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

WORKING GROUP MEETING 1
MARCH 17, 2021

JOIN ZOOM MEETING:
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MEETING ID: 992 6123 6780, PASSCODE: 990974
TELECONFERENCE DIAL-IN: 1-669-900-6833

Agenda

- Background
- Tanks Regulated Under Rule 1178
- Rule Development Process
- Next Steps

BACKGROUND

Rule Background

- Rule 463 was adopted in 1977 to reduce VOC emissions from organic liquid above-ground storage tanks
  - Requirements for roof type, inspection, maintenance, reporting and recordkeeping
- Rule 1178 adopted on December 21, 2001 to further reduce VOC emissions from storage tanks at larger, higher emitting facilities
- Subsequent amendments to Rule 1178 addressed specific issues
  - 2006 – Allow alternative for drain cover, modified seal requirement, update inspection form, clarify compliance schedule
  - 2018 – Requirements for flexible enclosure systems, require repairs/replacements conducted within 72 hours, clarify report submissions
  - 2020 – Allow certain operators to accept permit condition limiting vapor pressure in lieu of installing domed roof

About Proposed Amended Rule 1178

- Rulemaking to focus on developing an enhanced leak detection and repair (LDAR) program to address emissions from storage tanks
- Explore technology and methods for early detection
  - Gas imaging devices
  - Continuous gas monitoring devices
  - Automated systems
- This meeting is the first Working Group Meeting as part of the rule development process

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https://www.projectcanary.com/wp-content/uploads/2019/03/facebook-share-image.jpg
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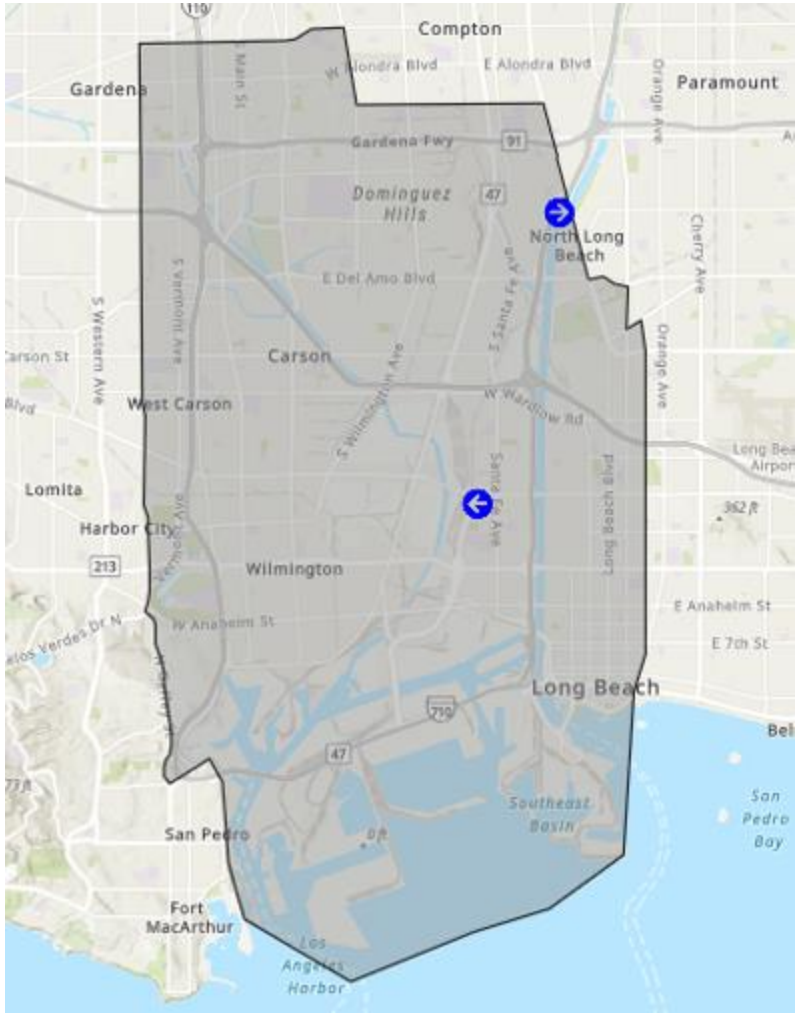
Assembly Bill (AB) 617 – Background

- AB 617[1] *s*igned into state law in 2017
- Requires strategies to reduce toxic air contaminants and criteria pollutants in disadvantaged communities
- Requires CARB to select communities to prepare and implement Community Emission Reduction Programs (CERPs) for selected communities
- CARB selected the Wilmington, Carson, West Long Beach (WCWLB) community in 2018



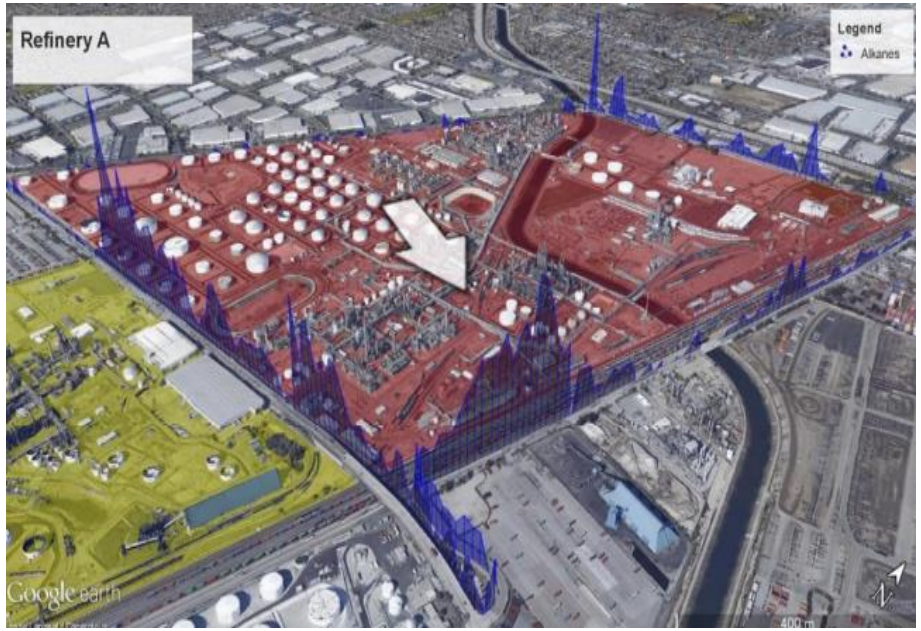
[1] Assembly Bill 617- Nonvehicular air pollution: criteria air pollutants and toxic air contaminants Health and Safety Code Section 44391.2

