

The logo for CTEH, featuring the letters 'CTEH' in a bold, white, sans-serif font with a registered trademark symbol (®) to the upper right. The text is set against a dark blue rectangular background.

**CTEH**<sup>®</sup>

THE SCIENCE OF READY<sup>SM</sup>

**VALERO ENERGY**

**BENICIA REFINERY PARTICULATE**

**RELEASE**

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**Benicia, CA**

**March 26, 2019**

**Project #111391**

## 1.0 Introduction

On March 23, 2019 Valero Energy requested that CTEH® conduct air monitoring in the surrounding community after a release of particulate matter from the Benicia Refinery in Benicia California. CTEH® arrived on-site on March 24, 2019 and began air monitoring operations. Activities were comprised of real-time air monitoring.

This report summarizes air monitoring data collected from March 25, 2019 06:00 PDT to March 26, 2019 06:00 PDT.

## 2.0 Air Monitoring and Sampling Methods

CTEH® developed and implemented an air sampling and analysis work plan (SAP) to document and quantify the release of fugitive emissions from the flue gas scrubber. All instrumentation was calibrated at least once per day or per manufacturer's recommendations. Target analytes were measured as, carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), 2.5-micron particulate matter (PM<sub>2.5</sub>), and 10-micron particulate matter (PM<sub>10</sub>), sulfur dioxide (SO<sub>2</sub>), toluene, volatile organic compounds (VOCs), and xylene using handheld instruments such as RAE Systems MultiRAEs, TSI SidePak™ AM510/AM520 Aerosol Monitors, TSI DustTrak™ Aerosol Monitors, and Gastec GV-100 pumps with chemical-specific colorimetric detection tubes.

Hand-held air monitoring consisted of roaming air monitoring in the surrounding community. All hand-held air monitoring was conducted in the breathing zone.

## 3.0 Air Monitoring Results

**Figures 1 – 10** in **Attachment A** depicts the site location and hand-held monitoring locations for this reporting period.

**Table 1** summarizes the results for community hand-held air monitoring readings.

**Table 1: Community Hand-Held Real-Time Air Monitoring Results**

Analyte	Instrument	# Readings	# Detections	Range
CO	Gastec 1LC	1	0	< 0.5 ppm
CO	MultiRAE	47	0	< 1 ppm
NO <sub>2</sub>	Gastec #9I/MultiRAE	40	0	<0.1 ppm
PM <sub>10</sub>	AM510/AM520/DustTrak	25	25	0.003 - 0.025 mg/m <sup>3</sup>
PM <sub>2.5</sub>	AM510/AM520/DustTrak	24	24	0.002 - 0.018 mg/m <sup>3</sup>
SO <sub>2</sub>	Gastec #5Lb	1	0	<0.01 ppm
SO <sub>2</sub>	MultiRAE	24	0	<0.1 ppm
Toulene	Gastec #122L	3	0	<0.5 ppm
VOCs	MultiRAE	27	1	1.0 ppm
Xylene	Gastec #123L	3	0	< 1 ppm

<sup>1</sup>Maximum detections preceded by the "<" symbol are considered non-detections below the limit of detection (LoD) value to the right.

Additionally, at the request of public health officials, particulate matter (PM<sub>2.5</sub> and PM<sub>10</sub>) data have been grouped by downwind direction and averaged over a 24-hour period for comparison to AQI category equivalents. Wind-rose maps are provided for the corresponding time periods (**Appendix B**). It is notable that the USEPA has eliminated spatial averaging provisions as part of the annual National Ambient Air Quality Standards (NAAQS) to avoid potential disproportionate impacts on at-risk populations. Additionally, due to the uneven temporal distribution of particulate matter monitoring data at these locations, averages may be biased and are not directly comparable to the NAAQS. Comparisons to AQI category equivalents are provided for illustration purposes only.

