air pollution control district

SANTA BARBARA COUNTY

Network Assessment of the Santa Barbara County Air Pollution Control District Ambient Air Monitoring Network

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1.0 Introduction

This report was prepared by the Santa Barbara County Air Pollution Control District (District) as an assessment of the air quality surveillance system in Santa Barbara County. Title 40, Part 58, Section 10 of the Code of Federal Regulations (40 CFR 58.10) requires that an assessment be performed every 5 years to determine if the network meets the monitoring objectives of this title. There are three basic monitoring objectives:

1) Provide air pollution data to the general public in a timely manner;
2) Support compliance with ambient air quality standards and emissions strategy development; and,
3) Support for air pollution research studies.

In order to support the air quality management work indicated in the three basic air monitoring objectives, the network is designed with a variety of monitoring station types. There are six general types:

1) Stations located to determine the highest concentrations expected to occur in the area covered by the network;
2) Stations located to measure typical concentrations in areas of high population density;
3) Stations located to determine the impact of significant sources or source categories on air quality;
4) Stations located to determine general background concentration levels;
5) Stations located to determine the extent of regional pollutant transport among populated areas; and in support of secondary standards; and,
6) Stations located to measure air pollution impacts on visibility, vegetation damage, or other welfare-based impacts.

The assessment is also required to help determine if new stations are needed or existing stations can be terminated and whether new technologies are appropriate for incorporation into the ambient air monitoring network. The current air monitoring network meets or exceeds the minimum monitoring requirements as set forth in 40 CFR 58 Appendix D. Details of these minimum monitoring requirements are discussed in the Santa Barbara County Air Pollution Control District 2020 Network Plan.

2.0 Santa Barbara County Setting

Santa Barbara County is located on the Pacific coast of California bordered to the north by San Luis Obispo County and to the east by Ventura County. The Pacific Ocean forms the west and southern borders of the county. The Santa Ynez mountain range, which runs east/west parallel to the southern coast of the county is one of the predominant land features of the county that serves as a dividing feature between the northern and southern portions of the county.

Local air quality is highly dependent upon the climate and meteorology of the area because meteorological conditions control the transport and diffusion of emitted pollutants. Climate is a long-term average of daily and seasonal weather conditions, while meteorology deals with the day by day and hour by hour specific weather conditions. Understanding the climate of Santa Barbara County helps to explain annual cycles of local air quality. Understanding the meteorology of Santa Barbara County helps to explain shorter term variations in local air quality.

2.1 Climate of Santa Barbara County

Santa Barbara County has a Mediterranean climate characterized by warm, dry summers, and cooler, relatively damp winters. Mild temperatures occur throughout the year, particularly near the coastline. Maximum summer temperatures average 70 degrees Fahrenheit near the coast and in the high 80s to low 90s inland. During winter, average minimum temperatures range from the 40s along the coast to the 30s inland.

The climate of Santa Barbara is strongly influenced by a persistent high-pressure area which lies off the Pacific Coast. As a result, sunny skies are common throughout most of the area. Rainstorms periodically occur, mostly from October to April. Annual rainfall amounts range from 10 to 18 inches along the coast, with more substantial amounts in the higher elevations. On occasion, tropical air masses produce rainfall during the summer months.

Cool, humid marine air causes frequent fog and low clouds along the coast, generally during the night and morning hours in the late spring and early summer months. The fog and low clouds can persist for several days at a time until broken up by a change in the weather pattern.

2.2 Meteorology of Santa Barbara County

Meteorology deals with shorter time periods and smaller spatial scales than climate. Understanding the interaction between local meteorology and emitted pollutants is essential in understanding how elevated levels of pollutants can occur in the atmosphere. This relationship between local meteorology and elevated pollutant levels is necessary in evaluating the design of an ambient air monitoring network.

2.2.1 Surface Winds

The air flow around the county plays an important role in the movement of pollutants. In northern Santa Barbara County (north of the ridgeline of the Santa Ynez Mountains), the sea breeze (from sea to land) is typically northwesterly throughout the year. During summer months, these northwesterly winds are stronger and persist later into the night. At night, the sea breeze subsides, and as air adjacent to the surface cools it descends down the coastal mountains into the valleys, resulting in light land breezes (from land to sea). This land/sea breeze cycle, combined with local topography, greatly influences the direction and speed of the winds throughout the county. In addition, the alternation of the land-sea breeze cycle can sometimes produce a "sloshing" effect, where pollutants are swept offshore at night and are subsequently carried back onshore during the day. This effect is exacerbated during periods when wind speeds are low.

Topography plays another role in wind patterns experienced in the county. The terrain around Point Conception, combined with the change in orientation of the coastline from north-south north of Point Conception to east-west south of Point Conception, can cause counter-clockwise circulations or eddies to form east of the Point. These eddies fluctuate from time-to-time and place-to-place, which often leads to highly variable winds along the southern coastal strip. Point Conception also marks the change in the prevailing surface winds from northwesterly north of Point Conception to southwesterly south of Point Conception.

Another type of wind regime that influences air quality in Santa Barbara County is the "Santa Ana" wind condition. Santa Ana winds are dry northeasterly winds that occur throughout Southern California, primarily during the fall and winter months. These winds descend down the slopes of mountain ranges and typically are associated with warm and dry conditions. Wind speeds associated with a Santa Ana event are generally 15-20 mph, though they can reach speeds in excess of 60 mph. During Santa Ana conditions, pollutants emitted in Santa Barbara County, Ventura County, and the South Coast Air Basin (the Los Angeles region) are moved out to sea. These pollutants can then move back onshore into Santa Barbara County (via the Santa Barbara Channel) in what is called a "post-Santa Ana condition." The effects of the post-Santa Ana can be experienced throughout the county. However, not all post-Santa Ana conditions lead to high pollutant concentrations.

2.2.2 Upper Level Wind and Temperature

Upper-level winds in the atmosphere are also critical to the air quality of Santa Barbara County. The winds at 1,000 feet and 3,000 feet are generally from the north or northwest throughout the year. Occurrences of southerly and easterly winds are most frequent in winter, especially in the morning. Upper-level winds from the southeast are infrequent during the summer months, though they are usually associated with periods of higher ozone (O_3) levels. As with the surface winds, upper level winds can move pollutants that originate in other areas into the county.

Another factor that affects the concentrations of pollutants in the air is the stability of the atmosphere. Atmospheric stability regulates the amount of air exchange (referred to as mixing) both horizontally and vertically. Restricted mixing (a high degree of stability) and low wind speeds are generally associated with higher pollutant concentrations. These conditions are typically related to temperature inversions (temperature increase with height) that cap the pollutants that are present below or within them.

Surface inversions (0-500 ft.), as measured at Vandenberg Air Force Base, are most frequent during the winter, and subsidence inversions (1000-2000 ft.) are most frequent during the summer. Generally, the lower the inversion base height and the greater the rate of temperature increase from the base to the top, the more pronounced effect the inversion will have on inhibiting dispersion. The subsidence inversion is very common along the California coast and is one of the principle causes of air stagnation.

Poor air quality is often associated with "air stagnation" (high stability/restricted air movement). Therefore, it is reasonable to expect a higher frequency of pollution events in the southern portion of the county where light winds are frequently observed, as opposed to the northern portion where the prevailing winds are strong and persistent.

2.3 Santa Barbara County Population Distribution

The 2019 population of Santa Barbara County is estimated to be 446,499 according to the U. S. Census. This is a 5.3 percent increase from the year 2010 Census count of 423,895. The distribution of population by race, ethnicity, and age (from 2018 census estimate) is presented in Table 2-1 below. Note that the census considers race and ethnicity as separate traits. The census considers Hispanic/Latino as an ethnic trait, not a race, so an individual that is identified White or Black may also be identified as Hispanic/Latino.

Table 2-1 Santa Barbara County Distribution of Population by Race and Age

SANTA BARBARA COUNTY POPULTATION DISTRIBUTION BY RACE AND ETHNICITY							
Cacausan /White	African American /Black	Indigenous	Asian	Pacific Islander	Other	Multiple	Hispanic/ Latino
78.4%	2.1%	1.4%	5.6%	0.1%	7.9%	4.5%	45.8%

SANTA BARBARA COUNTY POPULATION DISTRIBUTION BY AGE					
Age<14	Age 15-24	Age 25-54	Age 55-64	Age 65-74	Age >75
18.7%	19.2%	35.5%	11.3%	8.4%	6.9%

The population is concentrated in the areas surrounding the cities of the south coast, Lompoc, Santa Maria, and Santa Ynez/Solvang. The remaining areas of the county are very scarcely populated, especially the large area of National Forest in the northeastern area of the county.

3.0 Air Monitoring Network

The District and the California Air Resources Board (CARB) began installing State and Local Air Monitoring Stations (SLAMS) to measure the air quality within the populated urban areas of Santa Barbara County in the early to mid-1970s, as required by the 1970 federal Clean Air Act. These stations were used to determine Santa Barbara County's compliance with the National Ambient Air Quality Standards (NAAQS). Between the mid-1970s and the mid-1980s, the number and location of monitoring stations did not change. No new large industrial sources of air pollution were permitted/constructed in the county during this period.

Several changes occurred in the early- to mid-1980s that resulted in an expansion of the monitoring network. First, Santa Barbara County adopted its New Source Review and Prevention of Significant Deterioration rules, as required by the federal Clean Air Act Amendments of 1977, Part D. These rules have been revised over the years, and they serve to guide the District's air quality permitting program.

Also, in the 1980's, a few oil companies requested development permits from the County and the District for major onshore industrial facilities associated with large-scale offshore oil development projects. This triggered monitoring requirements as part of the Prevention of Significant Deterioration (PSD) program, which requires major industrial pollution sources to conduct air monitoring for various purposes. Prior to constructing the facilities, air monitoring was conducted and was used to determine baseline conditions and to provide input to computer models used to estimate air quality impacts. After construction of the facilities, their respective permits required the continuation of air monitoring. These industrial air monitors are used to determine the impacts that facility operations may have on overall air quality and to validate the assumptions used for issuing the permit. The primary purpose of all these air monitoring requirements is to protect public health and welfare.

The next change came in the early 1990s, when some of these major facilities were at peak operational capacity and some were reducing operations. The stations operating under the Industrial monitoring program were re-evaluated, and several of them were shut down because there enough data had been collected to adequately characterize the pollutant concentrations near the facilities.

In 2018 and again in 2019, the Environmental Protection Agency (EPA), CARB, and the District discussed various options for changing the District's monitoring network to free up District, CARB, and EPA resources so that they could be used elsewhere, while still providing appropriate monitoring for the community. In February 2019, EPA approved changes to the network and the District implemented those changes in March 2019. Monitors that were approved for shutdown are listed in Table 3-1.

Table 3-1 EPA Approved Monitor Shutdown

AQS#	Station Name	Station Type	CO	NO_2	SO_2	O_3	PM_{10}
06-083-0008	El Capitan	SLAMS		X	X	X	X
06-083-2011	Goleta	SLAMS	X				
06-083-1018	Nojoqui	Industrial		X		X	
06-083-1021	Carpinteria	Industrial		X		X	
06-083-1025	Las Flores Canyon #1	Industrial	X	X	X		X
06-083-1014	Paradise Road	Industrial		X			
06-083-1013	Lompoc HSP	Industrial		X	X	X	
06-083-4003	VAFB STS	Industrial	X	X	X	X	X
06-083-1020	West Campus	Industrial			X		

EPA also approved changing the O_3 monitors at Carpinteria, Las Flores Canyon #1, and Paradise Road from Industrial to SLAMS monitors. This change was proposed because these O_3 monitors historically recorded the highest O_3 concentrations in Santa Barbara County.

Some of the monitors approved by EPA for shutdown were classified as non-NAAQS Industrial monitors and continue to operate. Other non-essential or redundant Industrial and SLAMS monitors were eliminated. The resulting non-NAAQS Industrial or Other (e.g., odor station) monitoring network in Santa Barbara County is listed in Table 3-2.

Table 3-2 Non-NAAQS Compliant Industrial or Other Monitors

AQS#	Station Name	CO	NO_2	SO_2	O_3	PM_{10}	THC	H_2S	TRS
06-083-1021	Carpinteria		X						
06-083-1025	Las Flores Canyon #1	X	X	X		X	X		
06-083-1014	Paradise Road		X						
06-083-1013	Lompoc HSP		X	X	X		X		
06-083-1020	West Campus			X				X	X
06-083-1022	Lompoc Odor							X	X
06-083-1037	Las Flores Canyon Odor							X	

Currently, there are 12 ambient air quality monitoring stations operating within Santa Barbara County (Figure 3-1). The network consists of SLAMS, Non-NAAQS compliant Industrial monitors and "other" monitors. The stations are operated by the District, CARB, or private contractors. The Industrial stations can be subdivided into source-specific monitors and regional air quality monitors. The "other" stations are designed to measure odorous compounds from nearby industrial sources.

