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

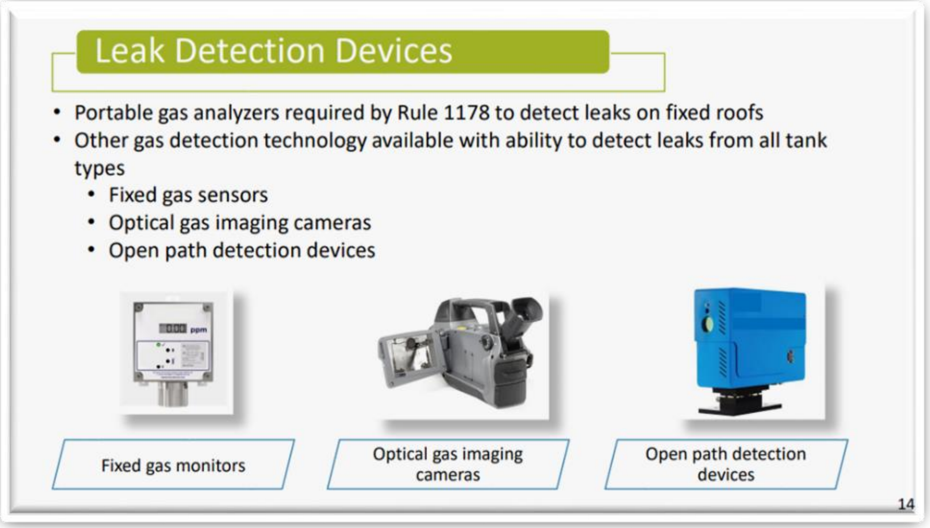
WORKING GROUP MEETING 4
MARCH 24, 2022

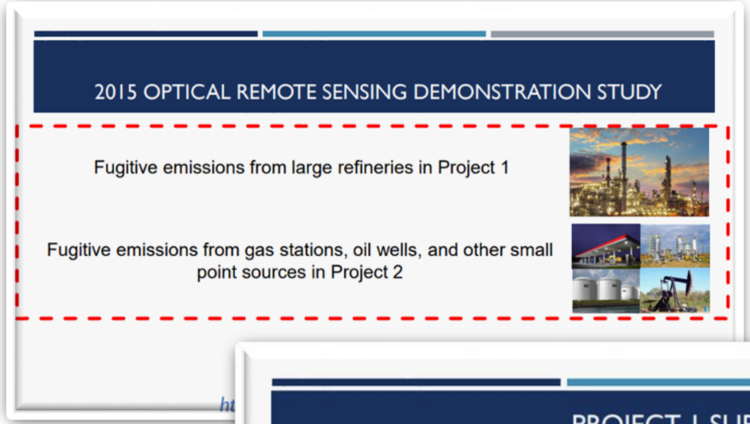
JOIN ZOOM MEETING
HTTPS://SCAQMD.ZOOM.US/J/93814044899
MEETING ID: 938 1404 4899
TELECONFERENCE DIAL-IN: 1-669-900-6833

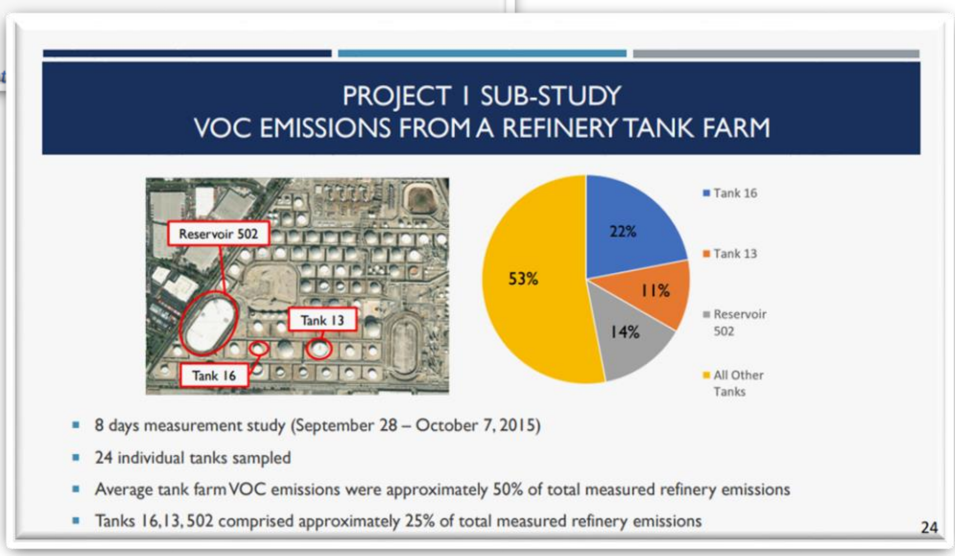
Summary of Working Group Meeting #3

At Working Group meeting #3, staff presented information on:

