

Benicia Refinery
Benicia, California



Valero Benicia Refinery - Community Advisory Panel (CAP) Health, Safety & Environmental (HSE) Presentation

December 12, 2023

Agenda

- 1 Air Monitoring Overview
- 2 Fenceline Open Path Update
- 3 Hydrogen Vent Emissions Update

Benicia Refinery
Benicia, California



CAP HSE Presentation

Air Monitoring Overview

Valero Benicia Refinery

Air Quality Monitoring Map & Devices

Refinery Monitors (Blue Lines)

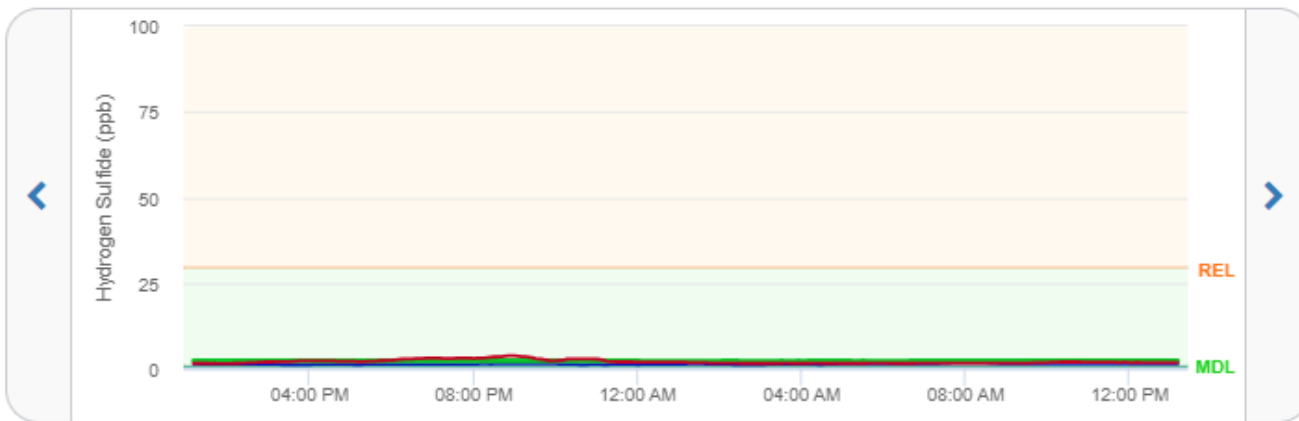
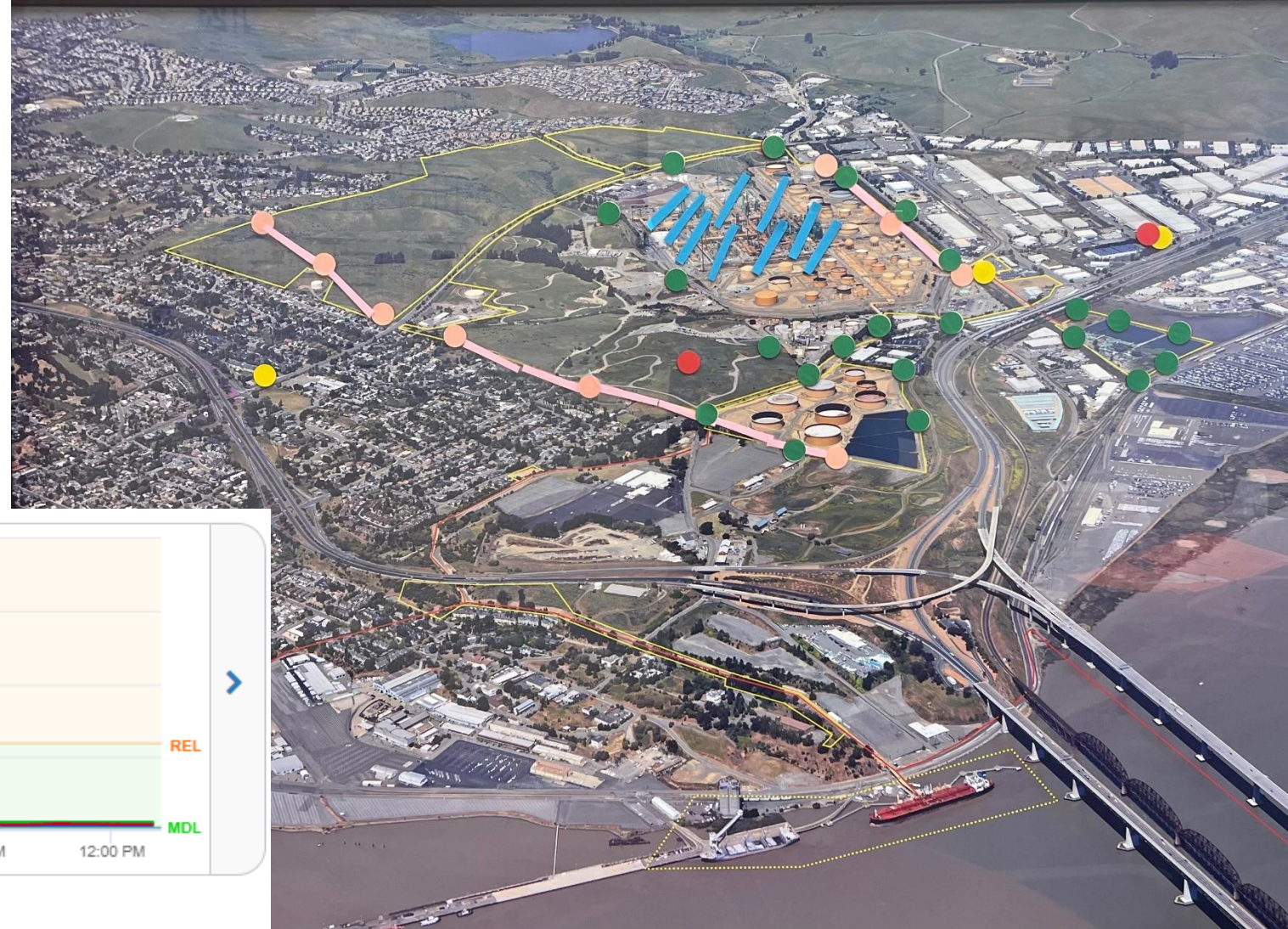
- Routine operations monitored by analyzers
 - Continuous Emissions Monitors (CEMs) for Nitrogen Oxides (NO_x), Carbon Monoxide (CO), Sulfur Dioxide (SO₂), Hydrogen Sulfide (H₂S), Total Reduced Sulfur (TRS), etc.
 - Over 100 devices requiring daily calibration and data historization
 - Stack testing for non-CEMs constituents (eg: Particulate Matter (PM))
- Extensive emissions reporting required to multiple agencies, and BAAQMD conducts frequent data reviews and site visit oversight
 - Monthly flare information is available on BAAQMD's website:
<http://www.baaqmd.gov/about-air-quality/research-and-data/flare-data>



