Action: Stationary and mobile monitoring to identify high-emitting vessels, leaks from oil tankers, and sources of odor in the coastal areas

Background & Objective

The Ports of Los Angeles and Long Beach (Ports) combined are the busiest ports in the United States with almost 40% of imported containers passing through them. The Wilmington, Carson, West Long Beach (WCWLB) community identified the Ports as an air quality priority.

Port-related emission sources include diesel emissions from on-road heavy-duty trucks, locomotives, ocean-going vessels (OGVs), oil tankers, commercial harbor craft (e.g. ferries, tugboats, fishing boats), and cargo-handling equipment (e.g. yard trucks, forklifts, reach stackers). It should be noted that some of these sources have been identified and addressed as part of other air quality concerns and are discussed in separate progress reports (see progress reports for railyards and truck traffic). Moreover, the community steering committee (CSC) identified specific actions (including those related to air monitoring) to address concerns related to emissions other than diesel exhaust, such as potential fugitive emission leaks from oil tankers. In addition, air monitoring can help identify potential high-emitting OGVs, causes of odor complaints in the coastal areas near the Ports, and track the progress of emission reduction strategies.

Method

As part of the San Pedro Bay Ports Clean Air Action Plan (CAAP), the Ports each operate an air monitoring network (Figure 1), which collect continuous data on ambient air quality and meteorological conditions, including particulate matter (PM10 and PM2.5), black carbon (BC), ultrafine particles (UFP), carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), and sulfur dioxide (SO_2). The real-time environmental data collected by these stations is available for public review at: https://monitoring.cleanairactionplan.org/current-data/

In addition, South Coast AQMD will conduct mobile monitoring for pollutants related to diesel emissions at the Ports and in nearby residential areas to assess the contribution of Ports' activities on measured pollutant levels in the impacted communities. South Coast AQMD will also employ advanced air monitoring technologies and specialized techniques, including optical gas imaging technology and specialized mobile platforms, to identify potential fugitive emission leaks from oil tankers, off-shore platforms, oil production sites and other port related activities that may cause odors in nearby communities. For this purpose, in 2015 the South Coast AQMD worked with Fluxsense Inc. to evaluate one of these air monitoring techniques to identify potential high-emitting OGVs at the Ports by measuring emissions of NO_2, SO_2, and PM from ships and vessels. This intensive four-week campaign (Attachment A) included land and mobile (i.e. on-vessel) measurements using a combination of optical methods and a real-time "sniffer" system. As part of the AB 617 program, the South Coast AQMD has contracted Aerodyne Research LLC to investigate this issue using its Aerodyne Mobile Laboratory, which

is equipped with a suite of near-real-time, next-generation analytical equipment, capable of detecting a variety of important air pollutants, such as VOCs.

Results

- Data from Ports' monitoring stations have been analyzed and it was determined that this network of monitoring stations adequately serve the purpose of tracking the progress of diesel emissions reduction measures put into effect at the Ports (Attachment B)
- A comprehensive report of the monitoring campaign conducted by Fluxsense Inc. at the Ports can be found here (Attachment A)

Next steps

- Use air monitoring results to assist with identification of opportunities for emissions reductions
- Work with Aerodyne Research LLC to conduct measurements near the Ports and in the coastal areas using highly sensitive monitors to detect potential sources of odors
- Use optical gas imaging technology, air measurements, and other available emissions information to identify potential fugitive emission leaks from oil tankers