- Early leak detection technologies
- 2015 Fluxsense Study







Agenda

- Public Comments and Responses
- Control Technology
- Enhanced Leak Detection Methods
- Emission Reduction Methodology
- Next Steps

PUBLIC COMMENTS AND RESPONSES

Comment Letter

- On December 6, 2021, 6 environmental organizations submitted a collaborative comment letter[1] providing feedback on Rule 1178 development
  - Organizations include Earth Justice, Coalition for Clean Air, California Communities Against Toxics, East Yard Communities for Environmental Justice, Sierra Club, Center for Biological Diversity

Comments addressed on slides 6-8

[1]Available on the Proposed Rule 1178 website, at http://www.aqmd.gov/home/rules-compliance/rules/scaqmd-rule-book/proposed-rules/rule-1178

Impact from Storage Tanks and Measures to Reduce Leaks

Comment	Response
▪ Leaking storage tanks are harmful and disproportionally impact low income communities	▪ Staff acknowledges storage tanks may emit vapors that affect health ▪ Amendments to Rule 1178 proposed in response to community concerns expressed in AB 617 meetings ▪ Goal of PAR 1178 is to reduce emissions from storage tanks throughout district and in AB 617 communities
▪ Amendments to PAR 1178 must include preventative and remedial measures to reduce leaks	▪ Staff is exploring areas of improvement in Rule 1178 including preventative and remedial measures to reduce leaks (e.g., gap allowances, doming, early leak detection)

Require Best Available Emission Control Technologies

Comment	Response
▪ Require internal floating or domed external floating roofs	▪ Staff is analyzing the feasibility, associated emissions reductions and costs for these methods of control ▪ Cost effectiveness will be determined for feasible technologies and methods with emission reduction benefit
▪ Require cable suspended floating roofs	
▪ Require vapor recovery systems with at least 98% control efficiency	
▪ Require secondary seals	
▪ Adopt stricter gap requirements	▪ Staff is analyzing the emission reduction benefit of stricter gap requirements

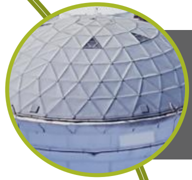
Require Best Available Monitoring Technology

Comment	Response
▪ Require the use of updated monitoring technology such as optical gas imaging	▪ Staff recognizes the benefit of advanced leak detection technology ▪ Staff is presenting leak detection methods and costs in later slides
▪ Increase inspection frequency (at least monthly)	▪ Cost effectiveness analysis will be conducted for increasing current inspections ▪ Costs presented in later slides
▪ Require re-inspections and third-party audits on leak repairs	▪ Staff is exploring services available from third-party monitoring companies ▪ Services and costs presented in later slides
▪ Adopt stricter leak thresholds	▪ Leak thresholds will be evaluated depending on the monitoring technology

CONTROL TECHNOLOGY

Control Technologies

- Staff identified control technology with potential to reduce emissions



Domes

Cable suspended floating roofs

Proximity switches

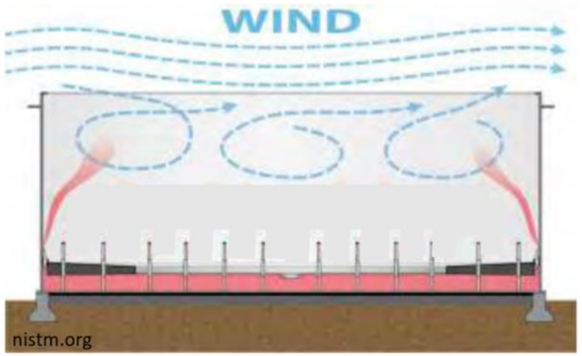
Advanced pressure vacuum vents

- Staff to assess vapor recovery systems in later presentation

Domes

Fixed structure reduces emissions from external floating roof tanks by minimizing effects from wind causing vapors to be carried out of tank