WCWLB Community Steering Committee (CSC) and Community Emissions Reduction Plan (CERP)

- Community Steering Committee (CSC)
  - CSC members live, work, own business, or attend school in the community
  - Identified community air quality priorities
  - Worked with South Coast AQMD, CARB and other entities to develop the CERP that addresses the community air quality priorities
- Community Emissions Reduction Plan (CERP)
  - Governing Board adopted the CERP in September 2019
  - Identifies goals and actions to reduce emissions and exposure in the community
  - Chapter 5b, Action 4 initiates effort to amend Rule 1178 to reduce VOC emissions from refinery storage tanks

2015 Community Monitoring

- South Coast AQMD collaborated with three monitoring companies to perform an emissions study using enhanced optical remote sensing to obtain measurement-based emissions data from refinery equipment
- Three final reports were released by the monitoring companies and detail Project #1 – Quantification of Fugitive Emissions from Large Refineries
- Will present additional information on monitoring efforts and findings at a subsequent working group meeting



2020 Community Monitoring

- Staff committed to perform similar emissions monitoring in 2020 at the refineries in the Wilmington, Carson and West Long Beach community in order to establish a refinery VOC emission baseline year
- Monitoring put on hold due to COVID-19
- Tentative plans to commence measurements in Summer 2021, COVID-19 permitting

TANKS REGULATED UNDER RULE 1178

Applicability

- Rule 1178 applies to above-ground petroleum storage tanks at facilities engaged in the production, refining, storage, transfer or distribution of petroleum products at facilities that emit > 20 tons per year VOC in any emission inventory year beginning year 2000 that:
  - Have a capacity ≥ 19,815 gals (75,000 liters); and
  - Store organic liquids with a true vapor pressure (TVP) > 0.1 psia (under actual storage conditions)

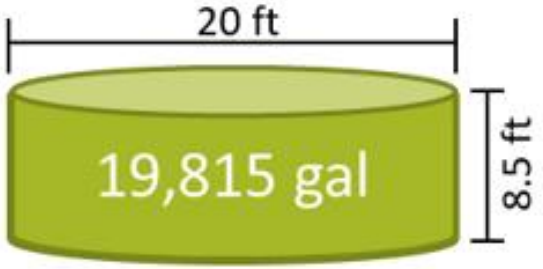
Facilities that emit > 20 tons per year

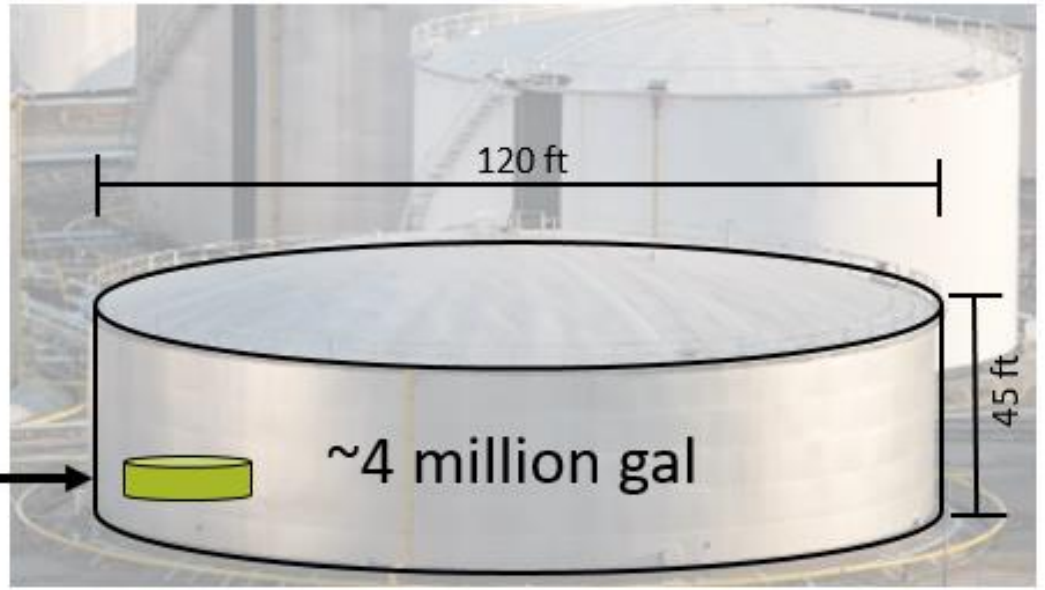
- Large facilities such as refineries, bulk liquid terminals
- Likely to have many tanks at a single location

Storage Tanks with Capacity ≥ 19,815 Gallons

How much is 19,815 gallons?

Comparison to typical tank at a large refinery



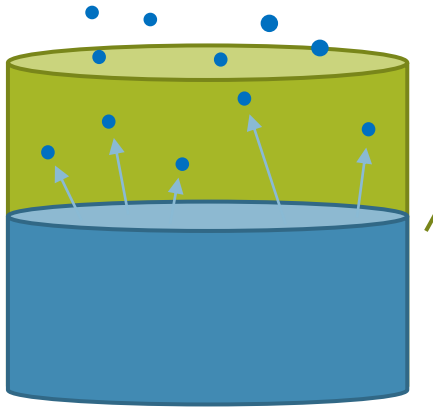


- Storage tank capacity of affected facilities range from ~20,000 gallons to millions of gallons
- Majority of non-portable tanks subject to Rule 1178 have capacity of > 1 million gallons