Valero Benicia Refinery Air Quality Monitoring Map & Devices

Ground Level Monitors (GLMs) (Yellow Dots)

- Before Valero acquired the Benicia Refinery, 3 GLMs were installed in 1982 and are currently in continuous operation in the community
 - GLMs measure H₂S and SO₂ in the ambient air from all sources, including mobile sources (e.g. cars and trucks) and stationary sources (e.g. refinery, homes and other businesses)
 - Data is available on the Valero Benicia Refinery Fenceline monitoring website: <http://www.beniciarefineryairmonitors.org/>



GLM (Ground Level Monitor) **GLM1** **GLM2** **GLM3**

Valero Benicia Refinery

Air Quality Monitoring Map & Devices

Fenceline Open Path Monitors

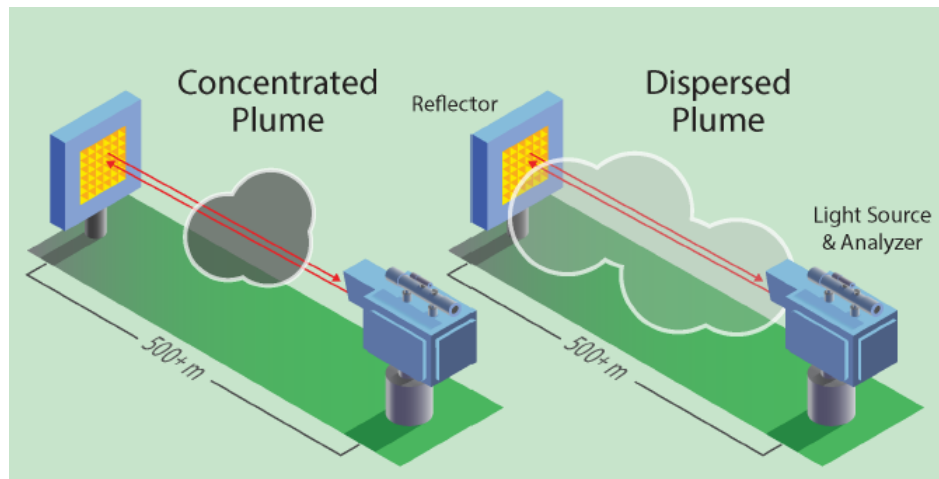
(Orange Dots/Pink Lines)

- The Bay Area Air Quality Management District's (BAAQMD) Regulation 12-15 required refinery fenceline monitoring by June of 2019 with H₂S open-path monitoring extended to January 1, 2023.
 - Valero's fenceline system monitors measure specific pollutants that cross the facility's fenceline in real time
 - Measures multiple compounds - SO₂, H₂S, Benzene, Toluene, Ethylbenzene, Xylene (BTEX)
 - Valero is currently working with BAAQMD to revise the Air Monitoring Plan (AMP) and Quality Assurance Project Plan (QAPP) for re-submittal
 - Data is available on the Valero Benicia Refinery Fenceline monitoring website:
<http://www.beniciarefineryairmonitors.org/>



Open Path Background

- Broadband UV, IR light source, Tunable Diode Laser (TDL)
 - Light-absorbing compounds within the path are detected and quantified using proprietary analysis routines
 - UV monitors multiple compounds simultaneously



- The minimum detection limit (MDL)
 - The lowest concentration a substance can accurately be measured
 - Path length and atmospheric conditions (fog, smoke, etc.) effect detection limits



