Appendix A:
BAAQMD’s 2015 five year network assessment

Air Monitoring Five-Year Assessment

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Executive Summary

This Network Assessment for the Bay Area Air Quality Management District (Air District) follows a top-down methodology to determine whether the existing air monitoring network meets the needs of seven million Bay Area residents. It assesses whether the existing network meets all State and national air monitoring requirements, as well as all local air monitoring priorities (such as SO_2 monitoring near oil refineries far beyond EPA mandated requirements), and suggests locations where monitoring should be initiated or terminated.

The requirement to submit an assessment of the air quality surveillance system to the EPA Regional Administrator is provided for in 40 CFR, Part 58 which states:

> *"The State, or where applicable local, agency shall perform and submit to the EPA Regional Administrator an assessment of the air quality surveillance system every 5 years to determine, at a minimum, if the network meets the monitoring objectives defined in appendix D to this part, whether new sites are needed, whether existing sites are no longer needed and can be terminated, and where new technologies are appropriate for incorporation in the ambient air monitoring network. The network assessment must consider the ability of existing and proposed sites to support air quality characterization for areas with relatively high populations of susceptible individuals (e.g., children with asthma), and, for any sites that are being proposed for discontinuance, the effect on data users other than the agency itself, such as nearby States and Tribes or health effects studies. For $PM_{2.5}$, the assessment also must identify needed changes to population-oriented sites. The State, or where applicable local, agency must submit a copy of this 5-year assessment, along with a revised annual network plan to the Regional Administrator. The first assessment is due July 1, 2010."*

The Air District's Executive Management requires that every criteria pollutant be measured in each of the nine Bay Area counties unless a criteria pollutant is in attainment. In that case, lesser monitoring may be approved. When less extensive monitoring is approved, the freed resources may be directed at other, more locally valuable air monitoring efforts (such as temporary source-oriented multi-pollutant monitoring at Cupertino, Berkeley, and Benicia in the recent past). Therefore, knowledge of the attainment status for each criteria pollutant is critical for this network assessment.

The Air District is in attainment for three of the six criteria pollutants: carbon monoxide, sulfur dioxide, and lead. The Air District is in non-attainment for ozone and fine particulate matter ($PM_{2.5}$), and is unclassified for nitrogen dioxide and PM_{10}. Therefore, by Air District policy, ozone and $PM_{2.5}$ must be monitored in each county but some flexibility is allowed in monitoring the other pollutants (but still meeting EPA minimum requirements). Finally, it is Air District policy that within each of the nine Bay Area counties, monitoring priority is given to the city with the largest population unless compelling reasons dictate otherwise. This is the basic framework for this assessment.

To achieve tangible cost-savings, and to maximize the resources available to conduct a multi-county air monitoring network, it is important to eliminate entire monitoring sites rather than curtailing the measurement of one pollutant at a site. In short, there is little savings curtailing carbon monoxide monitoring at a site if ozone monitoring at that site must continue.

Another way to improve efficiency in the network is to combine two or more sites. As pollutant levels have decreased over time, it is reasonable to suspect that some sites once deemed of high importance are no longer critical in defining a county or regions air quality. In practice, this is already occurring through written agreements with the Monterey Bay Unified Air Pollution Control District to share monitoring responsibilities in Santa Clara and San Benito Counties. These counties are part of a single Core Based Statistical Area with EPA minimum monitoring requirements applicable to both agencies in the absence of such written agreements. Below are the major recommendations from this assessment.

<u>Actions for Consideration</u>:

- Close the Fairfield site. Ozone is the only pollutant measured at this site and the data show ozone to be well below the NAAQS. The nearby site, Vacaville, can adequately describe ozone levels in the Fairfield-Vacaville area.

- Combine monitoring sites at San Martin and Gilroy into one site. Because San Martin has a much higher design value for ozone, it should continue operating. Therefore, move $PM_{2.5}$ monitoring at Gilroy five miles to the north and discontinue ozone monitoring at Gilroy. There have been no NAAQS violations for ozone in four years at Gilroy. The $PM_{2.5}$ annual design value is 7.6µg/m3 and the daily design value is 18µg/m3, both well below the annual and daily NAAQS respectively.

- Close the Oakland site. This site measures a wide array of pollutants. However, the first year of CO, NO_2, and $PM_{2.5}$ data at the newly opened Laney College site shows that concentrations at Laney College are representative of measurements at Oakland. There is no need to operate two sites in the same area. Additionally, the source-oriented Oakland West site, in combination with the Laney College site, more than adequately characterizes source-oriented and population oriented air pollution in and around Oakland.

- Discontinue monitoring CO at all sites except at EPA required near-road sites and at San Jose Jackson for the NCore program. If data users wish CO monitoring to continue, then change to trace-level analyzers because CO levels are very low in the Bay Area.

- Discontinue SO_2 monitoring at Bethel Island. This monitor is identified as being needed to assess background and transport of SO_2. However, San Jose Jackson (an NCore site) has a similar design value and is far from most SO_2 sources. Therefore, at this time, the San Jose Jackson trace-level monitor could be considered a background monitor. SO_2 levels are so low in the Bay Area that a transport site at Bethel Island is of limited value. However, because the site is important for other pollutant measurements (ozone), little savings would result from this action.

Overview of 5-Year Network Assessment

Background

The Bay Area Air Quality Management District (Air District) is the public agency responsible for air quality management in nine Bay Area counties: Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, southwestern Solano, and southern Sonoma. The Air District operates air monitoring stations in each of these nine counties. The Air District has been measuring air quality in the San Francisco Bay Area since 1957. At the close of 2014 there were 30 sites in the air monitoring network measuring criteria air pollutants, two sites measuring only H_2S (a non-criteria pollutant), and one site measuring Black Carbon (another non-criteria pollutant) in a wood smoke prone site in Marin County.

For most pollutants, EPA requires a minimum number of monitors based on the population in Core Based Statistical Areas (CBSAs). In the Bay Area, there are five CBSAs. The San Jose – Santa Clara – Sunnyvale CBSA is shared with Monterey Bay APCD because this CBSA includes San Benito County which is part of Monterey Bay APCD. Monitoring agreements between the two Air Districts are in place to meet EPA minimum monitoring requirements. The Vallejo – Fairfield CBSA is shared with Yolo-Solano APCD and the Santa Rosa – Petaluma CBSA is shared with Northern Sonoma APCD. However, the Bay Area Air District meets all minimum monitoring requirements within its own network. Therefore, no monitoring agreements are needed to meet EPA minimum monitoring requirements in these CBSAs. The other two CBSAs are fully within the Air District jurisdiction. In the Bay Area, CBSAs are identical to Metropolitan Statistical Areas (MSA) found in some EPA monitoring requirements.

Purpose of Monitoring

The purpose of the Air District monitoring network is:

- To provide air pollution data to the general public in a timely manner.
- To support compliance with California and national ambient air quality standards (NAAQS). When sites do not meet the standards, attainment plans are developed to attain the standards.
- To support air pollution research studies.

To meet its monitoring objectives the Air District monitoring network collects ambient air data at locations with a variety of site types which, as defined in 40 CFR Part 58 Appendix D, Table D-1, are intended to characterize air pollution levels in areas of high pollution, high population, transported air pollution, and air pollution near specific sources. Figure 1 shows the current Air District monitoring network superimposed on a map showing population density. Most air monitoring stations are located in the populated areas of the Bay Area.

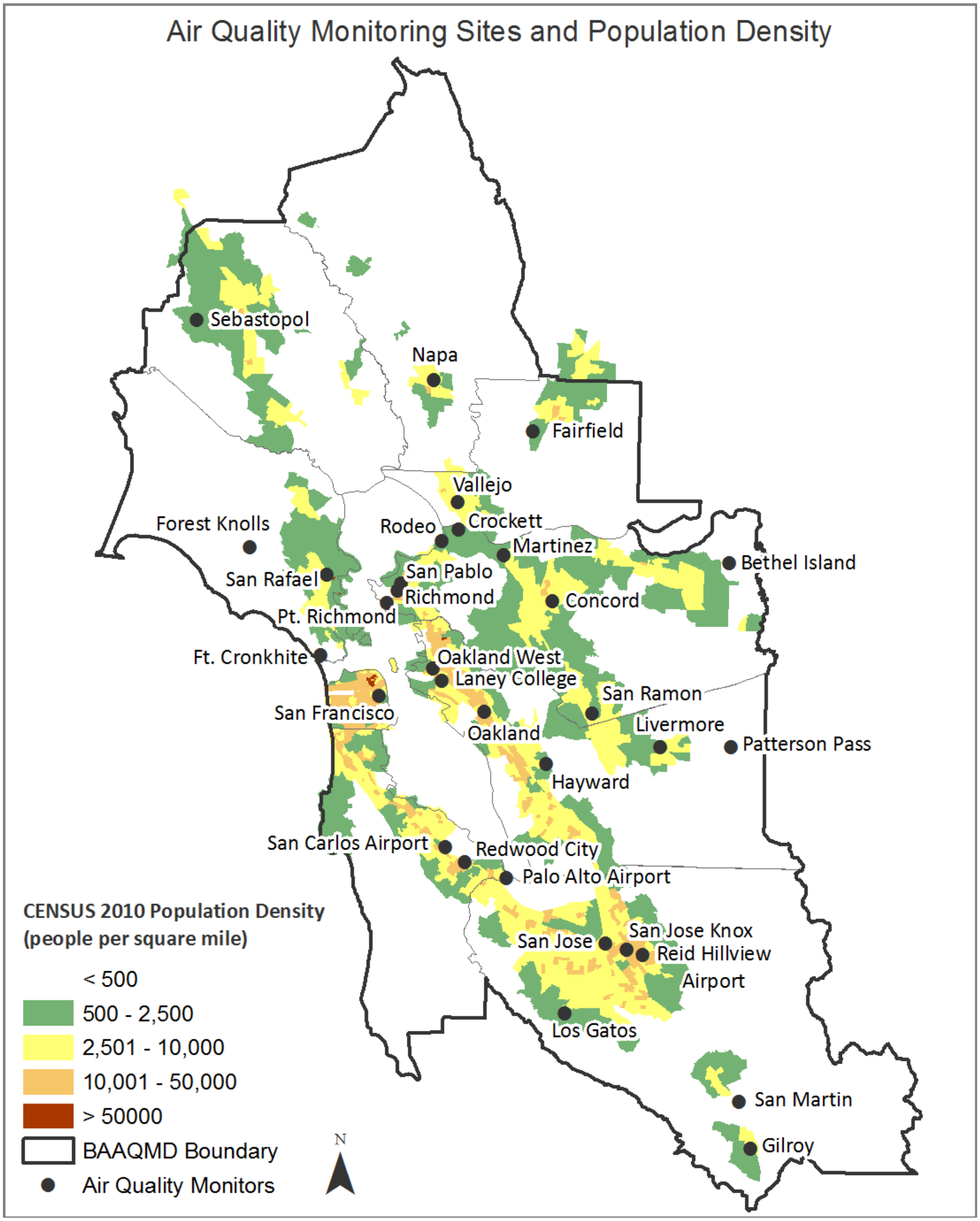


Figure 1. Air quality monitoring sites and population density (2010 CENSUS)

Ambient air monitoring at Air District stations is intended to meet one or more of the following monitoring objectives:

- A determination of typical concentrations in areas of high population density.
- A determination of the highest concentrations expected to occur in the area covered by the network.
- A determination of impacts from significant sources.
- A determination of general background concentration levels.
- A determination of the extent of regional pollutant transport.

To meet its monitoring objectives the Air District collects ambient air data at locations with a variety of monitoring site types. These site types, as defined in 40 CFR Part 58, Appendix D Table D-1 are listed below:

<u>Extreme downwind</u>: Sites established to characterize the extreme downwind transported ozone and its precursor concentrations, located in the predominant afternoon downwind direction from the local area of maximum precursor emissions. This site type is only used at sites designated as PAMS or unofficial PAMS.

<u>Highest concentration</u>: Sites expected to have the highest concentration, even if populations are sparse in that area. High concentrations may be found close to major sources, or further downwind if pollutants are emitted from tall stacks. High concentrations may also be found at distant downwind locations when the pollutants such as ozone or secondary particulate matter are a result of chemical reactions in the atmosphere.

<u>Maximum ozone concentration</u>: Sites intended to monitor maximum ozone concentrations occurring downwind from the area of maximum precursor emissions. Locations should be chosen so that urban scale measurements are obtained. Typically, these sites are located 10 to 30 miles from the fringe of the urban area. This site type is only used at sites designated as PAMS or unofficial PAMS.

<u>Maximum precursor impact</u>: Sites established to monitor the magnitude and type of precursor emissions in the area where maximum precursor emissions are representative of the CBSA are expected to impact and are suited for the monitoring of urban air toxic pollutants. This site type is only used at sites designated as PAMS or unofficial PAMS.

<u>Population exposure</u>: Sites in areas with high population density to evaluate exposure to air pollution. In most cases, stations are located within the largest cities in each county. Because people spend more time at home than at work, air monitoring sites are generally located in residential areas rather than at downtown locations.

<u>Source oriented</u>: Sites in areas downwind of potential major sources of pollutants. In the Bay Area, there are five refineries that are potential pollutant sources: Chevron, Shell, Tesoro, Phillips 66, and Valero. The Port of Oakland also can be a significant source of particulates, CO, and toxics. General aviation airports can be sources of lead because piston engine aircraft continue to use leaded fuel.

Upwind background: Sites in areas that have no significant emissions from mobile, area, or industrial sources. At these sites, the measured concentrations reflect the transported air quality levels from upwind areas. This site type is only used at sites designated as PAMS or unofficial PAMS.

General Background: Where there are no significant emission sources upwind of a site, then the site is considered to be a general background site.

Regional Transport: The Air District shares a common boundary with six other air districts: Monterey Bay Unified APCD, San Joaquin Valley APCD, Sacramento Metropolitan AQMD, Yolo-Solano AQMD, Lake County AQMD, and Northern Sonoma County APCD. When upwind areas have significant air pollution sources, pollutants may be transported into the Bay Area Air District and result in overall higher air pollution levels in the Bay Area.

Welfare-related impacts: Sites located to measure impacts on visibility, vegetative damage, or other welfare-based impacts.

Quality Assurance: Sites where dual or collocated instruments are maintained to confirm that the primary instruments are providing accurate data.

Criteria for Assessment

This assessment will rate the importance of all criteria-pollutant monitors operated by the Air District. Criteria pollutants monitored are carbon monoxide, ozone, nitrogen dioxide, sulfur dioxide, PM_{10}, and $PM_{2.5,}$ and lead. Monitors will be designated as high, medium, or low in importance. These evaluations will be based on how well the monitor helps meet the monitoring objectives defined in 40 CFR Part 58 Appendix D, and how well the monitor meets the monitoring objectives of the Air District. The assessment will also determine whether new monitoring sites are needed. Specific criteria used to assess the need for monitoring will be based on the following:

- Meeting the minimum number of monitors within each Core Based Statistical Area as required by EPA.
- Monitoring non-attainment criteria pollutants in each of the nine Bay Area counties.
- Locating a monitor at the expected maximum concentration for each pollutant.
- Locating monitors to determine background or transported pollutant levels.
- Operating fewer monitors for pollutants in attainment of the NAAQS.
- Operating more monitors for non-attainment criteria pollutants.

To meet EPA monitoring objectives, only monitors which are designated State and Local Air Monitoring Stations(SLAMS) are counted toward meeting EPA minimum monitoring requirements. SLAMS monitoring has specific requirements which vary by pollutant and are based on siting factors such as the distance from roadways and obstructions to air flow.

In addition to SLAMS, the Air District operates Special Purpose Monitors (SPMs) at some sites for special needs or shorter term studies. These monitors cannot be counted toward meeting EPA minimum monitoring requirements according to 40 CFR Part 58. However, these monitors are needed to meet Air District objectives (such as monitoring ozone in each County – a more stringent requirement than that of EPA). All SPM monitoring is held to the same calibration and audit requirements as SLAMS monitors.

Criteria Pollutant Assessment

Carbon Monoxide

The Air District currently operates 14 carbon monoxide (CO) monitors in its network, two of which are at near-road sites. Carbon monoxide had been a problem in the past before lower tailpipe emission standards were enacted by California and national governmental agencies. The Air District has not exceeded the 1-hr CO standard since 1967, and has not exceeded the 8-hour national carbon monoxide standard since 1991. Carbon monoxide levels have continued to decrease since then to levels that are now less than 1/3 of the national standard at all locations in the Bay Area.

Figure 2 shows the current locations of SLAMs carbon monoxide monitors. The stations are superimposed on a gridded carbon monoxide emission map. It shows that the stations are generally located in areas of significant CO emissions. Bethel Island, a background concentration site, can be seen in an area of low CO emissions. Additionally, the Air District plans to start monitoring CO at a new near-road site in Dublin starting in late 2015. This site is not needed to meet EPA minimum monitoring requirements. This site is being installed at the request of the Air District's Board of Directors and is not shown in Figure 2 or Table 1.

EPA requires CO monitoring at one near-road site in each CBSA that has a required near-road site. In the Air District, this would amount to a minimum of two sites because two CBSAs are required to operate near-road sites. There are no CO monitors required for Air District SIP or Maintenance Plans. The Air District was selected to operate an NCore site (effective January 1, 2011) and EPA approved NCore operations at the San Jose Jackson site. The NCore program began in January 2011. The requirement is for the Air District to operate a trace-level CO monitor at this site. In summary, there are three sites that require CO monitoring (San Jose Jackson and at two near-road sites).

Table 1 lists the stations currently measuring carbon monoxide in the Bay Area by County. It also lists the site type and the design values. The last column rates the importance of the data measured at the site in meeting the Air District's monitoring objectives. There are no SPMs in the network.

Alameda County has three CO monitoring sites – Oakland, Oakland West, and Laney College (an EPA required near-road monitoring site). Oakland is rated low because although Oakland is a major city in the Bay Area there are two other monitoring sites in Oakland measuring CO (Laney near-road and Oakland West). Oakland West is rated high because it is a source-oriented site downwind of the Port of Oakland and Interstate 880. The Laney College site is rated high because it is required by EPA for near-road CO monitoring.

Contra Costa County has three CO monitoring sites – Bethel Island, Concord, and San Pablo. Bethel Island is a background site and was rated high in the assessment of 2010. However, a background site is not of high priority any longer because the design values are so low for CO in the Bay Area. The other two sites, Concord and San Pablo are rated low because their design values are low and similar to other sites.

In Santa Clara County there are two CO monitors, both rated high. The San Jose Jackson CO is required because it is part of the EPA's NCore program. San Jose Knox Avenue is rated high because it is a near-road monitoring site and is required by EPA regulations.

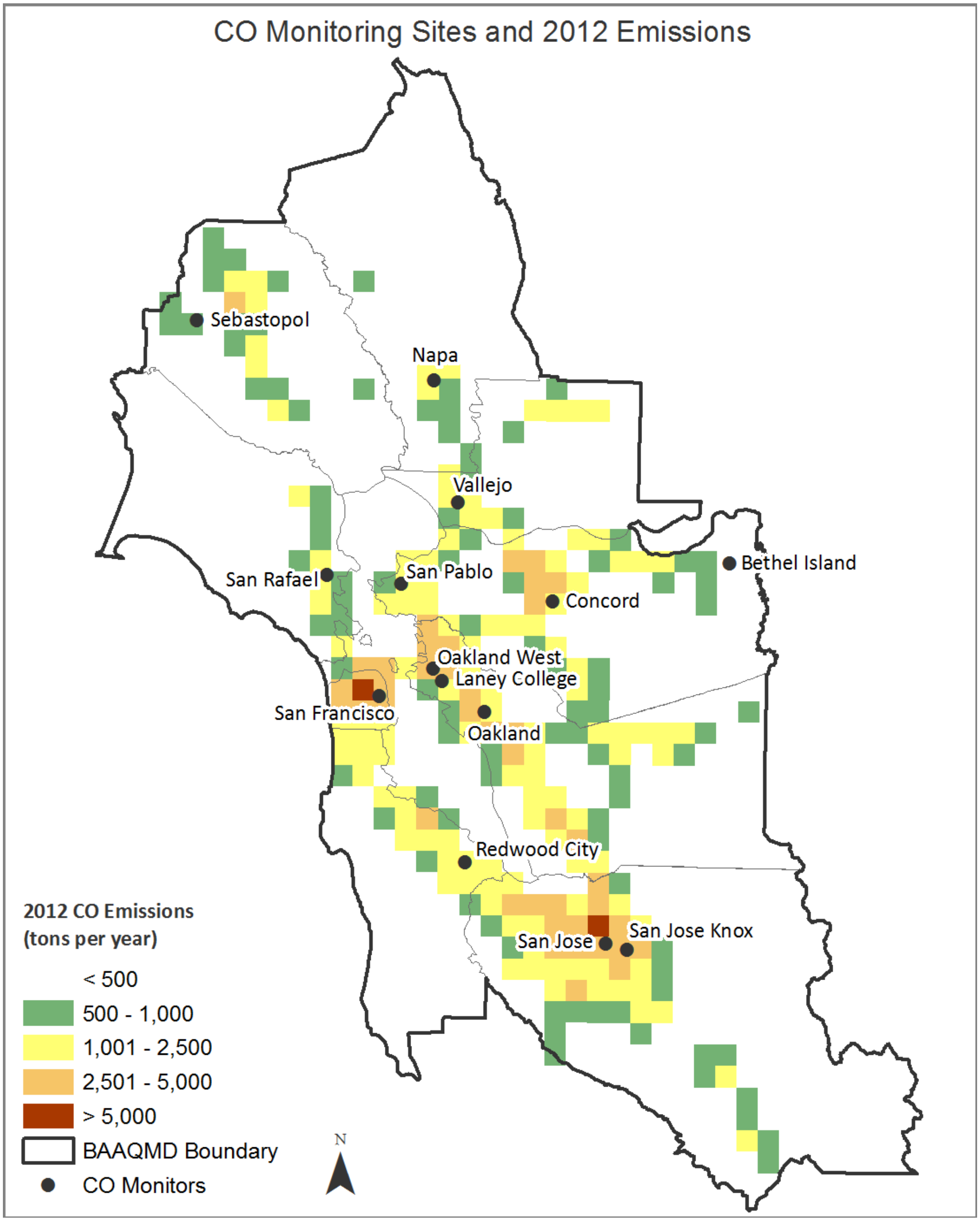


Figure 2. Carbon monoxide monitoring sites and 2012 emissions

All other sites are rated low because their design values are quite low and similar to the sites that are rated high or medium. Overall, the Air District is over-monitoring CO. Monitoring of CO at low value sites is recommended to be discontinued. However, if a low value site will continue monitoring another pollutant, then the cost-savings is minimal. Alternatively, if CO monitoring is continued at all low value sites, then trace-level monitors may need to be considered employed because CO levels across the Bay Area are now roughly as low as they are at San Jose where NCore program requirements are already using trace-level analyzers.

Table 1. Carbon monoxide SLAMS monitoring sites

Station	County	Site Type	1-hr CO Design Value[1] (ppm) 2013-14	8-hr CO Design Value[1] (ppm) 2013-14	Assigned Value from Assessment
Laney College	Alameda	Source Oriented Population Exposure (Near-road)	Insufficient Data[2]	Insufficient Data[2]	High
Oakland	Alameda	Population Exposure	3.6	1.9	Low
Oakland West	Alameda	Source Oriented	3.6	2.6	High
Bethel Island	Contra Costa	Background	1.0	0.8	Low
Concord	Contra Costa	Population Exposure	1.3	1.0	Low
San Pablo	Contra Costa	Population Exposure	1.7	1.0	Low
San Rafael	Marin	Population Exposure	2.1	1.0	Low
Napa	Napa	Population Exposure	2.8	1.5	Low
San Francisco	San Francisco	Population Exposure	1.8	1.3	Low
Redwood City	San Mateo	Population Exposure	3.3	1.6	Low
San Jose Jackson	Santa Clara	Population Exposure (NCore)	2.8	2.1	High
San Jose Knox Avenue	Santa Clara	Source Oriented Population Exposure (Near-road)	Insufficient Data[2]	Insufficient Data[2]	High
Vallejo	Solano	Population Exposure	2.6	2.0	Low
Sebastopol	Sonoma	Population Exposure	Insufficient Data[2]	Insufficient Data[2]	Low

1. CO design values are the higher of the 2nd highest concentration from each of the past two years.
2. Laney College, San Jose Knox Avenue, and Sebastopol sites opened in 2014. Two years of data are needed to assess a design value.

Ozone

At the close of 2014, the Air District operated 15 SLAMS and 4 SPM ozone (O_3) monitors in its network. The number of EPA-required SLAMS ozone monitors is based on the CBSA population and design value; as specified in Table D-2 of 40 CFR Part 58, Appendix D – SLAMS Minimum O_3 Monitoring Requirements. SPM monitors are not counted toward meeting the minimum requirements. The Bay Area meets all minimum monitoring requirements for ozone with its own network. No additional monitors are required in the SIP or Maintenance Plan for ozone. No monitoring agreements are needed with other Air

Districts to meet minimum requirements. The Annual Network Plan for 2014 has more specific details about minimum monitoring requirements, which are also listed in Table 2.

Ozone levels have dropped significantly in the Bay Area since the 1960s (see Figure 3). At the close of 2014, every ozone monitor in the Bay Area has a design value below the national standard. The highest design value is 72 ppb at Livermore. The second highest is 70 ppb at San Martin. Both of these sites are downwind of the major metropolitan area where ozone levels rise appreciably during hot summer days. A map of the 2014 8-hour ozone design values is shown in Figure 4. About ⅔ of the Air District adjacent to the Pacific Ocean enjoys relatively low ozone levels with design values of 65 ppb or below. Less than ⅓ of the Air District is between 70 to 75 ppb. The map also suggests there is a small portion of western Alameda County that is above 75 ppb range but this is an artifact of the spatial interpolation technique used to create the contours. In Sonoma County, no values are shown but the Santa Rosa site (closed in December 2013) had a 2013 DV of 47 ppb.

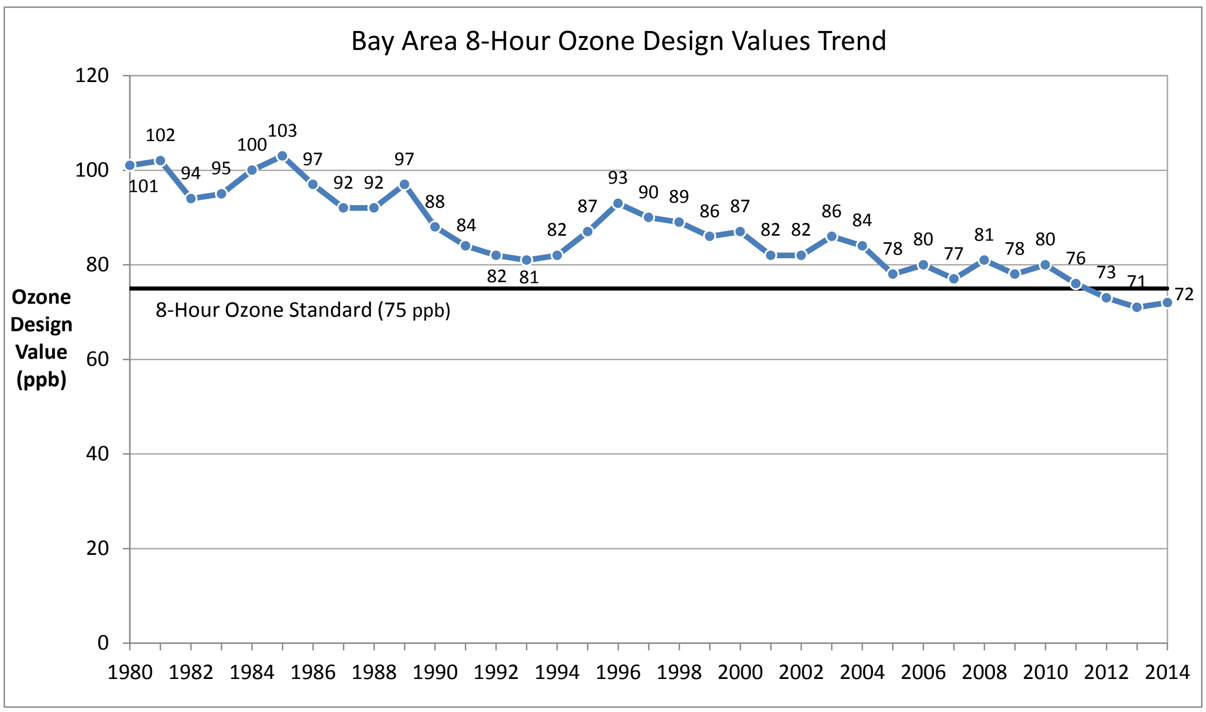
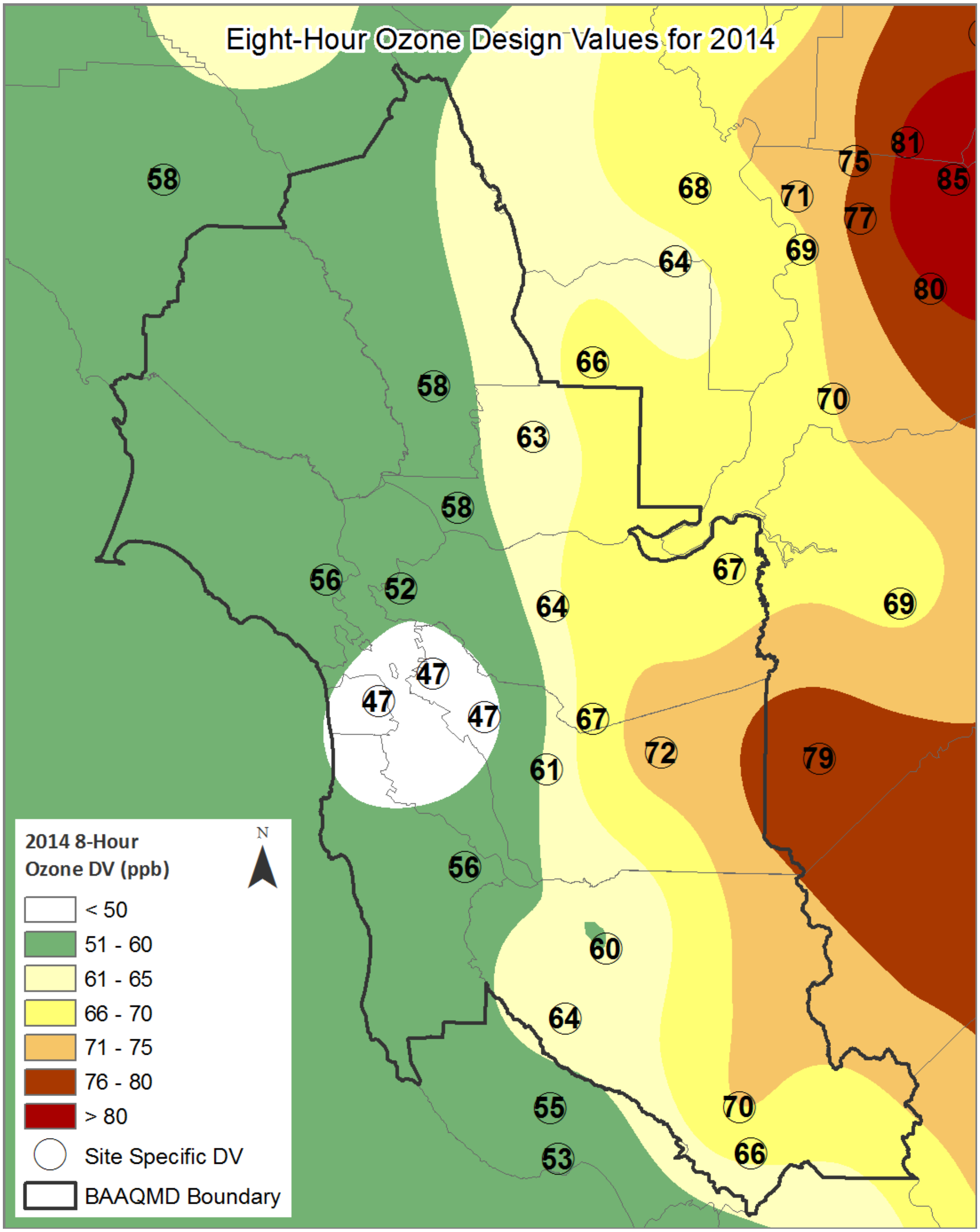


Figure 3. Bay Area 8-hour ozone design value trend (1980 through 2014)



Note: Spatial interpolation technique is adopted from the Maryland Department of the Environment (http://www.mde.state.md.us/programs/Air/AirQualityMonitoring/Pages/OzonePlumeHelp.aspx).

Figure 4. Spatial pattern for the 2014 8-hour ozone design values

Figure 5 shows the current Bay Area ozone monitoring stations. The stations are superimposed on a color-coded exceedance probability map. There are a number of wind patterns on hot days which can produce high ozone levels. The most common summertime wind pattern in the Bay Area is a delayed afternoon sea breeze that carries precursor pollutants to the eastern and southern portions of the Air District, as is depicted in Figure 5. Ozone monitors have been placed at Bethel Island, Livermore, Concord, and Fairfield to measure these high levels. Occasionally a very light wind pattern occurs, which results in high ozone concentrations close to source areas near the bay, generally at San Jose, Los Gatos, Napa, and Hayward.

Table 2. Minimum monitoring requirements for ozone SLAMS sites

CBSA	County	Population in millions 2010	8-hour Design Value[1] (ppb) 2012-14	Number of SLAMS Monitors Required	Number of SLAMS Monitors Operated by the Bay Area Air District	Number of SLAMS Monitors Operated by the Bay Area and other Air Districts
San Francisco-Oakland-Fremont	SF, Marin, Alameda, San Mateo, Contra Costa	4.34	72	3	7	7
San Jose-Sunnyvale-Santa Clara	Santa Clara, San Benito	1.84	70	2	4	6[2]
Santa Rosa-Petaluma	Sonoma	0.48	58	1	1	2[3]
Vallejo-Fairfield	Solano	0.41	66	2	2	3[4]
Napa	Napa	0.14	58	0	1	1

1 Design values are calculated at each monitoring site by taking the 3-year mean of the 4th highest 8-hour concentration. Design values at or below the 0.075 ppm National Ambient Air Quality 8-hour Ozone Standard meet the standard.
2 One monitor is in Hollister and another is in Pinnacles National Monument. Both are in San Benito County within the Monterey Bay Unified Air Pollution Control District.
3 One monitor is in Healdsburg in Sonoma County and is within the Northern Sonoma Air Pollution Control District.
4 One monitor is in Vacaville in Solano County and is within the Yolo-Solano Air Pollution Control District.

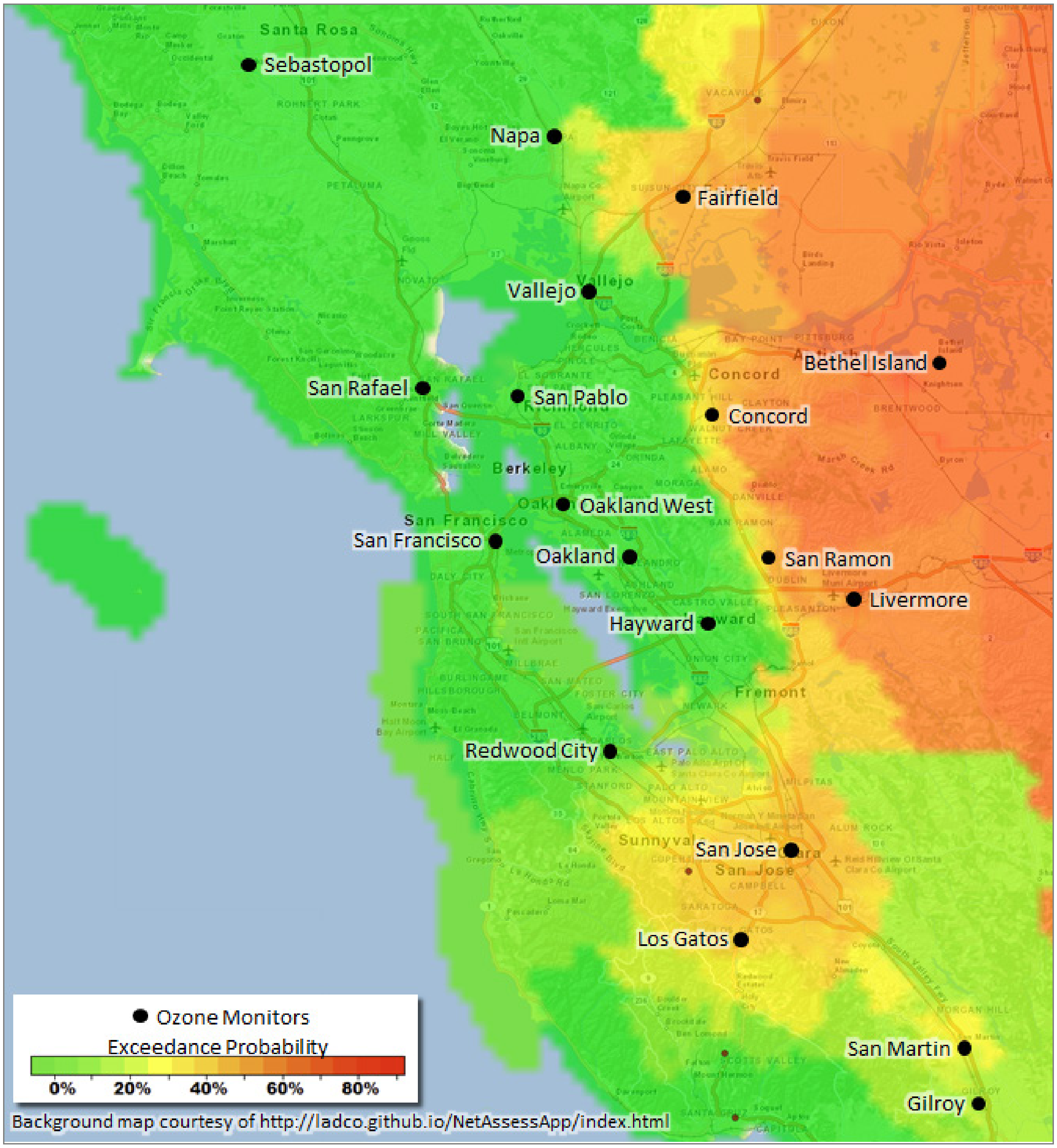


Figure 5. Ozone monitoring sites and ozone exceedance probability

Table 3 lists sites measuring ozone in the Bay Area by county. It also lists the monitor type, site type and the ozone design values. The last column rates the importance of the data measured at the site in meeting monitoring objectives.

Table 3. Ozone monitoring (SLAMS and SPM) sites

Station	County	Monitor Type	Site Type	8-hour Design Value (ppb) 2012-14	Assigned Value from Assessment
Hayward	Alameda	SLAMS	Population Exposure	61	Low
Livermore	Alameda	SLAMS	Population Exposure & Highest Concentration	72	High
Oakland	Alameda	SPM	Population Exposure	47	Low
Oakland West	Alameda	SLAMS	Population Exposure	47	Low
Bethel Island	Contra Costa	SLAMS	Regional Transport Highest Concentration	67	High
Concord	Contra Costa	SLAMS	Population Exposure	64	High
San Pablo	Contra Costa	SPM	Population Exposure	52	Low
San Ramon	Contra Costa	SPM	Population Exposure Upwind Background (unofficial PAMS)	67	Low
San Rafael	Marin	SPM	Population Exposure	56	High
Napa	Napa	SLAMS	Population Exposure & Highest Concentration	58	High
San Francisco	San Francisco	SLAMS	Population Exposure	47	High
Redwood City	San Mateo	SLAMS	Population Exposure	56	High
Gilroy	Santa Clara	SLAMS	Population Exposure	66	Low
Los Gatos	Santa Clara	SLAMS	Population Exposure	64	Medium
San Jose Jackson	Santa Clara	SLAMS	Population Exposure (NCore)	60	High
San Martin	Santa Clara	SLAMS	Population Exposure & Highest Concentration	70	High
Fairfield	Solano	SLAMS	Population Exposure & Highest Concentration & Regional Transport	63	Low
Vallejo	Solano	SLAMS	Population Exposure	58	High
Sebastopol	Sonoma	SLAMS	Population Exposure & Highest Concentration	Insufficient Data	High

The importance of each ozone monitor is related to

- EPA minimum monitoring requirements.
- Demonstration of attainment of air quality standards.
- Proximity of the site to other sites.
- The monitoring purpose.
- The number of monitors in a county.
- The size of the population in the surrounding area.

The Air District desires to operate at least one ozone monitor in each of the nine Bay Area counties. There are five counties where the Air District operates only one monitor: San Francisco, San Mateo, Marin, Napa, and Sonoma (there is another monitor in Healdsburg which is in Northern Sonoma Air District). These monitors are rated high because they are the only ozone measurements done by the Air District in those counties.

Alameda County has four ozone monitors. Livermore is rated high because it has the highest design value in the Air District. Livermore is located downwind of the major metropolitan area and experiences hot summers compared to the more ocean-sourced cooler air near the coast and bay. All other Oakland sites are rated low because although they are in a major population center, their design values are very low and NAAQS violations almost never occur.

Figure 6 shows an ozone correlation matrix for the San Francisco – Oakland – Fremont CBSA. The correlation matrix was created using the NetAssess software developed by the Lake Michigan Air Directors Consortium (LADCO). The matrix displays the correlation, relative difference, and distance between pairs of sites within the CBSA. The purpose of the matrix is to identify possible redundant sites that could be removed. Possible redundant sites would exhibit fairly high correlations and would have low average relative difference despite the distance. The shape of the ellipses represents the Pearson correlation between sites (http://en.wikipedia.org/wiki/Pearson_product-moment_correlation_coefficient). Circles represent zero correlation and straight diagonal lines represent a perfect correlation. The correlation may indicate whether a pair of sites is related. However, it does not indicate if one site consistently measures pollutant concentrations at levels substantially higher or lower than the other. For this purpose, the average relative difference between the two sites is calculated. The average relative difference between the two sites is an indicator of the overall measurement similarity between the two sites. Site pairs with a lower average relative difference are more similar to each other than pairs with a larger difference.

The matrix in Figure 6 shows that the Oakland – Oakland West site pairing has a high Pearson correlation and a low average relative difference. Since Oakland West is similar to Oakland, it is recommended that ozone monitoring be discontinued at Oakland.

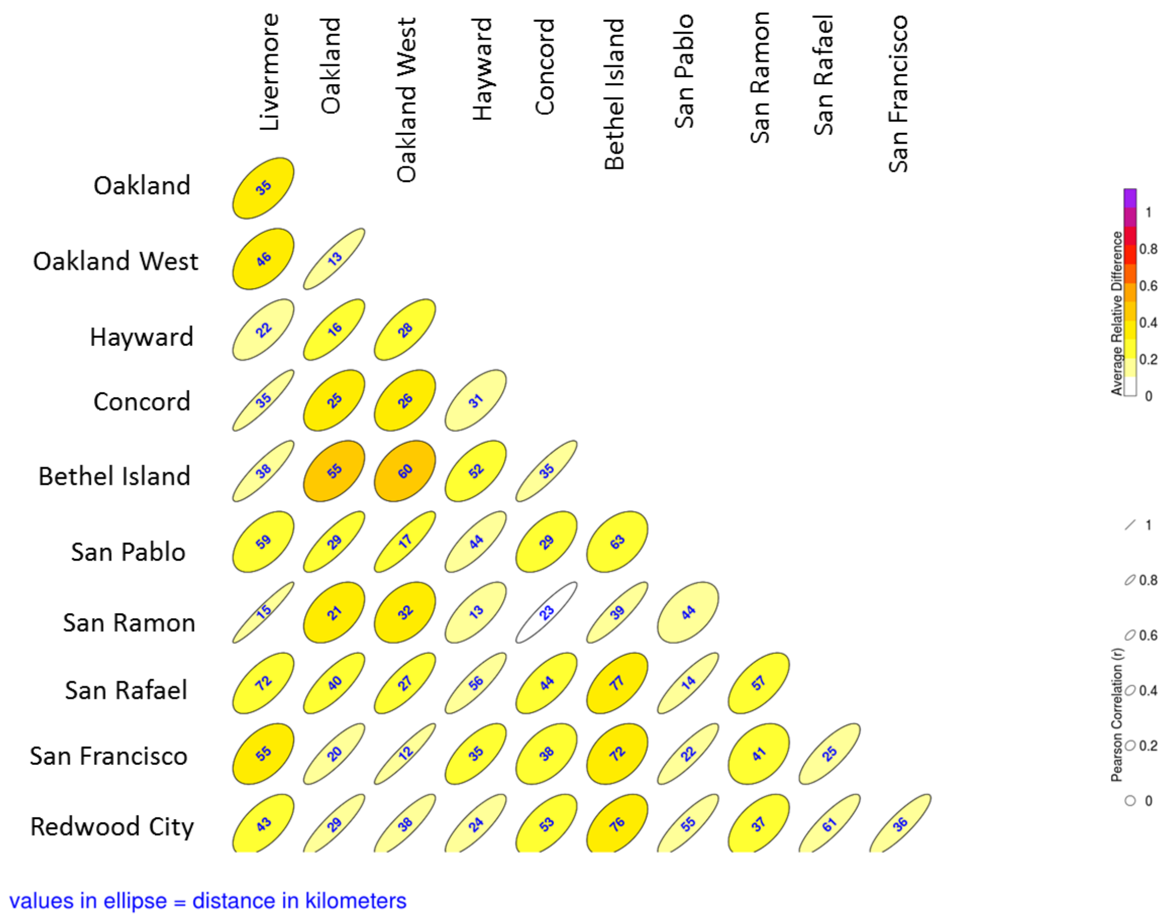


Figure 6. Eight-hour daily maximum ozone correlation matric for the San Francisco – Oakland – Fremont CBSA.

Contra Costa County has four ozone monitoring sites. Bethel Island is rated high because it has the highest design value in the county. Concord is also rated high because its design value is elevated and the site is in the most populated city in the county. San Pablo is rated low because the site is near the cooler waters of San Francisco Bay and, therefore, has a low design value. San Ramon is rated low because this SPM is being operated to support an unofficial PAMS study being done by the Air District. Data has been collected for this study since 2012, and may soon be terminated depending on the results of the study (which are unknown at this time). San Ramon is also rated low because it is highly correlated with the Concord site, as shown in Figure 6.

Santa Clara County has four ozone monitoring sites. San Jose is rated high because it is required for NCore and is the most populated city in the Bay Area. San Martin is rated high because it has the highest design value in Santa Clara County (and the CBSA which is shared with San Benito County in the Monterey Bay Air District). Los Gatos is rated medium because it is located on the west side of Silicon Valley and near the hills that border with Santa Cruz County. The other site, Gilroy, is rated low. Gilroy is rated low because it is very close to San Martin (only 5.5 miles separate the two sites), and has not recorded an exceedance of the NAAQS in the past four years. At Gilroy, only ozone and $PM_{2.5}$ are measured and $PM_{2.5}$ levels are well below the national standard and $PM_{2.5}$ may be moved to San Martin. Therefore, if ozone monitoring is discontinued, then the entire Gilroy site may be closed.

Figure 7 shows an ozone correlation matrix for the San Jose – Sunnyvale – Santa Clara CBSA. The matrix in Figure 7 shows that the San Martin – Gilroy site pairing has a high Pearson correlation and a low average relative difference. Since San Martin has the highest design value in the CBSA, and Gilroy is similar to San Martin, it is recommended that ozone monitoring be discontinued at Gilroy.

