San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

South Central Fresno Community Air Monitoring Report

2022 1st Quarter (January – March)

Table of Contents

I. Background

Assembly Bill (AB) 617, signed into law in July 2017, has resulted in a statewide effort to reduce air pollution and improve public health in communities that experience disproportionate burdens from exposure to air pollutants statewide through new community-focused and community-driven actions. AB 617 provides mechanisms and resources to implement community-specific air quality monitoring networks, develop and implement emission reduction programs; improve availability of data and other technical information; and invest substantial funding in the community through voluntary incentive funding measures. South Central Fresno, a densely populated community within the city of Fresno, was selected as a first year community by CARB in September of 2018.

District staff provided assistance to the Community Steering Committee (CSC) members by helping them to develop their recommended air monitoring priorities. The District worked with CSC members as they reviewed and evaluated a variety of different resources, including maps of stationary sources, area sources, mobile sources, prevailing wind direction data, and sensitive receptor locations relative to sources of air pollution within the community. The CSC adopted their official recommendation on June 12, 2019, including the deployment of various air monitoring platforms within the community as a part of the South Central Fresno Community Air Monitoring Plan (CAMP).

The District has invested an extensive amount of work into implementing the CAMP, including researching, developing, configuring, deploying, trouble-shooting, and maintaining new state-of-the-art high precision air monitoring equipment. This also includes the use of the mobile air monitoring van to take measurements in a variety of locations of interest and to respond to community concerns. The District has also contracted with analytical laboratories to conduct the needed analysis to speciate the VOC and PM2.5 samples being taken in the community. In addition, the District has worked closely with organizations to negotiate leases to authorize the deployment of the equipment on site, followed by logistical, electrical, and site preparation work for the installation of the air monitoring equipment.

Access to Data from South Central Fresno Community Air Monitoring Network

In addition to quarterly reports, the District is continuing its efforts to enhance the availability of air monitoring data and information to ensure that the community is fully apprised of the ongoing air monitoring efforts and are receiving the latest air quality information. This includes continued regular updates to the Community Steering Committee (CSC), continuously posting real-time and all historical air monitoring data, and bilingual weekly updates in South Central Fresno, which are all available on the South Central Fresno Air Monitoring webpage. In addition, raw hourly data from the South Central Fresno community air monitoring network are also being sent to CARB and are expected to become available on CARB's statewide AQView data portal once the website is complete.

II. Summary of Findings for the Quarter

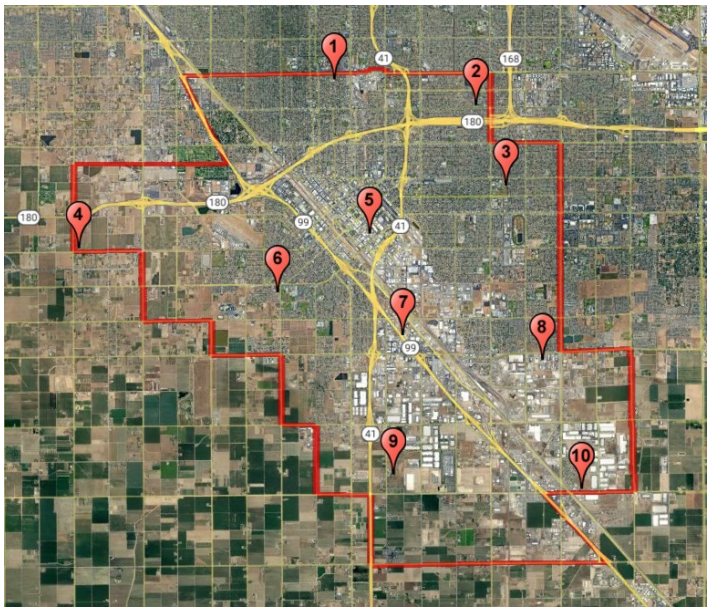
Through the continued implementation of the South Central Fresno CAMP during this period, the following was observed among the pollutants monitored:

- The first quarter of 2022 was characterized by dry weather patterns with limited wind movement which led to poor dispersion conditions. Periods of weather conditions categorized by dispersive winds throughout the quarter led to improved air quality.
- Most of the 24-hour average PM2.5 values and 8-hour average ozone values are below the federal standards except days during poor dispersion caused by clear, dry weather conditions with minimal wind. One PM2.5 day was observed in the Unhealthy AQI category in the beginning of January at the Roosevelt High School site.
- During this period, acetaldehyde, methanol, ethanol, 2-propanol, and acetone were the primary VOCs detected. Overall, during this monitoring period the concentrations of VOCs were detected in the samples taken were well below health based thresholds.
- January and the beginning of February experienced multiple days of higher ammonium nitrate and organic carbon levels attributed to extended periods of minimal winds and dry weather.
- See Appendix for further analysis including Heat Maps and Charts

III. Status of Community Air Monitoring Network

Consistent with the community recommended air monitoring network design, the District is now implementing the community air monitoring plan for South Central Fresno. The following map and table detail the network design for the South Central Fresno CAMP, as well as the status of implementing each specified air monitoring site.