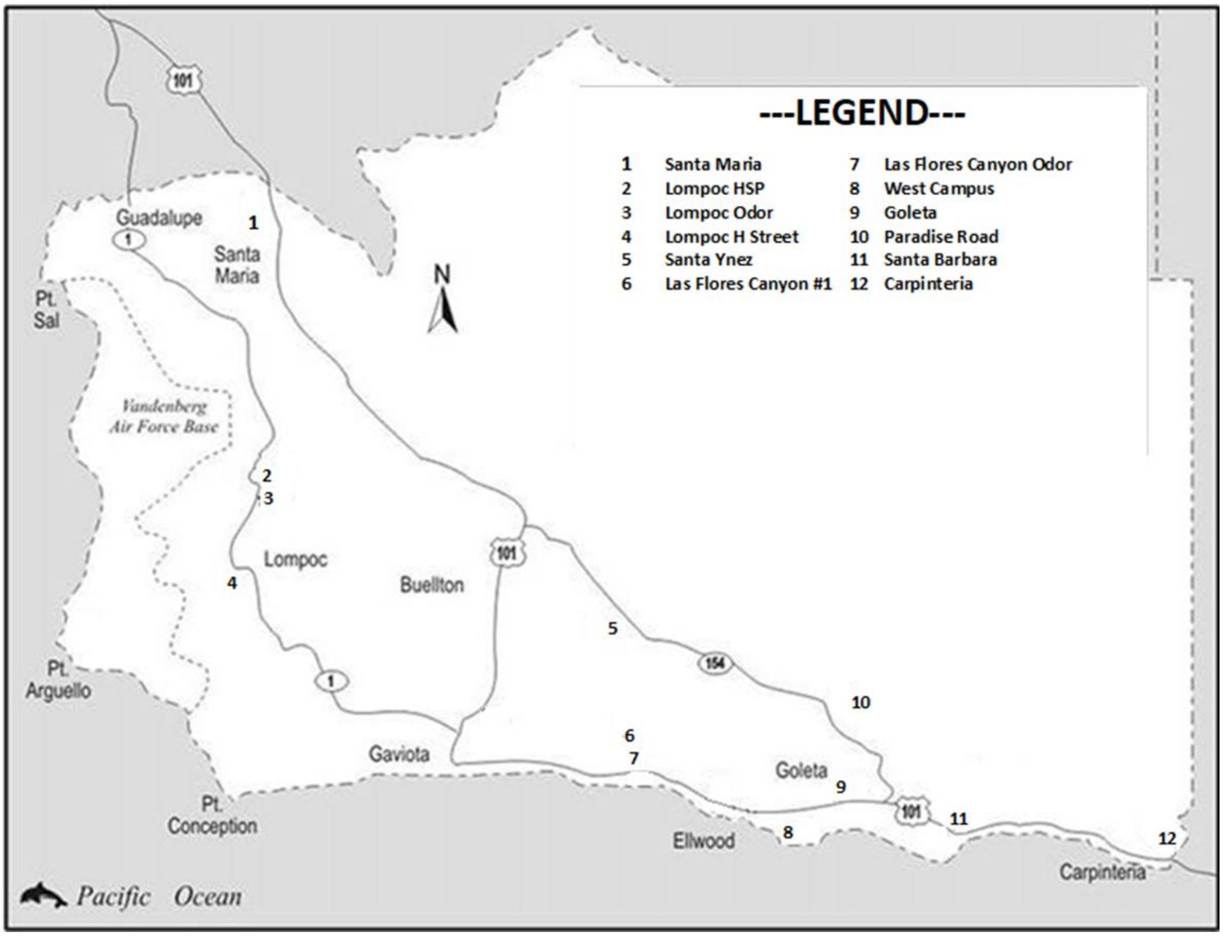


Figure 3-1 – 2020 Map of Monitoring Network

The SLAMS stations are sited to monitor air quality in populated urban areas or areas with the historically highest concentration. The Industrial stations monitor local impacts of specific industrial facilities and cumulative impacts of large facilities on regional air quality in the county. A monitoring station can serve a dual purpose when its location satisfies the objectives of more than one classification, or for more than one facility. Many of the county's large industrial facilities, however, are in areas of complex topography with complex meteorological conditions, limiting the ability of a single station to represent multiple facilities. Table 3-3 lists these stations, the parameters measured, and the monitor classification.

Table 3-3 Measured Parameters with Monitor Classification

Parameter	O3	NO_2	SO_2	CO	$PM_{2.5}$	PM_{10}	THC	H_2S	TRS
Carpinteria	SLAMS	Industrial							
Goleta	SLAMS				SLAMS	SLAMS			
Las Flores Canyon #1	SLAMS	Industrial	Industrial	Industrial		Industrial	Industrial		
Las Flores Canyon Odor								Other	
Lompoc H St.	SLAMS	SLAMS	SLAMS	SLAMS	SLAMS	SLAMS			
Lompoc HSP	Industrial	Industrial	Industrial				Industrial		
Lompoc Odor								Other	Other
Paradise Road	SLAMS	Industrial							
Santa Barbara	SLAMS				SLAMS	SLAMS			
Santa Maria	SLAMS	SLAMS		SLAMS	SLAMS	SLAMS			
Santa Ynez	SLAMS								
West Campus			Industrial				Industrial	Other	Other

3.1 SLAMS Stations/Monitors

There are five SLAMS monitoring stations operating in Santa Barbara County. They are located in Santa Barbara, Goleta, Lompoc, Santa Maria, and Santa Ynez. CARB operates the downtown Santa Maria station, while the District is responsible for the operation of the remaining stations. Three additional stations contain both SLAMS and Industrial monitors. The Carpinteria, Las Flores Canyon #1, and Paradise Road station O_3 monitors are classified as SLAMS because they historically measure the highest O_3 concentrations in the county. All the SLAMS stations have been operating in these areas since the late 70’s or early 80’s, which has provided helpful long-term air quality trend data.

3.2 Industrial Stations/Monitors

There are five stations containing industrial monitors. These monitors are designed to measure maximum pollutant concentrations, regional air quality, background levels, or transport emissions. These monitors are required by operating permits issued to stationary emission sources. Industrial monitors are not required to comply with federal NAAQS monitoring requirements; therefore, they are not included in the evaluation of data in this report.

3.3 Odor Stations

There are three stations sited to measure odorous compounds that could potentially be emitted from certain oil and gas facilities. These stations typically measure hydrogen sulfide, total reduced sulfur, wind, and temperature. The three stations are Las Flores Canyon Odor, West Campus, and Lompoc Odor. These stations are required by permits issued to these facilities. The Las Flores Canyon Odor station has been temporarily shut down in July 2018 and will be re-started when production at the ExxonMobil Las Flores Canyon processing facility resumes. The odorous compounds measured at these stations are not criteria pollutants, therefore they are not included in the evaluation of data in this report.

3.4 Meteorological Station

Most of the SLAMS and Industrial stations include meteorological monitors; one station is set up exclusively for monitoring meteorological conditions and is located at the Ellwood Onshore facility. The meteorological conditions measured include wind speed, wind direction and temperature. The meteorological data from these stations are used to characterize the transport of pollutants in the air and can help to identify the source of the pollutants measured.

4.0 Pollutants Monitored and Analysis of Data

EPA has established a set of air quality standards known as the National Ambient Air Quality Standards, or NAAQS. The standards were established to protect human health and welfare. They include O_3, NO_2, SO_2, CO, PM_{10} and $PM_{2.5}$. These pollutants are measured at several locations to determine whether the District meets, or attains, the air quality standards. Other pollutants are also monitored in the county; some are monitored for state air quality standards, some for safety, and others for research. These pollutants include hydrogen sulfide, total reduced sulfur, and total hydrocarbons. Wind speed, wind direction, and temperature are also measured at most stations to help characterize the source of the measured pollutants. This report includes an evaluation of the pollutants that are measured for comparison with the NAAQS.

EPA has created an application named NetAssess to help organizations analyze data and generate the graphical displays used in this section. The NetAssess application retrieves data from EPA's Air Quality System (AQS), US Census, and Centers for Disease Control and Prevention Public Health System to produce the analytical products.

4.1 O_3 Monitors

O_3 is monitored for NAAQS comparison at eight locations in the county. Santa Barbara, Goleta, Lompoc H Street, Santa Maria, Santa Ynez are in the major populated areas of the county for population exposure. Carpinteria, Paradise Road and Las Flores Canyon #1 are in areas with a low population density but have consistently measured the highest concentrations of O_3 in the county. Paradise Road is north of the Santa Ynez mountain range and represents air in the northern portion of the county, while Las Flores Canyon #1 and Carpinteria are south of the Santa Ynez mountain range and are representative of the foothill region of the southern portion of the county.

4.1.1 Analysis of O_3 Measurements

Summary statistics were compiled for these monitors and summarized in Table 4-1. The fourth-highest eight-hour O_3 value was determined for each year from 2017 through 2019. These fourth-highest values were averaged for each monitor and compared with the NAAQS standard of 0.070 ppm. The monitors were ranked based on the percent of the standard.

Table 4-1 O_3 Summary

AQS #	Monitor	2017 4th Max ppm	2018 4th Max ppm	2019 4th Max ppm	3 year Avg. ppm	% of Std 0.07 ppm	Rank
06-083-1025	Las Flores Canyon #1	0.066	0.063	0.066	0.065	92.9%	1
06-083-1021	Carpinteria	0.053	0.062	0.068	0.061	87.1%	2
06-083-1014	Paradise Road	0.062	0.058	0.062	0.060	85.7%	3
06-083-0011	Santa Barbara	0.063	0.055	0.061	0.059	84.3%	4
06-083-2011	Goleta	0.061	0.053	0.057	0.057	81.4%	5
06-083-3001	Santa Ynez Airport	0.059	0.054	0.058	0.057	81.4%	6
06-083-1008	Santa Maria	0.051	0.046	0.045	0.047	67.1%	7
06-083-2004	Lompoc H Street	0.051	0.037	0.032	0.040	57.1%	8

There were no stations that exceeded the standard for the 2017-2019 period examined. The Las Flores Canyon #1 monitor was the highest, with a measured value that is 92.9% of the current O_3 standard. Overall, six stations were within 20% of the current O_3 standard.

4.1.2 Correlation Analysis of O_3 Measurements

Correlation analysis compares the measurements from nearby stations to determine if concentrations correlate temporally. Figure 4-1 below includes a graphic representation of the correlation between O_3 monitors used for NAAQS comparison in Santa Barbara County, for the period 2016 through 2018.

Monitor pairs with Pearson correlation values near one are highly correlated, while monitor pairs with Pearson correlation values near zero have no correlation. Monitors that do not correlate well with other monitors exhibit unique temporal concentration variation relative to other monitors and are likely to be important for assessing local emissions, transport, and spatial coverage. Monitor pairs with high Pearson correlation values (e.g., r > 0.75) exhibit similar temporal concentrations.

Monitor pairs with low average relative difference (white or light red) measure similar O_3 concentrations, while monitors with high average relative differences (deep red) measure significantly different O_3 concentrations.

Possible redundant monitors would exhibit high correlations consistently across all of their pairings and would have low average relative difference, despite the distance between the monitors. Usually, it is expected that correlation between monitors will decrease as distance increases. However, for a regional air pollutant such as O_3, monitors in the same airshed can have very similar concentrations and be highly correlated. More unique monitors would exhibit the opposite characteristics. They would not be very well correlated with other monitors, and their relative difference would be higher than other monitor-to-monitor pairs.

The two monitor pairs with the best correlation are Goleta-Santa Barbara and Santa Ynez-Paradise Road. This is not surprising, as both pairs of monitors are sampling the from the same airshed and are near each other. The coastal monitor at Lompoc H compares poorest with the inland and elevated monitors of Paradise Road, Carpinteria, and Las Flores Canyon #1.

