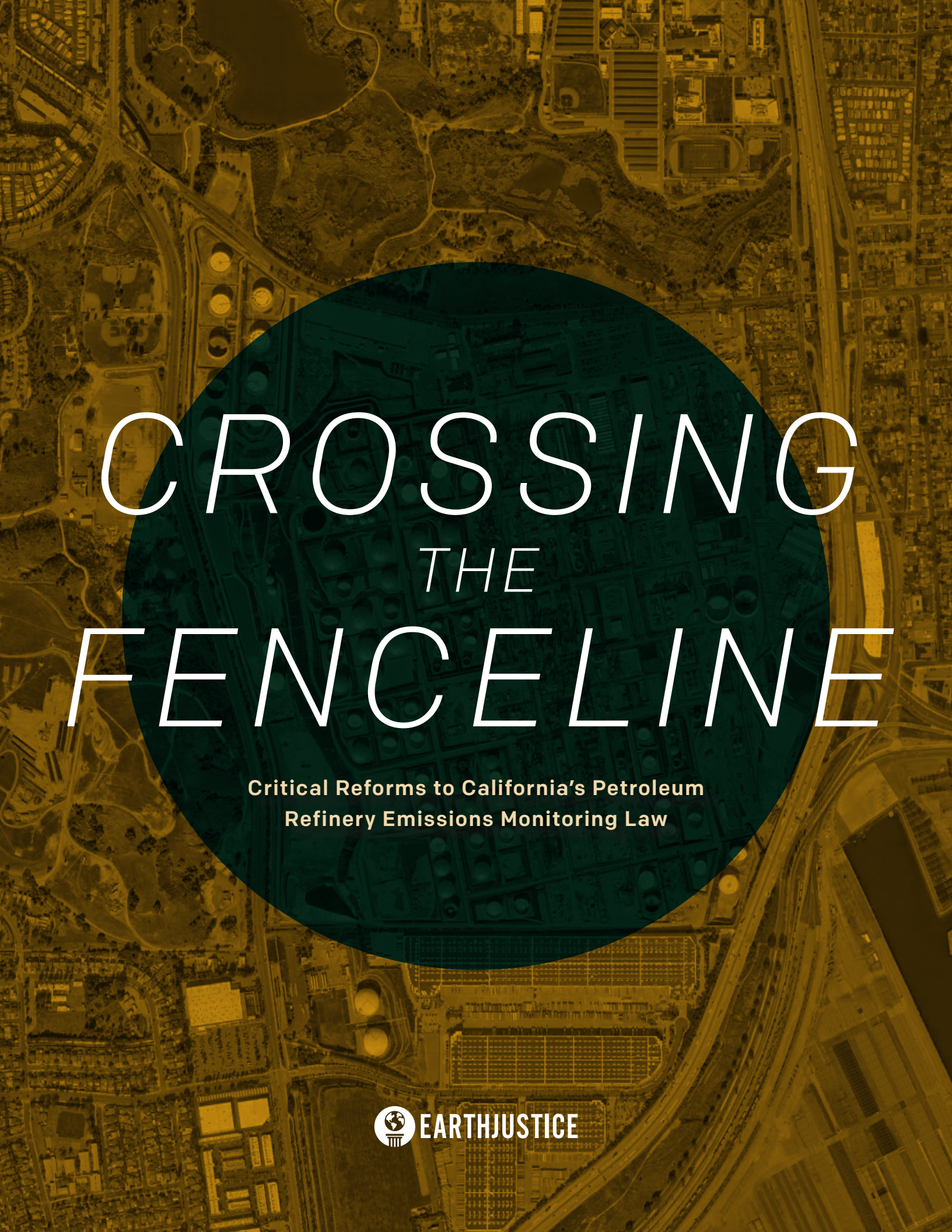

CROSSING THE FENCELINE

Critical Reforms to California's Petroleum Refinery Emissions Monitoring Law

EARTHJUSTICE

This report is presented by Earthjustice's Community Partnerships Program.

EARTHJUSTICE'S COMMUNITY PARTNERSHIPS PROGRAM

Earthjustice's Community Partnerships Program (CPP) provides legal and advocacy resources to local leaders demanding a safe, just, and healthy environment in which their communities can thrive – no matter how long the fight. CPP works hand-in-hand with frontline communities to remove environmental hazards and secure access to environmental benefits. CPP acts collectively with our community partners to challenge harmful social and political structures, and to improve the environmental conditions in neighborhoods. CPP supports community-led movements using a full range of advocacy strategies to challenge the status quo.

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EXECUTIVE SUMMARY

Petroleum refineries are inherently dangerous operations and significant sources of pollution that put nearby community members at risk. California, in particular, is home to numerous refineries that are some of the largest stationary emitters of toxic air contaminants, criteria pollutants, and greenhouse gases in the entire state.[1] Incidents at these refineries – including explosions, fires, and flaring events – threaten nearby community members, first responders, and refinery workers. There is a clear need to transition away from these harmful operations but in the meantime, it is imperative that emissions are mitigated and that additional safeguards are enacted to protect public health and safety from these aging, dangerous facilities. To this end, and in recognition of the importance of providing real-time emissions data to community members, first responders, and regulators, California legislators passed and Governor Brown signed Assembly Bill 1647, a bill to impose fenceline monitoring requirements at refineries in the state. The purpose of this legislation was to understand pollution sources at refineries and ways to mitigate their hazardous emissions, and to inform and notify community members of these emissions. Five years since this legislation was enacted, it is clear that there are serious flaws in the implementation of the statute's requirements. Specifically, these flaws include: (1) inconsistent implementation of the statutory requirements; (2) inadequate notification to the public of excess emissions; (3) lack of access to key data and information; (4) absence of corrective action to address elevated emissions; (5) inclusion of unlawful exemptions; and (6) lack of adequate fenceline monitoring coverage at some refineries. These flaws undermine the purpose of the legislation and result in a weak and ineffective fenceline monitoring program.

To ensure that the fenceline monitoring program is working as intended, we recommend that the Legislature amend Health and Safety Code section 42705.6 to require the following:

1. The air districts, in accordance with standardized guidance developed by CARB, must: (1) ensure that refineries are measuring all necessary pollutants; (2) set threshold levels that align with California Office of Environmental Health Hazard Assessment's (OEHHA) Reference Exposure Levels; (3) require notification of exceedances; (4) require refineries to submit and publish quarterly data reports; (5) standardize siting criteria for fenceline monitors; and (6) set technology requirements. The air districts must update their regulations to clarify that the requirements are applicable to biorefineries.

2. The air districts must require refineries to provide adequate public notification when thresholds are exceeded.

3. The air districts must ensure that quarterly reports and data from the fenceline monitors are readily accessible for community members and researchers. The air districts must engage in a regular review and audit of the data to assess trends and variations that can inform emissions reductions and other actions.

4. The air districts must require refineries to conduct a root cause analysis of threshold exceedances and engage in corrective action.

5. The air districts must remove all exemptions currently in place to comply with the intent of the statute.

6. The air districts must require refineries to include storage tank farms within their fenceline monitoring systems and must ensure that fenceline monitors are properly sited to provide adequate coverage. CARB must standardize siting criteria to ensure that refineries are considering all relevant factors.

INTRODUCTION

Petroleum refineries in California emit numerous toxic pollutants that put community members at risk. These refineries are primarily located in low-income communities and communities of color that are already overburdened with toxic emissions. In an effort to assist in identifying harmful sources of pollution that community members face and mitigate these toxic emissions, legislation was enacted that required refineries to set up fenceline monitoring networks. However, the implementation of the fenceline monitoring program in California has been riddled with flaws that undermine its effectiveness. This report discusses these flaws in implementation and provides recommendations to fix these problems and strengthen the fenceline monitoring program so that it better serves community members.

Flaring at a Phillips 66 refinery in California. *Source: Jesse Marquez.*

HEALTH AND COMMUNITY IMPACTS OF REFINERIES

California is the country's third largest refiner of crude oil, with 19 refineries located in the Los Angeles area, Bay area, and San Joaquin Valley areas.[2] Refineries engage in a range of processes involving the storage and manufacture of numerous petroleum products, resulting in the release of criteria pollutants such as particulate matter, nitrogen oxide, and sulfur dioxide. Several of these pollutants contribute to ground-level ozone formation. Exposure to ground-level ozone and particulate matter can result in asthma attacks, decreased lung function, irregular heartbeat, and increased mortality.[3] Petroleum refineries also regularly release known toxic air contaminants and hazardous volatile organic compounds (VOCs). In a 2019 report, the California Office of Environmental Health Hazard Assessment (OEHHA) compiled a list of 188 chemicals that California refineries emit and ranked these chemicals based on exposure and toxicity potential.[4] Based on this ranking, OEHHA developed a list of 18 chemicals that are the top candidates for air monitoring. This list includes: (1) acetaldehyde; (2) ammonia; (3) benzene; (4) 1,3-butadiene; (5) cadmium; (6) diethanolamine; (7) formaldehyde; (8) hydrogen fluoride; (9) hydrogen sulfide; (10) manganese; (11) naphthalene; (12) nickel; (13) nitrogen oxide; (14) polycyclic aromatic hydrocarbons (PAH); (15) particulate matter (PM); (16) sulfur dioxide; (17) sulfuric acid; and (18) toluene.[5] These chemicals have numerous adverse impacts on human health, including irritation of the eyes, skin, and respiratory tract; decreased pulmonary function; asthma; immune system damage; fatigue; liver, kidney, and heart damage; nausea; and headaches, among many others.[6]

In addition to the adverse health impacts caused by air pollution from routine operations, petroleum refineries also experience flaring events, fires, spills, and explosions that release even more hazardous air pollutants into nearby residential areas and put community members', first responders', and refinery workers' lives at risk.[7] From January 2021 to June 2022 alone, there were over 100 incidents at California refineries (see Appendix A). The following incidents over the last couple decades exemplify the extreme dangers present at refineries:

- In 2012, at the Chevron Refinery in the Bay Area, an incident occurred that resulted in the release of a "large plume of vapor, particulates, and black smoke, which traveled across the surrounding area."[8] As a result, 15,000 people from the surrounding communities needed to seek medical treatment in the weeks after the incident.[9]
- In 2015, a major explosion at the Torrance Refinery in the Los Angeles area injured four workers.[10] This explosion caused a piece of debris to almost hit a tank containing hydrofluoric acid – a highly toxic substance that can seriously injure or cause death at low levels of exposure.[11]
- On January 19, 2005, a flash fire occurred after a pipeline broke at Kern Oil & Refining in the Central Valley that killed one worker and severely burned two others. More recently, on January 18, 2018, firefighting crews responded to a large fire at this refinery.[12]