Figure 1 Design and Status of South Central Fresno Community Air Monitoring Network



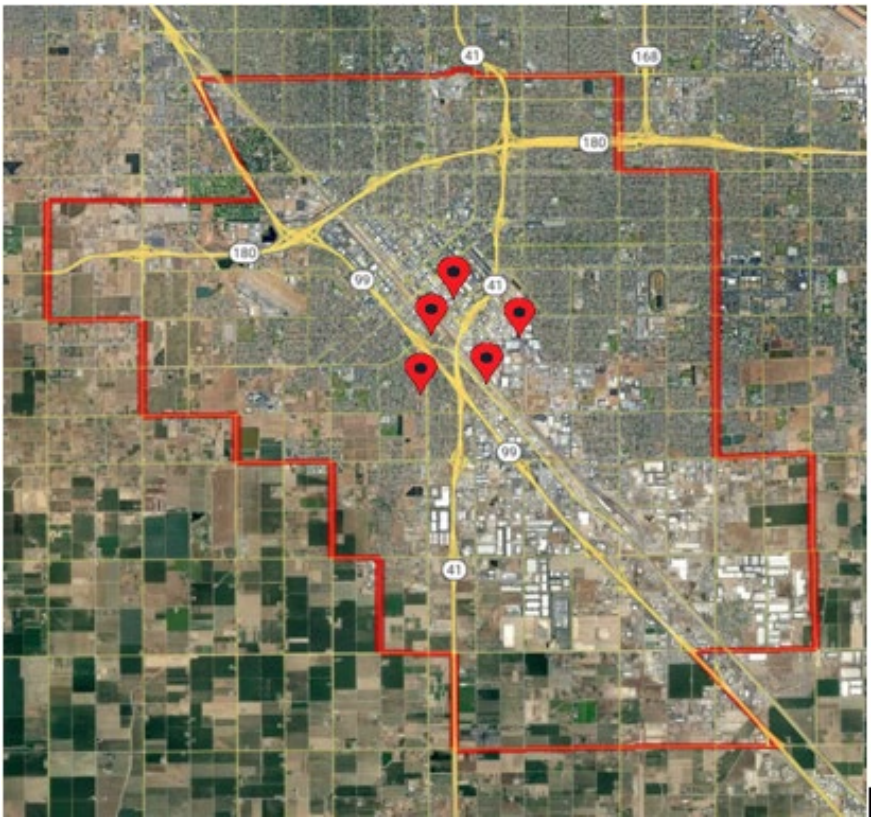
Location	Site Location	Monitoring Platform	Implemented (Y/N)
1	Heaton Elementary School	Real-time PM2.5	Y
2	Yosemite Middle School	Real-time PM2.5	Y
3	Roosevelt High School	Real-time PM2.5	Y
4	Madison Elementary School	Real-time PM2.5	Y
5	Bitwise South Stadium	Real-time PM2.5	Y
6	Edison High School	Compact Multi-Pollutant	Y
7	Fresno-Foundry Park	Real-time PM2.5	Y
8	Fresno-Drummond	Ozone, NO_2, PM10	Y
9	West Fresno Middle School	Compact Multi-Pollutant	Y
10	Malaga Elementary School	Air Monitoring Trailer	Y

The District continues to work on implementing the South Central Fresno CAMP, as well as making changes as needed based on CSC member comments and other logistical reasons.

IV. Mobile Air Monitoring Van Activities

During this quarterly air monitoring period, the District used the mobile air monitoring van to measure air quality at the following locations:

Figure 2 Mobile Air Monitoring Locations



The following table provides a summary of the results of the air quality data collected with the air monitoring van during this period. Green colored values represent pollutant concentrations that are below the applicable health standard or Reference Exposure Level (REL), while orange colored values represent elevated values or values above the applicable health standard or REL. For reference, a detailed table of all community air monitoring data collected with the mobile air monitoring van is available on the South Central Fresno community air monitoring website.