- ~70%-75% reduction in standing losses*



Costs

- Costs for materials, installation and shipping
- Other construction costs may apply

Tank diameter (ft)	Cost ($)
30 – 50	40,000 – 65,000
>50 – 100	65,000 – 225,000
>100 – 160	225,000 – 450,000
>160 – 200	450,000 – 715,000
>200 – 275	715,000 – 1,400,000

*Based on TankESP PRO software calculation for doming external floating tanks of various sizes storing crude oil with RVP 6 – RVP 9 at 80 °F, located in Los Angeles County, with standard deck fittings and seals

Cable Suspended Floating Roofs

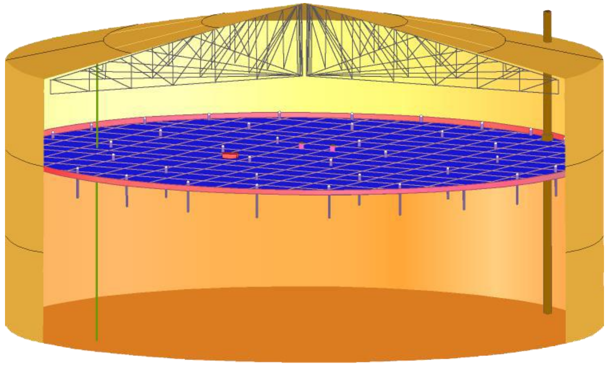
Reduce emissions from internal floating roofs by eliminating floating roof leg penetrations providing openings in floating roof

- Can be retrofit to some tanks depending on existing floating roof and fixed roof material and structure
- ~35% reduction in standing losses*

Floating roof with cable suspension system

Costs

- Equipment and installation:
  - $200,000 – New floating roof with suspension system
  - $70,000 – Cable suspension retrofit to existing floating roof



Floating roof with leg penetrations

* Based on TankESP PRO software calculation for eliminating roof legs on internal floating roof tank 70', 90' and 117' in diameter and 40' to 50' high, storing gasoline with RVP 6 and RVP 10, crude RVP 6 and RVP 10, jet kerosene at 80 °F, located in Los Angeles county, with standard deck fittings and seals

Proximity Switches

Reduce emissions from roof components not properly closed (i.e., open/unlatched hatches, malfunctioning vents)

- Alerts facility staff when switch detects open covers or vents

Examples of proximity switches

Costs

- $1000 – $2,000 per tank
  - Switch, transmitter, receiver and power
- Labor and construction costs may apply

Advanced Pressure Vacuum Vents

Reduced leak rates compared to other pressure vacuum vents

Industry leak rate: 1.0 scfh @ 90% of set pressure

Advanced leak rate: 0.1 scfh @ 90% of set pressure

Costs

- New install:
  - $8,000 – $12,000 (equipment)
  - $400 – $1,600 (labor[*])
  - $1,000 (crane rental)
- Retrofit kits available for certain existing pressure vacuum vents
  - $1,500 – $4,000 (retrofit)
  - $400 – $1,600 (labor[*])

PRD with proximity switch and transmitter

* Assumes 4 workers paid an hourly rate of $100 and 1 - 4 hours of work

ENHANCED LEAK DETECTION METHODS

Enhanced Leak Detection Methods

- Staff identified 4 methods to improve leak detection at facilities

- Continuous monitoring systems

- Optical gas imaging self inspections

- Third party inspections
- Increased inspection frequency

Continuous monitoring systems, Optical gas imaging self inspections, Third party inspections: 3 applications for optical gas imaging

Third party inspections: Inspections performed by non-facility personnel

Increased inspection frequency: Performed by facility personnel

- Costs are discussed for each method of leak detection
  - Some methods may result in cost savings

Continuous Monitoring Systems

- 3 technologies with ability to continuously monitor storage tanks for leaks
  - Each technology has advantages and disadvantages (discussed in last Working Group meeting)

Costs

Gas Sensors

- Equipment + install:
  $1,800/unit
- O&M: $4,800/unit/year
  (costs include automated LDAR reports)

Optical Gas Imaging

- Equipment:
  $60,000-$100,000 per camera
- Install:
  50%-150% cost of equipment
  (depending on existing infrastructure)
- O&M:
  $5,000 per year per camera