These refineries are largely located in communities of color and low-income communities, with some of the surrounding communities considered "very low-income" according to the Department of Housing and Urban Development (see Table 1). Most of these communities are already overburdened with other sources of toxic contamination that pollute their environment and harm their health. For instance, all but one refinery are located in counties that received a failing grade from the American Lung Association for ozone air quality in 2022 and all of the refineries are in counties with a failing grade for particle pollution.[13]

Table 1: Demographics of Communities Around Refineries

	% People of Color[a]	Per Capita Income[b]	Low-Income or Very Low-Income?[c]	Pollution Burden Percentile[d]
LOS ANGELES AREA				
Marathon Petroleum (Carson)	88%	$25,562	Very Low-Income	99
Marathon Petroleum (Wilmington)	84%	$28,393	Very Low-Income	99
Chevron (El Segundo)	64%	$51,194	Low-Income	97
PBF Energy (Torrance)	74%	$41,405	Low-Income	95
Valero (Wilmington)	82%	$28,952	Very Low-Income	99
Phillips 66 (Wilmington)	77%	$35,653	Very Low-Income	96
Phillips 66 (Carson)	84%	$28,081	Very Low-Income	99
AltAir Paramount (Paramount)*	89%	$24,150	Very Low-Income	89
World Oil (South Gate)*	95%	$19,497	Very Low-Income	100
Valero Asphalt Refinery (Wilmington)*	84%	$28,344	Very Low-Income	93
BAY AREA				
Chevron (Richmond)	82%	$36,354	Very Low-Income	92
Shell (Martinez)	43%	$46,724	Low-Income	91
Phillips 66 (Rodeo)	72%	$35,703	Very Low-Income	86
Marathon Petroleum (Martinez)	49%	$42,909	Very Low-Income	91
Valero (Benicia)	51%	$41,155	Low-Income	69
SAN JOAQUIN VALLEY				
Alon (Bakersfield)	56%	$24,774	Low-Income	87
Kern Oil & Refining Co. (Bakersfield)	89%	$14,795	Very Low-Income	91
San Joaquin Refining Co. (Bakersfield)	60%	$22,577	Very Low-Income	87
Tricor Refining (Bakersfield)	65%	$20,145	Very Low-Income	76

**Not currently subject to fenceline monitoring requirements due to exemptions put in place by air districts.*

a. EPA, EJScreen, https://ejscreen.epa.gov/mapper/ (ACS 2019 Reports, 5-mile radius).
b. EPA, EJScreen, https://ejscreen.epa.gov/mapper/ (ACS 2019 Reports, 5-mile radius).
c. Dep't of Housing & Urban Development, Office of Policy Development & Research, Income Limits, https://www.huduser.gov/portal/datasets/il.html#2019_query (2019 data).
d. Pollution burden percentile "represents the potential exposures to pollutants and the adverse environmental conditions caused by pollution." A higher percentile indicates a greater pollution burden. OEHHA, CalEnviroScreen 4.0, https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-40.

FENCELINE MONITORING

In order to better identify and understand the severe risks that refineries pose to surrounding communities, Governor Brown signed Assembly Bill 1647 (Muratsuchi) in 2017, which codified Health and Safety Code section 42705.6. This statute aimed to identify pollution sources at petroleum refineries, inform measures to reduce emissions, and alert residents of hazardous releases.[14] Specifically, by January 1, 2020, petroleum refineries were required to develop, install, operate, and maintain fenceline monitoring systems and provide real-time monitoring data to the public in an accessible format.[15] A fenceline monitoring system is defined as "equipment that measures and records air pollutant concentrations at or adjacent to a petroleum refinery and that may be useful for detecting or estimating the quantity of fugitive emissions, gas leaks, and other air emissions from the refinery."[16] Air districts - the regional regulatory bodies that are responsible for regulating stationary sources of pollution, including refineries - were required to develop guidance and regulations to implement the refinery fenceline monitoring systems.[17]

Assembly Bill 1647 was enacted with recognition that while some air districts were working on fenceline monitoring regulations or had already adopted them, there needed to be a consistent state-wide standard. Additionally, the U.S. EPA had already implemented fenceline monitoring for refineries at the federal level in 2015 but California's statute sought to go beyond the limited requirements of EPA's regulation.[18] For instance, the federal requirement was limited to passive monitoring, wherein samples are collected biweekly for laboratory analysis, but Assembly Bill 1647 required refineries to provide real-time data.[19] The lack of real-time data for the federal requirement means that it does not "provide value as an emergency monitoring tool" or as a tool for community members to know what's happening as it's happening.[20] The federal requirement is also limited because it only requires refineries to monitor for benzene emissions.[21] On the other hand, the federal regulation does require facilities to conduct a root cause analysis and engage in corrective action when they exceed the established benzene concentration limit – a provision that is not included in California's statute or the implementing regulations, as discussed further below.[22]

RELEVANT CALIFORNIA REGULATORY AGENCIES

There are numerous agencies in California that play a part in the oversight and regulation of refineries. In terms of implementing Assembly Bill 1647, the primary role belongs to the air districts. Each air district is responsible for overseeing stationary sources of air pollution in a specified geographic area. There are three air districts in particular that are responsible for oversight of the majority of the refineries in California[23]:

1. The South Coast Air Quality Management District (South Coast AQMD) is responsible for regulating stationary sources in large areas of Los Angeles, Orange, Riverside, and San Bernardino counties.[24] There are ten refineries in this air district.

2. The Bay Area Air Quality Management District (Bay Area AQMD) is responsible for the nine counties that surround San Francisco Bay, including Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, southwestern Solano, and southern Sonoma counties.[25] There are five refineries in this air district.

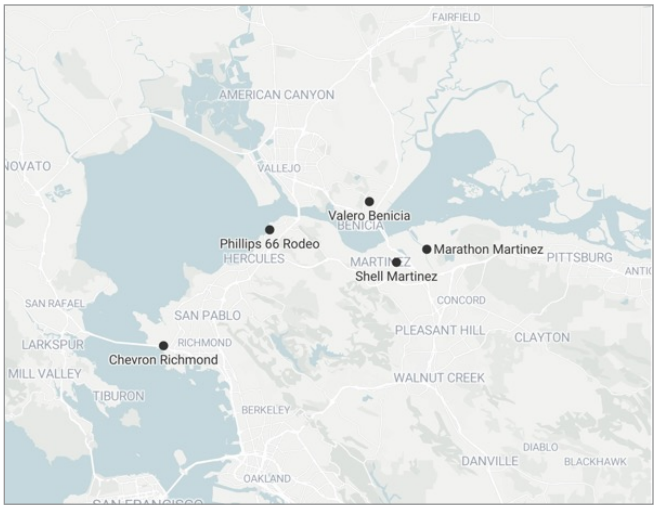
3. The San Joaquin Valley Air Pollution Control District (San Joaquin Valley APCD or Valley Air) is responsible for eight counties in California's Central Valley – San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, Tulare, and a portion of Kern.[26] There are four refineries in this air district.

In addition to the air districts, the California Air Resources Board (CARB) has also played a large part in assessing the operations of refineries. In particular, CARB notes that its role includes researching "the

causes and effects of air pollution problems – and potential solutions – using the best available science and technology."[27] To that end, CARB issued a report in March 2019 "recommending actions to improve emergency and routine air monitoring at California's major oil refineries and in the communities that surround them."[28] Specifically, CARB recommended a four-part approach that involves expanding air monitoring; improving modeling techniques to better understand the impacts of pollution and incidents; providing real-time information about air quality near refineries; and improving state and local coordination through the creation of an interagency refinery monitoring working group.[29] This proposed refinery monitoring working group would "develop guidance for refinery air monitoring plans considering individual refinery and community conditions, identifying which chemicals should be monitored in each case and the associated approaches and methods appropriate to individual circumstances."[30] CARB also participates in the Interagency Refinery Task Force (IRTF).[31] The IRTF was established in 2013 "with the goal of better coordinating refinery safety and compliance efforts, and improving preparedness for future incidents."[32]

IMPLEMENTATION OF ASSEMBLY BILL 1647 BY THE AIR DISTRICTS

South Coast AQMD, Bay Area AQMD, and Valley Air are each responsible for implementing the requirements of Assembly Bill 1647 and issuing regulations and guidance for refineries in their respective districts. Before the passage of Assembly Bill 1647, the Bay Area AQMD had already enacted fenceline monitoring requirements for refineries through Regulation 12, Rule 15. The South Coast AQMD had enacted similar requirements in December 2017 through Rule 1180. Valley Air, on the other hand, waited until December 2019 – one month before the statutory deadline – to adopt Rule 4460. Each of the regulations implemented by the air districts has glaring deficiencies that undermine the purpose and intent of the fenceline monitoring program and fail to protect nearby communities from outsized risk and unnecessary harm.



Bay Area Refineries

San Joaquin Valley Refineries

South Coast Refineries

*Refineries with colored dots are currently exempt from the fenceline monitoring requirements.

IMPLEMENTATION ISSUES

There are several issues with the implementation of Assembly Bill 1647 that deny communities the full protections of a well-designed fenceline monitoring program. This section discusses these issues and then recommends that the Legislature make critical amendments to Health and Safety Code section 42705.6 to address these problems so that community members can be assured that the program is working as originally intended.

INCONSISTENT IMPLEMENTATION BY AIR DISTRICTS

Assembly Bill 1647 was meant to create a statewide standard by imposing uniform requirements across air districts for refinery fenceline monitoring. Instead, because each of the air districts was tasked with creating its own regulations to implement Assembly Bill 1647, the results have diverged in key ways. Implementation varies for the following criteria:

POLLUTANTS REQUIRED TO BE MEASURED

Given the number of pollutants that are emitted by refineries, a well-designed fenceline monitoring system needs to ensure that an adequate range of pollutants are measured. Valley Air's updated rule is the most comprehensive among the air districts as it is the only one that requires refineries to monitor for the full range of pollutants identified as top candidates for air monitoring by OEHHA.[33] In contrast, Bay Area AQMD only requires refineries to monitor a limited number of pollutants (benzene, toluene, ethylbenzene, xylenes, and hydrogen sulfide) and then suggests that refineries consider monitoring other pollutants in their air monitoring plans (sulfur dioxide, alkanes or other organic compound indicators, 1,3-butadiene, and ammonia).[34] The South Coast AQMD requires refineries to measure more pollutants than the Bay Area AQMD (see Table 2) but does not require monitoring of all pollutants identified as top candidates for air monitoring by OEHHA.