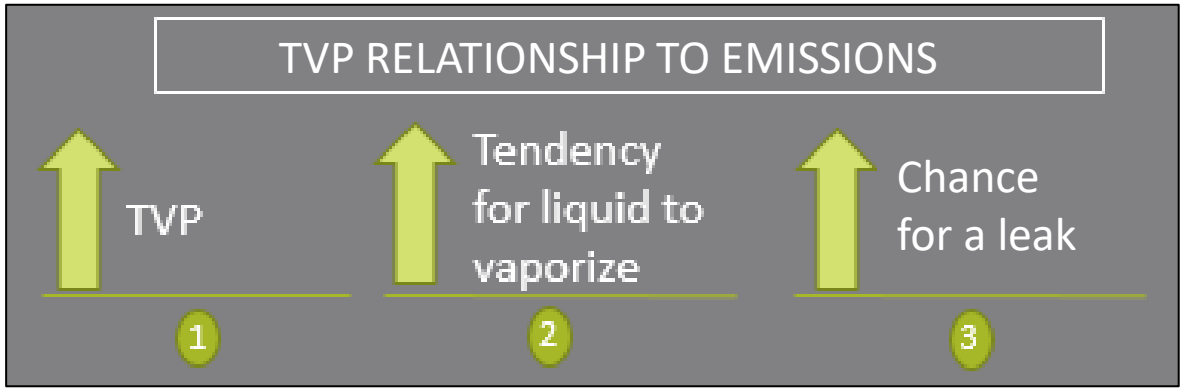
Organic Liquids with True Vapor Pressure (TVP) > 0.1 psia

What is TVP?

- TVP is a measure of the likelihood of a liquid to turn from its liquid phase to its vapor phase
- More vapor molecules break away from liquid molecules in substances with high TVP
- Liquids with TVP ≤ 0.1 psia less likely to vaporize at actual storage conditions



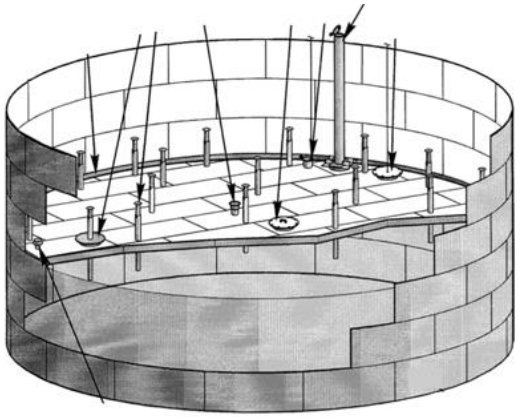
Vapor molecules have the potential to escape an enclosure due to their migrating nature



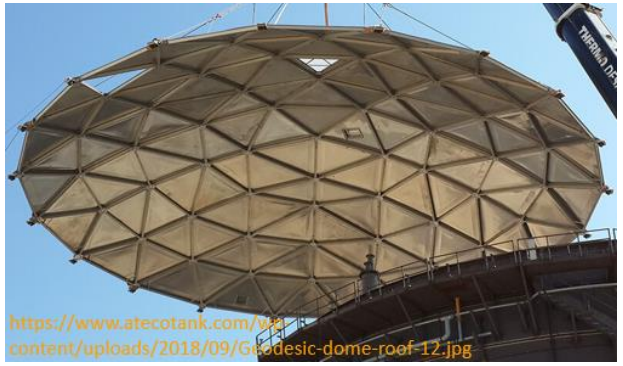
How do vapors make it out of a storage tank?

Storage Tanks

- Storage tanks at petroleum facilities are used to hold organic liquid waiting to be transported or processed
  - Example: crude oil to be transported to a refinery



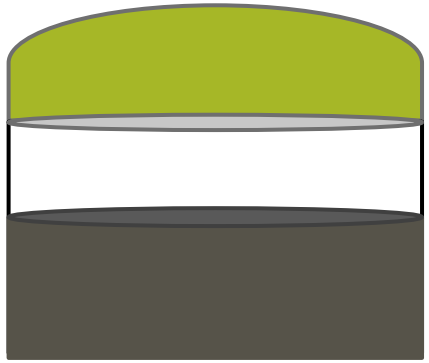
- Several components to storage tanks necessary for proper operation
  - Deck fittings
  - Seal systems



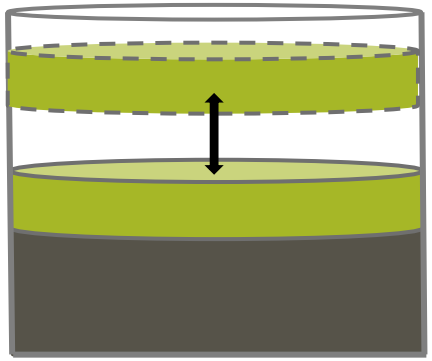
- Different design features depend on the use of the tank
  - Roof types
  - Other features (mixers, heaters, etc)

Storage Tank Roof Types

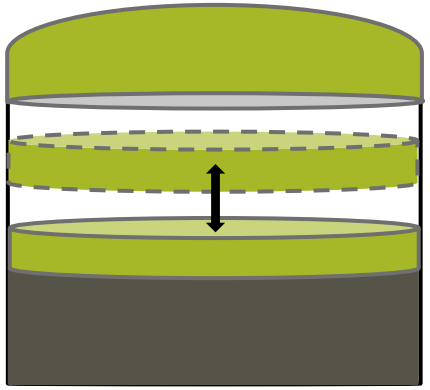
Fixed Roof



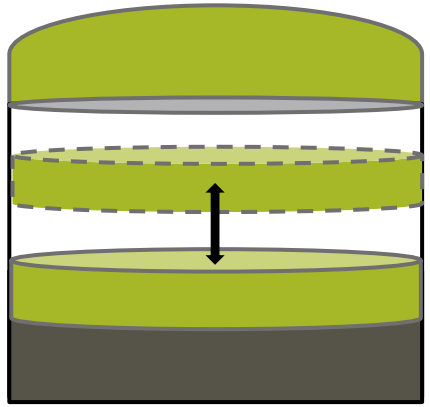
External Floating Roof (EFR)