Table 1 Summary of Data Collected with Mobile Air Monitoring Van

Pollutant	Peak 1-hour Average Value	Applicable Standard
PM2.5*	42.0 µg/m^3*	35 µg/m^3 (24-hr average)
Ozone*	59.6 ppb*	70 ppb (8-hr average)
CO	0.4 ppm	35 ppm (1-hr average)
NO2	26.3 ppb	100 ppb (1-hr average)
SO2	3.7 ppb	75 ppb (1-hr average)
Benzene	2.8 ppb	8 ppb (Acute Risk Exposure Level) 1 ppb (Chronic Risk Exposure Level)

Toluene	2.2 ppb	9,818 ppb (Acute Risk Exposure Level) 80 ppb (Chronic Risk Exposure Level)
Ethylbenzene	0.7 ppb	461 ppb (Chronic Risk Exposure Level)
Xylene	0.0 ppb	5,067 ppb (Acute Risk Exposure Level) 161 ppb (Chronic Risk Exposure Level)
H2S	4.8 ppb	30 ppb (Acute Risk Exposure Level) 7 ppb (Chronic Risk Exposure Level)

*Peak 1-hour values not directly comparable to 24-hour and 8-hour average standards for PM2.5 and ozone, respectively

V. Summary of PM2.5 and VOC Speciation Analysis

To build a better understanding of the various constituents that compose the overall PM2.5 and Volatile Organic Compound (VOC) concentrations in the South Central Fresno community, in November 2019 the District began operating PM2.5 and VOC speciation sampling at the Fresno-Foundry site near the intersection of Jensen Avenue and Highway 99. On March 11, 2022, VOC and PM2.5 speciation air monitoring efforts were shifted to the air monitoring trailer at Edison High School. The collected samples were sent to a third-party laboratory for analysis to determine the contribution of various species of PM2.5, as well as the various species of VOCs in the air sampled in the community.

Details on the types of species measured through this analysis, and potential activities, can be found in the appendix to this report.

PM2.5 Speciation Analysis

The following figures show the PM2.5 speciation concentrations and relative comparison of the various PM2.5 species sampled at the Malaga Elementary School air monitoring site. Samples were taken over a 3-month period during the timeframe of this report.

This analysis shows that during this quarter, the highest concentrations of PM2.5 were primarily driven by ammonium nitrate and organic carbon. The first quarter of 2022 was characterized by dry weather patterns with limited wind movement which led to poor dispersion conditions. Periods of weather conditions categorized by dispersive winds throughout the quarter led to improved air quality. Unseasonably high temperatures and dry conditions were present in the beginning of February. Beginning on 3/11/2022, speciation sampling began at the Edison High School site.

Figure 3 Speciated PM2.5 Concentrations at Malaga Elementary School and Edison High School