THRESHOLDS

Refineries in the South Coast and San Joaquin Valley are required to establish thresholds based on National Ambient Air Quality Standards (NAAQS) and Reference Exposure Levels as assessed by OEHHA. The Reference Exposure Level is the threshold above which chemicals are considered to be hazardous to human health. If these threshold values are exceeded, then the refineries send out notification of the exceedance to alert community members and first responders so they can take appropriate action. These notifications also alert the refinery of elevated emissions above the applicable threshold. However, Bay Area AQMD does not require refineries to determine thresholds as part of their fenceline monitoring plans – a clear oversight that diminishes the effectiveness and utility of the fenceline monitoring systems.

NOTIFICATIONS

As noted, notifications of exceedances provide community members and first responders with essential information about the pollution levels and real-time risks in their community. In contrast to the South Coast AQMD and Valley Air, Bay Area AQMD does not require refineries to provide notification of elevated emissions. The air district claims this is because their regulation does not establish thresholds or limits and thus, there cannot be an exceedance if there is no limit. According to Bay Area AQMD, the monitoring "is meant to be informative only."[35] As a result, the only way for community members near Bay Area refineries to find out what is happening at the refineries is to go onto each facilities' website to view real-time data.[36] Bay Area AQMD's regulatory structure leaves surrounding communities and first responders without the information they need to respond appropriately to exceedance events.

Table 2: Differences in Implementation Amongst Air Districts

	SOUTH COAST AQMD	BAY AREA AQMD	VALLEY AIR*
Pollutants Required to be Measured	Acetaldehyde Acrolein Ammonia Benzene Black carbon 1,3 butadiene Carbonyl sulfide Ethylbenzene Formaldehyde Hydrogen cyanide Hydrogen fluoride Hydrogen sulfide Nitrogen oxide Styrene Sulfur dioxide Toluene Total VOCs Xylene	Benzene Ethylbenzene Hydrogen sulfide Toluene Xylene	Acetaldehyde Ammonia Benzene 1,3 butadiene Cadmium Diethanolamine Ethylbenzene Formaldehyde Hydrogen fluoride Hydrogen sulfide Manganese Naphthalene Nickel Nitrogen oxide Polycyclic Aromatic Hydrocarbons (PAH) Particulate Matter Sulfur dioxide Sulfuric Acid Toluene Xylene
Thresholds	✓	✗	✓
Notifications	✓	✗	✓
Quarterly Data Reports	✓	✗	✗
Siting of Fenceline Monitors	Refineries must assess potential pollutant hotspots within the facility and ensure adequate coverage of the area along the facility perimeter. Must also take into consideration the proximity of refinery emissions sources to sensitive receptors; the type of pollutants to be measured; and information from dispersion modeling, gradient sampling and mobile measurements.	Refineries must assess populated areas within 1 mile of the refinery fenceline likely to be affected when the annual mean wind direction lies in an arc within 22.5 degrees of a direct line from source to receptors 10% of the time, or greater.	Refineries must assess the distance from the facility to the closest sensitive receptor(s); the location of impacted communities; and refinery air pollutant distribution in these communities.
Technology Requirements	Open path technologies recommended.	Open path technologies required.	Open-path technologies or point monitoring required.
Inclusion of Biorefineries	✗	✓	✗

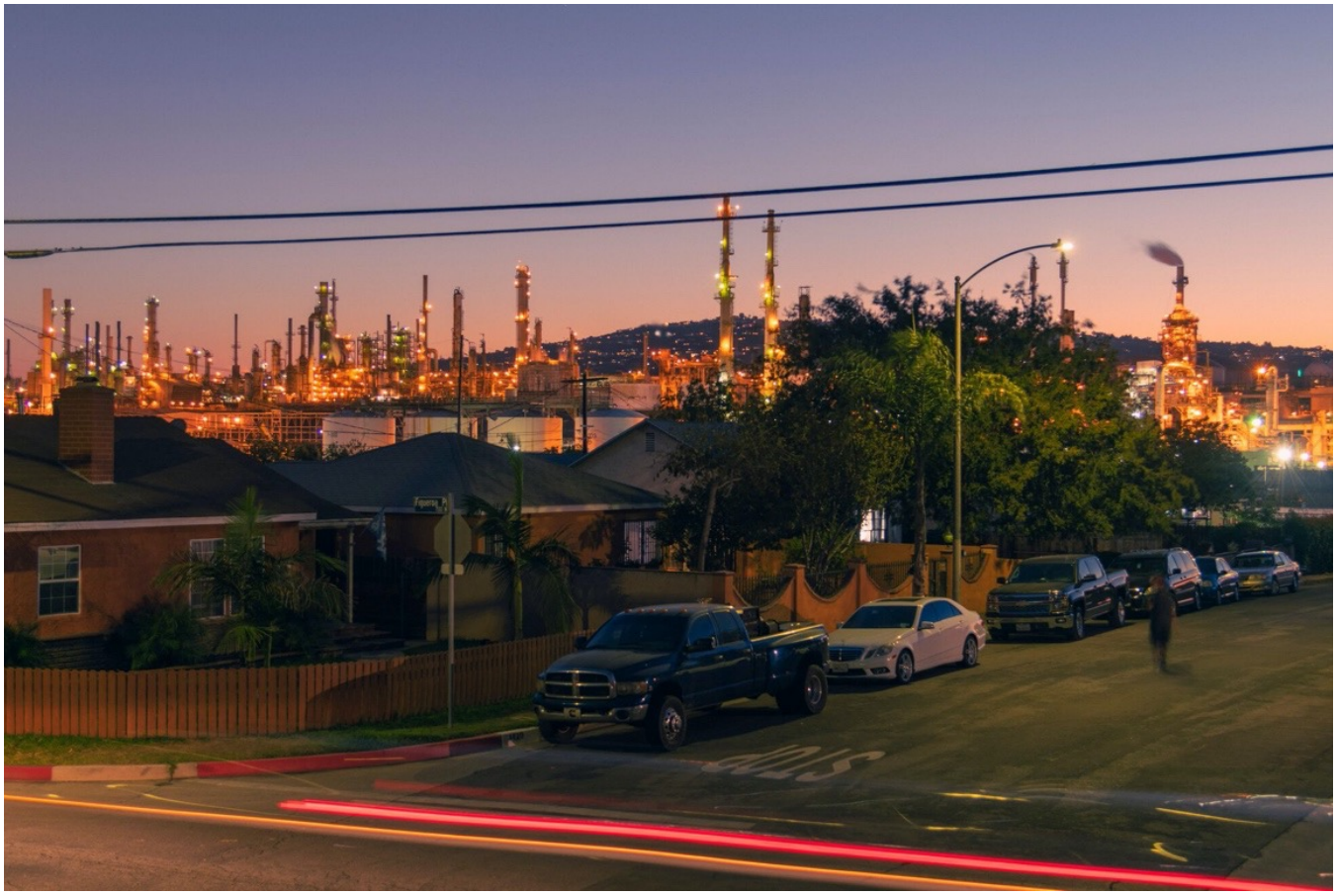
* Valley Air is scheduled to adopt an amended rule after the release of this report. The information in this chart pertains to Valley Air's most recently proposed version of its amended rule from August 2022.

QUARTERLY REPORTS

Quarterly reports of fenceline monitoring data provide the public, as well as air districts, with information about pollutant levels, variations, and trends over a 3-month timeframe. Indeed, the ability to understand long-term variations and trends in emissions is one of the main objectives of South Coast AQMD's fenceline monitoring program.[37] As such, South Coast AQMD requires refineries to publish quarterly reports "written at a public-friendly level" and post these reports on the refinery's fenceline monitoring website.[38] Neither Valley Air nor Bay Area AQMD require such reports. Valley Air only requires refineries to submit a report to the air district describing the times when the fenceline monitoring system was inoperative and describing repairs/adjustments. These reports are not available on the refineries' fenceline monitoring websites or on Valley Air's website. Bay Area AQMD does not require quarterly reports at all.[39]

SITING OF FENCELINE MONITORS

Each of the air districts recommends different criteria for assessing the siting of fenceline monitors. Proper siting of fenceline monitors should ensure that both an adequate number of monitors are installed and that the monitors are installed in optimal locations to detect excess emissions. Refineries in the Bay Area are required to assess "populated areas within 1 mile of the refinery fence-line likely to be affected when the annual mean wind direction lies in an arc within 22.5 degrees of a direct line from source to receptors 10% of the time, or greater."[40] Valley Air refineries must assess the distance from the facility to the closest sensitive receptor(s); the location of impacted communities; and refinery air pollutant distribution in these communities.[41] Because Valley Air does not require refineries to evaluate emissions from individual on-site



Communities near the Phillips 66 Wilmington refinery. *Source: Hannah Benet.*

"Understanding refineries' harmful emissions is a vital first step to holding this industry accountable for the damage they continue to cause in our community."
Jesus Alonso, Community Organizer, Clean Water Action

sources, the result is that refineries simply model emissions from the center of their facility. Such modeling overlooks the communities most impacted by harmful emissions from the refinery and impacts the location and amount of monitors that are installed.[42] South Coast refineries, on the other hand, are advised to identify potential pollutant hotspots within the facility and to ensure adequate coverage of the area along the facility perimeter.[43] South Coast AQMD also notes that:

> Considerations, such as, the proximity of refinery emissions sources to sensitive receptors (i.e., residents, schools, hospitals, etc.) and type of pollutants to be measured could require additional open-path monitors for a facility. Also, information available from dispersion modeling, gradient sampling and mobile measurements, should be taken into consideration when assessing adequate coverage of a facility perimeter with a fenceline air monitoring system.[44]

These widely differing siting requirements result in refineries with inadequate fenceline coverage, as discussed further below.