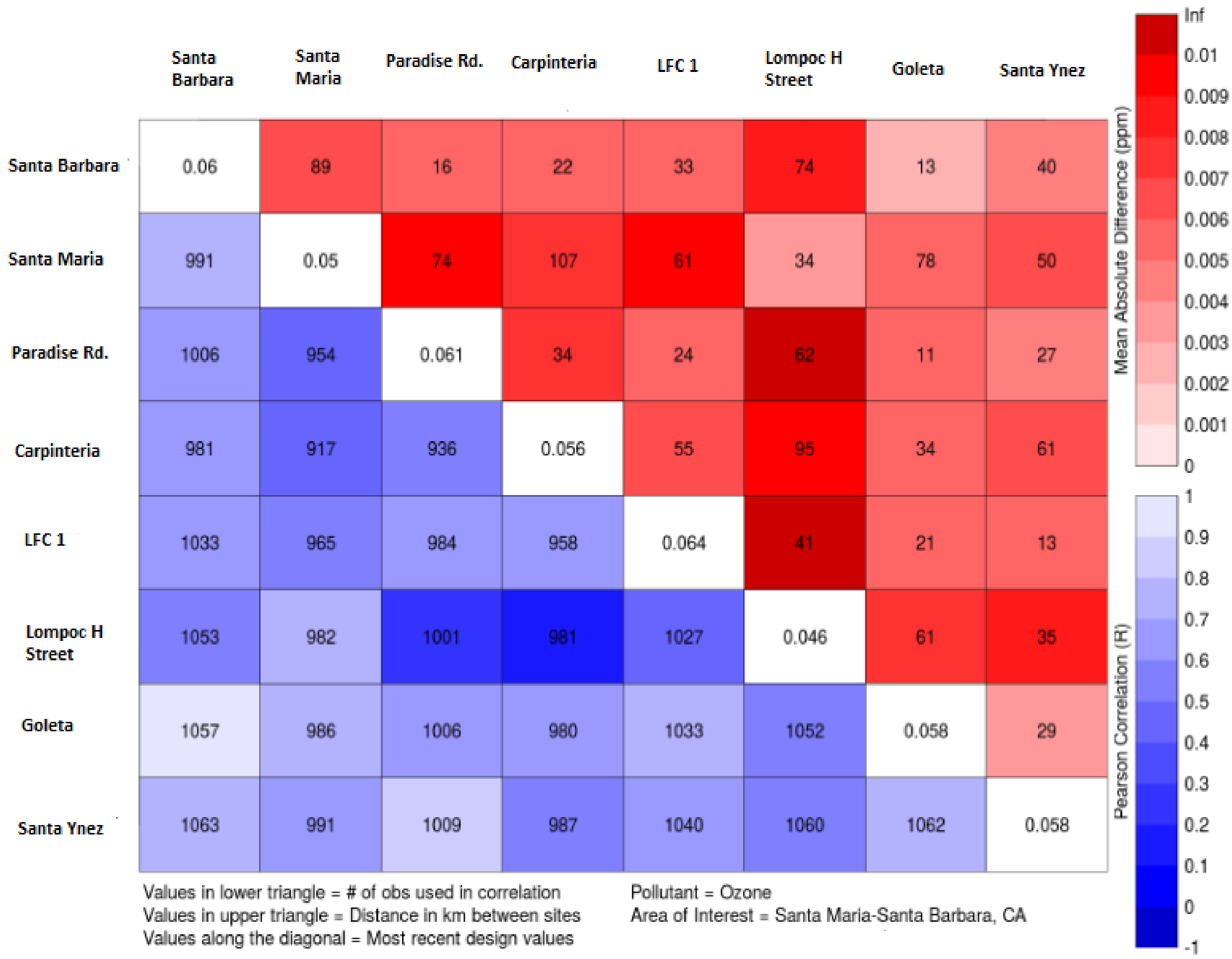


Figure 4-1 O_3 Correlation Analysis

4.1.3 O_3 Exceedance Probabilities Analysis

A significant goal of the network assessment is to determine whether new monitors are needed. In order to make that decision, it is helpful to have an estimation of the extreme pollution levels in areas where no monitors currently exist. To assist in understanding the probability of exceedances occurring in areas where no monitors exist, surface probability maps were generated. These maps were generated by calculating estimates of ground level O_3 for the centroid of each census tract. These are statistical estimates from “fusing” photochemical modeling data and ambient monitoring data using Bayesian space-time methods.

The map below is intended to be used as a spatial comparison, and not for probability estimates for a single geographic point or area. This information, along with demographic and emissions data, could be used in a weight of evidence approach for proposing new monitor locations. The probability estimates displayed on the map alone should not be used to justify a new monitor; they should be used in conjunction with existing monitoring data.

Figure 4-2 plots the probability of exceeding the current 8-hour O_3 standard of 70 ppb. This analysis shows low probability of exceeding the current O_3 standard across Santa Barbara County.

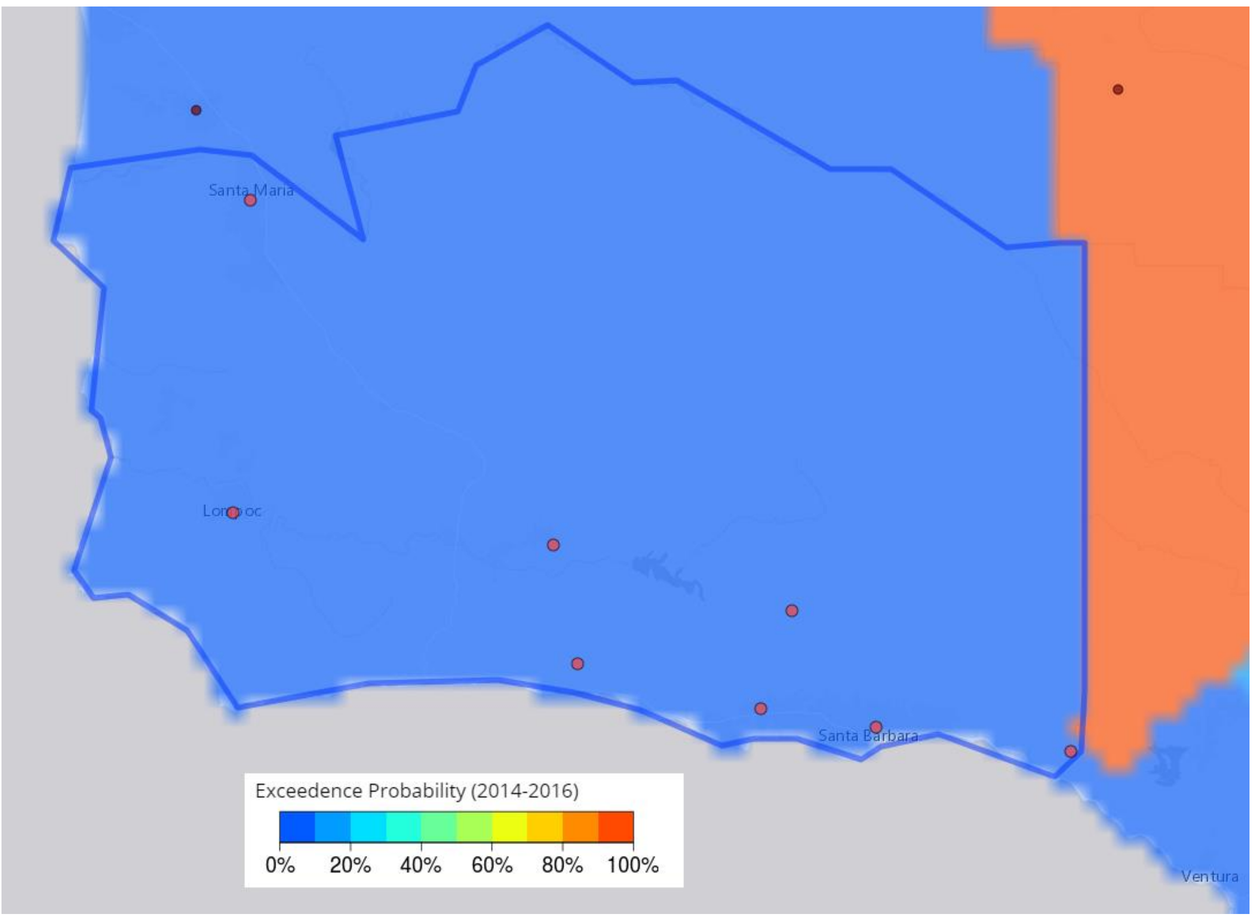
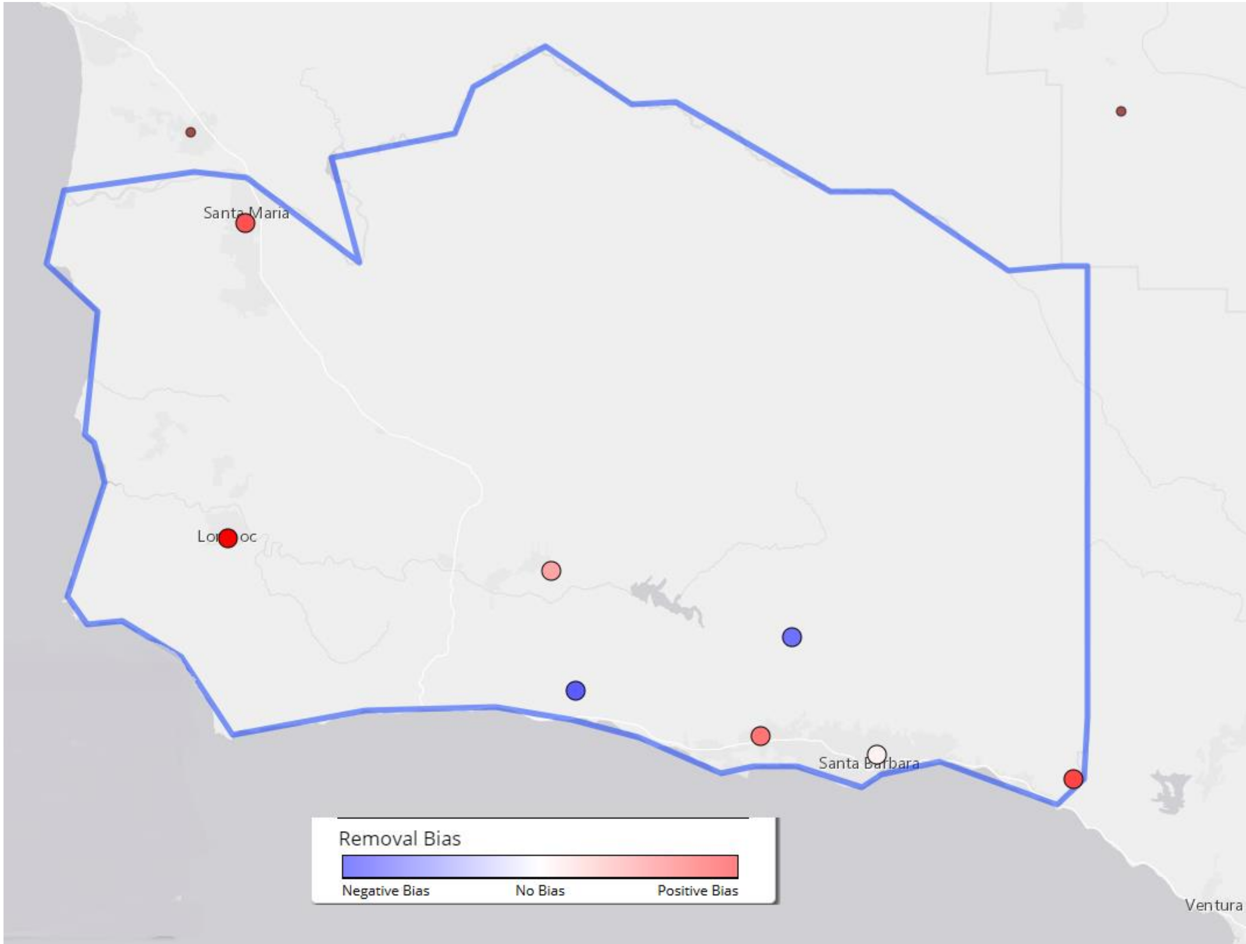


Figure 4-2 Surface Probability Plot for Exceeding the Existing O_3 Standard

4.1.4 O_3 Removal Bias Analysis

The removal bias analysis is a tool used to determine possible redundant monitors. The bias estimation uses the nearest neighbors to each monitor to estimate the concentration at the location of the monitor, if the monitor had never existed. This is done using the Voronoi Neighborhood Averaging algorithm with inverse distance squared weighting. The squared distance allows for higher weighting for concentrations at monitors located closer to the monitor being examined. The bias was calculated for each day at each monitor by taking the difference between the predicted value from the interpolation and the measured concentration. A positive average bias would mean that if the monitor being examined was removed, the neighboring monitors would indicate that the estimated concentration would be larger than the measured concentration. Likewise, a negative average bias would suggest that the estimated concentration at the location of the monitor is smaller than the actual measured concentration. A monitor with no bias indicates that the estimated concentration at the location of the monitor matches the actual measured concentration. Monitors with little to no bias are monitors where removal could be considered. However, the analysis results indicate that using estimates from nearby monitors in lieu of any existing monitor would introduce significant bias. One exception is the Santa Barbara monitor, which is located in an area of dense population. Figure 4-3 below presents the removal bias for O_3 monitors using 2016-2018 data.