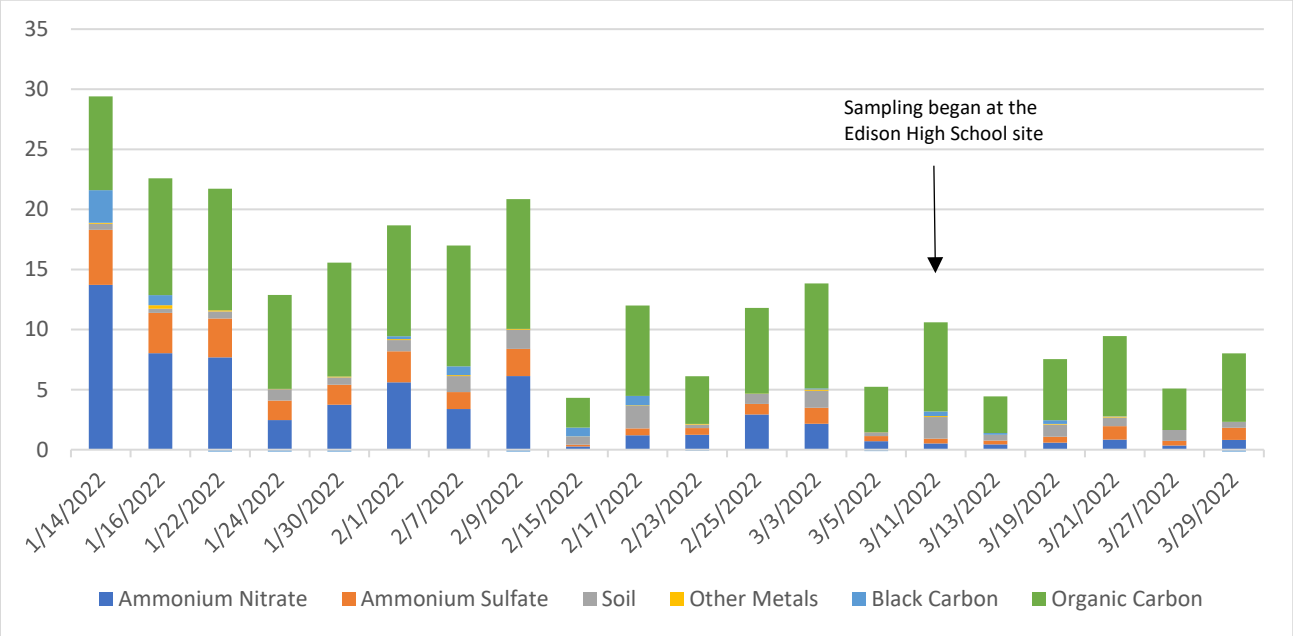
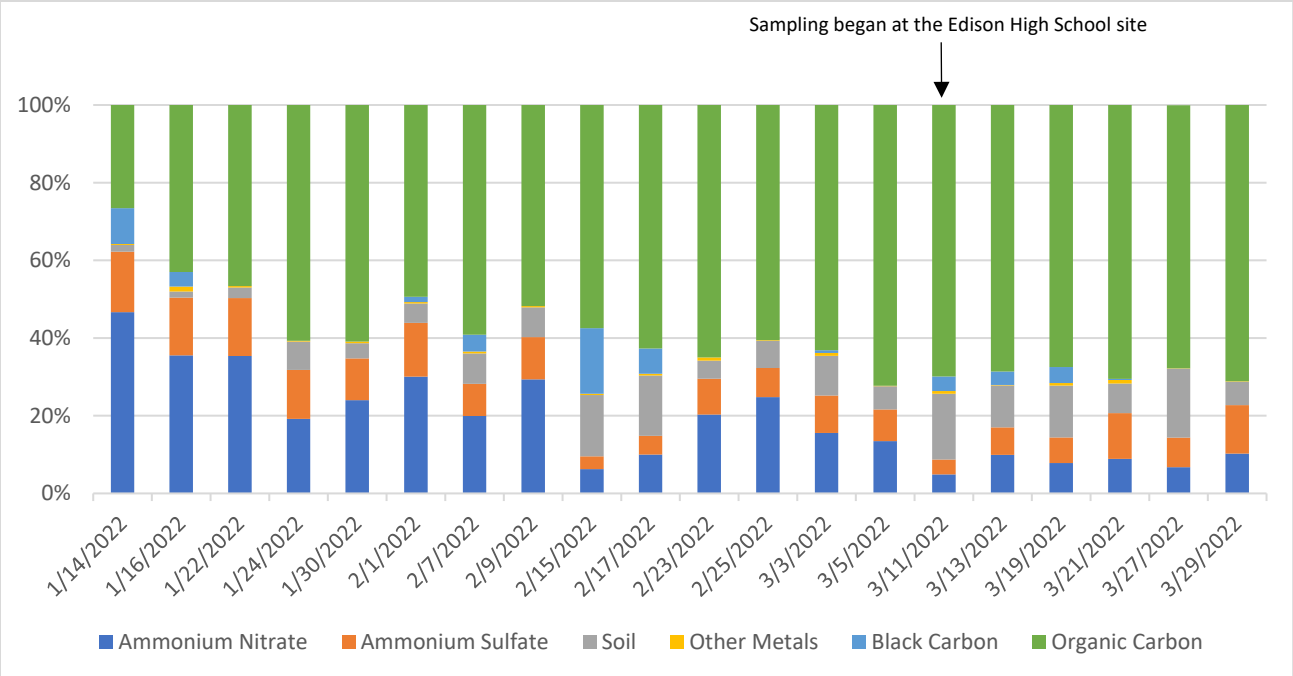


Figure 4 Relative Comparison of PM2.5 Species Measured at Malaga Elementary School and Edison High School



VOC Speciation Analysis

VOCs are carbon chained compounds that vaporize in ambient conditions. Among these compounds are BTEX, 1,3-butadiene, PAH, aldehydes, naphthalene, and diethanolamine. These compounds are typically emitted from products such as paints, inks, organic solvents, petroleum products, and vehicle exhaust. The health effects of these compounds vary but, long term exposure can have lasting adverse health effects. A more detailed list of possible VOCs and the associated health effects is provided by the California Office of Environmental Health Hazard Assessment (OEHHA)[1].

During this period, the District collected 19 air samples for laboratory analysis. The VOC laboratory analysis is capable of isolating concentrations of 83 VOC species, however during this period most VOCs were not detected in the atmosphere.

Acetaldehyde, methanol, ethanol, 2-proponal, and acetone were the primary VOCs detected. Of these three, only acetaldehyde and methanol have an associated Reference Exposure Level (REL), a health risk metric established by the Office of Environmental Health Hazard Assessment (OEHHA). Below is a summary of the potential sources and a comparison of the peak concentration with the associated OEHHA REL. Green colored values represent pollutant concentrations that are below the applicable REL, while orange colored values represent elevated values or values above the applicable REL. All shaded values in the table below are colored green and no concerning concentrations of VOCs were detected in the samples taken.