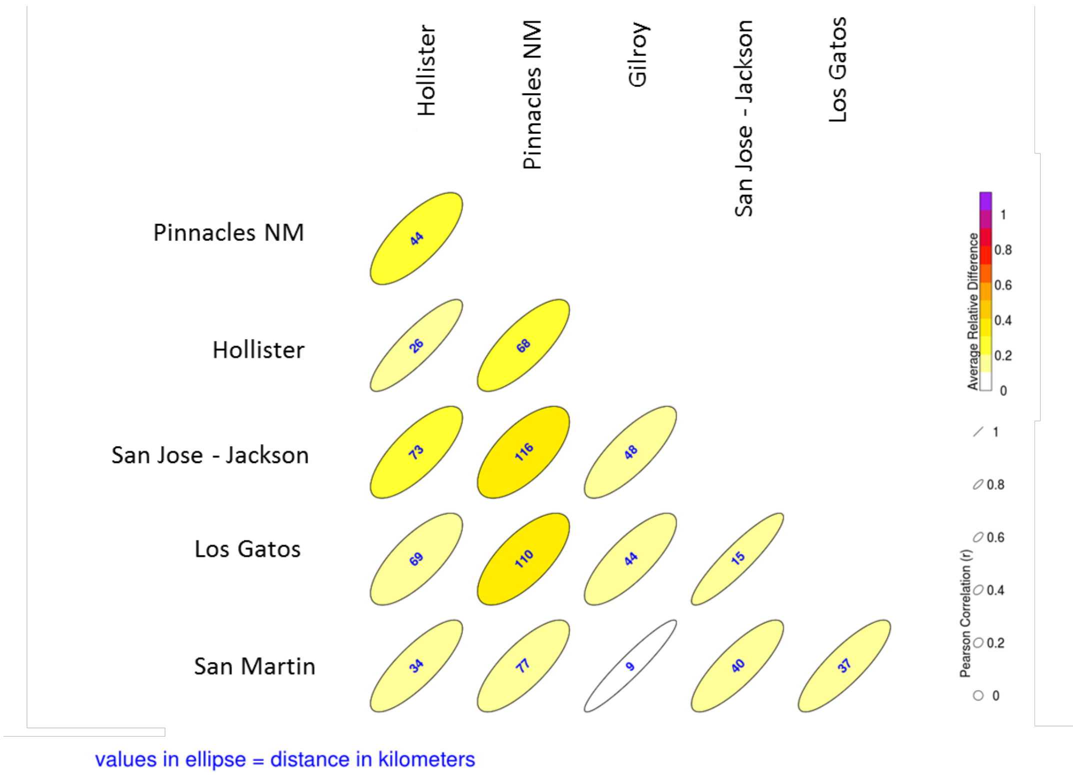


Figure 7. Eight-hour daily maximum ozone correlation matric for the San Jose – Sunnyvale – Santa Clara CBSA.

Solano County is in the Vallejo-Fairfield CBSA and is required to operate two ozone monitors to meet EPA minimum monitoring requirements. The Air District operates two ozone monitoring sites in Solano County at Vallejo and Fairfield. Additionally, the Yolo-Solano Air District operates a third monitor at Vacaville.

Ozone monitoring in Vallejo is rated high because it is a good trend site, having monitored ozone since 1976 and is in the most populated city in Solano County. Fairfield is rated low because it is just 11 miles southwest of the Vacaville ozone monitoring site (in the Yolo-Solano Air District) and has a lower design value. Both sites can be considered transport sites (Fairfield measuring transport out of the Bay Area and Vacaville measuring transport into the Sacramento Valley).

The ozone design value at Vacaville is 66 ppb while at Fairfield it is 64 ppb. Both sites have been monitoring ozone since 2005 and the DV has been higher at Vacaville in 8 of the 10 years as summarized in Table 4 below.

Table 4. Vacaville vs Fairfield ozone design value comparison

Year	Vacaville (Ulatis Drive) DV (ppb)	Fairfield (Chadbourne Rd) DV (ppb)
2005	71	68
2006	73	69
2007	74	66
2008	75	68
2009	72	67
2010	71	69
2011	68	69
2012	69	68
2013	65	67
2014	66	63

Figure 8 shows an ozone correlation matrix for the Vallejo – Fairfield, CA CBSA. The Fairfield – Vacaville site pairing has a high Pearson correlation and a low average relative difference. Therefore, the two sites are similar. Because two sites are not needed to characterize transport between the Bay Area and the Sacramento Valley, it is reasonable to consider closing the Fairfield site. Closure would require a monitoring agreement with the Yolo-Solano Air District to meet EPA required minimum monitoring requirements for ozone in the CBSA.

Vallejo – Fairfield, CA CBSA

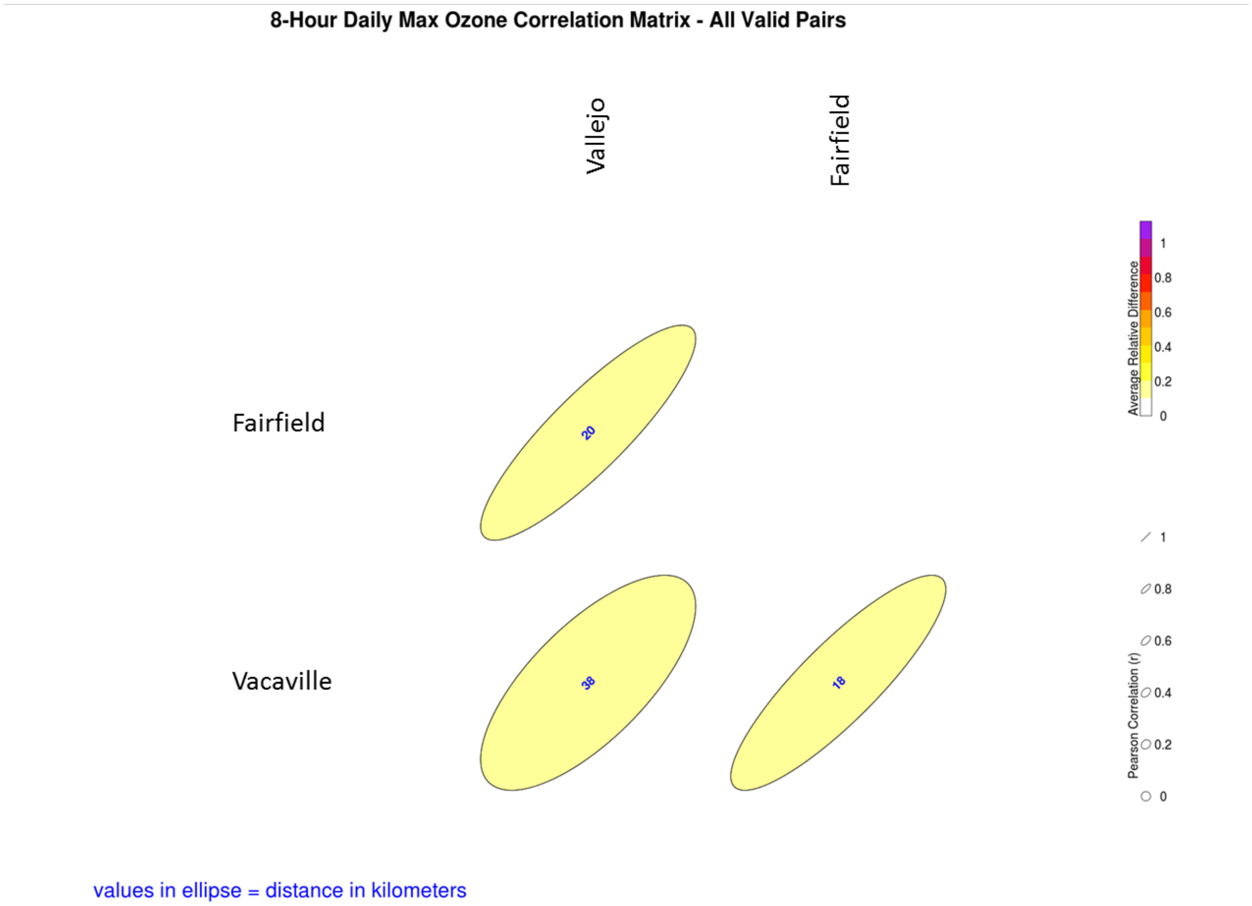


Figure 8. Eight-hour daily maximum ozone correlation matric for the Vallejo – Fairfield CBSA.

Nitrogen Dioxide

At the close of 2014, the Air District operated 17 nitrogen dioxide (NO_2) monitors in its network. Within the network two monitors (San Ramon and Patterson Pass) are SPM and are not counted toward meeting minimum monitoring requirements. Two additional monitors (Laney College and San Jose Knox) are for EPA required near-road monitoring and are not contributing toward area-wide monitoring (but are counted in meeting near-road monitoring requirements). Of the remaining 13 monitors, four (Napa, Oakland, San Rafael, and San Pablo) are classified as middle scale because their probes are too close to nearby busy roadways and not counted toward meeting monitoring requirements. The remaining nine sites are counted for area-wide monitoring and exceed EPA minimum monitoring requirements.

EPA also requires 40 sites across the United States to measure NO_2 near susceptible and vulnerable populations. The Oakland West site was selected to be one of the sites for this program. It is loosely termed Regional Administrator monitoring or RA-40 monitoring.

NO_2 monitors also measure nitrogen oxide (NO), and the sum of NO_2 and NO, is called NO_x. NO_2 measurements have been made in the Bay Area since the 1960s. NO_2 levels have only exceeded the national 1-hour standard once in the past five years. NO_2 is formed from vehicle, power plant and other industrial emissions, and contribute to the formation of ozone and fine particulate matter.

Figure 9 shows the current locations of NO_2 monitors. The stations are superimposed on a gridded NO_x emission map. NO_x is used in place of NO_2 because the amount of NO_x is better quantifiable and because NO and NO_2 concentrations change throughout the day depending upon the amount of sunlight, the ambient temperature, and the concentration of oxidizing pollutants available in the air. The map shows that the stations are generally located in areas of high NO_x emissions. Bethel Island, a site located to measure transported pollutants, is in an area of low NO_x emissions. Additionally, the Air District plans to start monitoring NO_x at a new near-road site in Dublin starting in late 2015. This site is not needed to meet EPA minimum monitoring requirements. This site is being installed at the request of the Air District's Board of Directors and is not shown in Figure 9 or Table 5.

EPA minimum area-wide monitoring requirements are based on CBSA population. EPA near-road minimum monitoring requirements are based on CBSA and maximum highway traffic counts in the CBSA. Monitoring requirement details are listed in Table 5. No additional monitors are required for the SIP or Maintenance Plans because the Air District has never been designated as non-attainment for NO_2. The Air District is not presently meeting the near-road minimum requirement because the Berkeley Aquatic Park site has been held up in local permits. It is now planned to open early in the 2^{nd} half of 2015.

For planning purposes, it should be noted that presently only one near-road site is required in the San Jose – Sunnyvale – Santa Clara CBSA. However, the maximum traffic count in the CBSA is 245,000 (2013 data, the latest available). Should it reach 250,000, EPA requires an additional near-road NO_2 site in this CBSA.

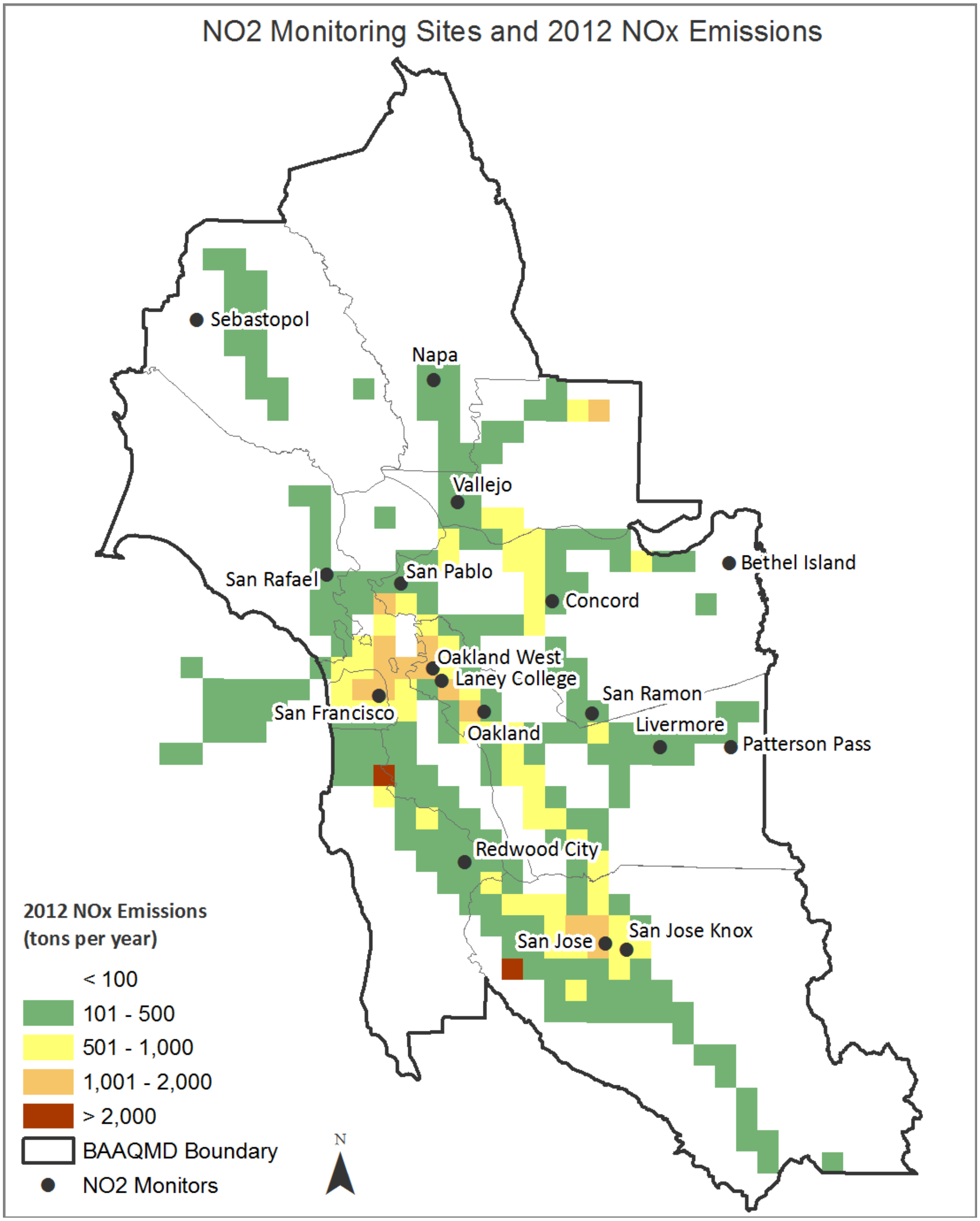


Figure 9. Nitrogen dioxide monitoring sites and 2012 NOx emissions

Table 5. Minimum monitoring requirements for NO_2 SLAMS sites

			Near-road Monitoring			Area-wide Monitoring		
CBSA	Pop. 2010 Census	Max Traffic Count (2013)	Required Monitors	Active Monitors	Additional Monitors Needed	Required Monitors	Active Monitors	Additional Monitors Needed
San Francisco-Oakland-Fremont	4,335,391	270,000	2	1	1[a]	1[b]	6	0
San Jose-Sunnyvale-Santa Clara	1,836,911	245,000	1	1	0	1	1	0
Santa Rosa-Petaluma	483,878	146,000	0	0	0	0	1	0
Vallejo-Fairfield	413,344	202,000	0	0	0	0	1	0
Napa	136,484	119,000	0	0	0	0	0	0

a One near-road monitor is expected to open at Berkeley Aquatic Park by mid-2015, and another in late 2015 or early 2016 in Dublin. While only one additional monitor is required to be opened, the Air District will be opening 2 within the next year.

b One area-wide monitor is required however the Oakland West monitoring site was selected as one of the 40 nationwide sites for monitoring near susceptible and vulnerable populations. Therefore, there are two required for this CSBA (one based on population and one for Regional Administrator Required Monitoring).

Table 6 lists the stations currently measuring nitrogen dioxide in the Bay Area in each county. It also lists the site and monitor type, and the NO_2 design values for each site. The last column rates the importance of the data measured at the site in meeting Air District and EPA monitoring objectives.

The Air District desires at least one NO_2 monitor in each of the nine Bay Area counties. There are six counties with only one monitor: San Francisco, San Mateo, Marin, Sonoma, Solano, and Napa. They are rated medium in importance because NO_2 levels are only about one half of the 1-hour national standard, and less than a quarter of the national annual standard but they are the only monitor in their respective counties.

In Santa Clara County, there are two NO_2 monitors. Both are rated of high importance. The San Jose Knox monitor is required for near-road NO_2 monitoring. The San Jose Jackson monitor is rated high because San Jose is the most populated city in the Bay Area.

Table 6. Nitrogen Dioxide Monitoring Sites

Station	County	Monitor Type	Site Type	1-hour Design Value[1] (ppb)	Annual Design Value[2] (ppb)	Assigned Value from Assessment
Laney College	Alameda	SLAMS	Population Exposure Source Oriented (Near-road)	Insufficient Data[3]	17	High
Livermore	Alameda	SLAMS	Population Exposure	44	10	High
Oakland	Alameda	SLAMS	Population Exposure	50	12	Low
Oakland West	Alameda	SLAMS	Population Exposure Source Oriented (RA-40 site)	51	14	High
Patterson Pass	Alameda	SPM	Extreme Downwind (unofficial PAMS)	Insufficient Data[3]	Insufficient Data[3]	Low
Bethel Island	Contra Costa	SLAMS	Transport	30	5	High
Concord	Contra Costa	SLAMS	Population Exposure	37	8	High
San Pablo	Contra Costa	SLAMS	Population Exposure	40	9	Low
San Ramon	Contra Costa	SPM	Upwind background (unofficial PAMS)	Insufficient Data[3]	Insufficient Data[3]	Low
San Rafael	Marin	SLAMS	Population Exposure	47	11	Medium
Napa	Napa	SLAMS	Population Exposure	39	8	Medium
San Francisco	San Francisco	SLAMS	Population Exposure	61	12	Medium
Redwood City	San Mateo	SLAMS	Population Exposure	46	11	Medium
San Jose Jackson	Santa Clara	SLAMS	Population Exposure	53	13	High
San Jose Knox	Santa Clara	SLAMS	Population Exposure Source Oriented (Near-road)	Insufficient Data[3]	Insufficient Data[3]	High
Vallejo	Solano	SLAMS	Population Exposure	42	8	Medium
Sebastopol	Sonoma	SLAMS	Population Exposure	Insufficient Data[3]	4	Medium

1 The 1-hour design value is the 8th highest daily maximum hourly value at a site per year, averaged over the past three years. Design values at or below the national NO_2 1-hour standard of 100 ppb meet the standard.
2 The annual design value is the average of all hourly NO_2 measurements during the most recent year. Design values at or below the national NO_2 annual standard of 53 ppb meet the standard.
3 Laney College, San Jose Knox, and Sebastopol sites opened in 2014. There is not enough data to calculate design values. Patterson Pass and San Ramon do not monitor NO_2 during winter. There is not enough data to calculate design values.

Alameda County has five NO_2 monitors. Livermore is rated high because ozone exceedances frequently occur and NO/NO_2 data are needed for modeling and analysis as ozone precursors. Oakland West is rated high because it is a source-oriented site as well. Laney College is also rated high as it is a near-road monitor. Oakland is rated low because Laney College and Oakland West already characterize the pollution in the Oakland area. Patterson Pass is also rated low because it is in an SPM operating in an unpopulated area as part of an Air District ozone study. The site may be closed when the results of the study are known.

Contra Costa County has four NO_2 monitoring sites. Bethel Island and Concord are rated high because NO/NO_2 data are needed for modeling and analysis of ozone exceedances. Bethel Island is also important for measuring NO_x transport to and from neighboring air districts. San Pablo is rated low because there is no specific need for the data, and NO_2 design values are low. San Ramon is rated low because it is an SPM as part of an Air District ozone study. The site may be closed when the results of the study are known.

Sulfur Dioxide

At the close of 2014, the Air District operated nine sulfur dioxide monitors (SO_2) in its network. Eight of the monitors are SLAMS and one (at Crockett) is an SPM because it does not meet SLAMS siting requirements. SO_2 measurements have been made in the Bay Area since 1969. Today the network is primarily source-oriented with most monitoring done near oil refineries and at Oakland West downwind of the Port of Oakland. Unlike other pollutants, SO_2 concentrations are normally measured near sources. Counties without sources usually have concentrations near background levels.

Figure 10 shows the locations of sulfur dioxide monitors. The stations are superimposed on a gridded SO_2 emission map. The map shows areas off the coast and on the San Francisco Bay with SO_2 emissions. These emissions are from ships. The Oakland West SO_2 monitor is located downwind of the Port of Oakland to measure SO_2 from shipping. The other major source of SO_2 emissions are Bay Area refineries owned by Chevron, Shell, Tesoro, Valero, and ConocoPhillips. Most of the remaining monitors are located near these refineries. One other SO_2 monitor is located at the San Jose NCore site, a requirement of 40 CFR Part 58. Bethel Island also has an SO_2 monitor to measure transport and background levels.

The Air District meets the minimum number of SO_2 monitors as shown in Table 7. The number of required SO_2 monitors in each CBSA is proportional to the product of the total amount of SO_2 emissions in the CBSA and its population as specified in 40 CFR Part 58, Appendix D Section 4.4. The resulting value is defined as the Population Weighted Emissions Index (PWEI). SO_2 emissions shown in Table 7 are from the 2011 National Emissions Inventory (NEI). No additional monitors are required for SIP or Maintenance Plans, because the Air District has never been designated as non-attainment for SO_2, and no SIP or Maintenance Plans have been prepared for SO_2.

Table 8 lists the stations currently measuring sulfur dioxide in the Bay Area in each county. It also lists the site and monitoring types along with the SO_2 design values. It shows that design values are significantly below the 75 ppb 1-hour SO_2 national standard. The last column rates the importance of the data measured at the site in meeting both the Air District's and EPA's monitoring objectives.

In Contra Costa County there are six monitors. All are rated high except Bethel Island which is rated low. Bethel Island is rated low because it was originally designed to measure transport and background levels. However, the design value is similar to San Jose Jackson (an NCore monitor) and both of these sites could be considered background today. With SO_2 levels so low and well below the NAAQS, the need for a transport site at Bethel Island is somewhat questionable. The other monitors are near the oil refineries and are rated high.

In Alameda County there is one monitor. This is at Oakland West to measure emissions from shipping and is therefore rated high. In Santa Clara County there is one monitor. This is for the EPA NCore program at San Jose Jackson and is therefore rated high. In Solano County there is one monitor at Vallejo which is downwind of the refineries and is the only SO_2 monitor in Solano County, so it is rated high.

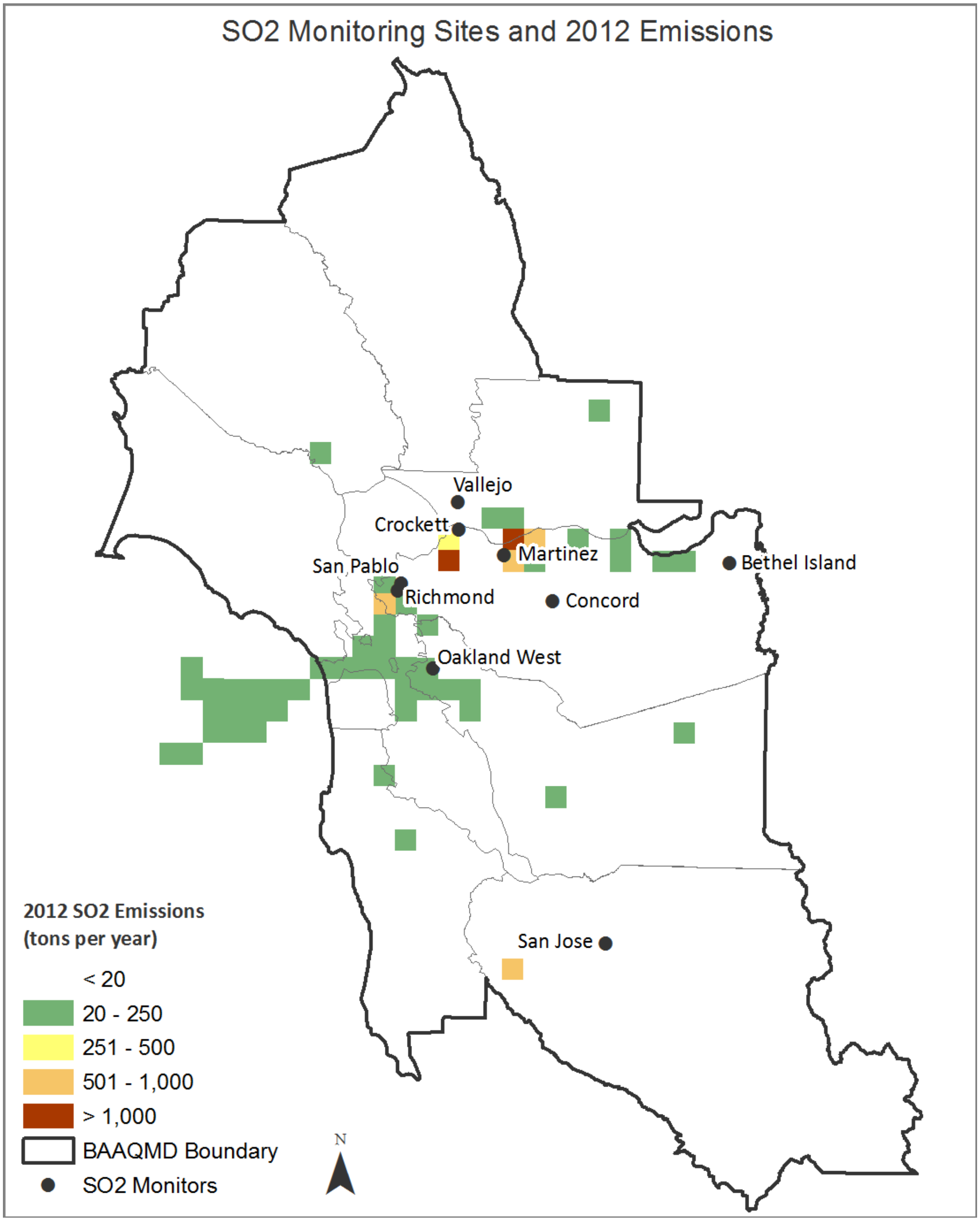


Figure 10. Sulfur dioxide monitoring sites and 2012 emissions

Table 7. Minimum monitoring requirements for SO_2 SLAMS sites

CBSA	County or Counties	Pop. 2010 Census	Total SO_2 (tons/yr) 2011 NEI	PWEI (million -person-tons/yr)	Required SLAMS Monitors	Active SLAMS Monitors	Additional SLAMS Monitors Needed
San Francisco-Oakland-Fremont	SF, San Mateo, Alameda, Marin, Contra Costa	4,335,391	5318	23056	1	6[1]	0
San Jose-Sunnyvale-Santa Clara	Santa Clara, San Benito	1,836,911	608	1117	1 (NCore)	1	0
Santa Rosa-Petaluma	Sonoma	483,878	20	10	0	0	0
Vallejo-Fairfield	Solano	413,344	4080	1686	0	1	0
Napa	Napa	136,484	6	1	0	0	0

1 The Crockett monitor does not meet SLAMS siting criteria and is designated as an SPM monitor. Therefore, it is not counted in the Table above.

Table 8. Sulfur dioxide monitoring sites

Station	County	Monitor Type	Site Type	1-hour Design Value[1] (ppb) 2012-14	Assigned Value from Assessment
Oakland West	Alameda	SLAMS	Population Exposure & Source Oriented	14	High
Bethel Island	Contra Costa	SLAMS	Transport & Background	4	Low
Concord	Contra Costa	SLAMS	Population Exposure & Source Oriented	8	High
Crockett	Contra Costa	SPM	Population Exposure & Source Oriented	12	High
Martinez	Contra Costa	SLAMS	Population Exposure & Source Oriented	14	High
Richmond 7th	Contra Costa	SLAMS	Population Exposure & Source Oriented	11	High
San Pablo	Contra Costa	SLAMS	Population Exposure & Source Oriented	8	High
San Jose Jackson	Santa Clara	SLAMS	Population Exposure (NCore)	3	High
Vallejo	Solano	SLAMS	Population Exposure & Source Oriented	5	High

1 For SO_2, the design value is the average of the 4th highest daily hourly maximum value from the past 3 years, 2012-2014

PM_{10}

At the close of 2014, the Air District operated four SLAMS and three SPM PM_{10} samplers in its network. The three SPM samplers operate every 12th day and do not meet the SLAMS requirement to operate every 6th day. These SPMs would have been discontinued completely but some data was desired for research purposes. Therefore, the Air District continues to operate the three sites, but on a reduced schedule.

The last year when exceedances of the 24-hour national standard were recorded in the Bay Area was 1991 (at Livermore and San Jose). Figure 11 shows the current Bay Area PM_{10} monitoring stations. The stations are superimposed on a gridded PM_{10} emission map. It shows that the stations are generally located in areas of high PM_{10} emissions.

Because PM_{10} levels are one-half or less of the national standard, there is no need to measure PM_{10} in every county. Instead, monitoring resources have been put into sampling for fine particulate ($PM_{2.5}$) because the Bay Area is not in attainment of the 24-hour $PM_{2.5}$ national standard and because the fine particles have more serious health impacts.

The number of required PM_{10} monitors in each CBSA is determined by population and design value, as specified in Table D-4 of Appendix D to 40 CFR Part 58 – PM_{10} Minimum Monitoring Requirements. PM_{10} design values are a calculated concentration (see footnote no.1 below in Table 9) which are used to determine the PM_{10} attainment status of an area.

Table 9 shows that the Air District monitoring network meets or exceeds the PM_{10} minimum monitoring requirements. No additional monitors are required for the SIP or Maintenance Plan because the Bay Area has never been designated as non-attainment for PM_{10}, and no SIP or Maintenance Plans have been prepared for PM_{10}. Note that the Bay Area Air District has a monitoring agreement with Monterey Bay Air District to share PM10 monitoring responsibilities in the San Jose – Sunnyvale – Santa Clara CBSA. No other monitoring agreements are needed to meet minimum requirements.

Table 9. Minimum monitoring requirements for PM_{10} SLAMS sites

CBSA	County or Counties	Pop. 2010 Census	Highest 24-hr conc. ($\mu g/m^3$)	Highest 24-hr conc. site & AQS ID	Required SLAMS Sites[a]	Active SLAMS Sites	Additional SLAMS Sites Needed
San Francisco-Oakland-Fremont	SF, San Mateo, Alameda, Marin, Contra Costa	4,335,391	57	Bethel Island 060131002	2-4	2	0
San Jose-Sunnyvale-Santa Clara	Santa Clara, San Benito	1,836,911	56	San Jose 06085005	2-4	2[b]	0
Santa Rosa-Petaluma	Sonoma	483,878	42	Healdsburg 060970002	0-1	3[c]	0
Vallejo-Fairfield	Solano	413,344	28	Vacaville 060953001	0-1	1[d]	0
Napa	Napa	136,484	37	Napa 060550003	0-1	1	0

a For PM_{10} in the Bay Area, the number of monitors required depends on the population of the CBSA and whether the ambient concentration of PM_{10} exceed 80% of the 150 $\mu g/m^3$ NAAQS. No stations in the CBSAs listed exceed the 80% threshold. Therefore, the minimum monitoring requirement is determined from Table D-4 of Appendix D, Part 58 of 40 CFR under the "low concentration" category.

b One of the two monitors is in Hollister which is in the Monterey Bay Unified Air Pollution Control District.

c Monitors are in Healdsburg, Guerneville, and Cloverdale. All are in the Northern Sonoma Air Pollution Control District.

d This monitor is in Vacaville which is in the Yolo-Solano Air Quality Management District.

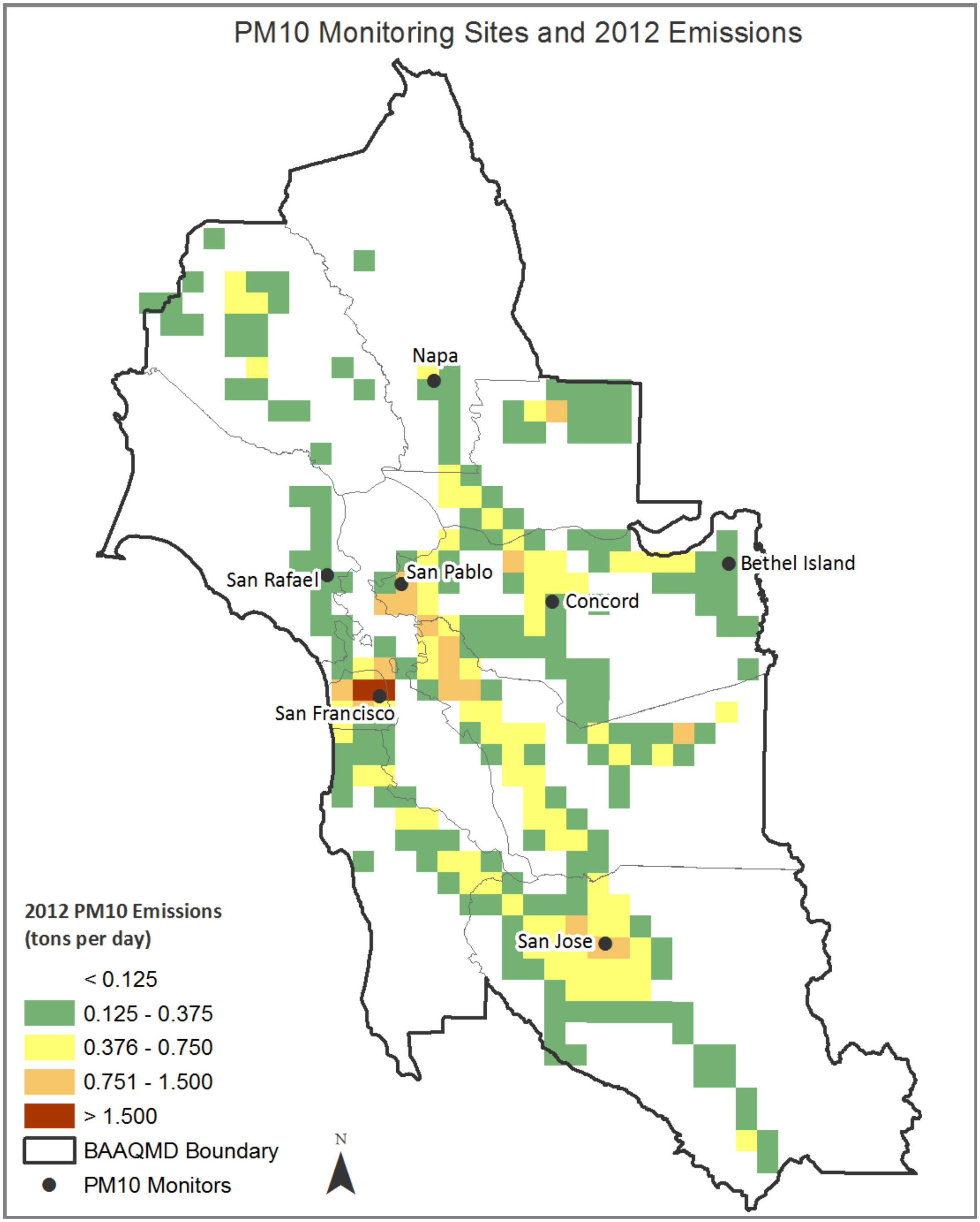


Figure 11. PM_{10} monitoring sites and 2012 emissions

Table 10 lists the stations currently measuring PM_{10} in the Bay Area along with monitoring and site types, and the maximum 24-hour value (µg/m^3) from 2012-14 for each site. The last column rates the importance of the data measured at the site in meeting the Air District and EPA monitoring objectives.

The Air District operates one PM_{10} monitor in Napa County. There is no requirement for PM_{10} monitoring in Napa County, and the concentrations are not particularly high, so it is rated as medium. Napa is rated medium (rather than low) because it is the only sampler operated by the Air District in Sonoma, Napa, and Solano Counties which generally have more emissions from agricultural burning. Additionally, the Napa Valley has extensive vineyards which are periodically pruned and then burned in piles. This site also has a collocated PM_{10} sampler for Quality Assurance purposes, but with PM_{10} levels so low, the collocated sampler may be located at any SLAMS site.

Two PM_{10} monitors are required for the San Jose-Sunnyvale-Santa Clara CBSA. One monitor is operated by the Monterey Bay Unified APCD in San Benito County. The second is at the San Jose Jackson site. It is used to derive PM coarse measurements, which can be calculated by subtracting $PM_{2.5}$ concentrations from PM_{10} concentrations and is required by the NCore program. Consequently, the San Jose Jackson PM_{10} monitor is rated high.

PM_{10} air monitoring was reassessed by the Air District in 2013 with low value placed on monitors at Bethel Island, Concord, and San Francisco because their maximum values were quite low. PM_{10} monitoring at these sites was being considered for total discontinuation to free up resources for airport lead and near-road monitoring programs but in the end the sites were maintained but sample frequency reduced. This assessment finds no reason to adjust previous assessments for these low value sites.

San Pablo is rated high because it is downwind of major emission areas near San Francisco and Oakland, and is also near the Chevron oil refinery where a 2012 explosion and fire stirred strong public interest in PM_{10} monitoring and the related filter analysis for multiple compounds.

Table 10. PM_{10} monitoring sites (SLAMS and SPM)

Station	County	Monitor Type	Site Type	Max 24 hour Value (µg/m^3) 2014	Assigned Value from Assessment
Bethel Island	Contra Costa	SPM	Background & Transport	57	Low
Concord	Contra Costa	SPM	Population Exposure	40	Low
San Pablo	Contra Costa	SLAMS	Population Exposure	44	High
San Rafael	Marin	SLAMS	Population Exposure	39	Low
Napa	Napa	SLAMS	Population Exposure Quality Assurance	37	Medium
San Francisco	San Francisco	SPM	Population Exposure	34	Low
San Jose Jackson	Santa Clara	SLAMS	Population Exposure (NCore)	56	High

$PM_{2.5}$

At the close of 2014, the Air District operated SLAMS $PM_{2.5}$ monitors at 15 sites in the Bay Area. There were no SPM monitors in the $PM_{2.5}$ network. All primary $PM_{2.5}$ monitors are continuous FEM-BAMs which record an hourly reading. The Air District operates a FRM $PM_{2.5}$ sampler at San Jose Jackson for quality assurance and support of the NCore program. This is a collocated monitor and it does not provide hourly readings. It is not counted toward meeting EPA minimum monitoring requirements for primary monitors but it is counted in meeting the EPA collocated monitoring requirements for quality assurance. A more complete discussion of collocation requirements is in the 2014 Air District Annual Network Plan.

The number of required $PM_{2.5}$ monitors for each CBSA in the Bay Area is determined by its population and design value, as specified in Table D-5 of Appendix D to 40 CFR Part 58. $PM_{2.5}$ design values are calculated concentrations (see footnotes in Table 11) used to determine the $PM_{2.5}$ attainment status of an area. Table 11 shows that the Air District monitoring network meets or exceeds the $PM_{2.5}$ minimum monitoring requirements.

Table 11. Minimum monitoring requirements for $PM_{2.5}$ SLAMS sites

CBSA	County	Pop. in millions 2010	Annual Design Value[1] (µg/m^3) 2012-14	24-hour Design Value[2] (µg/m^3) 2012-14	Monitors Required	Active Monitors
San Francisco-Oakland-Fremont	SF, San Mateo, Alameda, Marin, Contra Costa	4.32	9.8	27	2	9
San Jose-Sunnyvale-Santa Clara	Santa Clara, San Benito	1.84	10.0	30	3	4[3]
Santa Rosa-Petaluma	Sonoma	0.47	N/A[4]	N/A[4]	0	1
Vallejo-Fairfield	Solano	0.41	9.6	26	0	1
Napa	Napa	0.13	N/A[5]	N/A[5]	0	1

[1] Annual design values are calculated at each site by taking the 3-year mean (2012-2014) of the annual averages for each site. Design values at or below the national $PM_{2.5}$ annual standard of 12.0µg/m^3 indicate the area meets the standard.

[2] Daily design values are calculated by taking the 3-year mean (2012-2014) of the 98th percentiles for each site. Design values at or below the national $PM_{2.5}$ 24-hour standard of 35µg/m^3 meet the standard.

[3] One of the monitors is located in Hollister in San Benito County and is operated by the Monterey Bay Unified Air Pollution Control District.

[4] The Sebastopol site opened in January 2014, therefore design values cannot be calculated. However, Santa Rosa operated from 2009 to 2013 and met completeness requirements. The daily and annual design values for Santa Rosa were 22µg/m3 and 8.4µg/m3 respectively for 2011-13.

[5] There were no FRM or FEM $PM_{2.5}$ monitors in Napa County until December 2012. Therefore there are no annual or daily design values because three full years of data have yet to be completed. The two year average 98th percentile for daily values at Napa is 26µg/m3 and the two year annual average is 11.9µg/m3.

There are no monitoring agreements with the Monterey Bay Air Pollution Control Agency for $PM_{2.5}$ because the Bay Area meets the requirements with its own network. This is a recent change. In 2014, the San Jose Knox Avenue monitoring became operational, making the past monitoring agreement with Monterey Bay unneeded. Additionally, there are no monitoring agreements with the Northern Sonoma Air District because the Santa Rosa – Petaluma CBSA is not required to have any $PM_{2.5}$ monitors. There are no monitoring agreements with the Yolo-Solano Air District because the Vallejo – Fairfield CBSA is not required to have any $PM_{2.5}$ monitors. No additional monitors are required for the State Implementation Plan or Maintenance Plans.

Figure 12 shows the current Bay Area $PM_{2.5}$ monitoring stations. The stations are superimposed on a gridded $PM_{2.5}$ emission map. It shows that the stations are located in areas of high $PM_{2.5}$ emissions. All of the stations are population oriented, in addition to meeting other monitoring objectives. Additionally, the Air District plans to start monitoring $PM_{2.5}$ at a new near-road site in Dublin starting in late 2015. This site is not needed to meet EPA minimum monitoring requirements. This site is being installed at the request of the Air District's Board of Directors and is not shown in Figure 12 or Table 12.

Particulate concentrations have dropped significantly in the Bay Area since $PM_{2.5}$ monitoring began in 1999. The daily and annual $PM_{2.5}$ design value trend graphs are shown in Figure 13 and Figure 14. At the end of 2014, every $PM_{2.5}$ monitor in the Bay Area has design values below the national standards. The highest daily design value is 30 µg/m3 at the San Jose Jackson Street station which is located in the largest city in the Bay Area, with a population of 945,942 according to the 2010 census. Additionally, San Jose is located in the Santa Clara Valley, which tends to trap emissions and transported pollutants during winter particulate episodes. The second highest daily design value is 27 µg/m3 at Livermore, followed by Vallejo at 26 µg/m3. Vallejo and Livermore $PM_{2.5}$ air monitoring sites are located in areas that are subject to regional transport. Due to geography and seasonal weather patterns, both of these sites are frequently downwind of the Sacramento and San Joaquin Valleys, which are often heavily laden with particulates during winter months (November-February). A map of the Bay Area's daily $PM_{2.5}$ design value is shown in Figure 15.

The highest annual design value is 10.0 µg/m3 at San Jose Jackson, due to high population and its complex geography. The second highest annual design value is San Rafael at 9.8 µg/m3, which is primarily caused by light winds combined with wood burning, vehicular traffic, and surfaced-based inversions during winter. The third highest is 9.6 µg/m3 at Vallejo, which is related to regional transport. A map of the Bay Area's annual $PM_{2.5}$ design values is shown in Figure 16.

Table 12 lists the stations where $PM_{2.5}$ concentrations are measured in the Bay Area along with the monitoring objective and the $PM_{2.5}$ design value for each site. The last column rates the importance of the data measured at the site in meeting both the Air District's and EPA's monitoring objectives.

The Air District desires to operate at least one $PM_{2.5}$ monitor in each of the nine Bay Area counties. There are six counties with only one monitor: Napa, Marin, San Francisco, San

Mateo, Solano, and Sonoma. All monitors in those counties are rated high because they are the only monitors in those counties.

Alameda County has four monitoring sites. Livermore is rated high because the site is impacted by transport from the San Joaquin Valley and is one of the first sites to detect this transport for the Bay Area. Oakland West is rated high because it is near the Port of Oakland and is a source oriented site. Laney College is rated high because it is an EPA required near-road monitoring site. Oakland is rated low because Laney College and the Oakland West site adequate characterize the pollutant levels in the Oakland area.