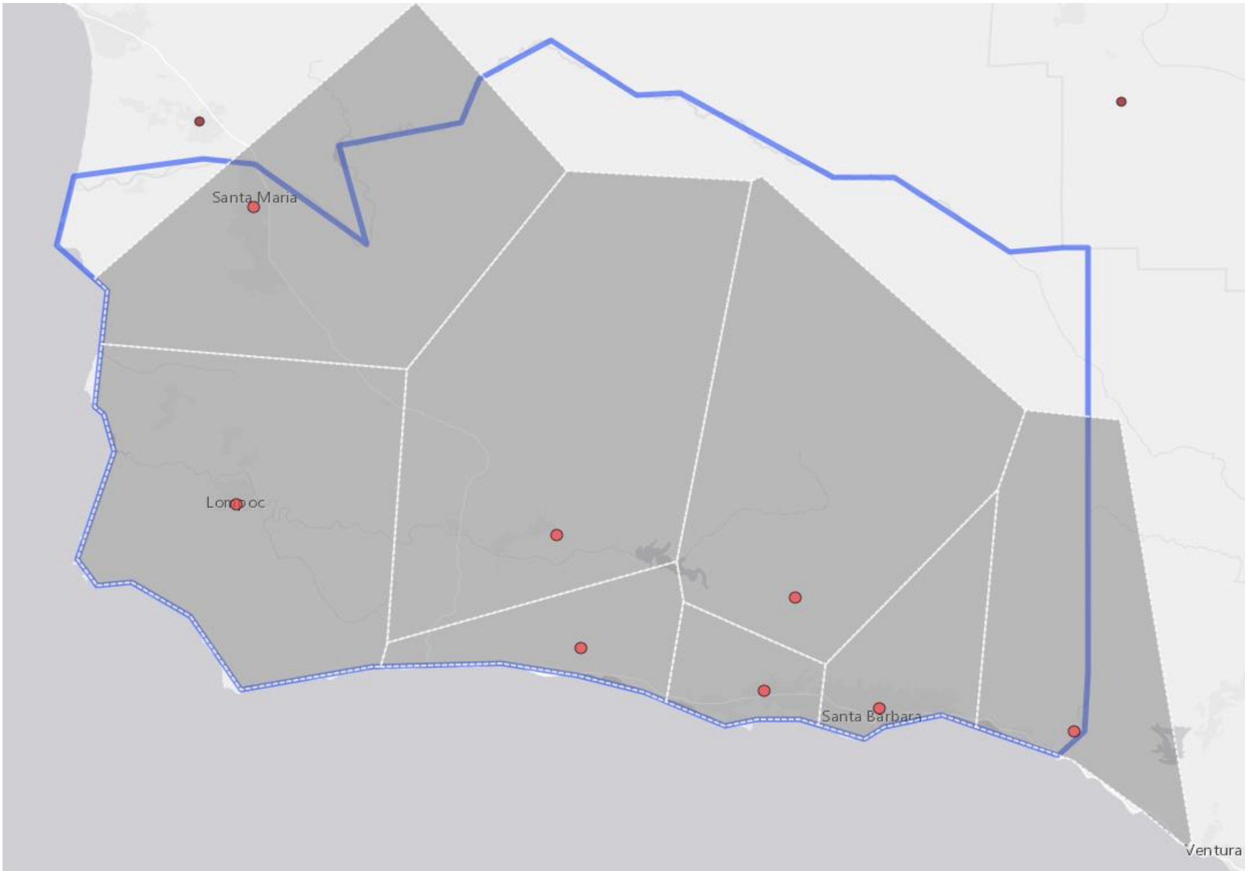
Monitor	Neighbors Included	Mean Removal Bias	Mean Relative Bias (%)	Min Relative Bias (%)	Max Relative Bias (%)
Santa Barbara	4	3.00E-04	1.8	-36	187
Santa Maria	4	0.004	13	-12	100
Paradise Rd	7	-0.0033	-6.3	-61	55
Carpinteria	5	0.0043	13.9	-29	102
Las Flores Canyon #1	5	-0.0038	-8	-53	52
Lompoc H Street	8	0.0059	22.5	-16	383
Goleta	5	0.0032	10	-19	582
Santa Ynez	5	0.0021	6.5	-31	65

Figure 4-3 O_3 Removal Bias Analysis

4.1.5 O_3 Area Served Analysis

This analysis uses a spatial analysis technique known as Voronoi or Thiessen polygons to approximate the area served by a monitor. The shape and size of each polygon is depends on the proximity to the nearest neighboring monitor. This technique provides an easy way to understand the general area and demographics represented by a monitor. It is important to understand that the polygons constructed by this analysis are based only on the distance to the nearby monitors. The constructed polygons do not represent the area of representativeness for the monitor's data. The complex topography of Santa Barbara County introduces significant error in the determination of the area served by each monitor. However, understanding the general area represented by the constructed polygons and the demographic distribution surrounding a monitor can help to ensure that a monitor is not removed from a location that serves a historically underserved segment of the population, or from an area with a high proportion of sensitive population such as children and the elderly.

Figure 4-4 represent the results of this analysis for O_3. Note that demographic data is calculated from the 2010 census. Overall, the racial and gender proportions for most of the monitor locations mirror the overall county demographics (See Table 2-1). Note that the demographic data for race and "Hispanic/Latino" can be confusing, as the Census considers the "Hispanic/Latino" classification as differently than the race classification. A person whose race is White or Black can also be classified as "Hispanic/Latino". The Santa Maria monitor serves a slightly higher proportion of ethnically Hispanic/Latino, and the Lompoc H Street monitor serves a slightly higher proportion of Black residents than the overall County demographics. Additionally, Lompoc H Street and Santa Maria serve a slightly higher percentage of children and Paradise Road serves a higher proportion of elderly than the countywide age distribution. With the extensive O_3 monitoring network in Santa Barbara County, this analysis shows that O_3 monitoring covers all demographic groups, including the underserved and the most sensitive groups.



Monitor	Area (km^2)	Total Population	Male	Female	Caucasian /White	African/ Black	Native American	Asian	Pacific Islander	Other Race	Multiple Races	Hispanic/ Latino
Santa Maria	550	132726	50.2%	49.8%	62.2%	1.6%	1.7%	4.7%	0.2%	24.7%	4.9%	59.9%
Paradise Rd.	3047	4441	50.1%	49.9%	88.4%	0.3%	0.7%	3.2%	0.1%	4.8%	2.6%	19.0%
Carpinteria	236	18659	49.3%	50.7%	76.4%	0.7%	0.9%	2.4%	0.1%	15.9%	3.6%	40.2%
LFC 1	738	2510	52.4%	47.6%	78.6%	0.6%	0.5%	4.8%	0.0%	12.0%	3.6%	27.2%
Lompoc H Street	1190	57742	52.7%	47.3%	65.0%	5.4%	1.6%	4.0%	0.5%	17.6%	5.9%	43.2%
Goleta	97	78588	49.7%	50.3%	70.8%	1.8%	0.8%	9.4%	0.1%	12.4%	4.7%	28.2%
Santa Ynez	1041	22670	49.4%	50.6%	84.6%	0.6%	1.9%	1.8%	0.1%	7.8%	3.2%	25.2%
Santa Barbara	121	100155	49.4%	50.6%	77.3%	1.4%	1.0%	3.3%	0.1%	13.1%	3.8%	34.2%

Monitor	Age <15	Age 15-24	Age 25-49	Age 50-64	Age 65-74	Age >75
Santa Maria	24.7%	16.4%	33.1%	14.6%	5.4%	5.9%
Paradise Rd.	17.1%	10.1%	26.3%	25.7%	10.7%	10.1%
Carpinteria	16.3%	12.9%	31.7%	23.5%	8.3%	7.3%
LFC 1	17.6%	15.2%	32.3%	24.7%	6.8%	3.4%
Lompoc H Street	21.8%	15.0%	35.4%	16.7%	5.8%	5.3%
Goleta	12.4%	35.6%	25.7%	14.3%	5.6%	6.3%
Santa Ynez	17.2%	12.7%	28.9%	24.0%	9.3%	7.9%
Santa Barbara	15.1%	15.3%	34.5%	19.9%	7.3%	7.9%

Figure 4-4 O_3 Area Served Analysis

4.2 NO_2 Monitors

NO_2 is monitored for NAAQS comparisons at 2 locations in the county. NO_2 is often sited in conjunction with O_3 monitors to characterize the precursors to O_3.

In February of 2010, a new 1-hour NAAQS was set at 100 ppb for NO_2. The form of the standard is based on the three-year average of the 98th percentile of the daily maximum 1-hour average.

As noted previously, recent shutdown of NO_2 monitors were approved by EPA. This approval was based on a detailed analysis showing very low likelihood of any removed monitor ever exceeding the NO_2 NAAQS.

4.2.1 Analysis of NO_2 Measurements

Table 4-2 shows the summary of the county's NO_2 concentrations from 2017 – 2019 compared with this new standard. No monitors in the county came close to exceeding the standard. Both the Santa Maria and Lompoc H street monitors are in urban centers with high traffic volumes, where one would expect the highest measured NO_2 concentrations.

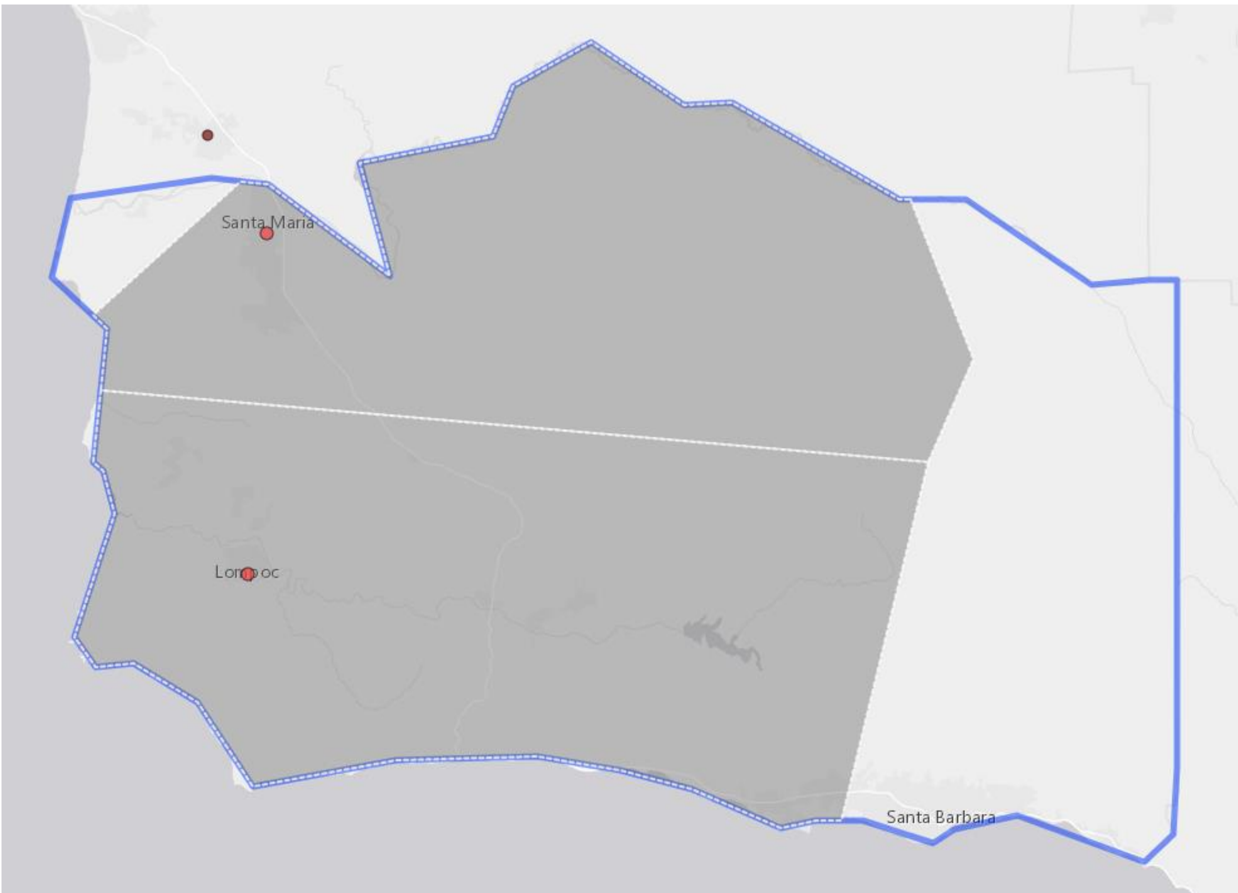
Table 4-2 NO_2 Summary

AQS #	Monitor Name	2017 98th ppb	2018 98th ppb	2019 98th ppb	3 Yr Avg 98th ppb	% of Std 100 %	Rank
06-083-1008	Santa Maria	37.9	32.2	26.4	32	32%	1
06-083-2004	Lompoc H Street	27.0	23.0	23.0	24	24%	2

4.2.2 NO_2 Area Served Analysis

This analysis uses a spatial analysis technique known as Voronoi or Thiessen polygons to approximate the area served by a monitor. The shape and size of each polygon is depends on the proximity to the nearest neighboring air monitor. This technique provides an easy way to understand the general area and demographics represented by a monitor. It is important to understand that the polygons constructed by this analysis are based only on the distance to the nearby monitors. The constructed polygons do not represent the area of representativeness for the monitor's data. However, understanding the general area represented by the constructed polygons and the demographic distribution surrounding a monitor can help to ensure that a monitor is not removed from a location that serves a historically underserved segment of the population, or froman area with a high proportion of sensitive population such as children and the elderly.

Figure 4-5 represent the results of this analysis for NO_2. Note that demographic data is calculated from 2010 census. Because of the low number of monitors, the analysis tool used seems to indicate that the portions of Santa Barbara County farthest from any NO_2 monitor are not served. Because historical NO_2 measurements across the area have never measured concentrations anywhere near the level of the NO_2 NAAQS, this lack of coverage of the NO_2 monitoring network does not justify the amount of resources necessary to locate and operate another NO_2 monitor. The area served demographics show that NO_2 monitoring in Santa Barbara County covers all demographic groups, including the underserved and the most sensitive groups.