Internal Floating Roof (IFR) + Fixed Roof



Domed External Floating Roof



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external-floating-roof-tanks.jpg (500×334) (gsctanks.com)

https://www.geldof.be/wp-content/uploads/2015/06/Double-walled-storage-tanks-with-floating-roof-Geldof-28624-01.jpg

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FIXED ROOF

Typically used to store product with lower vapor pressures

- Advantages: Less expensive than floating roof types
- Disadvantages: Vapor space (space between liquid and roof) allows vapors to accumulate leading to increased evaporative losses/emissions, vapor recovery units needed for emission control

EXTERNAL FLOATING ROOF

Typically used to store large amount of product with higher vapor pressures

- Advantages: No vapor space, reduced evaporative losses/emissions
- Disadvantages: Exposed roof susceptible to wind and rain damage, requires drainage system for rainwater, cost

INTERNAL FLOATING ROOF

Typically used to store large amount of product with higher vapor pressures

- Advantages: No vapor space, floating roof reduces evaporative losses and emissions, dome further reduces evaporative losses/emissions
- Disadvantages: Cost

DOMED EXTERNAL FLOATING ROOF

Typically used to store large amount of product with higher vapor pressures

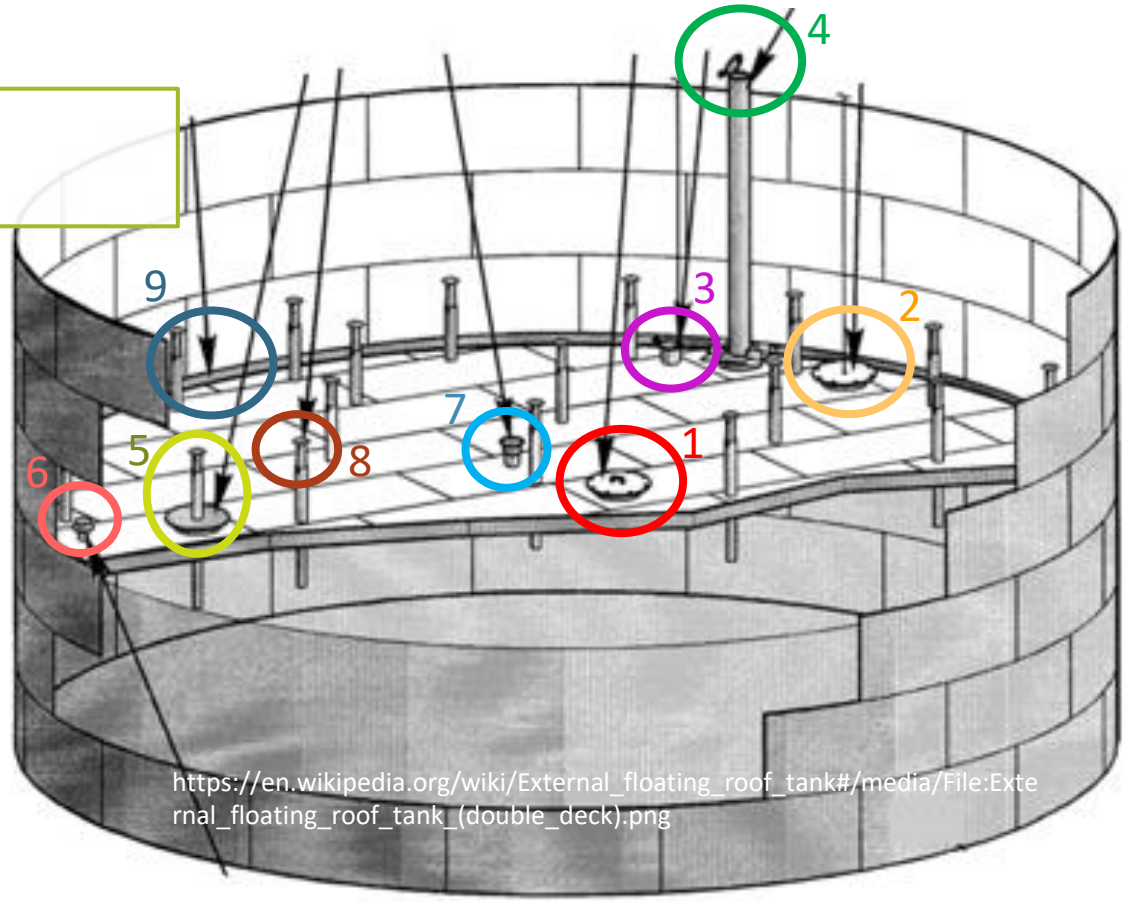
- Advantages: No vapor space, floating roof reduces evaporative losses and emissions, dome further reduces evaporative losses/emissions
- Disadvantages: Cost

Openings in Storage Tank Roofs

- Several components to a storage tank roof serve different functions
- Deck fitting components penetrate the storage tank roof and provide pathways for vapors to escape tank
  - Required to have covers and wipers that prohibit vapors from escaping
- Factors that can contribute to leaking deck fittings include:
  - Material degradation (weather worn gaskets)
  - Malfunction (seals not closing properly)
  - Human error (hatches left open)
- Opening between tank shell and floating roof also provides pathway for vapors to escape
  - Rim seal systems required to prevent vapors from escaping though opening

Storage Tank Components

1. Access Hatch - Opening to allow for access inside of tank
2. Gauge float - Indicates level of liquid inside tank
3. Gauge hatch/sample port - Opening to allow for gauging or reading of liquid levels inside tank and/or taking liquid samples
4. Guide pole - Keeps floating roof in correct position
5. Pressure-vacuum vent - Safety device that maintains pressure inside of tank
6. Rim vent - Release excess pressure or vacuum present in vapor pocket between the seal and floating roof
7. Roof drain - Drains rainwater from roof
8. Roof leg - Supports roof when landed on floor of an empty tank
9. Rim seal - Seal between tank shell and floating roof



https://en.wikipedia.org/wiki/External_floating_roof_tank#/media/File:External_floating_roof_tank_(double_deck).png