TECHNOLOGY REQUIREMENTS

The type of technology used to monitor emissions can impact the overall quality of the fenceline monitoring network at each refinery. Currently, open-path monitoring – in contrast to point monitoring – is considered the most effective monitoring technology in most circumstances. The Bay Area AQMD requires the use of open-path technologies.[45] South Coast AQMD recommends that refineries use open-path technologies.[46] Valley Air allows for the use of open-path technologies or point monitoring.[47] For all three air districts, if a refinery wants to use an emerging technology then it must provide the rationale for its choice.[48]

INCLUSION OF BIOREFINERIES

The Bay Area AQMD recently amended its rule to incorporate biorefineries (refineries processing alternative fuels, such as biofuels) given that two refineries in its jurisdiction applied to convert to biorefineries. The South Coast AQMD and Valley Air have not included biorefineries in their fenceline monitoring regulations. As Bay Area AQMD noted, the products at the biorefineries "will be very similar, if not identical, to the current products produced by the petroleum operation. Furthermore, each facility is likely to import petroleum-based products for distribution or blending, so there will be both petroleum and non-petroleum materials at the facility. The types of air pollution emitted by the repurposed facilities will be similar to current operation."[49] Thus, ensuring that the fenceline monitoring rule applies to biorefineries "will ensure emissions will not increase, keeping existing community protections in place."[50]

Recommendation: The air districts, in accordance with standardized guidance developed by CARB, must: (1) ensure that refineries are measuring all necessary pollutants; (2) set threshold levels that align with OEHHA's Reference Exposure Levels; (3) require notification of exceedances; (4) require refineries to submit and publish quarterly data reports; (5) standardize siting criteria for fenceline monitors; and (6) set uniform technology requirements. The air districts must update their regulations to clarify that the requirements are applicable to biorefineries.

INADEQUATE PUBLIC NOTIFICATION OF EXCESS EMISSIONS

Notifications of exceedances at fenceline monitors are an essential aspect of the fenceline monitoring program. These notifications inform the public that certain pollutants are exceeding thresholds and "may pose a potential health concern, allowing the public to consider further actions to protect their health."[51] The notifications also provide information to refinery operators so that they can "rapidly identify and mitigate any undetected and/or accidental emissions. This can have a significant impact on the reduction of refinery fugitive emissions."[52] A review of data from refineries in the South Coast air district from 2020 Quarter 2 to 2021 Quarter 3 shows that nearly half of all exceedances included in the quarterly reports did not have a corresponding email notification sent out (97 exceedances did not have an email notification sent out versus 109 exceedances that did). These notification systems ensure that community members, as well as first responders, are properly informed about the air quality in their community. If half of the exceedances are not resulting in a notification, then clearly the systems are not working as intended. Additionally, as noted above, refineries in the Bay Area are not even required to send out notifications of exceedances since they do not have to establish thresholds that would be used to determine if an exceedance has occurred. It is especially egregious that the Bay Area refineries do not have notification systems for exceedances given that the establishment of fenceline monitoring requirements by the Bay Area AQMD was in part due to the 2012 Chevron incident.

The notification systems are also deficient because currently the only option for community members to receive notifications is through email, which is often not the most effective way of getting information to community members in a timely way. The air districts must ensure that refineries are providing public notification through a variety of means other than just email, such as text messages, in order to ensure that community members can actually stay informed.

Recommendation: The air districts must require refineries to provide adequate public notification when thresholds are exceeded.

Image: Children playing soccer in front of Phillips 66 Wilmington. *Source: Hannah Benet.*

LACK OF ACCESS TO DATA AND INFORMATION

In addition to the inadequacies in providing public notifications, air districts and refineries are also not ensuring that community members are aware of and have access to key documents and data. Refineries in the South Coast are supposed to provide notice of the availability of quarterly reports, but based on a review of email notifications, it does not appear that any such notifications have been sent out since the implementation of the program. Quarterly reports from refineries in Valley Air's district are also hard to come by. Valley Air's Rule 4460 only requires refineries to submit quarterly reports—that merely contain equipment downtime and repair information—to the air district and there are no requirements to ensure that the public is able to easily access these documents.[53] For instance, Kern Oil & Refining notes in its air monitoring plan that hard copies of its quarterly report "will be made available to the public at the refinery on an appointment basis."[54] This is clearly inadequate and only obstructs community members from gaining access to this information. Refineries in the Bay Area do not have a requirement to create quarterly reports at all. These documents are an essential aspect of the program as they provide an overview of the data from the past three months, including exceedances, malfunctions, and repairs. The air districts should require refineries to publish these reports on their fenceline monitoring websites, send out notification when the reports are published, and provide easy access to the reports through a variety of means.

Furthermore, if anyone wants access to the direct data from the fenceline monitoring systems, then the refineries simply direct them to go to the air districts' website or submit a public information request.[55] None of the air districts' websites include links to this data for the public to easily access and analyze, so the only option is to submit a public information request—a step that can take months for air districts to complete and may be burdensome for many members of the public. Moreover, if a researcher or community member wants ongoing access to the data, they would have to make repeated requests, thus adding to the burden. Additionally, when Earthjustice requested fenceline monitoring data from the South Coast AQMD, the air district only provided copies of the email notifications that are sent to the public. In other words, the air district did not have the actual fenceline monitoring data since the data is kept by the refineries, so submitting a public information request was futile. Air districts must play a larger role in the maintenance and oversight of fenceline monitoring data, including having the data available for the public to download on a platform that is easy to navigate and in a format that does not require extensive data cleaning. Additional data access recommendations from researchers who have been studying fenceline monitoring data—including ensuring that APIs (application programming interfaces) are public and open and that the public can download .csv files of the data—are included in Appendix B.

In addition to making the data more accessible, the air districts should also commit to regularly reviewing the data for trends that can inform regulatory and enforcement actions. While quarterly reports are helpful in providing an overview of information from the fenceline monitors, it is essential that the air districts independently review the raw data so that they have a full picture of what the monitors are detecting and what steps can be taken to address exceedances and protect community members. Further, the air districts should periodically conduct audits of the fenceline monitoring systems to ensure that the systems are being run properly and will detect threshold exceedances.

Recommendation: The air districts must ensure that quarterly reports and data from the fenceline monitors are readily accessible for community members and researchers. The air districts must engage in a regular review and audit of the data to assess trends and variations that can inform emissions reductions and other actions.

LACK OF REQUIREMENT TO ENGAGE IN ROOT CAUSE ANALYSIS & CORRECTIVE ACTION

The regulations implemented by the South Coast AQMD and Bay Area AQMD do not provide for any type of root cause analysis or corrective action requirement when there is an exceedance of established emissions limits or health and safety thresholds. As noted above, the federal fenceline monitoring regulation includes this requirement, which is key to ensuring that whatever is causing the exceedance is investigated and adequately addressed. An analysis of data from the federal monitoring requirement found that the "fenceline program is working as intended to identify problems and malfunction or 'upset' events" as several facilities had been able to "successfully decrease their annual average net concentration over time, with several eventually achieving compliance with the action level after sustained periods of exceedance."[56]

Since South Coast AQMD and Bay Area AQMD have not included a corrective action requirement, there is no reason for refineries in these air districts to meaningfully investigate detected exceedances. While refineries in the South Coast typically include a description of any actions taken related to exceedances in their quarterly reports, these actions are voluntary with no standards of accountability. As such, a review of quarterly reports from the refineries in the South Coast from 2020 Quarter 2 to 2021 Quarter 3 shows that for the vast majority of exceedances (141), no cause was found and the facility simply surveilled the perimeter. For 31 exceedances, the event was attributed to an off-site source and for only 28 out of the total 206 exceedances was a cause found and the issue corrected. The South Coast AQMD has issued some notices of violation and conducted compliance investigations as a result of exceedances, but these actions are rare. The Bay Area AQMD set up their program without established emission limits or thresholds, so essentially there aren't any exceedances because there isn't a threshold to exceed. Thus, it follows that there is no chance a refinery will investigate and correct a detected exceedance since they don't consider anything detected by the fenceline monitoring system an exceedance. The Bay Area AQMD's fenceline monitoring guidance states that one of the main goals of fenceline monitoring is "to potentially aid in identifying corrective actions that will lower emissions."[57] This potential is unlikely given the way that Bay Area AQMD has set up its program. In contrast, Valley Air has proposed to include both a root cause analysis and a corrective action provision in its updated fenceline monitoring rule. Specifically, refineries would be required to submit a report within ten days of an exceedance that includes information about all corrective actions taken if the suspected source of the exceedance is within the refinery's fenceline.[58] Air districts should not only require a root cause analysis but also ensure that the analysis is publicly accessible for community members.

Recommendation: The air districts must require refineries to conduct a root cause analysis of threshold exceedances and engage in corrective action.

"[Fenceline monitoring] regulations must be strengthened to finally hold polluters accountable for public health harms caused to Kern County communities and those near refineries across the state. More stringent rules coupled with robust enforcement are essential to reducing the harms caused by the fossil fuel industry and an important step toward achieving environmental justice in the San Joaquin Valley."
Jasmin Martinez, Coordinator, CVAQ

INCLUSION OF UNNECESSARY AND UNLAWFUL EXEMPTIONS

Air districts have introduced another flaw in their implementation of the statutory requirements by creating exemptions for certain facilities. South Coast AQMD exempts refineries with capacity below 40,000 bpd[59]; Bay Area AQMD exempts refineries with capacity below 20,000 bpd[60]; and Valley Air originally exempted refineries that were "not currently engaged in refining crude oil."[61] Valley Air also exempted smaller refineries from having to monitor for several extremely toxic pollutants – refineries with a capacity of greater than 40,000 bpd were required to screen for ten pollutants, whereas refineries processing under this threshold only had to screen for four pollutants. The statute does not provide for any of these exemptions.