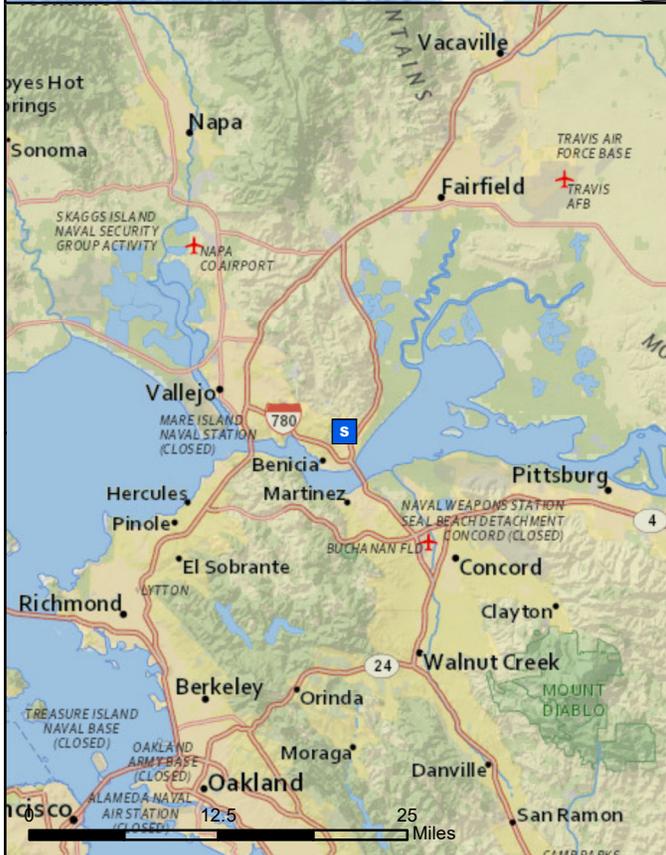
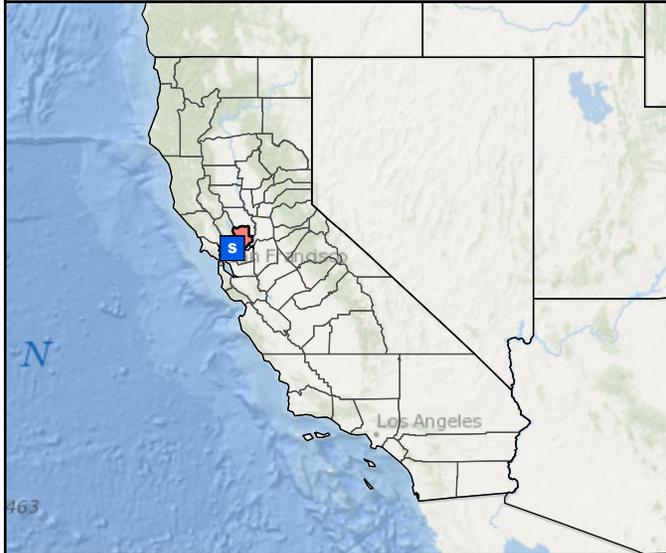
#### **4.0 Weather Conditions**

Figure 8 in attachment C contains meteorological data and a wind rose depicting wind speed and direction for this reporting period. Data was acquired from California Irrigation Management System (CIMIS) meteorological station #170 located in Concord to the southeast of the Benicia Refinery.

# Attachment A

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## CTEH Air Sampling and Monitoring Locations

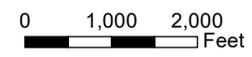


**Legend**

- Valero Benicia Refinery Location
- Benicia Refinery



Figure 2: Hand-Held Real-Time Monitoring Locations  
Benicia Refinery Particulate Release