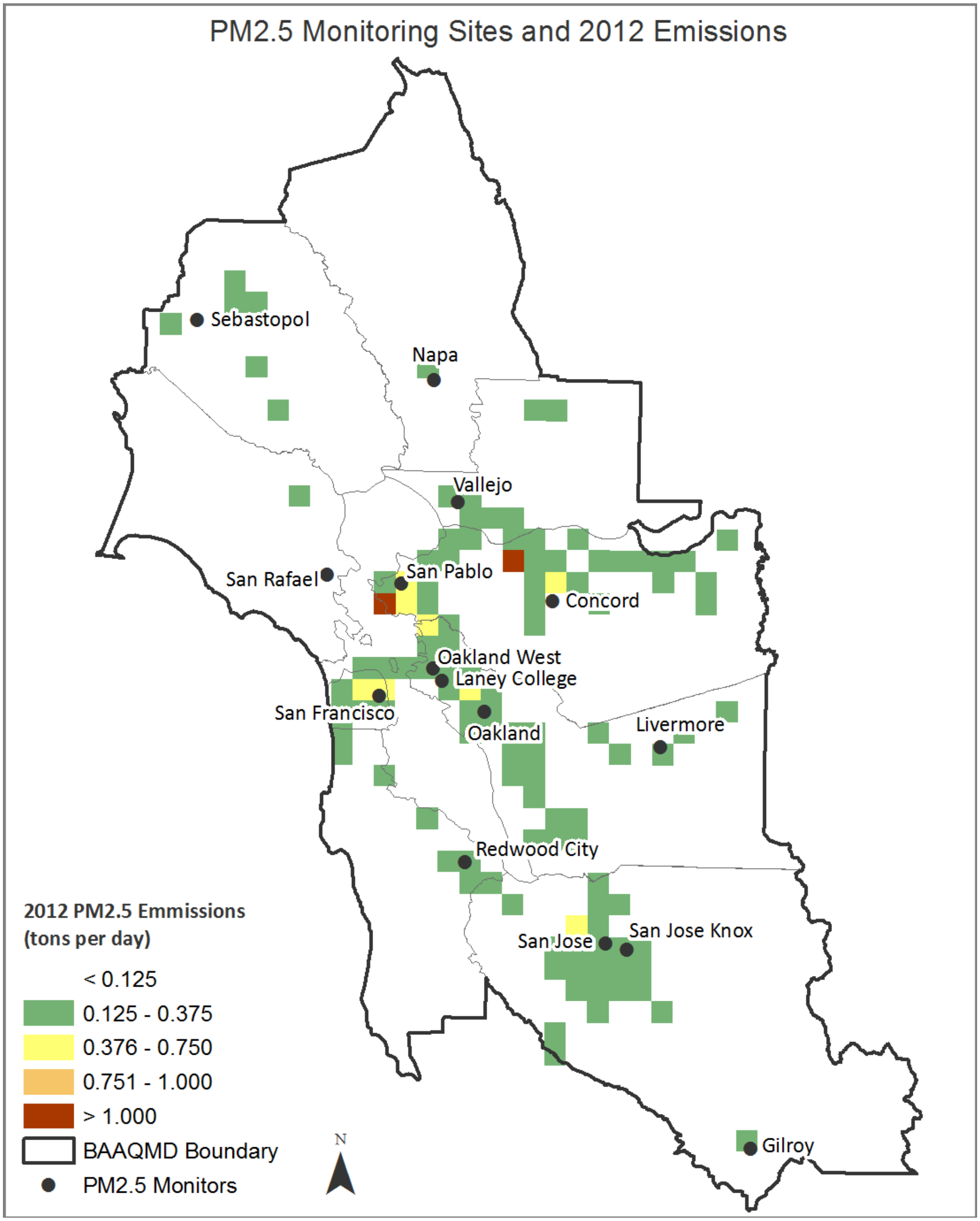


Figure 12. $PM_{2.5}$ monitoring sites and 2012 emissions

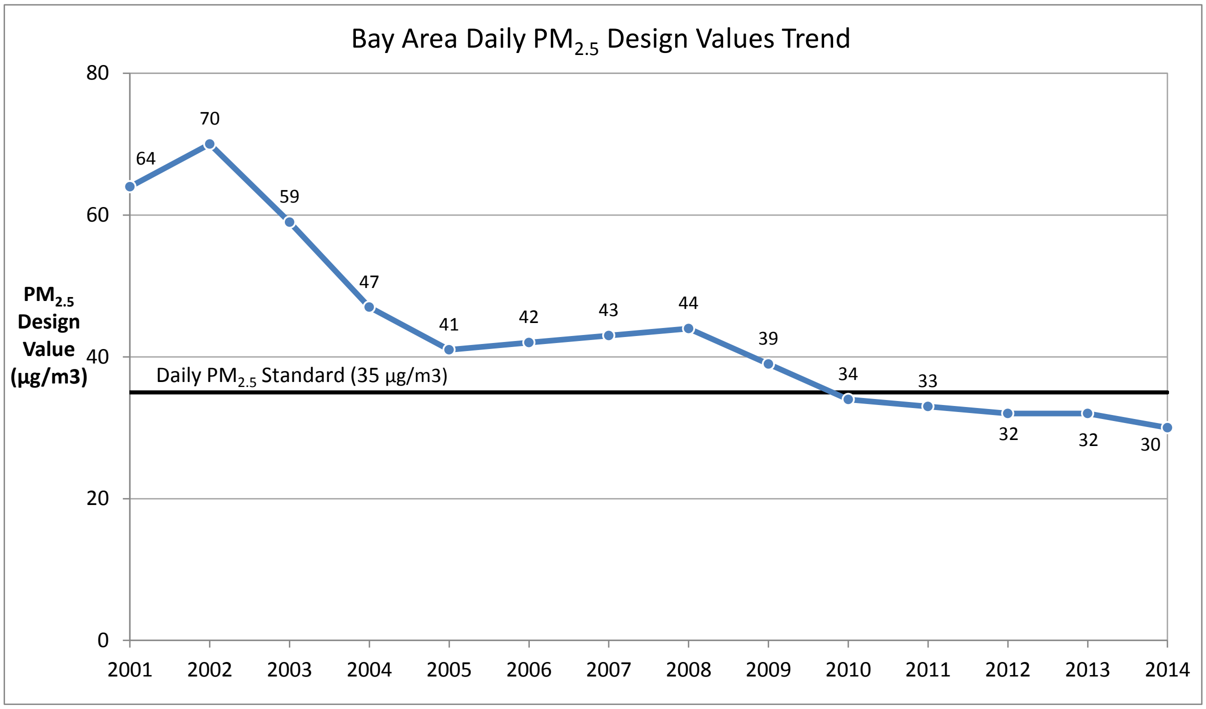


Figure 13. Bay Area daily $PM_{2.5}$ design values trend (2001 through 2014)

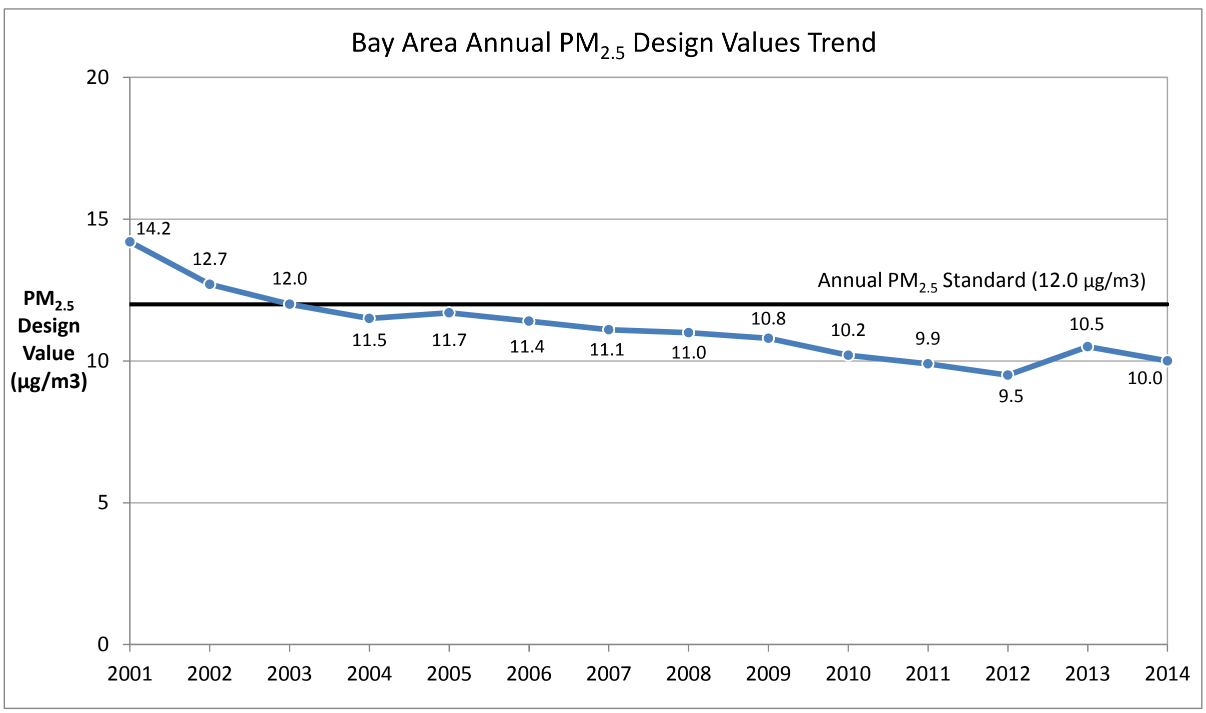
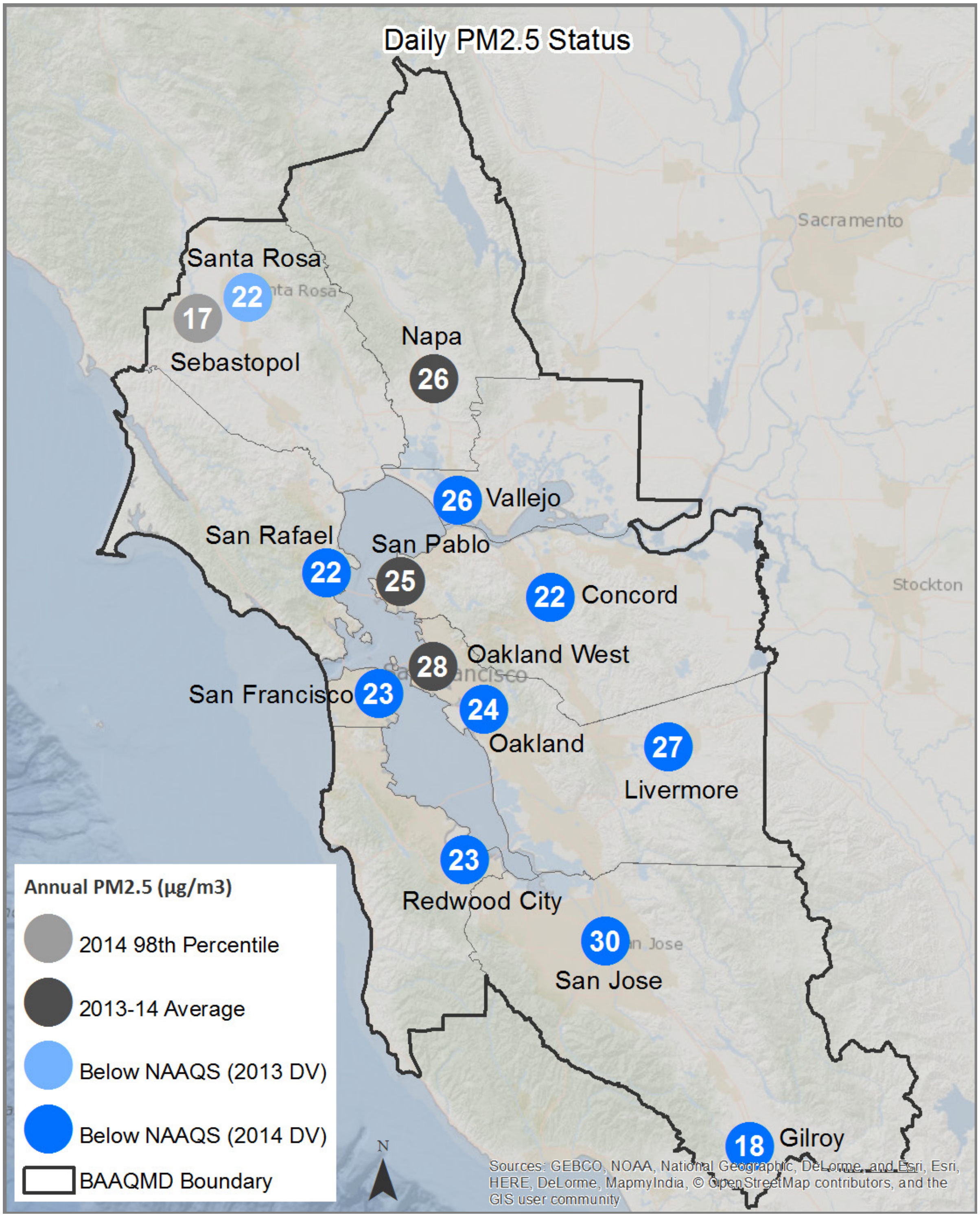
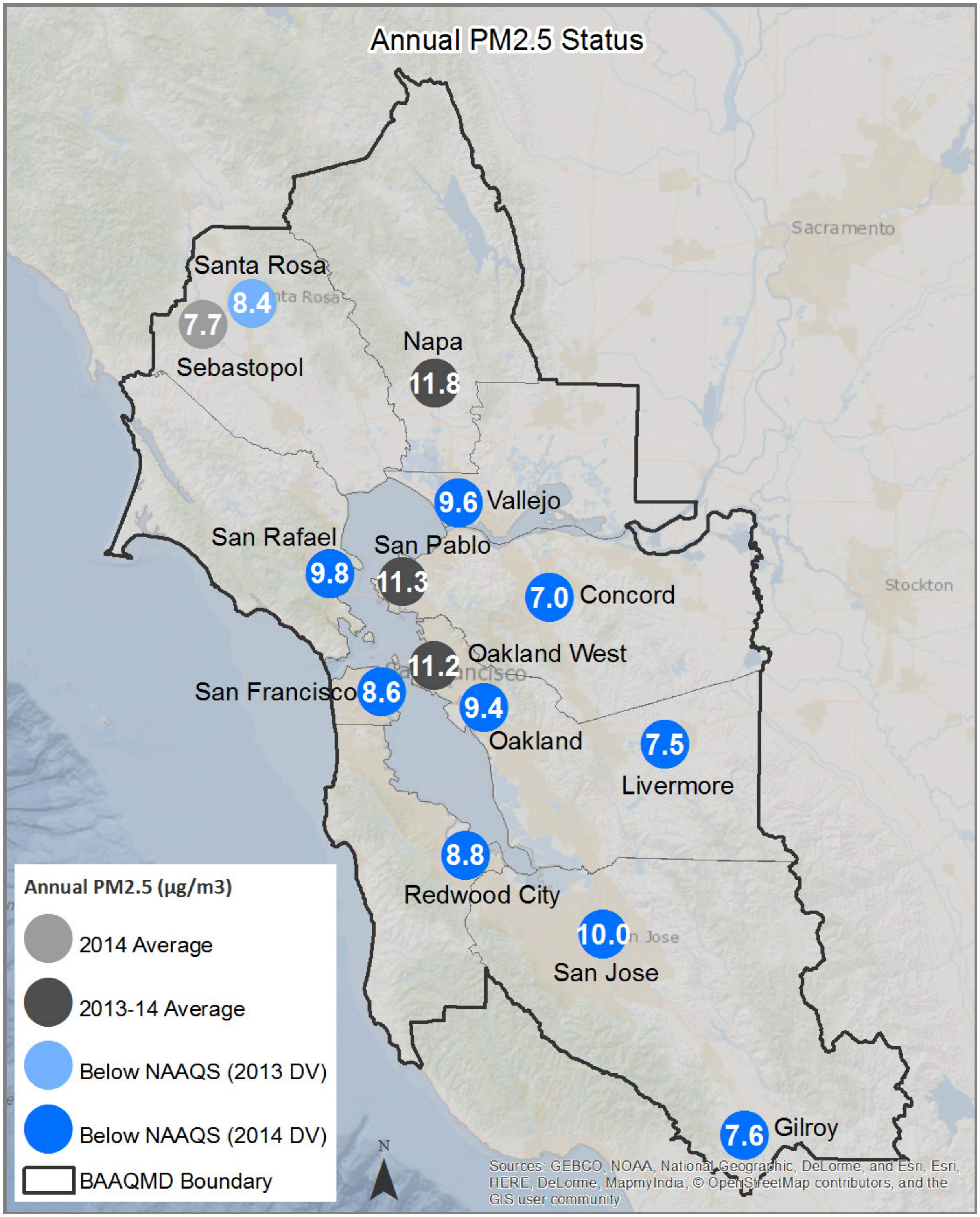


Figure 14. Bay Area annual $PM_{2.5}$ design values trend (2001 through 2014)



Note: (a) The Santa Rosa site was closed in December 2013 and its 2013 design value is shown to provide a reference for particulate concentration in Sonoma County. (b) The Sebastopol site was opened in January 2014 and replaced the Santa Rosa site. Therefore, only the 2014 98th percentile can be provided. (c) FEM $PM_{2.5}$ monitoring began at Napa, Oakland West and San Pablo in December 2012. Therefore, only 2013-2014 average of the 98th percentiles is provided.

Figure 15. Spatial pattern for the 2014 daily $PM_{2.5}$ design values



Note: (a) The Santa Rosa site was closed in December 2013 and its 2013 design value is shown to provide a reference for particulate concentration in Sonoma County. (b) The Sebastopol site was opened in January 2014 and replaced the Santa Rosa site. Therefore, only the 2014 98th percentile can be provided. (c) FEM $PM_{2.5}$ monitoring began at Napa, Oakland West and San Pablo in December 2012. Therefore, only 2013-2014 average of the 98th percentiles are provided.

Figure 16. Spatial pattern for the 2014 annual $PM_{2.5}$ design values

Contra Costa County has two $PM_{2.5}$ monitors and both are rated high. Concord is rated high because it is geographically separated from all other monitors and is a major population area. San Pablo is rated high because of public concern of pollution from nearby oil refineries.

Santa Clara County is part of the San Jose-Sunnyvale-San Benito CBSA which is required to operate three monitors. The Air District operates three $PM_{2.5}$ monitors in Santa Clara County and Monterey Bay Air District operates one in San Benito County. The San Jose Jackson monitor is in the largest city in the Bay Area and is needed to support the NCore program, so it is rated high. The monitor at San Jose Knox Avenue is part of the EPA near-road monitoring program and is therefore rated high. The monitor in Gilroy is rated low because measurements show this location to be well below national standards and the lowest in the entire Bay Area. Some redirecting of resources is possible by discontinuing monitoring in Gilroy and moving $PM_{2.5}$ monitoring five miles north to San Martin to see if it is more of a hot-spot.

Table 12. SLAMS $PM_{2.5}$ monitoring sites

Station	County	Site Type	24-hour Design Value[1] (µg/m3)	Annual Design Value[2] (µg/m3)	Assigned Value from Assessment
Laney College	Alameda	Population Exposure Source Oriented (near-road)	N/A[3]	N/A[3]	High
Livermore	Alameda	Population Exposure	27	7.5	High
Oakland	Alameda	Population Exposure	24	9.4	Low
Oakland West	Alameda	Population Exposure Source Oriented	N/A[3]	N/A[3]	High
Concord	Contra Costa	Population Exposure	22	7.0	High
San Pablo	Contra Costa	Population Exposure	N/A[3]	N/A[3]	High
San Rafael	Marin	Population Exposure	22	9.8	High
Napa	Napa	Population Exposure	N/A[3]	N/A[3]	High
San Francisco	San Francisco	Population Exposure	23	8.6	High
Redwood City	San Mateo	Population Exposure	23	8.8	High
Gilroy	Santa Clara	Population Exposure	18	7.6	Low
San Jose Jackson	Santa Clara	Population Exposure (NCore)	30	10.0	High
San Jose Knox	Santa Clara	Population Exposure Source Oriented (near-road)	N/A[3]	N/A[3]	High
Vallejo	Solano	Population Exposure	26	9.6	High
Sebastopol	Sonoma	Population Exposure	N/A[3]	N/A[3]	High

[1] Design values at or below the national $PM_{2.5}$ standard of $35\mu g/m^3$ meet the standard.
[2] Design values at or below the national $PM_{2.5}$ annual standard of $12.0\mu g/m^3$ indicate the area meets the standard.
[3] The $PM_{2.5}$ monitors with N/A for design values have less than three years of data, which is inadequate to calculate design values.

Location of maximum concentration in the San Francisco – Oakland – Fremont CBSA

The Air District operates nine $PM_{2.5}$ FEM BAM monitors in the San Francisco – Oakland – Fremont CBSA and eight of the monitors are population oriented while representing area-wide concentrations. One additional monitor operates at Laney College measuring microscale near-road concentrations. The Laney College monitoring data appears to be representative of area-wide concentrations found in the Oakland area (see Appendix A). While the EPA only requires three monitors in the CBSA (two area-wide monitors and one near-road monitor for 2015) the Air District operates nine monitors (eight at neighborhood or greater scale and one near-road monitor). EPA Region 9 is not satisfied that the nine active monitors are capturing the maximum concentration in the CBSA due to the predominance of wood smoke in the Marin County portion of the CBSA during the winter as many of the homes in Western Marin County do not have gas or electricity service, and rely on wood burning as their sole source of heat.

Marin County is somewhat unique in the San Francisco Bay Area because of its relatively high coastal mountains and complex terrain. The county is bounded by the Pacific Ocean to the west and San Pablo Bay to the east. The county has high steep terrain along its central spine, generally running south to north. It is within the hilly and complex terrain away from the coast and bay that wood smoke is prone to become trapped during winter because vertical mixing depths are frequently low in winter and many of the populated regions are in wind sheltered valleys. Further complicating the air pollution issue is that many homes in the sheltered valleys of Marin County do not have natural gas service and wood burning is the sole source of heat for these homes.

In order to meet EPA requirements to monitor within the CBSA at the location of maximum $PM_{2.5}$ concentration, the Air District relies extensively on public smoke complaints as well as visual observations from its Compliance and Enforcement (C&E) staff. Because it is monetarily not practical to deploy the estimated twenty to *thirty* $PM_{2.5}$ monitors to cover every part of the CBSA which *may* have the maximum concentration on any given day, the Air District has had to rely on human monitoring information to narrow down this ill-defined location (that is, the sole location with the maximum concentration where monitoring is required by EPA guidance and regulations).

Part of the issue with EPA guidance is in defining what is meant by maximum concentration. It could mean the highest one-hour average for a year, or perhaps the location with the highest daily average for a year, or the location with the highest design value (either annual or daily). Nonetheless, based on the Air District's internal observations and records, Forest Knolls was identified as potentially having the highest concentration within the complex terrain regions of Marin County (and the San Francisco – Oakland – Fremont CBSA), or if it is not the location with the highest concentration, it would be representative of many locations with similar complex mountain/valley terrain in the county and CBSA during the winter.

Forest Knolls is not significantly impacted by car or truck emissions (see Appendix B). Therefore, this area was chosen to be monitored so the Air District could measure wood smoke without having other source categories interfere with the measurements.

Additionally, the Air District concluded that the San Rafael monitoring site would continue to monitor $PM_{2.5}$ to measure the sum total of all other source categories, in addition to wood smoke. San Rafael has been a monitoring site for $PM_{2.5}$ since 2009, and a trend site in Marin County was desired, so there was no consideration given to closing the $PM_{2.5}$ monitor at San Rafael and moving it to Forest Knolls. Monitoring for wood smoke (Black Carbon) began in 2013 using an Aethalometer in Forest Knolls.

As an illustration of the variability in $PM_{2.5}$ concentrations in the complex terrain of Marin County, Sonoma Technology, Inc. (STI) monitored $PM_{2.5}$ at two locations in Marin County between November 2010 and February 2011. STI then compared the $PM_{2.5}$ daily averaged data with those from the Air District monitoring site in San Rafael. A summary of the study is included in Appendix C.

The results of the STI study showed that $PM_{2.5}$ concentrations in San Anselmo were lower than those at San Rafael. However, $PM_{2.5}$ was higher in Woodacre than in San Rafael or in San Anselmo and no station was well correlated with another station. This is exactly the problem with identifying the location of maximum concentration – there is no day to day, week to week, or year to year consistency in making such a determination using stationary measurement methods. Because the study was only conducted for one winter, there is some question about whether the results of the study would be similar in subsequent years or whether they were unique to that year insofar as assessing which of the three sites has the "maximum concentration" as required by EPA regulations. As is well known, wood smoke concentrations are significantly impacted by just a single neighborhood "burner" moving out ofan area, or a new "burner" moving into an area.

Another study was conducted jointly by the Air District and STI in Sonoma County between November 22, 2013 and February 7, 2014. Sonoma County is adjacent to Marin County but has much less complex terrain. In this study, five $PM_{2.5}$ monitors were deployed in and around Santa Rosa, the most populated city in Sonoma County, as shown in Figure 17 and Figure 18, below.

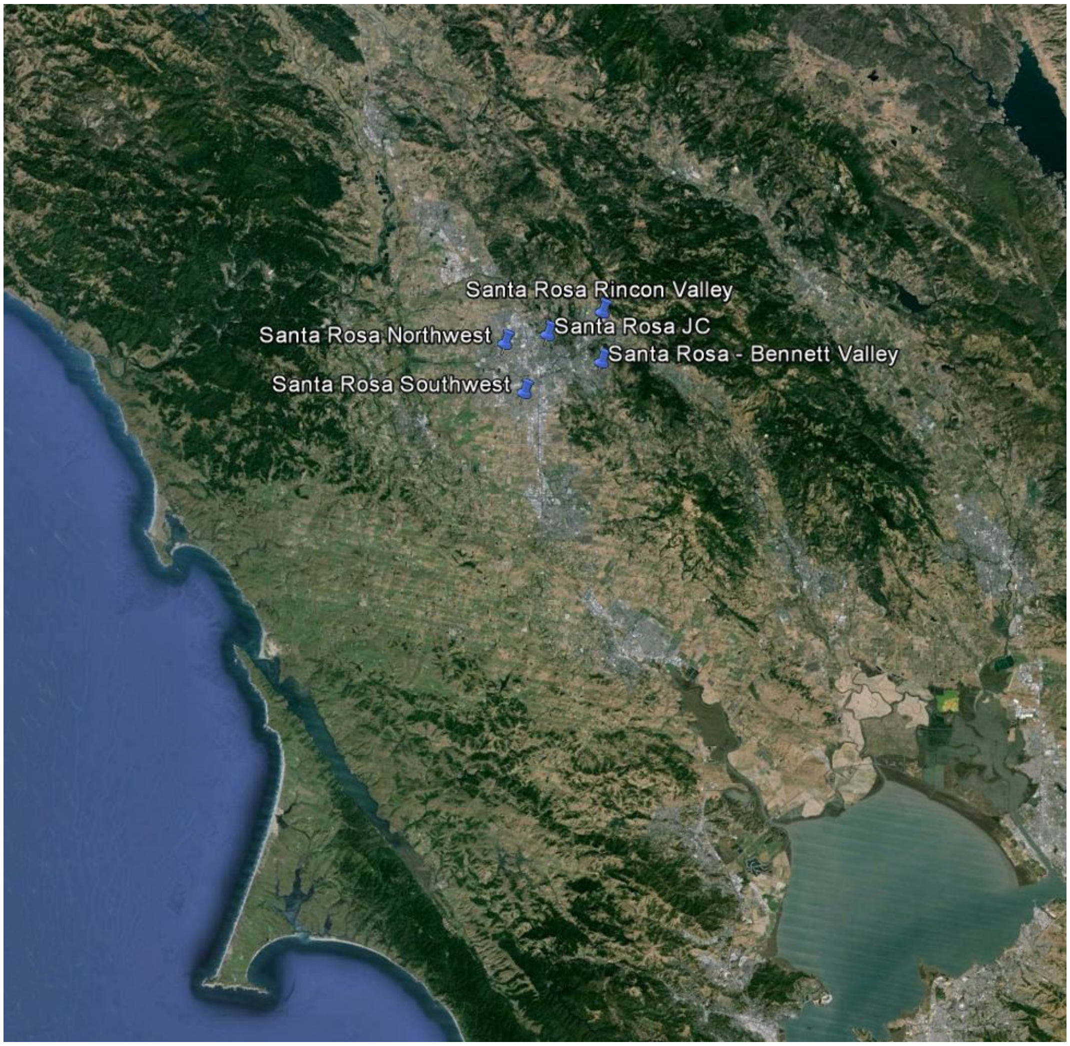


Figure 17. Locations of PM2.5 monitors during Air District/STI study.

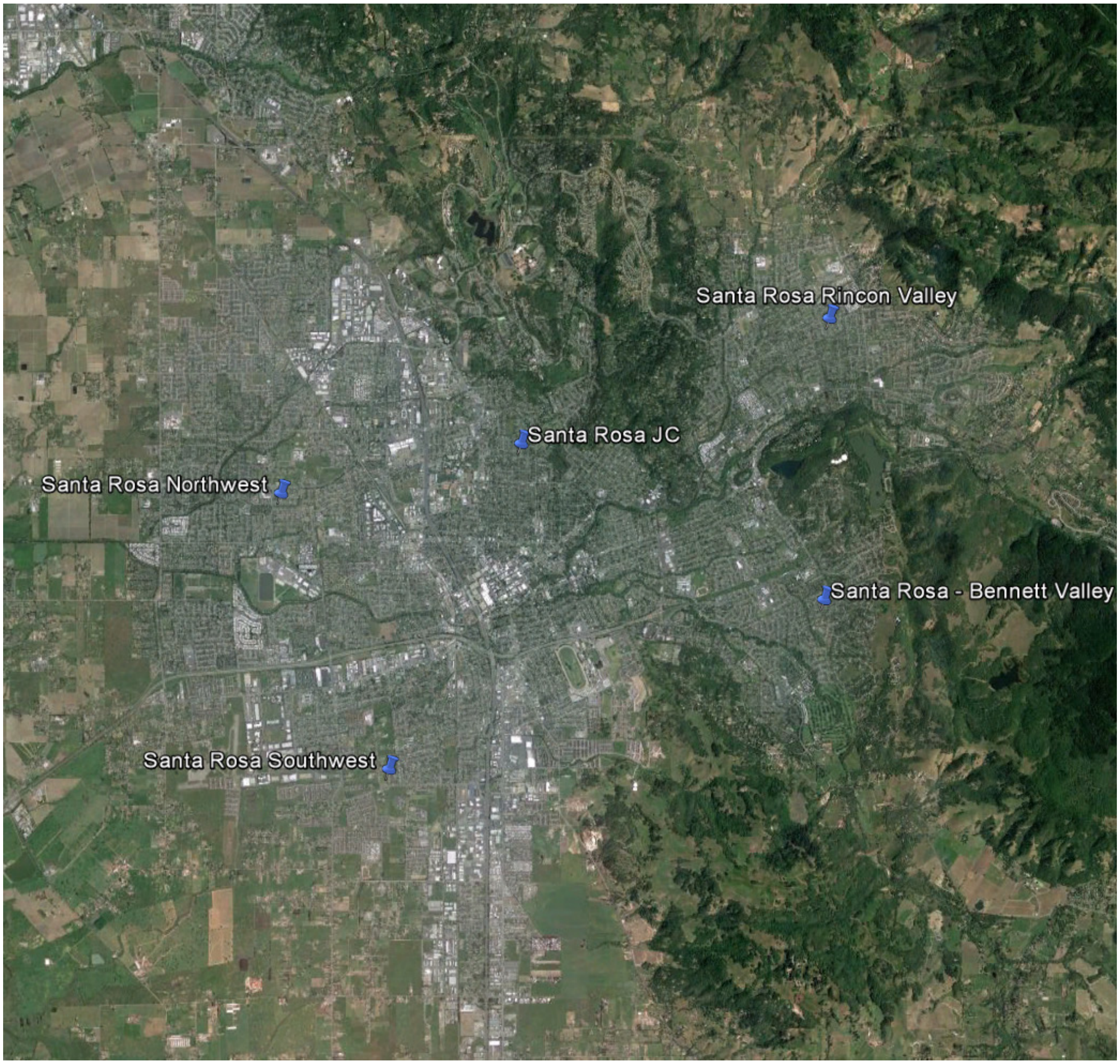


Figure 18. Locations of PM2.5 monitors during Air District/STI study.

The results of this study showed two sites in the west side of the city to have consistently higher values than sites to the east of the core. What is not known is whether the small sample size is representative of what longer term observations would show or if the primary source of the wood smoke was just several “heavy” wood burners.

The Air District recognizes the need to protect public health in the wind sheltered regions of Marin County and in all regions of the Bay Area. While the Air District acknowledges that winter time wood smoke is a major health concern, we do not feel that more monitoring is the solution. Instead, the Air District has been seeking a broad range of solutions to address the impacts from wood smoke during winter.

Spare the Air (20% risk)

To protect public health and reduce the adverse impacts from wood smoke during winter, the Air District makes wood burning illegal when meteorological conditions suggest that $PM_{2.5}$ may reach the Unhealthy for Sensitive Groups (USG) AQI category. Recognizing that $PM_{2.5}$ accumulates in different areas from day to day, and is highly variable within complex mountain /valley terrain, burn bans are issued when there is a 20% risk of reaching the USG AQI category anywhere in the Bay Area, including remote areas where monitoring is not occurring. This highly conservative approach has been implemented since the winter of 2012-13 to account for the spatial variability in $PM_{2.5}$ concentrations from hour to hour and from day to day. The location of maximum concentration is not a fixed and steady location, but varies from day to day throughout the Bay Area, so the 20% risk threshold was implemented to ensure an adequate margin of safety keeping in mind the actual $PM_{2.5}$ level will vary by the number of burners in a neighborhood as well as the duration of their burning. In a perfect world, there would be no burners when a burn ban is in effect, by the reality is otherwise. Additionally, there are provisions in Air District regulations to allow burning when the sole source of heat is from wood burning.

Wood Smoke Burn Ban Enforcement

To ensure burn ban restrictions are enforced the Air District fines individuals who are confirmed to be burning while a burn ban is in effect. First-time violators are encouraged to take a Wood Smoke Awareness course to learn more about the health impacts from wood smoke. Those who choose not to take the course receive a $100 ticket. Second-time violators receive a $500 ticket, with tickets amounts increasing for subsequent violations.

During the winter of 2014-15 (defined as November 1 through February 28) the Air District received a total of 3,739 wood smoke complaints from residents, and most were from Marin County. A total of 155 tickets were issued to residents who were observed to be in violation of the Wood Burning Rule. Preliminary survey data indicates that the Wood Burning Rule is an effective instrument for reducing particulates from wood smoke. Despite 23 burn ban days, 30% of Bay Area residents indicated they are burning less wood even on days when an alert has not been issued. Surveys also indicated that 75 percent of Bay Area residents support the Air District's Wood Burning Rule.

Winter 2014-15 (Total # complaints = 3739)

Complaints by County

Alameda – 499
Contra Costa – 576
Marin – **865 (most of all counties)**
Napa – 123
San Francisco – 85
San Mateo – 423
Santa Clara – 521
Solano – 94
Sonoma – 521
No county indicated – 32

Complaints by CBSA

San Francisco – Oakland – Fremont – **2448 (most of all CBSAs)**
San Jose – Sunnyvale – Santa Clara – 521
Vallejo – Fairfield – 94
Napa – 123
Santa Rosa – Petaluma – 521
No CBSA indicated – 32

Lead

At the close of 2014, the Air District operated three lead samplers. The San Jose Jackson site samples lead from the PM_{10} filter as required for the NCore program. The EPA has additional requirements which are stated in 40 CFR Part 58, Appendix D Section 4.5. In short, EPA requires lead monitoring near sources expected to contribute to a maximum lead concentration in ambient air in excess of the NAAQS. In the Bay Area there are no sources meeting this criteria according to the latest National Emissions Inventory (NEI). However, additional sections of 40 CFR do require source oriented monitoring near three airports in the Bay Area (Palo Alto, San Carlos, and Reid-Hillview) because emissions from piston engine aircraft using leaded fuel may approach 0.50 tons per year (one half of the NAAQS).

The San Carlos Airport I site operated from March 2012 to September 2013, but had to be closed due to expiration of the lease and the owner would not renew it. A new San Carlos Airport lead monitoring site (San Carlos Airport II) opened on March 25, 2015 and is about 120 meters southeast of the old site.

The Palo Alto Airport site operated from February 3, 2012 through December 19, 2014. This site had to be closed because of an FAA review of the airport operations found the sampler was not properly located to comply with FAA regulations. The review was triggered by an ownership transfer from Santa Clara County to the City of Palo Alto.

As of late June 2015, a new site has not been determined for Palo Alto airport, and it is possible that one will never be located on the airport property.

All airport lead monitors are rated high value because these airports are specifically named for lead monitoring in the regulations. Lead monitoring at San Jose Jackson is also rated high because it is required for the NCore program.

Table 13. Source-oriented airport lead monitoring sites in July 2015

Source Name	Monitors Required	Monitors Active	Monitors Needed
San Carlos Airport	1	1	0
Palo Alto Airport	1	0	1
Reid-Hillview Airport	1	1	0

Table 13. Source-oriented NCore lead monitoring site in July 2015

NCore Site	CBSA	Pop. 2010 Census	Monitors Required	Monitors Active	Monitors Needed
San Jose Jackson	San Jose-Sunnyvale-Santa Clara	1,836,911	1	1	0

Summary

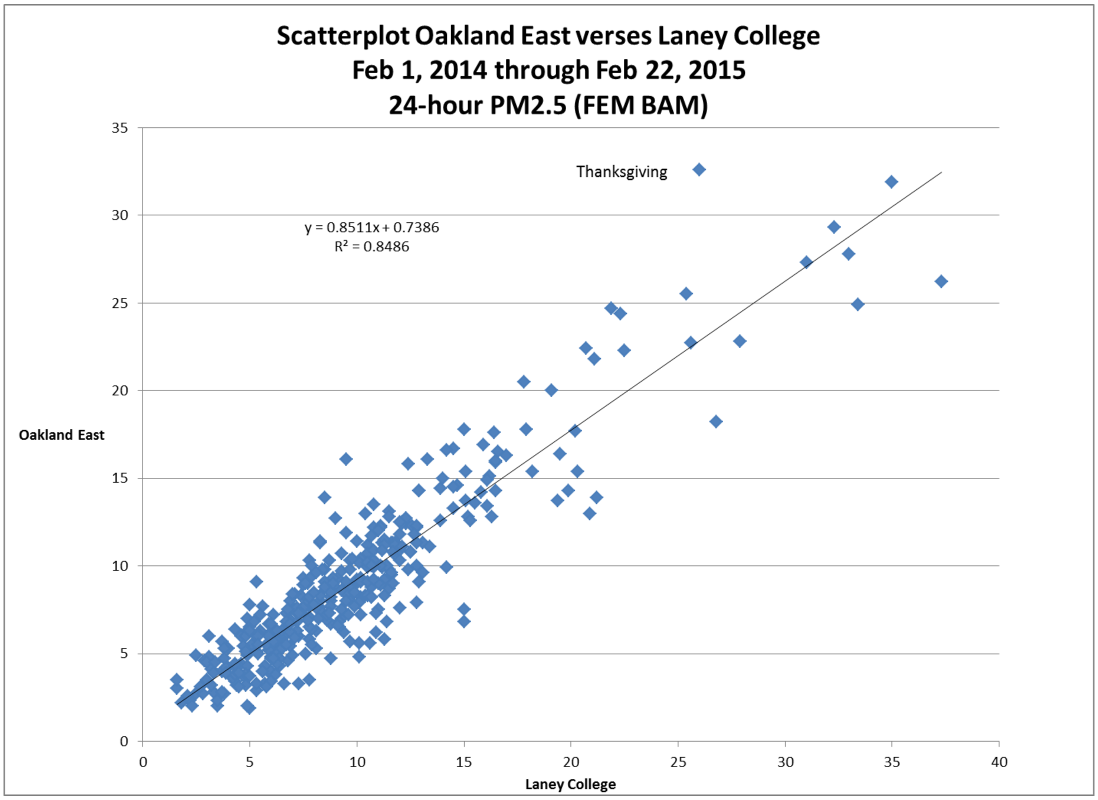
The purpose of this assessment is to rate the effectiveness of each monitor in the Bay Area Air Quality Management District's air monitoring network in meeting the monitoring objectives defined in 40 CFR, Part 58 Appendix D, and the local objectives of the Bay Area Air Quality Management District. This assessment also determines whether new monitors or sites are needed and if monitors or sites may be discontinued to free up resources for alternative monitoring efforts, and to assess if new technologies for monitoring should be deployed.

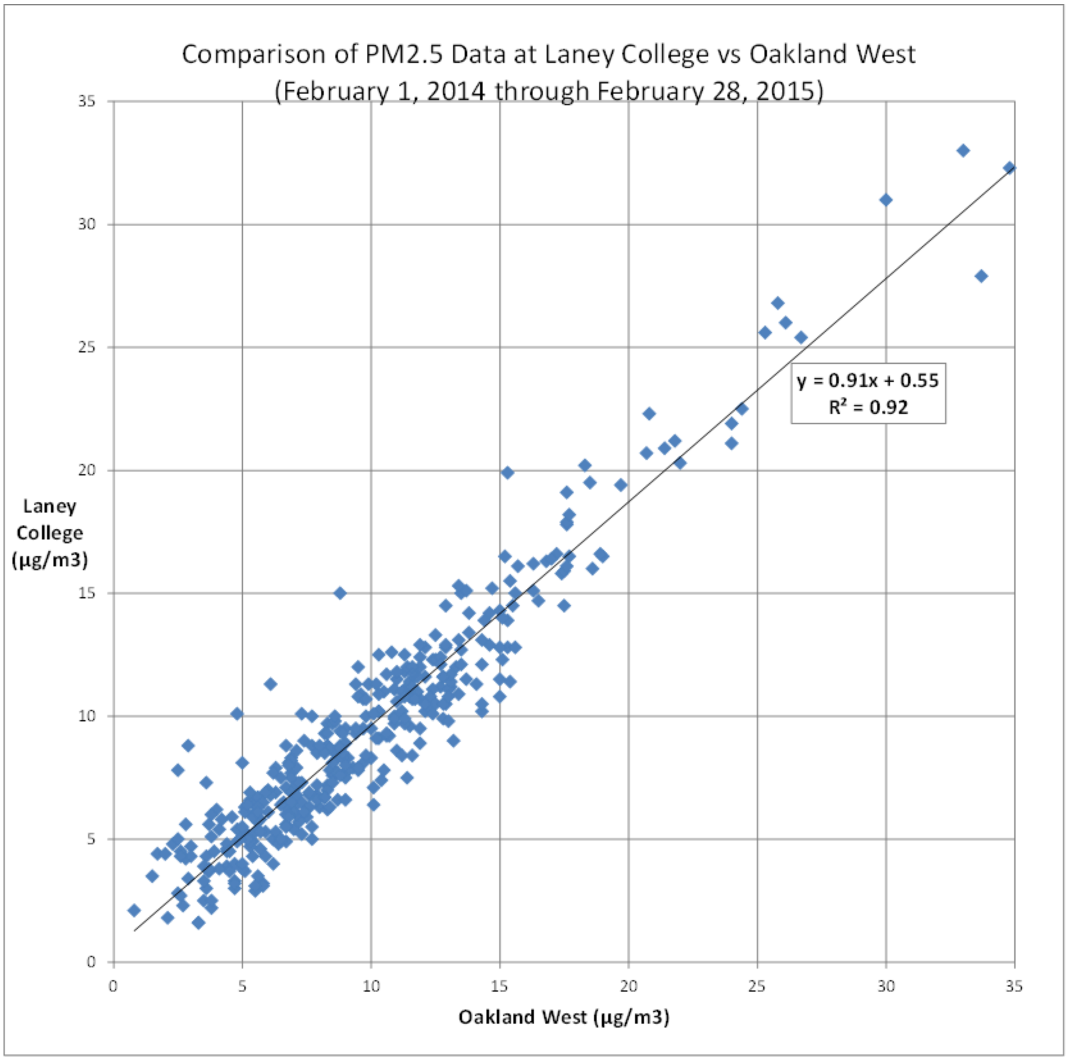
Table 14. Assessment ratings of monitors

Station	CO	Ozone	NO_2	SO_2	PM_{10}	$PM_{2.5}$
Bethel Island	Low	High		Low	Low	
Hayward		Low				
Livermore		High	High			High
Oakland	Low	Low	Low			Low
Oakland West	High	Low	High	High		High
Laney College	Low		High			High
Concord	Low	High		High	Low	High
Patterson Pass			Low			
Crockett				High		
Martinez				High		
Richmond 7th				High		
San Pablo	Low	Low	Low	High	High	High
San Ramon		Low	Low			
San Rafael	Low	High	Medium		Low	High
Napa	Low	High	Medium		Medium	High
San Francisco	Low	High	Medium		Low	High
Redwood City	Low	High	Medium			High
Gilroy		Low				Low
Los Gatos		Medium				
San Jose Jackson	High	High	High	High	High	High
San Jose Knox	High		High			High
San Martin		High				
Fairfield		Low				
Vallejo	Low	High	Medium	High		High
Sebastopol	Low	High	Medium			High

Appendices A through C

Appendix A. Laney College monitoring data.




Comparison of PM2.5 Data at Laney College vs Oakland West
(February 1, 2014 through February 28, 2015)
Laney College (µg/m3)
Oakland West (µg/m3)
y = 0.91x + 0.55
R² = 0.92
0
5
10
15
20
25
30
35

Appendix B. Forest Knolls aethalometer study.

Analysis of Forest Knolls aethalometer data

There are concerns that wintertime wood burning leads to unhealthy PM levels in the San Geronimo Valley. In response to these concerns, the District has operated an aethalometer at Forest Knolls since January, 2013.

An Aethalometer measures the absorption of a wavelength of light that is particularly sensitive to carbon particles. Thus, although the measurements don't provide a measurement of the total fine particle concentration, they do provide information on carbonaceous particles. Both woodsmoke and tailpipe emissions are largely carbon, and largely in the fine fraction (mostly < 2.5 microns in diameter), so that it is possible to estimate the contribution to $PM_{2.5}$ concentrations from these sources.

This analysis:

1. Establishes that a very high fraction of the Forest Knolls aethalometer readings derive from wood burning rather than other sources, and

2. Develops a function that relates the aethalometer readings to woodsmoke concentrations, and apply this function for Forest Knolls.

We conclude that woodsmoke does significantly impact this area, raising wintertime mean $PM_{2.5}$ concentrations as high or higher than urban sites, and causing $PM_{2.5}$ to exceed the national 24-hour standard on some days.

Data

The District has operated aethalometers at several sites, with measurements on an hourly basis. Besides Forest Knolls, the sites with a substantial data record are San Jose, Livermore, and West Oakland. Other measurements are made at these same sites that allow us to estimate woodsmoke, diesel and gasoline PM concentrations. More specifically, 24-hour filter samples are collected at these sites on a regular basis. A range of species is measured, including elements with atomic weights of aluminum and higher, certain ions, and elemental and organic carbon. Table 1 presents information about the measurements available at each site.

Table 1.

	Aethalometer			Speciated Filters		
Site	Start	Most Recent	# of obs'ns.	Start	Most Recent	# of obs'ns*
Forest Knolls	2013-07-30	present	817			
Livermore	2011-04-	present	1,722	2008-09-	2013-06-	130

	22			03	27	
Oakland West	2009-02-27	present	1,018	2009-02-12	2013-06-27	227
San Jose	2009-01-01	2011-04-04	373	2009-01-01	2013-09-10	172

* # of observations with corresponding aethalometer measurements on same day.

In addition to aethalometer measurements, the District has conducted wintertime wood burning surveys of Bay Area residents, with approximately 13,000 responses between the winters of 2005-06 and 2012-13. Respondents' zip code of residence is known, and they are asked if they'd burned the day before and how many hours they typically burn.

Also available are Census data on households and the fraction of households using wood for fuel. These were obtained down to the block group level from the 5-year aggregated American Community Survey 2008-2012 (Census 2014). The fuel use data were combined with the latitude & longitude interior points for each Census block group.

Estimated wood burning in neighborhood of site

Table 2 presents information on wood burning in the neighborhood of the four sites. Forest Knolls has only one tenth as many households as the other sites. But the fraction of those households using wood for fuel is much higher because the Forest Knolls area does not have natural gas service. A much higher percentage of Forest Knolls residents burn on a given winter night and they tend to burn much longer, again because they are generally burning to heat rather than for ambiance.

The last column combines the information on the number of households and the amount burned. It provides a rough measure of the amount of woodsmoke that may be present in the air around the sites. The take-away is that the air around the Forest Knolls site may have a substantial amount of woodsmoke even though the population density is low.

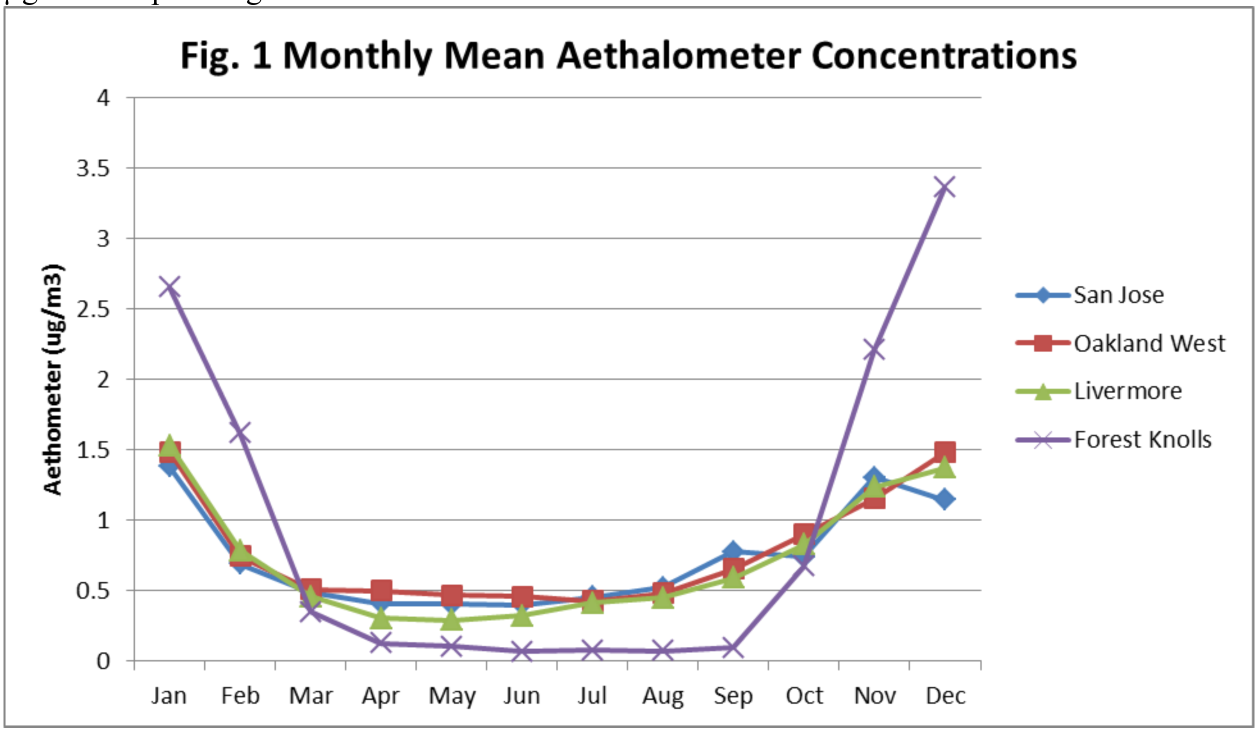
Table 2.

Site	# households within 1 mile	% using wood for fuel	% burning per winter night	Average hours burned	Wood burning hours/night*
San Jose	9,787	0.2%	3.1%	0.8	226
Livermore	6,593	1.3%	12.4%	1.9	1,524
Oakland West	13,414	0.6%	2.9%	0.8	291
Forest Knolls	786	18.6%	30.0%	5.2	1,233

* Estimated number of household-wood burning hours = hhs x fraction burning x Ave. hrs burned.