H₂S Open Path Technology

- Measuring H₂S uses a special instrument called a H₂S Tunable Diode Laser Absorption Spectroscopy (TDL) to accurately measure H₂S
 - Light absorption of H₂S is similar to that of common atmospheric compounds H₂O and CO₂
 - The TDL distinguishes H₂S from H₂O and CO₂
 - Small light absorption range for H₂S
 - The TDL uses infrared to measure a small range of wavelengths
- Maintenance to ensure accurate data
 - Monthly:
 - Inspection of system and optics. Optics cleaning if necessary
 - Bump tests
 - Quarterly:
 - 3-point calibrations
 - Review and test light and signal levels

Valero Benicia Refinery

Air Quality Monitoring Map & Devices

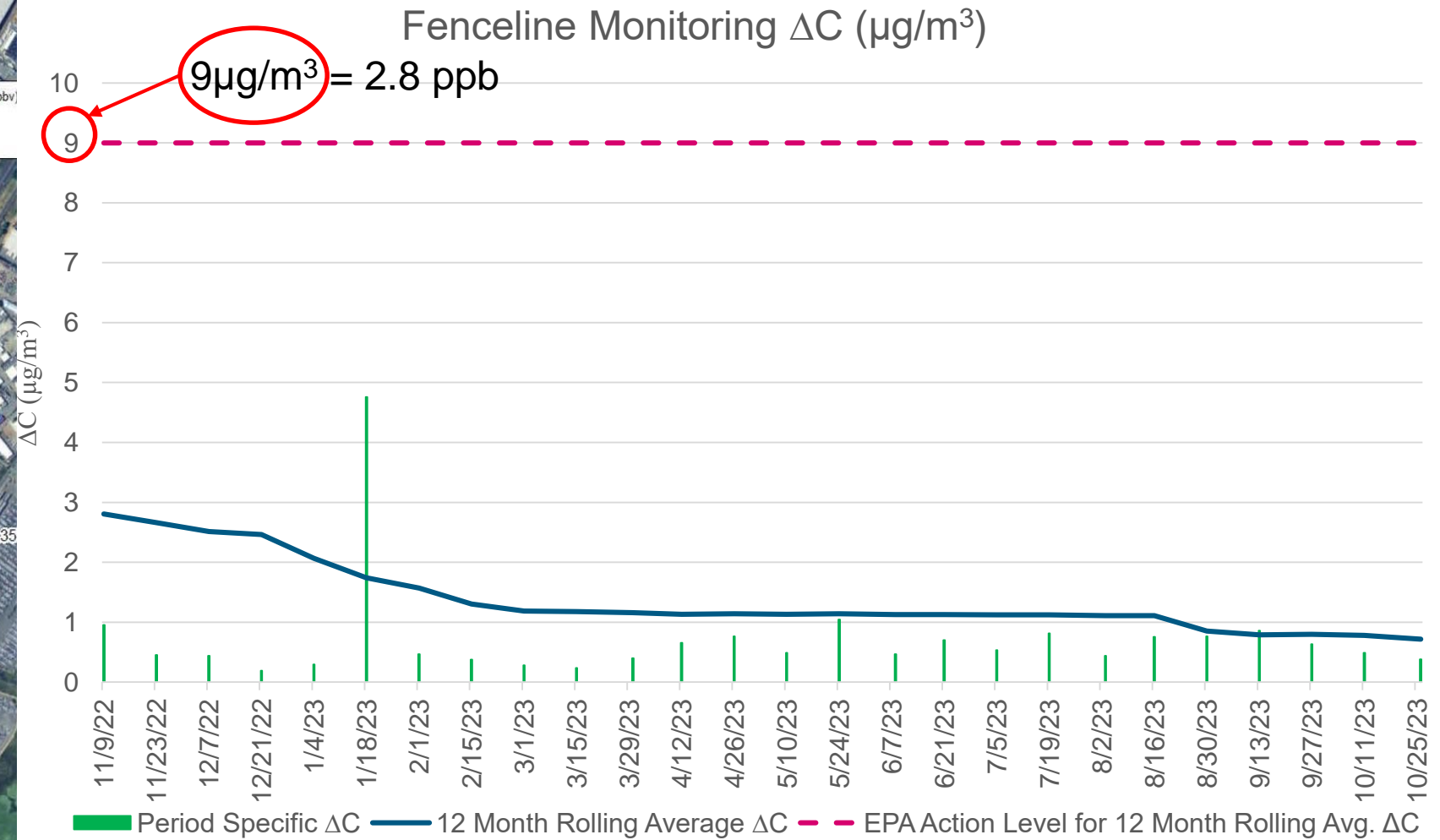
Fenceline – Benzene Passive Monitors (Green Dots)

- United States Environmental Protection Agency (EPA) Petroleum Refinery Sector Rule (RSR) requires refineries to monitor concentrations of benzene at their fenceline.
 - Sorbent tubes are placed at each of the prescribed locations. The tubes trap and retain benzene over a two week period. The tubes are then gathered and sent to an accredited lab for processing and analysis.
 - Valero submits that data to EPA on a quarterly basis and the EPA uploads lab results for refineries across the country to their website.
 - Valero Benicia Refinery is below the EPA action levels.
 - Data is available on EPA's website: https://awsedap.epa.gov/public/extensions/Fenceline_Monitoring/Fenceline_Monitoring.html?sheet=MonitoringDashboard