Table 2 Summary of VOC Speciation Analysis

Pollutant	Potential Sources of Emission	Short Term Impact		Long Term Impact	
		Max Measured [24-hour] (ppb)	OEHHA Acute REL [1-hour] (ppb)	Average Measured [Annual] (ppb)	OEHHA Chronic REL [Annual] (ppb)
Methanol	Automobile exhaust, solvent use, and naturally from vegetation and microbes	79.3	21,367	22.6	3,052
Acetaldehyde	Wood combustion in fireplaces and woodstoves, coffee roasting, burning of tobacco, vehicle exhaust fumes, and coal refining and waste processing	104.0	61	23.9	78

[1] https://oehha.ca.gov/air/general-info/oehha-acute-8-hour-and-chronic-reference-exposure-level-rel-summary

VI. Appendix of Pollutant Species and Comparative Analysis

Overview of PM2.5 Species

The nature and formation of PM2.5 in the San Joaquin Valley is highly complex as it can be composed of any material that has a diameter of 2.5 microns or less. PM2.5 can be emitted directly as primary PM2.5 from various sources or formed secondarily through chemical reactions in the atmosphere. The resulting ambient PM2.5 mixture can include aerosols (fine airborne solid particles and liquid droplets) consisting of components of nitrates, sulfates, organic carbon, black carbon, soil, trace metals, and more.

PM2.5 in the Valley is comprised of many species that contribute to the total PM2.5 mass. This complex mixture is attributable to emissions from stationary, mobile, and area-wide sources, as well as naturally occurring emissions. Although the list of species contributing to PM2.5 in the Valley is lengthy, it can be grouped into larger representative categories. The following is a brief description of each of these larger species categories:

- **Ammonium Nitrate:** Ammonium nitrate is formed from the reaction of ammonia and nitric acid, where the nitric acid is formed from emissions of nitrogen oxides.

- **Ammonium Sulfate:** Ammonium sulfate is form from the reaction of ammonia and sulfuric acid, where the sulfuric acid is formed primarily from emissions of sulfur oxide, with smaller amounts forming from direct emissions of sulfur.

- **Organic carbon:** Organic carbon (OC) are generated as primary organic aerosol, predominantly through the combustion of hydrocarbons. Key sources include cooking, industrial processes, mobile source exhaust, tire wear, and wood burning. Secondary organic aerosols are formed from the oxidation of motor vehicle hydrocarbons, wood burning, solvent use, and industrial processes.

- **Black Carbon:** Black carbon is also known as soot or elemental carbon, and is formed during incomplete combustion in fuels, including mobile exhaust (mainly diesel) and wood burning.

- **Soil:** This category consists of road dust and soil dust that are entrained in the air from activity, such as soil disturbance or airflow from traffic.

- **Other Metals:** Identified as components from soil emissions or found in other particulates having been emitted in connection with combustion from engine wear, brake wear, and similar processes. Certain metals are also emitted from the use of fireworks.

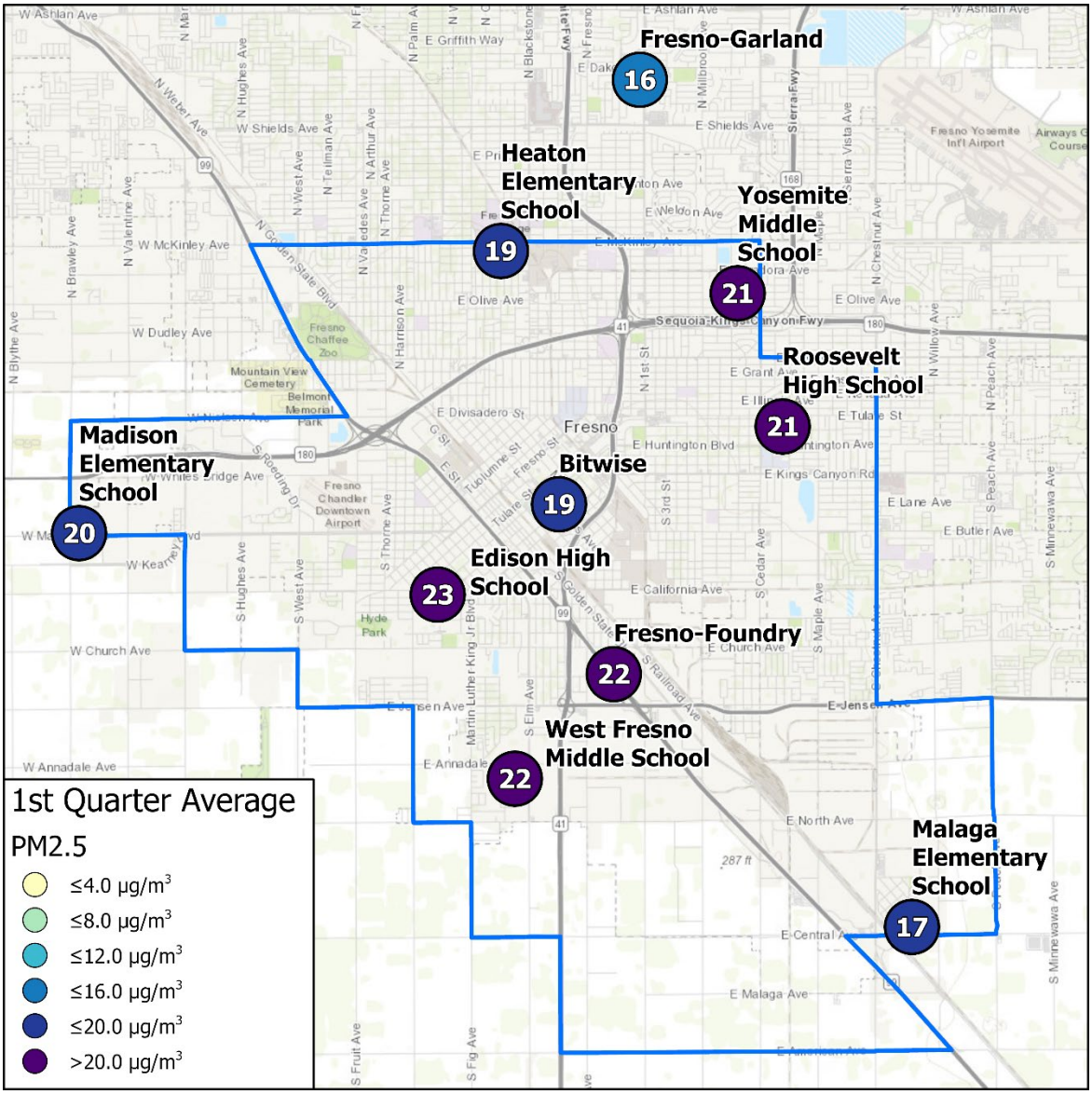
Comparative Analysis of Measured Pollutants