Sources of aethalometer readings

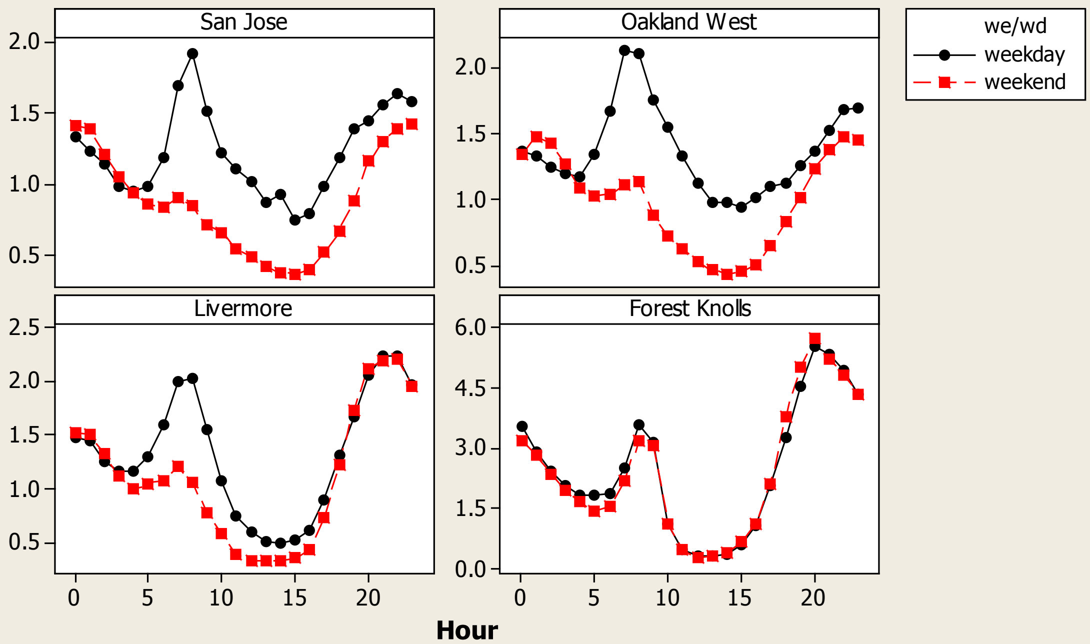
The main sources of carbonaceous particles in the Bay Area are wood smoke, diesel exhaust, gasoline exhaust, and cooking (Fairley 2012). These sources vary by time of day, day of week, and season. Figure 1 shows mean aethalometer concentrations at the four sites by month. The three urban sites show a very similar pattern, with means between 1.0 and 1.5 µg/m3 in January, November and December and 0.3 to 0.5 µg/m3 in April through August. Forest Knolls shows a quite different pattern – much higher in the winter, and close to 0 µg/m3 in April-August.



The three urban sites are surrounded by busy city streets and are within a mile of major freeways. Forest Knolls, in contrast, is near roads with much less traffic and has no freeway nearby.

Figure 2 shows winter (Jan, Feb, Nov, and Dec) weekday and weekend mean aethalometer concentrations by hour for each of the four sites. All sites show an evening peak and a secondary peak around 8 am.

Fig 2. Winter Aethalometer Means by Hour - Weekend vs. Weekday



For the urban sites, the 8 am peak is high on weekdays and barely noticeable on weekends. In contrast, the Forest Knolls 8 am peak is almost as high on weekends and weekdays. Also, its weekday 8 am peak is considerably lower than its evening peak, unlike the other sites.

Forest Knolls sits in the San Geronimo Valley, which is distinctive in having no natural gas service; a large fraction of homes use wood for heating. It seems reasonable that its 8 am peak derives mainly from residents stoking up their woodstoves rather than from commuting.

Estimated wood burning contribution to Forest Knolls $PM_{2.5}$

The urban sites above have all had speciated samples that overlap with aethalometer readings, as shown in Table 1. Chemical Mass Balance (CMB) analysis was performed for some of these data (Fairley 2012), and was augmented for the present study using the same software to include more recently collected measurements. The CMB analysis provides estimates of the contributions of woodsmoke and motor vehicle exhaust to 24-hour $PM_{2.5}$. Figure 3 shows the relation of these estimated woodsmoke values to 24-hour averaged aethalometer measurements for the winter months.

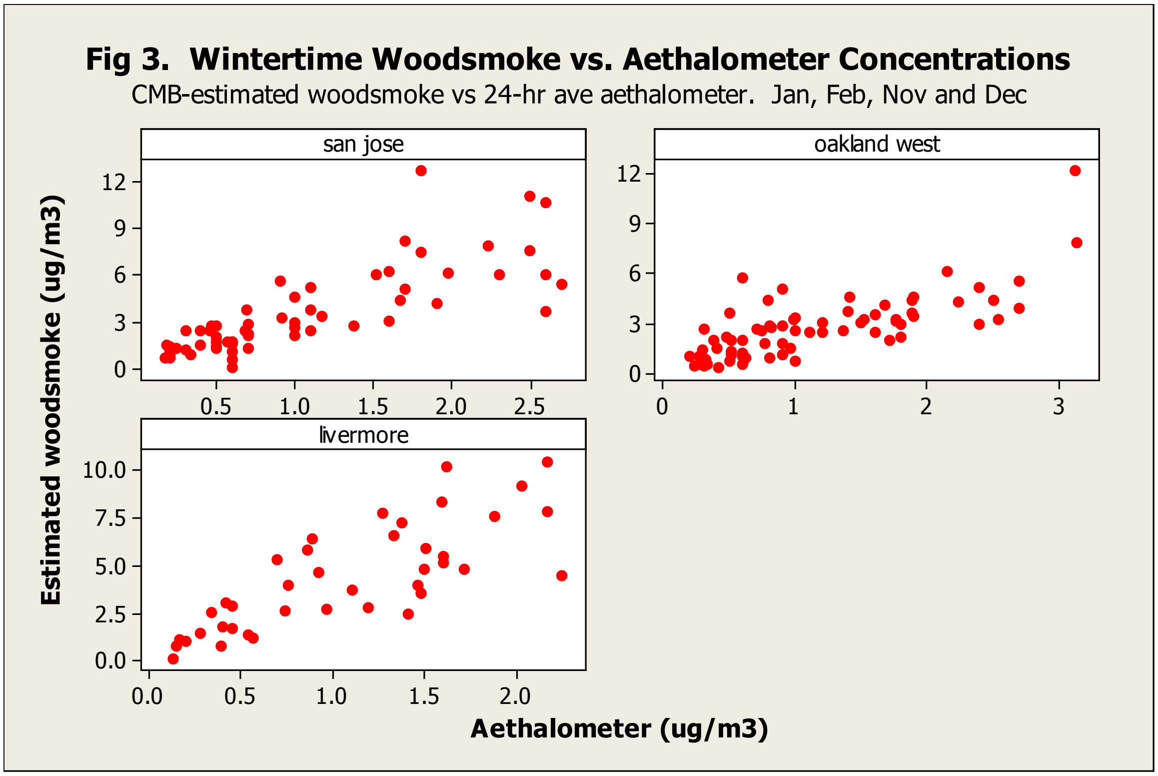
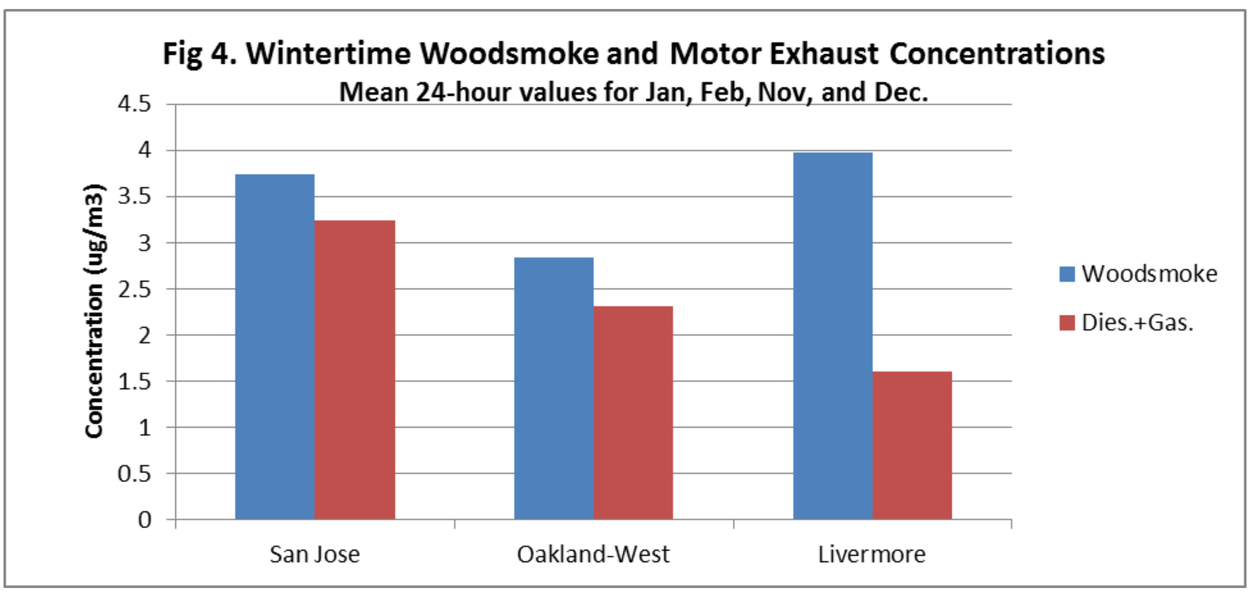


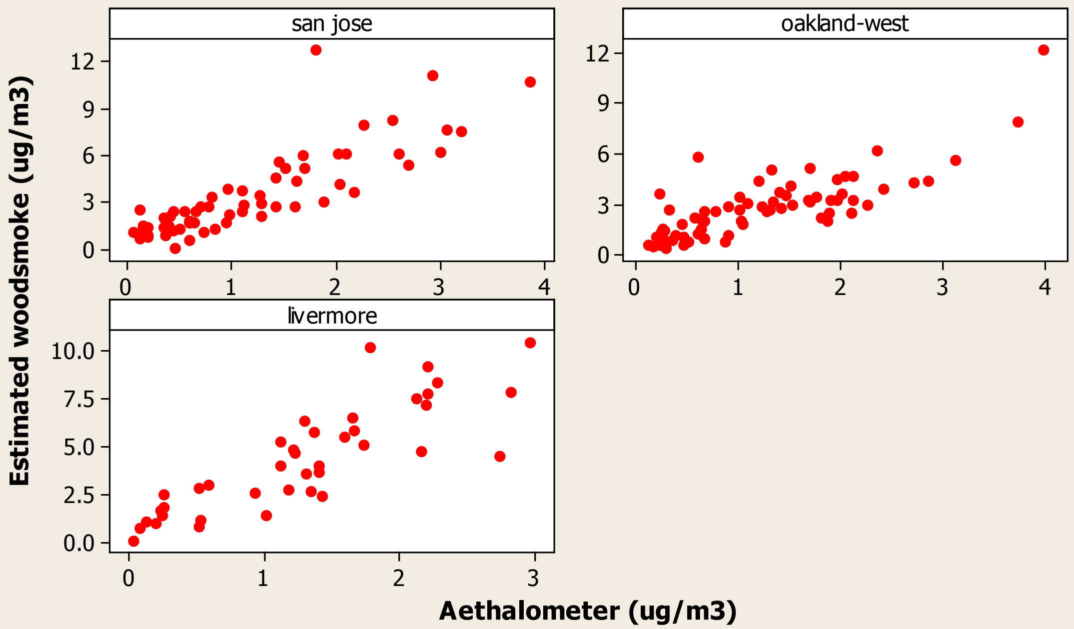
Figure 4 shows that the wintertime contributions from motor exhaust are still relatively large relative to woodsmoke at the urban sites. This implies that the aethalometer measurements from these sites will be substantially greater than from woodsmoke alone. Thus, using the relationship of woodsmoke to 24-hour aethalometer measurements from these sites to predict Forest Knolls woodsmoke concentrations would likely lead to substantial underestimation.



An alternative is to consider the average aethalometer values during the hours where woodsmoke predominates. Figure 5 is like Figure 3, except using the aethalometer measurements averaged over the hours 0-6 am and 8-12 pm.

Fig 5. Wintertime Woodsmoke vs. Nighttime Aethalometer Concentrations

CMB-estimated woodsmoke vs 0-6am+8-12pm ave aethalometer. Jan, Feb, Nov and Dec



Even during the nighttime, a substantial fraction of winter $PM_{2.5}$ may derive from motor vehicle exhaust as $PM_{2.5}$ often remains suspended for long periods. Figure 4 shows that Livermore has substantially less mv exhaust relative to woodsmoke than do San Jose or Oakland-West, and Figure 2 shows that Livermore's nighttime $PM_{2.5}$ on weekends is similar to its weekday concentrations, unlike SJ or OW, but like Forest Knolls. Therefore, we use the relationship of woodsmoke to nighttime average aethalometer from Livermore only. The regression relation[1] is woodsmoke = 3.27*(nighttime average aethalometer), where the units are both $\mu g/m^3$.

From Table 1, the period of burning is longer at Forest Knolls than at the other sites. And it apparently includes a morning spurt around 7-9 am as discussed above. Thus, to estimate the 24-hour contribution of woodsmoke we take the average aethalometer measurements from 0-10 am plus 8-12 pm, and scale this value upward by the ratio of the number of hours: (10+4)/(6+4) = 14/10.

Applying the 3.27 factor and the ratio correction, we estimate that the mean woodsmoke contribution to winter $PM_{2.5}$ in the Forest Knolls area was 14.9 $\mu g/m^3$. Over the same winter days, the mean total $PM_{2.5}$ from San Jose, Oakland-West and Livermore was 19.2 $\mu g/m^3$, 16.6 $\mu g/m^3$, and 15.7 $\mu g/m^3$ respectively. Thus, at Forest Knolls, woodsmoke alone may

[1] The intercept was non-significant, so the regression was run through the origin.

have resulted in mean $PM_{2.5}$ concentrations almost as high as $PM_{2.5}$ concentrations at urban sites from all sources.

The maximum estimated woodsmoke concentration for Forest Knolls was 39 $\mu g/m^3$, exceeding the national 24-hour $PM_{2.5}$ standard of 35 $\mu g/m^3$. Note that the actual $PM_{2.5}$ concentrations must have been a several $\mu g/m^3$ higher, at least. Secondary $PM_{2.5}$, including ammonium nitrate and sulfate, accounts for about 40% of Bay Area $PM_{2.5}$ at its urban sites.

Conclusions

The District's aethalometer monitoring reinforces the evidence that woodsmoke is a significant factor in the air quality in San Geronimo Valley. There can be little doubt that woodsmoke raises $PM_{2.5}$ concentrations to unhealthy levels, occasionally exceeding the national air quality standards. As with any monitoring location, this site provides data for one specific location; there will be other areas with higher woodsmoke concentrations, perhaps substantially higher.

The San Geronimo Valley is unusual for the Bay Area in not being serviced by natural gas. Thus, measures to reduce $PM_{2.5}$ in the Bay Area, such as cleaner diesel engines, may have limited benefit in improving the air quality in San Geronimo Valley.

Extending natural gas service to this area would certainly improve its air quality locally. But it is valuable to step back and consider the wider and longer-term picture, namely that natural gas is a fossil fuel that contributes to global warming, producing CO_2 when it's burned, and emitting methane – which is about 30 times more potent greenhouse forcer than CO_2 – when it leaks. Wood, on the other hand, is renewable, at least in theory. Newer wood stoves and pellet stoves emit considerably less $PM_{2.5}$. On the other hand, these stoves may well produce black carbon, a greenhouse forcer 900 times more potent than CO_2.

What is incontestable would be measures to make residences snugger – like weather-stripping and double-glazed windows – that would reduce the need for heating and very likely improve air quality. This also points to the importance of considering the climate implications of District initiatives.

Reference

Census. American Community Survey 5-year summary 2008-2012 http://www2.census.gov/acs2012_5yr/summaryfile/2008-2012_ACSSF_By_State_All_Tables/, Accessed 2/8/14.

D. Fairley. "Sources of Bay Area Fine Particles: 2010 Update and Trends." December 2012.

Appendix C. Winter PM2.5 monitoring study in Marin County.

Sonoma Technology, Inc.
Air Quality Research and Innovative Solutions

MEMORANDUM

March 14, 2011 Reference: 911010

To: Susan Goldsborough (Families for Clean Air)

From: Fred Lurmann, Manager of Exposure assessment Studies

CC: Eric Stevenson (Bay Area Air Quality Management District)
Jack Broadbent (Bay Area Air Quality Management District)

Re: Winter $PM_{2.5}$ Monitoring Study in Marin County

The purpose of this memorandum is to summarize our findings from the $PM_{2.5}$ monitoring conducted this winter in Marin County. The monitoring was conducted to objectively quantify air pollution levels in communities commonly impacted by wood smoke. The impetus for this monitoring effort was a concern that the Bay Area Air Quality Management District's San Rafael monitoring was not adequately capturing the range of $PM_{2.5}$ concentrations commonly occurring in residential areas of Marin County. The San Rafael monitoring location is well suited for capturing the urban and motor-vehicle contributions to PM; however, the extent to which the station captures the impacts of wood smoke emissions is uncertain.

To address this concern, we installed $PM_{2.5}$ BAM monitors in Woodacre and the Sleepy Hollow area of San Anselmo. The monitors were operated from mid November (2010) through February (2011) in accordance with our standard operating procedures. The monitors were installed on the roof tops of residences at 49 Castle Rock Ave. in Woodacre and 6 Crane Drive in San Anselmo (see Figure 1). The monitoring inlets were located high enough (about 5 meters above ground) and far enough away from obstructions to capture free following air in the communities (see Figures 2 and 3). The locations were selected for convenience (Goldsborough and Lurmann residences) rather than expected location of highest concentrations. The hourly data, including instrument operating parameters, were carefully reviewed and validated. Daily average concentrations (midnight-to-midnight) were calculate from hourly data that exceeded the 75% completeness criteria. Real-time data (not quality assured) from the San Rafael monitor were downloaded from AIRNow Tech for comparison purposes.

Daily $PM_{2.5}$ concentrations from the San Anselmo and San Rafael monitoring location are shown in Figure 4. With only one exception, they show that the concentrations in San Anselmo were lower than those observed in San Rafael. Concentrations during this period[1] did not exceed the level of the National Ambient Air Quality Standard (NAAQS) for daily $PM_{2.5}$ (35 µg/m^3) at either location.

Daily $PM_{2.5}$ concentrations from the Woodacre monitoring location are compared to those in San Rafael in Figure 5[2]. $PM_{2.5}$ levels in Woodacre were consistently higher (30% on average) than those in San Rafael. The maximum daily concentration (42.5 µg/m^3) in Woodacre was 49% higher than that at San Rafael (28.5 µg/m^3). The level of the $PM_{2.5}$ daily NAAQS was exceeded on five days in Woodacre, compared to zero days in San Rafael. Not only was the frequency of exceedance high, but also the severity was high, as indicated below:

Date	Daily PM2.5
Nov. 25, 2010	39.3 µg/m^3
Nov. 26, 2010	42.5 µg/m^3
Nov. 30, 2010	41.0 µg/m^3
Dec. 1, 2010	40.0 µg/m^3
Jan. 5, 2011	40.3 µg/m^3

Air quality conditions on the evening of Nov. 30th were particularly adverse. The daily average concentration from noon on Nov. 30th to noon on Dec. 1st was 49 µg/m^3, or 40% above the level of the NAAQS. Furthermore, these conditions occurred in a winter with meteorological conditions that were less adverse for air pollution than most winters in the Bay Area.

Four of the days with $PM_{2.5}$ exceeding the level of the NAAQS occurred in one week. Figure 6 shows the hourly and daily concentrations in Woodacre during the Nov. 25 – Dec. 2 period. The hourly concentrations reach a peak of 111 µg/m^3 at 11 pm on Nov. 30th. The hourly data indicate concentrations are much higher at night, often in the middle of the night, than in the daytime which is consistent with other areas where wood smoke is the main source of $PM_{2.5}$. Lastly, a scatter plot of Woodacre and San Rafael daily $PM_{2.5}$ data, shown in Figure 7, indicates the concentrations at the two locations are not well correlated (r^2=0.37). The measurements in San Rafael are not only lower than in Woodacre, but they are only able to explain 37% of the variance in concentrations at Woodacre.

As you are aware, the NAAQS is not a 'never to exceed' standard but rather a statistical standard that states the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m^3. The form of the PM2.5 daily standard effectively allows up to 22 days over the 35 µg/m^3 level standard in a 3-year period in an air basin such as the SF Bay Area. The data from the Woodacre site this winter alone would provide 5 of those allowable days out of the average of 7.3 per year.

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[1] Nov. 21, 2010 to Feb. 7, 2011 excluding days with missing data: Dec. 28-31, Jan. 1-3, 7, and 23-25.
[2] Nov. 21, 2010 to Mar. 5, 2011 excluding days with missing data: Jan. 7, 9-15, and 20-23, and Feb 1-2.

In conclusion, while conditions in San Anselmo were cleaner than those in San Rafael, the $PM_{2.5}$ levels in Woodacre were consistently higher than and not well correlated with those in San Rafael. The diurnal patterns of concentrations in Woodacre matched the conceptual model of wood smoke impacted areas (i.e., high nighttime levels). We observed 5 days above the level of the daily $PM_{2.5}$ NAAQS in Woodacre this winter. The frequency of high $PM_{2.5}$ observations in this pilot study would contribute significantly (5 of 7.3 days per year) to the pool of allowable days above the level of the NAAQS in the Bay Area. These results suggest the need for additional monitoring in subregions of Marin County impacted by wood smoke for purposes of compliance with the NAAQS and protection of public health.

Woodacre
PM Monitoring

San Anselmo
PM Monitoring

Figure 1. PM monitoring locations in Woodacre and San Anselmo.

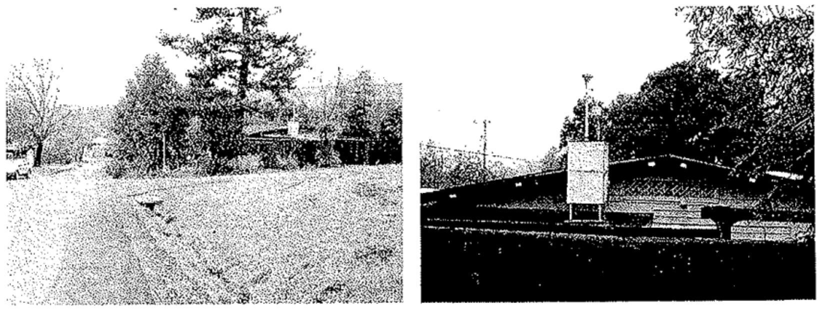

Figure 2. Photographs of monitoring shelter installed in Woodacre.

Figure 3. Photographs of monitoring shelter installed in San Anselmo.

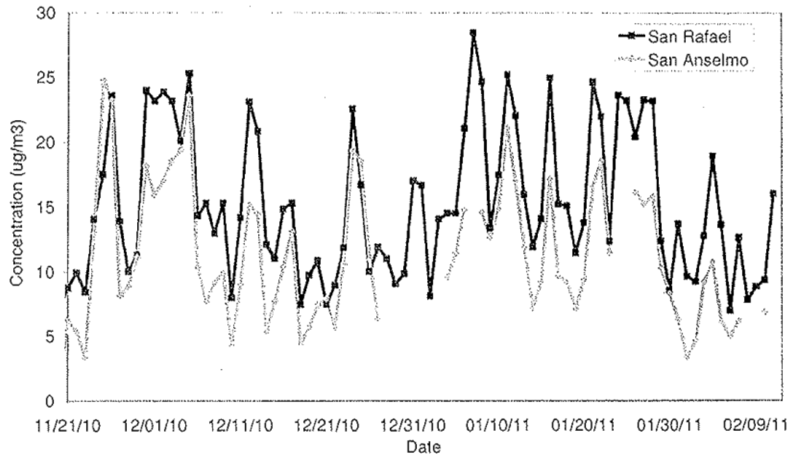

Figure 4. Comparison of Daily PM2.5 concentrations in San Anselmo and San Rafael (Marin County) in winter 2010/2011

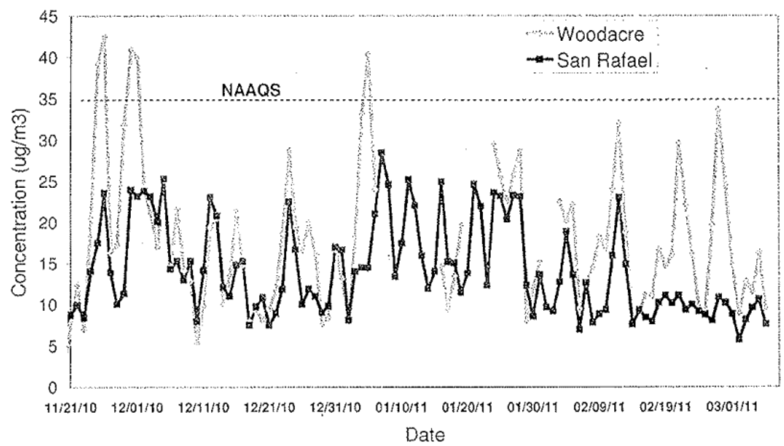

Figure 5. Comparison of Daily $PM_{2.5}$ concentrations in Woodacre and San Rafael (Marin County) in winter 2010/2011.

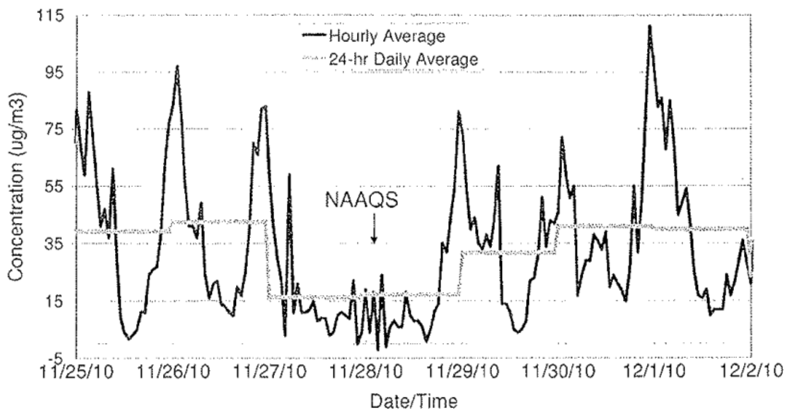

Figure 6. PM2.5 in Woodacre Nov 25 - Dec 2, 2010, indicating 4 NAAQS Exceedances.

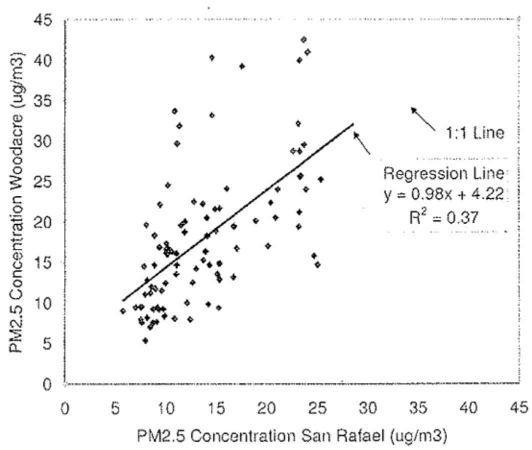

Figure 7. Scatterplot of Woodacre vs San Rafael $PM_{2.5}$ data indicating poor correlation (r^2=0.37). The San Rafael data only explain 37% of the variance in the Woodacre data for this period.

Morongo Band of Mission Indians Network Assessment Element-7/28/15

As provided in the submitted 2015 Monitoring Network Plan, the Morongo Air Monitoring Station is located within the general area of the Morongo residential area, and adjacent to the Pre-K through 4th grade campuses.

To satisfy all the requirements of 40 CFR 58.10(d), the following information is provided.

- The site meets the monitoring objectives outlined in 40 CFR 58 Appendix D, as well as the general monitoring requirements. Additionally, the site is operated to meet the design criteria for ozone and particulate matter 2.5.
- There are no plans to move/remove the air monitoring station. Furthermore, because of the location of the site and the subsequent spatial representation, no additional sites are needed.
- The current state of science for ozone and particulate matter being implemented at the station is satisfactory for calculation of the NAAQS and no additional or new technologies will be incorporated into the site. A NOx monitor has been recently installed, and once satisfactorily running and meeting data quality objectives, will also be used for regulatory monitoring, anticipated within the next 12-18 months.
- The site supports air quality characterization because of its monitoring of ozone and particulate matter. Determining the population of the Morongo Indian Reservation that have and/or are susceptible to respiratory illness/disease has not been quantified. However, nearly 20% of the population are over the age of 55, and over 20% of the population are age 17 or younger.
- The site currently meets the monitoring objectives of the Morongo Band of Mission Indians.

Please address any questions/concerns to James Payne, Environmental Director at jpayne@morongo-nsn.gov or at 951-755-5298.

Five Year Ambient Air Monitoring Network Assessment

Pechanga Ambient Air Monitoring Station

Criteria Pollutants: O_3, NO_2, $PM_{2.5}$

September 21, 2015

Pechanga Band of Luiseño Indians
Environmental Department
P.O. Box 1477
Temecula, CA 92593

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Figures

Tables

1.0 Introduction

The Pechanga Band of Luiseño Indians (Tribe), located on the Pechanga Indian Reservation (Reservation), has completed this assessment of the air quality surveillance system. This assessment is required every five years according to the 40 Code of Federal Regulations (CFR) Part 58.

> *The EPA's final regulation, found in 40 CFR Part 58.10, requires: (d) The state, or where applicable local, agency shall perform and submit to the EPA Regional Administrator an assessment of the air quality surveillance system every 5 years to determine, at a minimum, if the network meets the monitoring objectives defined in appendix D to this part, whether new sites are needed, whether existing sites are no longer needed and can be terminated, and whether new technologies are appropriate for incorporation into the ambient air monitoring network. The network assessment must consider the ability of existing and proposed sites to support air quality characterization for areas with relatively high populations of susceptible individuals (e.g., children with asthma), and, for any sites that are being proposed for discontinuance, the effect on data users other than the agency itself, such as nearby states and tribes or health effects studies. The state, or where applicable local, agency must submit a copy of this 5-year assessment, along with a revised annual network plan, to the Regional Administrator. The assessments are due every five years beginning July 1, 2010.*

The requirement for the assessment is to determine if the network is effective and efficient in meeting monitoring objectives. This includes whether new sites are needed or existing sites or monitors can be terminated and whether there are new technologies that can be incorporated. This assessment is conducted once every five years, this is the first report for Pechanga, the assessment provides a comprehensive conceptualization of the current and future needs of the tribe's air surveillance network.

2.0 Background

The Pechanga Ambient Air Monitoring Program has been in operation since 2008 and is managed and maintained by the Pechanga Environmental Department (Department). The primary objective of the monitoring project is to determine whether or not the National Ambient Air Quality Standards (NAAQS) for nitrogen dioxide (NO_2) particulate matter ($PM_{2.5}$), and ozone (O_3) are exceeded within the Reservation. The data gathered are also utilized to understand the impact pollutants have on the air quality of the Pechanga community. The Department maintains and operates its ambient air monitoring station according to all applicable federal regulations and guideline documents.

The station also monitors for the following meteorological parameters: wind speed, wind direction, temperature, relative humidity, precipitation, solar radiation, and barometric pressure. The purpose of the meteorological measurements at the station is to provide local information to the Tribe and to assist in providing characterizations of regional-scale meteorological patterns in conjunction with the air quality measurements.

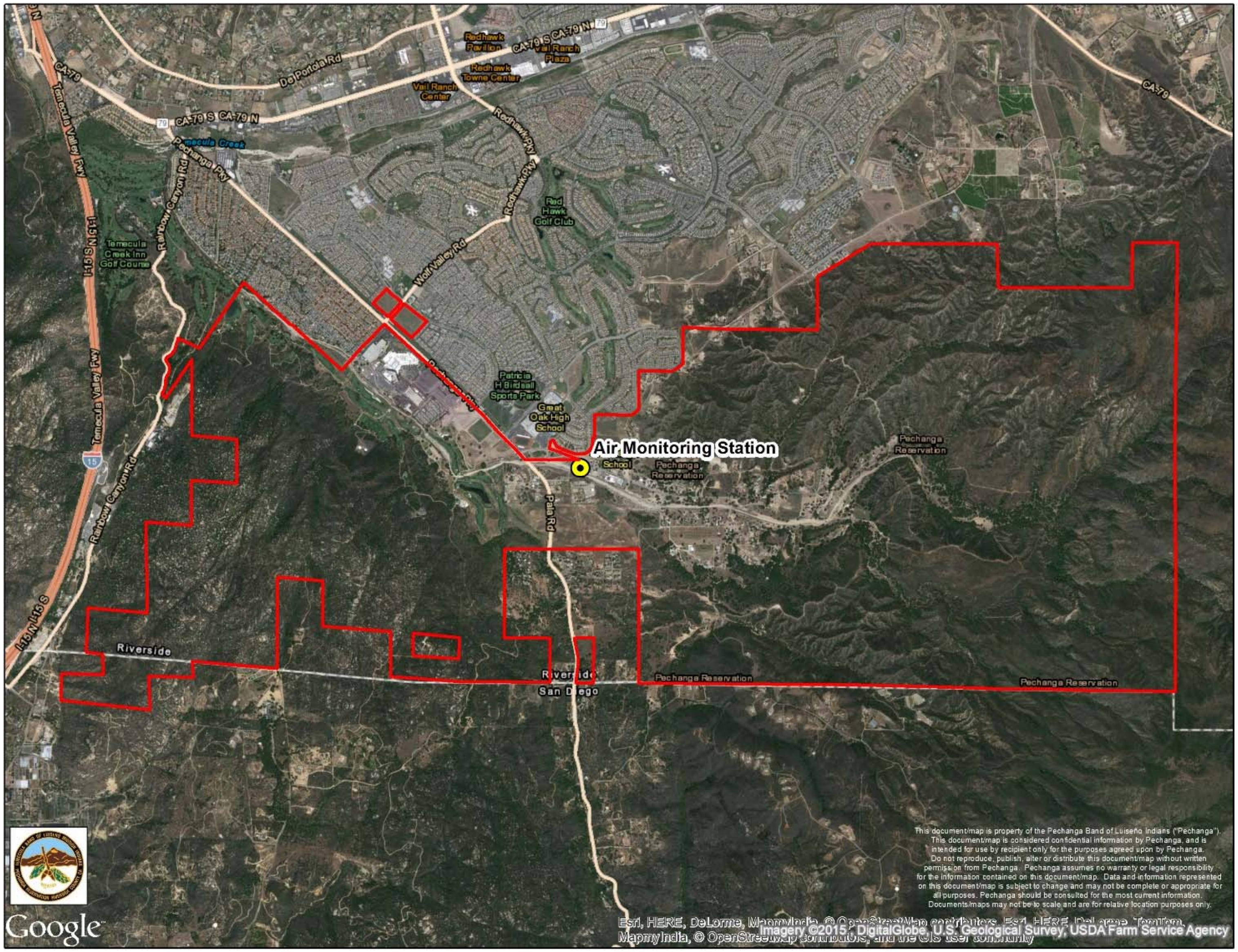

Figure 1: Location of Air Station on the Pechanga Reservation

2.1 Topography

The Reservation is comprised of mountains and plateaus, with elevation that range from 335 meters to 793 meters.

2.2 Location

The Reservation is located in Southwestern Riverside County near the city of Temecula to the northwest, the town of Rainbow to the southwest, and the Cleveland National Forest Agua Tibia Wilderness to the southeast. The Pechanga Reservation is located on a total land base of approximately 2711.4 hectares.

Interstate 15, a major transportation route for the inland counties in southern California, is located approximately 0.3 kilometers west of the Reservation; the City of Temecula is located approximately six kilometers to the northwest, with State Route (SR) 79 as the main transportation corridor providing access to the Reservation.

Riparian scrub and woodland vegetation occur predominately along Pechanga Creek and tributaries with oak woodland found in the upper reaches. North of the residential areas on the main Reservation a mix of chaparral and coastal sage-scrub are present. Chaparral is the predominate vegetation on the remainder of the Reservation.

2.3 Traffic

Road conditions on the Reservation vary from highly developed paved roads and parking lots to unpaved dirt roads in the residential areas. Conditions for the unpaved and unimproved roads vary from good to poor. Unpaved reservation roads leading along steep hillsides have the potential for erosion, due in part to erodible soil conditions. The following near roadways are paved. The nearest freeway is Interstate 15 located 4.6 kilometers from the Reservation. Pechanga Parkway, a main street in Temecula is located 1,075 meters from the main Reservation road. Pala Road, a main road that runs from Pechanga Parkway in Riverside County to Highway 76 in San Diego County is 608 meters from the Reservation.

Traffic counts	Pechanga Road: no data (road is within Reservation) Pechanga Parkway: 13,230 ADT (2014 data) Pala Road: 8,500 ADT (2014 data) I-15: 133,000 ADT (2013 data)

Table 1: Traffic Data

2.4 Climate

The region experiences year-round Mediterranean climate conditions which are characterized by warm summers, mild winters, infrequent rainfall, frequent morning coastal fog, and moderate on-shore breezes. Summer temperatures average in the mid-80 to mid-90 degrees Fahrenheit which are cooled in the evening by mild cyclic breezes. During the peak summer months, temperature inversions and the Santa Rosa mountain ranges create a barrier, preventing the cooler coastal temperatures from reaching the inland valleys during the day, allowing for higher temperatures in contrast to typical temperatures found in the coastal areas.

The regional climate is greatly influenced by the semi-permanent high pressure area of the eastern Pacific Ocean. Precipitation is usually limited to the winter season between November and April, with an average rainfall of approximately 13 inches per year[1]. During the summer months, the pressure center moves northward, keeping storm cells from moving in the southern portions of California. In winter, the Pacific high moves south, this allows storm cells to move over California, some of which reach beyond the borders of Mexico. Changes in the circulation pattern allow storm cells to move in from a southwesterly direction, which can allow heavy rains and flooding to occur during the winter months.

2.5 Population

Land uses on the Reservation include 81 hectares of commercial/recreational development, 121.4 hectares of rural residential /industry, with approximately 486 hectares of allotted land. The main Reservation hosts approximately 180 homes and 12 government buildings with an estimated 540 full-time residents. Most of the current land use on the main Reservation is rural residential, with homes generally located near the creek channel.

Commercial activities include a resort, hotel, casino and convention center, associated parking structures, a gas station/convenience store, a golf course, a 200 space RV Park and car wash.

2.6 Demographics

Almost all of the Pechanga Reservation is located in Riverside County. A small portion of the Reservation is located in San Diego County, approximately 33.2 hectares out of the total 2711.4 hectares of the Reservation. The 33.2 hectares are located in a remote and uninhabited area that is undeveloped.

[1] Temecula Weather, *Temecula, California Precipitation Summary*, 2015

Item	Unit	Value
Population	Capita	~540
Area	Hectares	2,711.4
Reservation Border Miles	Kilometers	~39.386

Table 2: Pechanga Reservation Population[2]

2.7 Air Monitoring and Health Effects

According to the American Lung Association, deaths from chronic lung disease are on the rise surpassing stroke as the third leading cause of death in the US. In 2010, Chronic Lower Respiratory Disease (CLRD) contributed to the death of nearly seven percent of Riverside County residents. CLRD is the third leading cause of death for Riverside County and the fourth leading cause for California[3].

Ozone exposure has been associated with increased susceptibility to respiratory infections, medication use, doctor and emergency department visits and hospital admissions for individuals with lung disease. Ozone exposure also increases the risk of premature death from heart and lung disease. Children are at increased risk from ozone because their lungs are still developing and they are more likely to have increased exposure since they are often active outdoors[4].

Fine particulate matter with a diameter of 2.5 microns or less ($PM_{2.5}$) is created primarily from industrial processes and fuel combustion. These particles are breathed deeply into the lungs. Exposure to particle pollution is linked to a variety of significant health problems ranging from aggravated asthma to premature death in people with heart and lung disease[5].

NO_2 is a highly toxic, reddish brown gas that is created primarily from fuel combustion in industrial sources and vehicles. It creates an odorous haze that causes eye and sinus irritation, blocks natural sunlight, and reduces visibility. These pollutants are linked to respiratory issues including asthma, inflammation in the lungs and CLRD.[6]

Asthma is a chronic condition that affects the lungs. It is characterized by inflammation and constriction of the airways, causing wheezing, coughing, and chest tightness. Although the cause is unknown, specific exposures such as tobacco smoke, allergens, and respiratory infections can trigger and exacerbate symptoms.

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[2] Pechanga Band of Luiseno Indians Environmental Department, *2012 Emissions Inventory*, March 2013
[3] County of Riverside-Department of Health, *Community Health Profile*, 2013
[4] U.S. EPA. 2015. Ozone and Your Patients' Health Training for Health Care Providers. (http://www.epa.gov/apti/ozonehealth/population.html)
[5] AirNow. 2015. Particle Pollution (PM). (http://www.airnow.gov/index.cfm?action=aqibasics.particle)
[6] County Profile – Riverside Fiscal Year 2013/2014

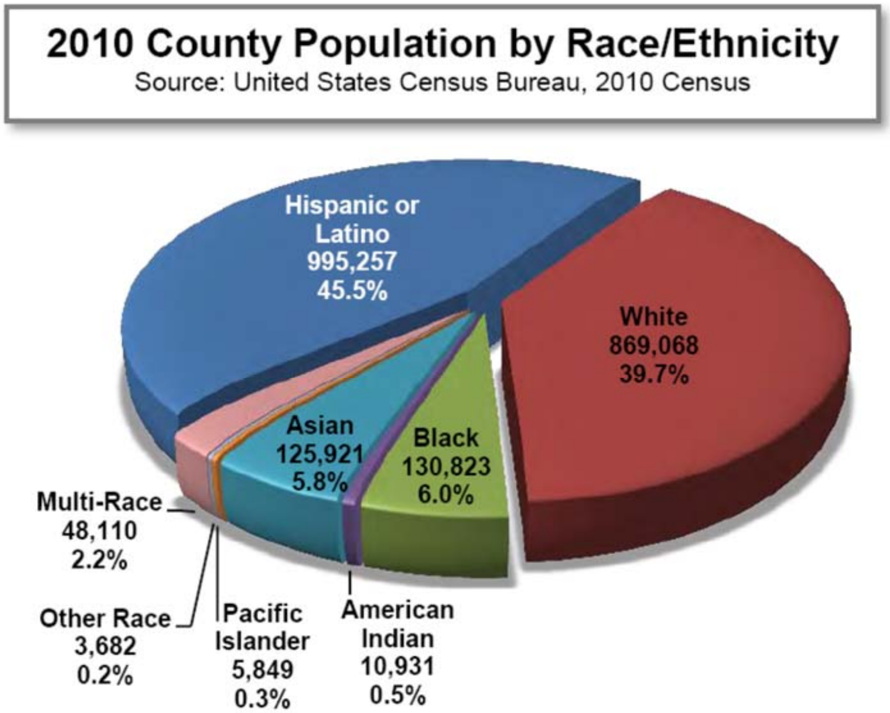


Figure 2: 2010 Riverside County Population by Race/Ethnicity [7]

According to the health statistics, asthma prevalence is higher in Riverside County compared to the State of California average (14.5% and 13.6%, respectively).

Figures 2 and 3 show the demographics in Riverside County and the Chronic Lung Disease Mortality Rate. These numbers reflect the importance of air monitoring in the community and for trending, research and data submission to the United States Environmental Protection Agency (EPA).

[7]County Profile – Riverside Fiscal Year 2013/2014

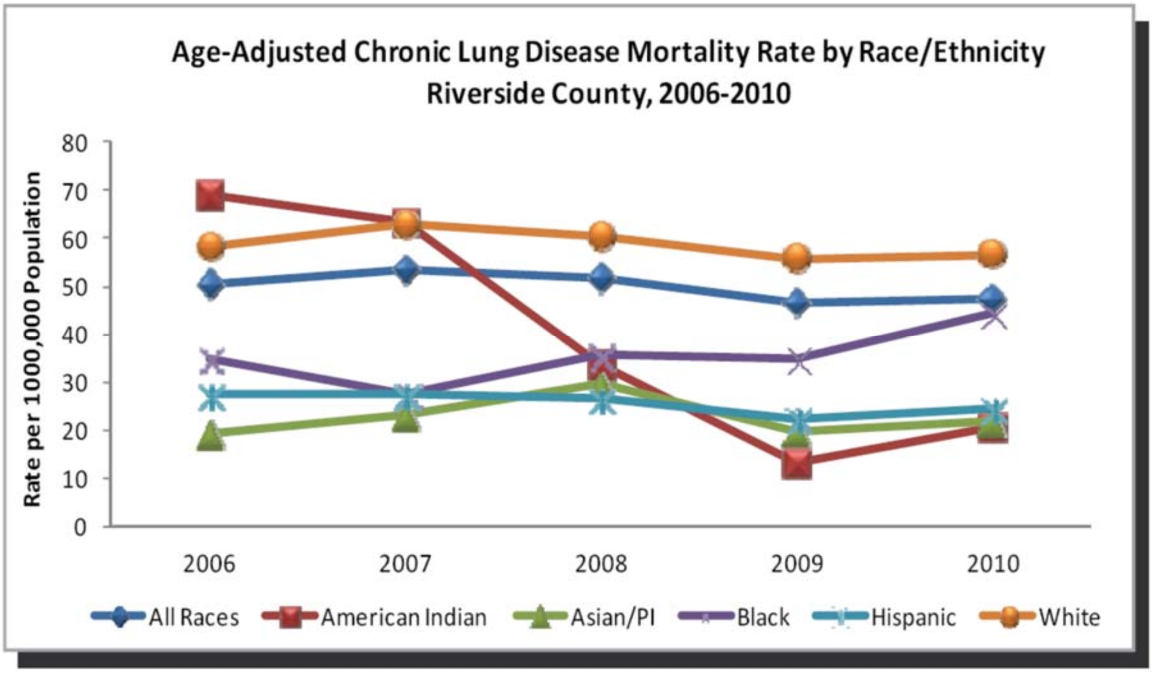


Figure 3: Chronic Lung Disease Mortality Rate Riverside County[8]

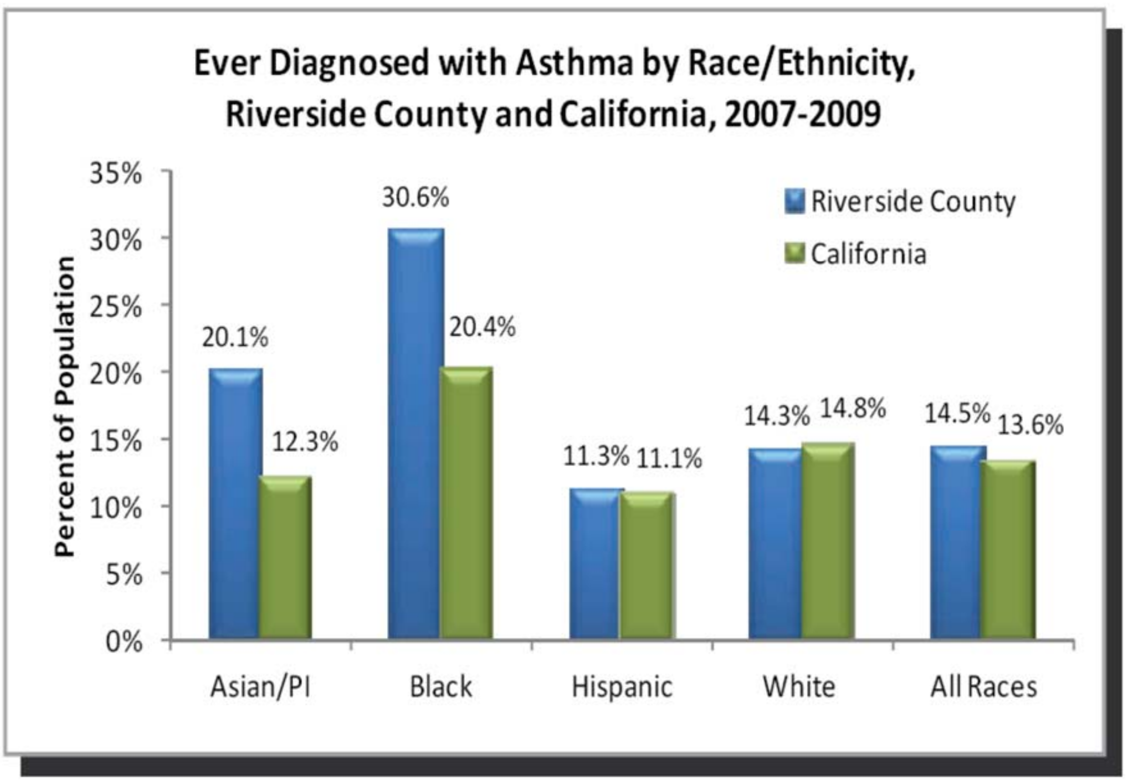


Figure 4: Patients Diagnosed with Asthma, Riverside County[9]

[8]County Profile – Riverside Fiscal Year 2013/2014
[9]County Profile – Riverside Fiscal Year 2013/2014

3.0 Air Monitoring and Emissions

The Pechanga Air Program began in 2008 with the collection of air quality data according to the program Quality Assurance Project Plan (QAPP) which follows the EPA's NAAQS. The data collected and monitored at Pechanga Air Station include ozone (O_3), $PM_{2.5}$, and oxides of nitrogen (NO_x); the data are submitted to EPA annually.