Federal RSR Rule – Passive Fenceline Monitoring for Benzene

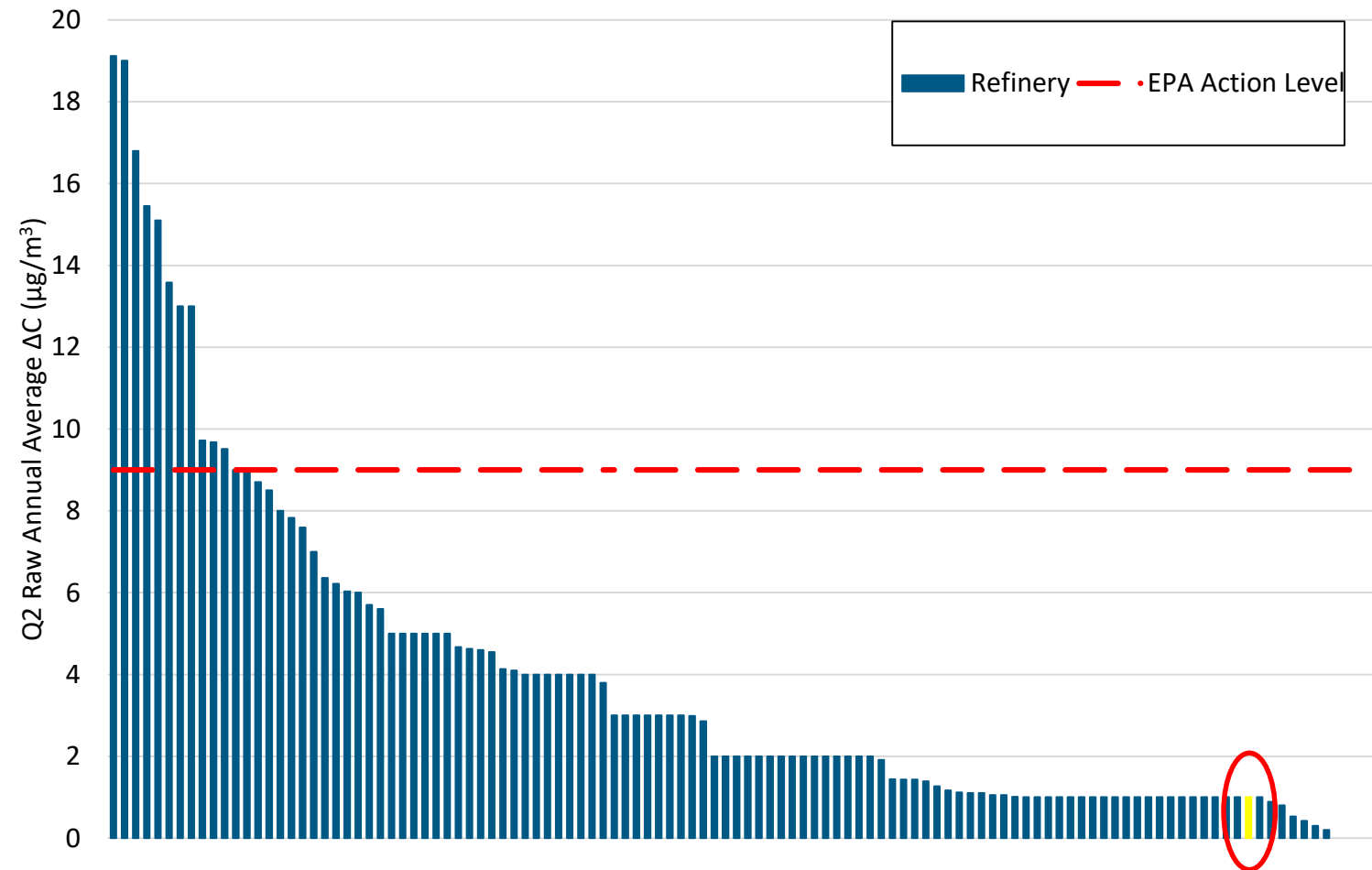
In compliance since rule implementation in January 2018



Note: The delta concentration represents the highest measured reading minus the lowest

Fenceline – Industry Metrics

- OSHA defines the benzene permissible exposure limits as:
 - a Time-weighted average of **1000 ppb** over 8 hours, and
 - a short-term exposure limit of **5000 ppb** in any 15-minute period.
- The Passive sampling action level is **2.8 ppb**, or 1/357th of the OSHA permissible exposure limit, and is not a health-based threshold. Therefore, the Passive sampling action level is **Health Protective**.