Open Path Detection

- Equipment:
  $180,000 per unit
- Install:
  Undetermined at this time
- O&M:
  Undetermined at this time

Optical Gas Imaging Self Inspections

- Optical gas imaging devices can enhance current visual and EPA Method 21 inspections
  - Increase effectiveness of inspection
  - Inspections of hard or unsafe to access areas (i.e., floating roof seals)
- Incorporating optical gas imaging may allow for modification to other requirements such as visual inspections and gap measurements

Costs

- Equipment: $100,000 per camera (operator training may be additional cost)
- Labor costs:

Inspection type	# Workers	Hourly wage	Tanks per hour	Cost per tank
Optical gas imaging	1	$100/person	4	$25

Third Party Inspections

- Monitoring services available to perform leak surveys
- Monitoring services provide:
  - Leak surveys with one or more leak detection technologies (OGI, TVA)
  - Leak reports
  - Repair tracking systems
  - Follow up monitoring on leaking components
  - Experienced technicians
  - Quantification with high flow samplers

Costs

- $1,000/day, 10-20 tanks per day
  - Includes leak detection with OGI and TVA measurements
  - Costs may vary depending on individual facility needs (e.g., facility requires quantification)

Increased Inspection Frequency

- Increased inspections have potential to identify leaks earlier
- 3 inspections method currently required and vary depending on tank
  - Gap measurements
  - Method 21
  - Visual and LEL readings

Costs

- Equipment: No additional equipment
- Labor costs:

Inspection type	# Workers	Hourly wage	Tanks per hour	Cost per tank
Gap measurements	4	$100/person	1	$400
Method 21	2	$100/person	2	$100
Visual inspections + LEL readings	1	$100/person	4	$25

Existing Monitoring at Facilities

- 7 refineries subject to Rule 1178 implement fenceline monitoring
  - Does not apply to refineries with capacity of less than 40,000 barrels per day
- Fenceline monitoring currently not required for other Rule 1178 facilities (small refineries, bulk storage and bulk loading)

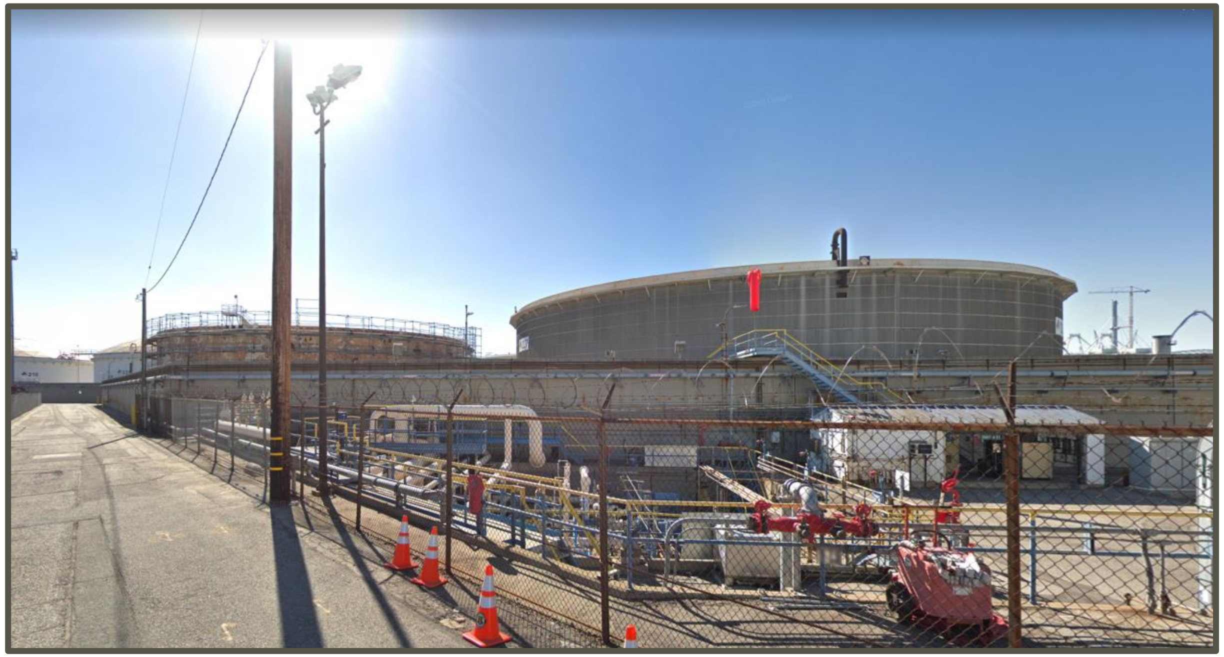
Tank Location	Number of Tanks
At refineries with fenceline monitoring	645
At other facilities	464