In April of 2015, the EPA took final action to revise the boundaries of the Southern California air quality planning areas to designate the Reservation as a separate air quality planning area for the 1997 8-hour ozone NAAQS.

3.1 Monitoring Objectives

The Pechanga Air Station monitoring network has been designed to meet three basic monitoring objectives. The appearance of any one objective in the order of the proceeding list is not based upon a prioritized scheme. Each objective is equally important and must be considered individually:

(a) Provide air pollution data to the general public in a timely manner. The Pechanga Air program makes their data available through the Air Quality System (AQS). The data are uploaded into the AQS quarterly.

(b) The Pechanga air program will work to capture data to meet compliance with NAAQS standards and emissions strategy development. Data from monitors of various types can be used in the development of attainment and maintenance plans.

(c) The Pechanga Air Program submits information to AQS which can be accessed for the purpose of support for air pollution research studies.

3.2 Reservation Sources

An emissions inventory was completed in 2013 for the Tribe. The emissions accounts for three general source categories: Area Sources, Mobile Sources, and Natural Sources. Following EPA guidelines, Pechanga Reservation does not have qualifying point sources under Federal General Conformity thresholds. The Federal General Conformity thresholds are as follows: 50 metric tons per year for NO_x, 100 metric tons per year for CO, 50 metric tons per year for Volatile Organic Compounds (VOCs), 100 metric tons per year for PM, and 100 tons per year for SO_2.[10]

3.3 Area Sources

[10] Pechanga Band of Luiseno Indians Environmental Department, *2012 Emissions Inventory*, March 2013

A total of seven (7) area sources have been identified on the Reservation. Typically, area sources are inventoried collectively due to number of sources or geographical separation:

Pechanga Resort & Casino (PRC)	Tribal Government Building	Recreation Center
Gas Station	Residences	Unpaved Roads
Emergency Generators		

Table 3: Sources of Emission on the Reservation

The Pechanga Resort and Casino (PRC) emissions are covered under a CAA Title V permit. Because emissions for all NAAQS are reported yearly under the Title V permit, , emissions information was not included in the emissions inventory.

3.4 Mobile Sources

Mobile sources include emissions from on-road and off-road vehicles and equipment that directly impact the Reservation. On-road sources include passenger cars, trucks, buses and motorcycles. Off-road vehicles include construction and farm equipment. Other off-road vehicles; such as aircraft, trains and boats, are not operated within the boundaries of the Reservation and are not included in the calculations.

3.5 Natural Sources

Emissions from Natural Sources on Pechanga Reservation include wildfires, vegetation, and dust from undisturbed surfaces.

The Pechanga ambient air monitoring station was established in the spring of 2008 in order to represent neighborhood scale air quality. It is located at the Pechanga Government Center.

The percent emissions reductions achieved between the 2000 base year and the 2012 attainment year from permanent and enforceable emissions control programs were calculated following EPA guidance[11], and the results are presented in Table 4.

[11] Calcagni, Procedures for Processing Requests to Redesignate Areas to Attainment, September 4, 1992.

Table 4
2000-2012 Reductions in Summer Season Precursor Emissions (Tons Per Day)

Source Category	Jurisdiction	VOCs 2000	VOCs 2012	% VOCs Reduction	NO_x 2000	NO_x 2012	% NO_x Reduction
South Coast Air Basin							
Consumer Solvent Products	ARB	106.2	85.2	20%	--	--	--
On-Road Motor Vehicles	ARB	381.7	136.4	64%	645.9	283.2	56%
Non-Road Mobile Sources	ARB & EPA	207.1	136.0	34%	235.7	139.5	41%
Stationary & Area Sources	SCAQMD	298.9	138.9	54%	159.9	65.2	59%
Total		993.9	496.5	50%	1,041.5	487.9	53%
Riverside County (portion within SoCAB)							
Source Category	Jurisdiction	VOCs 2000	VOCs 2012	% VOCs Reduction	NO_x 2000	NO_x 2012	% NO_x Reduction
Consumer Solvent Products	ARB	8.6	8.5	1%	--	--	--
On-Road Motor Vehicles	ARB	32.0	17.6	45%	65.9	38.6	41%
Non-Road Mobile Sources	ARB & EPA	17.5	13.5	23%	20.8	14.6	30%
Stationary & Area Sources	SCAQMD	26.0	15.6	40%	8.4	4.6	45%
Total		84.1	55.2	34%	95.1	57.8	39%
San Diego County							
Source Category	Jurisdiction	VOCs 2000	VOCs 2012	% VOCs Reduction	NO_x 2000	NO_x 2012	% NO_x Reduction
Consumer Solvent Products	ARB	21.8	17.5	20%	--	--	--
On-Road Motor Vehicles	ARB	80.4	29.9	63%	133.3	63.9	52%
Non-Road Mobile Sources	ARB & EPA	56.4	40.6	28%	43.6	32.1	26%
Stationary & Area Sources	SCAQMD	49.1	47.5	3%	15.6	6.6	58%
Total		207.7	135.5	35%	192.5	102.6	47%
Pechanga Nonattainment Area							
Source Category	Jurisdiction	VOCs 2006	VOCs 2012	% VOCs Reduction	NO_x 2006	NO_x 2012	% NO_x Reduction
Consumer Solvent Products	ARB	0.0032[e]	0.0025[e]	22%-	--	--	--
On-Road Motor Vehicles	ARB	0.0113[e]	0.0040[e]	64%	0.0192[e]	0.0084[e]	56%
Non-Road Mobile Sources	ARB & EPA	0.0061[e]	0.0040[e]	34%	0.0070[e]	0.0041[e]	41%

Table 4
2000-2012 Reductions in Summer Season Precursor Emissions (Tons Per Day)

Stationary & Area Sources	Pechanga Tribe	0.0049	0.0022	55%	0.012	0.016	-33%
Total		0.0255	0.0128	50%	0.0382	0.0285	25%

Regional Totals (Riverside + San Diego + Pechanga)

Source Category	Jurisdiction	VOCs 2006	VOCs 2012	% VOCs Reduction	NO_x 2006	NO_x 2012	% NO_x Reduction
Consumer Solvent Products	ARB	30.4	26.0	14%	--	--	--
On-Road Motor Vehicles	ARB	112.4	47.5	58%	199.2	102.5	49%
Non-Road Mobile Sources	ARB & EPA	73.9	54.1	27%	64.4	46.7	27%
Stationary & Area Sources	Local Agency	75.1	63.1	16%	24.0	11.2	53%
Total		291.8	190.7	35%	287.6	160.4	44%

- Inventory data from CARB's CEPA: 2013 Almanac –Standard Emissions Tool.
- South Coast Air Basin totals include Riverside County.
- Inventory data from CARB's CEPA: 2013 Almanac –Standard Emissions Tool.
- Pechanga emission inventory for on-reservation sources only (by Sierra Research).
- Scaled from South Coast emissions based on relative population (467/15,735,186).

3.6 Air Monitoring Equipment

The Pechanga ambient air monitoring station was established in the spring of 2008 in order to represent neighborhood scale air quality. It is located at the Pechanga Government Center.

Site Name	AQS Code	Pollutants Monitored
Pechanga Air Station Latitude 33.447867 N Longitude -117.088649 W	TT-586-0009	NO_2 O_3 $PM_{2.5}$

Table 5: Pechanga Air Station

Pollutant	Analyzer Make and Model	Range, ppm
NO, NO_x, NO_2	Ecotech EC9841	0-0.500
O_3	Thermo Scientific 49i	0-0.500
$PM_{2.5}$	Met One BAM 1020	2 to 1,000 µg/m^3

Table 6: Pechanga Continuous Analyzers

3.6 Site Selection and Purpose

The selection of the air monitoring site was based on the following basic monitoring objectives:

- determine representative concentrations and exposure in areas of population density;
- determine the highest concentrations of pollutants in an area based on topography and/or wind patterns;
- judge compliance with and/or progress made towards meeting the NAAQS;
- track pollution trends;
- determine general background concentration levels (The exact location of a site is most often dependent on the logistics of the area chosen for monitoring, such as site access, security and power availability); and,
- determine the welfare-related impacts in more rural and remote areas such as visibility impairment and effects on vegetation.

4.0 Site Analysis

The Tribe operates a single ambient monitoring station, continuously monitoring ambient ozone levels in compliance with federal requirements.[12] The data generated at this monitor are used to define the nature and severity of air pollution on the Reservation, identify nitrogen dioxide (NO_2) particulate matter ($PM_{2.5}$), and ozone (O_3) pollution trends, and determine compliance with the NAAQS.

4.1 Nearby Air Monitors

Air quality control in California is a shared responsibility among Tribal, local, State, and federal agencies. Local air districts regulate emissions from non-mobile (stationary) sources, such as stationary industrial and commercial sources, and some area-wide sources such as coatings and industrial solvents. At the State level, California Air Resources Board (CARB) adopts measures to reduce emissions from on-road motor vehicles, off-road vehicles and equipment, fuels, and some consumer products. At the federal level, EPA regulates off-road equipment and mobile sources such as ships, trains, aircraft, and out-of-state vehicles, as well as some consumer products.

Ozone levels are continuously monitored at a number of other monitors near Pechanga. These monitors are operated by two air districts and one tribe with jurisdiction over the area where they are located:

- Lake Elsinore, South Coast Air Quality Management District (AQMD);
- Temecula (Winchester/Lake Skinner), South Coast AQMD;
- Oceanside (Camp Pendleton), San Diego County Air Pollution Control District (APCD); and
- Pala, Pala Band of Mission Indians.

A map indicating the location of the ozone monitors operated in the area near the Reservation is presented in Figure 5.

[12] 40 CFR Part 58, "Ambient Air Quality Surveillance."

Pursuant to federal requirements, the Pechanga Tribe ensures the quality of the ambient ozone concentration data collected at its monitoring sites through analysis of precision and accuracy data. These ambient concentration data and quality assurance data are submitted to the EPA's ambient air quality database, AQS.

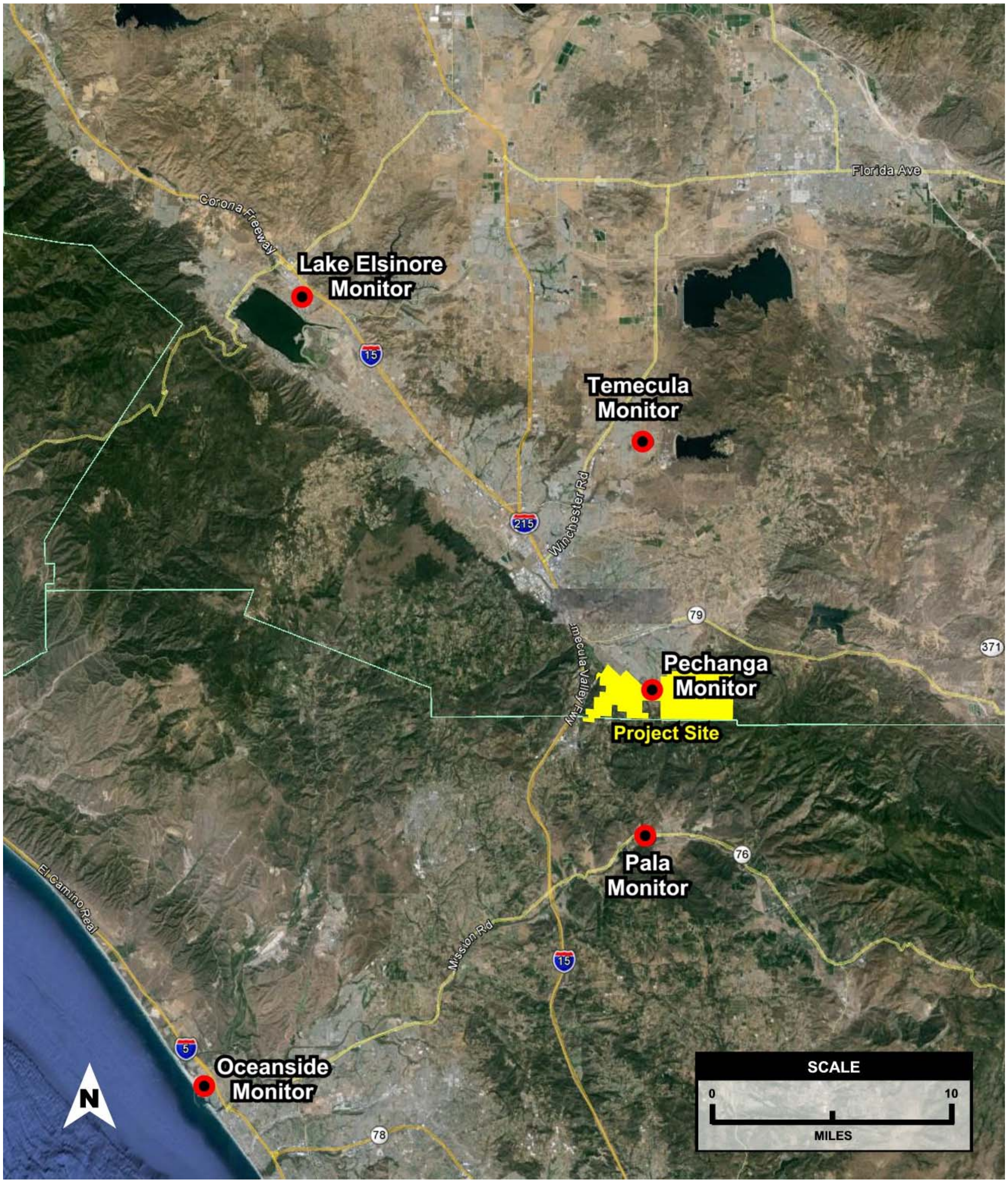


Figure 5
Ozone Monitors in Pechanga Vicinity of Reservation

Because ozone levels in Pechanga are overwhelmingly the result of emissions in the South Coast and San Diego air basins, and because both of these areas are committed to continued reductions in ozone precursor emissions, it is expected that ozone levels in Pechanga will continue to decline. As shown in Table 7, regional emissions of VOCs and NO_x are expected to decline between now and 2025.

Table 7
Ozone Attainment Inventory (Summer 2012)
(Tons per Day)

Pollutant	VOCs	NO_x
South Coast[a]	496.5	487.9
Riverside County (portion within SoCAB)[a]	55.2	57.8
San Diego[a]	135.5	102.6
Pechanga[b]	0.013	0.029
Regional (Riverside + San Diego + Pechanga)	190.7	160.4

a. Inventory data from California Air Resources Board's (CARB's) California Environmental Protection Agency (CEPA): 2013 Almanac –Standard Emissions Tool.
b. Pechanga emission inventory for on-reservation sources only (by Sierra Research).

Table 8
Ozone Maintenance Demonstration
2012-2025 Maintenance Period
Projected Inventory of Ozone Precursors (Tons per Day)

Pollutant	Average Total Daily Emissions			
	2012	2015	2020	2025
South Coast Air Basin[a]				
VOCs	496.5	456.8	424.1	414.8
NO_x	487.9	430.8	343.4	280.1
Riverside County (portion with SoCAB)[a]				
VOCs	55.1	53.2	52.5	53.7
NO_x	57.8	51.5	40.9	31.4
San Diego County[a]				
VOCs	135.6	127.7	121.6	118.7
NO_x	104.3	88.8	67.0	54.1

Pechanga[b]				
VOCs	0.013	0.013	0.012	0.011
NO_x	0.029	0.029	0.028	0.028
Regional (Riverside + San Diego + Pechanga)				
VOCs	190.7	180.9	174.1	172.4
NO_x	162.1	140.3	107.9	85.5

5.0 Assessment Results

The Tribe will continue to operate the ambient air quality program. The air monitoring equipment is centrally located on the Reservation and at this time is found sufficient for collecting air data. In the next 10 years the Tribe may establish an additional monitoring station. The location may be further southeast from the existing location on the Reservation. However, in the immediate future there is no plan for expansion of monitors.

The Tribe will continue monitoring for nitrogen dioxide (NO_2) particulate matter ($PM_{2.5}$), and ozone (O_3) pollutants. There are no future plans at this time to expand the program to collect additional pollutants.

The Tribe will continue to ensure that all necessary air reports, assessments and permit applications are completed and submitted to EPA. The staff will continue to collect, analyze and submit the data to the AQS database.

The Pechanga Environmental Department will continue to track air trends. The Environmental Department is planning to launch a dynamic Air Quality Index program for the community. This program will inform the community about the air quality on the Pechanga Reservation and health effects by displaying real-time air quality data in community areas such as the Government Center and tribal Recreation Center.

North Coast Unified Air Quality Management District

2015
Annual Network Plan and Assessment For Ambient Air Monitoring

July 1, 2015

North Coast Unified
Air Quality Management District
707 L Street, Eureka, CA 95501
Telephone (707) 443-3093 - FAX (707) 443-3099
http://www.ncuaqmd.org

Table of Contents

Definition of Terms

AAC	Atmospheric Analysis and Consulting
AQS	Air Quality System
BAAQMD	Bay Area Air Quality Management District
CARB	California Air Resources Board
E-BAM	Emergency Beta-Attenuation Monitor
FEM	Federal Equivalency Method
FRM	Federal Reference Method
MSA	Micropolitian Statistical Area
NAAQS	National Ambient Air Quality Standards
NOAA	National Oceanographic and Atmospheric Administration
NCUAQMD	North Coast Unified Air Quality Management District
POC	Parameter Occurrence Code
PQAO	Primary Quality Assurance Organization
SIP	State Implementation Plan
SLAMS	State and Local Air Monitoring Station
SPM	Special Purpose Monitor
TRS	Total Reduced Sulfur

Executive Summary

The North Coast Unified Air Quality Management District's (District) "2015 Annual Network Plan and Assessment for Ambient Air Monitoring" is an examination and evaluation of the District's network of ambient air pollution monitoring stations. This annual review of the District's air monitoring network is required by Title 40, Code of Federal Regulations, Part 58.10 (40 CFR 58.10). The report meets the requirements for an annual network plan as listed in 40 CFR 58.10, Appendix A.

The District is located in the far northwestern portion of California. It has jurisdiction over Humboldt, Del Norte, and Trinity Counties, which together cover 7,753 square miles. It is bordered on the west by the Pacific Ocean and extends from the Oregon Border south approximately 140 miles to the Mendocino County line. Eureka, the county seat of Humboldt County, is 284 miles north of San Francisco, 466 miles south of Portland, Oregon and on the coast of the Pacific Ocean. The area is made up of varied terrain, from coastal wetlands to rugged mountains. Inversions and diurnal offshore wind patterns are common.

The air in Humboldt, Del Norte and Trinity County is considered to be unclassified, or in attainment of state and federal ambient air quality standards except for the State's 24-hour PM10 standard in Humboldt County. The two pollutants of greatest concern are ozone and particulate matter. The county's sunny climate, pollution-trapping mountains and valleys, along with the growing population, all contribute to the problem.

The District maintains a network of air pollution monitoring equipment. The District is rich with monitoring network history. Total Reduced Sulfur (TRS) started to be monitored in the 70s at Fort Humboldt, fueled by concerns about practices at the pulp mills. Numerous special studies, including speciation, have occurred around Humboldt Bay. The first time the California Air Resources Board (ARB) mobile monitoring trailer was deployed it was to Humboldt County to investigate concerns around the Humboldt Flakeboard Panel plant in Arcata. Beginning in 1986, PM_{10} monitoring began with a solitary PM_{10} monitoring station. Currently there are four stations in operation.

The District only has a few major Title V sources which are located within Humboldt County: Eel River Power (Scotia), PG&E Humboldt Bay Generating Station (Eureka), DG Fairhaven (Samoa), and the Blue Lake Power Plant (Blue Lake). In addition to these major sources, the District is impacted by several large saw mills, minor industrial sources, and mobile sources throughout the traffic corridors. The District is also challenged by wood smoke in the winter and wildfires in the summer.

This report will be available for a 30-day public inspection period. Any comments received during the public inspection period will be forwarded to the United States Environmental Protection Agency (EPA) concurrently with submittal of the plan. This report may be viewed on the District's website, www.ncuaqmd.org and hardcopies are available for review at District's office. Written comments should be submitted to the North Coast Unified Air Quality Management District, Attn: Comments on Annual Network Monitoring Plan, 707 L Street, Eureka, California, 95501.

Annual Network Plan

Network Design

The District operated four monitoring sites in 2014. The following maps show the locations of the monitoring sites. Tables 1 and 2 list the pollutants measured at each site.

Table 1. List of Special Purpose Monitoring Sites

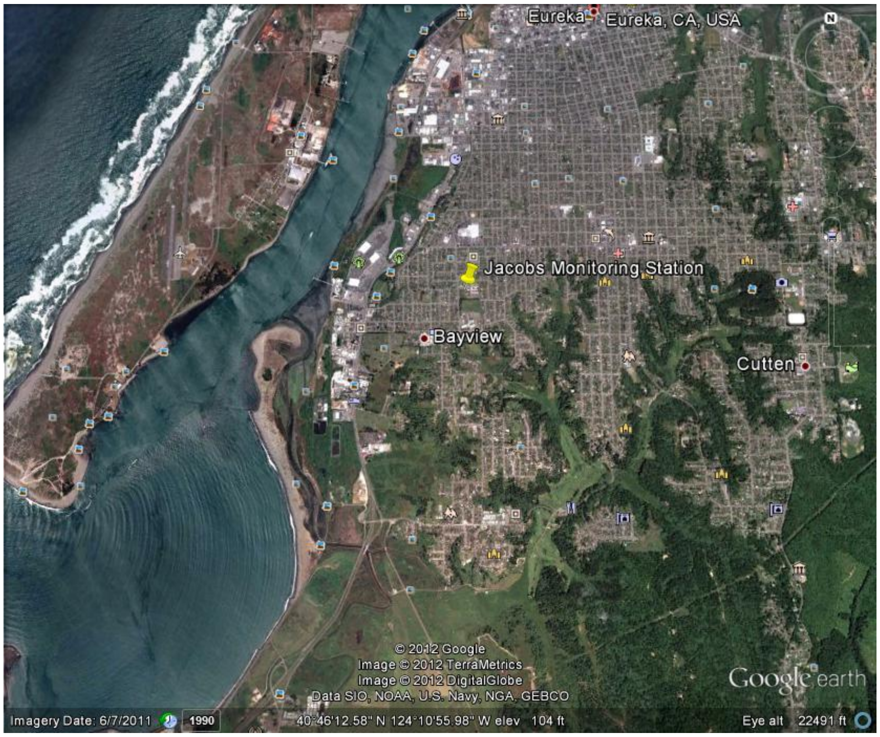
Site Name	AQS Site #	Pollutant Monitored
Humboldt Hill	060231005	$PM_{2.5}$, O_3, NO_2, CO, SO_2
Crescent City	060150006	$PM_{2.5}$

Table 2. List of State and Local Air Monitoring Sites

Site Name	AQS Site #	Pollutants Monitored
Jacobs	060231004	PM_{10}, $PM_{2.5}$, O_3, NO_2, CO, SO_2
Weaverville	061050002	$PM_{2.5}$

Monitoring Station Locations

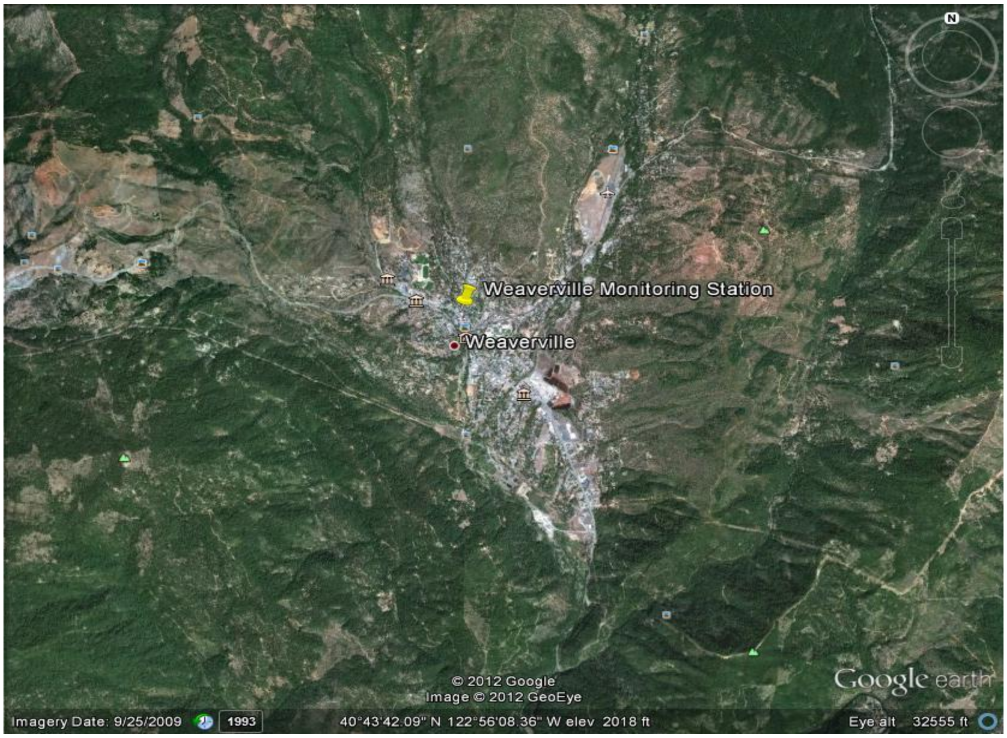
Jacobs Monitoring Station (717 South Ave, Eureka, Humboldt County)



Humboldt Hill Monitoring Station (7333 Humboldt Hill Rd., Eureka, Humboldt County)

Crescent City Monitoring Station, (994 G Street, Crescent City, Del Norte County)

Weaverville Monitoring Station, (11 Court Street, Weaverville, Trinity County)



Minimum Monitoring Requirements

This network meets the minimum monitoring requirements for all criteria pollutants (Tables 3-11).

Ozone

Table 3. Minimum Monitoring Requirements for Ozone.

Micropolitian Statistical Area	County	Pop. In Year 2010	4th highest 8-hour max. (ppm) (2012-2014)	3 year design value	SLAMS Monitors Required	Active SLAMS Monitors	Active SPM Monitors	Monitors Needed
Eureka-Arcata-Fortuna	Humboldt	134,623	Jacobs 0.045 Humboldt Hill 0.046	Jacobs 0.044 Humboldt Hill 0.044	0	1	1	0
Crescent City	Del Norte	28,610	-	-	0	0	0	0
none	Trinity	13,786	-	-	0	0	0	0

No monitors are required for either a SIP or Maintenance Plan. The District monitors Ozone as an examination of population exposure levels. The Ozone monitor at Humboldt Hill usually registers levels slightly above the monitor at Jacobs, but the difference usually on a scale of less than 10 ppb, and is not consistent. District does not feel the distinction of a ‘max ozone monitor’ is warranted.

PM 2.5

Table 4. Minimum Monitoring Requirements for FRM $PM_{2.5}$.

Micropolitian Statistical Area	County	Pop. In Year 2010	Annual Design Value (ug/m^3) (2012-2014)	Daily Design Value (ug/m^3) (2012-2014)	FRM Monitors Required	SLAMS Monitors Active	SPM Monitors Active	Monitors Needed
Eureka, Arcata, Fortuna	Humboldt	134,623	Jacobs 7.3 Humboldt Hill 5.7	Jacobs 23 Humboldt Hill 14	0	1	1	0
Crescent City	Del Norte	28,610	-	-	0	0	0	0
none	Trinity	13,786	-	-	0	0	0	0

The District does not feel the distinction of a ‘max $PM_{2.5}$’ instrument is warranted due to the number of variables affecting which monitor registers higher levels on any given day.

Table 5. Minimum Monitoring Requirements for Continuous $PM_{2.5}$ monitors.

Micropolitian Statistical Area	County	Pop. In Year 2010	SLAMS FEM monitors required	SLAMS Monitors Active	SPM Monitors Active
Eureka, Arcata, Fortuna	Humboldt	134,623	0	0	1*
Crescent City	Del Norte	28,610	0	0	1*
none	Trinity	13,786	0	1	0

* Grimm 180

Table 6. Collocation of continuous PM2.5 monitors

Method Code	# Primary Monitors	Required Collocated monitors	Active Collocated FRM monitors	Active Collocated FEM Monitors
195	2*	0	1	0
731	1	0	0	0

* Grimm 180 at Humboldt Hill requested to be POC 2
Collocation is a responsibility of the PQAO.

No PM2.5 monitors are required for either a SIP or Maintenance Plan.

PM10

Table 7. Minimum Monitoring Requirements for PM_{10}.

Micropolitian Statistical Area	County	Population in Year 2010	Max Concentration (2012-2014) (ug/m^3)	SLAMS Monitors Required	SLAMS Monitors Active	SPM Monitors Active	Monitors Needed
Eureka, Arcata, Fortuna	Humboldt	134,623	Jacobs 104	0	1	0	0
Crescent City	Del Norte	28,610	-	0	0	0	0
none	Trinity	13,786	-	0	0	0	0

Regular PM10 monitoring ceased in Del Norte and Trinity Counties as of January 2014.

NO2

Table 8. Minimum Monitoring Requirements for NO_2.

Micropolitian Statistical Area	County	Pop. in Year 2010	Annual Design Value (ppb) (2012-2014)	SLAMS Monitors Required	Active SLAMS Monitors	Active SPM Monitors	Monitors Needed
Eureka-Arcata, Fortuna	Humboldt	134,623	Jacobs 2.5 Humboldt Hill 0.6	0	1	1	0
Crescent City	Del Norte	28,610	-	0	0	0	0
none	Trinity	13,786	-	0	0	0	0

No monitors are required for SIP or Maintenance Plans. The District monitors NO_2 in Humboldt County to examine population exposure. Based on population, no near-road NO_2 monitors are required within the District boundaries.

SO2

Table 9. Minimum Monitoring Requirements for SO_2.

Micro-politian Statistical Area	County	Pop. in Year 2010	Annual Design Value (ppb) (2012-2014)	Max 24 hour (ppb) (2012-2014)	Max 1 hour (ppb) (2012-2014)	SLAMS Monitors Required	Active SLAMS Monitors	Active SPM Monitors	Monitors Needed
Eureka-Arcata, Fortuna	Humboldt	134,623	Jacobs 0.4 Humboldt Hill 0.2	Jacobs 1.2 Humboldt Hill 1.0	Jacobs 1.4 Humboldt Hill 1.2	0	1	1	0
Crescent City	Del Norte	28,610	-	-	-	0	0	0	0
none	Trinity	13,786	-	-	-	0	0	0	0

No monitors are required for SIP or Maintenance Plans. The District is not required to monitor SO_2. The District monitors SO_2 in Humboldt County to examine population exposure.

CO

Table 10. Minimum Monitoring Requirements for CO.

Micro-politian Statistical Area	County	Pop. in Year 2010	8-hour Design Value (ppm) (2012-2014)	1 hour. Design Value (2012-2014)	SLAMS Monitors Required	Col-located Monitors Required	Active SLAMS Monitors	Active SPM Monitors	Monitors Needed
Eureka-Arcata-Fortuna	Humboldt	134,623	Jacobs 0.9 Humboldt Hill 0.8	Jacobs 1.9 Humboldt Hill 0.9	0	0	1	1	0
Crescent City	Del Norte	28,610	-	-	0	0	0	0	0
none	Trinity	13,786	-	-	0	0	0	0	0

No monitors are required for SIP or Maintenance Plans. The District is not required to monitor CO. The District monitors CO in Humboldt County to examine population exposure.

Pb

Table 11. Minimum Monitoring Requirements for Pb.

MSA	County	Pop. In Year 2010	Annual Design Value	Monitors Required	Active Monitors	Monitors Needed
Eureka, Arcata, Fortuna	Humboldt	134,623	-	0	0	0
Crescent City	Del Norte	28,610	-	0	0	0
none	Trinity	13,786	-	0	0	0

No monitors are required for SIP or Maintenance Plans. The District is not required to monitor Pb and does not do so.

Quality Control

The District is a member of the ARB Primary Quality Assurance Organization (PQAO). All District ambient air monitoring meets stringent ARB Quality Control and Quality Assurance requirements. ARB audit records and site information for the District can be found on the ARB website at http://www.arb.ca.gov/aaqm/qmosqual/qmosqual.htm, or obtained by contacting the District at (707) 443-3093.

District $PM_{2.5}$ FRM filters are analyzed by the Bay Area Air Quality Management District (BAAQMD). The Bay Area Air Quality Management District Laboratory meets stringent Federal Requirements for Quality Control and Quality Assurance. Information regarding the laboratory can be found on the BAAQMD website at http://www.baaqmd.gov .

Collocation

The District is a member of the ARB PQAO and relies on the ARB PQAO network to satisfy all collocation requirements. CFR 58 App A 3.2.5 suggests to the District that it is the PQAO's responsibility to show that this requirement is met for all instruments used within a PQAO network.

The District does not have any collocated manual PM_{10} samplers. The District shut down the manual PM_{10} sampling program on Dec 31, 2013.

The District does not have any permanently collocated $PM_{2.5}$ samplers. It currently operates one collocated FRM $PM_{2.5}$ sampler. A FEM Grimm 180 has been collocated with this instrument since March 2013 at Humboldt Hill, for the purpose of comparing the FEM data to an FRM instrument. Removal of the $PM_{2.5}$ Grimm 180 from the District's network is planned for 2015. The District sought to establish the FRM as POC 1 in 2014. No decision has been issued to date.

Recent or Proposed Modifications to Network

Effective July 1, 2014, Del Norte and Trinity Counties were designated as Attainment for PM_{10}. The filter based PM10 monitoring program was discontinued as of December 31,

2013. PM_{10} continues being monitored in Humboldt County at the Jacob station, using a FEM PM_{10} BAM1020.

The District discontinued the Eureka I street station, which included PM_{10} and $PM_{2.5}$ samplers, the Crescent City FRM PM_{10} sampler, and the Weaverville FRM PM_{10} sampler on December 31, 2013. The Eureka I street FRM $PM_{2.5}$ instrument was moved to the Jacobs station, and began collecting data on January 1, 2014. As a SPM, it did not require EPA approval to begin operation.

The PM_{10} redesignation has allowed the District to monitor $PM_{2.5}$ in the recently redesignated counties. The District plans to monitor PM with a non-FEM GRIMM 180 instrument in Crescent City beginning in July 2015. This Grimm 180 monitor is located a short distance from the original Crescent City monitoring location. It is a SPM monitor, and as such does not require EPA approval to begin operation. Weaverville began monitoring $PM_{2.5}$ with a non-regulatory $PM_{2.5}$ BAM1020 in March 2015. It is located at the same station as the discontinued FRM PM_{10}. It is also a SPM monitor, as thus did not require EPA approval to begin operation.

The District conducted a study March 2013 through November 2014, to compare a Grimm 180 $PM_{2.5}$ to a Thermo 2000i $PM_{2.5}$. Data shows the Grimm 180 data is significantly biased when compared to the PM2.5 FRM and is not suitable for national comparison. A waiver for this instrument is requested for all existing District Grimm data (2011-2014). It is not anticipated that any appropriate change in the standard operating procedure used with the Grimm 180 will make the Grimm instrument's data comparable to FRM data. Thus, the Grimm 180s in the District network will be converted to measure non-FEM PM1.0 and non-FEM PM10 in 2015.

Review of Changes to PM2.5 Monitoring Network

The District has not changed the location of any violating $PM_{2.5}$ monitor. Any changes to the District's $PM_{2.5}$ network are reviewed by EPA Region 9. The District has never eliminated an FRM PM2.5 sampler from the network. If a violating $PM_{2.5}$ monitor ever needs to be moved, we plan to use the annual network plan inspection/comment process to provide for the review of the change.

In 2014, the District participated in the Federal Fine Particulates monitoring program by operating instruments at the Jacobs, Humboldt Hill, Crescent City and Weaverville stations. $PM_{2.5}$ was monitored with FRM instruments at the Jacobs and Humboldt Hill sites. These FRM instruments are suitable for national comparison.

The District discontinued the Eureka I street $PM_{2.5}$ monitor December 31, 2013.That R&P FRM 2000 instrument was relocated to the nearby Jacobs Station.

PM_{10} Redesignation has allowed the District to monitor Particulate Matter of smaller sizes in the recently redesignated counties. The District deployed a non-regulatory $PM_{2.5}$ BAM1020 to Weaverville, with operations beginning March of 2015. This unit is located at the same station as the discontinued FRM PM_{10}. It is a SPM monitor, thus did not require EPA approval to begin operation.

Grimm 180 monitors are currently located Humboldt Hill Station and Crescent City. The current configuration is set to measure FEM $PM_{2.5}$. The Grimm 180 in Crescent City is located a short distance from the original Crescent City monitoring location. It is a SPM monitor, and as such did not require EPA approval to begin operation. The Humboldt Hill Grimm was collocated with a FRM Thermo 2000i for the purpose of evaluating Grimm performance.

This collocation study ran March 2013 through December 2014. The data between the two instruments was found to be significantly biased. R Square was found to be 0.138, and Multiple R was 0.371. The data and report are attached in Appendix A of this Network Plan.

The District seeks a waiver of all Grimm 180 data (2011-2014). It is not anticipated that any appropriate change in the standard operating procedure used with the Grimm 180 will make the Grimm instrument's data comparable to FRM data. Because it is not possible to alter the SOP of the Grimm to improve its correlation to FRM measurements, and because the Grimm 180 does not meet District requirements for a PM2.5 FEM, both Grimm 180s will be converted to measure $PM_{1.0}$ in 2015. Attachment A of this document details the District's waiver request. Until the question of PM2.5 accuracy is addressed by the EPA, this will be the most effective use of the Grimm 180 within the District's network.

Current Particulate Matter research reveals that it is the smaller particles which potentially have the greatest health ramifications. As such, the District believes it will be useful to monitor for the smaller particles. $PM_{1.0}$ is monitored locally at Trinidad Head, so measuring $PM_{1.0}$ will expand the local $PM_{1.0}$ network.

The District owns auditing equipment for the Grimm 180, and conducts audits according to Grimm specifications. The ARB has recently purchased Grimm 180 auditing equipment, and plans to begin auditing the Grimm 180 in May of 2015.

Data Submission Requirements

Data and Precision/Accuracy reports are submitted to ARB no later than 60 days after the quarter of record. The ARB uploads District data to the National Air Quality System (AQS) no later than 90 days after the quarter of record. The ARB submits the annual data certification no later than May 1st of each year.

Data Availability

The District's air quality data is available on the AQS database. It can also be obtained directly from the District, in the form of monthly reports. Please contact the District at 707-443-3093 to request copies of these reports.

Detailed Site Information

Site Name: Jacobs

The Jacobs site was established in December of 2006. It is located on the south side of Eureka and is expected to represent neighborhood scale air quality.

Site Name	**Jacobs**					
AQS ID	060231004					
GIS coordinates	103.91015E 4514.83731N WGS84					
Location	Alice Birney Elementary School					
Address	717 South Ave, Eureka					
County	Humboldt					
Dist. to road (meters)	50					
Traffic count (AADT)	3100 (2007)					
Representative statistical area name	Eureka, Arcata, Fortuna					
Groundcover	grass					
PEP audit?	Information maintained by EPA					
NPAP audit?	Information maintained by EPA					
PM_{10} Flow audits	Performed every 2 weeks by NCUAQMD, Performed biannually by ARB					
$PM_{2.5}$ Flow audits	Performed monthly by NCUAQMD, Performed biannually by ARB					
Gaseous audits	Following the requirement in QA Volume II, performance audits are performed annually by ARB					
Date of most recent ARB audit	May 13, 2015					
Dates of two most recent semi-annual PM10 flow audits	September 25, 2014 May 13,2015					
Dates of two most recent semi- annual PM2.5 flow audits by ARB	September 25, 2014 May 13,2015					
Gaseous One-point control checks	Performed a minimum of once every two weeks					
Gaseous instrument calibrations	Performed by ARB bi-annually					
Representative Area	Humboldt County Micropolitian Statistical Area, Eureka-Arcata-Fortuna, suburban					
Pollutant	**O_3**	**NO_2**	**CO**	**SO_2**	**$PM_{2.5}$**	**PM_{10}**
Parameter Code	44201	42602	42101	42401	88101	85101
POC	1	1	1	1	1	1
Basic Monitoring Objective	NAAQS comparison	NAAQS comparison	NAAQS comparison	NAAQS comparison	NAAQS comparison	NAAQS comparison
Site Type	Population exposure	Population exposure	Population exposure	Population exposure	Population exposure	Population exposure

Site Name	**Jacobs**					
Pollutant	**O_3**	**NO_2**	**CO**	**SO_2**	**$PM_{2.5}$**	**PM_{10}**
Monitor Type	SLAMS	SLAMS	SLAMS	SLAMS	SLAMS	Special purpose
Spatial scale	Neighborhood	Neighborhood	Neighborhood	Neighborhood	Neighborhood	Neighborhood
Sampling method	Photometric EQOA-0880-047	Chemiluminescence RFNA-1289-074	Gas Filter correlation RFCA-0981-054	Pulsed Florescence EQSA-0486-060	Low Volume RFPS-0498-117	EQPM-0798-122
Instrument manufacturer and model	Thermo 49i	Thermo 42i	Thermo 48i	Thermo 43i	R&P 2000	Met One Bam1020
FRM/FEM/ARM	FEM	FRM	FRM	FEM	FRM	FEM
Collecting Agency	NCUAQMD	NCUAQMD	NCUAQMD	NCUAQMD	NCUAQMD	NCUAQMD
Analytical Lab	N/A	N/A	N/A	N/A	BAAQMD	N/A
Reporting Agency	ARB	ARB	ARB	ARB	BAAQMD	ARB
Start date	Dec 15, 2006	Dec 15, 2006	Dec 15, 2006	Dec 15, 2006	Dec 25, 2006	Jan 1, 2014
Current Sampling Frequency	continuous	continuous	continuous	continuous	1:3	continuous
Sampling season	Year round	Year round	Year round	Year round	Year round	Year round
Probe height (meters)	4.5	4.5	4.5	4.5	6	6
Distance from supporting structure (meters)	1.9	1.9	1.9	1.9	2	2
Distance from obstructions on roof	N/A	N/A	N/A	N/A	N/A	N/A
Distance from obstructions not on roof (meters)	19	19	19	19	19	19
Distance from trees (meters)	15	15	15	15	15	17
Distance to furnace or incinerator flue	N/A	N/A	N/A	N/A	N/A	N/A
Distance between collocated monitors	N/A	N/A	N/A	N/A	N/A	N/A
Unrestricted airflow (degrees)	360	360	360	360	360	360
Probe material	Teflon	Teflon	Teflon	Teflon	N/A	N/A
Residence time (seconds)	6	8	5	7	N/A	N/A
Will there be changes within the next 18 months?	No	No	No	No	No	No
Is it suitable for comparison against the annual PM2.5?	N/A	N/A	N/A	N/A	Yes	N/A

Site Name: Humboldt Hill

The Humboldt Hill site was established in June 2011. It is located on Humboldt Hill on the south side of Eureka and is expected to represent neighborhood scale air quality.

Site Name	**Humboldt Hill**					
AQS ID	060231005					
GIS coordinates	40.71528 (N) -124.20139 (W)					
Location	Humboldt Hill Summit					
Address	7333 Humboldt Hill Road, Eureka					
County	Humboldt					
Dist. to road	25					
Traffic count	Unknown, less than 50					
Groundcover	grass					
PEP audit?	Information maintained by EPA					
NPAP audit?	Information maintained by EPA					
$PM_{2.5}$ Flow audits	FRM: Performed monthly by NCUAQMD, Performed biannually by ARB			FEM: Quarterly by NCUAQMD		
Gaseous audits	Following the requirement in QA Volume II, performance audits are performed annually by ARB					
Dates of two most recent semi-annual $PM_{2.5}$ flow audits by ARB	FRM method: September 25, 2014 May 15, 2015			FEM Method: Not Performed		
Date of most recent ARB audit	May 15, 2015			May 15, 2015		
Gaseous One-point control checks	Performed a minimum of once per two weeks					
Gaseous Instrument Calibrations	Performed bi-annually by ARB					
Representative Area	Humboldt County Micropolitian Statistical Area, Eureka-Arcata-Fortuna, suburban					
Pollutant	**O_3**	**NO_2**	**CO**	**SO_2**	**$PM_{2.5}$**	**$PM_{2.5}$**
Parameter code	44201	42602	42101	42401	88101	88101
POC	1	1	1	1	1	1
Basic Monitoring Objective	NAAQS comparison	NAAQS comparison	NAAQS comparison	NAAQS comparison	Air pollution data	Air pollution Data
Site Type	Population exposure	Population exposure	Population exposure	Population exposure	Population exposure	Population exposure
Monitor Type	SPM	SPM	SPM	SPM	SPM	Special purpose

Site Name	Humboldt Hill				
Pollutant	**O_3**	**NO_2**	**CO**	**SO_2**	**$PM_{2.5}$**	**$PM_{2.5}$**
Spatial scale	Neighbor-hood	Neighbor-hood	Neighbor-hood	Neighbor-hood	Neighbor-hood	Neighbor-hood
Sampling method	Photometric EQOA-0880-047	Chemilum-inescence RFNA-1289-074	Gas Filter correlation RFCA-0981-054	Pulsed Florescence EQSA-0486-060	Low Volume RFPS-0498-117	Light scatter EQPM-0311-195
Instrument manufacturer and model	Thermo 49i	Thermo 42i	Thermo 48i	Thermo 43i	R&P 2000	Grimm 180
FRM/FEM/ ARM	FEM	FRM	FRM	FEM	FRM	FEM
Collecting Agency	NCUAQMD	NCUAQMD	NCUAQMD	NCUAQMD	NCUAQMD	NCUAQMD
Analytical Lab	N/A	N/A	N/A	N/A	BAAQMD	N/A
Reporting Agency	ARB	ARB	ARB	ARB	ARB	ARB
Start date	June 20, 2011	June 20, 2011	June 20, 2011	June 20, 2011	March 20, 2013	June 20, 2011
Current Sampling Frequency	continuous	continuous	continuous	continuous	1:3	continuous
Sampling season	Year round	Year round	Year round	Year round	Year round	Year round
Probe height (meters)	4.5	4.5	4.5	4.5	6	6
Distance from supporting structure (meters)	1.9	1.9	1.9	1.9	2	1.2
Distance from obstructions on roof	N/A	N/A	N/A	N/A	N/A	N/A
Distance from obstructions not on roof (meters)	15	15	15	15	15	15
Distance from trees (meters)	93	93	93	93	93	93
Distance to furnace or incinerator flue	N/A	N/A	N/A	N/A	N/A	N/A
Distance between collocated monitors	N/A	N/A	N/A	N/A	N/A	N/A
Unrestricted airflow (degrees)	360	360	360	360	360	360

Site Name	**Humboldt Hill**					
Pollutant	**O_3**	**NO_2**	**CO**	**SO_2**	**$PM_{2.5}$**	**$PM_{2.5}$**
Probe material	Teflon	Teflon	Teflon	Teflon	N/A	Stainless steel
Residence time (seconds)	6	6	5	8	N/A	N/A
Will there be changes within the next 18 months?	No	No	No	No	No	Yes
Is it suitable for comparison against the annual $PM_{2.5}$?	N/A	N/A	N/A	N/A	Yes	No. 40 CFR 58 11 (e) assessment indicated failure, waiver is requested.