Valley Air's exemption for refineries "not currently engaged in refining crude oil" would have applied to Alon Bakersfield Refining and Tricor Refining. Both of these refineries are operating and producing toxic emissions though. In 2020, for instance, Alon reported 425 pounds of toxic releases, 16.8 tons of carbon monoxide (CO), 5.3 tons of volatile organic compounds (VOCs), 5.1 tons of nitrogen oxides (NOx), 2.6 tons of particulate matter (PM), and 31.4 pounds of diesel PM.[62] Similarly, according to 2020 emissions inventories, Tricor reported 12.2 tons of CO, 7.9 tons of VOCs, 9.7 tons of NOx, and 1.4 tons of PM10.[63] Valley Air's exemption allowing smaller refineries to monitor for fewer pollutants would have applied to Kern Oil (26,000 bpd capacity), San Joaquin Refining (15,000 bpd capacity), and Tricor (12,500 bpd capacity).[64] This is especially problematic because these refineries are emitting some of the same compounds that the over-40,000 bpd refineries would have to monitor for. For instance, Kern Oil & Refining released nearly 4,400 pounds of ammonia in 2020 – a chemical that it would not have been required to monitor for under Valley Air's exemption.[65] Valley Air's unlawful exemptions were challenged in a lawsuit and a writ of mandate was issued requiring the removal of both exemptions. As a result, Valley Air has engaged in a rulemaking process to update its fenceline monitoring regulations and remove these exemptions.[66]

"[Exempting] South Gate from these rules because it 'produces less than 40,000 barrels a day' makes me feel completely unsafe. Unsafe because of the unknown activities that happen in that facility while community members drive past, shop at the stores right next to it, or watch a movie at the theater across the street."
Cindy Donis, Organizer and Member, EYCEJ

Additionally, in the South Coast, the World Oil South Gate refinery, AltAir Paramount, and the Valero Asphalt Refinery in Wilmington are exempt from the fenceline monitoring requirements. All three of these refineries produce the same toxic emissions that OEHHA identifies as top candidates for air monitoring. For instance, South Gate refinery released 19.3 tons of CO, 17.1 tons of VOCs, 27.6 tons of NOx, 18 tons of SOx, and 11.7 tons of PM in 2019.[67] AltAir Paramount similarly emitted 6.5 tons of CO, 23.7 tons of VOCs, 30.9 tons of NOx, 5.3 tons of SOx, and 10.5 tons of PM in 2019.[68] Additionally, AltAir Paramount had agreed to limit their throughput to 39,500 bpd—just 500 bpd under the limit—in order to receive the exemption.[69] Lastly, the Valero Asphalt Refinery emitted 7.9 tons of CO, 14.6 tons of VOCs, 6.3 tons of NOx, 116.9 pounds of benzene, and 776.8 pounds of ammonia in 2019.[70] Indeed, regardless of whether refineries process above or below a certain amount of barrels per day, these operations all use similar chemicals and processes that cause harmful emissions and safety hazards. Thus, all of these refineries must be subject to the fenceline monitoring requirements.

Recommendation: The air districts must remove all exemptions currently in place to comply with the intent of the statute.

LACK OF ADEQUATE FENCELINE MONITORING COVERAGE

Another flaw in the implementation of Assembly Bill 1647 is the inadequate coverage of the perimeters of refineries with fenceline monitoring systems that properly detect exceedances. For instance, some refineries, such as Marathon (Tesoro) Martinez, have not installed monitors to cover the areas around their storage tanks. The refinery notes that "there are no downwind areas of concern near Tesoro's auxiliary tank battery; thus, no open path monitoring in this area is proposed."[71] However, while it is essential to consider the location of nearby communities, that should not be the only criteria for installing fenceline monitors. The fenceline monitors are also meant to identify pollution sources at refineries and inform measures to reduce emissions and thus, it is imperative that monitors be installed to accurately capture emissions from storage tanks.

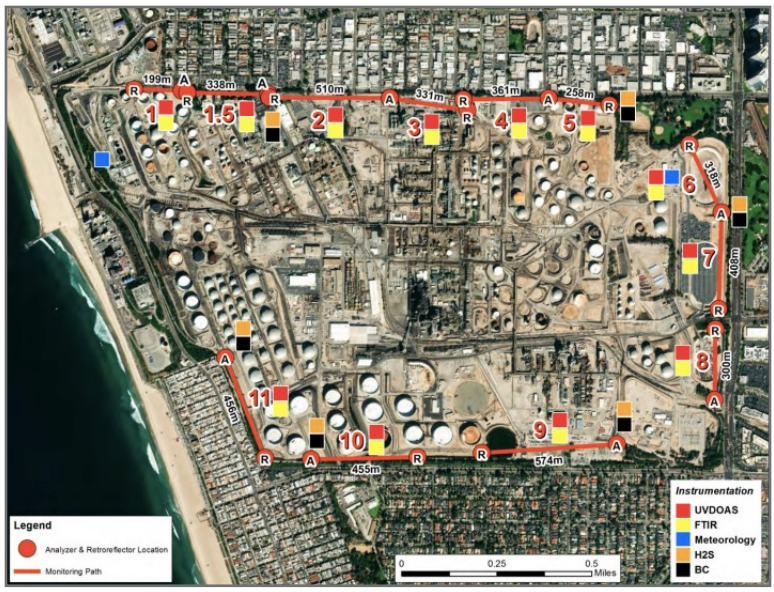
The South Coast AQMD explicitly notes the importance of using fenceline monitoring at storage tank farms:

> Fugitive emissions also occur from storage tanks … generally located together in what is referred to as the 'tank farm'. Due to the large number of potential leak sources that are scattered over a wide area at large refineries and difficulties in detecting and repairing these leaks (which may become significant collectively), these emissions are best monitored over a large area or path, using the open path systems.[72]

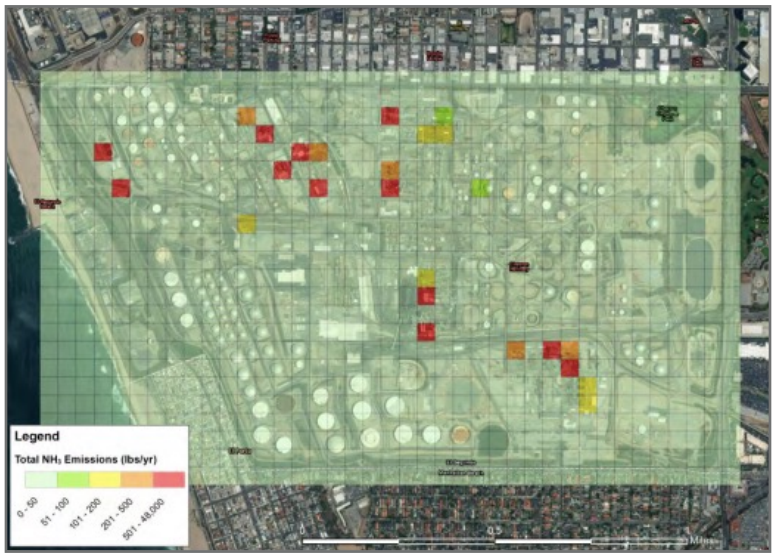
Fugitive emissions of VOCs from tanks can cause a range of health burdens. This is in part because VOCs contribute to ground-level ozone formation and ozone has a range of respiratory health impacts, including lung irritation, inflammation, and worsening of existing chronic health conditions.[73] The South Coast AQMD conducted a study in 2017 that evaluated excess emissions from leaking storage tanks at refineries.[74] As part of the study, researchers found that approximately half of one refinery's total measured emissions came from its storage tanks alone.[75] In fact, researchers discovered several leaking storage tanks while taking measurements at the petroleum refineries.[76] In sum, the study showed that leaking storage tanks are a significant source of VOC emissions. The use of fenceline monitors surrounding these tanks to help detect leaks and notify the refinery, the public, and the air district of exceedances is crucial.

Further, because of the differing guidance from the air districts, refineries are assessing whether and where to place monitors in divergent ways that often result in less protective systems. For instance, refineries in the Bay Area only assess sensitive receptors within one mile of the facility due to the Bay Area AQMD's guidance. Additionally, the San Joaquin Refinery only evaluated sensitive receptors within one mile of its facility. The refinery uses this radius to claim that air impacts on the community to the northwest of the refinery would be "minimal."[77] A one-mile radius is problematic though since VOCs are known to travel long distances after release, with VOCs with higher atmospheric lifetimes traveling the furthest.[78] Thus, it is unlikely that the impacts to a community outside the one-mile radius would actually be minimal. A one-mile radius is not sufficient and the presence of sensitive receptors within this radius—while important—is not the only consideration that needs to be accounted for. In contrast—and further highlighting the different approaches each refinery is taking, even within the same air district—Kern Oil & Refining actually assessed sensitive receptors within about four miles of its facility.[79]

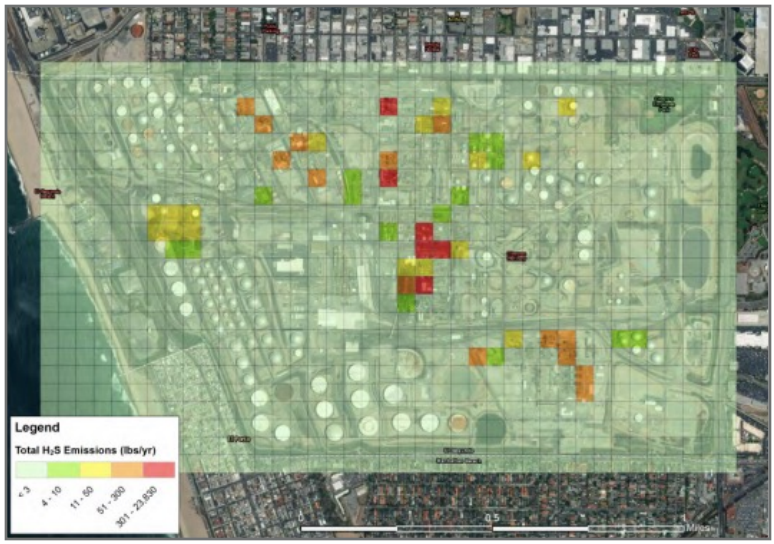
The Chevron Refinery in El Segundo is another example of a facility that has inadequate fenceline monitoring coverage, with most of the western side of the facility lacking any air monitors. Chevron's justification for this is that "there are no downwind sensitive receptors in this area."[80] However, this portion of the facility does have pollution hot spots that emit ammonia and hydrogen sulfide, and there are numerous tanks on this portion of the facility (see images below).[81]



Chevron El Segundo Fenceline Monitoring Map



Gridded Emissions of Ammonia



Gridded Emissions of Hydrogen Sulfide

The South Coast AQMD's requirements for assessing placement of monitors is not limited to simply determining if there are downwind sensitive receptors. Chevron should be required to consider all relevant factors and not simply avoid placing monitors on the western portion of its refinery because one of the criteria for placement is not met. Consistent guidance regarding the placement of monitors needs to be created so that all refineries implement equally protective fenceline monitoring systems.

Recommendation: The air districts must require refineries to include storage tank farms within their fenceline monitoring systems and must ensure that fenceline monitors are properly sited to provide adequate coverage. CARB must standardize siting criteria to ensure that refineries are considering all relevant factors.

