



<http://blogs.dailybreeze.com/history/files/import/27572-chevonaerial-thumb-400x262.jpg>



<https://media.gettyimages.com/videos/oil-refinery-at-dusk-drone-shot-video-id1058837302?s=640x640>

# Proposed Amended Rule 1178 – Further Reductions of VOC Emissions from Storage Tanks at Petroleum Facilities

**WORKING GROUP MEETING 3**  
**DECEMBER 9, 2021**

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JOIN ZOOM MEETING  
[HTTPS://SCAQMD.ZOOM.US/j/93814044899](https://SCAQMD.ZOOM.US/j/93814044899)  
MEETING ID: 938 1404 4899  
TELECONFERENCE DIAL-IN: 1-669-900-6833

# Agenda

Summary of Working Group Meeting #2

Public Comment and Responses

Rule 1178 Inspection and Monitoring

Leak Detection Technology

Fluxsense Study

Next Steps

## Summary of Working Group Meeting #2

At Working Group meeting #2, staff:

- Presented information on:
  - Facilities subject to Rule 1178
  - Quantity and type of tanks subject to Rule 1178
- Compared Rule 1178 requirements to storage tank requirements of other agencies



# PUBLIC COMMENT AND RESPONSES

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## Comment #1

BAAQMD's Regulation 8, Rule 5 – Storage of Organic Liquids allows fixed roof tanks with vapor recovery for tanks with capacity  $\geq 39,626$  gallons storing liquids with TVP  $> 0.5$  psia

## Response

- BAAQMD's Regulation 8, Rule 5 – Storage of Organic Liquids requires pressure tanks or an approved emission control system that includes vapor recovery systems on fixed roof tanks



## Comment #2

Enhanced monitoring is needed to detect leaks and identify degrading storage tanks

### Response

- Technology assessment for PAR 1178 will include enhanced monitoring systems, including continuous monitoring systems

## Comment #3

Existing monitoring should be considered when assessing additional technologies

### Response

- Existing monitoring technologies at facilities will be evaluated for effectiveness of monitoring VOCs from storage tanks



# **RULE 1178 INSPECTION AND MONITORING**

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# Rule 1178 Inspection Methods

- Current inspection methods:



Visual inspections for holes, tears, visible gaps in seals



Gap measurements of rim seals and component seals



EPA's Method 21 – Determination of VOC Leaks on Components

- Inspection method and frequency dependent on roof type (next slide)



# Current Inspection Requirements

## Visual Inspections

Applies to: Domed external and internal floating roofs

Procedure: Visually inspect rim seal systems and roof openings for visible gaps, holes and tears

Frequency: Semi-annually

## Gap Measurement Inspections

Applies to: All floating roofs

Procedure: Use probe to determine if rim seals and roof openings meet gap requirements

Frequency: Semi-annually (external floating roofs) and at least once every 10 years (domed external and internal floating roofs)

# Current Inspection Requirements *(continued)*

## EPA Method 21

Applies to: Fixed roofs (optional for external floating roofs)

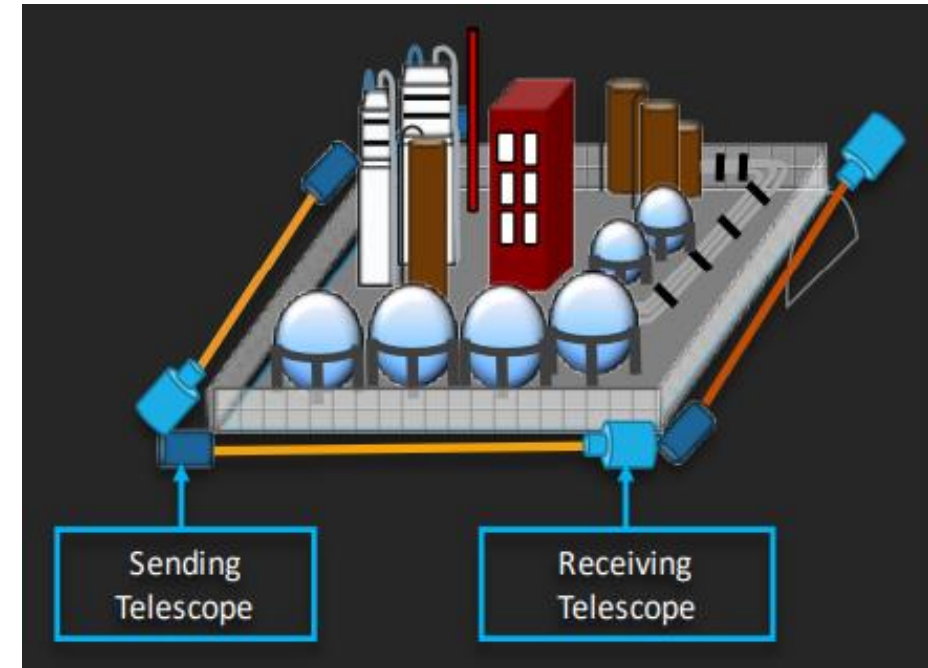
Procedure: Certified person uses portable device to detect and measure VOC emissions from roof openings or performs alternative soap test method