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Deck Fittings

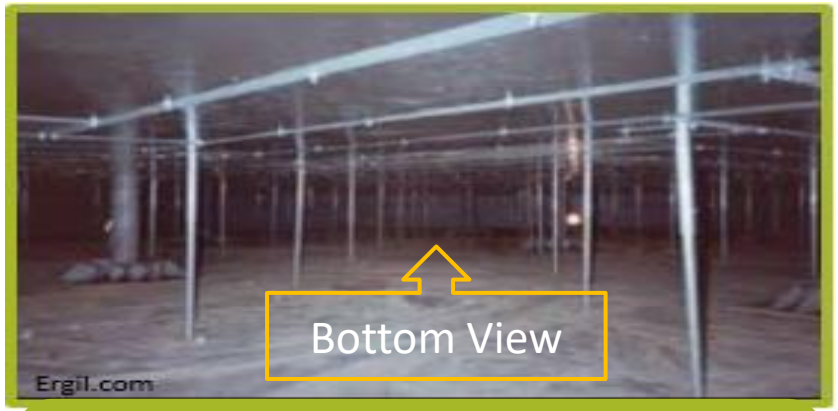
ACCESS HATCH
Larger opening to allow for human access inside of tank

GAUGE HATCH/SAMPLE PORT
Opening to allow for gauging or reading of liquid levels inside tank and/or taking liquid samples

GAUGE FLOAT (w/ cover)
Indicates level of liquid inside tank

Deck Fittings (*continued*)

PRESSURE-VACUUM VENT
Safety device that maintains pressure inside of tank



ROOF LEGS (w/ covers)
Supports roof when landed on floor of an empty tank

ROOF DRAIN
Drains rainwater from roof

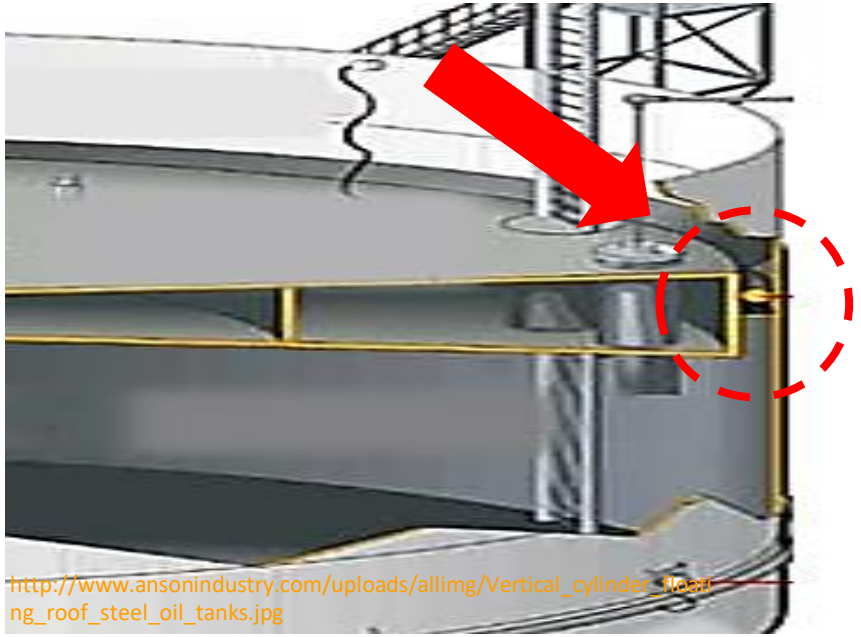
Deck Fittings (*continued*)

EMERGENCY RELIEF VENT
Releases pressure when tank is over pressurized

GUIDE POLE (w/ cover)
Keeps floating roof in correct position

Rim Seal Systems

- Prevent vapors from escaping through the opening between a floating roof and the tank shell
  - Consists of a primary seal and most likely secondary seal
  - Seals extend from the floating roof to the tank shell
  - Variations in seal system design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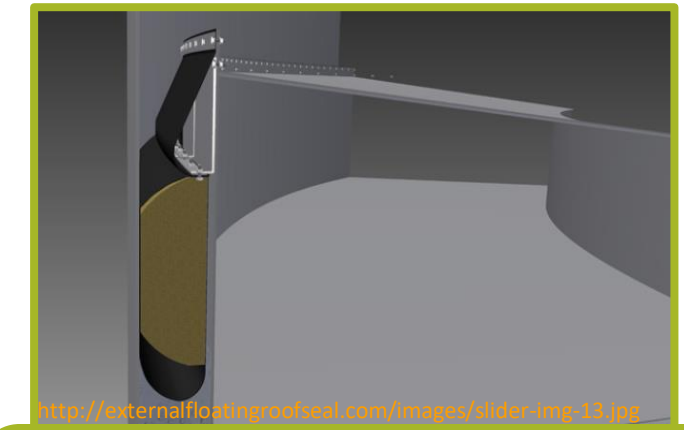
PRIMARY SHOE SEAL
Mechanical device containing a seal that extends from the floating roof to the tank shell

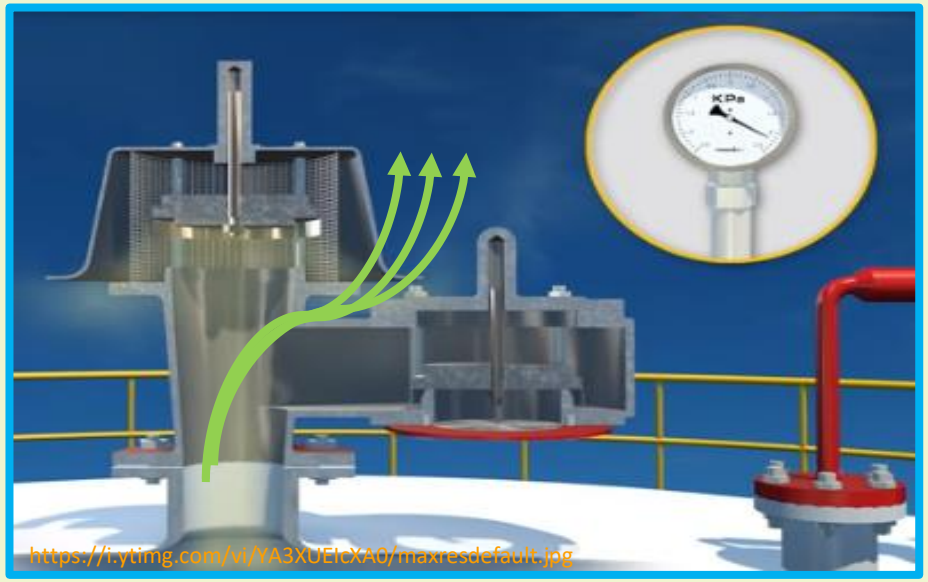

http://externalfloatingroofseal.com/images/slider-img-13.jpg

PRIMARY FOAM FILLED SEAL
Liquid-filled foam tube extends from floating roof to tank shell