Site Name: Weaverville

The Weaverville site was established in 1995. It is located in downtown Weaverville near HWY 299 and is expected to represent neighborhood air quality.

Site Name	**Weaverville**
AQS ID	061050002
GIS coordinates	104.95617E 4509.31330N WGS84
Location	Trinity County Courthouse
Address	11 Court Street, Weaverville
County	Trinity
Dist. to road	21 meters to highway 299
Traffic count	5,100 AADT for HWY 299
Groundcover	Paved
PEP audit	Information maintained by EPA
NPAP audit	Information maintained by EPA
$PM_{2.5}$ Flow audits	Performed biweekly by NCUAQMD, Performed biannually by ARB
Date of most recent ARB audit	Instrument has not yet been audited
Dates of two most recent semi-annual $PM_{2.5}$ flow audits by ARB	Instrument has not yet been audited
Representative Area	Rural, no MSA in Trinity County
Pollutant	**$PM_{2.5}$**
Parameter Code	88101
POC	1
Basic monitor objective	Air Pollution Data
Site Type	Population exposure
Monitor Type	SPM
Spatial scale	Neighborhood
Sampling method	none
Instrument manufacturer and model	Met One Bam1020
FRM/FEM/ARM	Non-FEM
Collecting Agency	NCUAQMD
Analytical Lab	N/A
Reporting Agency	ARB
Start date	March 2015
Current Sampling Frequency	continuous
Sampling season	Year round
Probe height (meters)	N/A
Distance from supporting structure (meters)	N/A
Distance from obstructions on roof (meters)	10

Site Name	**Weaverville**
Pollutant	**$PM_{2.5}$**
Distance from obstructions not on roof (meters)	20
Distance from trees (meters)	15
Distance to furnace or incinerator flue	N/A
Distance between collocated monitors	N/A
Unrestricted airflow (degrees)	270 (restricted in East)
Primary wind direction	West
Probe material	N/A
Residence time	N/A
Will there be changes within the next 18 months?	No
Is it suitable for comparison against the annual $PM_{2.5}$?	No

Site Name: Crescent City

The Crescent City site was established in 1998. Although it has been moved three times due to logistical problems, all sites have been in close proximity to each other. It is currently located at the Elk Crescent Middle School. It is expected to represent neighborhood scale air quality.

Site Name	**Crescent City**
AQS ID	060150006
GIS coordinates	41^{o} 45' 21" N 124^{o} 12' 13" W
Location	Elk Crescent Middle School
Address	994 G Street
County	Del Norte
Dist. to road	64 meters to 9th Street
Traffic count	13400 AADT HWY101 CRESCENT CITY, ON L STREET AT 9TH STREET
Groundcover	Paved/grass
PEP audit	Information maintained by EPA
NPAP audit	Information maintained by EPA
Flow audit	Performed quarterly by NCUAQMD
Date of most recent ARB audit	Not yet audited
Dates of two most recent semi-annual flow audits	Not yet audited
Representative Area	Del Norte County, Micropolitian Statistical Area, Crescent City Urban
Pollutant	**$PM_{2.5}$**
Parameter Code	88501
POC	1
Basic Monitoring Objectives	Air Pollution Data
Site Type	Population exposure
Monitor Type	SPM
Spatial scale	Neighborhood
Sampling method	Light scatter EQPM-0311-195
Instrument manufacturer and model	Grimm 180
FRM/FEM/ARM	FEM
Collecting Agency	NCUAQMD
Analytical Lab	N/A
Reporting Agency	ARB
Start date	Delayed, as of May 2015
Current Sampling Frequency	Continuous
Sampling season	Year round
Probe height	5.3
Distance from supporting structure	1.2

Site Name	**Crescent City**
Pollutant	$PM_{2.5}$
Distance from obstructions on roof	N/A
Distance from obstructions not on roof	30 meters
Distance from trees	93 meters
Distance to furnace or incinerator flue	49 meters
Distance between collocated monitors	N/A
Unrestricted airflow (degrees)	315 (restricted in North)
Primary Wind Direction	South
Probe material	N/A
Residence time	N/A
Will there be changes within the next 18 months?	Yes
Is it suitable for comparison against the annual $PM_{2.5}$?	No

Network Assessment

Monitoring Objectives

The District's domain of responsibility is the three counties which make up the northern portion of the North Coast Air Basin. The monitoring objectives of the District are the same as those found in the Code of Federal Regulations (CFR), part 58, appendix D: 1) to determine the highest concentrations expected to occur in the area covered by the network, 2) to determine representative concentrations in areas of high population density, 3) to determine the impact on ambient pollution levels of significant sources or source categories, 4) to determine background concentration levels, 5) to determine extent of regional pollution transport among populated area, and in support of secondary standards, and 6) to determine welfare-related impacts in more rural and remote areas- such as visibility impairment and effects on vegetation. These objectives are met to the greatest extent allowed by the size and funding of the District. The District prioritizes monitoring goals in the order listed above.

The District monitors for six criteria pollutants. It operates four monitoring stations: two which are complete stations that monitor all six pollutants, and two that are particulate only stations. Due to budget constraints, none of the stations are background stations. However, NOAA operates an Observatory within the District, which can be leveraged for background particulate and ozone levels.

Because the District is located in a region extremely susceptible to wildfire events of significant duration, the District views wildfire smoke monitoring as a primary responsibility of the District. The District owns three E-BAMs and operates a fourth, which is owned by Humboldt County. These units are deployed on an as needed basis during wildfire events. The objectives of the units are: 1) to determine the highest concentrations expected to occur in the area covered by the network, and 2) to determine representative concentrations in areas of high population density.

Monitoring Efficiency

The primary users of the monitoring data are District staff, users of the ARB ADAM database and EPA Air Quality System, County Health Departments of Humboldt, Trinity, and Del Norte Counties, Tribal Health Departments, and the United States Forest Service. The District compares its monitoring data to the Federal Ambient Air Quality Standards, and the California State Ambient Air Quality Standards. Current standards are listed in the table below:

Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards [1]		National Standards [2]		
		Concentration [3]	Method [4]	Primary [3,5]	Secondary [3,6]	Method [7]
Ozone (O_3)	1 Hour	0.09 ppm (180 $\mu g/m^3$)	Ultraviolet Photometry	—	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	0.070 ppm (137 $\mu g/m^3$)		0.075 ppm (147 $\mu g/m^3$)		
Respirable Particulate Matter (PM10)[8]	24 Hour	50 $\mu g/m^3$	Gravimetric or Beta Attenuation	150 $\mu g/m^3$	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 $\mu g/m^3$		—		
Fine Particulate Matter (PM2.5)[8]	24 Hour	—	—	35 $\mu g/m^3$	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 $\mu g/m^3$	Gravimetric or Beta Attenuation	12.0 $\mu g/m^3$	15 $\mu g/m^3$	
Carbon Monoxide (CO)	1 Hour	20 ppm (23 mg/m^3)	Non-Dispersive Infrared Photometry (NDIR)	35 ppm (40 mg/m^3)	—	Non-Dispersive Infrared Photometry (NDIR)
	8 Hour	9.0 ppm (10 mg/m^3)		9 ppm (10 mg/m^3)	—	
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m^3)		—	—	
Nitrogen Dioxide (NO_2)[9]	1 Hour	0.18 ppm (339 $\mu g/m^3$)	Gas Phase Chemiluminescence	100 ppb (188 $\mu g/m^3$)	—	Gas Phase Chemiluminescence
	Annual Arithmetic Mean	0.030 ppm (57 $\mu g/m^3$)		0.053 ppm (100 $\mu g/m^3$)	Same as Primary Standard	
Sulfur Dioxide (SO_2)[10]	1 Hour	0.25 ppm (655 $\mu g/m^3$)	Ultraviolet Fluorescence	75 ppb (196 $\mu g/m^3$)	—	Ultraviolet Flourescence; Spectrophotometry (Pararosaniline Method)
	3 Hour	—		—	0.5 ppm (1300 $\mu g/m^3$)	
	24 Hour	0.04 ppm (105 $\mu g/m^3$)		0.14 ppm (for certain areas)[10]	—	
	Annual Arithmetic Mean	—		0.030 ppm (for certain areas)[10]	—	
Lead[11,12]	30 Day Average	1.5 $\mu g/m^3$	Atomic Absorption	—	—	High Volume Sampler and Atomic Absorption
	Calendar Quarter	—		1.5 $\mu g/m^3$ (for certain areas)[12]	Same as Primary Standard	
	Rolling 3-Month Average	—		0.15 $\mu g/m^3$		
Visibility Reducing Particles[13]	8 Hour	See footnote 13	Beta Attenuation and Transmittance through Filter Tape	No National Standards		
Sulfates	24 Hour	25 $\mu g/m^3$	Ion Chromatography			
Hydrogen Sulfide	1 Hour	0.03 ppm (42 $\mu g/m^3$)	Ultraviolet Fluorescence			
Vinyl Chloride[11]	24 Hour	0.01 ppm (26 $\mu g/m^3$)	Gas Chromatography			

See footnotes on next page …

For more information please call ARB-PIO at (916) 322-2990

California Air Resources Board (6/4/13)

The District is heavily impacted by wood smoke. The District monitors for wood smoke through particulate monitoring and carbon monoxide monitoring. Peaks in particulate matter can often be correlated with low temperatures, as woodstoves are a common heat source in the area. The District has worked with the ARB in the past to investigate speciation of local particulate matter, in particular using levoglucosan as a tracer.

Monitoring data becomes particularly important to the Health Departments during times of wildfire. District data has been used to substantiate health-related Federal Declarations of Emergency in both Humboldt and Trinity Counties. Humboldt was the first County in California to issue a Declaration of Emergency based on Air Quality.

The population estimates for two Micropolitian Statistical Areas included in the District indicate only slight changes in population since the last Network Assessment, in 2010. As of 2014, the Crescent City area is estimated to have decreased by 6.0% in population, Trinity County is estimated to have decreased by 5%, and the Eureka-Arcata-Fortuna area population is estimated to have grown just 0.1%. Population change has not influenced the monitoring program.

The proposed Ozone NAAQS change, anticipated fall of 2015, is not expected to impact monitoring needs in the District. District ozone levels are below the lowest proposed NAAQS level, thus regardless of where the new standard is finally set, the District is expected to remain in attainment for ozone. The District plans to continue assisting other agencies who wish to maintain ozone equipment at District monitoring locations to assist with transport investigations.

The District operates four monitoring stations. These stations have been summarized in the Network Plan. Overviews of the assessment of each individual station follow:

Summary of Stations:

Station	AQS number	pollutant	Year start	Expected NAAQS exceed-ances	Micropolitian Area Served	Design value change 2010-2015	Assigned Value to NCUAQMD Network	Plan
Jacobs	060231004	ozone	2006	none	Eureka-Arcata-Fortuna	-0.03	Critical-primary SLAMS Humboldt County	keep
Jacobs	060231004	carbon monoxide	2006	none	Eureka-Arcata-Fortuna	-0.4	Critical-primary SLAMS Humboldt County	keep
Jacobs	060231004	sulfur dioxide	2006	none	Eureka-Arcata-Fortuna	+0.4	Critical-primary SLAMS Humboldt County	keep
Jacobs	060231004	Nitrogen dioxide	2006	none	Eureka-Arcata-Fortuna	-0.5	Critical-primary SLAMS Humboldt County	keep
Jacobs	060231004	PM_{10}	2006	4	Eureka-Arcata-Fortuna	+44	Critical-primary SLAMS Humboldt County	keep
Jacobs	060231004	$PM_{2.5}$	2006	none	Eureka-Arcata-Fortuna	-1	Critical-primary SLAMS Humboldt County	keep
Humboldt Hill	060231005	ozone	2011	none	Eureka-Arcata-Fortuna	N/A	Critical-source monitoring	keep
Humboldt Hill	060231005	carbon monoxide	2011	none	Eureka-Arcata-Fortuna	N/A	Critical-source monitoring	keep
Humboldt Hill	060231005	sulfur dioxide	2011	none	Eureka-Arcata-Fortuna	N/A	Critical-source monitoring	keep
Humboldt Hill	060231005	Nitrogen dioxide	2011	none	Eureka-Arcata-Fortuna	N/A	Critical-source monitoring	keep
Humboldt Hill	060231005	$PM_{2.5}$	2011	none	Eureka-Arcata-Fortuna	N/A	Critical-source monitoring	keep
Weaverville	061050002	$PM_{2.5}$	2011	none	n/a	N/A	Critical-SLAMS, only Trinity County station	keep
Crescent City	060150006	$PM_{2.5}$	2014	none	Crescent City	N/A	Critical-SLAMS, only Del Norte County station	keep

Jacobs

This is one of two gaseous monitoring stations within the District. It measures six pollutants. It also has a meteorological station measuring four parameters.

FRM PM10: During 2009-2013, conditions exceeded the state standard two times. The highest concentration recorded in that time was 64 ug/m^3.

FEM PM10: During 2014 conditions exceeded the state standard four times. The highest concentration recorded in that time was 104 ug/m^3.

FRM PM2.5 During 2009-2014, conditions did not exceed the federal standard. The highest concentration recorded in that time was 28.1 ug/m^3.

CO: From 2009-2014, CA AAQSs have not been exceeded.

O3: From 2009-2014, CA AAQSs have not been exceeded.

NOX From 2009-2014, CA AAQSs have not been exceeded.

SO2: From 2009-2014, CA AAQSs have not been exceeded.

This station is used to: establish regulatory compliance, complete emission reduction evaluations, monitor air quality impacts of an emission source, perform trend tracking and historical consistency comparisons and to perform accountability and performance measurements. It is valuable both because of its location downwind of several title five sources, and because it is a full station, allowing for a comparison of the various pollutants at a single location. This station is needed for geographical and population representation.

Humboldt Hill Monitoring Station

This is one of two gaseous monitoring stations within the District. It measures six pollutants. It also has a meteorological station measuring four parameters.

FRM PM10 During 2011-2013, conditions did not exceed the federal standard. The highest concentration recorded in that time was 44 ug/m^3.

FRM PM2.5 During 2011-2014, conditions did not exceed the federal standard. The highest concentration recorded in that time was 22.2 ug/m^3.

CO: From 2011-2014, CA AAQSs have not been exceeded.

O3: From 2011-2014, CA AAQSs have not been exceeded.

NOX From 2011-2014, CA AAQSs have not been exceeded.

SO2: From 2011-2014, CA AAQSs have not been exceeded.

This station’s primary function is to monitor the air quality impacts of an emission source. It is valuable because of its location downwind of the largest major Title V source in the District. No other monitoring equipment is located correctly to monitor emissions from this source. This station is needed to accurately evaluate source emissions.

Weaverville

The Weaverville Courthouse site is the only monitoring site in Trinity County. Weaverville is the most populous area of Trinity County. It currently monitors $PM_{2.5}$. It also hosts a NOAA Ozone instrument. This instrument is used to collect data for NOAA ozone transport studies. While the ozone data meets stringent Department of Commerce QAQC requirements, it does not meet the QAQC checks required by AQS, hence the data is not part of the AQS record.

FRM PM10: During 2009-2013 conditions exceeded the state standard 2 times. The highest concentration recorded in that time was 59. FRM PM10 monitoring ended in December 2013. Non-FEM $PM_{2.5}$ monitoring began in March 2015.

This station is used to establish regulatory compliance, complete emission reduction evaluations, and to perform accountability and performance measurements. The station is needed for geographical representation and because of the possibility of wildfire smoke affecting the population of Weaverville.

Crescent City

The Crescent City site is the only monitoring site in Del Norte County. PM is the only pollutant monitored. Historically, PM10 was monitored. In July of 2014, Del Norte County was reclassified as attainment for PM10. The instrument was replaced with an FEM PM2.5 Grimm 180. Unfortunately, that instrument is not yet operational. It is expected to come online July 2015.

PM10: During 2009-2013 conditions exceeded the state standard one time. The highest concentration recorded in that time was 61.

This station represents conditions in a large part of the northwestern portion of the North Coast Air Basin. The PM monitor is needed for geographical representation. It is used to establish regulatory compliance, evaluate emission reductions, track trends, assess the effects of air pollution control programs, and monitor wildfire smoke.

Mobile Units

The District operates four E-BAMs. These units are used primarily during wildfire season. They are sometimes also used to investigate air quality complaints. Data from the units has been used for air quality model evaluation, public reporting of AQI, air quality impacts of an emission source, and Public Service Announcement determinations. Monitoring data from these units has been used to establish welfare-related impacts in rural and remote areas.

Assessment Summary

The District has accomplished the transition to continuous methods for PM_{10}. Both Del Norte and Trinity County attained PM_{10} attainment designation in 2014, allowing manual methods for PM_{10} sampling to end at those locations. The Humboldt County monitoring locations began using a continuous method in 2014.

Transitioning to reliable continuous methods for PM is the highest priority in the District network monitoring plan. This is both to obtain more complete monitoring data, and to reduce costs. The Trinity County location has a continuous $PM_{2.5}$ measuring system, however it is not FEM. The Grimm 180 instruments currently in use cannot be compared to the NAAQS, so they will be transitioned to $PM_{1.0}$ monitors. The usefulness of this approach will be evaluated in the next network assessment.

All monitoring stations are recommended to continue at their current levels. All stations are required due to geographical need. Monitoring objectives have been met to the greatest extent allowed by the size and funding of the District. The highest pollutant concentrations populations are exposed to are expected to be discovered at the stations. The impact on ambient pollution levels of significant sources or source categories is measured by monitoring downwind of significant contributors of pollution. Background concentration levels are not obtained by the network due to limitations on monitoring funding. However, a NOAA Observatory is located within the District, which can be leveraged to obtain background levels for some pollutants.

The determination of regional pollution transport among populated areas and in support of secondary standards is beyond current funding constraints upon the District. However, the District supports NOAA efforts to study Ozone Transport Issues. This ozone transport information is not expected to have ramifications on North Coast ozone attainment, but is expected to generate useful data for the more inland counties.

Appendix A

PM2.5 Grimm 180 Waiver Request

A. Review of Network
See Annual Network Plan, above.

B. Review of data comparability of the $PM_{2.5}$ continuous monitors
Data from the Grimm 180 to the Thermo 2000i was compared for 20 consecutive months. A total of 163 comparison dates were observed. Data was evaluated using the EPA ARM Candidate Method Test. Data below a threshold of 3 *u*g/m_3 was excluded from the evaluation. Results from that evaluation are below.

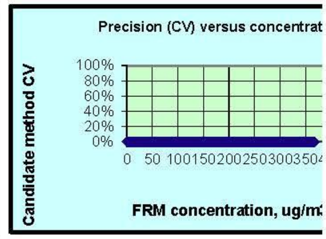
Summary - Candidate ARM Comparability

Applicant:	NCUAQMD
Candidate method:	Grimm 180 - Class
Test site:	Humboldt Hill - (Site location)

Data sets	Number
Valid data sets available:	163
Number of valid data sets required for ARM Comparison:	90
Number of valid data sets for this test is:	OK
Additional data sets needed:	--

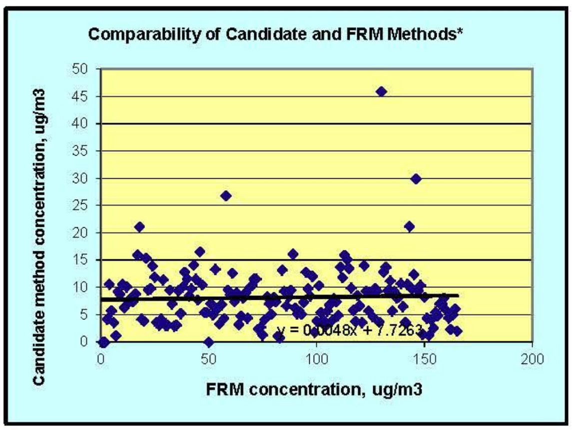
(Including 72 data sets excluded because FRM co

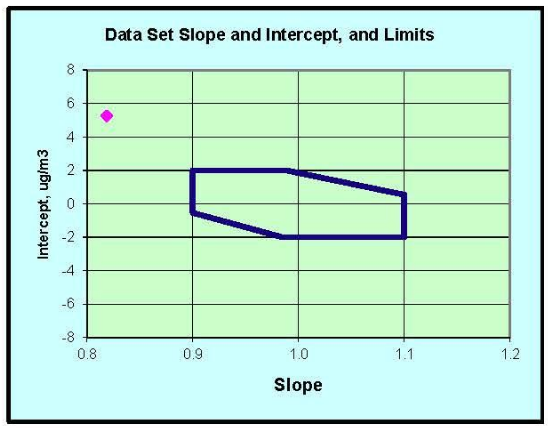
Precision (if data are available)	Data set mean, µg/m³		Data set precision, µg/m³		Relative precision (CV)	
	FRM	Candidate	FRM	Candidate	FRM	Candidate
Mean:						
Maximum:	0.0	0.0				
Minimum:	0.0	0.0				
Candidate / FRM Ratio:						
RMS Relative Precision for this site:						
Test requirements - Class III:					10.0%	15.0%
Precision Test Results for site:						



Regression statistics		Slope[1]	Intercept[2]	Correlation (r)
Statistics for this test site:		0.819	5.277	0.37122
Limits for Class III	Upper:	1.100	2.000	
	Lower:	0.900	0.872	0.95000
Test Results (Pass/Fail):		FAIL	FAIL	FAIL

[1] Multiplicative bias [2] Additive bias





*If chart does not plot correctly, go to the Regression sheet and click on the▼ in the Validity column and then on "ok." If new data are added, click "all" then "ok" to include the new data.

Data:

date	**Grimm** *u*g/m3	**FRM** *u*g/m3
20-Mar-13	4.2	2.3
23-Mar-13	10.6	5.5
26-Mar-13	5.7	3.9
29-Mar-13	3.6	1.9
4-Apr-13	1.2	0.9
10-Apr-13	9.2	3.8
16-Apr-13	8.7	5.3
22-Apr-13	10.6	4.5
28-Apr-13	6.3	3.4
4-May-13	10.1	8
10-May-13	7.3	3
16-May-13	8	3
22-May-13	7.4	4.9
28-May-13	8.8	2.9
3-Jun-13	16	7.9
9-Jun-13	21.1	12.2
15-Jun-13	4.2	1
21-Jun-13	3.8	1.7
3-Jul-13	15.4	6.4
9-Jul-13	9.5	2.5
15-Jul-13	9.8	3.1
21-Jul-13	13.9	1.1
27-Jul-13	11.9	4
2-Aug-13	3.6	0.5
8-Aug-13	3.1	3.2
14-Aug-13	4.2	1.9
20-Aug-13	11.4	4.8
26-Aug-13	3.1	1.6
1-Sep-13	3.1	1.5
7-Sep-13	9.5	1.7
18-Sep-13	7	0.3
21-Sep-13	2.9	1.8
25-Sep-13	3.1	1.3
1-Oct-13	9.4	4.9
4-Oct-13	5.2	8.4
8-Oct-13	10.1	4.7
10-Oct-13	12.8	7.6
13-Oct-13	11.6	3.5
16-Oct-13	8.4	3.3
19-Oct-13	9.7	4.7
22-Oct-13	14.1	2.6
25-Oct-13	11.5	5.6
29-Oct-13	7.7	4.8
31-Oct-13	16.5	7.7
3-Nov-13	10.5	5.6
6-Nov-13	5.4	1.9
9-Nov-13	5.4	3.5
21-Nov-13	0	9.7
24-Nov-13	7	4.4
27-Nov-13	5	4.4

30-Nov-13	13.3	7.8
3-Dec-13	6	1.9
6-Dec-13	3.3	3.4
9-Dec-13	6.9	4.7
12-Dec-13	4.3	3.5
15-Dec-13	26.8	12.4
18-Dec-13	9.5	15.4
21-Dec-13	8.7	3
24-Dec-13	12.6	4.9
27-Dec-13	7.4	9.1
30-Dec-13	9	5.5
5-Jan-14	3.2	2.5
8-Jan-14	4.7	1.5
11-Jan-14	8.1	3.8
14-Jan-14	9	4.9
17-Jan-14	4.4	3.7
20-Jan-14	10	6.1
23-Jan-14	10.4	4.8
26-Jan-14	11.5	5.3
29-Jan-14	11.5	2.6
1-Feb-14	2.3	0.9
4-Feb-14	2.7	0.5
7-Feb-14	1.3	5.5
10-Feb-14	4.1	2.6
13-Feb-14	8.3	0.8
16-Feb-14	7	2.5
19-Feb-14	5.1	2.3
22-Feb-14	8.2	2.6
25-Feb-14	7.4	4.4
28-Feb-14	1	4.7
3-Mar-14	0.8	0.7
6-Mar-14	13.2	1.3
9-Mar-14	9.3	1.0
12-Mar-14	6.6	2.5
15-Mar-14	8.3	2.4
18-Mar-14	9.5	4.5
21-Mar-14	16.1	6.7
24-Mar-14	6.2	4.1
27-Mar-14	5.2	4.2
30-Mar-14	5.6	3.1
2-Apr-14	5.1	2.5
5-Apr-14	7.3	4.3
8-Apr-14	12.8	2.4
14-Apr-14	9.8	5.3
17-Apr-14	8.4	2.8
20-Apr-14	12	4.8
23-Apr-14	1.8	1.3
26-Apr-14	3.8	1.8
29-Apr-14	10.3	5.7
2-May-14	5.4	2.9
5-May-14	4	2.4
8-May-14	2.9	1.5
11-May-14	5.7	1.9
14-May-14	6.8	5.9

17-May-14	3.9	2.5
20-May-14	8	0.4
23-May-14	7.4	1.2
26-May-14	4.9	3.0
29-May-14	13.7	6.5
1-Jun-14	11.8	5.5
4-Jun-14	15.9	7.7
7-Jun-14	15.1	8.0
10-Jun-14	13.5	7.4
13-Jun-14	9.9	3.0
16-Jun-14	5.8	3.4
19-Jun-14	3.8	2.3
22-Jun-14	8.5	4.7
25-Jun-14	6.7	0.5
28-Jun-14	3.6	1.9
1-Jul-14	14	3.2
4-Jul-14	9.3	4.2
7-Jul-14	5.7	0.9
10-Jul-14	9	1.4
13-Jul-14	4.6	2.0
16-Jul-14	9.8	3.3
19-Jul-14	9.3	1.1
22-Jul-14	3.7	1.0
28-Jul-14	45.9	1.7
31-Jul-14	12.8	2.7
3-Aug-14	13.7	3.2
6-Aug-14	9.4	0.0
9-Aug-14	11.2	4.6
12-Aug-14	5.7	2.0
15-Aug-14	9.3	1.2
18-Aug-14	8.1	1.8
21-Aug-14	8.3	4.6
24-Aug-14	10.7	0.2
27-Aug-14	6.5	0.0
30-Aug-14	3.6	1.7
2-Sep-14	10.6	4.0
5-Sep-14	21.2	9.5
8-Sep-14	9.7	0.0
11-Sep-14	12.4	0.3
14-Sep-14	29.9	3.4
17-Sep-14	9.4	3.8
20-Sep-14	10.4	3.8
23-Sep-14	1.4	1.1
11-Oct-14	8.2	2.4
14-Oct-14	4.4	4.2
17-Oct-14	1.2	1.7
20-Oct-14	4	1.9
23-Oct-14	2.5	1.6
29-Oct-14	5.5	4.5
1-Nov-14	4.8	3.0
4-Nov-14	7	5.0
7-Nov-14	7	4.0
10-Nov-14	8.1	4.0

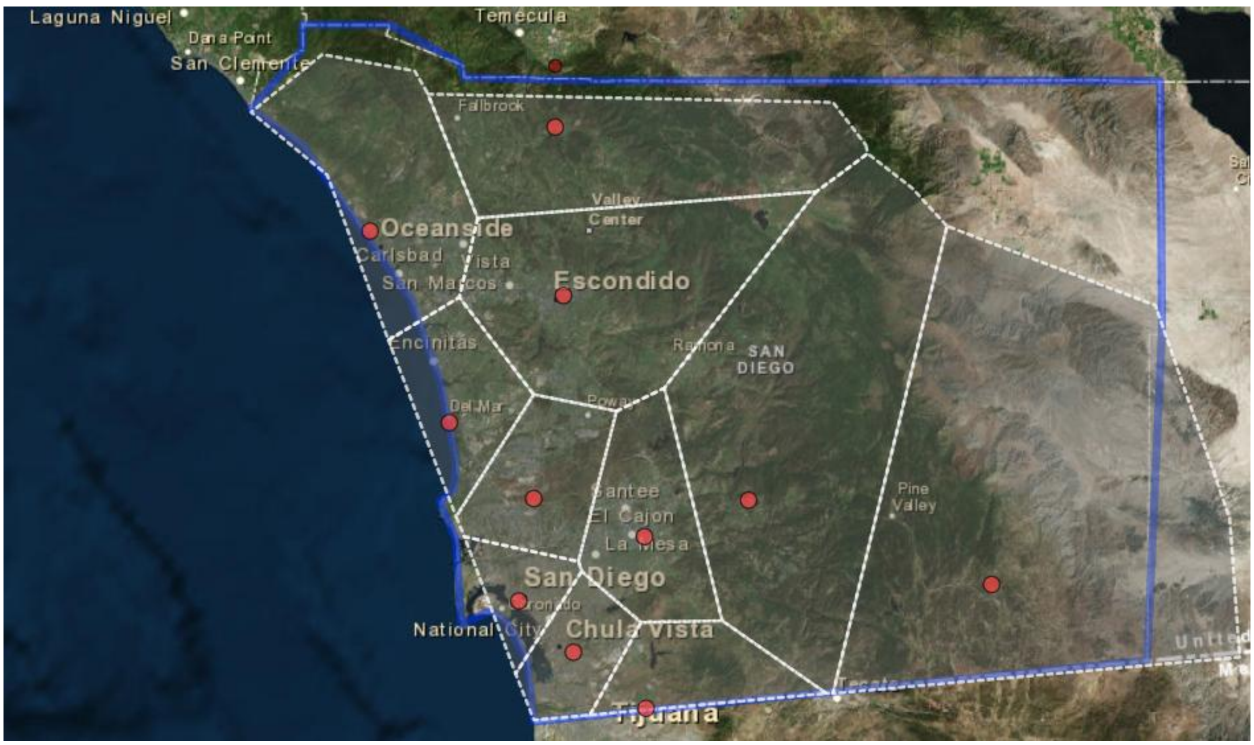
13-Nov-14	5.8	4.8
16-Nov-14	4.4	3.2
19-Nov-14	2.3	2.0
22-Nov-14	5	3.0
25-Nov-14	6.1	5.1
28-Nov-14	2	2.5

C. Waiver Request

Due to the failure of the Grimm 180 data in the study, the District requests an exclusion of PM2.5 data obtained from the Grimm 180 instruments in the District network.

AIR POLLUTION CONTROL DISTRICT
COUNTY OF SAN DIEGO

SAN DIEGO AIR POLLUTION CONTROL DISTRICT 5-YEAR AIR QUALITY MONITORING NETWORK ASSESSMENT 2015



Prepared by:

The Staff of the Monitoring and Technical Services Division
of the
San Diego Air Pollution Control District

July 1, 2015

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Introduction

Purpose of the Network Assessment

Monitoring networks are designed to achieve, with limited resources, the best possible scientific data to inform the protection of public health, the environment and public welfare. The number, location, and types of monitors needed to achieve this goal depends on a myriad of factors, including demographics, pollution levels, air quality standards, technology, budgets, and scientific understanding. These factors all change over time. In accordance with EPA monitoring regulations, each State and local air pollution control agency must conduct an assessment of its monitoring network every five years in order to determine the following:

- if the network meets the monitoring objectives defined in Appendix D of 40 CFR 58.10,
- whether new monitoring sites are needed,
- whether existing sites are no longer needed and can be terminated, and
- whether new technologies are appropriate for incorporation into the ambient air monitoring network.

On October 12, 2006, the United States (U.S.) Environmental Protection Agency (EPA) finalized an amendment to the ambient air monitoring regulations. As part of this amendment, the EPA added the following requirement for State, or where applicable local, monitoring agencies to conduct network assessments once every five years [40 CFR 58.10(e)].

> *"(e) The State, or where applicable local, agency shall perform and submit to the EPA Regional Administrator an assessment of the air quality surveillance system every 5 years to determine, at a minimum, if the network meets the monitoring objectives defined in appendix D to this part, whether new sites are needed, whether existing sites are no longer needed and can be terminated, and whether new technologies are appropriate for incorporation into the ambient air monitoring network. The network assessment must consider the ability of existing and proposed sites to support air quality characterization for areas with relatively high populations of susceptible individuals (e.g., children with asthma), and, for any sites that are being proposed for discontinuance, the effect on data users other than the agency itself, such as nearby States and Tribes or health effects studies. For PM2.5, the assessment also must identify needed changes to population-oriented sites. The State, or where applicable local, agency must submit a copy of this 5-year assessment, along with a revised annual network plan, to the Regional Administrator. The first assessment is due July 1, 2010."*

Ambient air monitoring objectives can shift over time, which is one of the major reasons behind the re-evaluation and reconfiguration of many monitoring networks. The alteration of a monitoring network can be initiated for several reasons. The primary reason is in response to a change in air quality. Air quality has changed since the adoption of the Clean Air Act (CAA) and National Ambient Air Quality Standards (NAAQS). For example, the ambient concentrations of lead have dropped radically compared to past levels in the U.S. A second reason is a change in population and behaviors. For example, the U.S. population has grown, aged and shifted toward more urban and suburban areas over the past few decades. In addition, the rates of vehicle ownership and annual miles driven have also risen. A third reason is the establishment of new air quality objectives. New programs and rules are constantly being instituted, including rules that will reduce air pollution. A fourth reason is the result of an improved understanding of air quality issues, as well as improved monitoring capabilities. Together, the enhanced understanding and capabilities can be used to design more effective air monitoring networks.

As a result of such changes, the San Diego Air Pollution Control District's (District) air monitoring network may have unnecessary or redundant monitors, or ineffective and inefficient monitoring locations for some pollutants, while other areas or pollutants may have a lack of monitors (an air pollution monitoring gap). This assessment will assist the District in optimizing its current network to help better protect today's population and environment, while maintaining the ability to understand long-term historical air quality trends. In addition, the advantages of implementing new air monitoring technologies combined with an improved scientific understanding of air quality issues would greatly benefit the District's network, as well as the stakeholders, scientists, and general public who use it.

Scope of the Network Assessment

The network assessment must consider the ability of existing and proposed monitoring sites to provide relevant data for air quality characterization for areas with relatively high populations of susceptible individuals (e.g., children with asthma). The assessment also must show the effects of proposals to discontinue any sites on data users other than the agency itself, such as nearby States and Tribes or organizations conducting studies on health effects. For the criteria pollutant $PM_{2.5}$, the assessment also must identify needed changes to population-oriented sites.

The objectives for this network assessment are three-fold:

- to determine whether the existing network is meeting the intended monitoring objectives,
- to evaluate the network's adequacy for characterizing current air quality and impacts from future industrial and population growth, and
- to identify/discuss potential areas where new monitors can be sited or removed to support network optimization and/or to meet new monitoring objectives.

To meet these objectives, a series of analyses will be performed to address the following questions on the network:

- How well does the current monitoring network support the current objectives? Which objectives are being met, and which objectives are not being met? Are unmet objective(s) appropriate concerns for the District? If so, what monitoring is necessary to meet those unaddressed objectives? What are potential future objectives for the monitoring network?
- Are the existing sites collectively capable of characterizing all criteria pollutants? Are the existing sites capable of characterizing criteria pollutant trends (spatially and temporally)? If not, which areas lack appropriate monitoring? If needed, where should new monitors be placed? Does the existing network support future emissions assessment, reconciliation, and modeling studies? Are there parameters (at existing sites) or new sites that need to be added to support these objectives?
- Is the current monitoring network sufficient to adequately assess local air quality conditions with respect to all criteria pollutants? If not, where should monitors be relocated or added to improve the overall effectiveness of the monitoring network? How can the effectiveness of the monitoring network be maximized?

This assessment details the current monitoring network in the San Diego Air Basin (SDAB) for the criteria pollutants: ozone (O_3), nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), lead (Pb), fine particulate matter 2.5 micrometers and less in diameter ($PM_{2.5}$), and particulate matter 10 micrometers and less in diameter (PM_{10}). This assessment considers the aforementioned parameters, with particular attention paid to ozone and $PM_{2.5}$ due to concerns with attainment status and health effects, in terms of associated monitoring requirements and a shrinking budget. This report describes the network of ambient air quality monitors operated by the District, analyzes the effectiveness and efficiency of the monitors in regards to the overall network, and makes recommendations for changes to the network.

Rating System Used to Rank the Monitors and Stations

The District used a multilayered approach to rank the air monitors, samplers, and stations. This method included the following:

- trends data,
- monitor designation/purpose of the monitor/purpose of the station,
- quality assurance needs,
- number of monitors and samplers at a site,
- nearby influences,
- community need,
- type of community,
- population shift,
- rate of asthma, chronic obstructive pulmonary disease (COPD), and heart related issues in the community,
- EPA Network Assessment Tools (Correlation, Removal Bias, and Area Served), and
- recent expenditures to the station.

Except for number of monitors, each parameter was rated on a scale of 1-10, with 10 representing the highest score and entered into a master score sheet muck like Figure A. For example, if a station is located in an Environmental Justice (EJ) area, the station would receive a “10” for type of community and a“10” for community need. Thus, the overall ranking would be biased high, due to the previously stated parameters, to counter lower rankings from the EPA tools, which do not take into account the needs of the community.

Trends data

The duration of historical data, which is valuable for tracking pollutant trends, is useful for assessing the effectiveness of air pollution reduction programs. Rankings are irrespective of monitor redundancy with another site. If a monitor has an established trend and is needed, it received a high ranking.

Monitor designation/purpose of the monitor/purpose of the station

Some monitors have designations that will require multiple layers of approval to remove or relocate. For example, changes regarding the Photochemical Assessment Monitoring Stations (PAMS) required monitors will need EPA-National approval, which is very difficult to obtain. Such monitors received a high ranking.

Quality assurance needs

Some sites are needed for quality assurance purposes. For example, collocated particulate instrumentation must be located in areas that approach the NAAQS or have a higher probability of approaching the NAAQS. These sites were awarded higher rankings than others.

Number of monitors and samplers at a site

Sites having the most parameters measured ranked higher. Each monitoring instrument counts as one parameter. This method takes into account budgetary apportionment, because one site with several instruments has a cost savings in time and travel over another site with few instruments.

Nearby influences
Is the station in place to record possible influence(s) from a power plant or a freeway? If the station has such a purpose, it received a higher score than a site that does not. Conversely, if a station was established to record possible influences and those influences have since been removed, it received a lower score than a typical ambient station.

Community need
Did a community action group request monitoring in their area? Has that group come to rely on these monitors? Stations that have such instrumentation received a higher score than stations that were not requested.

Type of community
Is the community a bedroom community, industrial zone, or mixed use? The rating is highest for a mixed use community, because industrial pollutants have a greater impact on the residents of the community. A predominantly bedroom community was rated the lowest, because there is less pollutant impact (unless it is immediately downwind of a source).

Population shift
Is this a community in which the station is located whose population is growing, decreasing, or relatively the same? Is the community in a desirable area, where population will grow? These areas received a higher ranking.

Rate of asthma, COPD, and heart related issues in the community
Data were culled from local, State, and Federal resources to ascertain if a community in which a station is located has a higher rate of the titled health issues. If so, these stations received a higher ranking than ones with a lower percentage of the population with these aliments.

EPA Network Assessment Tools (Correlation, Removal Bias, and Area Served)
The report generated using the Network Assessment Tools was rated according to the results without consideration of other parameters. If the tool showed that a monitor is redundant, the monitor received a low rating (advocating removal), without regard to the area served or type of community. This method ensures an unbiased ranking.

Recent expenditures to the station
If significant capital has been spent upgrading a station for safety or other reasons, then the station received a higher rating due to the expenditure. For example, a new wooden sampling deck costs $35,000 (about 1/3 the cost of an entire station start-up); therefore, if a station recently was upgraded to a new deck, then it received a higher number than one that was not.

Figure A Station Score Sheet

	Trends	Purpose	QA	No. of Monitors	Nearby Influences	Community Need	Type of Community	Population Shift	Health	Correlation	Removal	Area Served	Recent Expenditures	**TOTAL**
Alpine (ALP)														
Camp Pendleton (CMP)														
Chula Vista (CVA)														
Del Mar (DMR)														
Otay Mesa-Donovan (DVN)														
El Cajon. (FSD)														
Escondido (ESC)														
McClellan-Palomar Airport (CRQ)														
San Diego-Beardsley (DTN)														
San Diego-Kearny Villa Rd. (KVR)														
San Diego-Rancho Carmel Dr. (RCD)														
San Ysidro (SAY)														

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ACRONYMS

Symbols & Numbers
>- Greater than
<- Less than
≥- Greater than or equal to
≤- Less than or equal to
%- percent
µg/m^3- micrograms per cubic meter
7/24- Monitor that operates 7 days a week, 24 hours a day

A
AADT- Average Actual Daily Traffic
Acid Rain- Rain which is especially acidic, which typically is composed of sulfuric and/or nitric acid. Formed by the combination of nitrogen and sulfur oxides with water vapor in the atmosphere.
Aerosol- Particles of solid or liquid matter that can remain suspended in air for long periods of time because of extremely small size and/or weight.
Area wide- Stationary sources of pollution
Attainment Area; a geographic area which is in compliance with the NAAQS
Air Explorer- AQS data analysis tool
AirNow- AQI real time data
ALP- Alpine monitoring location
AMP reports- Series of AQS retrieval reports
AMTIC- Ambient Monitoring Technical Information Center
APCD- Air Pollution Control District; a county agency with authority to regulate sources of air pollution within the county and governed by the county supervisors.
AQI- Air Quality Index
AQMD- Air Quality Management District; a group of counties or an individual county with authority to regulate sources of air pollution within the region and governed by a regional air pollution control board.
AQS- Air Quality System
ARM- Approved Regional Method
Automated (aka continuous)- A sampler that operates on a 7/24 schedule

B
BAM- Beta Attenuation Monitor
BURN- Agricultural Burning refers to the intentional use of fire for the burning of vegetation produced wholly from the growing and harvesting of crops in agricultural operations. This includes the burning of grass and weeds in fence rows, ditch banks, and berms in non-tillage orchard operations, fields being prepared for cultivation, agricultural wastes, and the operation or maintenance of a system for the delivery of water for agricultural operations.

C
CAA- Clean Air Act
CARB- California Air Resources Board
CASAC- Clean Air Science Advisory Committee

CASTNET- Clean Air Status and Trends Network
CA TAC- California Air Toxics monitoring
CBSA- Core Bases Statistical Area
CFR- Code of Federal Regulations
CL- Chemiluminescence method is based upon the emission of photons in the reaction between ozone and nitric oxide (NO) to form nitrogen dioxide and oxygen.
CMP- Camp Pendleton monitoring location
CO- Carbon monoxide
CO_2- Carbon dioxide
Collocated- a monitor/sampler that is located within 1-4 meters, depending on the sampling rate of another one of the same sampling method.
Continuous (aka automated)- A sampler that operates on a 7/24 schedule
Criteria pollutants- An air pollutant for which acceptable levels of exposure can be determined and for which an ambient air quality standard has been set.
CRQ- McClellan-Palomar Airport monitoring location
CSA- Core based Statistical Area
Cr(VI) (aka Cr^{+6})- Chromium 6
CSN- Monitors that are part of the Chemical Speciation Network (carbon analyses)
CT- Low volume, continuous sampler, size selective inlet method is based upon a regulated low flow (16.7 LPM) instrument that operates 7 / 24.
CVA- Chula Vista monitoring location

D
DVN- Donovan monitoring station
DMR- Del Mar monitoring station
DNPH- 2,4 –dinitrophenyl hydrazine; a derivatizing agent on cartridges used to collect carbonyl samples
DTN- San Diego/Beardsley St. monitoring location

E
EIR- Environmental Impact Report
EC- Elemental Carbon
ECA- El Cajon monitoring station
EPA- Environmental Protection Agency
ESC- Escondido monitoring station
EXDN- Extreme downwind site type

F
FDMS- Filter Dynamic Measurement System
FE- Fleet equivalency
FEM- Federal Equivalent Method
FIP- Federal Implementation Plan
FL- Fluorescence method is based upon the principle that SO_2 molecules absorb ultraviolet (UV) light and become excited at one wavelength, then decay to a lower energy state emitting UV light at a different wavelength. The intensity of fluorescence is proportional to the SO2 concentration.
FR- Federal Register
FRM- Federal Reference Method
FSL- Fused silica lined

G

G/B- General/Background site type
GC/FID- Gas Chromatography with a flam ionization detector
GC/MS- Gas Chromatography followed by mass spectroscopy

H

HAP- Hazardous Air Pollutant; An air pollutant considered by the EPA to be particular hazardous to health.
HC- Highest concentration site type
HD- High density
HPLC- High Performance Liquid Chromatography
Hr- Hour
Hydrocarbon- Any of a large number of compounds containing various combinations of hydrogen and carbon atoms.

I

ICP/MS- Inductively Coupled Plasma Mass Spectrometry
IMPROVE- Interagency Monitoring of Protected Visual Environments
IO- Inorganic
IR- Nondispersive infrared method is based upon the absorption of infrared radiation by CO in a non-dispersive photometer. Infrared energy from a source is passed through a cell containing the gas sample to be analyzed, and the quantitative absorption of energy by CO in the sample cell is measured by a suitable detector.

K

KMA- San Diego/Overland (aka Kearny Mesa) monitoring location
KVR- Kearny Villa Road monitoring location

L

Lat- Latitude
Level I calibrator- A calibrator that is certified according to EPA specifications
Level II- calibrator- A calibrator that is not certified
Lon- Longitude

M

Manual (aka sequential)- A sampler that requires a media change and operates on a schedule set by the EPA.
MDL- Method Detection Limit
Met- Meteorological
MI- Microscale is an expanse of uniform pollutant concentrations, ranging from several meters up to 100m.
MOA- Memorandum of Agreement
Mobile Sources- Sources of air pollution that are not stationary, e.g. automobiles.
Monitoring- The periodic or continuous sampling and analysis of air pollutants in ambient air or from individual pollutant sources.
MOU- Memorandum of Understanding
MS- Middle Scale is an expanse of uniform pollutant concentrations, ranging from about 100 meters to 0.5 kilometers

MSA- Metropolitan Statistical Area
MXO- Maximum ozone concentration site type
MXP- Maximum ozone precursor site type

N
NAAQS- National Ambient Qir Quality Standard
NACAA- National Association of Clean Air Agencies
NAFTA- North American Trade Agreement
NAMS- National Air Monitoring Station
NATA- National Air Toxics Assessment
NATTS- National Air Toxics Trends Sites
NCore- National Core multipollutant monitoring stations
NEI- National Emissions Inventory
NEPA- non-EPA Federal monitor type
NIST- National Institute of Standards and Technology
NOAA- National Oceanic and Atmospheric Administration
Non-Methane Hydrocarbons- (aka ROGs); a chemical gas composed of hydrocarbons that may contribute to the formation of smog.
NOx- Oxides of Nitrogen
NO- Nitric oxide
NO_2- Nitrogen dioxide
NOy- Reactive oxides of nitrogen
NPAP- National Performance Audit Program
NPEP- National Performance Evaluation Program
NPS- National Parks Service
NS- Neighborhood Scale is an expanse with dimensions, ranging in the 0.5 kilometer to 4.0 kilometer range.
NSR- New Source Review; a program used in development of permits for modifying industrial facilities which are in a non-attainment area.
Non-Attainment Area- A geographic area identified by the EPA as not meeting the NAAQS for a given pollutant.
NTIS- National Technical Information Service

O
OAQPS- Office of Air Quality Planning and Standards
OC- Organic Carbon
OTAQ- Office of Transportation and Air Quality
OTM- Otay Mesa monitoring location
O_3- Ozone
Ozone layer- A layer of ozone 12-15 miles above the earth's surface which helps to filter out harmful UV rays from the sun.
Ozone ground level- Exists at the earth's surface and is a harmful component of smog.
Ozone precursors- Chemicals, such as hydrocarbons, occurring naturally or anthropogenic, which contribute to the formation of ozone.

