- Must provide specific chemical information

Overall Compliance Approach

Compliance Assistance

Description
Clarification needed for isolated situations

Example
Reports not completed correctly

Action
Consulted Two with Primary Chemical Suppliers

Compliance Advisories

Description
Clarification for system-wide problem

Example
Missing or inaccurate reporting

Action
Two Compliance Advisories Issued

Notices to Comply

Description
Non-compliance with a specific provision

Example
Failure to submit reports

Action
43 Notices to Comply Issued

Notices of Violation

Description
Persistent non-compliance

Example
Failure to respond to Notice to Comply

Action
No Notices of Violation have been issued

Next Steps

- Continue to collect and analyze data
- Continue compliance efforts
- In six months
  - Provide update to Working Group
  - Provide update, and findings and recommendations for potential future rulemaking to the Stationary Source Committee