The following spatial comparison map depicts the quarterly PM2.5 averages and locations of each site within the community. Good air quality is represented in the map by the light yellow, light green, and light blue colors. Moderate air quality and above is represented by darker blues and purples based on how high the quarterly average is for that site.

Quarter	Clovis	Fresno-Garland	Roosevelt High School	Bitwise South Stadium	Fresno-Foundry
2022 Q1	16.0	16.0	20.8	19.4	22.1

Quarter	Heaton Elementary School	Yosemite Middle School	Malaga Elementary School	West Fresno Middle School	Madison Elementary School	Edison High School
2022 Q1	19.3	20.6	16.7	22.1	20.0	23.3

Spatial Comparison of PM2.5 Quarterly Averages

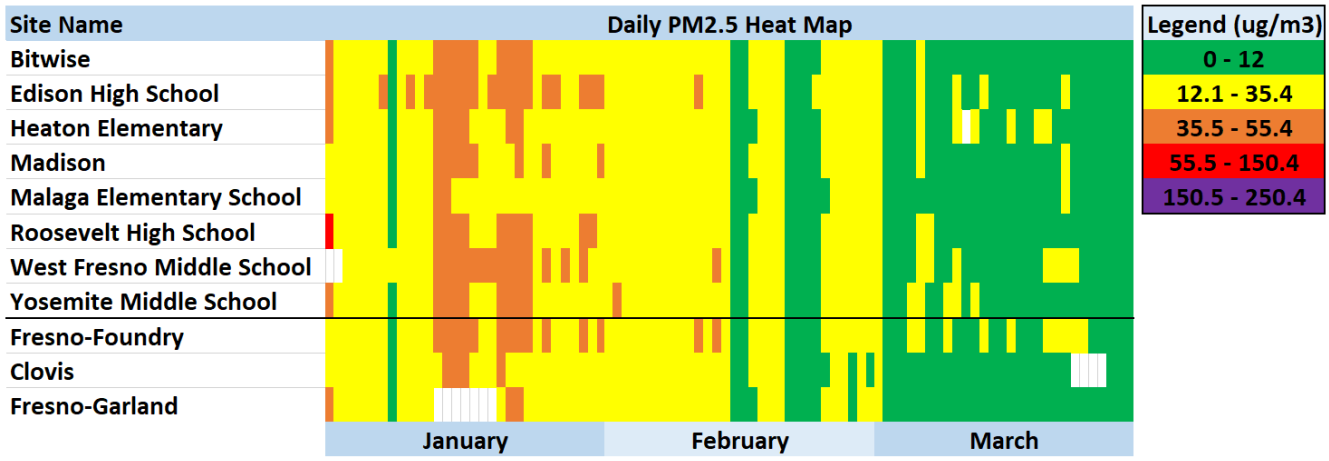


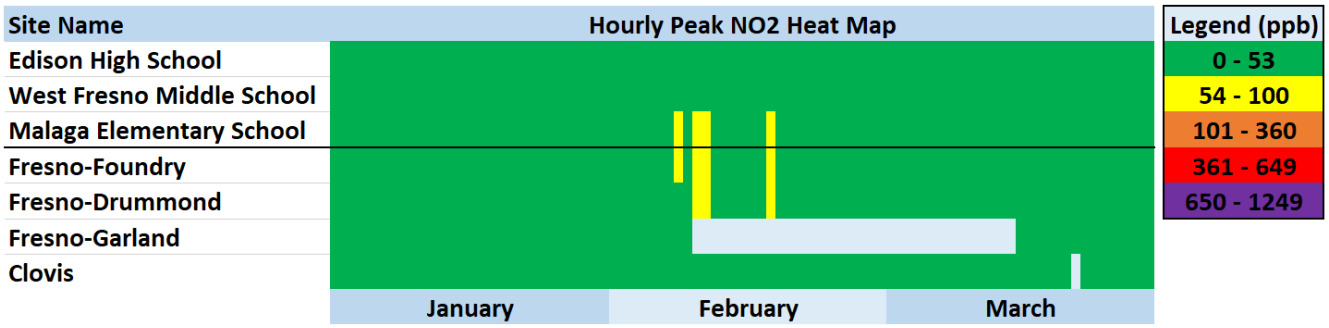