Frequency: Quarterly (fixed roof), Semi-annually (external floating roofs-optional)

## Rule 1180 – Refinery Fenceline and Community Air Monitoring

- Applies to petroleum refineries
- Requires facilities to submit plan to implement real-time fenceline air monitoring system
- Several pollutants required to be continuously monitored – VOCs included
- Air pollutant levels data collected and shared with public
  - Current data is viewable at [aqmd.gov](http://www.aqmd.gov) on the *Rule 1180 Community Air Monitoring* page or the following link:

<http://www.aqmd.gov/home/rules-compliance/rules/support-documents/rule-1180-refinery-fenceline-monitoring-plans/rule-1180-community-air-monitoring>



# Enhanced Leak Detection and Repair

- Staff assessing current practices
  - Rule 1178 requirements
  - Other rule requirements such as fenceline monitoring
  - Voluntary monitoring conducted by facilities
- Staff exploring technologies with potential to improve leak detection and repair timelines

The background of the slide is a photograph of several large, cylindrical industrial storage tanks, likely for oil or gas, arranged in a row. The image is covered with a semi-transparent green filter. Overlaid on this is the title text in white, bold, sans-serif font. A thin white horizontal line is positioned below the title.

# LEAK DETECTION TECHNOLOGY



# Leak Detection Devices

- Portable gas analyzers required by Rule 1178 to detect leaks on fixed roofs
- Other gas detection technology available with ability to detect leaks from all tank types
  - Fixed gas sensors
  - Optical gas imaging cameras
  - Open path detection devices



Fixed gas monitors



Optical gas imaging cameras



Open path detection devices

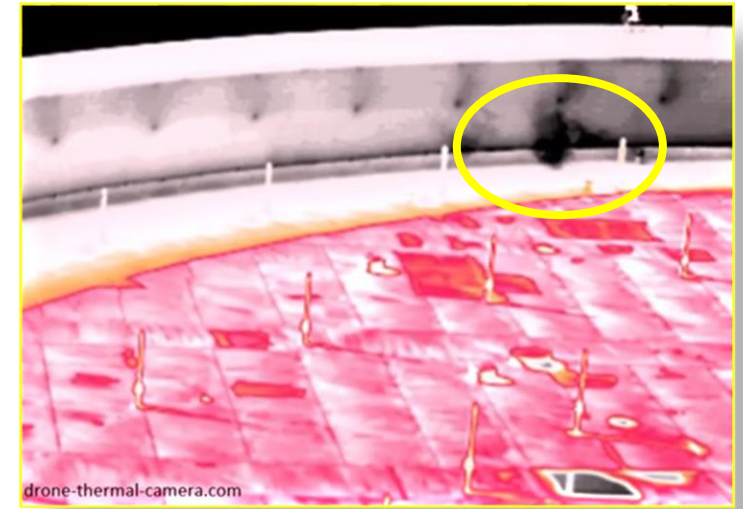
# Portable Gas Analyzers

- Gas analyzers are required by EPA Method 21 to determine a VOC leak
- Advantages
  - Detection limit: <1 ppm
  - Measures concentration
  - Low equipment costs
- Limitations
  - Short range
  - Not continuous
  - Time consuming (~500 components/day)
  - Possible error in identifying leaking component
  - Not efficient for finding large leaks
  - Inability to access all sources of leaks