Valero Benicia Refinery has one of the lowest Benzene RSR - Fenceline emissions in the country

Air Quality Monitoring

Routine Community Monitoring

- Daily Perimeter Checks
- Observations by Plant Personnel and Contractors
- Ground Level Monitors and Fenceline Monitors
- Metrological Stations (Red Dots)

Non-Routine Community Monitoring

- Community phone inquiries
- Instrument monitoring for community complaints and/or abnormal conditions observed during perimeter checks to monitor the location of where odors are reported and other downwind locations that may be impacted
- Incident monitoring

Non-Valero Community Monitoring

- BCAMP Monitors
- BAAQMD
- City of Benicia Fire Department
- Solano County CUPA



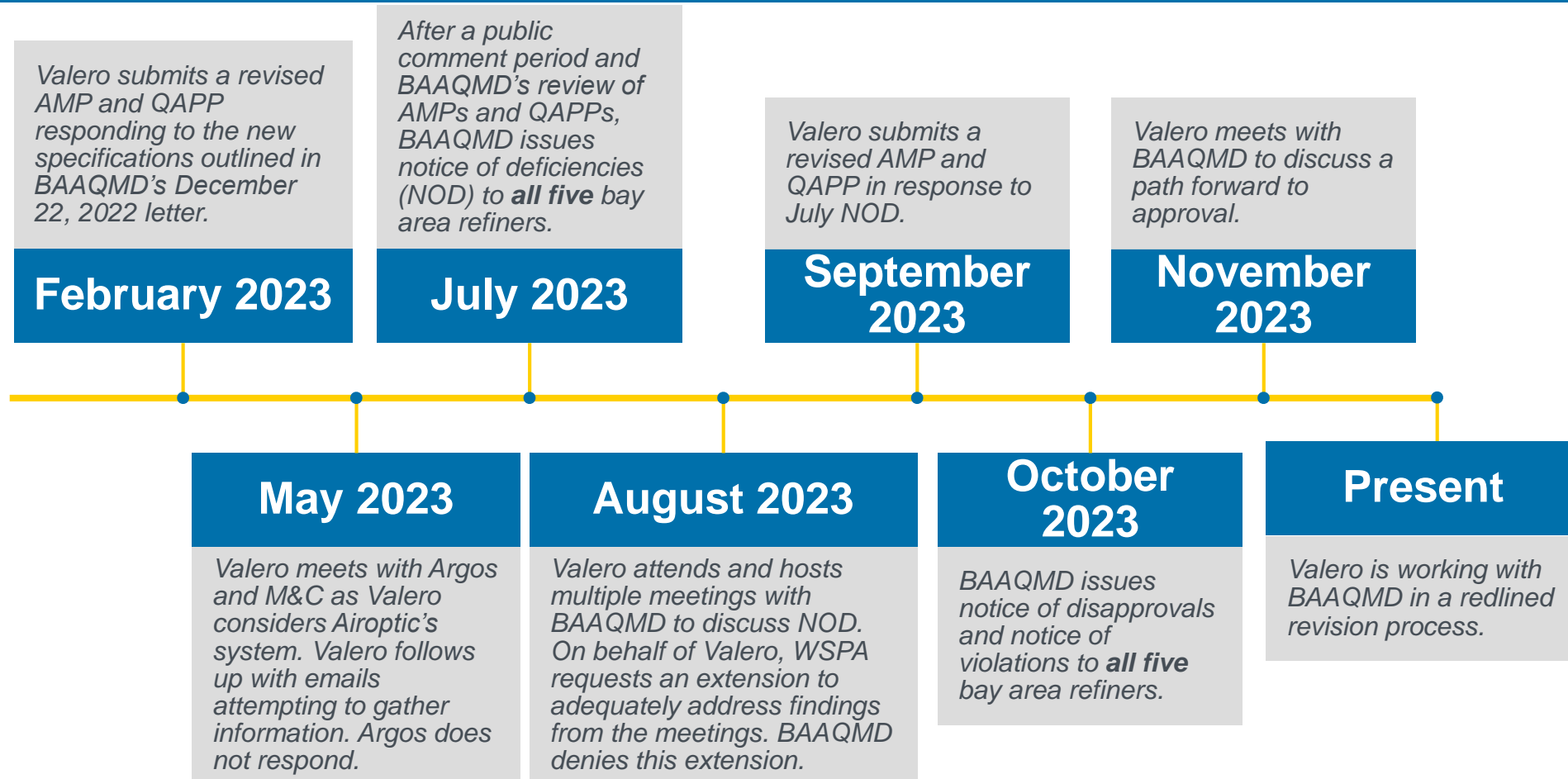
Benicia Refinery
Benicia, California



CAP HSE Presentation

Fenceline Open Path Update

Open Path Fenceline History



Valero has continuously worked with its vendors to troubleshoot the equipment to improve the accuracy and detection levels to try to meet the standards and revised standards set by the BAAQMD