Pollutant Concentration Heat Maps

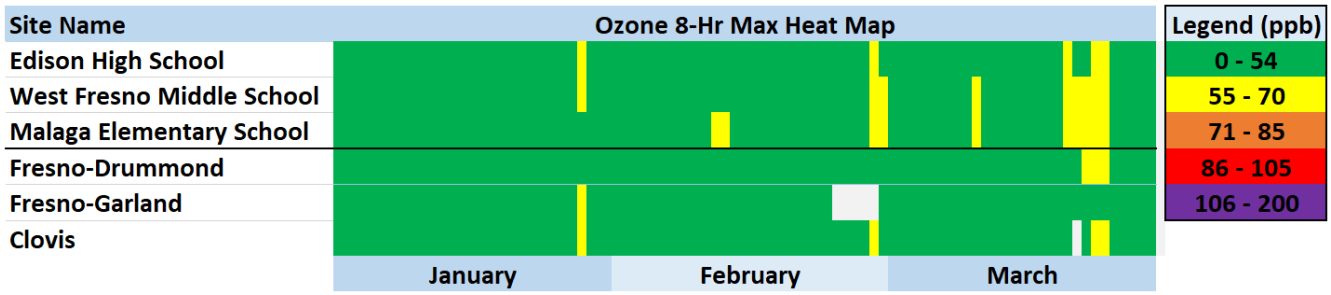
The following Heat Maps provide a comparative analysis of various pollutants being measured at the air monitoring sites as a part of the community air monitoring network. The color scales for each table are based on the Air Quality Index (AQI) or the associated Reference Exposure Level (REL).

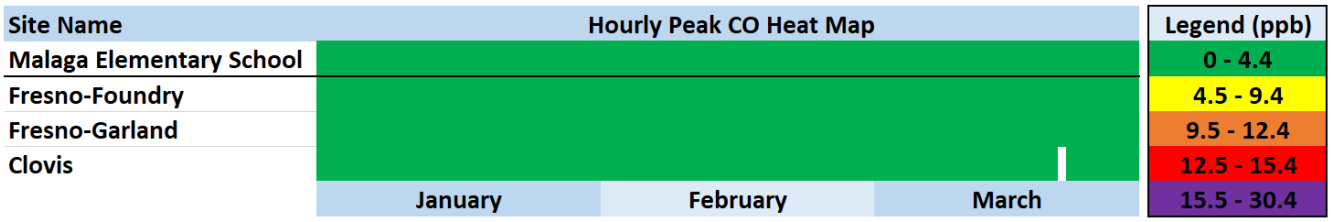
January 2022 was characterized primarily by dry weather patterns with limited wind movement which led to poor dispersion conditions. Periods of weather conditions categorized by dispersive winds throughout the quarter led to improved air quality. As such, the lack of dispersion contributed to elevated PM2.5 concentrations through the period. With the exception of a weather system that brought good dispersion to the