- Staff assessing capability of fenceline monitors or other existing monitoring devices to detect leaks from storage tanks
- Staff seeking information from facilities on:
  - Leaks from storage tanks detected by fenceline monitors
    - Leaks identified during inspections
    - Other leaks identified by fenceline monitors

Facility Site Visits

- Staff is conducting site visits at refineries, bulk storage and loading terminals
  - 2 refineries and 1 storage facility have been visited
  - Viewed a variety of tanks including external floating, domed external floating, internal floating and fixed roof tanks

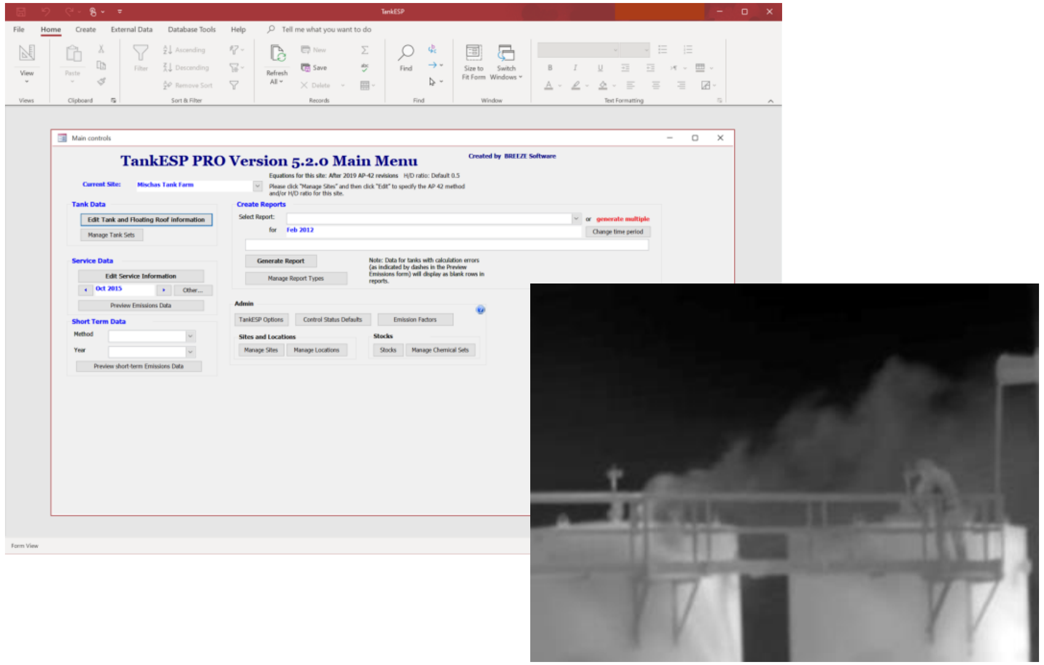
- Staff obtaining information on existing control technologies such as vapor recovery systems, seals and other control devices, and fenceline monitoring
- Staff plans to conduct additional site visits at facilities affected by rule



EMISSION REDUCTION METHODOLOGY

Calculating Emission Reductions

- Emission reductions needed to determine cost effectiveness of implementing leak detection methods or emission controls



- Emission calculating programs can calculate reductions based on tank specifications such as the addition of a dome or vapor recovery
- Emission calculating programs do not account for leaks that may occur

- Staff identified methodologies to quantify emissions from leaks to determine cost-effectiveness of leak detection technology or emissions controls

Emission Reduction Methods

- Some emission reductions can be quantified using TanksESP with assumptions
  - Doming external floating roof tanks
  - Installing cable suspended internal floating roofs
- Some emission reductions can be quantified by using engineering calculations
  - Installing proximity switches
  - Installing advanced pressure vacuum vents
- Staff in process of developing methodology to quantify emissions from leaks
  - Emission reductions from implementing enhanced monitoring may consider information from tank emission studies and leak reports