SUMMARY OF PROBLEMS & RECOMMENDATIONS

Problem: The Air Districts are inconsistently implementing Assembly Bill 1647, creating large variations in what was meant to be a uniform state-wide program.	**Recommendation:** The air districts, in accordance with standardized guidance developed by CARB, must: (1) ensure that refineries are measuring all necessary pollutants; (2) set threshold levels that align with OEHHA's Reference Exposure Levels; (3) require notification of exceedances; (4) require refineries to submit and publish quarterly data reports; (5) standardize siting criteria for fenceline monitors; and (6) set technology requirements. The air districts must update their regulations to clarify that the requirements are applicable to biorefineries.
Problem: Petroleum refineries are failing to notify the public of detected exceedances.	**Recommendation:** The air districts must require refineries to provide adequate public notification when thresholds are exceeded.
Problem: The underlying fenceline monitoring data and key documents are not easily accessible, which prevents community members and researchers from being able to meaningfully analyze the data. Also, the air districts are not taking enough of an active role in analyzing the data to inform regulatory actions.	**Recommendation:** Refineries and the air districts must ensure that quarterly reports and data from the fenceline monitors are readily accessible for community members and researchers (see Appendix B). The air districts must engage in a regular review and audit of the data to assess trends and variations that can inform emissions reductions and other actions.
Problem: Petroleum refineries are not required to locate and mitigate sources of toxic releases that exceed health and safety thresholds.	**Recommendation:** The air districts must require refineries to conduct a root cause analysis of threshold exceedances and engage in corrective action.
Problem: The air districts are unlawfully adding exemptions to their rules resulting in reduced protections for community members.	**Recommendation:** The air districts must remove all exemptions currently in place to comply with the intent of the statute.
Problem: Petroleum refineries are excluding portions of their facilities from fenceline monitoring, such as storage tanks, and are failing to take into consideration all of the necessary criteria to determine proper monitor siting.	**Recommendation:** The air districts must require refineries to include storage tank farms within their fenceline monitoring systems and must ensure that fenceline monitors are properly sited to provide adequate coverage. CARB must standardize siting criteria to ensure that refineries are considering all relevant factors.

CONCLUSION

Phillips 66 refinery in California. *Source: John F. Gannon.*

Without meaningful statewide oversight, each air district has created deeply flawed fenceline monitoring programs with massive loopholes that benefit oil companies and negate many of the community protections that the legislation envisioned. California should ensure that the air districts meet the goals of the legislation – to inform community members of hazardous releases, to identify pollution sources at refineries, and to inform measures to reduce emissions.

APPENDIX A

INCIDENTS AT REFINERIES (JAN. 2021 TO JUNE 2022)

Date	Refinery	Short Description
1/9/21	Torrance Refinery	Released diethanolamine on-site.
1/10/21	Phillips 66 Wilmington	Flaring; SO2 released.
1/12/21	Valero Benicia	Released petroleum, impacting the Sulphur Springs Creek.
1/15/21	Marathon Carson	Released a barrel of hydrocarbon chemicals.
1/16/21	Chevron Richmond	Flaring.
1/19/21	Marathon Martinez	Released gasoline, potentially impacting groundwater.
1/28/21	Chevron El Segundo	Flaring; NOx released.
2/9/21	Chevron Richmond	Oil spill, leading to petroleum odors and a large sheen on the bay.
2/9/21	Chevron Richmond	Flaring; SO2 released.
2/11/21	Phillips 66 Carson	Flaring; SO2 released.
2/12/21	Phillips 66 Carson	Flaring.
2/21/21	Valero Benicia	H2S exceedance.
2/24/21	Phillips 66 Rodeo	Fire and plant upset resulted in release of a petroleum odor into the community.
3/6/21	Valero Wilmington	Flaring; SO2 released.
3/9/21	Valero Benicia	Oil sheen in Sulphur Springs Creek.
3/11/21	Chevron Richmond	Flaring; SO2 released.
3/22/21	Chevron Richmond	SO2 released.
4/14/21	Kern Oil Refinery	Released diesel additive onto the ground.
4/16/21	Kern Oil Refinery	Released multiple barrels of an amine chemical.
4/18/21	Valero Benicia	Released oil onto deck of barge.
4/20/21	Phillips 66 Wilmington	Petroleum leak.
4/20/21	Phillips 66 Wilmington	Leak of high pH water.
4/23/21	Phillips 66 Wilmington	Flaring; over 500 lbs. of SO2 released.
5/1/21	Kern Oil Refinery	Crude oil spill.
5/2/21	Chevron Richmond	Flaring.
5/6/21	Phillips 66 Wilmington	Flaring; over 500 lbs. of SO2 released.
5/8/21	Kern Oil Refinery	Crude oil spill.
5/14/21	Chevron Richmond	Fire and flaring.
5/27/21	Chevron Richmond	Flaring and heavy smoke.
5/24/21	Kern Oil Refinery	Released three barrels of gasoline onto soil.
6/7/21	Kern Oil Refinery	Petroleum spill.
6/10/21	Valero Wilmington	Flaring; almost 3,000 lbs. of SO2 released.
6/23/21	Phillips 66 Wilmington	Flaring; 500 lbs. of SO2 released.
7/10/21	Torrance Refinery	Released 15 barrels of sodium hydrochloride.
7/16/21	Valero Wilmington	Flaring; over 500 lbs. of SO2 released.

Date	Refinery	Short Description
7/21/21	Kern Oil Refinery	Released five barrels of spent caustic waste onto the ground.
7/22/21	Marathon Wilmington	Flaring; over 500 lbs. of SO2 released.
7/25/21	Chevron Richmond	Flaring, SO2 released.
8/9/21	Chevron El Segundo	Flaring; SO2 released.
8/10/21	Chevron Richmond	Flaring and heavy smoke.
8/13/21	Valero Benicia	Over 500 lbs. of SO2 released.
8/19/21	Chevron Richmond	SO2 released.
9/11/21	Chevron Richmond	SO2 released.
9/17/21	Marathon Carson	Flaring; SO2 released.
9/18/21	Phillips 66 Wilmington	Flaring, over 500 lbs. of SO2 released.
9/22/21	Marathon Carson	Flaring; over 500 lbs. of SO2 released.
9/24/21	Kern Oil Refinery	Spilled caustics and hydrocarbons on dirt floor.
10/9/21	Torrance Refinery	Two barrels of petroleum released.
10/12/21	Chevron El Segundo	500 lbs. of SOx released.
10/12/21	Kern Oil Refinery	Crude oil spill.
10/24/21	Chevron Richmond	Flaring; SO2 released; odors.
10/24/21	Valero Benicia	Petroleum overflowed into the Sulphur Springs Creek.
10/25/21	Marathon Martinez	Released sewage into a nearby wetland.
10/27/21	Chevron Richmond	Flaring, SO2 released.
10/30/21	Chevron Richmond	Flaring, over 500 lbs. of SO2 released.
10/30/21	Torrance Refinery	Pipe leaked petroleum onto asphalt and soil.
10/31/21	Torrance Refinery	Crude oil spill.
11/9/21	Chevron Richmond	Flaring, SO2 released.
11/11/21	Phillips 66 Rodeo	Flaring; over 500 lbs. of SO2 released.
11/18/21	Kern Oil Refinery	Spilled thirty barrels of petroleum.
11/28/21	Chevron Richmond	Released liquid ammonia.
12/1/21	Kern Oil Refinery	Released crude oil onto soil.
12/1/21	Phillips 66 Carson	Flaring; over 500 lbs. of SO2 released.
12/2/21	Kern Oil Refinery	Released crude oil onto soil.
12/10/21	Valero Benicia	Flaring; over 500 lbs. of SO2 released.
12/11/21	Valero Benicia	Vapor release.
12/13/21	Chevron Richmond	Flaring; SO2 released.
12/13/21	Torrance Refinery	Petroleum release.
12/15/21	Phillips 66 Wilmington	Flaring; almost 900 lbs. of SO2 released.
12/16/21	Martinez Refining (Shell)	Flaring; SO2 released.
12/30/21	Chevron Richmond	Flaring; SO2 released.
12/30/21	Phillips 66 Carson	Flaring; over 500 lbs. of SO2 released.
1/1/22	Phillips 66 Carson	Flaring; over 500 lbs. of SO2 released.
1/6/22	Phillips 66 Carson	Petroleum release.
1/11/22	Torrance Refinery	Petroleum release.

Date	Refinery	Short Description
1/21/22	Valero Wilmington	Flaring; 500 lbs. of SO2 released.
1/25/22	Kern Oil Refinery	Released sour water.
1/26/22	Chevron Richmond	Flaring; SO2 released.
2/7/22	Phillips 66 Rodeo	Gasoline release into San Pablo Bay.
2/16/22	Valero Benicia	SO2 exceedance.
2/19/22	Martinez Refining (Shell)	Flaring; over 500 lbs. of SO2 released.
2/25/22	Chevron Richmond	Flaring; SO2 released.
2/25/22	Chevron Richmond	Sewage spill.
3/3/22	Valero Wilmington	Released one barrel of wastewater.
3/4/22	Valero Wilmington	Flaring; over 500 lbs. of SO2 released.
3/4/22	Chevron Richmond	Flaring; SO2 released.
3/6/22	Torrance Refinery	Flaring; 500 lbs. of SO2 released.
3/11/22	Valero Benicia	Flaring.
3/15/22	Phillips 66 Wilmington	Released one barrel of diesel onto soil.
3/17/22	Martinez Refining (Shell)	Flaring; over 500 lbs. of SO2 released.
3/18/22	Marathon Carson	Petroleum spill.
3/21/22	Martinez Refining (Shell)	Over 500 lbs. of SO2 released.
3/31/22	Torrance Refinery	Flaring; 500 lbs. of SOx and over 1,000 lbs. of NOx released.
4/6/22	Chevron Richmond	500 lbs. of SO2 released.
4/16/22	Marathon Carson	Petroleum spill.
4/21/22	Torrance Refinery	Vapor release.
4/22/22	Phillips 66 Wilmington	Flaring; 500 lbs. of SO2 released.
4/24/22	Chevron Richmond	Flaring; SO2 released.
4/26/22	Phillips 66 Wilmington	Flaring; 500 lbs. of SO2 released.
5/3/22	Phillips 66 Wilmington	Flaring; over 500 lbs. of SO2 released.
5/4/22	Phillips 66 Wilmington	Flaring; over 500 lbs. of SO2 released.
5/5/22	Kern Oil Refinery	Released five barrels of crude oil.
5/6/22	Kern Oil Refinery	Released two barrels of petroleum onto soil.
5/6/22	Phillips 66 Wilmington	Flaring; over 500 lbs. of SO2 released.
5/10/22	Phillips 66 Wilmington	Flaring; over 500 lbs. of SO2 released.
5/14/22	Marathon Wilmington	Flaring; over 500 lbs. of SO2 released.
5/21/22	Chevron Richmond	Fire.
5/25/22	Phillips 66 Rodeo	Diesel fuel leaked into the San Pablo Bay.
6/2/22	Torrance Refinery	Petroleum spill onto soil.
6/7/22	Chevron Richmond	Flaring; almost 500 lbs. of SO2 released.
6/13/22	Phillips 66 Wilmington	Released eighteen barrels of sulfuric acid.
6/14/22	Marathon Carson	SO2 released.
6/20/22	Phillips 66 Rodeo	Diesel leaked into the Carquinez Strait.
6/23/22	Phillips 66 Wilmington	Flaring; over 500 lbs. of SO2 released.
6/28/22	Phillips 66 Wilmington	Flaring; over 500 lbs. of SO2 released.
6/29/22	Chevron Richmond	Flaring; SO2 released.