Project: 111391  
Client: Valero Energy  
City: Benicia, AR  
County: Solano



**Legend**

- Hand-Held Monitoring Location
- Benicia Refinery





Legend

- Benicia Refinery

**PM<sub>2.5</sub> Concentration (mg/m<sup>3</sup>)**

- 0.001 - 0.138
- 0.139 - 0.351
- >0.351

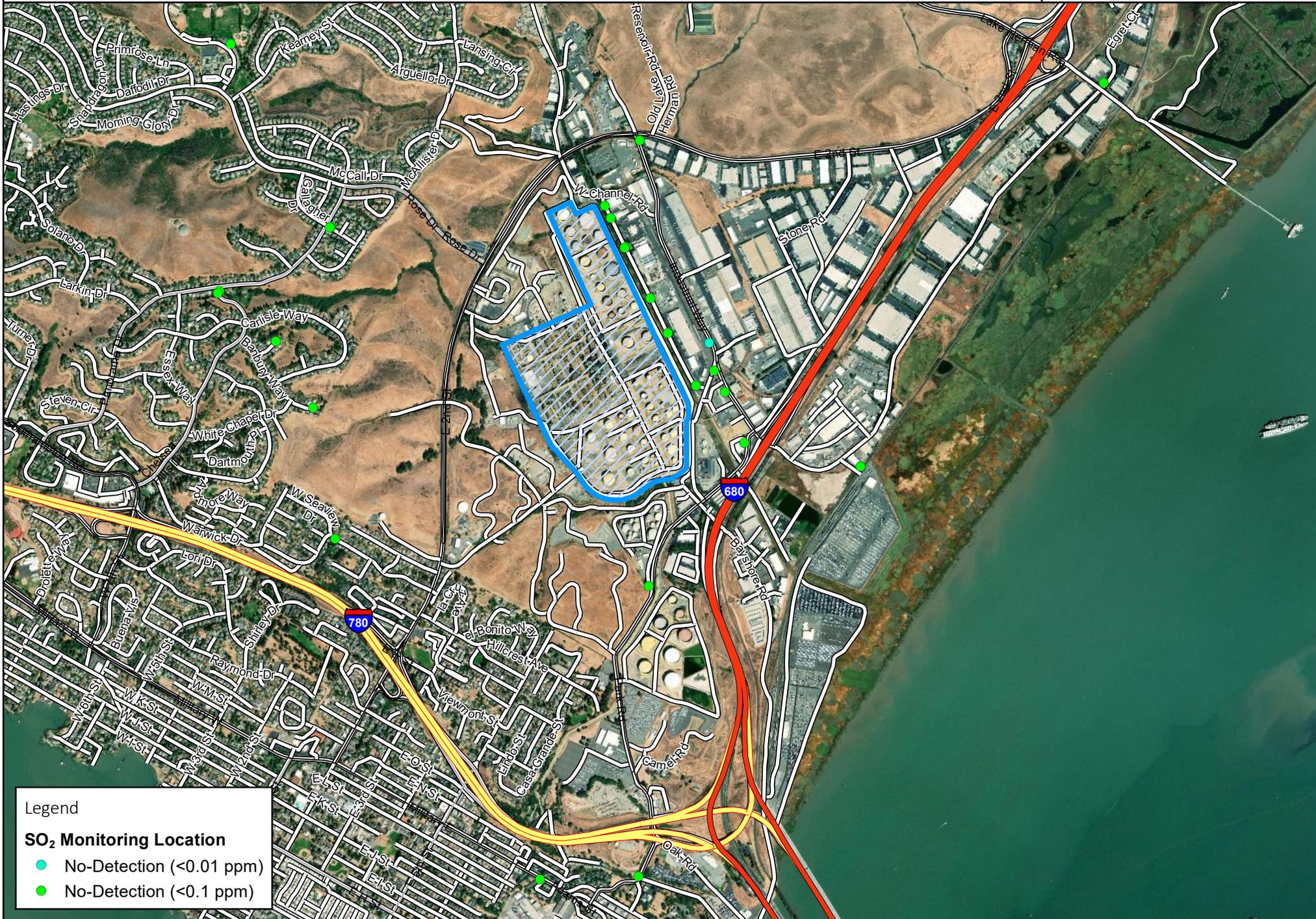


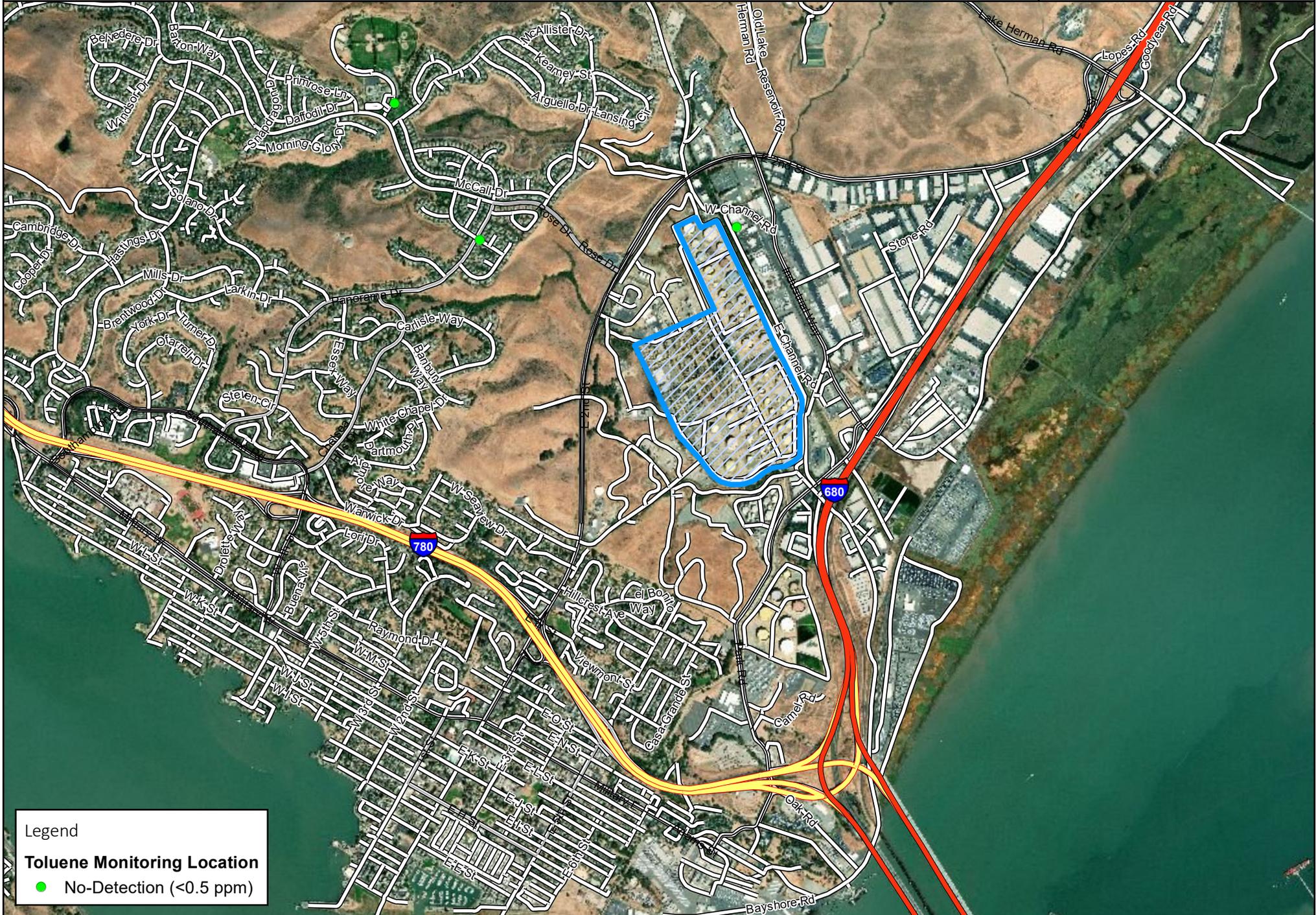


Legend

**(NO<sub>2</sub>) Monitoring Location**

- No-Detection (<0.1 ppm)