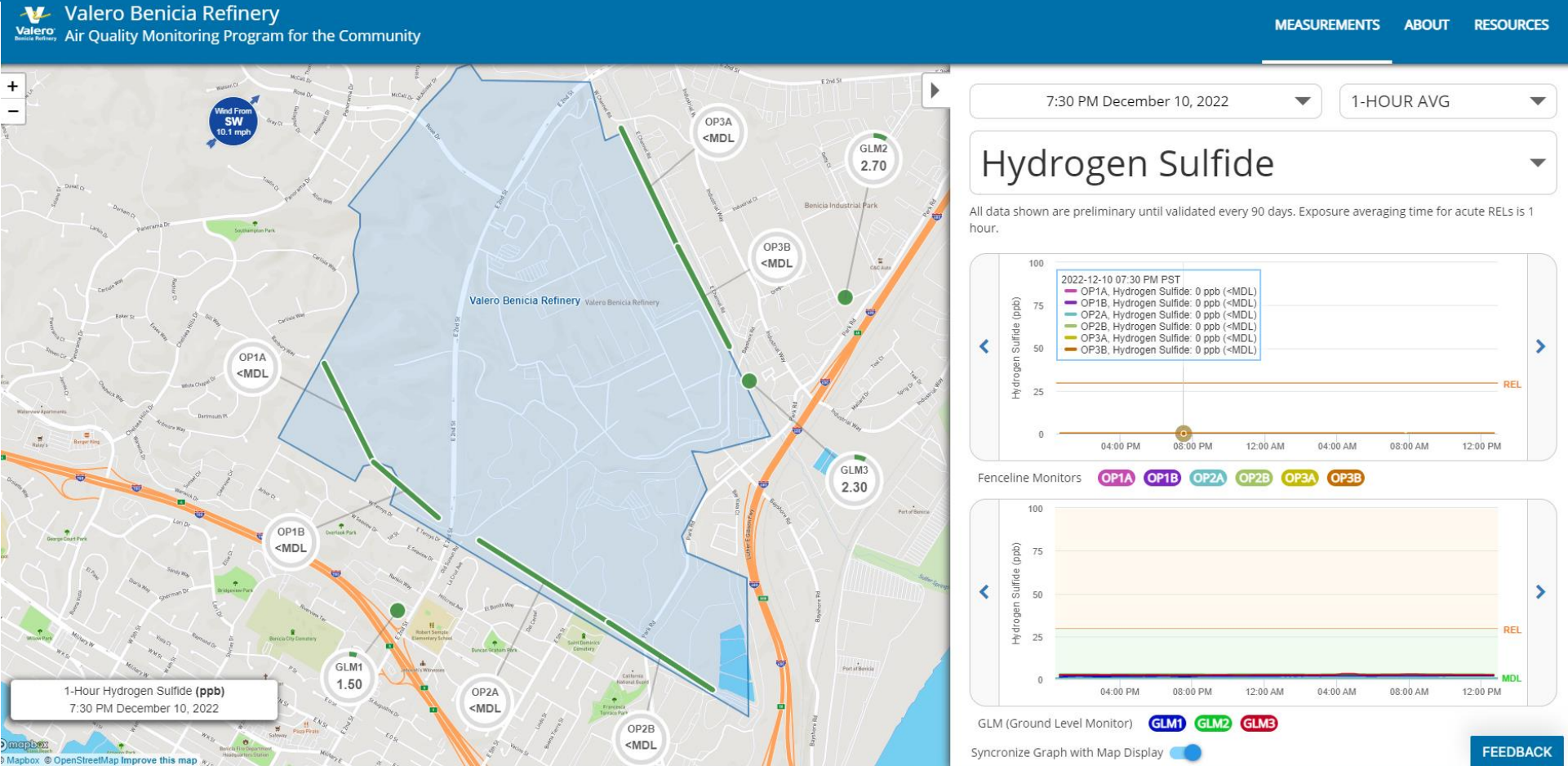
Continued Improvement

	BAAQMD Target Specifications from October 2021 Letter	BAAQMD Target Specifications from December 2022 Letter	Achieved Specifications as of December 2022	Achieved Specifications as of December 2023 on Path 2A
3 Point Quarterly Calibrations Accuracy	±2% below 5000 ppb	±15% below 60 ppb ±15% for two “reasonable” mid and high concentrations	±25% at < 2,000 ppm* ±10% between 2,000 and 7,000 ppm* ±10% at > 7,000 ppm*	±25% below 60 ppb ±25% for two reasonable mid and high concentrations
Monthly Bump Tests Accuracy	±2% below 5000 ppb	±15% below 100 ppb	±25% at < 9000 ppm*	±25% below 100 ppb
Light Transmission at 25 ppb MDL	<1%	<1%	<3%	<1%

*1 ppm = 1 ppb at a path length of 1,000 meters.

Community Website

Ambient levels usually below minimum detection level



- <https://beniciarefineryairmonitors.org/>

Benicia Refinery Overview

Future Capital Improvements – Pathway 4

Fenceline – Open Path '4' Monitor

- Civil/Electrical Engineering has started on the extension of the fenceline monitoring program along the northwest boundary (Path 4)
- Commitment remains to proceed with Path 4 installation once the appropriate resolution to technical H2S challenges has been determined