# Optical Gas Imaging Cameras

- Advantages
  - Long range (>100 m)
  - Continuous monitoring option
  - Measures flowrate (some models)
  - Less time consuming (~10,000 components/day )
  - Ability to pinpoint leaks
  - Efficient for large leaks
  - Can identify leaks in inaccessible areas
  - Video records of leaks
- Limitations
  - Detection limit: >2,500 ppm
  - Inability to measure concentration
  - Weather may affect effectiveness
  - High equipment costs



# Optical Gas Imaging Cameras

## Identify Leaks

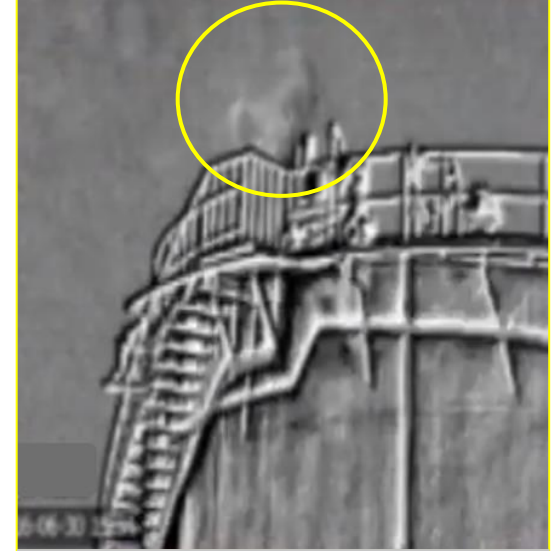
- Optical gas imaging devices produce images of vapors not seen with a naked eye
- Leak sizes estimated by vapor cloud image size

## Quantifies Leaks

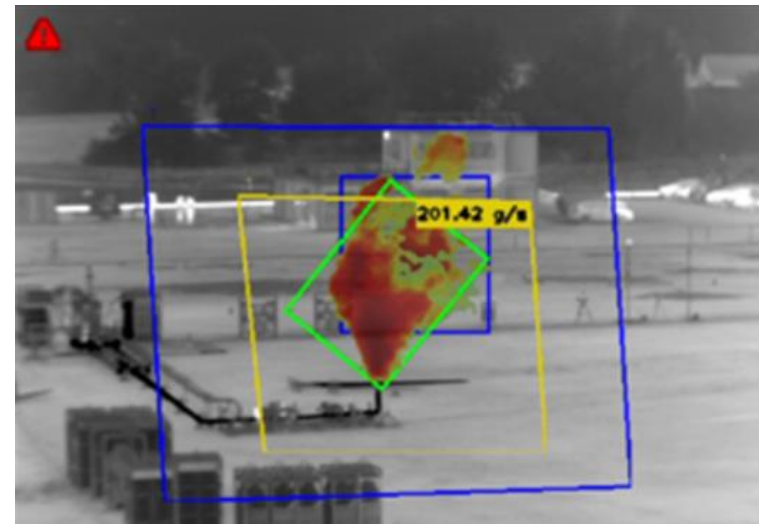
- Some optical gas imaging devices can measure flowrate of a leak