Monitor	Area (km^2)	Total Population	Male	Female	Caucasian/ White	African/ Black	Native American	Asian	Pacific Islander	Other Race	Multiple Races	Hispanic/ Latino
Santa Maria	3554	133971	50.2%	49.8%	62.4%	1.6%	1.7%	4.7%	0.2%	24.6%	4.9%	59.7%
Lompoc H Street	3046	141489	50.9%	49.1%	70.0%	3.1%	1.3%	6.6%	0.3%	13.7%	5.1%	33.3%

Monitor	Age <15	Age 15-24	Age 25-49	Age 50-64	Age 65-74	Age >75
Santa Maria	24.6%	16.4%	33.1%	14.6%	5.5%	5.8%
Lompoc H Street	16.7%	26.3%	29.5%	16.1%	5.9%	5.6%

Figure 4-5 NO_2 Area Served Analysis

4.3 SO_2 Monitors

SO_2 is measured for NAAQS comparison only at Lompoc H Street. Lompoc H is in an urban area and is also nearby an industrial source that has the potential to emit SO_2. As previously noted, EPA recently approved the shutdown of SO_2 monitors, based on an analysis that showed a very low likelihood of ever exceeding the NAAQS for any of the monitors approved for shutdown.

In June 2010, EPA established a new 1-hour NAAQS standard of 75 ppb for SO_2. The standard is in the form of a 3-year average of the 99th percentile of the annual distribution of daily maximum 1-hour average concentrations.

The District is not impacted by the SO_2 Data Requirements Rule proposed on May 13, 2014 because emissions in Santa Barbara County are not sufficient to trigger this requirement.

4.3.1 Analysis of SO_2 Measurements

Table 4-3 presents the Lompoc H Street SO_2 concentrations from 2017 – 2019 as compared to the new June 2010 standard. The Lompoc H street monitor did not come close to exceeding the standard.

Table 4-3 SO_2 Summary

AQS #	STREET_ADDRESS	2017 99th ppb	2018 99th ppb	2019 99th ppb	3 Yr Avg ppb	% ofStd 75 %	Rank
06-083-2004	Lompoc H Street	1	2	3	2	3%	1

4.4 CO Monitors

CO is measured for NAAQS comparisons at two locations in the county. Both Lompoc H Street and Santa Maria are in the major urban areas in the county.

As noted previously, recent shutdown of CO monitors was approved by EPA. This approval was based on a detailed analysis that showed a very low likelihood of any removed monitor ever exceeding the CO NAAQS.

4.4.1 Analysis of CO Measurements

Table 4-4 compares the county concentrations from 2017 – 2019 with the 1-hour standard for CO that is set at 35 ppm. The form of the standard is not to exceed more than once per year. Table 4.4 compares the 2nd maximum daily hourly maximum value for years 2017 – 2019. No monitor came close to exceeding the standard.

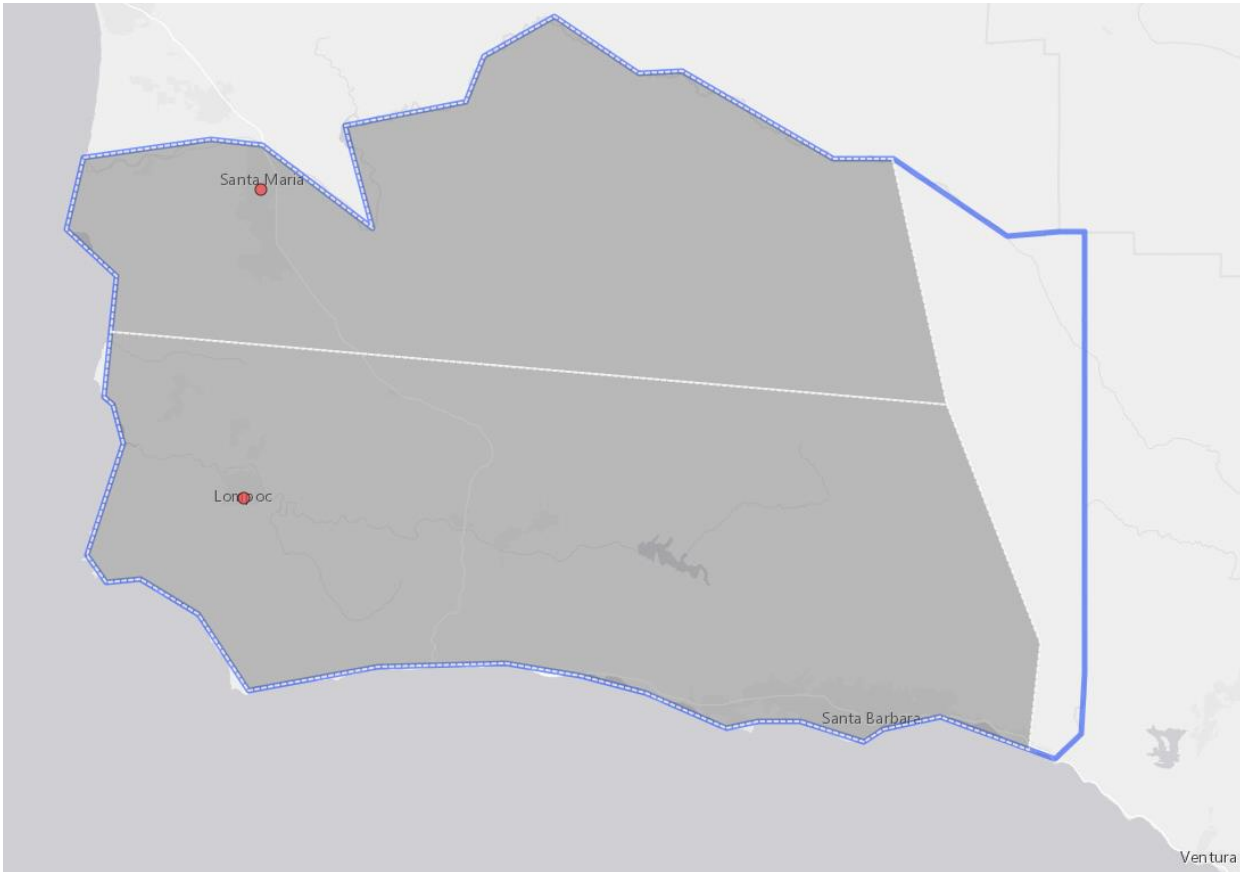
Table 4-4 CO Summary

AQS #	STREET_ADDRESS	2017 2nd Max ppm	2018 2nd Max ppm	2019 2nd Max ppm	3 Year Avg 2nd Max ppm	% of Std 35 %	Rank
06-083-1008	Santa Maria	1.0	2.4	2.4	1.9	5.5%	1
06-083-2004	Lompoc H Street	1.5	1.0	1.0	1.2	3.3%	2

4.4.2 CO Area Served Analysis

This analysis uses a spatial analysis technique known as Voronoi or Thiessen polygons to approximate the area served by a monitor. The shape and size of each polygon depends on the proximity to the nearest neighboring air monitor. This technique provides an easy way to understand the general area and demographics represented by a monitor. It is important to understand that the polygons constructed by this analysis are based only on the distance to the nearby monitors. The constructed polygons do not represent the area of representativeness for the monitor's data. However, understanding the general area represented by the constructed polygons and the demographic distribution surrounding a monitor can help to ensure that a monitor is not removed from a location that serves a historically underserved segment of the population or from an area with a high proportion of sensitive population such as children and the elderly.

Figure 4-6 represent the results of this analysis for CO. Note that demographic data is calculated from the 2010 census. Because of the low number of monitors, the analysis tool used seems to indicate that the portions of Santa Barbara County farthest from any CO monitor are not served. Because historical CO measurements across the area have never measured concentrations anywhere near the level of the CO NAAQS, this lack of coverage of the CO monitoring network does not justify the amount of resources necessary to locate and operate another CO monitor. The area served demographics show CO monitoring in Santa Barbara County covers all demographic groups, including the underserved and the most sensitive groups.



Monitor	Area (km^2)	Total Population	Male	Female	Caucasian/ White	African/ Black	Native American	Asian	Pacific Islander	Other Race	Multiple Races	Hispanic/ Latino
Santa Maria	3718	141316	50.2%	49.8%	61.6%	1.6%	1.7%	4.6%	0.2%	25.3%	5.0%	61.1%
Lompoc H Stree	3359	280014	50.2%	49.8%	73.6%	2.2%	1.1%	5.0%	0.2%	13.4%	4.4%	33.5%

Monitor	Age <15	Age 15-24	Age 25-49	Age 50-64	Age 65-74	Age >75
Santa Maria	24.8%	16.4%	33.1%	14.6%	5.4%	5.8%
Lompoc H Street	16.0%	20.5%	31.5%	18.3%	6.8%	6.9%

Figure 4-6 CO Area Served Analysis

4.5 PM_{10}

PM_{10} is currently being measured for comparison to NAAQS at four locations in the county. All monitors used for PM_{10} measurements are continuous samplers. All four of these monitors are in urban areas with high population density.

4.5.1 Analysis of PM_{10} Measurements

The standard for PM_{10} is based on the daily averages. The 24-hour PM_{10} average must exceed 150 µg/m^3 to be an exceedance. If data is not present for all days in the year, an algorithm is used to estimate the number of exceedances for that year. The 24-hour primary and secondary standards are attained when the expected number of exceedances per year at each monitor is less than or equal to one. Table 4-5 compares the PM_{10} data collected from 2017 – 2019 in the county. All monitors are below the standard except at Santa Barbara, which was impacted by wildfire emissions in 2017 that likely qualify as exceptional events. Without the wildfire impacts, Santa Barbara, along with all other monitors, would have shown attainment of the 24-hour PM_{10} standard.

Table 4-5 PM_{10} Summary

AQS #	Monitor	2017 Exceed Count	2018 Exceed Count	2019 Exceed Count	3 Year Avg Count	% of Std Count	Rank
06-083-0011	Santa Barbara	7 * **	0	0	2.3	230%	1
06-083-2011	Goleta	1	0	0	0.3	30%	2
06-083-2004	Lompoc H Street	0	0	0	0	0%	3
06-083-1008	Santa Maria	0 *	0	0	0	0%	4

* Denotes data completeness for the year was not met.
** Denotes data contains exceptional event periods (wildfire impacts).

4.5.2 Correlation Analysis of PM_{10} Data

Correlation analysis compares the measurements from nearby monitors to determine if concentrations correlate temporally. Figure 4-7 below includes a graphic representation of the correlation between PM_{10} monitors used for NAAQS comparison in Santa Barbara County for the period 2016 through 2018.

Monitor pairs with Pearson correlation values near one are highly correlated, while monitor pairs with Pearson correlation values near zero have no correlation. Monitors that do not correlate well with other monitors exhibit unique temporal concentration variation relative to other monitors and are likely to be important for assessing local emissions, transport and spatial coverage. Monitor pairs with high Pearson correlation values (e.g., $r > 0.75$) exhibit similar temporal concentrations.

Monitor pairs with low average relative difference (white or light red) measure similar PM_{10} concentrations, while monitors with high average relative differences (deep red) measure significantly different PM_{10} concentrations.

Possible redundant monitors would exhibit high correlations consistently across all of their pairings and would have low average relative difference despite the distance between the monitors. Usually, it is expected that correlation between monitors will decrease as distance increases. More unique monitors would exhibit the opposite characteristics. They would not be very well correlated with other monitors, and their relative difference would be higher than other monitor-to-monitor pairs.

Santa Maria – Lompoc H and Santa Barbara – Goleta show strong correlation, indicating similar concentrations measured at each pair. While Santa Maria – Santa Barbara and Goleta – Santa Maria show poor correlation. This pattern is likely due to the proximity of the monitors to each other. Note that the Santa Barbara monitor did not have sufficient data to calculate design values for the data period evaluated.