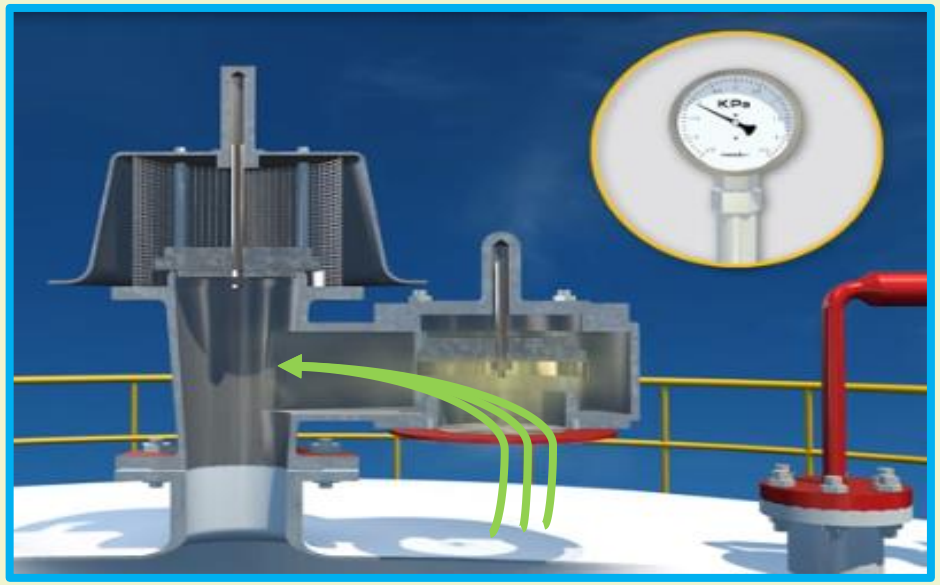

SealMaster Secondary Seal.jpg (712×193) (hmttank.com)

SECONDARY SEAL
Located above primary seal and provides second barrier

Tank Safety



Pressure vents release vapors to prevent build up of pressure that can cause an explosion



Vacuum vents bring air or gas into the tank to prevent a vacuum affect that can cause tank to implode

- Pressure-vacuum vents are necessary to maintain pressure inside tank
- Minimal emission losses occur as part of this safety operation

Vapor Recovery

- Vapor recovery systems are used when volumes of vapor are sufficient
  - Fixed roof tanks
  - Portable tanks
  - Certain operating practices such as tank filling
- Some components on storage tanks are not vented to vapor recovery systems
  - Insufficient volume of vapors produced

Emissions

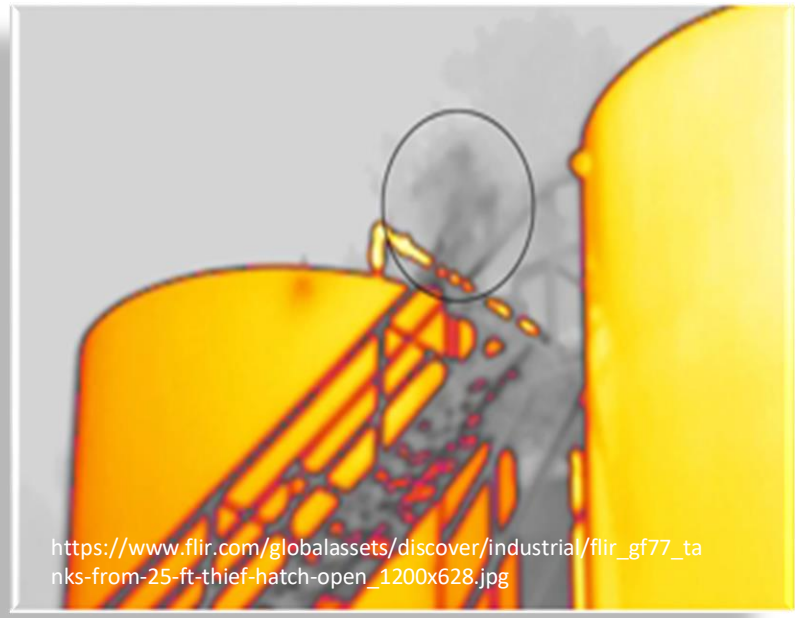
- Emissions from leaks are unintended and irregular releases of emissions (i.e., emissions from leaks, breathing effects) that are not recovered
- Emissions quantified using calculation method based off tank specifications and assumed efficiencies of tank components (seals, floating roofs, etc.)
- Difficult to quantify emissions from leaks

Identifying Leaks

- Rule 1178 requires self-inspections of tanks to identify leaks
  - Fixed roofs
    - Performance test on vapor recovery systems (annually)
    - EPA Method 21 leak detection (quarterly)
  - External floating roofs
    - EPA Method 21 leak detection or gap measurements on all roof openings; and
    - Complete rim seal gap measurements (semi-annually and whenever tank is emptied or degassed)
  - Domed external and internal floating roof tanks
    - Visual inspection of rim seal system and roof openings (semi-annually)
    - Complete gap measurements of rim seal system (whenever tank is emptied or degassed, at least once every ten years)
- Implementing earlier leak detection strategies can reduce emissions

Rule Objectives

- Incorporate enhanced leak detection technologies and methods, where appropriate
- Enhance repair program to further reduce emissions from leaks