Naked Eye



OGI Camera





# Optical Gas Imaging Cameras

## Platform Variety

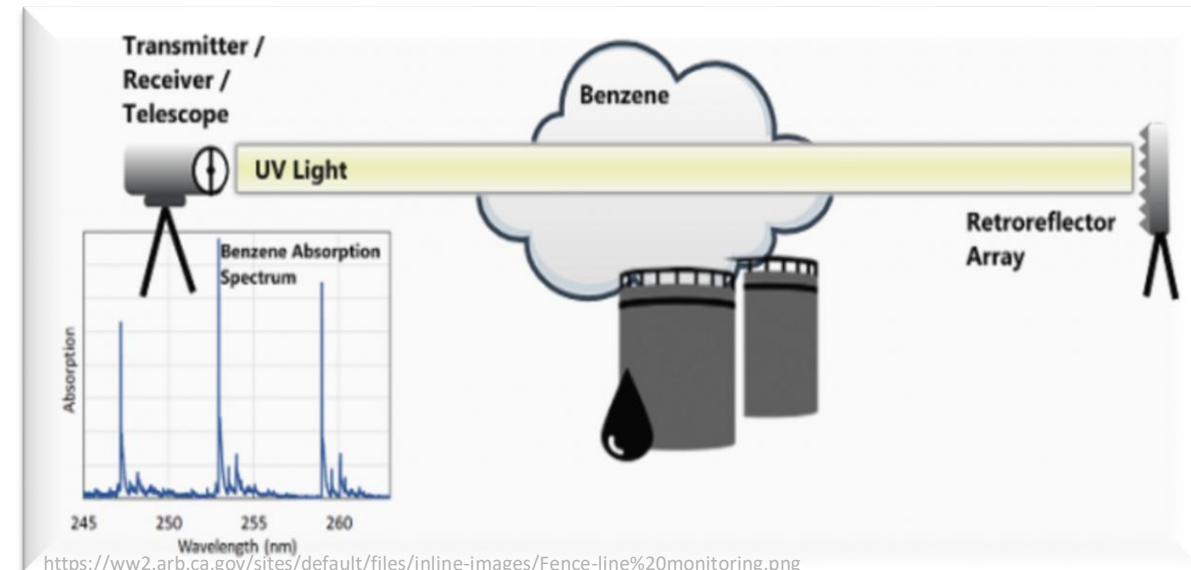
- Optical gas imaging devices can be used on different platforms to suit monitoring needs
  - Portable handheld
  - Drone
  - Stationary with pan and tilt option





# Open Path Detection Devices

- Open path detection devices produce a beam across an area and alert when emissions interfere with beam
- Advantages
  - Detectable limit: ppb level
  - Long range (300m)
  - Continuous monitoring
  - Measures gas concentrations
  - VOC speciation
- Limitations
  - Gas must reach light path
  - Cannot directly identify source of emissions
  - Weather may affect effectiveness
  - High equipment costs



# Stationary Gas Sensors

- Stationary or portable devices that detect gas once in contact with sensor
- Advantages
  - Detectable limit: <1 ppm
  - Continuous monitoring
  - Measures gas concentrations
  - VOC speciation
- Limitations
  - Gas must reach sensor
  - Cannot directly identify source of emissions
  - High operating and maintenance costs





# FLUXSENSE STUDY

# 2015 OPTICAL REMOTE SENSING DEMONSTRATION STUDY

Fugitive emissions from large refineries in Project 1



Fugitive emissions from gas stations, oil wells, and other small point sources in Project 2





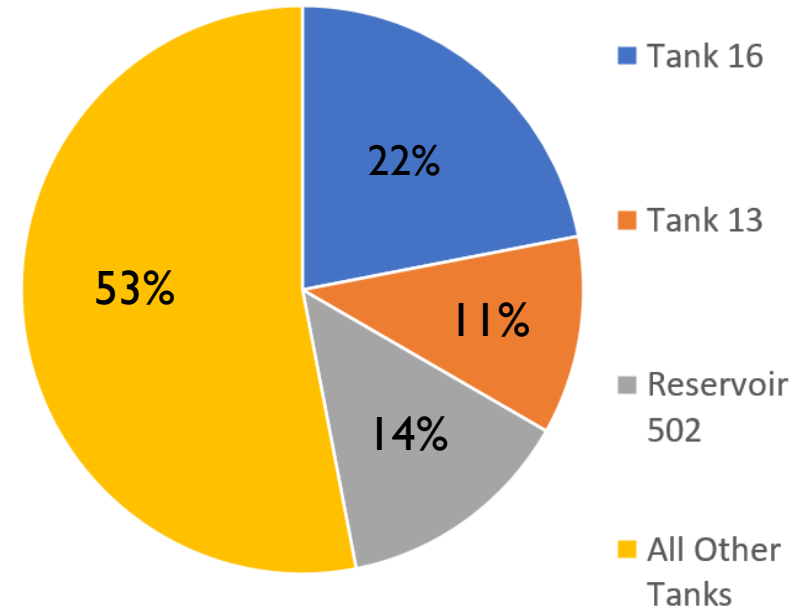
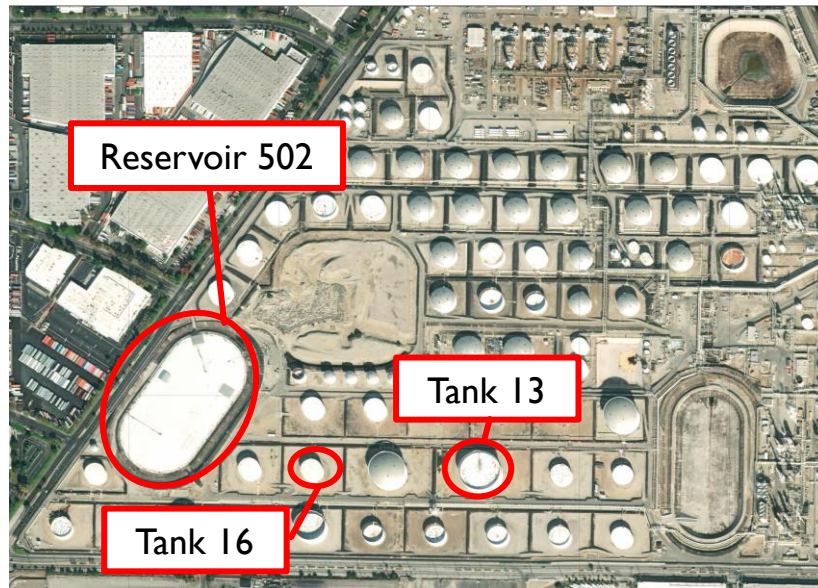
# MOBILE OPTICAL REMOTE SENSING: PRINCIPLE OF OPERATION