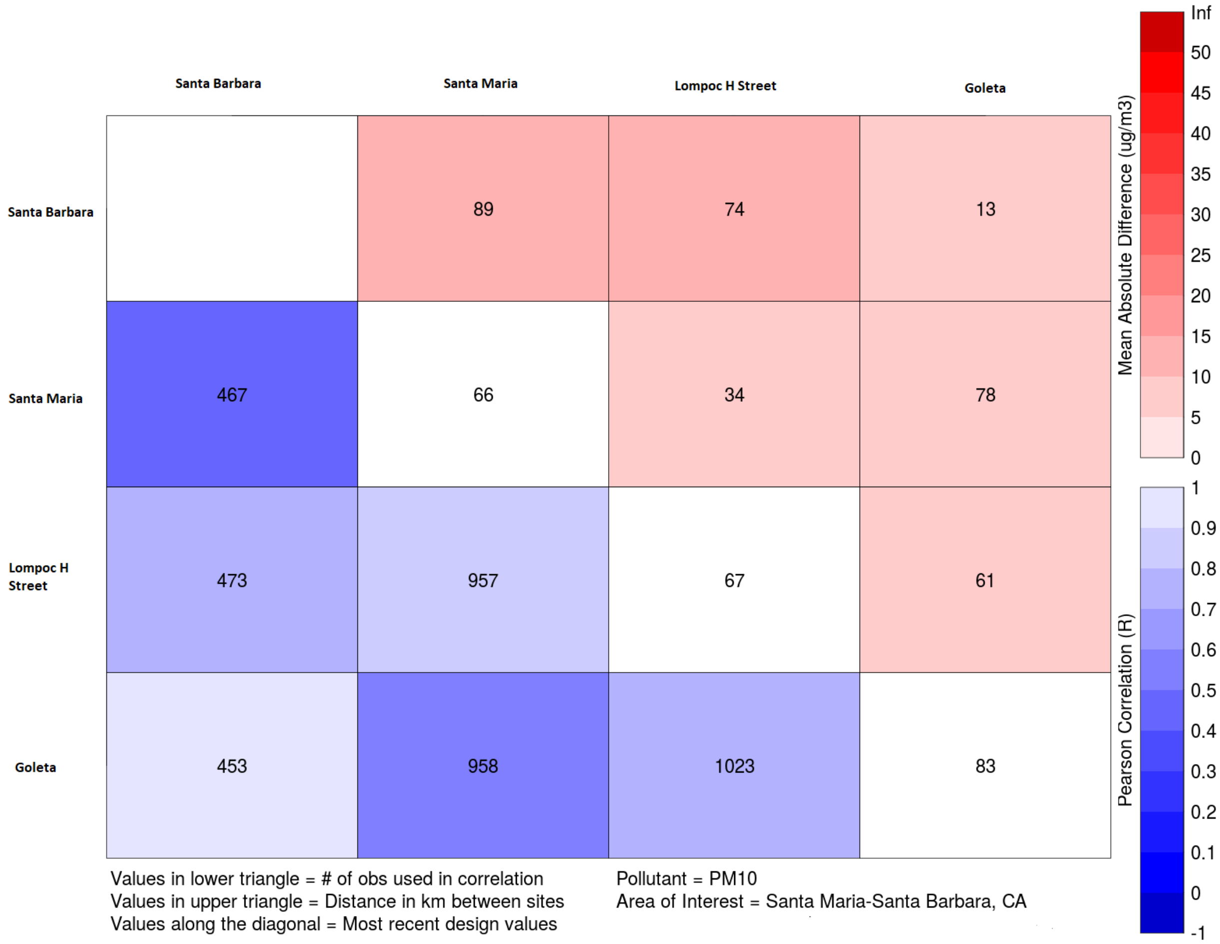
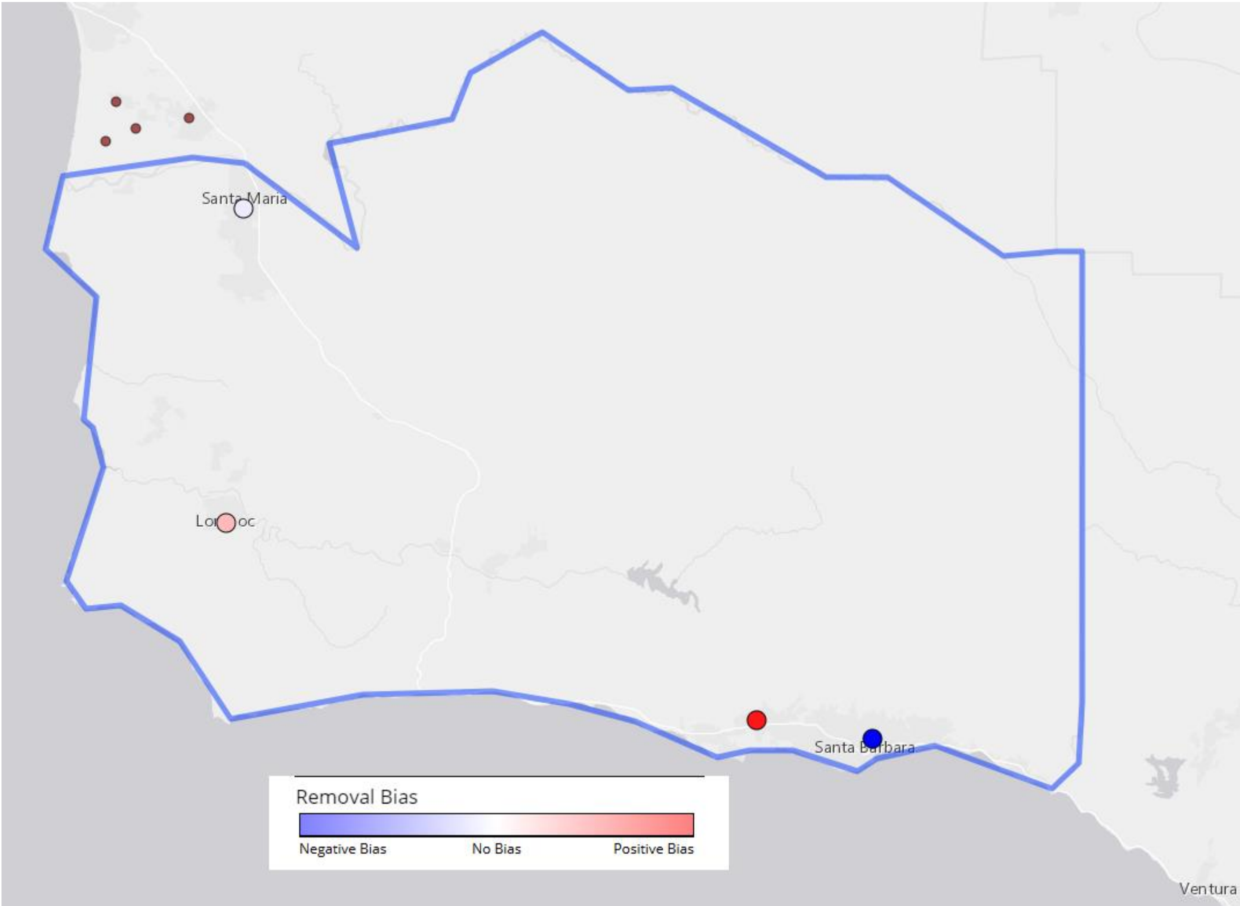


Figure 4-7 PM_{10} Correlation Analysis

4.5.3 PM_{10} Removal Bias Analysis

The removal bias analysis is a tool used to determine possible redundant monitors. The bias estimation uses the nearest neighbors to each monitor to estimate the concentration at the location of the monitor if the monitor had never existed. This is done using the Voronoi Neighborhood Averaging algorithm with inverse distance squared weighting. The squared distance allows for higher weighting for concentrations at monitors located closer to the monitor being examined. The bias was calculated for each day at each monitor by taking the difference between the predicted value from the interpolation and the measured concentration. A positive average bias would mean that if the monitor being examined was removed, the neighboring monitors would indicate that the estimated concentration would be larger than the measured concentration. Likewise, a negative average bias would suggest that the estimated concentration at the location of the monitor is smaller than the actual measured concentration. A monitor with no bias indicates that the estimated concentration at the location of the monitor matches the actual measured concentration. Monitors with little to no bias are monitors where removal could be considered.

Figure 4-8 below presents the removal bias for PM_{10} monitors using 2016-2018 data.
Santa Maria shows little to no bias if removed but is important as it is located in an area of high population density.



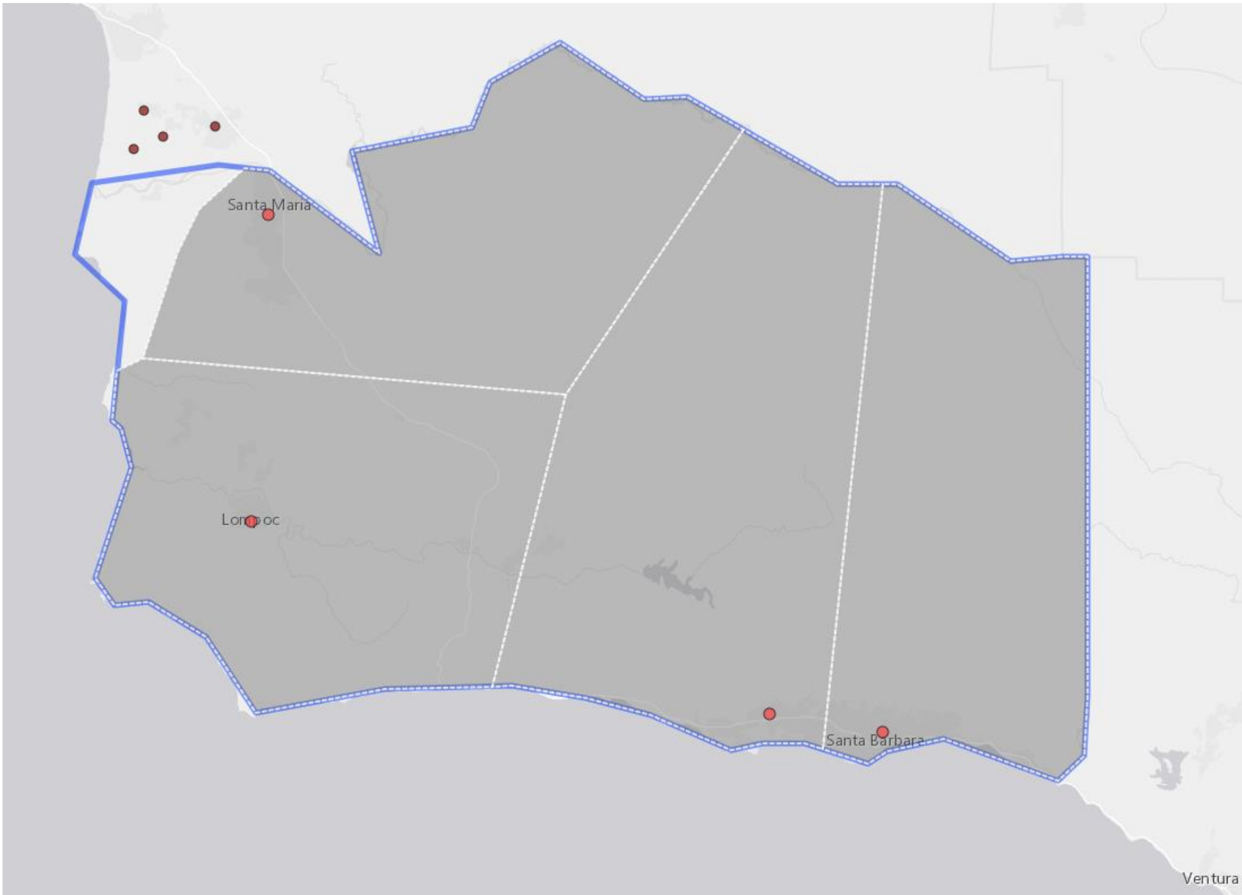
Monitor	Neighbors Included	Mean Relative Bias (%)	Min Relative Bias (%)	Max Relative Bias (%)
Santa Barbara	3	-19.1	-100	167
Santa Maria	7	-1.2	-81	181
Lompoc H Street	7	15.8	-89	417
Goleta	6	51	-51	1158

Figure 4-8 PM_{10} Removal Bias Analysis

4.5.4 PM_{10} Area Served Analysis

This analysis uses a spatial analysis technique known as Voronoi or Thiessen polygons to approximate the area served by a monitor. The shape and size of each polygon depends on the proximity to the nearest neighboring monitor. This technique provides an easy way to understand the general area and demographics represented by a monitor. It is important to understand that the polygons constructed by this analysis are based only on the distance to the nearby monitors. The constructed polygons do not represent the area of representativeness for the monitor's data. However, understanding the general area represented by the constructed polygons and the demographic distribution surrounding a monitor can help to ensure that a monitor is not removed from a location that serves a historically underserved segment of the population or from an area with a high proportion of sensitive population such as children and the elderly.

Figure 4-9 represent the results of this analysis for PM_{10}. Note that demographic data is calculated from the 2010 census. The analyses show that most monitors represent the same racial/age proportions as the county, with the Santa Maria monitor serving a slightly higher proportion of ethnically Hispanic/Latino, and Lompoc H Street serving a slightly higher proportion of Black. With the existing monitoring network in Santa Barbara County, this analysis shows that PM_{10} monitoring covers all demographic groups, including the underserved and the most sensitive groups.



Monitor	Area (km^2)	Total Population	Male	Female	Caucasian /White	African/ Black	Native American	Asian	Pacific Islander	Other Race	Multiple Races	Hispanic/ Latino
Santa Maria	550	132726	50.2%	49.8%	62.2%	1.6%	1.7%	4.7%	0.2%	24.7%	4.9%	59.9%
Lompoc H Street	1633	71311	52.0%	48.0%	68.5%	4.5%	1.5%	3.6%	0.4%	16.1%	5.4%	40.8%
Goleta	4480	94640	49.8%	50.2%	73.4%	1.6%	0.9%	8.3%	0.1%	11.3%	4.4%	26.6%
Santa Barbara	256	117873	49.4%	50.6%	77.0%	1.3%	1.0%	3.2%	0.1%	13.6%	3.7%	35.3%

Monitor	Age <15	Age 15-24	Age 25-49	Age 50-64	Age 65-74	Age >75
Santa Maria	24.7%	16.4%	33.1%	14.6%	5.4%	5.9%
Lompoc H Street	21.2%	14.5%	34.5%	17.8%	6.2%	5.8%
Goleta	13.0%	31.7%	26.0%	16.2%	6.4%	6.6%
Santa Barbara	15.3%	15.0%	34.1%	20.4%	7.4%	7.8%

Figure 4-9 PM_{10} Area Served Analysis

4.6 $PM_{2.5}$

$PM_{2.5}$ is currently measured at four locations. All locations currently utilize continuous $PM_{2.5}$ monitors. All four of these monitors are in urban areas with high population density.