**Legend**

**Toluene Monitoring Location**

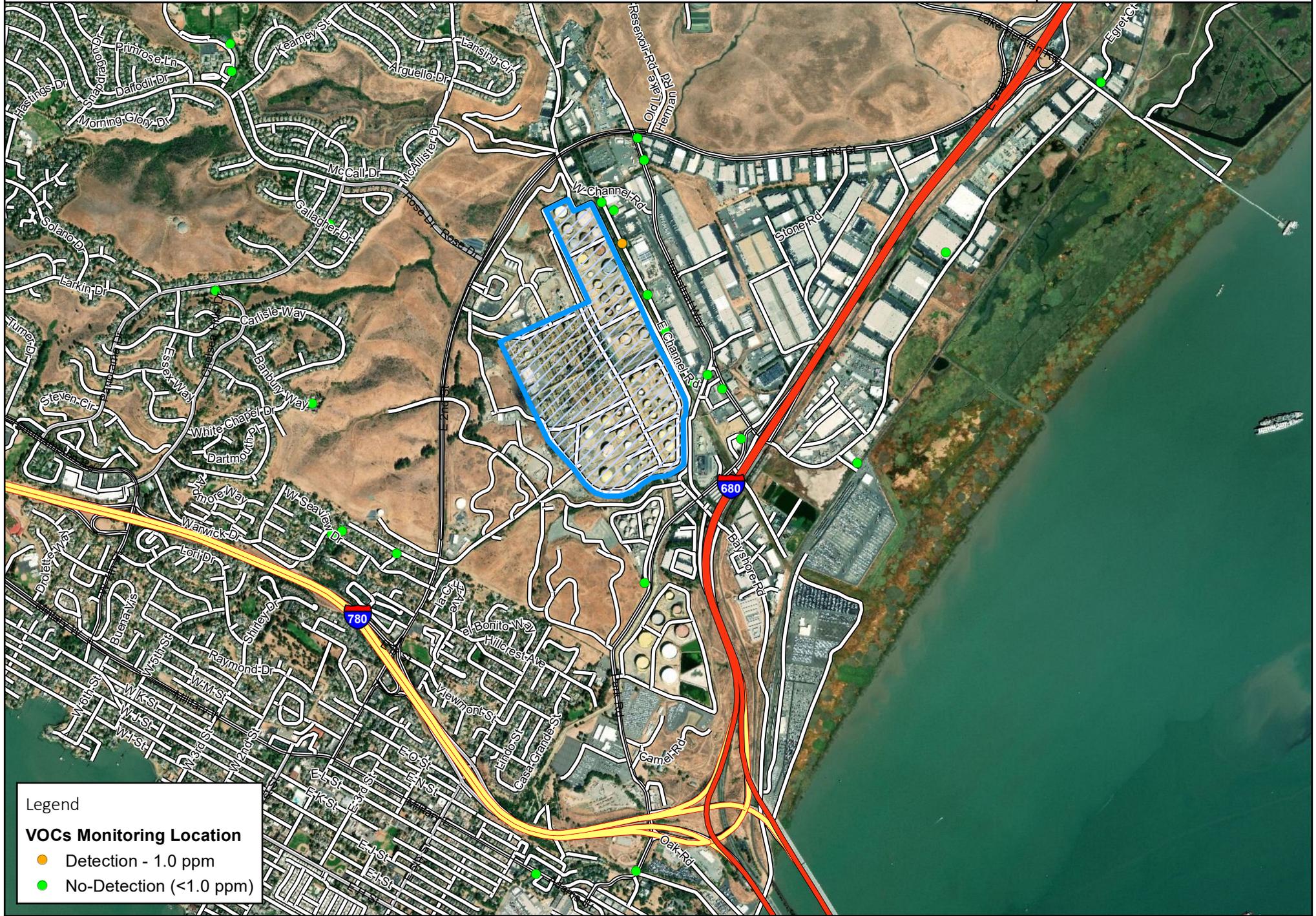
- No-Detection (<0.5 ppm)



Figure 9: Hand-Held Real-Time Monitoring Locations (VOCs)  
Benicia Refinery Particulate Release