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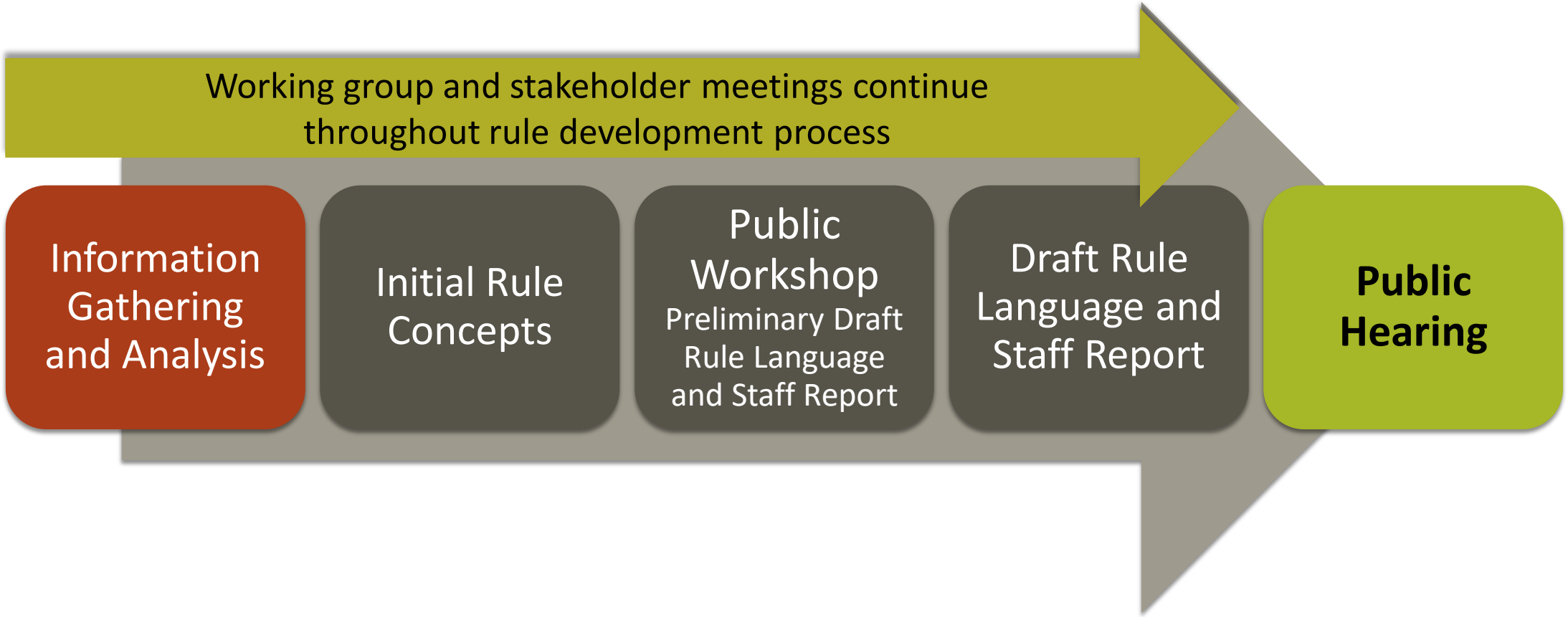
RULE DEVELOPMENT PROCESS

Overview of Rule Development Process



Staff is available throughout the rule development to meet with stakeholders via phone call, email, virtual meeting, face-to-face meeting

Information Gathering and Analysis

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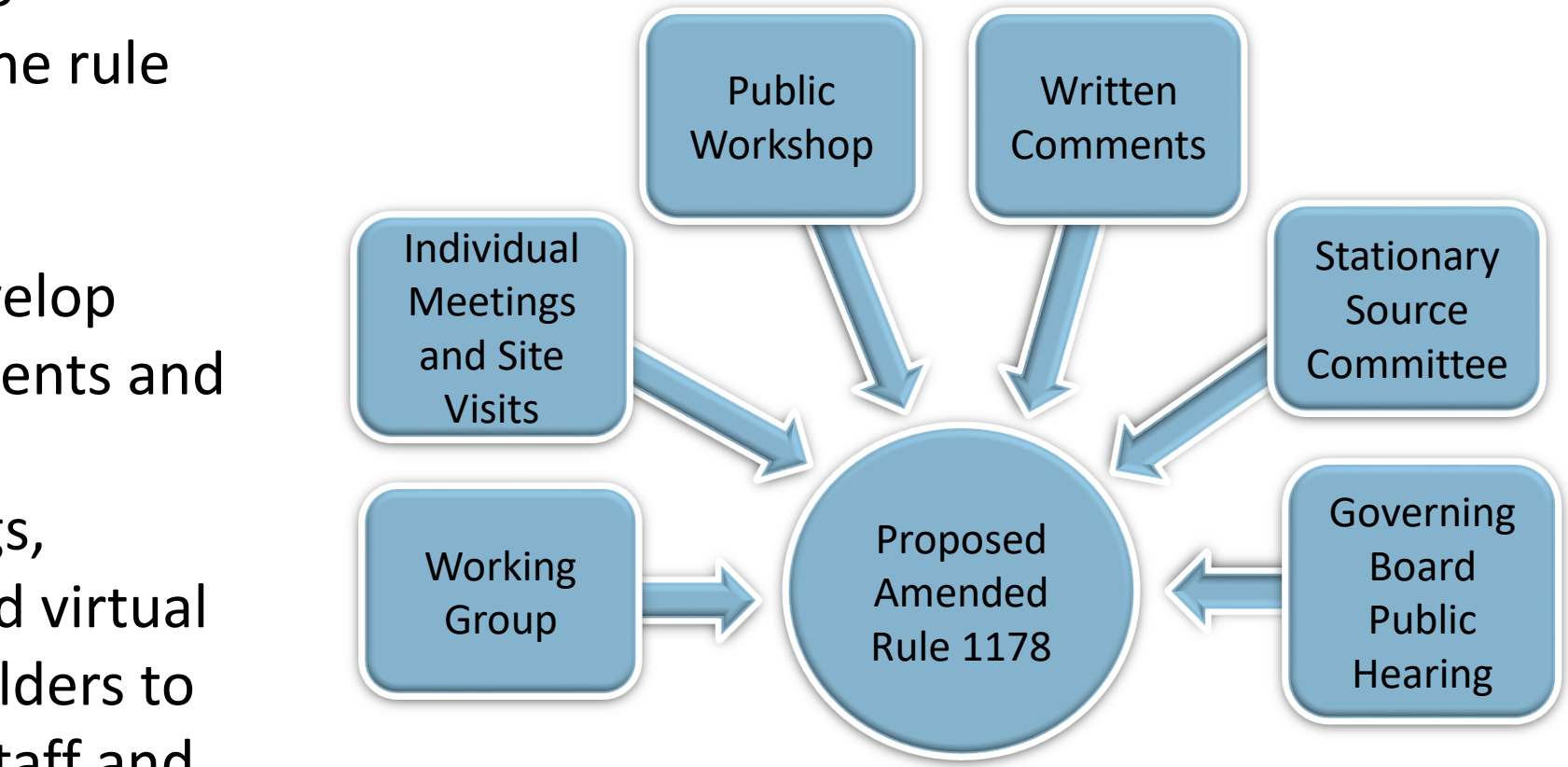
- Information gathering and analysis occurs throughout the rule development
  - Initial data gathering starts well before the first Working Group Meeting to identify potentially affected facilities and equipment
  - Additional information gathered from stakeholders, facilities, technology suppliers
- Information and analysis presented to the Working Group