4.6.1 Analysis of PM2.5 Measurements

The 24-hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard of 35 µg/m^3. Table 4-6 compares the concentrations from 2015 – 2019 to this standard. The Santa Barbara monitor, without the wildfire impacts, would have attained the standard along with the other monitors in the monitoring network.

Table 4-6 $PM_{2.5}$ Summary

AQS #	Monitor	2017 98th µg/m3	2018 98th µg/m3	2019 98th µg/m3	3 YEAR AVG. 98% µg/m3	% of Std 35	Rank
06-083-0011	Santa Barbara	105.1 * **	19	16.2	47	134%	1
06-083-2011	Goleta	40.2	17.7	12.1	23	66%	2
06-083-2004	Lompoc H Street	25.9 *	19.7	13.2	20	57%	3
06-083-1008	Santa Maria	17.2	18.8	12	16	46%	4

* Denotes data completeness for the year was not met.
** Denotes data contains exceptional event periods (wildfire impacts)

4.6.2 Correlation Analysis of $PM_{2.5}$ Measurements

Correlation analysis compares the measurements from nearby monitors to determine if concentrations correlate temporally. Figure 4-10 below includes a graphic representation of the correlation between $PM_{2.5}$ monitors used for NAAQS comparison in Santa Barbara County for the period 2016 through 2018.

Monitor pairs with Pearson correlation values near one are highly correlated, while monitor pairs with Pearson correlation values near zero have no correlation. Monitors that do not correlate well with other monitors exhibit unique temporal concentration variation relative to other monitors and are likely to be important for assessing local emissions, transport and spatial coverage. Monitor pairs with high Pearson correlation values (e.g., $r > 0.75$) exhibit similar temporal concentrations.

Monitor pairs with low average relative difference (white or light red) measure similar PM_{10} concentrations, while monitors with high average relative differences (deep red) measure significantly different $PM_{2.5}$ concentrations.

Possible redundant monitors would exhibit high correlations consistently across all of their pairings and would have low average relative difference, despite the distance between the monitors. Usually, it is expected that correlation between monitors will decrease as distance increases. More unique monitors would exhibit the opposite characteristics. They would not be very well correlated with other monitors and their relative difference would be higher than other monitor-to-monitor pairs.

The correlation between $PM_{2.5}$ data follows a similar pattern as noted above for PM_{10} measurements in Santa Barbara County. Santa Maria – Lompoc H and Santa Barbara – Goleta show strong correlation, indicating similar concentrations measured at each pair. While Santa Maria – Santa Barbara and Goleta – Santa Maria show poor correlation. This pattern is likely due to the proximity of the monitors to each other. Note that the design day values in the diagonal show both the 24-hour and annual design values. The Santa Barbara monitor does not have sufficient data to calculate valid design values for the data period evaluated.

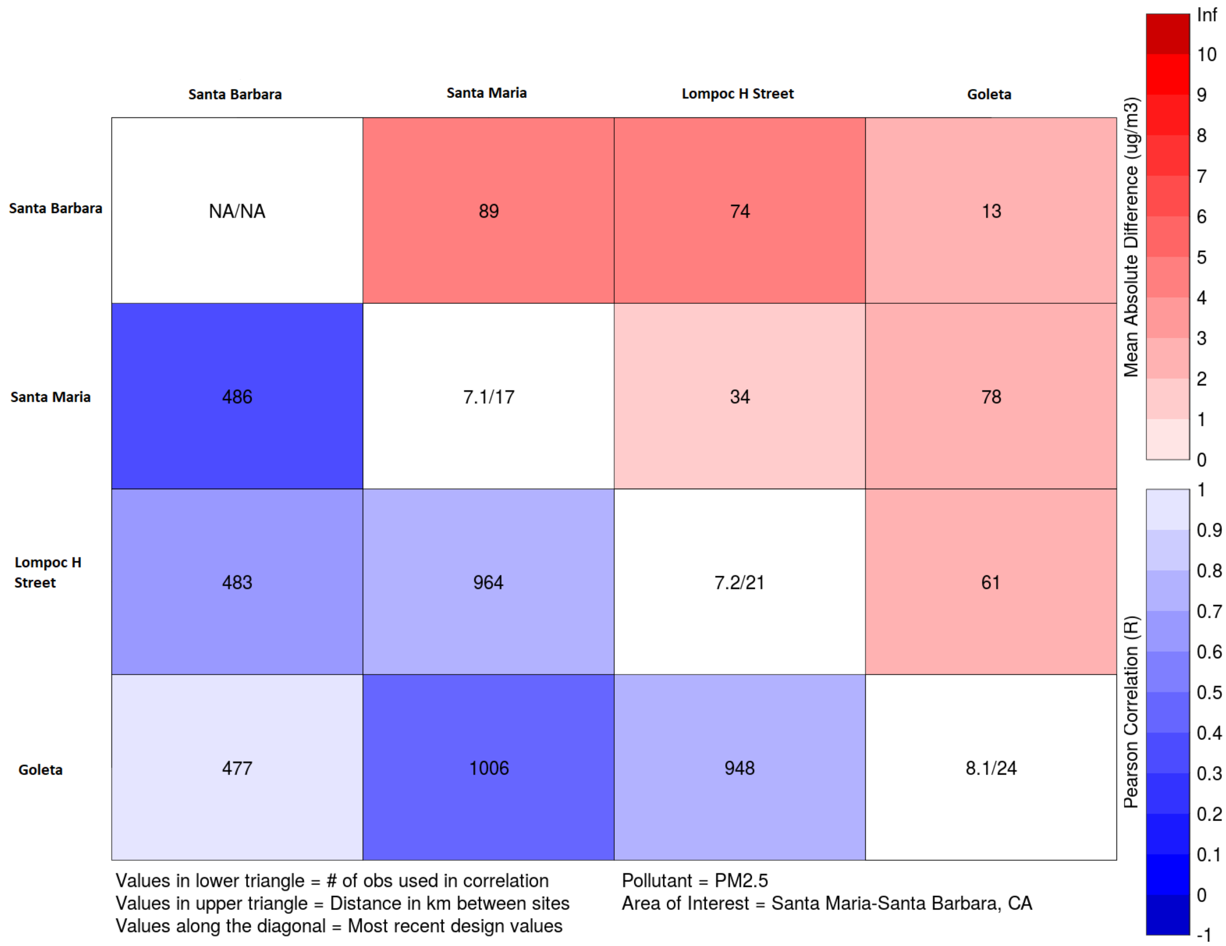


Figure 4-10 $PM_{2.5}$ Correlation Analysis

4.6.3 $PM_{2.5}$ Exceedance Probabilities Analysis

A significant goal of the network assessment is to determine whether new monitors are needed. In order to make that decision, it is helpful to have an estimation of the extreme pollution levels in areas where no monitors currently exist. To assist in understanding the probability of exceedances occurring in areas where no monitors exist, surface probability maps were generated. These maps were generated by calculating estimates of $PM_{2.5}$ for the centroid of each census tract. These are statistical estimates from “fusing” photochemical modeling data and ambient monitoring data using Bayesian space-time methods.

The map below is intended to be used as a spatial comparison and not for probability estimates for a single geographic point or area. This information, along with demographic and emissions data, could be used in a weight of evidence approach for proposing new monitor locations. The probability estimates displayed on the map alone should not be used to justify a new monitor; they should be used in conjunction with existing monitoring data.

Figure 4-11 plots the probability of exceeding the $PM_{2.5}$ daily standard of 35 μg/m^3. This analysis shows a low probability of $PM_{2.5}$ NAAQS exceedances across all of Santa Barbara County.

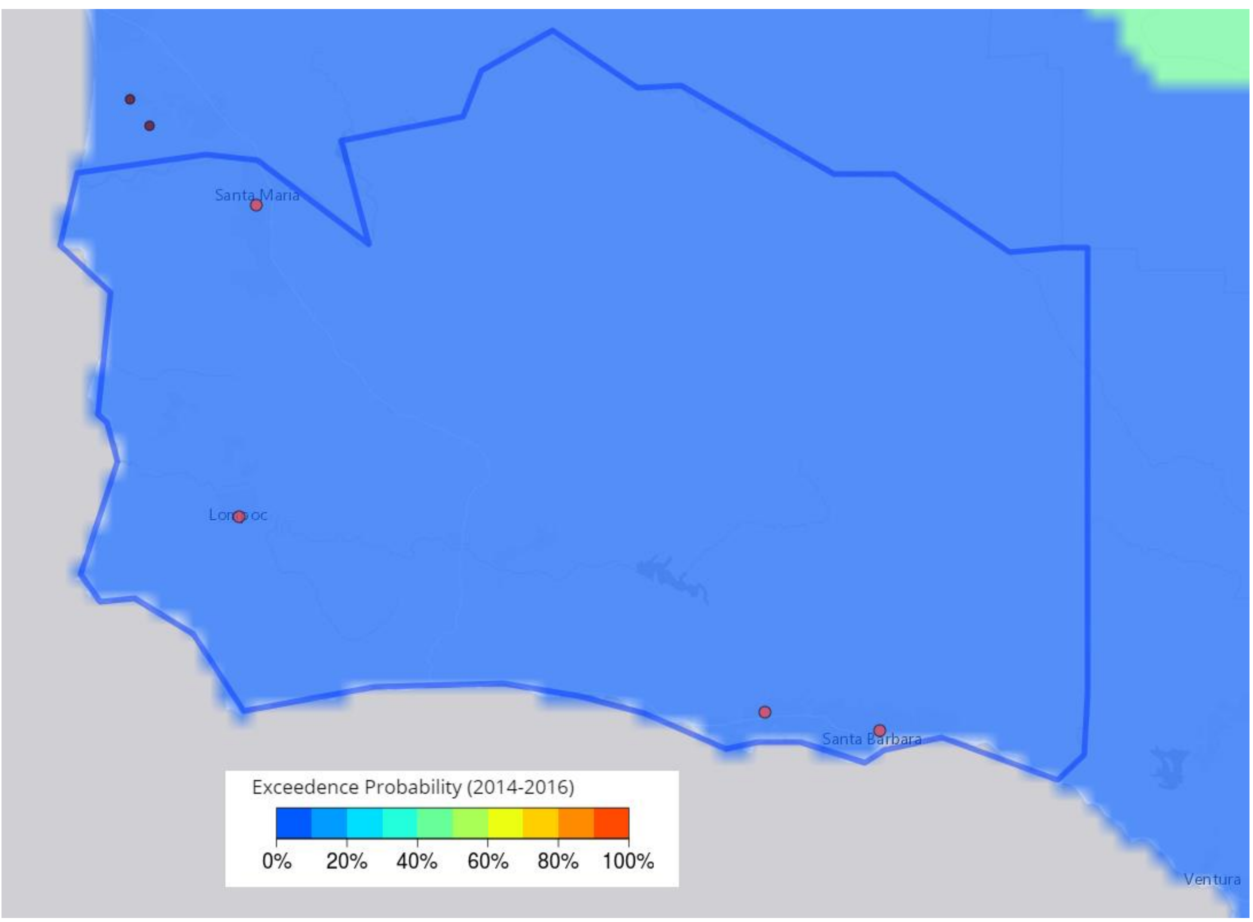
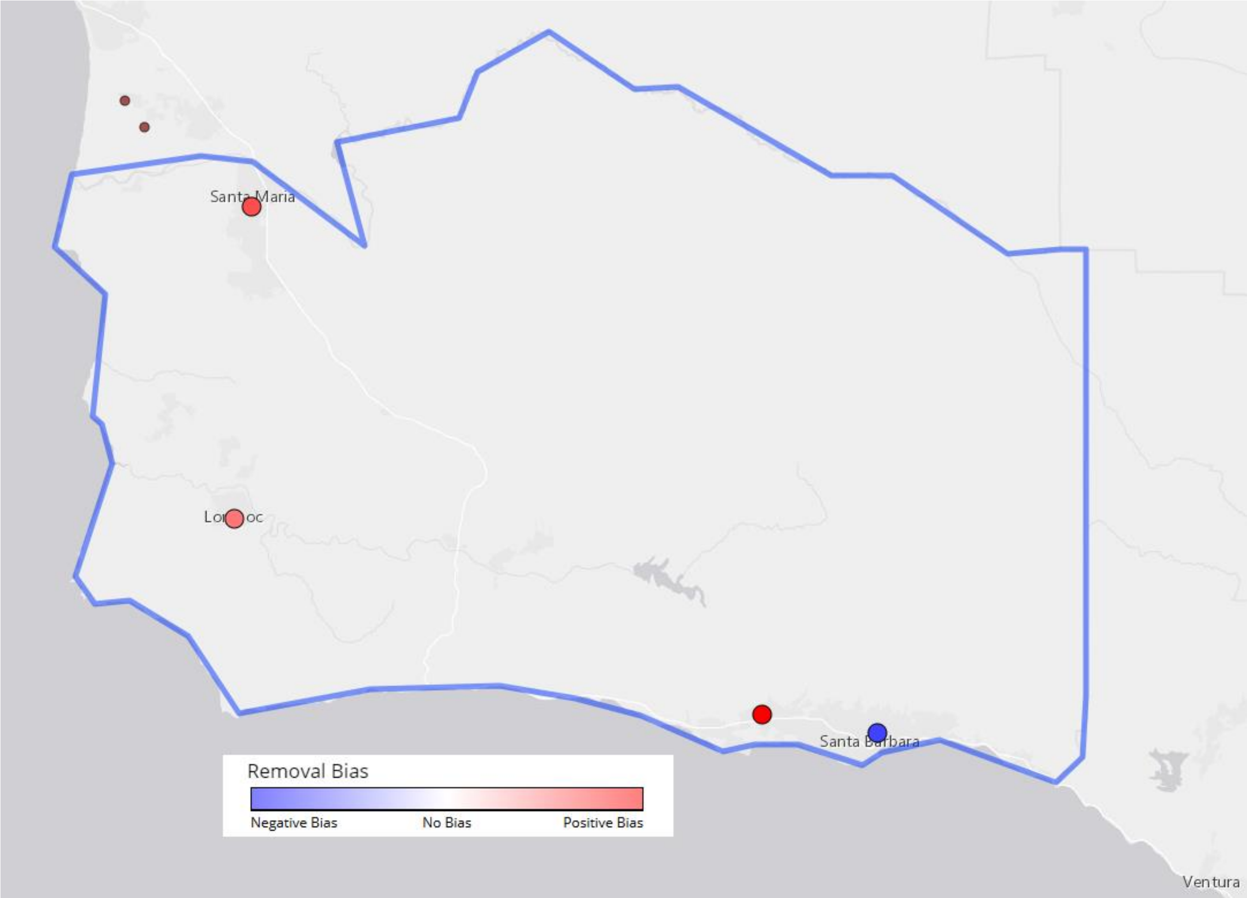