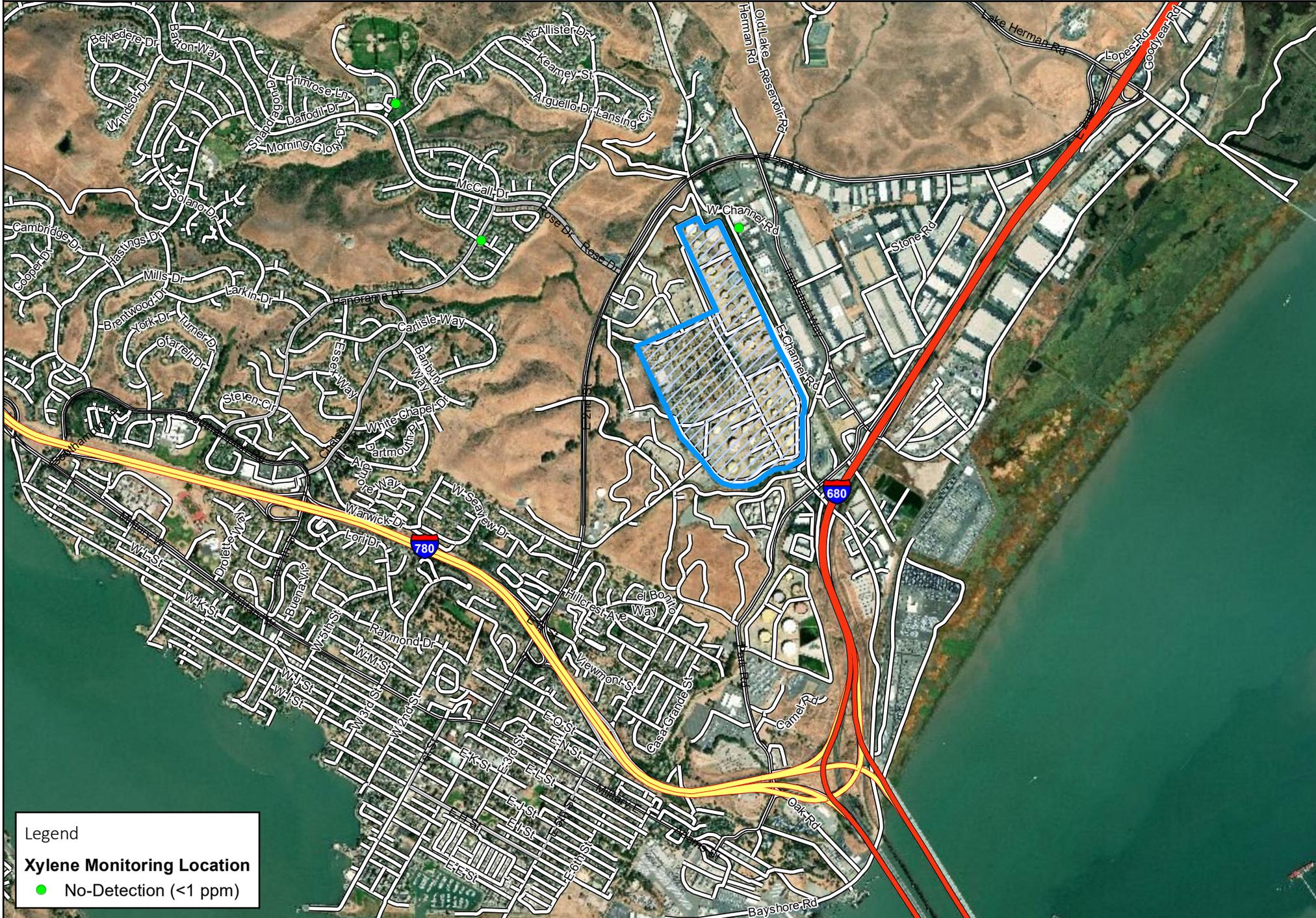
Project: 111391  
Client: Valero Energy  
City: Benicia, AR  
County: Solano



**Legend**

**VOCs Monitoring Location**

- Detection - 1.0 ppm
- No-Detection (<1.0 ppm)



Legend

**Xylene Monitoring Location**

- No-Detection (<1 ppm)

# Attachment B

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## Directional Averages



PM<sub>2.5</sub> Directional Averages  
Benicia Refinery Particulate Release

PM<sub>2.5</sub> Avg. for 24 Hour Period  
March 25 06:00 - March 26 06:00<sup>1</sup>