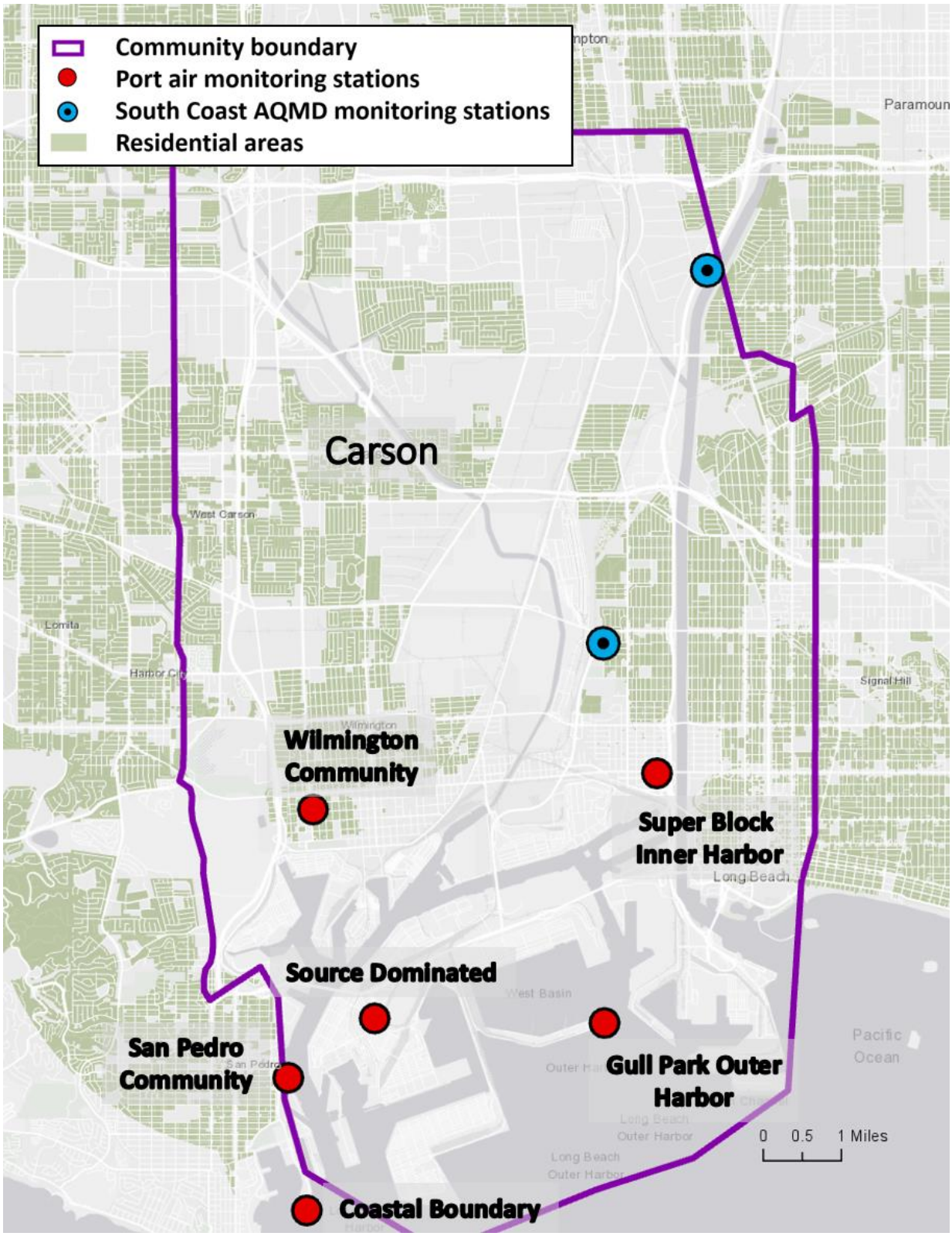

Figure 1. Location of the monitoring stations operated by the ports

Attachment A

In October and November 2015, the South Coast AQMD conducted a four week study with Fluxsense Inc.[1] to measure emissions and emission factors of nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter (PM), and other relevant air pollutants from marine vessels in the Los Angeles and Long Beach Port areas. For this purpose, Fluxsense Inc. carried-out a series of land and mobile (i.e. on-vessel) measurements using a combination of optical methods and a real-time "sniffer" system.

Overall, the technology employed for this study provided the capability for automatic and unattended measurements of ship emissions, as well as reliable measurements of emission factors from various types of ships. Based on the measurement results from this project it was determined that during the period of testing 99% of almost 700 ships entering and exiting the Ports were compliant with current fuel sulfur content regulations.

This was one of the three Optical Remote Sensing (ORS) projects to characterize emissions from refineries, small stationary sources, marine vessels, and the Ports. A presentation summarizing the main findings of the three 2015 ORS projects can be found here.

For more information on each project, click on the links below:

Project 1: Quantification of Fugitive Emissions from Large Refineries

Project 2: Quantification of Gaseous Emissions from Gas Stations, Oil Wells, and Other Small Point Sources

Project 3: Quantification of Stack Emissions from Marine Vessels

[1] Fluxsense Inc. is subsidiary of Fluxsense AB (www.fluxsense.se; San Diego, CA). Fluxsense started as a spin-off from research conducted at Chalmers University of Technology in Sweden and has been active for more than a decade.

Attachment B

The Port of Long Beach and the Port of Los Angeles (Ports) each operate an air quality monitoring network which collect continuous data on ambient air quality and meteorological conditions in the San Pedro Bay region. The monitoring stations are strategically located throughout the Ports (Figure 1). Within the Port of Long Beach, the monitoring stations are located at:

(1) the Inner Harbor area, near West Long Beach, and
(2) the Outer Harbor area on the Navy Mole.