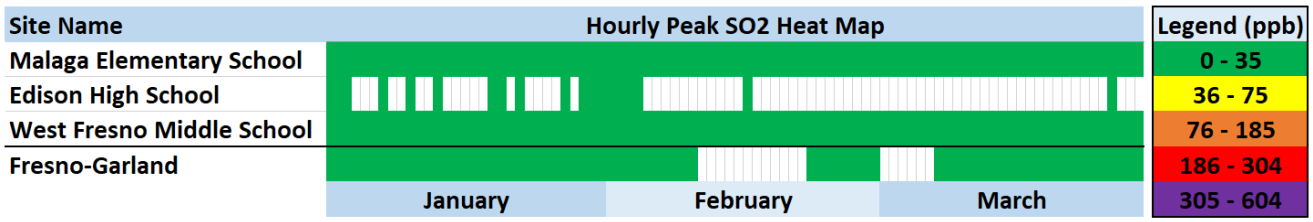
northern portion of the District during the first two days of February, dry conditions with light winds remained prevalent across most of the Valley through mid-February. The long period of poor dispersion finally ended on February 15th as alternating weather patterns began traversing the region. The alternating weather patterns, characteristic of springtime, led to the more frequent arrival of dispersive weather systems and shorter durations of dry systems. The better dispersion conditions continued through March and helped PM2.5 concentrations decrease across the Valley through the end of the quarter.

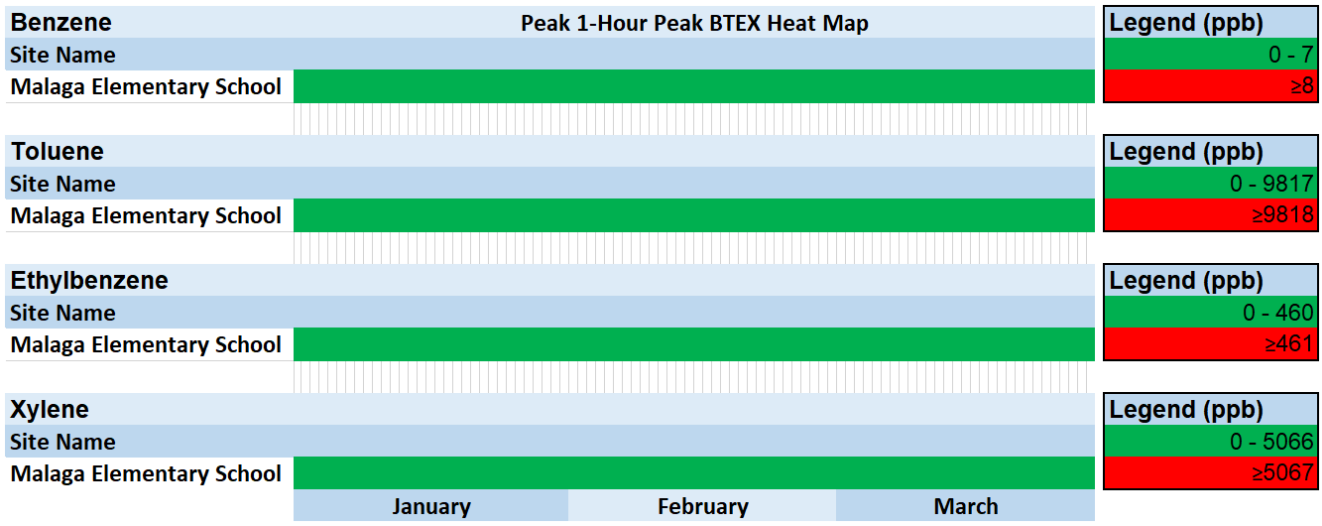


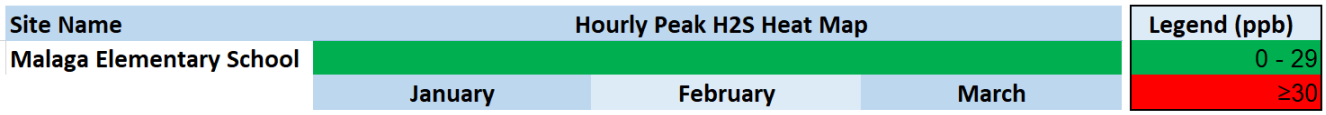







Site Name
Hourly Peak SO2 Heat Map
Malaga Elementary School
Edison High School
West Fresno Middle School
Fresno-Garland
January
February
March
Legend (ppb)
0 - 35
36 - 75
76 - 185
186 - 304
305 - 604


Benzene
Peak 1-Hour Peak BTEX Heat Map
Site Name
Malaga Elementary School
Legend (ppb)
0 - 7
≥8
Toluene
Site Name
Malaga Elementary School
Legend (ppb)
0 - 9817
≥9818
Ethylbenzene
Site Name
Malaga Elementary School
Legend (ppb)
0 - 460
≥461
Xylene
Site Name
Malaga Elementary School
Legend (ppb)
0 - 5066
≥5067
January
February
March


Site Name
Hourly Peak H2S Heat Map
Malaga Elementary School
January
February
March
Legend (ppb)
0 - 29
≥30