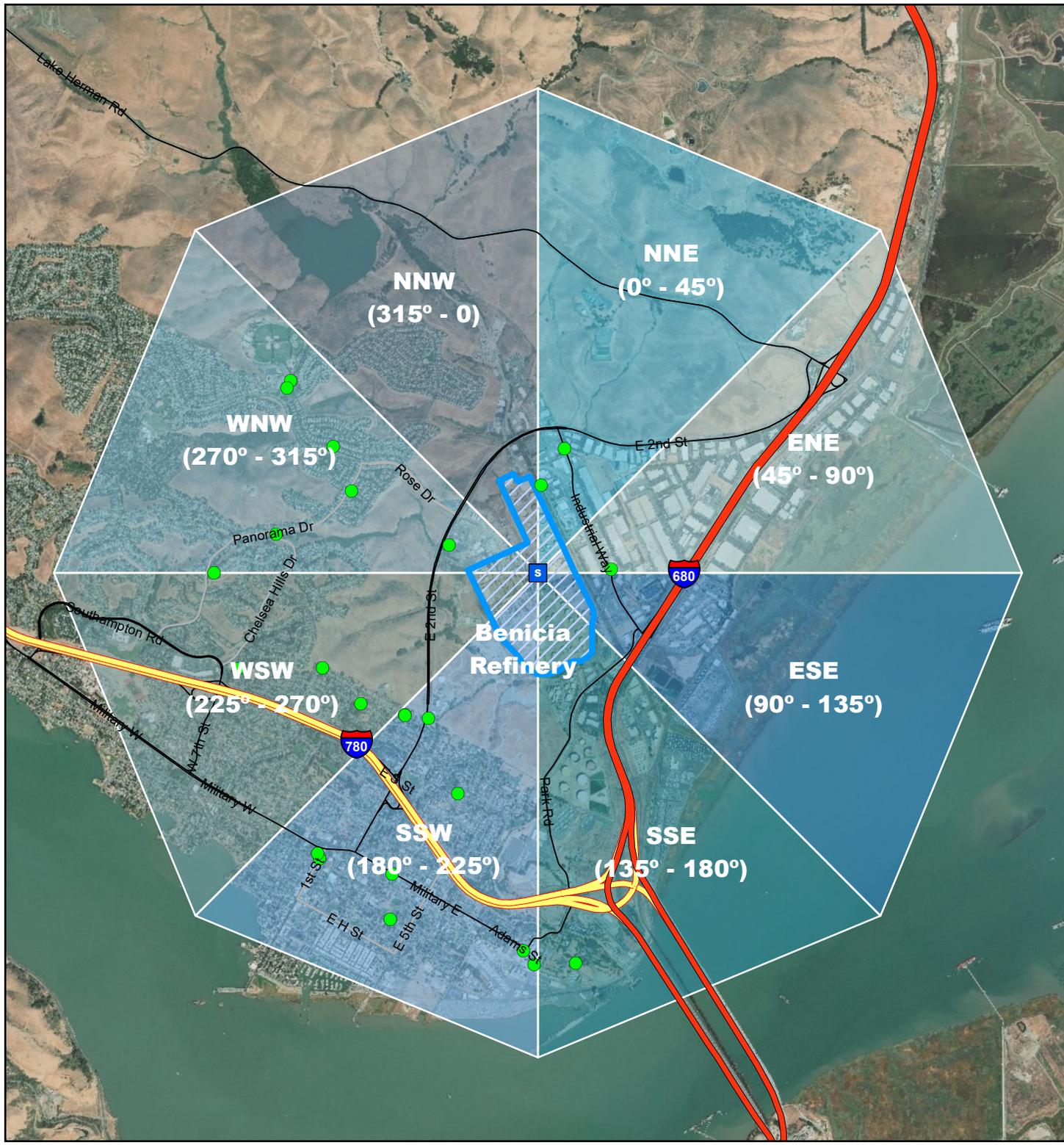
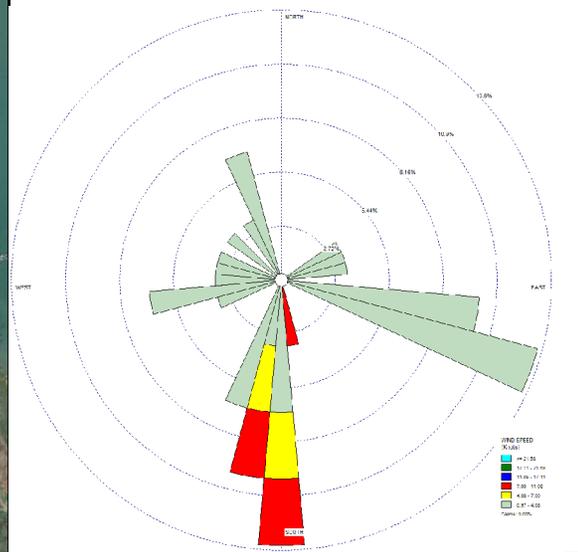
Direction	# Readings	# Detections	Avg (mg/m <sup>3</sup> )	Range (mg/m <sup>3</sup> )	AQI Category Equivalent
ENE	1	1	0.002	0.002	Good
NNE	2	2	0.011	0.004 - 0.018	Good
SSE	1	1	0.012	0.012	Good
SSW	9	9	0.005	0.003 - 0.013	Good
WNW	6	6	0.00517	0.002 - 0.009	Good
WSW	4	4	0.00225	0.002 - 0.003	Good

<sup>1</sup>The EPA has eliminated spatial averaging provisions as part of the annual National Ambient Air Quality Standards (NAAQS) to avoid potential disproportionate impacts on at-risk populations. Additionally, due to the uneven temporal distribution of particulate matter monitoring data at these locations, averages may be biased and are not directly comparable to the NAAQS.