The monitoring stations for Port of Los Angeles network are located at:

(1) the Outer Harbor area at Berth 47,
(2) the Terminal Island Treatment Plant (TITP),
(3) within the San Pedro community near the intersection of South Harbor Boulevard and 3rd Street, and
(4) within the Wilmington Community at the Saints Peter & Paul Elementary School.

The Ports' monitoring network operated as part of the San Pedro Bay Ports Clean Air Action Plan (CAAP) supports their joint commitment to improving air quality within the San Pedro Bay region. The Ports use the air quality and weather data to better manage and provide feedback on the Ports' air quality improvement efforts. Each Port's monitoring stations collect real-time measurements for various air pollutants, including particulate matter (PM10 and PM2.5), black carbon (BC), ultrafine particles (UFP), carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), sulfur dioxide (SO_2), and hydrogen sulfide (H_2S). The list of available environmental data from each monitoring station is provided in Table B-1. The real-time environmental data collected by these stations is available for public review at:
https://monitoring.cleanairactionplan.org/current-data/

Table B-1 - Air quality and meteorological parameters measured at each station in the port

Parameter	Wilmington Community	Coastal Boundary	San Pedro Community	Source Dominated	Super Block	Gull Park
$PM_{2.5}$	X	X	X	X	X	X
PM_{10}	X	X	X	X	X	X
Ultrafine Particle	X	X	X	X		
Black Carbon				X	X	X
CO	X	X	X	X	X	X
NO_2	X	X	X	X	X	X
O_3	X	X	X	X	X	X
SO_2	X	X	X	X	X	X
Meteorological parameters (wind speed & direction, temp.)	X	X	X	X	X	X

The measurements at these sites began in 2006, providing continuous data that can be used to track the progress of emission reduction measures put into effect at the Ports by measuring the concentration trends over time. The air quality measurements can help to establish a baseline for different air pollutants in the Ports region and to track the progress of emission reductions strategies over time. Examples of concentration trends are shown in Figure B-1.