APPENDIX B

DATA ACCESS RECOMMENDATIONS (PROF. GWEN OTTINGER, DREXEL UNIVERSITY WITH THE FAIR TECH COLLECTIVE)

BACKGROUND

The Fair Tech Collective, an interdisciplinary research group based at Drexel University in Philadelphia, PA, has been working with fenceline monitoring data since 2015. Our goal has been to make monitoring data more meaningful for communities near oil refinery fencelines. To this end, we have developed web-based tools to enhance communities' ability to access and interact with monitoring data, in collaboration with refinery-adjacent communities in the San Francisco Bay Area. We have also created innovative techniques for analyzing data.

Our success has been constrained by two key factors: (1) data are not available in standardized, interoperable formats, and (2) data quality is difficult to assess. Both of these constraints on meaningful public access could be addressed by requirements for fenceline monitoring that specify how data are to be provided to the public.

RECOMMENDATIONS

Based on our experiences, we recommend that the following provisions be included in all requirements, new and existing, for fenceline monitoring.

To ensure data quality

- Raw spectral data from open-path sensing and gas chromatography should be made publicly available. This allows for the auditing of monitoring results and the identification of monitors that are not operating properly.
- Time and date values should be expressed in Coordinated Universal Time (UTC), using ISO-8601 standard formatting.
- Metadata should accompany pollution measurements to allow data users to assess the contexts and quality of data collection. Relevant metadata include but are not limited to locations of monitors (latitude and longitude), detection limits, signal strength (for open path monitors), documentation of calibration and other quality control checks, and QA/QC plans.
- Data quality audits should be conducted routinely by trusted third parties. Funds for this work should be provided as part of the monitoring plan.

To ensure public access to data

- REST APIs (application programming interfaces) should be provided for all data endpoints.
- APIs should be documented using a widely recognized standard such as OpenAPI.
- APIs should be public and open. Any measures instituted to prevent inauthentic requests should be designed in such a way that users need not ask permission of monitor operators or other entities to be able to access the data.
- APIs should be versioned, with ample notification provided to users when new versions are available or old versions phased out.
- Databases and their APIs should be optimized to minimize API latency when executing requests for data. Under most circumstances, users should not have to wait more than a few seconds for requested data to be delivered.
- Intuitive, ADA-compliant user interfaces should be created to enable individuals with no programming background to select and download data in .csv format.

To ensure long-term resilience of monitoring systems

- Monitoring plans should specify measures for routine maintenance and periodic upgrades to monitoring systems.
- Monitoring plans should specify measures for maintenance and periodic upgrades to APIs and user interfaces.
- Monitoring data should be stored on a hosted cloud service (rather than local servers) to provide redundancy and protection against loss.
- Adequate resources should be allocated for maintenance and upgrades. These include not only funding but also appropriate expertise (e.g., experts in database and user interface design as well as experts in monitoring techniques).

To foster community understanding and engagement

- Funding should be made available for affected communities and professional researchers to explore and analyze fenceline monitoring data, using methods that can shed light on community concerns.
- Regulators should facilitate discussions with affected communities about fenceline monitoring results. The purpose of these discussions should be to mobilize local knowledge to give context to data, collaboratively formulate questions for further investigation, and identify priorities for immediate action–not merely to instruct or reassure communities.

ENDNOTES

1 Cal. Assembly Floor Analysis, Concurrence in Senate Amendments to AB1647 (2017-2018 Reg. Sess.) at 2 (Sept. 12, 2017), https://leginfo.legislature.ca.gov/faces/billAnalysisClient.xhtml?bill_id=201720180AB1647.

2 Cal. Air Res. Bd., *Refineries*, https://ww2.arb.ca.gov/resources/documents/refineries; Cal. Air Res. Bd., *California Refineries*, https://ww2.arb.ca.gov/resources/documents/california-refineries (last updated July 14, 2020).

3 EPA, *Health Effects of Ozone Pollution*, https://www.epa.gov/ground-level-ozone-pollution/health-effects-ozone-pollution (last updated June 14, 2022); EPA, *Health and Environmental Effects of Particulate Matter (PM)*, https://www.epa.gov/pm-pollution/health-and-environmental-effects-particulate-matter-pm (last updated July 18, 2022).

4 Cal. Off. Of Env't Health Hazard Assessment, *Analysis of Refinery Chemical Emissions and Health Effects* at ii (March 2019), https://oehha.ca.gov/media/downloads/faqs/refinerychemicalsreport032019.pdf.

5 *Id.* at vi.

6 *Id.* at 21–26, A-1–A-23.

7 *Id.* at iv (127 incidents reported at refineries between 2001 and 2012).

8 U.S. Chem. Safety and Hazard Investigation Bd., Rep. No. 2012-03-I-CA, *Final Investigation Report Chevron Richmond Refinery Pipe Rupture and Fire* at 1 (Jan. 2015), https://www.csb.gov/chevron-refinery-fire/.

9 *Id.* at 2.

10 U.S. Chem. Safety and Hazard Investigation Bd., Rep No. 2015-02-I-CA, *ExxonMobil Torrance Refinery, Electrostatic Precipitator Explosion Investigation Report* at 23 (May 2017), https://www.csb.gov/exxonmobil-refinery-explosion-/.

11 *Id.*

12 Steve E. Swenson, *DA Alleges Kern Oil and Refining Co. Broke Business, Safety Laws*, The Bakersfield Californian (Dec. 18, 2009), https://www.bakersfield.com/news/da-alleges-kern-oil-and-refining-co-broke-business-safety-laws/article_0a54ee3e-6892-5ded-aa1c-01b1a1f8ae4a.html; Jose Franco, *KCFD Crews Battle Fire at Oil Refinery Just North of Lamont*, KGET (Jan. 18, 2018), https://www.kget.com/news/kcfd-crews-battle-fire-at-oil-refinery-just-north-of-lamont/.

13 Am. Lung Ass'n, *State of the Air 2022, Report Card: California*, https://www.lung.org/research/sota/city-rankings/states/california (relevant counties are Contra Costa, Kern, Los Angeles, and Solano).

14 Cal. Assembly Floor Analysis, Concurrence in Senate Amendments to AB 1647, *supra* note 1, at 2.

15 Cal. Health and Safety Code, § 42705.6(c).

16 Cal. Health and Safety Code, § 42705.6(a)(2).

17 Cal. Health and Safety Code, § 42705.6(b)(1), (c).

18 40 C.F.R. § 63.658.

19 *Compare* Cal. Health and Safety Code § 42705.6(d) *with* 40 C.F.R. § 63.658(e).

20 Cal. Air Res. Bd. & Cal. Air Pollution Control Officers Ass'n, Refinery Emergency Air Monitoring Assessment Report, Objective 2: Evaluation of Air Monitoring Capabilities, Gaps, and Potential Enhancements at 46 (Mar. 2019), https://www.arb.ca.gov/fuels/carefinery/crseam/o2reamarfinal.pdf?_ga=2.153433584.935977187.1647621597-1727642359.1536255136 [hereinafter "REAMAR Report"].

21 Benzene is intended to be used "as a surrogate pollutant to track and limit overall fugitive emissions of hazardous air pollutants at the fenceline." Env't Integrity Project, *Monitoring for Benzene at Refinery Fencelines* at 5–6 (Feb. 6, 2020), https://www.environmentalintegrity.org/wp-content/uploads/2020/02/Benzene-Report-2.6.20.pdf; *see also* Petroleum Refinery Sector Risk and Technology Review and New Source Performance Standards, 80 Fed. Reg. 75,178, 75,196 (Dec. 1, 2015).

22 40 C.F.R. § 63.658(g), (h) ("[w]ithin 5 days of determining that the action level has been exceeded … the owner or operator shall initiate a root cause analysis to determine the cause of such exceedance and to determine appropriate corrective action").

23 The San Luis Obispo County Air Pollution Control District is responsible for oversight of one refinery in its jurisdiction – the Phillips 66 Santa Maria Refinery, which is currently in the process of closing. The Santa Barbara County Air Pollution Control District is also responsible for oversight of one refinery – the Santa Maria Asphalt Refinery. These air districts and refineries are not covered in this report.

24 South Coast Air Quality Mgmt. Dist., *About*, http://www.aqmd.gov/nav/about.

25 Bay Area Air Quality Mgmt. Dist., *About the Air District*, https://www.baaqmd.gov/about-the-air-district (last updated May 15, 2020).

26 San Joaquin Valley Air Pollution Control Dist., *About the District*, https://ww2.valleyair.org/about/.

27 Cal. Air Res. Bd., *About*, https://ww2.arb.ca.gov/about.

28 Cal. Air Res. Bd., News Release 19-13a, *Air Quality Regulators Call for Improved Monitoring at California Refineries, Surrounding Communities* (Mar. 20, 2019), https://ww2.arb.ca.gov/news/air-quality-regulators-call-im-

proved-monitoring-california-refineries-surrounding-communities; REAMAR Report, *supra* note 20, at 2.

29 Cal. Air Res. Bd., News Release 19-13a, *supra* note 28.

30 REAMAR Report, *supra* note 20, at 3, 27.

31 The IRTF also includes representatives from the four air districts with refineries in their jurisdictions (Bay Area AQMD, South Coast AQMD, Valley Air, and San Luis Obispo Air Pollution Control District). Cal. EPA, *About the Task Force*, https://calepa.ca.gov/refinery/about-the-task-force/.

32 REAMAR Report, *supra* note 20, at 1; *see also* Cal. EPA, *Interagency Refinery Task Force: Workgroups*, https://calepa.ca.gov/refinery/workgroups/.