Benicia Refinery

Monitoring Direction

- ENE
- ESE
- NNE
- NNW
- SSE
- SSW
- WNW
- WSW



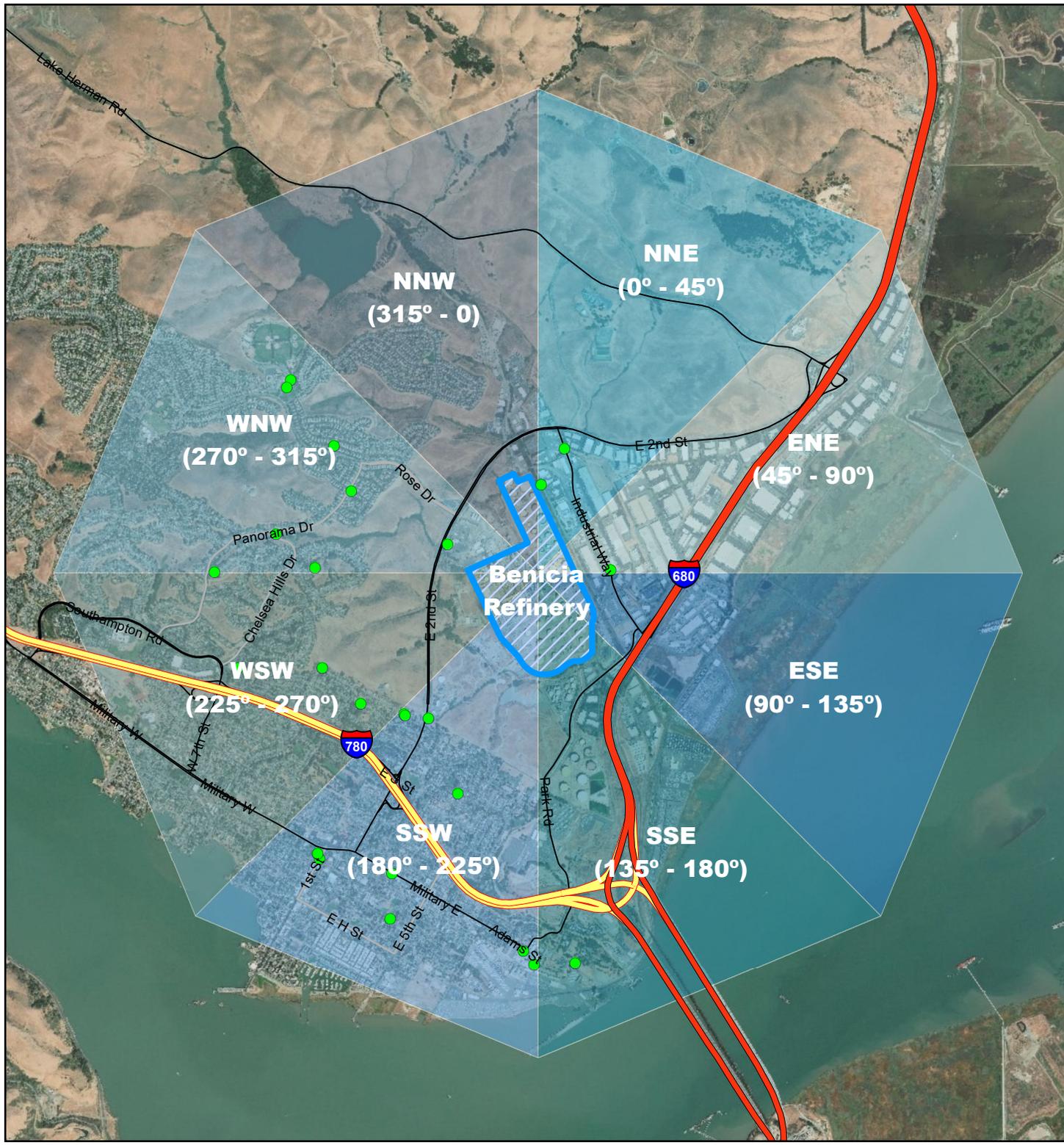


PM<sub>10</sub> Directional Averages  
Benicia Refinery Particulate Release

**PM<sub>10</sub> Avg. for 24 Hour Period**  
**March 25 06:00 - March 26 06:00<sup>1</sup>**

Direction	# Readings	# Detections	Avg (mg/m <sup>3</sup> )	Range (mg/m <sup>3</sup> )	AQI Category Equivalent
ENE	1	1	0.007	0.007	Good
NNE	2	2	0.0165	0.008 - 0.025	Good
SSE	1	1	0.016	0.016	Good
SSW	10	10	0.0075	0.004 - 0.017	Good
WNW	8	8	0.00913	0.003 - 0.014	Good
WSW	3	3	0.00467	0.004 - 0.005	Good