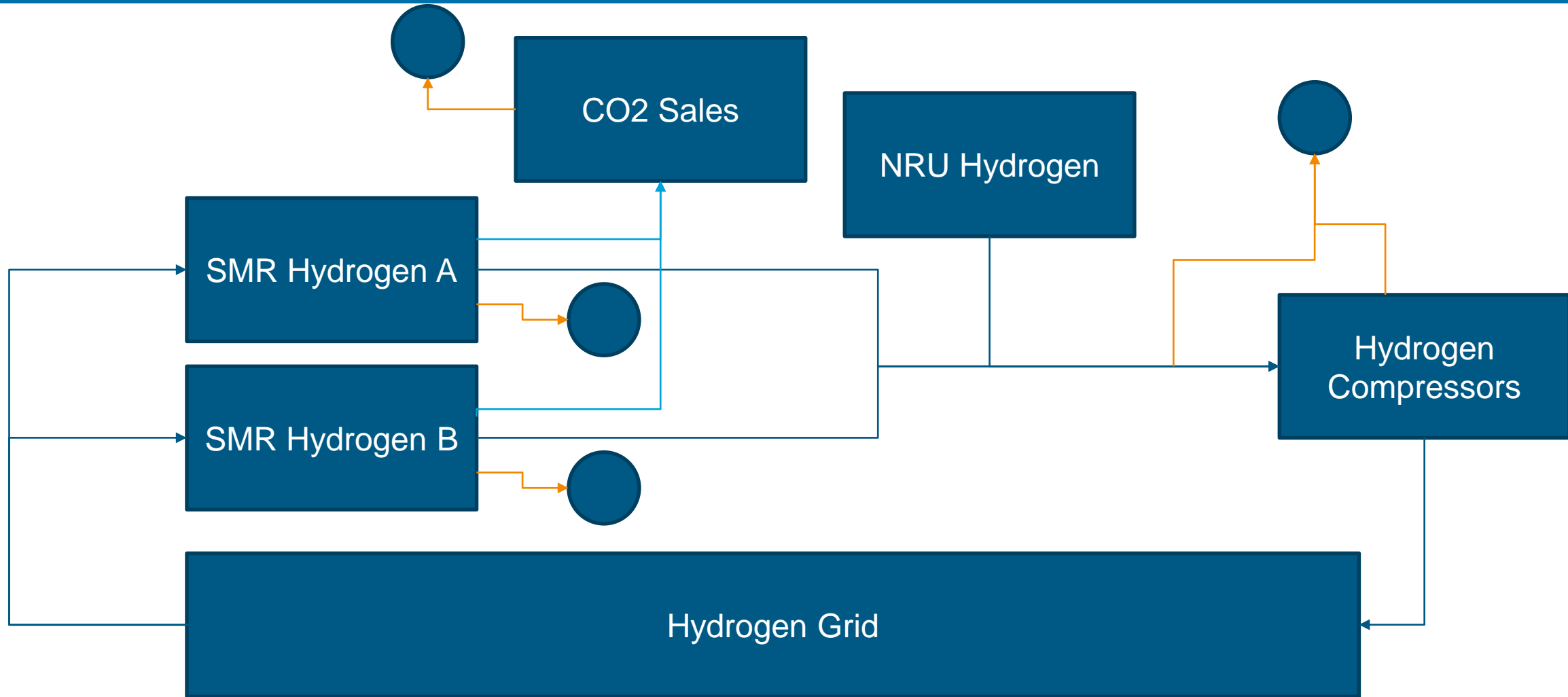
Benicia Refinery
Benicia, California



CAP HSE Presentation

Hydrogen Vent Emissions Update

Valero Benicia's Hydrogen System



Hydrogen Vent Summary

- **Initial Response (November 2018 – February 2021)**
 - In late 2018, an investigation discovered trace amounts of previously unknown VOCs from the hydrogen vent. Valero took immediate steps to reduce emissions and by February 2021, Valero was able to reduce emissions from the vent by 98% through improvements to existing operational controls.
- **Project Development (March 2021 – Dec 2023)**
 - Valero developed a project to address the remaining 2% and submitted a permit on September 13, 2022. Valero is currently working with the BAAQMD and is ready and able to implement as soon as the permit is issued.
 - In September 2023, through a separate BAAQMD permit, Valero completed a sub-portion of the project to route the Compressor Safety Relief Devices to the existing flare system.
 - Additionally, Valero continues to progress a separate project to meet new requirements in Regulation 13-5.

Since 2018, Valero has been working cooperatively with BAAQMD to resolve the issue. This included multiple site visits, sampling and data requests from BAAQMD.

Stipulated Order of Abatement (SOA)