Figure 4-11 $PM_{2.5}$ Exceedance Probability Map

4.6.4 $PM_{2.5}$ Removal Bias Analysis

The removal bias analysis is a tool used to determine possible redundant monitors. The bias estimation uses the nearest neighbors to each monitor to estimate the concentration at the location of the monitor if the monitor had never existed. This is done using the Voronoi Neighborhood Averaging algorithm with inverse distance squared weighting. The squared distance allows for higher weighting for concentrations at monitors located closer to the monitor being examined. The bias was calculated for each day at each monitor by taking the difference between the predicted value from the interpolation and the measured concentration. A positive average bias would mean that if the monitor being examined was removed, the neighboring monitors would indicate that the estimated concentration would be larger than the measured concentration. Likewise, a negative average bias would suggest that the estimated concentration at the location of the monitor is smaller than the actual measured concentration. A monitor with no bias, indicates that the estimated concentration at the location of the monitor matches the actual measured concentration. Monitors with little to no bias are monitors where removal could be considered. Figure 4-12 presents the removal bias analysis for $PM_{2.5}$ monitors in Santa Barbara County using 2016 – 2018 data. This analysis shows significant bias in the removal of any $PM_{2.5}$ monitor in Santa Barbara County.



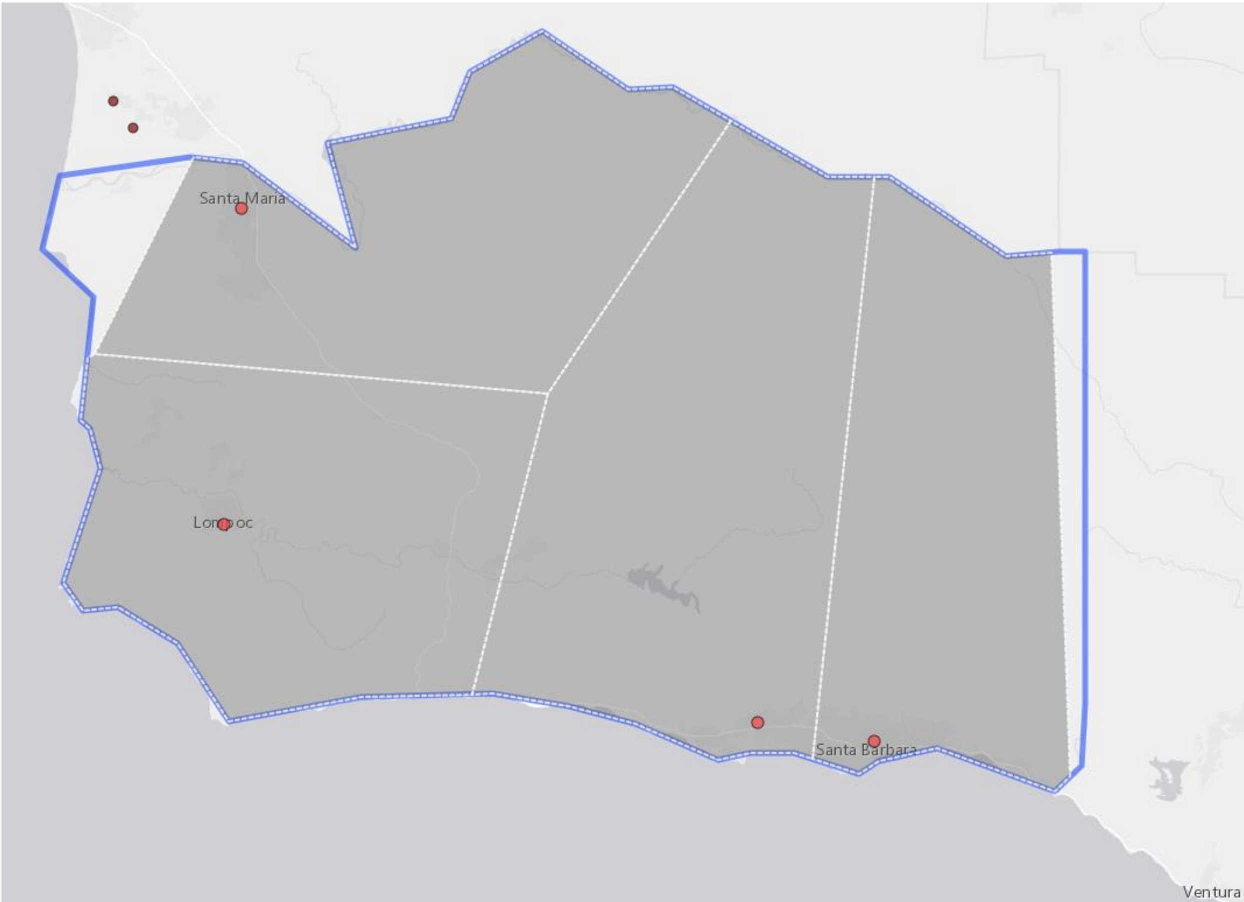
Site	Neighbors Included	Mean Relative Bias (%)	Min Relative Bias (%)	Max Relative Bias (%)
Santa Barbara	4	-2.5	-68	250
Santa Maria	8	15.8	-92	310
Lompoc H Street	6	21.3	-72	753
Goleta	6	21.3	-70	718

Figure 4-12 $PM_{2.5}$ Removal Bias Analysis

4.6.5 $PM_{2.5}$ Area Served Analysis

This analysis uses a spatial analysis technique known as Voronoi or Thiessen polygons to approximate the area served by a monitor. The shape and size of each polygon depends on the proximity to the nearest neighboring monitor. This technique provides an easy way to understand the general area and demographics represented by a monitor, it is important to understand that the polygons constructed by this analysis are based only on the distance to the nearby monitors. The constructed polygons do not represent the area of representativeness for the monitor's data. However, understanding the general area represented by the constructed polygons and the demographic distribution surrounding a monitor can be help to ensure that a monitor is not removed from a location that serves a historically underserved segment of the population or from an area with a high proportion of sensitive population such as children and the elderly.

Figure 4-13 represent the results of this analysis for $PM_{2.5}$. Note that demographic data is calculated from the 2010 census. The analyses show that most monitors represent the same racial/age proportions as the county, with the Santa Maria monitor serving a slightly higher proportion of ethnically Hispanic/Latino and Lompoc H Street serving a higher proportion of Black. With the existing monitoring network in Santa Barbara County, this analysis shows that PM_{10} monitoring covers all demographic groups, including the underserved and the most sensitive groups.



Monitor	Area (km^2)	Total Population	Male	Female	Caucasian /White	African/ Black	Native American	Asian	Pacific Islander	Other Race	Multiple Races	Hispanic/ Latino
Santa Maria	550	132726	50.2%	49.8%	62.2%	1.6%	1.7%	4.7%	0.2%	24.7%	4.9%	59.9%
Lompoc H Street	1633	71311	52.0%	48.0%	68.5%	4.5%	1.5%	3.6%	0.4%	16.1%	5.4%	40.8%
Goleta	4480	94640	49.8%	50.2%	73.4%	1.6%	0.9%	8.3%	0.1%	11.3%	4.4%	26.6%
Santa Barbara	256	117873	49.4%	50.6%	77.0%	1.3%	1.0%	3.2%	0.1%	13.6%	3.7%	35.3%

Monitor	Age <15	Age 15-24	Age 25-49	Age 50-64	Age 65-74	Age >75
Santa Maria	24.7%	16.4%	33.1%	14.6%	5.4%	5.9%
Lompoc H Street	21.2%	14.5%	34.5%	17.8%	6.2%	5.8%
Goleta	13.0%	31.7%	26.0%	16.2%	6.4%	6.6%
Santa Barbara	15.3%	15.0%	34.1%	20.4%	7.4%	7.8%

Figure 4-13 $PM_{2.5}$ Area Served Analysis

5.0 Data Users

Data is collected from all the monitoring stations and stored in a database by a central data acquisition system (DAS) located at the District office. Internet connections are used for all stations to allow the DAS to poll data every minute. This data is screened for outliers before being reported to the public and other end users of the air quality data.

Every hour, data is sent to several outside agencies. Some data is used for reporting air quality data to the public and some data is used by researchers and scientists. O_3, PM_{10}, $PM_{2.5}$, wind and temperature data are posted to the District website every hour. This data is posted as AQI values and engineering units. The data is also sent to the AirNow system on an hourly basis for AQI reporting on a national scale. All hourly values are sent to CARB's AQMIS system for reporting data on a statewide level. Wind and temperature data are made available to other users such as the National Weather Service and Naval Weapons Group.

On a monthly basis, a quality assurance review is performed on the data. The final data are then submitted to the EPA's AQS database as per NAAQS requirements. CARB retrieves data from the AQS database to determine compliance with State of California ambient air quality standards, which are typically more protective than the NAAQS. Periodically throughout the year, the District will receive various data requests. A UCSB researcher is using hydrocarbon and wind data to study oil and gas seeps in the ocean off our coast. Other researchers use wind data to study beach erosion or sand migrations. Other data users include the National Weather Service, U.S. Fish and Game, and private consultants. Meteorological data are also compiled and used for air quality modeling purposes.

6.0 Conclusions and Future Changes

The air monitoring network in Santa Barbara County meets the objectives discussed at the beginning of this report. Air quality data is reported to several end users on an hourly basis. Quality-assurance reviewed data is submitted for compliance purposes and data is readily available and utilized for research and for general air quality purposes.

The analysis in this report for the O_3 network shows that all measured concentrations are currently below the existing O_3 NAQQS standard. Based on the overall analysis of the O_3 monitoring network, no new monitors are warranted at this time. While this analysis suggests removal of some O_3 monitors might be accomplished without impacting the ability to meet the network goals outlined in Section 1 of this document, from a practical standpoint the disadvantages appear to outweigh the benefits at this time.

The NO_2, SO_2, and CO networks meet the network goals outlined in Section 1. These monitors measure concentrations significantly below the NAQQS standard at all stations.

Both the PM_{10} and $PM_{2.5}$ monitoring networks meet the network goals outlined in Section 1. A PM_{10} monitor was recently installed at the Santa Ynez station as a special purpose monitor to develop a better understanding of PM concentrations and trends in that area of the county. Should the District decide to permanently install a PM_{10} monitor at Santa Ynez for NAAQS comparison, CARB and EPA will be included in this decision through the established network modification procedures. In the future, the District may also consider installing special purpose PM monitors at other locations, such as in Carpinteria, in order to develop a better understanding of PM concentrations and trends in other areas of the county.

No other new monitors are considered at this time as our overall monitoring network measurements (excluding data clearly impacted by exceptional events) are well below the NAAQS, and the O_3 and $PM_{2.5}$ exceedance probability analyses demonstrate a low probability for other locations' measurements exceeding the NAQQS.

The District plans to take responsibility of the Santa Maria monitoring station from CARB toward the end of 2020. When this transition occurs, the station location may be moved to achieve compliance with O_3 and NO_2 distance-to-roadway siting requirements. Alternatively, a waiver may be requested for the siting of the O_3 monitor when the Santa Maria station transition occurs. CARB is currently submitting a termination letter to EPA to shut down the CO and NO_2 monitors at the Santa Maria station. Any shutdown requests will include CARB and EPA and will follow the established shutdown procedures. Other reductions to the networks are not being considered, as the monitoring network provides valuable information to the public, especially during wildfires or other extreme events that occur increasingly in Santa Barbara County.

Analysis of demographic data served by each monitor showed that most monitors served a demographic distribution of race and age similar to the overall county distributions. However, Santa Maria, Lompoc H Street monitors do serve a slightly higher proportion of children and Paradise Road serves a higher proportion of elderly. As children and elderly have been shown to be more sensitive to poor air quality, any future consideration of removal of these stations needs to take into consideration that these stations serve a higher proportion of the sensitive population.