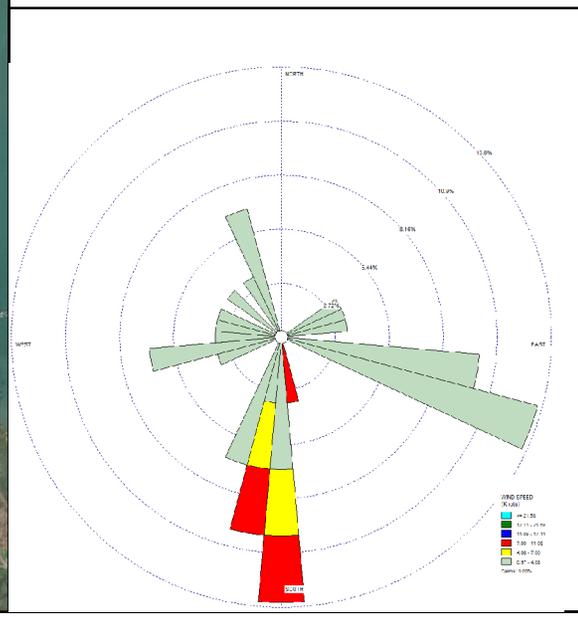
<sup>1</sup>The EPA has eliminated spatial averaging provisions as part of the annual National Ambient Air Quality Standards (NAAQS) to avoid potential disproportionate impacts on at-risk populations. Additionally, due to the uneven temporal distribution of particulate matter monitoring data at these locations, averages may be biased and are not directly comparable to the NAAQS.



Benicia Refinery

**Monitoring Direction**

- ENE
- NNW
- WNW
- ESE
- SSE
- WSW
- NNE
- SSW



# Attachment C

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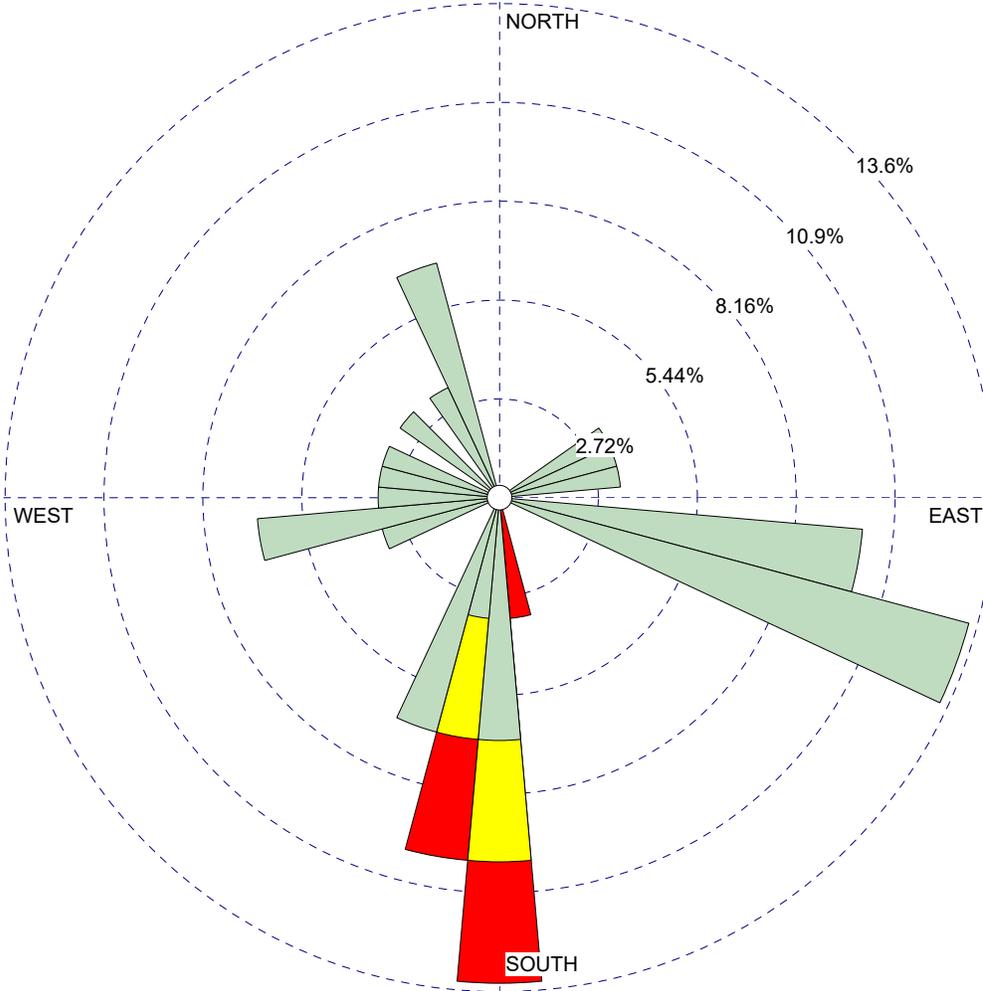
## Meteorological Conditions

WIND ROSE PLOT:

Station #CIMIS

DISPLAY:

Wind Speed  
Direction (blowing from)



WIND SPEED  
(Knots)

- >= 21.58
- 17.11 - 21.58
- 11.08 - 17.11
- 7.00 - 11.08
- 4.08 - 7.00
- 0.97 - 4.08
- Calms: 0.00%

COMMENTS:

DATA PERIOD:

Start Date: 3/25/2019 - 01:00  
End Date: 3/26/2019 - 06:00

COMPANY NAME:

MODELER:

CALM WINDS:

0.00%

TOTAL COUNT:

30 hrs.

AVG. WIND SPEED:

2.40 Knots

DATE:

3/26/2019

PROJECT NO.:

111391