Respondent Exhibit D

Valero Benicia Refinery—SOA Requirements

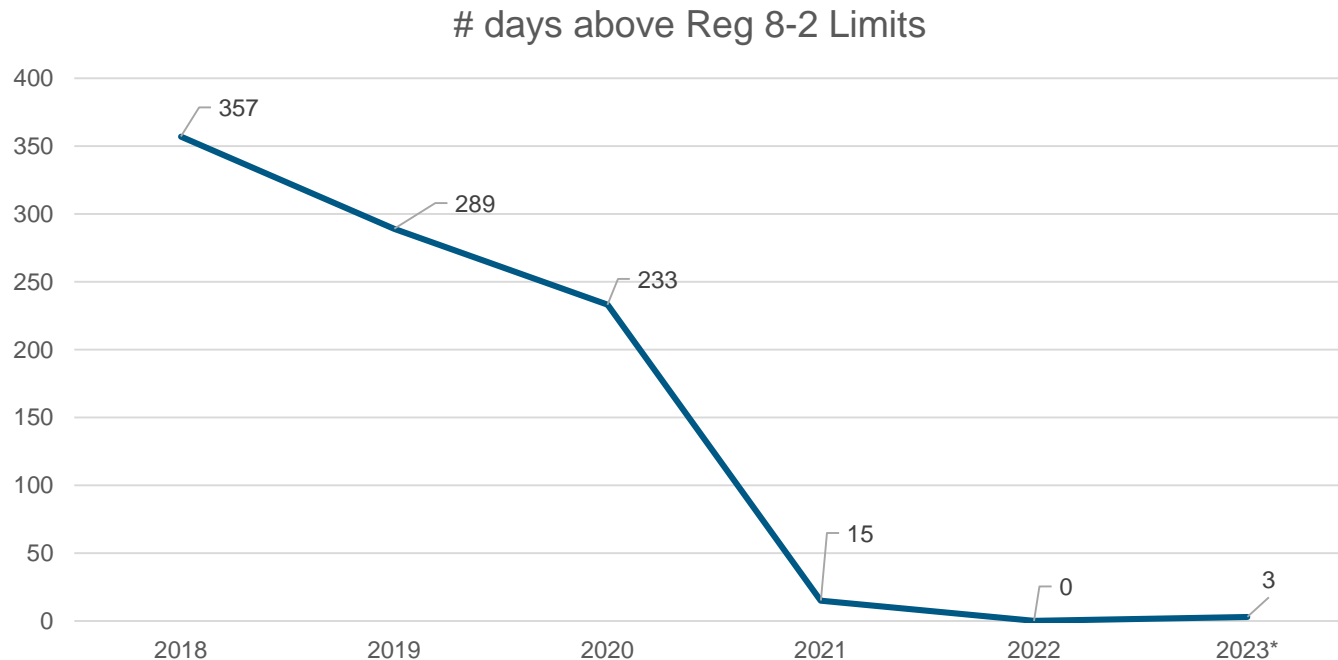
SOA Monitoring & Reporting Requirements

- The BAAQMD Hearing Board approved the SOA at its March 15, 2022 hearing.
- The SOA is an agreement between BAAQMD and Valero which commits Valero to implement a vent project to address the remaining 2% of emissions by the end of the next refinery-wide turnaround.

<u>Monitoring</u>	<u>Reporting</u>
<ul style="list-style-type: none"> • Interim Monitoring—Commences date the SOA approved. <ul style="list-style-type: none"> ○ Continuous monitoring of flow to ST-302. ○ Weekly representative stream composition samples testing for total carbon, methane, NMOC, BTEX. ○ Upset sampling: Within 30 minutes of an upset and every 3 hours thereafter, if safe to do so. • Submission of Sampling & Analysis Plan <ul style="list-style-type: none"> ○ Ongoing monitoring as approved by District. ○ Duration: 30 days from District approval through 24 months after Vent Project completion. <div style="border: 2px solid green; padding: 5px; text-align: center; margin-top: 10px;"> <p>Submitted 4/15/22</p> </div>	<ul style="list-style-type: none"> • Bimonthly Progress Reports—Through the life of the SOA. <ul style="list-style-type: none"> ○ Stream sampling data: <ul style="list-style-type: none"> ▪ Quantity ▪ Concentration ▪ Mass emissions ○ Contextual information; ○ Update on interim measures taken; ○ Update on Vent Project status; ○ Update on modifications to Vent Project. • Requests for Information—Valero shall respond within 10 business days.

No Threat to Public Health or Safety

- Under the Cooperation Agreement, Valero is required to provide notification to the City when there is an immediate or threatened release that could impact public health or safety.
- The hydrogen vent releases were below the reference exposure level (“REL”) for public health, therefore there was no public health or safety impact.



Is the public at risk now?

- Air District tools cannot tell us whether people actually become sick from exposure, as there are many other factors that influence this. However, currently our tools indicate the risk of developing cancer or long-term (chronic) health impacts is below the health protective standards in Air District rules.
- Air District rules are widely regarded as some of the most stringent in the country and in the world.
- Our tools indicate there is a very small chance of short-term health effect from current facility emissions but only under rare meteorological conditions. The types of impacts people may notice include temporary eye, nose, throat and lung irritations, headaches and dizziness.
- In a 5-year period, the meteorological conditions which might allow this exposure to occur only existed for 2 hours.
- Even with the low predicted occurrence of this exposure, it may exceed the Air District rule limits and the facility is being required to prevent these emissions.
- The Air District has provided its data to the Solano County Health Department to answer questions regarding the actual health impact to the community from the current emissions.
- The Air District is seeking to control the emissions from this source below levels required in its regulations by going to its Hearing Board.



What was the historic risk to the public?

- Historic emissions with the potential to cause cancer were above the regulatory levels where the facility would have been required to reduce or control them.
- Historically, the potential risk that a cancer might have occurred as a result of these emissions was approximately three chances in 1,000,000. By comparison, the average risk that a person may contract cancer from air pollution in Benicia is about 300 to 500 chances in 1,000,000, and the chance that a person may get cancer over their lifetime in the United States is one chance in three.
- Valero reduced emissions significantly as a result of a Notice of Violation issued by the Air District.



Being a Good Neighbor

Benicia Refinery Resource Tools

Resources for Benicia Residents

5 ways to stay informed about Valero Benicia Refinery

- 1 Valero's 24-Hour Community Relations Phone Number: **707-745-7534**
email: BeniciaCommunityRelations@valero.com
- 2 Sign up for Refinery Notifications at Valero Benicia Refinery Community Relations website: www.beniciarefinery.com
- 3 Sign up for Non-Emergency Notifications with your email or telephone number at the City of Benicia's Public Information Bank website:
www.ci.benicia.ca.us/publicinfobank
- 4 Valero Benicia Refinery Community Advisory Panel (CAP) website:
www.beniciacap.com
- 5 Benicia Refinery Air Monitoring Program website:
www.beniciarefineryairmonitors.org

Please call **707-745-7534** for additional questions.



Questions?