Next Steps

- ❑ Technology Assessment
  - ❑ Vapor recovery
  - ❑ Secondary seals
- ❑ Other Requirements
  - ❑ Gap allowances
- ❑ Cost Effectiveness
  - ❑ Leak detection implementation
  - ❑ Emission reducing technology
- ❑ Site Visits
- ❑ Working Group Meeting #5

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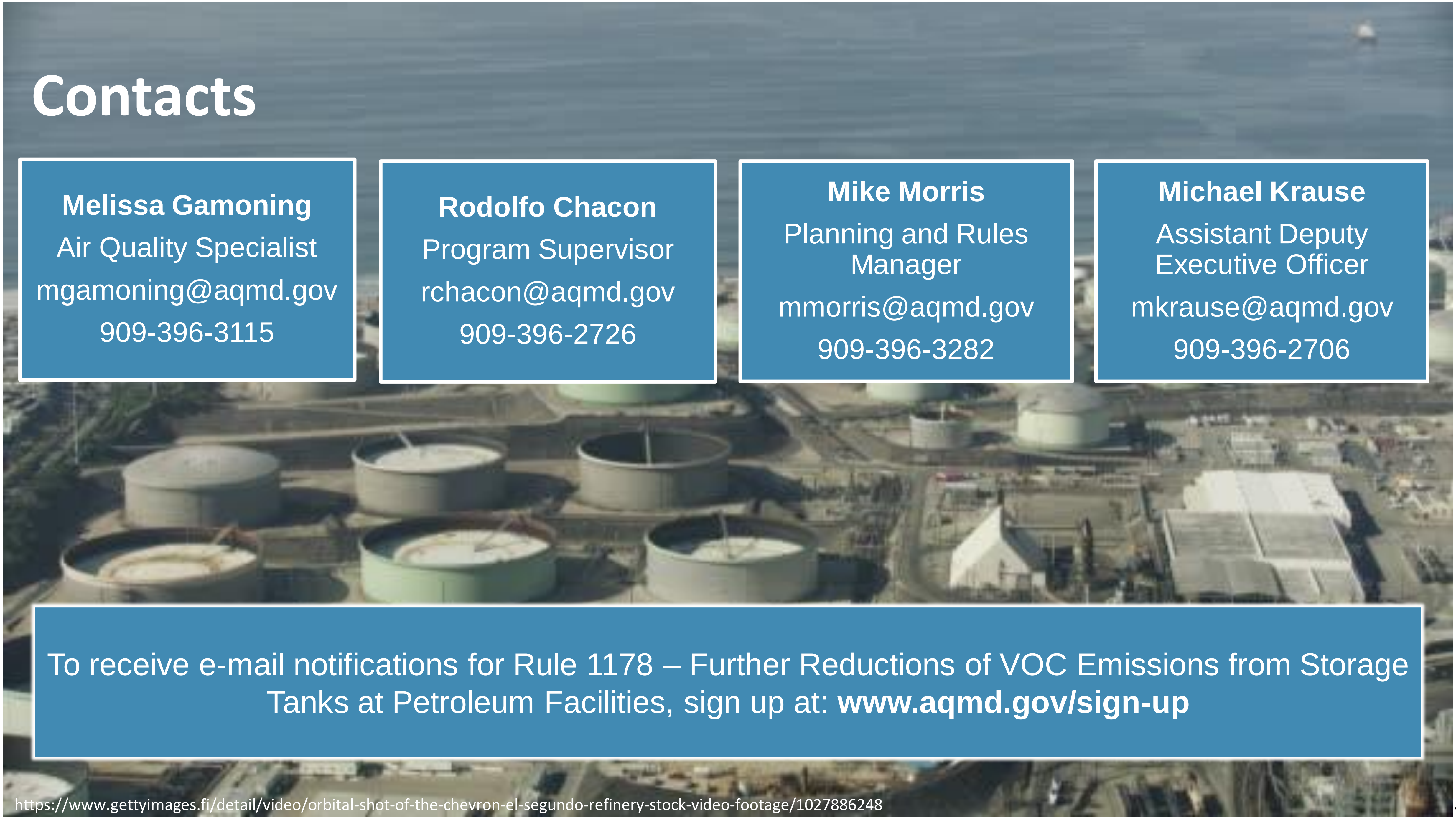

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