P
P&A- Precision and Accuracy
PAH- Polynuclear Aromatic Hydrocarbon

PAMS- Photochemical Assessment Monitoring Stations
PAMS Type I- Designation for areas which are subjected to overwhelming incoming transport of ozone. Located in the predominant morning upwind direction from the area of maximum precursor emissions (upwind and background). Typically located near the upwind edge of the photochemical grid model domain .
PAMS Type II- Designation for areas immediately downwind of the area of maximum precursor Emissions (maximum precursor emissions impact) and are placed near the downwind boundary of the central business district or primary area of precursor emissions mix.
PAMS Type III- Maximum ozone concentrations occurring downwind for the area of maximum precursor emissions. Typically these sites are located 10-30 miles from the fringe of the urban area.
Pb- Lead
PE- Population exposure site type
PEP- Performance Evaluation Program
Photochemical reaction- A term referring to chemical reactions brought about by the light energy of the sun.
PM- Particulate Matter
PMcoarse- (aka PMc or $PM_{10-2.5}$) the resultant particles of the subtraction of $PM_{2.5}$ from PM_{10}. Coarse particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometers
$PM_{2.5}$- An air pollutant of particle size of 2.5 micrometers or less, which is inhalable.
PM_{10}- An air pollutant of particle size of 10 micrometers or less, which is inhalable.
POC- Parameter Occurrence Code
ppb- Parts per billion
ppm- Parts per million
ppt- Parts per trillion
PQAO- Primary Quality Assurance Organization
PWEI- Populated Weighted Emissions Index
%RH- Relative humidity

Q
QA- Quality Assurance and Quality Assurance site type
QAC- Quality Assurance Collocated monitor type
QAPP- Quality Assurance Project Plan
QC- Quality Control
QIP- Quality Improvement Plan
QMP- Quality Management Plan
Qtr- Quarter

R
RASS- Radar Acoustic Sounding System
ROG- Reactive Organic Gas (aka non-Methane hydrocarbons); a chemical gas composed of hydrocarbons that may contribute to the formation of smog.
RT- Regional transport site type
RTI- Research Triangle Institute
RTP- Research Triangle Park

S
SDAB- San Diego Air Basin
SEE- Gillespie Field monitoring location
SI- High volume, manual, size selective method is based upon a regulated high flow (>200 LPM) instrument that operates on a set schedule.
SIP(M)- State Implementation Plan
SLAMS- State/Local Air Monitoring Station
S/L/T- State, Local, and Tribal agencies
Smog- A combination of smoke, ozone, hydrocarbons, nitrogen oxides, and other chemically reactive compounds, which can result in a murky brown haze, which has adverse health effects.
SMP- System Management Plan
Speciation- Collection of a $PM_{2.5}$ sample that has its composition analyzed
SO- Source oriented site type
SOP- Standard Operating Procedures
SO_2- Sulfur dioxide
SOW- Statement of Work
SP- Low volume, speciated method is based upon a regulated low flow (< 200 LPM) instrument that operates on a set schedule.
SPM- Special Purpose monitor type
SQ- Low volume, sequential, size selective inlet method is based upon a regulated low flow (< 200 LPM) instrument that operates on a set schedule.
STN- Monitors that are part of the Speciation Trends Network (ions and wood smoke)
STAG- State Air Grand (federal)
SU- Supplemental Speciation

T
TA- Trend Analysis monitoring is useful for comparing and analyzing air pollution concentrations over time. Trend analyses show the progress (or lack of progress) in improving air quality for an area over a period of years.
TAC- Toxic Air Contaminant
TAD- Technical Assistance Document
TLE- Trace Level
Toxics (aka Air Toxics)- A generic term referring to a harmful chemical or group of chemicals in the air that are especially harmful to health.
Toxic Hot Spot- An area where the concentration of air toxics is at a level where individuals may be exposed to an elevated risk of adverse health effects.
TTN- Technology Transfer Network

TR- Pollutant Transport is the movement of a pollutant between air basins. Transport monitoring is used to help determine whether observed pollutant concentrations are locally generated or generated outside of the air basin and blown ("transported") in, thereby raising local ambient air pollutant concentrations.
Trends- STN or CSN monitor type
TSP- Total Suspended Particulate

U

UNPAMS- Unofficial PAMS monitor type
UPBD- Upwind background
US- Urban Scale is Citywide pollutant conditions with dimensions ranging from 4 to 50 kilometers.
UV- Ultraviolet Absorption method is based upon the absorption of UV light by the ozone molecule and subsequent use of photometry to measure reduction of light at 254 nm, as expressed by the Beer-Lambert Law.

V

VOC- Volatile Organic Compounds

W

WD- Wind Direction
WF- Welfare Effects monitoring is used to measure air pollution impacts on visibility, vegetation damage, architectural damage, or other welfare-based impacts.
WS- Wind Speed

Y

Yr- Year

Z

ZAG- Zero Air Generator

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Executive Summary

Section I Results of the Scoring of the Network Assessment

The District recently relocated several stations and recently started-up some stations (and will be relocating and starting up more stations). These activities were facilitated by a thorough evaluation of our air quality monitoring network. This entailed a full network review that answered the same questions required in the 5-yr Network Assessment report, such as:

- Do we have redundant stations and/or monitors?
  -If so, can we close the station and not create an air quality monitoring gap?
  -If not, can we decommission monitors within the station without creating a gap?
- Do we have an existing air quality monitoring gap(s)?
  -Are there gaps in our network that can only be filled by adding a new station?
  -Are there gaps in our network that can be filled by adding monitors to a station(s)?
- Are our stations and monitors/samplers still valid for the air quality purpose they were designed?
  -If not, why?
  -Is it outmoded technology, obstructions to the airflow, the growth of trees around the station, and other such reasons.

Consequently, the results from the using the EPA Network Assessment tools were not unexpected.

Our internal network review and the review using the EPA Network Assessment tools revealed that there is:

- No need for any major changes (adding/relocating/closing stations) beyond those already planned or anticipated;
- Do recommend some minor changes of removing borderline redundant and/or costly monitors and adding certain non-criteria pollutant monitors to sites, if funding allows;
- Do suggest some temporary monitoring in some rapidly growing areas in anticipation of future network coverage needs (see Figure 1 for a map of the current state of the network and where there may be coverage gaps).

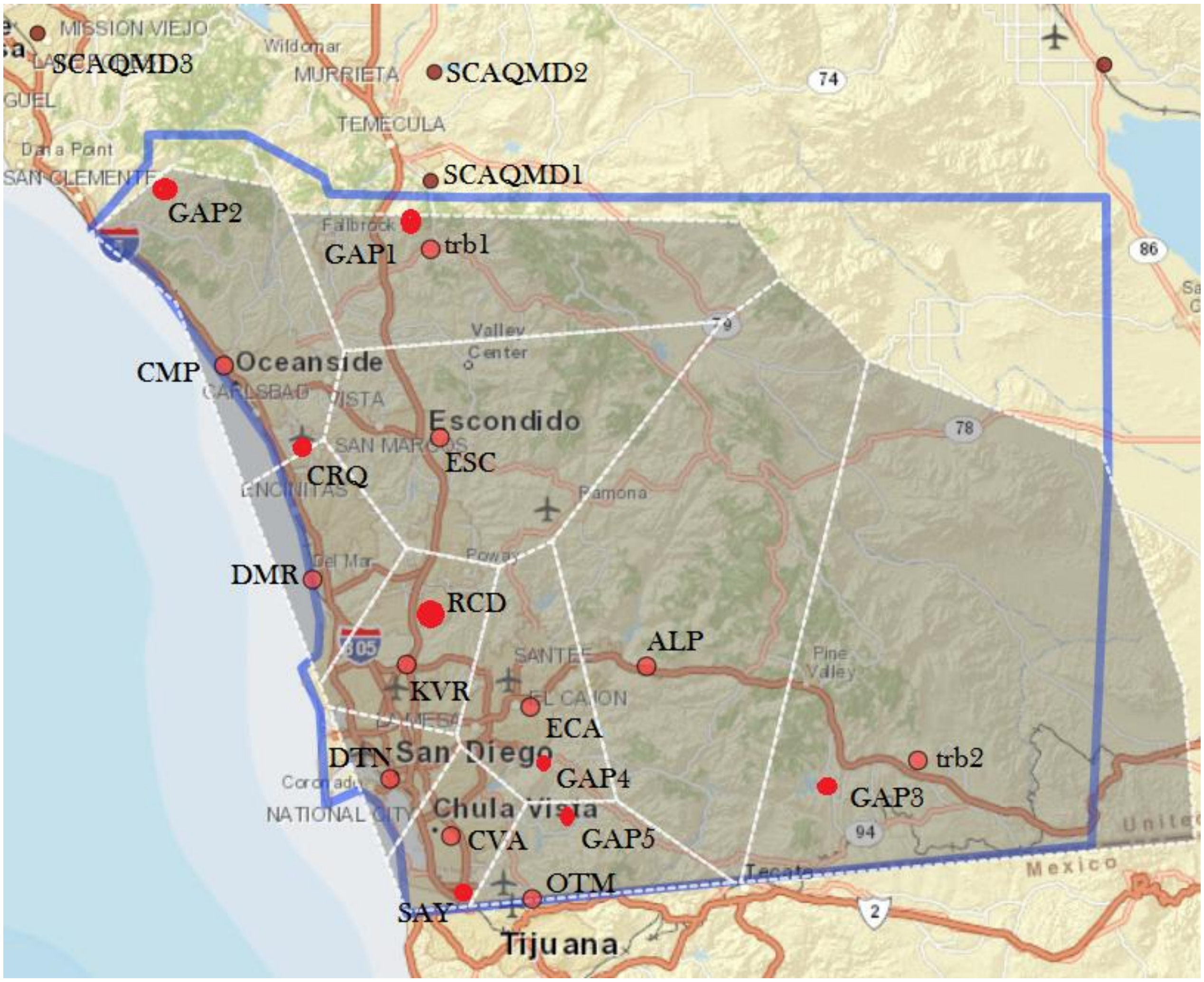
The Executive Summary encapsulates all the network assessment summaries and recommendations for the individual pollutants as determined in each chapter of this assessment, including monitor decommissioning and expansion, as well as station closures or relocations. Table 1 provides a summary of the scores.

Table I Summary of Network Assessment Scoring

	TOTAL SCORE	O_3 Scoring	NOx Scoring	CO Scoring	SO_2 Scoring	Pb Scoring	$PM_{2.5}$ Scoring	PM_{10} Scoring	PAMS-Carbonyls Scoring	PAMS- VOC Scoring	Toxics-Metals Scoring	Toxics- VOC Scoring	Population Scoring	Health Risk Scoring	$PM_{2.5}$ Speciation Scoring
San Diego-Beardsley (DTN)	**410**	72	38	34	n/a	n/a	86	26	24	n/a	40	40	10	10	30
El Cajon (ECA)	**391**	87	43	34	***A***	***A***	86	44	30	30	n/a	n/a	7	8	66
Escondido (ESC)	**383**	68	36	34	n/a	n/a	73	32	***B***	n/a	33	33	8	6	60
Otay Mesa-Donovan (DVN)	**253**	58	29	n/a	n/a	n/a	28	33	28	n/a	32	32	7	6	***E***
Chula Vista (CVA)	**227**	71	30	n/a	n/a	n/a	75	34	n/a	n/a	n/a	n/a	8	9	n/a
San Diego-Kearny Villa Rd. (KVR)	**209**	64	27	n/a	n/a	n/a	49	24	31	n/a	n/a	n/a	10	4	n/a
Camp Pendleton (CMP)	**206**	72	27	n/a	n/a	n/a	61	n/a	n/a	33	n/a	n/a	10	3	n/a
Alpine (ALP)	**180**	63	28	n/a	n/a	n/a	49	n/a	n/a	32	n/a	n/a	2	6	n/a
2nd Near-road Site (to be determined)	**109**	n/a	29	24	n/a	n/a	37	n/a	***B***	n/a	***C***	***D***	9	10	n/a
Rancho Carmel Dr. (RCD)	**104**	n/a	27	27	n/a	n/a	34	n/a	***B***	n/a	***C***	***D***	10	6	n/a
San Ysidro (SAY)	**44**	n/a	n/a	n/a	n/a	n/a	31	n/a	n/a	n/a	***C***	***D***	7	6	***E***
Del Mar (DMR)	**22**	21	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0	1	n/a
Palomar Airport (CRQ)	**5**	n/a	n/a	n/a	n/a	***A***	n/a	n/a	n/a	n/a	n/a	n/a	n/a	5	n/a

A. This federally required monitor has no pollutant scoring, because the District has no authority to decommission it.
B. Because the surrounding areas are highly impacted by Formaldehyde which is the top cancer driver, Carbonyls analysis should be expanded to include this site, if funding becomes available.
C. Toxics-Metals analysis should be expanded to include this site representing highly impacted areas, if funding becomes available.
D. Toxics-Volatile Organic Compounds (VOC) analysis should be expanded to include this site representing highly impacted areas, if funding becomes available.
E. $PM_{2.5}$-speciation analysis should be expanded to include this site representing highly impacted areas, if funding becomes available.

Figure I Map of the Air Quality Monitoring Network



Legend:

ECA= El Cajon
DMR= Del Mar
ESC= Escondido
ALP= Alpine
CMP= Camp Pendleton
DTN San Diego-Beardsley St./Downtown San Diego
KVR= Kearny Villa Rd.
OTM= Otay Mesa now Otay Mesa-Donovan (DVN)
CVA= Chula Vista
RCD= Rancho Carmel Dr.
SAY= San Ysidro
CRQ= McClellan-Palomar Airport
trb1= Pala (not a San Diego APCD air monitoring site)
trb2= Blvd (not a San Diego APCD air monitoring site)

GAP1= Inland North County
GAP2= Coastal North County
GAP3= East County
GAP4= Mid-County
GAP5= Southeast County
SCAQMD1= Temecula
SCAQMD2= Elsinore
SCAQMD3= Mission Viejo

Section II Station/Sampler/Monitor Changes to the Network

No matter how in-depth a numbers analysis, scoring, or ranking system is, it will omit other factors. For example, the Rancho Carmel Drive station has a total score of 104, which is very low compared to the El Cajon station (391), and yet both sites and most of the samplers and monitors housed by these stations are federally mandated. This section explains each station's need, starting with the station with the highest score (therefore the highest rated) and ending with the lowest scored station.

Except for the Del Mar site, all ambient air monitoring stations that have an O_3 monitor also have a collocated NOx monitor. The two pollutants have an inverse relationship. Therefore, they serve as an automated data validation tool for each other. For example, if the O_3 monitor at ECA has seemingly anomalous high values, but the NOx monitor has corresponding dips in concentrations, the O_3 and NOx data is real and the data is kept. Therefore, all NOx monitors are considered essential and will not be discussed further in this summary in regards to decommissioning.

1. San Diego-Beardsley St. (DTN)

   This station is located in an Environmental Justice (EJ) area. Most of its instruments are federally mandated. The NOx and $PM_{2.5}$ concentrations are high for the air basin. Due to community concerns regarding the heavy industry surrounding the neighborhood, the District expanded monitoring at the site by adding the following non-mandated monitors or samplers:
   - PAMS-Carbonyls,
   - Toxics-Metals,
   - Toxics-VOC, and
   - $PM_{2.5}$ speciated.

   RECOMMENDATION
   - ✓ The station will neither be closed nor relocated.
   - ✓ All Historical PM_{10} data should be reviewed for possible decommissioning.

2. El Cajon (ECA)

   This station is federally mandated for PAMS and NCore. The non-mandated equipment includes the following:
   - NOx and
   - $PM_{2.5}$ speciated (for Carbon) sampler (channel 3) for the District's internal CSN program.

   The NCore program requires NOy sampling, which is very costly. The values measured with the collocated NOx monitor equal the NOy measured concentrations. The District will use this redundancy to decommission the NOy monitor when the EPA permits such action. The District uses the black carbon analysis at ECA as a baseline for the ESC and DTN locations. The SO_2 concentrations are so low that they are insignificant (cannot be plotted with the same scale as the NAAQS standard). The Pb-TSP concentrations register ambient levels. The District is in the process of relocating back to its original location.

   RECOMMENDATION
   - ✓ The station will neither be closed nor relocated.
   - ✓ The District recommends that the EPA consider decommissioning the Pb-TSP sampler and the NOy and SO_2 monitors.

3. Escondido (ESC)
   This station is situated in a borderline EJ location. It is located east of the most trafficked Interstate highway and State Route in the air basin, is sited to register fires under both normal and Santa Ana weather conditions, is along the Los Angeles and San Diego air basins, and is downwind of agricultural fields. Its NOx and $PM_{2.5}$ concentrations are high for the air basin. The non-mandated equipment includes the following:
   - CO,
   - Toxics-VOC, and
   - $PM_{2.5}$ speciated (for Carbon) sampler (channel 3) for the District's internal CSN program.

   The CO monitor is used for marking exceptional events due to inland fires and typically registers the highest concentrations for this air basin. The Toxics-VOC and $PM_{2.5}$ speciated samplers are the northernmost and easternmost samplers in the District's Toxics and Carbon networks, respectively.

   RECOMMENDATION
   - ✓ The station will neither be closed nor relocated.
   - ✓ All samplers and monitors will be retained.
   - ✓ If funding becomes available, PAMS-Carbonyls should be added.

4. Otay Mesa-Donovan (DVN)
   This station is the District's southeastern most site and is approximately 2.2 miles downwind of the Otay Mesa border crossing. Otay Mesa is the busiest Heavy Duty truck crossing in California and one of the busiest in the nation. The areas upwind and north of this station are the second fastest growing areas in the County. The NOx monitor is used to measure the border crossing influence due to the heavy truck traffic. This station was just relocated to the R.J. Donovan State Prison area from the U.S. Customs parking lot at the Otay Mesa border crossing. Not all equipment housed here is mandated by the EPA, but some are requested by the EPA. The non-mandated and non-requested equipment includes the following:
   - Toxics-Metals
   - Non-FEM $PM_{2.5}$ sampler and
   - Toxics-VOC.

   RECOMMENDATION
   - ✓ The station will neither be closed nor relocated.
   - ✓ All samplers and monitors will be retained.
   - ✓ If funding becomes available, PAMS-Carbonyls should be added.

5. Chula Vista (CVA)
   This station is located midway between the Downtown station and the San Ysidro border crossing. The city of Chula Vista has the highest rate of respiratory ailments in the County. Because the station is located inland, the measured concentrations can be used to interpolate the concentrations for several surrounding cities and communities. This station will have its deck for PM samplers completely remodeled. The non-mandated equipment includes the following:
   - O_3.

   RECOMMENDATION
   - ✓ The station will neither be closed nor relocated.
   - ✓ Historical PM_{10} data should be reviewed for possible decommissioning.
   - ✓ A $PM_{2.5}$ FRM sampler should be added for quality assurance purposes.

6. San Diego-Kearny Villa Road (KVR)
This station is located in the secondary business district of San Diego. As it is inland, the data from this station are used for many surrounding communities. All equipment is mandatory. This station was recently relocated.
RECOMMENDATION
   - ✓ The station will neither be closed nor relocated.
   - ✓ The $PM_{2.5}$ FRM sampler used for quality assurance purposes should be relocated to CVA.
   - ✓ Historical PM_{10} data should be reviewed for possible decommissioning.

7. Camp Pendleton (CMP)
This location is the District's northernmost station, and it records transport from Los Angeles; furthermore, the data from this area are used to interpolate the concentrations for the communities along State Route 78 (north and south). These areas are the fastest growing in the County. The non-mandated equipment includes the following:
   - $PM_{2.5}$ non-FEM continuous.

RECOMMENDATION
   - ✓ The station will neither be closed nor relocated.
   - ✓ All samplers and monitors will be retained.

8. Alpine (ALP)
This location is the easternmost station of the District's air monitoring network. It registers the County's transport as it is leaving the SDAB. It is the ozone Design Value site, and it recently was relocated. The non-mandated equipment includes the following:
   - $PM_{2.5}$ non-FEM continuous.

RECOMMENDATION
   - ✓ The station will neither be closed nor relocated.
   - ✓ All samplers and monitors will be retained.

9. 2nd Near-road site
The District is under negotiation with local authorities to site the 2nd Near-road station in the Barrio. The Barrio is an EJ area, giving this station a higher ranking than the 1st Near-road site.
RECOMMENDATION
   - ✓ If funding becomes available, PAMS-Carbonyls, Toxics-VOC, and Toxics-Metals should be added.
   - ✓ Add a CO monitor, if funding becomes available.

10. Rancho Carmel Drive (RCD)
This area is one of the most trafficked areas in the County. There is no non-mandated equipment at this site.
RECOMMENDATION
   - ✓ If funding becomes available, PAMS-Carbonyls, Toxics-VOC, and Toxics-Metals should be added.
   - ✓ A $PM_{2.5}$ sampler could possibly be added for comparison to ESC.

11. San Ysidro (SAY)

This temporary station/ $PM_{2.5}$ sampler was requested by the EPA and the community. The measured concentrations are not unexpected and are observed with the District's $PM_{2.5}$ samplers located north of the border crossing.

RECOMMENDATION

- ✓ If the station becomes permanent and funding becomes available, PAMS-Carbonyls, Toxics-VOC, and Toxics-Metals should be added.

12. Del Mar (DMR)

This station only houses ozone instrumentation. Other than for a few days out of the year, it is duplicitous with the ozone measurements at CMP. The next station is 40 miles south; therefore, it cannot be decommissioned without leaving a large gap in the coastal coverage.

RECOMMENDATION

- ✓ This station should be relocated to the south and possibly inland somewhat.
- ✓ If the station is relocated, instrumentation should be expanded to include NOx and possibly $PM_{2.5}$ samplers.

13. Palomar Airport (CRQ)

This station is federally mandated, because the measured concentrations for lead triggered a minimum threshold to transition the temporary study/sampling to permanent. If the measured concentrations are less than 80% of the NAAQS for three consecutive years, the District will petition the EPA to close this site.

RECOMMENDATION

- ✓ This site should be closed when the above conditions are met.

Section III Gaps in the Air Pollution Monitoring Network

A. Inland North County

The 2010 Network Assessment revealed a possible gap in the air pollution monitoring network in the areas north, northwest, and northeast of the Escondido monitoring station. This region includes the Hidden Valley/Rainbow/Pala, Fallbrook/Bonsall, and Pauma Valley/Valley Center areas, respectively (GAP1 in Figure 1). The Area served tool of the current Network Assessment also showed that this one monitoring station has a wide coverage area.

RECOMMENDATION

- ✓ No new/additional stations are suggested for the north and northwest areas. The SCAQMD has monitors for ozone, nitrogen dioxide, PM_{10}, and $PM_{2.5}$ in the area north of Escondido, Temecula (SCAQMD1 in Figure 1) and Elsinore (SCAQMD2 in Figure 1). The ozone, nitrogen dioxide, PM_{10}, and $PM_{2.5}$ concentrations for the general areas of Bonsall and Fallbrook can be derived from the Escondido and Temecula ozone, nitrogen dioxide, PM_{10}, and $PM_{2.5}$ monitors.
- ✓ No new/additional stations are suggested for the northeast areas. Studies have shown that the measured concentrations are equivalent to those observed at the Escondido station and that no new information will be gained.

B. Coastal North County

The 2010 Network Assessment revealed a possible gap in the air pollution monitoring network in the area north of the Camp Pendleton monitoring station (GAP2 in Figure 1). The Area served tool of the current Network Assessment also showed this one monitoring station has a wide coverage area.

RECOMMENDATION

- ✓ No new/additional stations are suggested, because this area is very sparsely populated due to the Camp Pendleton military base. Furthermore, any new location would just measure transport from the Los Angeles air basin, and this phenomena is already measured at the Camp Pendleton station. If needed, the SCAQMD has monitors north of the Camp Pendleton border (SCAQMD3 in Figure 1) in the Mission Viejo area, so the District can track transport using their information.

C. East County

The 2010 Network Assessment revealed a possible gap in the areas east of the Alpine station (GAP3 in Figure 1). The Area served tool of the current Network Assessment tool also showed this one monitoring station has a wide coverage area.

RECOMMENDATION

- ✓ No new/additional stations are suggested, because the areas east of the Alpine station have low population centers, low traffic count, and similar topography. Therefore, an additional ozone monitor in this area would add little informational value. Additionally, District studies in these areas have shown the measured concentrations to be the same (just time delayed) as Alpine.

D. Mid-County

The 2010 Network Assessment revealed a possible gap in coverage northeast and southwest of the Chula Vista and El Cajon monitoring stations, respectively (GAP4 in Figure 1). The current Network Assessment tool shows adequate coverage, but this area has a highly dense population.

RECOMMENDATION

- ✓ Temporary sampling may be conducted. Although previous studies have shown that the measured concentrations are equivalent to the average concentration between the Downtown and El Cajon stations, the EPA's NATA and EJView database do indicate a difference in VOC values.

E. Southeast County

The Area served tool of the current Network Assessment showed the Otay Mesa-Donovan station has a wide coverage area (GAP5 in Figure 1). The Eastlake area is the second fastest growing area in the County.

RECOMMENDATION

- ✓ Temporary sampling may be conducted. Although previous studies have shown that the measured concentrations are equivalent to those observed at Otay Mesa, the population has grown and further testing in the Proctor Valley now may be necessary.

Chapter 1 Overview of the Network

Section 1.0 San Diego Air Basin General Information

The first step in performing a network assessment is gaining an understanding of the current and historical network, characteristics of the air basin, and objectives for each monitoring site, as well as population shifts and pollutants trends.

The topography of San Diego County is highly varied, being comprised of coastal plains and lagoons, flatlands and mesas, broad valleys, canyons, foothills, mountains, and deserts. Generally, building structures are on the flatlands, mesas, and valleys, while the canyons and foothills tend to be sparsely developed. This segmentation is what has carved the region into a conglomeration of separate cities that led to low density housing and an automobile-centric environment.

The topography also drives the pollutant levels. The San Diego Air Basin (SDAB) is not classified as a contributor; instead, it is classified as a transport recipient. The transport pollutants are O_3, NOx, and volatile organic compounds (VOCs), which are transported from the South Coast Air Basin to the north and, when the wind shifts direction, Tijuana, Mexico, to the south.

The climate also drives the pollutant levels. The climate of San Diego is classified as Mediterranean, but it is incredibly diverse due to the topography. The climate is dominated by the Pacific High pressure system that results in mild, dry summers and mild, wet winters. The Pacific High drives the prevailing winds in the SDAB. The winds tend to blow onshore during the daytime and offshore at night. In the summer, an inversion layer develops over the coastal areas, which increases the O_3 levels. In the winter, San Diego often experiences a shallow inversion layer that tends to raise carbon monoxide and $PM_{2.5}$ concentration levels due to the increased use of residential wood burning.

In the fall months, the SDAB is often impacted by Santa Ana winds. These winds are the result of a high pressure system over the Nevada-Utah region that overcomes the westerly wind pattern and forces hot, dry winds from the east to the Pacific Ocean. These winds are powerful and incessant. They blow the air basin’s pollutants out to sea. However, a weak Santa Ana can transport air pollution from the South Coast Air Basin and greatly increase the San Diego O_3 concentrations. A strong Santa Ana also primes the vegetation for firestorm conditions.

1.1 Network Design Requirements

The EPA regulations specify the minimum number of sites at which State and local air agencies must deploy monitors. The State and local agencies generally find they need to deploy more monitors than are minimally required to fulfill State and local purposes for monitoring. For example, the California air quality standards are often more stringent than the National standards; thereby, many areas need more monitors than required to show compliance with State and National standards.

For pollutant monitoring, the minimum requirements for the number of monitors are provided in the 40 CFR 58, Appendix D “Network Design Criteria for Ambient Air Quality Monitoring”. Each pollutant has different requirements for determining the minimum number of monitors needed for a Metropolitan Statistical Area (MSA), and the requirements can change yearly. The MSA is based upon the total population within the district. Some districts are comprised of multiple air basins. The County of San Diego encompasses San Diego County and part of the Sultan Sea air basins, as outlined by the California Air Resources Board. Also, some pollutants have additional monitoring requirements associated with them, e.g., $PM_{2.5}$ monitoring has requirements for continuous and sequential monitors.

Each section in this report that discusses the criteria pollutants lists the current Network Design Criteria for Ambient Air Quality Monitoring. For all pollutants, the District is required to ensure that sufficient monitoring exists in the County, according to 40 CFR 58, Appendix D "Network Design Criteria for Ambient Air Quality Monitoring". This section summarizes the minimum monitoring requirements from the criteria pollutant chapters in this report. For greater detail, refer to the specific pollutant's chapter.

The District develops changes to its monitoring network in several ways. New monitoring locations and/or additional monitors have been added as a result of community concerns about air quality, e.g., the Downtown $PM_{2.5}$ monitor that was established in the Barrio Logan area and as part of the District's internal $PM_{2.5}$ speciation network. Other monitors have been established as a result of special studies, e.g., the TSP-Pb monitor that was established at the McClellan-Palomar Airport.

The most common reasons for monitors being removed from the network are that the land/building is modified, such that the site no longer meets current EPA siting criteria, the area surrounding the monitor is being modified in a way that necessitates a change in the monitoring location, or the landowner wants the land for other purposes. The most current example of this case is the El Cajon/NCore site. This site was moved in 2014 due to the construction of a new building on the lot where the station was located. Monitors are also removed from the network after a review of the data showed that the levels have dropped to the point where it is no longer necessary to continue monitoring at that location. An example of this situation is the elimination of ambient level SO_2 monitors from the network.

1.2 San Diego Air Pollution Control District Network Design

The topography, climate, and population distribution are the main contributing factors into the design of the ambient air quality network for the SDAB. The District has conducted occasional air monitoring in remote portions of the County, including the mountain and desert areas. Historical measurements have shown relatively low levels of air pollution in these areas. The population and growth in these areas have remained low enough that routine air sampling has not become necessary. Measurements of harmful air contaminants are found in those areas where the population is dense, traffic patterns are heavy, and industrial sources are concentrated.

As pollutants are carried inland by prevailing winds, they are frequently trapped against the mountain slopes by a temperature inversion layer, generally occurring between 1500 and 2500 feet above sea level. Therefore, our air monitoring stations are found between the coast and the mountain foothills up to approximately 2000 feet. The monitoring network needs to be large enough to cover the diverse range of topography, meteorology, emissions, and air quality in San Diego, while adequately representing the large population centers. This monitoring network plays a critical role in assessing San Diego County's clean air progress and in determining pollutant exposures throughout the County.

The ambient air quality is routinely measured for air pollutants at several locations. All these sites are operated by the District. The measured data provide the public with information on the status of the air quality and the progress underway to improve air quality. The data can be used by other interested parties, such as health researchers and environmental groups or organizations with business interests.

Ambient concentration data are collected for a wide variety of pollutants. In the SDAB, the most important of these pollutants are ozone, $PM_{2.5}$, PM_{10}, and a number of toxic compounds. Other measured pollutants include oxides of nitrogen, carbon monoxide, sulfur dioxide, and lead. Monitoring for meteorological parameters is also conducted at most monitoring locations. Data for all of the pollutants are needed to better understand the nature of the ambient air quality in San Diego County, as well as to inform the public regarding the quality of the air they breathe. Not all pollutants are monitored at all sites, but most sites monitor for multiple pollutants. A particular site's location and monitoring purpose determine the actual pollutants measured at that site.

A fundamental purpose of air monitoring is to distinguish between areas where pollutant levels exceed the ambient air quality standards and areas where those standards are not exceeded. Health-based ambient air quality standards are set at levels that preclude adverse impacts to human health (allowing for a margin of safety). The District develops strategies and regulations to achieve the emission reductions necessary to meet all health-based standards. Data from the ambient monitoring network are then used to indicate the success of the regulations and control strategies in terms of the rate of progress toward attaining the standards or to demonstrate that standards have been attained and maintained. Thus, there is an established feedback loop between the emission reduction programs and the ambient monitoring programs. Over the years, Federal, State, and District regulatory/strategic measures have proven to be extremely successful at reducing levels of harmful air contaminants. Monitors once placed throughout the County to document the frequent and regular exceedance of ozone, nitrogen dioxide, carbon monoxide, and particulate matter standards now record the continued downward concentration trends of these pollutants.

1.3 Current San Diego Air Pollution Control District Network

All monitors are reviewed on a regular basis to determine if they are continuing to meet their monitoring objectives. To complete this step, a thorough review of each site in the network was performed. District staff travelled to each site and performed a site evaluation. Monitor coordinates were verified, as were distances to roadways and obstacles. Has the population, land use or vegetation around the monitor changed significantly since the monitor was established? If it has, is there a better location for the monitor? All files were updated, and the process of verifying the monitoring sites' objectives began. Table 1.1a lists the locations and monitoring parameters of each site currently in operation in the SDAB. Table 1.1b lists the pertinent EPA Air Quality System (AQS) database information for each site. T

The District does not own the property on which any air monitoring stations are located; consequently, the District cannot alter or destroy vegetation without landlord consent, influence new structure encroachment, and must relocate when notified by the landlord, as well as other reasons. Over the last few years, the District has had to relocate or start-up 1-2 stations per year for any combination of the aforementioned reasons. The average cost of an air monitoring station start-up is $100,000, not including monitoring equipment; meanwhile, the dismantling and destruction of an old air monitoring station costs approximately half the start-up costs, depending on a myriad of County requirements. These station relocations (temporary and permanent) and destructions, as well as new EPA program start-up programs, place a severe additional strain on the constantly shrinking air monitoring budget.

Due to these recent ambient air monitoring station relocations, the District already has undertaken a scaled-down version of a Network Assessment. Consequently, no recent station start-up/relocation will be closed; furthermore, no air monitoring equipment in those stations will be decommissioned immediately, because the instrumentation, as well as the station itself, was fully vetted for decommissioning or full station closure. No relocated station triggered any internal District threshold for closure. Additionally, most air monitoring equipment did not trigger any internal District threshold for decommissioning. The District has relocated or started-up the following stations within the last five years (the period of the last Network Assessment):

- San Diego-Overland (Kearny Villa Road),
- Otay Mesa-Donovan,
- El Cajon,
- Alpine,

- Palomar,
- Rancho Carmel Drive, and
- San Ysidro.

The District anticipates the following large one-time expenditures to handle over the next 18-24 months:

- two station destructions (the temporary Alpine location and the old Otay Mesa location),
- one new station start-up (2nd Near-road),
- the complete remodeling of the Chula Vista wood deck/sampling platform,
- one station relocation (the temporary El Cajon station back to its original location),
- two possible station relocations, due to landlord tenancy issues (Del Mar and Escondido), and
- one possible station relocation/startup for San Ysidro (certainly the destruction, once the project is competed).

If all the aforementioned tasks actually come to fruition, the only sites in the air monitoring network that will not have had significant capital recently invested in their upkeep will be the Camp Pendleton and Downtown stations. The Downtown station is in an Environmental Justice (EJ) area, and all its monitors are required by the EPA, requested by local concerned citizens, or added by the District for internal reasons. The Camp Pendleton station is the northernmost air monitoring location in the network, and it records pollution transport from the South Coast Air Basin. Both stations and the instrumentation therein are required, and neither will be decommissioned. As stated earlier, due to the recent flurry of station relocations and start-ups and new EPA monitoring programs (which require additional instrumentation), all stations have already been fully vetted by District staff for station closure or instrumentation decommissioning. All the stations were considered necessary for coverage, and any equipment deemed redundant or unnecessary was already decommissioned before relocation or start-up.

Table 1.1a Air Monitoring Sites with All Samplers

		ALP	CMP	CVA	DMR	DVN	ECA[1]	ESC	KVR	CRQ	DTN	RCD	SAY
		Alpine	Camp Pendleton	Chula Vista	Del Mar	Donovan	El Cajon	Escondido	Kearny Villa Rd.	Palomar Airport	Beardsley St.	Rancho Carmel Dr.	San Ysidro
AMBIENT	O_3	✓	✓	✓	✓	✓	✓	✓	✓		✓		
AMBIENT	NO_2	✓	✓	✓		✓	✓	✓	✓		✓	✓	
AMBIENT	CO							✓			✓	✓	
NCORE	NOy-TLE						2						
NCORE	CO-TLE						✓						
NCORE	SO_2-TLE						✓						
LEAD	(NCore) (Hi-Vol)						✓						
LEAD	(Airports) (Hi-Vol)									✓			
PM_{10}	(NCore) (Lo-Vol)						✓						
PM_{10}	(Ambient) (Hi-Vol)			✓		✓		✓	✓		✓		
$PM_{2.5}$	(non-FEM) (Continuous)	✓	✓			✓	✓				✓		✓
$PM_{2.5}$	(FRM) (Sequential)			✓			✓	✓	✓		✓		
STN	Channel 1 (Metals)						✓	✓					
STN	Channel 2 (Inorganic Ions)						✓	✓					
STN	Channel 3 (Wood Smoke)							✓					
CSN	(Carbon)						✓	✓					
SU	Channel 4 (Carbon)						✓	✓			✓		
PAMS	(VOCs)	✓	✓				✓						
PAMS	(Carbonyls)						✓						
UN	Channels 2 & 3 (Carbonyls)										✓		
TOXICS CA-TAC (CARB)	(VOCs)			✓			✓						
TOXICS CA-TAC (CARB)	(Total Metals)			✓			✓						
TOXICS CA-TAC (CARB)	(Cr^{+6})			✓			✓						
TOXICS CA-TAC (CARB)	(Aldehydes)			✓			✓3						
TOXICS SU (APCD)	(VOCs)					✓		✓			✓		
TOXICS SU (APCD)	Channel 1 (Total Metals)					✓					✓		
METEROLOGICAL PARAMETERS + Others	Wind Speed/ Wind Direction	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓
METEROLOGICAL PARAMETERS + Others	External Temperature	✓	✓	✓		✓	✓	✓	✓		✓	✓	✓
METEROLOGICAL PARAMETERS + Others	% Relative Humidity	✓					✓		✓			✓	
METEROLOGICAL PARAMETERS + Others	Internal Temperature	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
METEROLOGICAL PARAMETERS + Others	Barometric Pressure								✓				
METEROLOGICAL PARAMETERS + Others	Solar Radiation								✓				
Radar Wind Profiler/ Radio Acoustic Sounding									✓				

Areas in yellow indicate a collocation of samplers to satisfy Federal Quality Assurance (QA) requirements. Collocated $PM_{2.5}$ Federal Reference Method (FRM) monitors and PM_{10} monitors have a sampling frequency of 1:12 and 1:6, respectively. All other collocated monitors have the same sampling frequency as their respective main monitors. Areas in blue indicate duplicate channels and have the same sampling frequency as the main channel.

[1] The El Cajon (ECA) station was relocated to the Gillespie Field (FSD) area, and sampling began in July.

[2] The District has a waiver to temporarily suspend NOy sampling until the relocation of the station back to the original NCore location on Redwood Ave.

[3] The EPA designated the Chemical Speciation Network (CSN) sampling at FSD as Supplemental Speciation. It will revert back to CSN upon the return to the original sampling location on Redwood Ave.

Table 1.1b lists the District's stations and the pertinent information regarding location.

Table 1.1b Network Sites

Station Name	Station Abbreviation	Address	Latitude/ Longitude	AQS ID
Alpine	ALP	2495A W. Victoria Dr.	32.842324° -116.767885°	06 073 1006
Camp Pendleton	CMP	21441 W. B St.	33.217063° -117.396169°	06 073 1008
Chula Vista	CVA	80 E. J St.	32.631175° -117.059115°	06 073 0001
Del Mar	DMR	225 9th St.	32.952106° -117.264086°	06 073 1001
Donovan	DVN	480 Alta Rd.	32.578267° -116.921359°	06 073 1014
[1]El Cajon	ECA	1155 Redwood Ave.	32.791210° -116.942104°	06 073 0003
Escondido	ESC	600 E. Valley Pkwy.	33.127730° -117.075379°	06 073 1002
Otay Mesa-Donovan	DVN	480 Alta Rd.	32.578267° -116.921359°	06 073 1014
San Diego-Beardsley St.	DTN	1110A Beardsley St.	32.701492° -117.149663°	06 073 1010
Kearny Villa Rd.	KVR	Kearny Villa Rd.	32.845722° -117.123983°	06 073 1016
McClellan-Palomar Airport	CRQ	2192 Palomar Airport Rd.	33.130846° -117.272668°	06 073 1020
Rancho Carmel Dr.	RCD	11403 Rancho Carmel Dr.	32.985442° -117.082180°	06 073 1017
San Ysidro	SAY	795 East San Ysidro Blvd.	32.543475° -117.029028°	06 073 1019

[1]This station is temporarily located at 10537 Floyd Smith Dr.; the District will move the station back to its original location, once the remodeling of the school grounds of the original site has been completed.

For a summary of the site description see Tables 1.2a-1.2c, and 1.3; for greater detail on the Air Quality System (AQS) designations for the monitor type, site type, method, network affiliation, monitor designation, objective, spatial scale, sampling frequency, and equipment used, see each pollutants' chapter.

Table 1.2a Probe Inlet Summary (continued)

(Measurements are in meters)		Spacing from minor sources	Source	Spacing from obstructions	Obstruction	Spacing from trees Actual	Spacing from trees Required	Probe inlet distance from traffic lane	AADT	Data compared to NAAQS
ALP	O_3	n/a	none	n/a	none	12.3	>10	16.6	500 est	Yes
	NO_2									
	*$PM_{2.5}$	n/a		n/a		15.9		15.5		No
CMP	O_3	121.4	Military transport vehicles motor pool, repair, and fuel facility	n/a	none	33.3	>10	47.7	500 est	Yes
	NO_2									
	*$PM_{2.5}$	124.8		n/a		34.0		47.0		No
CVA	O_3	n/a	none	n/a	none	35.9	>10	54.3	9,100	Yes
	NO_2									
	CO									
	PM_{10}	n/a	none	n/a	none	34.0		57.8		Yes
	$PM_{2.5}$	n/a	none	n/a	none	34.3		58.0		Yes
DMR	O_3	n/a	none	n/a	none		>10		3,100 est	Yes
DVN	O_3	800	Peaker power plant	n/a	none	n/a	>10	12	300 est	Yes
	NO_2					n/a				
	PM_{10}	800		n/a	none	n/a		18		Yes
	*$PM_{2.5}$	800		n/a	none	n/a		19		No
RCD	NO_2	32	Interstate 15 (major source)	n	none	32	>10	24.4	11,800	Yes
	CO									Yes
	*$PM_{2.5}$	Not in place yet								

* non-FEM BAM n/a= not applicable est= estimate

Table 1.2b Probe Inlet Summary (continued)

(Measurements are in meters)		Spacing from minor sources	Source	Spacing from obstructions	Obstruction	Spacing from trees: Actual	Spacing from trees: Required	Probe inlet distance from traffic lane	AADT	Data compared to NAAQS
DTN	O_3	n/a	none	n/a	none	11.5	>10	11.6	3,000	Yes
	NO_2									Yes
	CO									Yes
	PM_{10}	n/a		n/a		13.3		10.0		Yes
	$PM_{2.5}$	n/a		n/a		12.7		10.7		Yes
	*$PM_{2.5}$	n/a		n/a		15.3		10.0		No
ECA	O_3	113.4	Metals shop	n/a	none	35.7	>10	14.4	5,300	Yes
	NO_2									Yes
	CO									Yes
	SO_2									Yes
	PM_{10}	117		n/a	none	40.6		11.2		Yes
	$PM_{2.5}$	117		n/a	none	40.6		11.2		Yes
	Pb-TSP	97.8		n/a	none	28.9		10.0		Yes
ESC	O_3	n/a	none	n/a	none	35.4	>10	95.4	2,500	Yes
	NO_2									
	CO									
	PM_{10}	n/a		n/a	none	35.7		98.7		Yes
	$PM_{2.5}$	n/a		n/a	none	39.9		99.5		Yes
	*$PM_{2.5}$	n/a		n/a	none	37.9		95.8		No

* non-FEM BAM n/a= not applicable est= estimate

Table 1.2c Probe Inlet Summary (concluded)

(Measurements are in meters)		Spacing from minor sources	Source	Spacing from obstructions	Obstruction	Spacing from trees: Actual	Spacing from trees: Required	Probe inlet distance from traffic lane	AADT	Data compared to NAAQS
KVR	O_3	n/a	none	n/a	none	none	>10	144.9	11,000	Yes
	NO_2									
	PM_{10}	n/a	none	n/a	none	none		138.5		Yes
	$PM_{2.5}$	n/a	none	n/a	none	none		140.3		Yes
CRQ	Pb-TSP	126	Airport runway (major source)	n/a	none	10	>10	n/a	n/a	Yes
SAY	*$PM_{2.5}$	19	Port of entry (major source)	n/a	none	none	>10	19	31,252	No

* non-FEM BAM   n/a= not applicable   est= estimate

Table 1.3 Individual Site Assessment Summary

Site Name	Abbreviation	Longevity (start year)	Comments/Issues	Cost to Move? (High/Avg/Low)	Moved Recently? (Yes/No)
Alpine	ALP	2015	O3 Design Value site; just relocated	High	Yes
Camp Pendleton	CMP	1997		Avg	No
Chula Vista	CVA	1974	Highest rate of asthma in the County; renovated the deck	High	No
Del Mar	DMR	1983	This area and the areas north and south of this site are the most expensive land in the County	Very High	No
Donovan	DVN	2014	Otay Mesa border crossing; just relocated	High	Yes
Rancho Carmel Dr.	RCD	2015	Federally required	Avg	Yes
El Cajon	ECA	1981	The station relocated about 271 meters southwest of its original location in 2015; NCore site	High	Yes
Escondido	ESC	1973	High NO2 and PM2.5 site	High	No
Kearny Villa Rd	KVR	2010	Secondary business district area; recently relocated	High	Yes
Palomar Airport	CRQ	2014	Federally required	Low	Yes
San Ysidro	SAY	2015	Just a BAM enclosure; not a full station	Very Low	Yes

Chapter 2 Population Trends

2.0 Population of San Diego

Over the years, the District's air monitoring network has evolved to its current state based on several factors:

- meteorology,
- topography,
- pollutant(s) being measured,
- monitor area(s) represented, and
- population centers/changes/shifts.

The monitoring stations are situated in the highest population areas that are far enough from another station to register different concentrations and different influences. The average distance between stations is approximately 12 miles for stations south of Interstate 8 and approximately 20 miles for stations north of Interstate 8.

Table 2.1 lists the most recent (2010) population trends in the County, according to the San Diego Association of Governments (SANDAG), and compares them against 2000 data.

Table 2.1 San Diego County Population Trends 2010 vs. 2000

City/Community	Population	Trend	Comments
Carlsbad	105,000	35%	Lead monitoring at Palomar Airport
Chula Vista	244,000	41%	Has an ambient station
Coronado	25,000	2%	
Del Mar	4,000	-5%	Has an ambient station
El Cajon	100,000	5%	Has the NCore station
Encinitas	59,000	3%	
Escondido	144,000	8%	Has an ambient station
Imperial Beach	26,324	-2%	
La Mesa	57,000	4%	
Lemon Grove	25,000	2%	
National City	59,000	8%	
Oceanside	167,000	4%	Has an ambient station in Camp Pendleton
Poway	48,000	0%	Has the Near-road station
San Diego	**1,302,000**	**6% Overall**	**Has ambient stations at Downtown-Barrio Logan and Kearny Villa Road and $PM_{2.5}$ monitoring at San Ysidro**
Barrio Logan	51,000	7.1%	
Kearny Mesa	74,000	6.7%	
San Ysidro	30,000	9%	
San Marcos	84,000	52%	
Santee	53,000	1%	
Solana Beach	13,000	-1%	
Vista	94,000	4%	
Unincorporated	**487,000**	**4% Overall**	**Has ambient stations at Alpine and Otay Mesa**
Alpine	14,000	14%	
Otay Mesa	69,000	41%	
Region (overall)	**3,100,000**	10%	

2.1 Air Monitoring Network with Respect to Population Centers

Each city/community is reviewed for industrial and population growth to determine if a new ambient air monitoring station should be placed there or if a close-by one should be relocated. If coverage can be determined by interpreting the data from two adjacent stations, then the city/community is deemed as covered by the ambient air quality monitoring network.