33 Valley Air Pollution Control Dist., Proposed Rule 4460 at 3-4 (Aug. 16, 2022), https://www.valleyair.org/Workshops/postings/2022/08-15-22/Proposed-Rule-4460.pdf; Valley Air Pollution Control Dist., Final Draft Staff Report at 25 (Sept. 15, 2022), https://www.valleyair.org/Workshops/postings/2022/08-15-22/Rule-4460-3200-Draft%20Staff-Report.pdf (noting that refineries will be required to monitor for "a comprehensive list of criteria pollutants and toxic air contaminants recommended by OEHHA for monitoring, unless a refinery can provide sufficient justification for not monitoring a specified pollutant.").

34 Bay Area Air Quality Mgmt. Dist., Air Monitoring Guidelines for Petroleum Refineries at 5 (Aug. 2015), https://www.baaqmd.gov/~/media/files/planning-and-research/public-hearings/2016/9-14-and-12-15/rg1215-appb-airmonitoringguidelines-pdf.pdf?la=en [hereinafter "Bay Area AQMD Guidance"].

35 Email from Adan Schwartz, Senior Assistant Counsel, Bay Area Air Quality Mgmt. Dist., to Lisa Fuhrmann, Earthjustice (May 11, 2021).

36 Bay Area AQMD Guidance at 18 (noting that "Air Monitoring Plans should provide information on how real-time data will be distributed to the community" and "[i]t is assumed that this will likely result in data being presented on a website …").

37 South Coast Air Quality Mgmt. Dist., Rule 1180 Refinery Community and Fenceline Air Monitoring, http://www.aqmd.gov/home/rules-compliance/rules/support-documents/rule-1180-refinery-fenceline-monitoring-plans.

38 South Coast Air Quality Mgmt. Dist., Rule 1180 Refinery Fenceline Air Monitoring Plan Guidelines at 19 (Dec. 2017), http://www.aqmd.gov/docs/default-source/rule-book/support-documents/1180/rule-1180-guidelines.pdf [hereinafter "South Coast AQMD Guidance"].

39 The only facility in the Bay Area that provides summary monthly reports is Phillips 66 due to the terms of a Memorandum of Understanding and not related to the requirements of Bay Area AQMD's fenceline monitoring regulations. Phillips 66 Rodeo Refinery Fenceline Data, https://www.fenceline.org/rodeo/data.php.

40 Bay Area AQMD Guidance, *supra* note 34, at 5.

41 Valley Air Pollution Control Dist., Rule 4460 Petroleum Refinery Fence-line Air Monitoring Plan Guidelines at 4 (Aug. 16, 2022), https://www.valleyair.org/Workshops/postings/2022/08-15-22/Proposed-Rule-4460-Guidelines.pdf. [hereinafter "Valley Air Guidance"].

42 Earthjustice et al., Comments on the Draft Fenceline Air Monitoring Plan for San Joaquin Refining at 3 (Feb. 23, 2021).

43 South Coast AQMD Guidance, *supra* note 38, at 3, 15; *see also id.* at 4 (Fenceline Air Monitoring Plan Checklist with listing of specific criteria to be used to determine fenceline air monitoring coverage).

44 *Id.* at 15.

45 Bay Area AQMD Guidance, *supra* note 34, at 5.

46 South Coast AQMD Guidance, *supra* note 38, at 13.

47 Valley Air Guidance, *supra* note 41, at 6-8.

48 South Coast AQMD Guidance, *supra* note 38, at 13; Bay Area AQMD Guidance, *supra* note 34, at 10; Valley Air Guidelines, *supra* note 41, at 7.

49 Bay Area Air Quality Mgmt. Dist., Staff Report, Proposed Amendments to Refinery Rules at 17 (Sept. 2021), https://www.baaqmd.gov/~/media/dotgov/files/rules/refinery-rules-definitions/20210920_02_sr_refinerydefinitions-pdf.pdf?la=en.

50 *Id.*

51 South Coast AQMD Guidance, *supra* note 38, at 21.

52 *Id.*

53 *Valley Air Pollution Control Dist., Proposed Rule 4460, § 8 (Aug. 16, 2022).*

54 *Kern Oil & Refining Co., Kern Fenceline Air Monitoring Plan for Rule 4460 at 5 (June 29, 2020),* https://www.valleyair.org/aqinfo/Docs/Kern-Oil-Refining-Fenceline-Air-Mon-Plan.pdf.

55 *See, e.g., Marathon Martinez Refinery, FAQs,* https://www.marathonmartinez.com/resources.html# (last visited Apr. 15, 2022), Valero Benicia Refinery, *FAQs*, https://beniciarefineryairmonitors.org/resources.html# (last visited Apr. 15, 2022), Kern Oil & Refining Co., *FAQs*, https://www.kern4460.com/resources.html?page=4 (last visited Apr. 15, 2022).

56 *See, e.g., Env't Integrity Project, Monitoring for Benzene at Refinery Fencelines, supra note 21, at 8.*

57 *Bay Area AQMD Guidance, supra note 34, at 10.*

58 *Valley Air Pollution Control Dist., Rule 4460, § 8 (Aug. 16, 2022).*

59 South Coast Air Quality Mgmt. Dist., Rule 1180(k).

60 Bay Area Air Quality Mgmt. Dist., Regulation 12-15-102.

61 Valley Air Pollution Control Dist., Final Draft Staff Report at 25-26 (Sept. 15, 2022), https://www.valleyair.org/Workshops/postings/2022/08-15-22/Rule-4460-3200-Draft%20Staff-Report.pdf.

62 EPA, TRI Explorer, Releases: Facility Report ("Bakersfield Renewable Fuels LLC – Areas 1 & 2)), https://enviro.epa.gov/triexplorer/release_fac?p_view=COFA&trilib=TRIQ1&sort=_VIEW_&sort_fmt=1&state=06&county=06029&chemical=All+chemicals&industry=324&year=2020&tab_rpt=1&fld=RELLBY&fld=TSFDSP; Alon Bakersfield, Emission Statement – Calendar Year 2020 Emissions (Apr. 7, 2021).

63 Tricor Refining, Emission Statement – Calendar Year 2020 Emissions (Apr. 13, 2021).

64 Valley Air Pollution Control Dist., PowerPoint Presentation at Public Scoping Meeting for Potential Amendments to District Rule 4460 (Petroleum Refinery Fenceline Air Monitoring) at 12 (Feb. 1, 2022), https://www.valleyair.org/Workshops/postings/2022/02-01-22_r4460/presentation.pdf.

65 Kern Oil & Refining Co., Emission Statement – Calendar Year 2020 Emissions (Apr. 8, 2021).

66 *See, e.g.*, Valley Air Pollution Control Dist., Final Draft Staff Report at 25-26 (Sept. 15, 2022), https://www.valleyair.org/Workshops/postings/2022/08-15-22/Rule-4460-3200-Draft%20Staff-Report.pdf.

67 Cal. Air Res. Bd., Facility Details, Lunday-Thagard Co. dba World Oil Refining (2019 data), https://www.arb.ca.gov/app/emsinv/facinfo/facdet.php?co_=19&ab_=SC&facid_=800080&dis_=SC&dbyr=2019&dd=.

68 Cal. Air Res. Bd., Facility Details, AltAir Paramount (2019 data), https://www.arb.ca.gov/app/emsinv/facinfo/facdet.php?co_=19&ab_=SC&facid_=187165&dis_=SC&dbyr=2019&dd=.

69 South Coast Air Quality Mgmt. Dist., Summary of Public Comments on Rule 1180 Fenceline Air Monitoring Plans at 1, http://www.aqmd.gov/docs/default-source/fenceline_monitroing/r1180_public_comment_summary_final_04192019docx.pdf?sfvrsn=6.

70 Cal. Air Res. Bd., Facility Details, Valero Wilmington Asphalt Plant (2019 data), https://www.arb.ca.gov/app/emsinv/facinfo/facdet.php?co_=19&ab_=SC&facid_=800393&dis_=SC&dbyr=2019&dd=.

71 *Tesoro Martinez Refinery, Air Monitoring Plan for the Tesoro Refinery in Martinez, California at 19 (Sept. 7, 2017),* https://www.baaqmd.gov/~/media/files/compliance-and-enforcement/refinery-air-monitoring-plans/marathon_amp_2017_0907-pdf.pdf?la=en&rev=5781b5b8ac3d46a8bff099a06f63fb93.

72 *South Coast AQMD Guidance, supra note 38, at 12–13.*

73 *Cal. Off. of Env't Health Hazard Assessment, Air Quality: Ozone,* https://oehha.ca.gov/calenviroscreen/indicator/air-quality-ozone (last visited Apr. 14, 2022).

74 *Johan Mellqvist et al., Emission Measurements of VOCs, NO2, and SO2 from the Refineries in the South Coast Air Basin Using Solar Occultation Flux and Other Optical Remote Sensing Methods* at 91–92 (Apr. 11, 2017), http://www.aqmd.gov/docs/default-source/fenceline_monitroing/project_1/fluxsense_scaqmd2015_project1_final-report(040717).pdf [hereinafter "*Fluxsense*"].

75 *Fluxsense, supra note 74, at 83.*

76 *Fluxsense, supra note 74, at 4.*

77 *San Joaquin Refinery, Rule 4460 Air Monitoring Plan at 17 (Nov. 5, 2020),* https://www.valleyair.org/notices/Docs/2021/01-22-21_SJR/plan.pdf.

78 *Aiswarya Ragothaman & William A. Anderson, Air Quality Impacts of Petroleum Refining and Petrochemical Industries, 4 Environments at 4–5 (Sept. 2017),* https://doi.org/10.3390/environments4030066; *see also,* Regina Montero-Montoya et al., *Volatile Organic Compounds in Air: Sources, Distribution, Exposure and Associated Illnesses in Children*, 84 Annals of Global Health, 225 (July 2008), https://doi.org/10.29024/aogh.910 (discussing how VOCs' "physical and chemical properties and mean lifetime in the atmosphere, which ranges from a few minutes to several months, allow them to travel large distances from the source of emission and to enter the body").

79 *Kern Oil & Refining Co., Kern Fenceline Air Monitoring Plan for Rule 4460 at 17 (June 29, 2020),* https://www.valleyair.org/aqinfo/Docs/Kern-Oil-Refining-Fenceline-Air-Mon-Plan.pdf.

80 *Chevron, Fenceline Monitoring Plan for the Chevron Refinery in El Segundo, California at 22 (Oct. 15, 2019),* https://www.aqmd.gov/docs/default-source/fenceline_monitroing/updated_rule_1180_plans/chevron-updated-fenceline-air-monitoring-plan-and-qapp-(10-15-19).pdf.

81 *Id. at 14.*

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