# PROJECT I SUB-STUDY

## VOC EMISSIONS FROM A REFINERY TANK FARM



- 8 days measurement study (September 28 – October 7, 2015)
- 24 individual tanks sampled
- Average tank farm VOC emissions were approximately 50% of total measured refinery emissions
- Tanks 16, 13, 502 comprised approximately 25% of total measured refinery emissions

# PROJECT 2 RESULTS

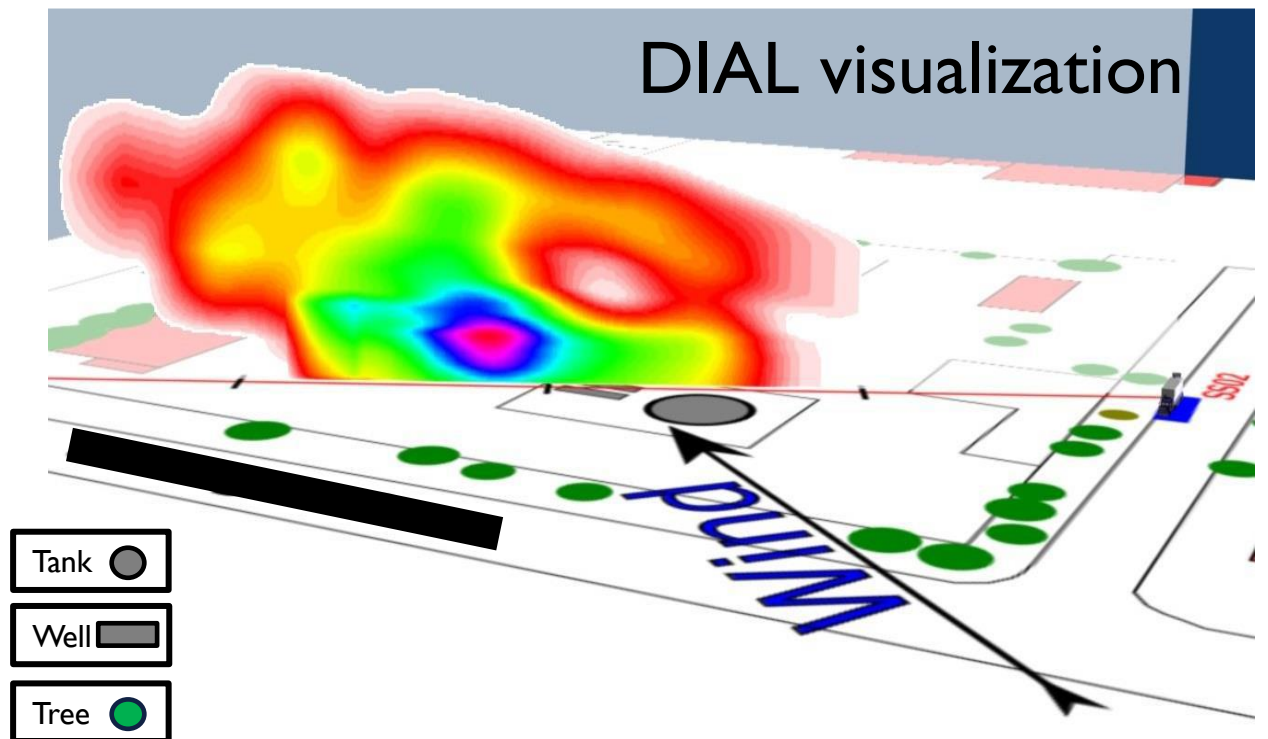
## SMALL OIL TREATMENT FACILITY



- September 1 – November 15, 2015
  - Sampled approximately small 60 sources
  - Maximum instantaneous concentrations measured during mobile measurement survey:
    - VOC (Alkanes): 3320 ppb
    - Benzene: 21 ppb\*
- \*Typical benzene range: 0.1 - 1.8 ppb

# PROJECT 2 RESULTS

## SMALL OIL TREATMENT FACILITY



Most of the measured emissions are likely from the main storage tank at this facility