Working Group Meetings

- Multiple meetings held throughout rule development and open to public
- The participants may include industry representatives, equipment suppliers, community groups, environmental groups and other stakeholders
- Objective:
  - Build consensus and work through issues
  - Opportunity for early input
  - Develop a rule that affected facilities can implement
- Assists staff in understanding:
  - Key issues and concerns
  - Industry terms, industry practices, etc.
  - Applicable technologies

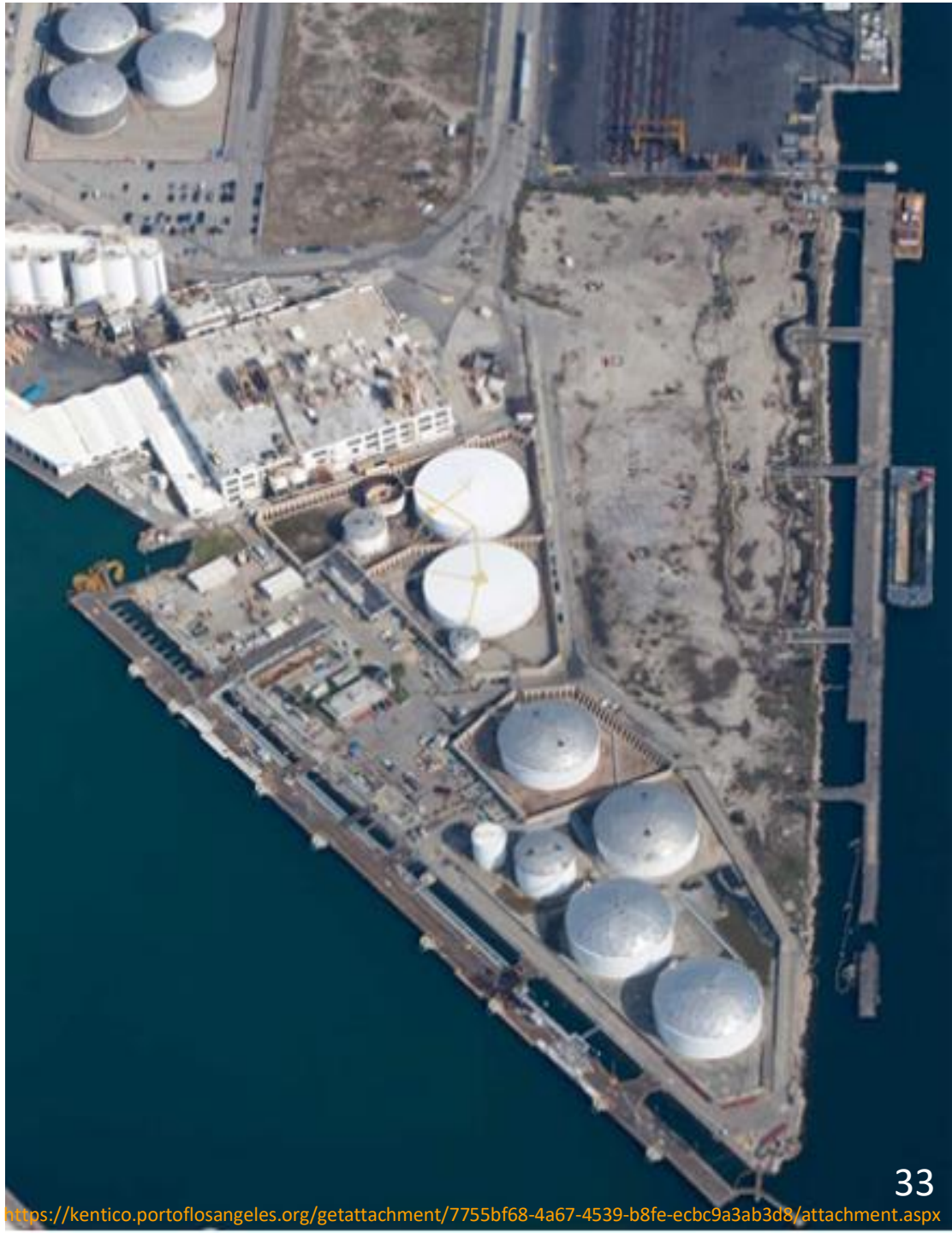
Stakeholder Input

- Several opportunities to comment throughout the rule development
- Early input is strongly encouraged to help develop proposed rule amendments and to address issues
- Working group meetings, individual meetings, and virtual site visits allow stakeholders to dialogue directly with staff and discuss individual issues



NEXT STEPS

- ❑ Continue information gathering
- ❑ Working Group Meeting #2 - TBD



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