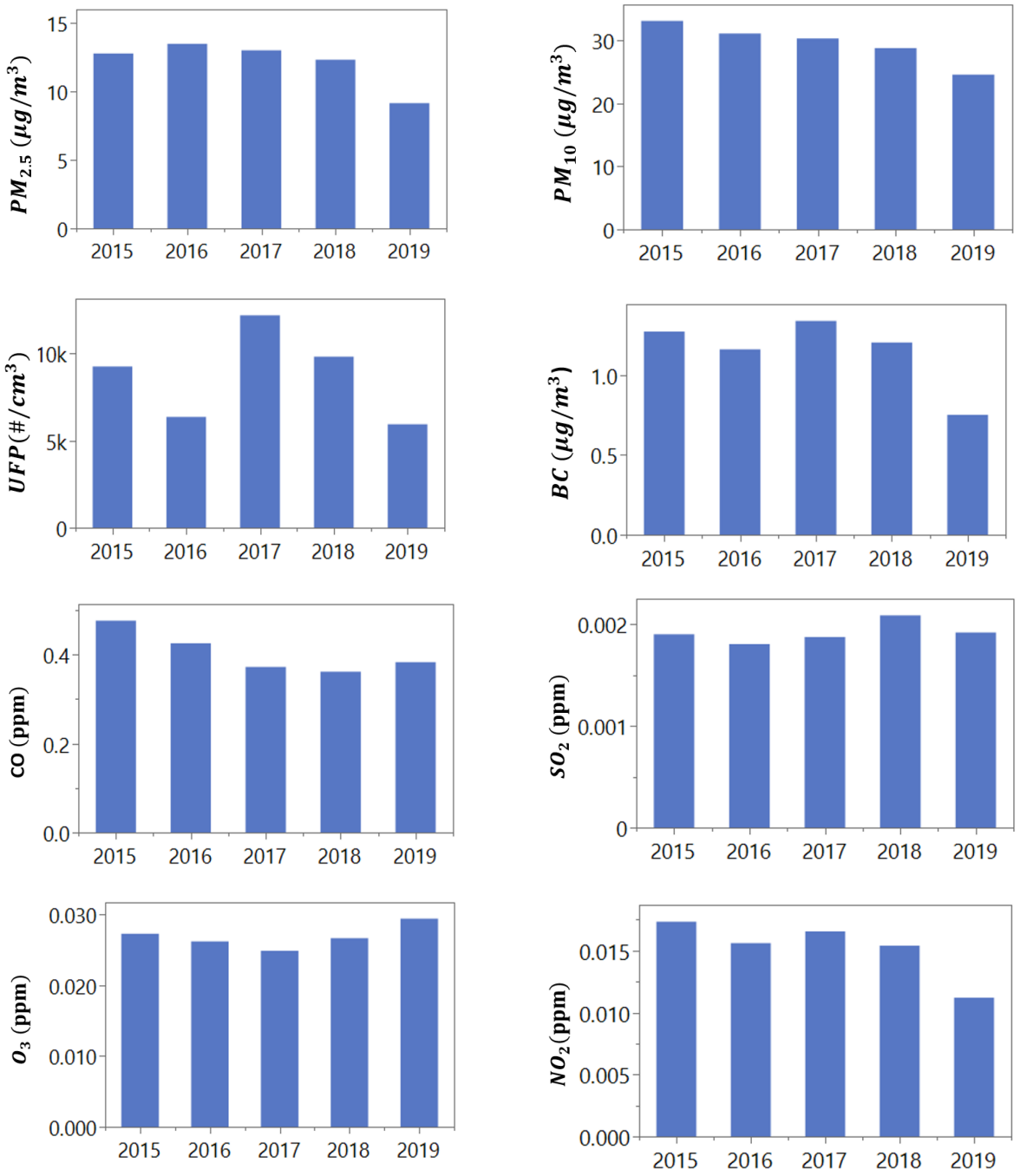

Figure B-1 - Annual average concentration levels for different pollutants averaged for all the port stations based on the data from January 1st, 2015 to October 1st, 2019

It should be noted that while the Ports' monitoring network is suitable capture the contribution of emissions from variety of sources, specifically diesel sources, the pollutants measured at these stations cannot identify the causes of odor complaints often received during the summertime in coastal communities near the Ports. The South Coast AQMD has received numerous odor complaints from the Seal Beach, Huntington Beach, and Long Beach areas in the past couple years related to a gas/sulfur/chemical type smell. South Coast AQMD responds to the odor complaints along the shorelines by deploying Compliance and Enforcement staff to investigate, although in most cases, the odors have already dissipated by the time they reach the area. During these events, the odors are reported to originate along the shoreline and quickly travel through the neighboring cities, eventually dissipating. Long Beach, Huntington Beach, and Seal Beach fire departments have also reported that their 911 emergency phone lines receive numerous calls for emergency service reporting natural gas leaks during these odor events, prompting them to ask for assistance from the South Coast AQMD in locating the source.

As part of the ongoing investigation into these odors, South Coast AQMD continues to respond to and investigate all odor complaints near the shoreline area and perform odor surveillance in the surrounding affected coastal communities of Long Beach, Seal Beach, and Huntington Beach. In some cases, the South Coast AQMD may collect samples as a result of an odor investigation or during routine surveillance activities. In addition, South Coast AQMD is working in collaboration with the Long Beach, Huntington Beach, and Seal Beach Fire Departments to collect air samples during their response to 911 calls for natural gas odors. Instantaneous samples (also known as grab samples) are collected when odors are present and take less than a minute to collect. Once a sample is collected, it is delivered to the South Coast AQMD laboratory to be analyzed for the presence of volatile organic compounds (VOCs) and/or sulfur compounds. More information is available on the South Coast AQMD webpage for Coastal Area Odor Complaint Response Information.

To date, the source(s) of the odors have not been clearly identified but potential sources are being investigated. There are multiple sources within the area that have the potential to emit gas/sulfur/chemical type odors, and due to the intermittent nature and unknown source location, it is challenging to assess the cause.

South Coast AQMD continues to explore and employ advanced air monitoring technologies and specialized techniques, including optical gas imaging technology and specialized mobile platforms, to identify potential fugitive emission leaks from oil tankers, off-shore platforms, oil production sites and other port related activities that may cause odors in nearby communities. For this purpose, in 2015 the South Coast AQMD worked with Fluxsense Inc. to evaluate one of these air monitoring techniques to identify potential high-emitting ocean-going vessels (OGVs) at the Ports by measuring emissions of nitrogen dioxide (NO_2), sulfur dioxide (SO_2) and particulate matter (PM) from ships and vessels. This intensive four-week campaign (Attachment A) included land and mobile (i.e. on-vessel) measurements using a combination of optical methods and a real-time "sniffer" system.

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