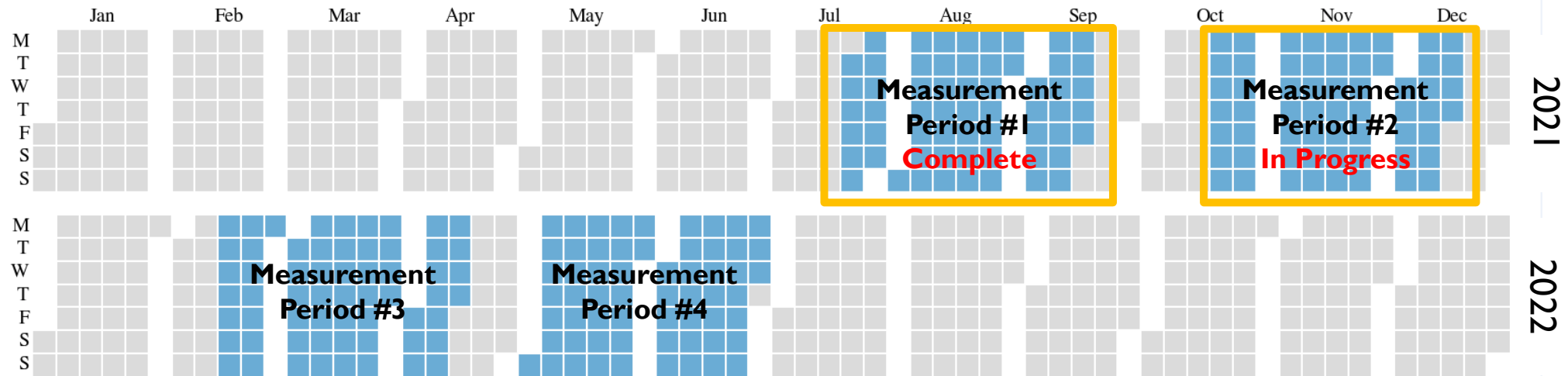
## CONCLUSIONS OF ORS TECHNOLOGY

ORS techniques provide:

- Characterization and quantification of certain industrial emissions
- Fenceline monitoring
- Identification of potential leaks
- Real-time notification system

# CURRENT STUDY

## BASELINE VOC REFINERY EMISSIONS (AB 617 PROGRAM)



- Four 2-month measurement periods distributed over July 2021 through June 2022
- Minimum of five valid measurement days for each facility
- Highly localized wind data measured near refinery



## Next Steps



- ☐ Technology costs
- ☐ Rule concepts
- ☐ Working Group  
Meeting #4

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To receive e-mail notifications for Rule 1178 – Further Reductions of VOC Emissions from Storage Tanks at Petroleum Facilities, sign up at: **[www.aqmd.gov/sign-up](http://www.aqmd.gov/sign-up)**