Carlsbad

This community is one of the faster growing areas in the county. It is located approximately midway between the Camp Pendleton and Del Mar stations. The Camp Pendleton and Del Mar stations are in place to measure, primarily, ozone transport from the South Coast Air Basin. Carlsbad and the adjacent cities/communities are covered by the Camp Pendleton and Del Mar stations.

Chula Vista

This city is the second fastest growing area in San Diego and second only to the City of San Diego for total population. An ambient air monitoring station is already in place. This population and the adjacent cities/communities are covered by our ambient air monitoring network.

Coronado

This population is covered by our Downtown station, which is located across the bay from Coronado.

Del Mar

The station was sited to gather information on pollutant transport from the South Coast Air Basin that the monitors at Camp Pendleton do not register. This population and the adjacent cities/communities are covered by our ambient air monitoring network.

El Cajon

The station in El Cajon supports both the National Core (NCore) and Photochemical Assessment Monitoring Stations (PAMS) programs. This population and the adjacent cities/communities are covered by our ambient air monitoring network.

Encinitas

This city is south of Carlsbad and just north of Del Mar. Encinitas and the adjacent cities/communities are covered by the Camp Pendleton and Del Mar stations.

Escondido

This city is one of the largest in the County. An ambient air monitoring station is already in place. It is located in a borderline Environmental Justice zone. This population and the adjacent cities/communities are covered by our ambient air monitoring network.

Imperial Beach

This city is located south of the Chula Vista air monitoring station and west of the Otay Mesa air monitoring station. Imperial Beach and the adjacent cities/communities are covered by the Chula Vista and Otay Mesa stations.

La Mesa

This city is east of the Kearny Villa Road station and just west of the El Cajon station. La Mesa and the adjacent cities/communities are covered by the Kearny Villa Road and El Cajon stations.

Lemon Grove
This city is east of the Downtown station and west of the El Cajon station. Lemon Grove and the adjacent cities/communities are covered by the Downtown and El Cajon stations.

National City
This city is south of the Downtown station and north of the Chula Vista station. National City and the adjacent cities/communities are covered by the Downtown and Chula Vista stations.

Oceanside
This city is the second biggest in the County. An ambient air monitoring station is already in place at Camp Pendleton. This population and the adjacent cities/communities are covered by our ambient air monitoring network.

Poway
A Near-road monitoring station is in place. Additionally, the Kearny Villa Road and Escondido stations are located south and north of Poway, respectively. Poway and the adjacent cities/communities are covered by the Escondido, Kearny Villa Road, and Rancho Carmel Drive stations.

San Diego
The City of San Diego is the largest city in the County, and it encompasses approximately 370 square miles. The bulk of the population is west of the El Cajon-Santee, south of Escondido-Camp Pendleton, and north of Chula Vista-Otay Ranch cities/communities. Immediately south of Downtown San Diego is the community of Barrio Logan and this is where an ambient air monitoring station is located. There is the Kearny Villa Road station in the approximate middle of the ring of cities/communities mentioned above.

San Marcos
This community has the fastest growing population base in the County. This city is east of the Camp Pendleton station and west of the Escondido station. San Marcos and the adjacent cities/communities are covered by the Camp Pendleton and Escondido stations.

Santee
This city is east of the Kearny Villa Road station and northwest of the El Cajon station. Santee and the adjacent cities/communities are covered by the Kearny Villa Road and El Cajon stations.

Solana Beach
This city is south of Carlsbad and just north of Del Mar. Solana Beach and the adjacent cities/communities are covered by the Camp Pendleton and Del Mar stations.

Vista
This city is east of the Camp Pendleton station and west of the Escondido station. Vista and the adjacent cities/communities are covered by the Camp Pendleton and Escondido stations.

Unincorporated Areas-South County
This area has the Otay Mesa ambient air monitoring station. This area is southeast of the Chula Vista and Downtown monitoring stations. Otay Mesa and the adjacent cities/communities are covered by the Otay Mesa and Chula Vista monitor stations.

Unincorporated Areas-East County
This area has the Alpine ambient air monitoring station. This area is east of El Cajon. Alpine and the adjacent cities/communities are covered by the station in place.

Unincorporated Areas-North County
This area includes the Bonsall, Fallbrook, Hidden Meadows, and Pala region. These areas are north of the Escondido station and south of three stations from the South Coast Air Quality Management District (SCAQMD). The Unincorporated Areas in North County are covered by the District's Escondido station and the SCAQMD stations.

2.2 Network Design History

Over the years, several studies have been performed by District personnel in locations throughout the SDAB to ascertain the viability of the network with regards to the criteria pollutants. The results of those studies and the decisions based on them are how the Network has evolved over the years to its current state of coverage. In addition, some stations have relocated within a community or city due to tenancy issues, such as redevelopment or lease expiration.

The community of Alpine in the foothills east of San Diego traditionally records the highest ozone readings in the network due to its location downwind of the populated areas of the County and the topography. In 1989, the District performed an ozone study 20 miles east of the Alpine station at a Caltrans maintenance facility off State Route 80 in the town of Descanso. The values recorded at the Descanso location were the same as those recorded at the Alpine location but with a 1-2 hour time lag depending upon the weather conditions. Because the values at the Descanso location would not add any substantial information to the network, the District discontinued the study.

The District also performed an ozone study in the community of Ramona. The city of Ramona is approximately 20 miles northwest of Alpine and 15 miles east-southeast of Escondido. It is also mid-elevation between the Escondido and Alpine locations. The values recorded in the Ramona study were essentially the average of the values between Alpine and Escondido. Because the values at the Ramona location could be interpolated between the Alpine and Escondido monitors, the Ramona location was discontinued, and no further monitoring was conducted.

Additional studies were performed to determine if the District needed to increase monitoring within the network. Such studies were conducted in Chollas Heights (five miles northeast of the Downtown location and 10 miles southwest of the El Cajon location) and the northern area of downtown San Diego (2.5 miles north of the current Downtown station location). Both locations showed equivalent numbers to the Downtown San Diego (south) monitor; therefore, the studies were discontinued, and no further monitoring was performed.

Lastly, a study was performed to determine if the District needed to expand the network along the southwest quadrant of the air basin. An ozone monitor was placed in the community of Imperial Beach, approximately 15 miles southwest of the old Downtown San Diego monitor. The numbers collected there directly coincided with the values collected at the old Downtown San Diego monitor location; therefore, the study was discontinued, and no further monitoring was performed.

2.3 Network Station Rating Based on Population

Table 2.2 is the ratings for the current ambient air monitoring stations with respect to the population of the area in which the station is located and taking into account the population of adjacent cities.

Table 2.2 Population Ranking

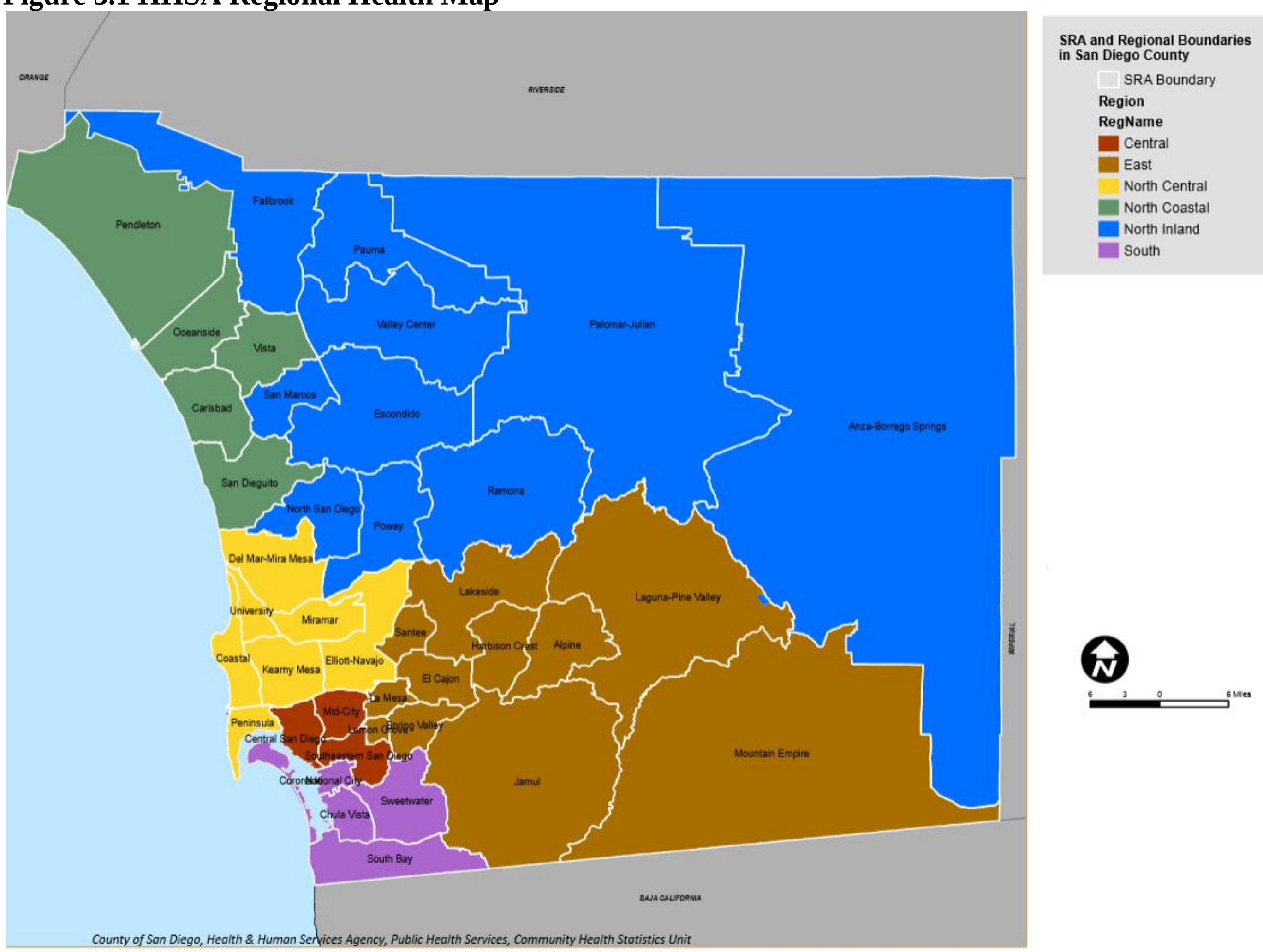
	Overall Scoring	COMMENTS
Alpine (ALP)	**2**	**Based on total population and population growth**
Harbison Canyon		
Descanso		
Camp Pendleton (CMP)	**10**	**Based on total population and surrounding population**
Oceanside		
Carlsbad		
Encinitas		
San Marcos		
Chula Vista (CVA)	**8**	**Based on total population and population growth**
Bonita		
Castle Park		
Imperial Beach		
San Ysidro		
Del Mar (DMR)	**0**	**Low population and low population growth**
Solana Beach		
La Jolla		
Sorrento Valley		
Fairbanks Ranch		
Rancho Santa Fe		
Otay Mesa-Donovan (DVN)	**7**	**Based on total population and population growth**
Otay Mesa-West		
Otay Mesa-East		
San Ysidro		
El Cajon-Floyd Smith Dr. (FSD)	**7**	**Based on total population and surrounding population**
La Mesa		
Santee		
Lakeside		
Casa de Oro		
Lemon Grove		
Spring Valley		
Escondido (ESC)	**8**	**Based on total population and surrounding population**
Vista		
Bonsall		
Fallbrook		
Poway		
Valley Center		
Pala		
San Diego-Beardsley (DTN)	**10**	**Based on total population and surrounding population**
Logan Heights		
Grant Hill		
East Village		
Sherman Heights		
Mountain View		
National City		
Downtown San Diego		
San Diego-Kearny Villa Rd. (KVR)	**6**	**Based on total population and surrounding population**
Tierrasanta		
Clairemont Mesa		
Mira Mesa		
Serra Mesa		
Scripps Ranch		
San Ysidro (SAY)	**7**	**If it becomes a full station**
Rancho Carmel Dr (RCD)	**10**	**Highest trafficked area**
2nd Near-road	**9**	**Required; Environmental Justice area**

Chapter 3 Health Statistics

3.1 Health Statistics for the County and Health Risk Summary

The County Department of Health and Human Services (HHSA) breaks down health statistics by region (Figure 3.1). A myriad of health statistics are detailed and discussed. For the purposes of the Network Assessment, greater weight will be given to those health issues more closely associated with air pollution: asthma, heart disease, and chronic obstructive pulmonary disease (COPD). Less weight will be given to cancer, neurological, and low birth weight issues, because less is known about their air pollution influence(s).

Figure 3.1 HHSA Regional Health Map



The EPA-Region 9 health risk mapping tool, CalEnviro 2.0, breaks down the health statistics by city block, and the EPA-National mapping database tool, EJ View, breaks down the health statistics by wherever the cursor is placed. EJ View combines all respiratory ailments into one category called Respiratory Risk and ranks accordingly (the higher the number, the higher the risk). Please note there is no coronary risk in EJView.

Table 3.1 is a summary of the tabulations from sections 3.1.1.1-3.1.6. A higher number indicates a worse situation (10 being the maximum).

Table 3.1 Health Risk Summary by Stations in the Network

	Health Scoring	**COMMENTS**	**1.** NATA Asthma	**2.** EJView Respiratory	**3.** CalEnviroS Asthma	**4.** HHSA Asthma	**5.** HHSA COPD	**6.** HHSA Coronary
Alpine (ALP)	**6**	**The HHSA numbers are very high**	**45**	**3.3**	**13**	**5**	**6**	**5**
Harbison Canyon			49	1.6	22	5	6	5
Descanso			36	1.0	16	5	6	5
Camp Pendleton (CMP)	**3**	**Surrounding areas have middle rates**	**42**	**1.6**	**0**	**1**	**1**	**2**
Oceanside			62	4.4	34	1	1	2
Carlsbad			59	5.4	19	1	1	2
Encinitas			53	3.0	4	1	1	2
San Marcos			70	3.5	13	1	1	2
Chula Vista (CVA)	**9**	**Very high rates for this location/station and the surrounding area**	**69**	**3.8**	**72**	**4**	**5**	**6**
Bonita			67	3.0	57	4	5	6
Castle Park			69	3.9	62	4	5	6
Imperial Beach			60	3.7	66	4	5	6
San Ysidro			89	5.3	66	4	5	6
Del Mar (DMR)	**1**	**Lowest rates in the County & surrounding areas are low**	**59**	**2.6**	**1**	**2**	**2**	**1**
Solana Beach			51	3.0	1	2	2	1
La Jolla			46	3.3	2	2	2	1
Sorrento Valley			73	2.4	2	2	2	1
Fairbanks Ranch			47	2.2	3	2	2	1
Rancho Santa Fe			78	2.7	3	2	2	1
Otay Mesa-Donovan (DVN)	**6**	**Fairly high rates for this location/station and the surrounding area**	**64**	**4.9**	**54**	**4**	**5**	**6**
Otay Mesa-West			70	3.2	54	4	5	6
Otay Mesa-East			64	4.9	54	4	5	6
San Ysidro			89	5.3	66	4	5	6
El Cajon-Floyd Smith Dr. (FSD)	**8**	**High rates for this station and the surrounding areas**	**70**	**3.6**	**77**	**5**	**6**	**5**
La Mesa			71	4.7	42	5	6	5
Santee			58	2.5	38	5	6	5
Lakeside			57	2.4	38	5	6	5
Casa de Oro			72	4.1	82	5	6	5
Lemon Grove			70	3.6	83	5	6	5
Spring Valley			69	3.6	92	5	6	5
Escondido (ESC)	**6**	**High EPA rates for this station and the surrounding area**	**68**	**3.5**	**49**	**3**	**3**	**4**
Vista			68	3.3	30	3	3	4
Bonsall			64	2.1	19	3	3	4
Fallbrook			61	2.2	21	3	3	4
Poway			83	2.9	15	3	3	4
Valley Center			59	2.0	27	3	3	4
Pala			66	1.7	27	3	3	4
San Diego-Beardsley (DTN)	**10**	**Highest rates in the County and the surrounding area**	**97**	**5.2**	**89**	**6**	**4**	**3**
Logan Heights			103	5.3	92	6	4	3
Grant Hill			96	4.9	86	6	4	3
East Village			96	5.2	87	6	4	3
Sherman Heights			124	5.7	90	6	4	3
Mountain View			97	4.0	91	6	4	3
National City			75	4.6	84	4	5	6
Downtown San Diego			135	5.9	87	6	4	3
San Diego-Kearny Villa Rd. (KVR)	**4**	**Slightly lower than average rates for EPA and excellent for HHSA**	**55**	**3.1**	**10**	**2**	**2**	**1**
Tierrasanta			64	2.8	7	2	2	1
Clairemont Mesa			69	4.3	51	2	2	1
Mira Mesa			60	2.8	22	2	2	1
Serra Mesa			87	7.3	51	2	2	1
Scripps Ranch			73	2.4	7	2	2	1
San Ysidro (SAY)	**6**		**89**	**5.3**	**66**	**4**	**5**	**6**
Rancho Carmel Dr (RCD)	**6**		**83**	**2.9**	**15**	**3**	**3**	**4**
2nd Near-road	**10**	**Possibly Logan Heights**	103	5.3	92	6	4	3
Palomar Airport (CRQ)	**5**		70	3.5	13	1	1	2

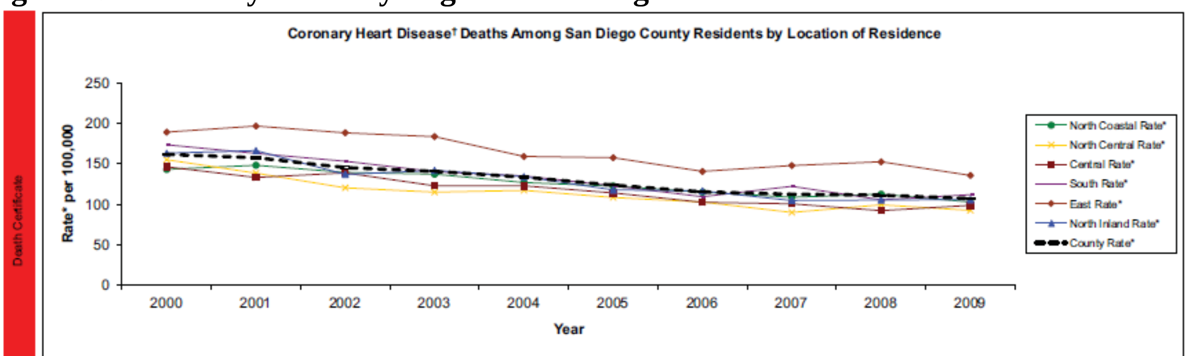
3.1 Health Statistics by Region/City/Community/Station

This section delineates the health issues by region/city/community. The data from this section will be used to grade the individual ambient air monitoring stations.

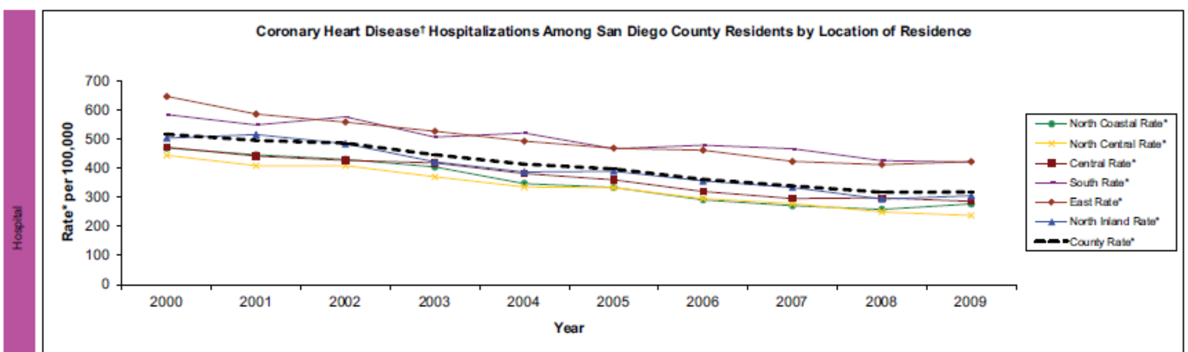
3.1.1 Coronary Issues by Region

Figure 3.2 includes graphs provided by HHSA that illustrate the regional trends with respect to coronary health. Table 3.1 & column 6 shows the scores of the stations according to HHSA statistics and groups the stations according to the region (ranking 1-6, with 6 as the worst) from Figure 3.2 (averaged from 2000-2009).

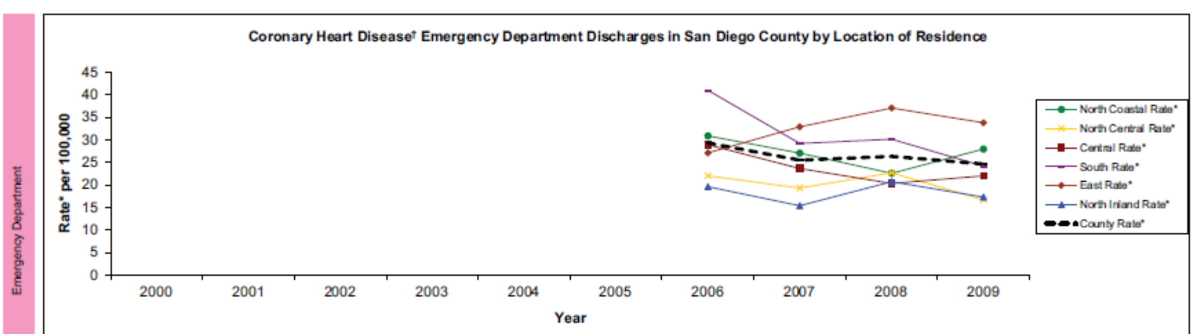
Figure 3.2 Coronary Issues by Region According to HHSA



* Rates per 100,000 population.
† Coronary Heart Disease death refers to (underlying cause of death) ICD-10 codes I11, I20-I25.
§ Rates not calculated for fewer than 5 events. Rates not calculated in cases where zip code is unknown.
Source: Death Statistical Master Files (CA DPH), County of San Diego, Health & Human Services Agency, Epidemiology & Immunization Services Branch; SANDAG, Current Population Estimates, 10/2010.
Prepared by County of San Diego (CoSD), Health & Human Services Agency (HHSA), Community Health Statistics, 01/12/2012.



* Rates per 100,000 population.
† Coronary Heart Disease hospitalization refers to (principal diagnosis) ICD-9 codes 402, 410-414, 429.2.
§ Rates not calculated for fewer than 5 events. Rates not calculated in cases where zip code is unknown.
Source: Patient Discharge Data, (CA OSHPD), County of San Diego, Health & Human Services Agency, Epidemiology & Immunization Services Branch; SANDAG, Current Population Estimates, 01/12/2012.
Prepared by County of San Diego (CoSD), Health & Human Services Agency (HHSA), Community Health Statistics, 01/12/2012.

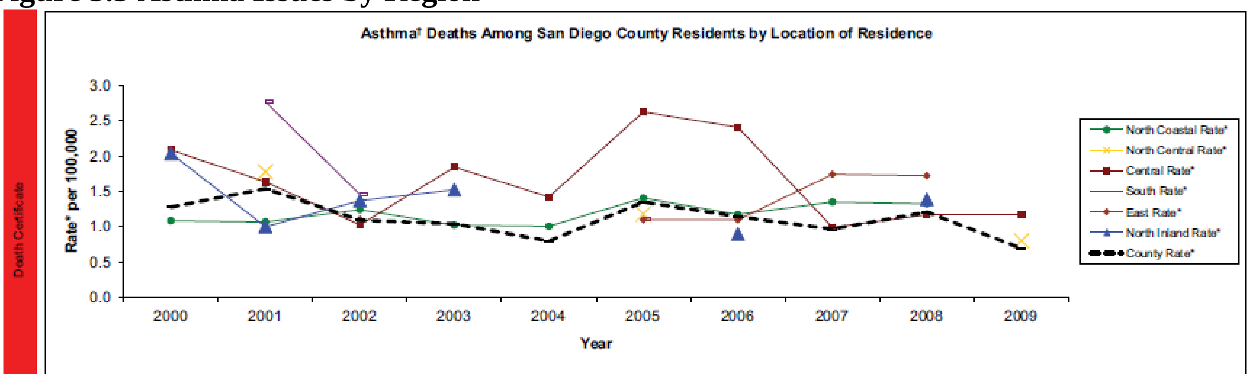


* Rates per 100,000 population.
† Coronary Heart Disease emergency department discharge refers to (principal diagnosis) ICD-9 codes 402, 410-414, 429.2
** New database; 2006 is first calendar year regional data is available
§ Rates not calculated for fewer than 5 events. Rates not calculated in cases where zip code is unknown.
Source: HASD&IC, CHIP, County of San Diego, Health & Human Services Agency, Emergency Medical Services, Emergency Department Database; SANDAG, Current Population Estimates, 10/2010.
Prepared by County of San Diego (CoSD), Health & Human Services Agency (HHSA), Community Health Statistics, 01/12/2012.

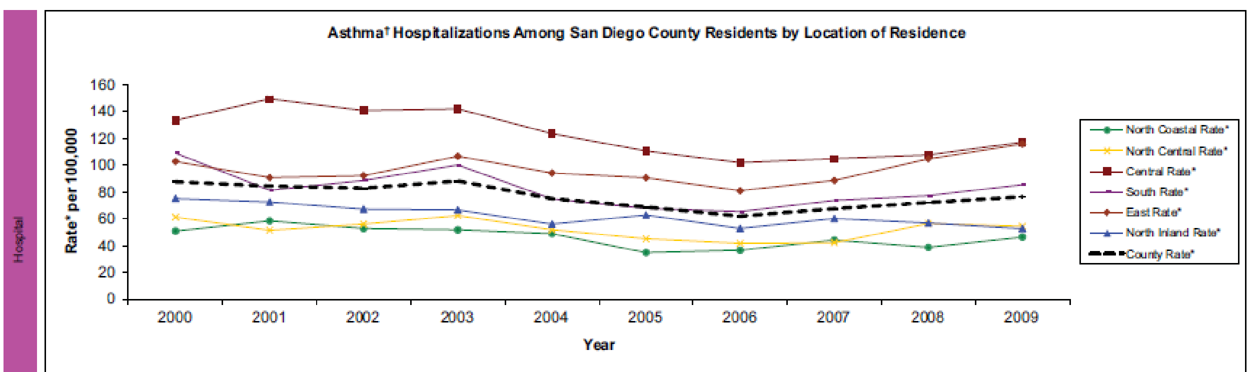
3.1.2 Asthma Issues by Region

Figure 3.3 includes graphs provided by HHSA that illustrate the regional trends with respect to asthma issues. Table 3.1 & column 4 shows the scores of the stations according to HHSA statistics and groups the stations according to the region (ranking 1-6, with 6 as the worst) from Figure 3.2 (averaged from 2000-2009).

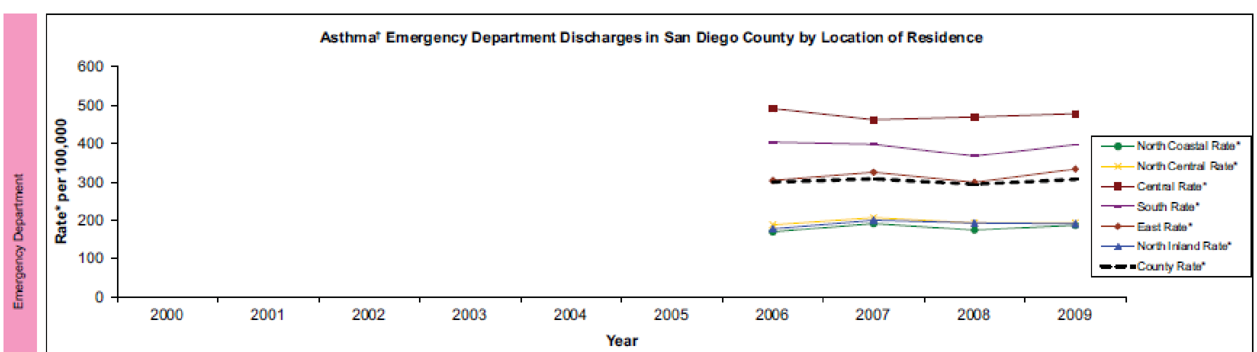
Figure 3.3 Asthma Issues by Region



* Rates per 100,000 population.
† Asthma death refers to (underlying cause of death) ICD-10 codes J45-J46
§ Rates not calculated for fewer than 5 events. Rates not calculated in cases where zip code is unknown.
Source: Death Statistical Master Files (CA DPH), County of San Diego, Health & Human Services Agency, Epidemiology & Immunization Services Branch; SANDAG, Current Population Estimates, 10/2010.
Prepared by County of San Diego (CoSD), Health & Human Services Agency (HHSA), Community Health Statistics, 01/12/2012.



* Rates per 100,000 population.
† Asthma hospitalization refers to (principal diagnosis) ICD-9 code 493
§ Rates not calculated for fewer than 5 events. Rates not calculated in cases where zip code is unknown.
Source: Patient Discharge Data, (CA OSHPD), County of San Diego, Health & Human Services Agency, Epidemiology & Immunization Services Branch; SANDAG, Current Population Estimates, 01/12/2012.
Prepared by County of San Diego (CoSD), Health & Human Services Agency (HHSA), Community Health Statistics, 01/12/2012.

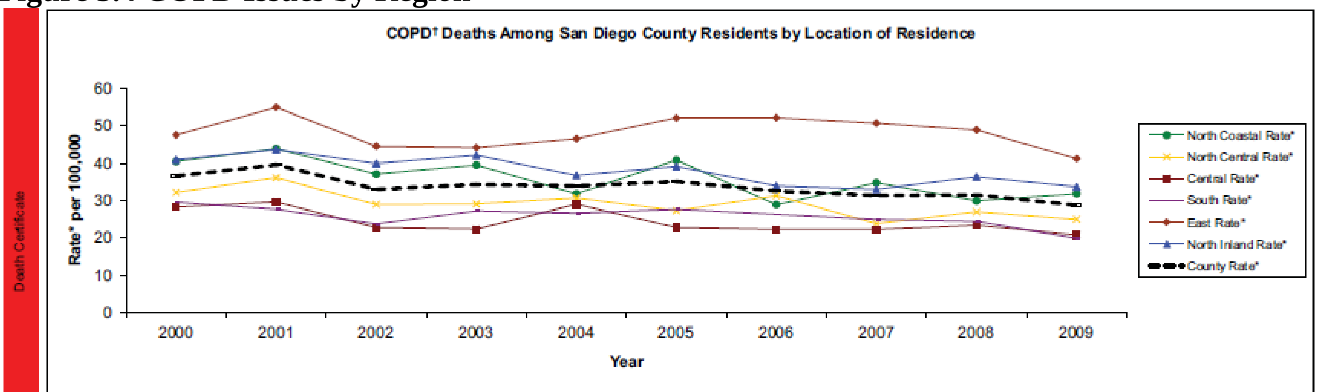


* Rates per 100,000 population.
† Asthma emergency department visit refers to (principal diagnosis) ICD-9 code 493
** New database; 2006 is first calendar year regional data is available
§ Rates not calculated for fewer than 5 events. Rates not calculated in cases where zip code is unknown or outside San Diego County.
Source: HASD&IC, CHIP, County of San Diego, Health & Human Services Agency, Emergency Medical Services, Emergency Department Database; SANDAG, Current Population Estimates, 10/2010.
Prepared by County of San Diego (CoSD), Health & Human Services Agency (HHSA), Community Health Statistics, 01/12/2012.

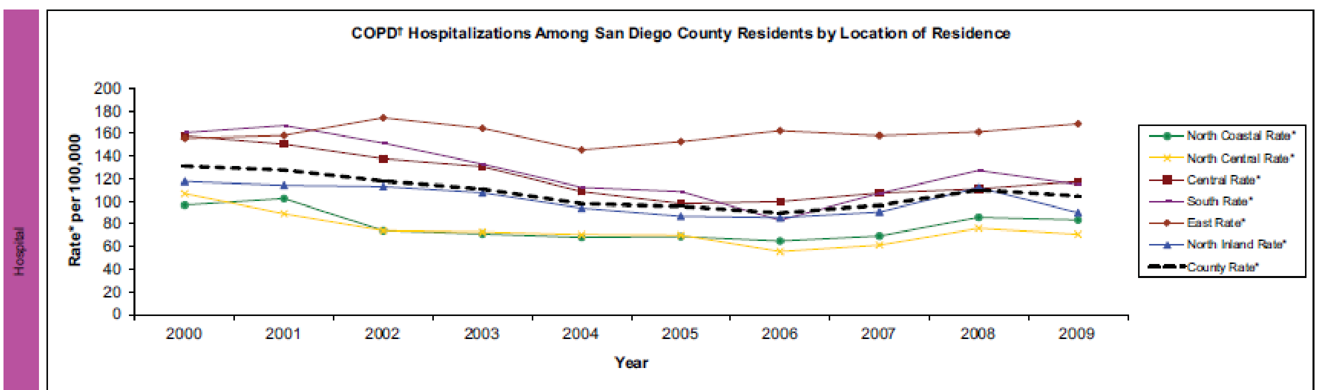
3.1.3 COPD Issues by Region

Figure 3.4 includes graphs provided by HHSA that illustrate the regional trends with respect to COPD issues. Table 3.1 & column 4 shows the scores of the stations according to HHSA statistics and groups the stations according to the region (ranking 1-6, with 6 as the worst) from Figure 3.2 (averaged from 2000-2009).

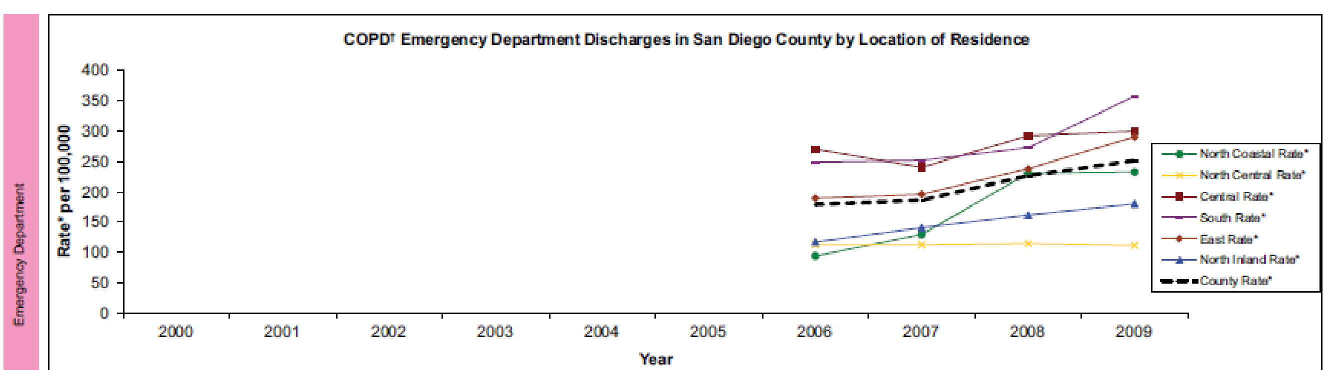
Figure 3.4 COPD Issues by Region



* Rates per 100,000 population.
† COPD death refers to (underlying cause of death) ICD-10 codes J40-44.
§ Rates not calculated for fewer than 5 events. Rates not calculated in cases where zip code is unknown.
Source: Death Statistical Master Files (CA DPH), County of San Diego, Health & Human Services Agency, Epidemiology & Immunization Services Branch; SANDAG, Current Population Estimates, 10/2010.
Prepared by County of San Diego (CoSD), Health & Human Services Agency (HHSA), Community Health Statistics, 01/12/2012.



* Rates per 100,000 population.
† COPD hospitalization refers to (principal diagnosis) ICD-9 codes 490-492, 496.
§ Rates not calculated for fewer than 5 events. Rates not calculated in cases where zip code is unknown.
Source: Patient Discharge Data, (CA OSHPD), County of San Diego, Health & Human Services Agency, Epidemiology & Immunization Services Branch; SANDAG, Current Population Estimates, 01/12/2012.
Prepared by County of San Diego (CoSD), Health & Human Services Agency (HHSA), Community Health Statistics, 01/12/2012.



* Rates per 100,000 population.
† COPD emergency department visit refers to (principal diagnosis) ICD-9 code 490-492, 496.
** New database; 2006 is first calendar year regional data is available
§ Rates not calculated for fewer than 5 events. Rates not calculated in cases where zip code is unknown or outside San Diego County.
Source: HASD&IC, CHIP, County of San Diego, Health & Human Services Agency, Emergency Medical Services, Emergency Department Database; SANDAG, Current Population Estimates, 10/2010.
Prepared by County of San Diego (CoSD), Health & Human Services Agency (HHSA), Community Health Statistics, 01/12/2012.

3.1.4 Respiratory Risk by City/Community/Station

The EPA program, EJView, combines all respiratory ailments and creates a risk factor to rank the area. A higher number (10 being the maximum) indicates a higher risk factor. Table 3.1 & column 2 tabulates respiratory issues by the city or community in which an ambient air monitoring station is located and the surrounding city or community.

3.1.5 Asthma Risk by City/Community/Station

Table 3.1 & column 3 tabulates asthma rate using EPA-Region 9's Environmental Justice mapping tool, CalEnviroScreen. A higher number (100 being the maximum) indicates a higher risk factor.

3.1.6 Total Health Risk by City/Community/Station

Table 3.1 & column 1 tabulates all health issues with respect to the chemicals prevalent in the area of concern. The health risks are listed by the city or community in which an ambient air monitoring station is located and the surrounding city or community. The health risk ratings listed (100 being the maximum) are from the National-Scale Air Toxics Assessment (NATA) database. A higher number indicates a higher risk factor.

Chapter 4 Ozone (O_3)

Section 4.0.0 Ozone - Introduction

Ambient level ozone was sampled on a continuous (7/24) basis at locations throughout the SDAB/(Figure 4.1). The network has had recent station moves:

- The Otay Mesa (OTM) station was permanently relocated to the Donovan State Prison area, and this station is called Donovan (DVN).
- The El Cajon station was temporarily relocated to the Gillespie Field area off of Floyd Smith Drive.

Figure 4.1 Ozone Network Map

The reported concentrations reflect a mix of the two station moves listed above. Because the Donovan relocation is permanent, the map and table parameters reflect the new site metadata (labeled as DVN). Because the Floyd Smith Drive relocation is temporary, the maps and table parameters reflect the permanent site metadata (labeled as ECA).

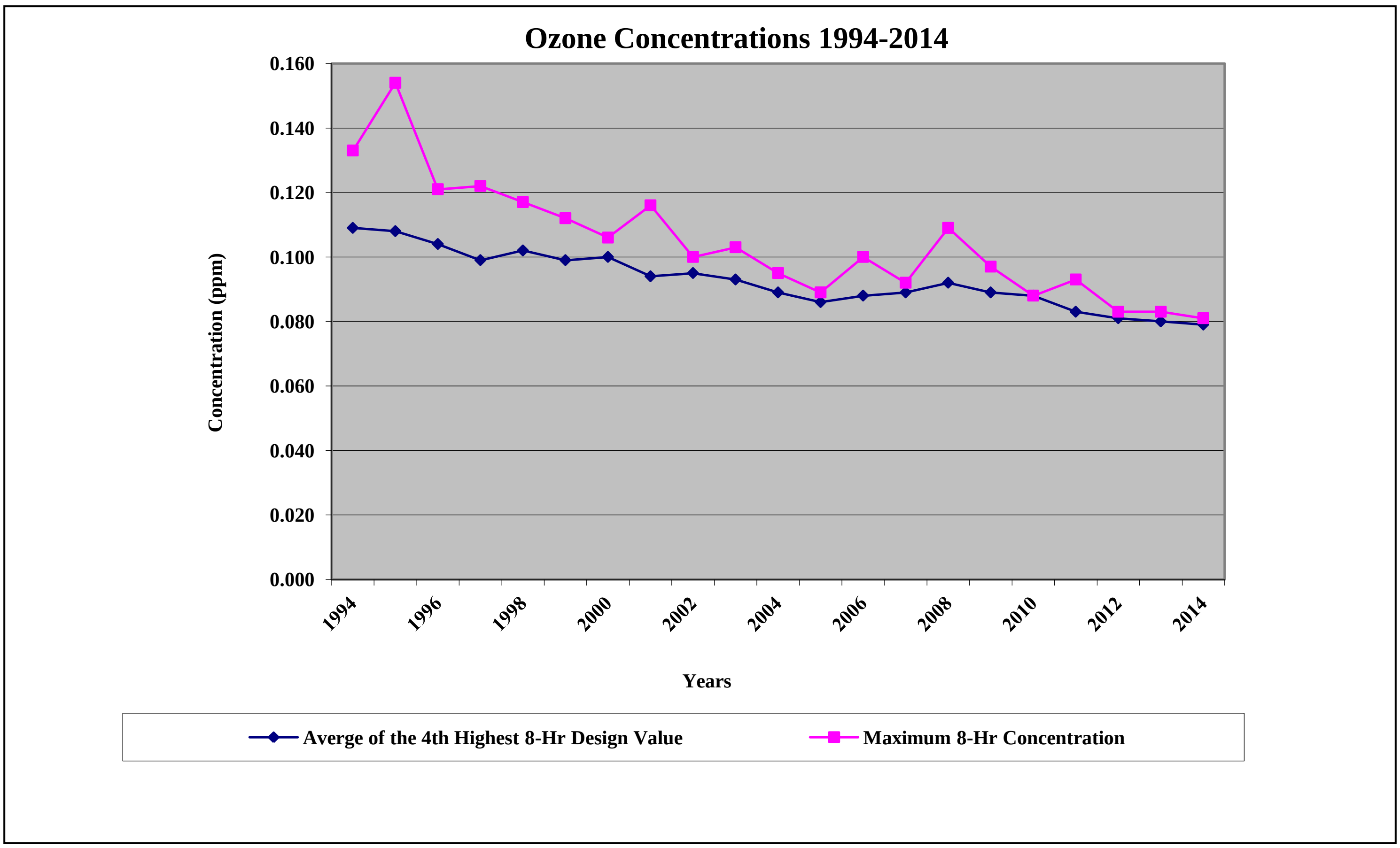
Section 4.1.0 Ozone - Trends in the SDAB

Over the years, the SDAB has seen a decrease in ozone levels (Table 4.1 and Figure 4.2). Over the last several years, San Diego realized a significant decrease in the 3-yr average of the exceedance days for ozone and has seen a sharp decrease in its 8-hour Design Value since 1990. Note that the "Days above the National 8-Hr Standard" row in Table 4.1 reflects the ozone standard for that year.

Table 4.1 Summary of Ozone Concentrations, 1994-2014

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Average of the 4th Highest 8-Hr Design Value (ppm)	0.109	0.108	0.104	0.099	0.102	0.099	0.100	0.094	0.095	0.093	0.089	0.086	0.088	0.089	0.092	0.089	0.088	0.083	0.081	0.080	0.079
Maximum 8-Hr Concentration (ppm)	0.133	0.154	0.121	0.122	0.117	0.112	0.106	0.116	0.100	0.103	0.095	0.089	0.100	0.092	0.109	0.097	0.088	0.093	0.083	0.083	0.081
Days above the National 8-Hr Standard (#)	90	94	64	43	58	44	46	43	31	38	23	24	38	27	35	24	14	10	10	7	12

Figure 4.2 Ozone Concentrations, 1994-2014



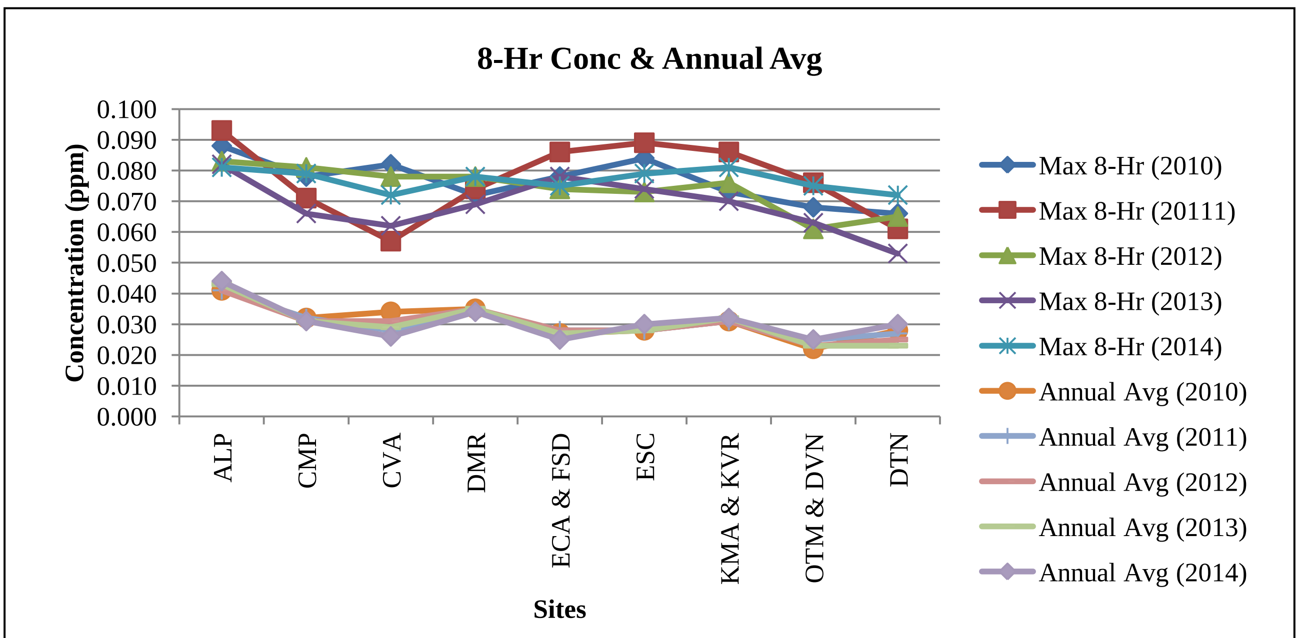
Section 4.1.1 Ozone Measurements by Site, 2010-2014

Table 4.2a lists the maximum ozone measurement for each ozone monitoring location by year. Figure 4.3 show the data graphically.

Table 4.2a Ozone Measurements by Site, 2010-2014

Site (name)		Maximum Concentration for 8-Hrs (ppm)					Annual Average (ppm)				
		2010	2011	2012	2013	2014	2010	2011	2012	2013	2014
Alpine	ALP	0.088	0.093	0.083	0.082	0.081	0.041	0.041	0.041	0.043	0.044
Camp Pendleton	CMP	0.078	0.071	0.081	0.066	0.079	0.032	0.032	0.031	0.031	0.031
Chula Vista	CVA	0.082	0.057	0.078	0.062	0.072	0.034	0.028	0.031	0.029	0.026
Del Mar	DMR	0.072	0.074	0.078	0.069	0.078	0.035	0.034	0.035	0.035	0.034
El Cajon	ECA & FSD	0.078	0.086	0.074	0.078	0.075	0.027	0.028	0.028	0.027	0.025
Escondido	ESC	0.084	0.089	0.073	0.074	0.079	0.028	0.028	0.028	0.028	0.030
Kearny Villa Road	KMA & KVR	0.073	0.086	0.076	0.070	0.081	0.031	0.031	0.031	0.032	0.032
Otay Mesa	OTM & DVN	0.068	0.076	0.061	0.063	0.075	0.022	0.025	0.023	0.023	0.025
San Diego-Beardsley	DTN	0.066	0.061	0.065	0.053	0.072	0.028	0.027	0.025	0.023	0.030

Figure 4.3 Graph of 8-Hr Concentration and Annual Average



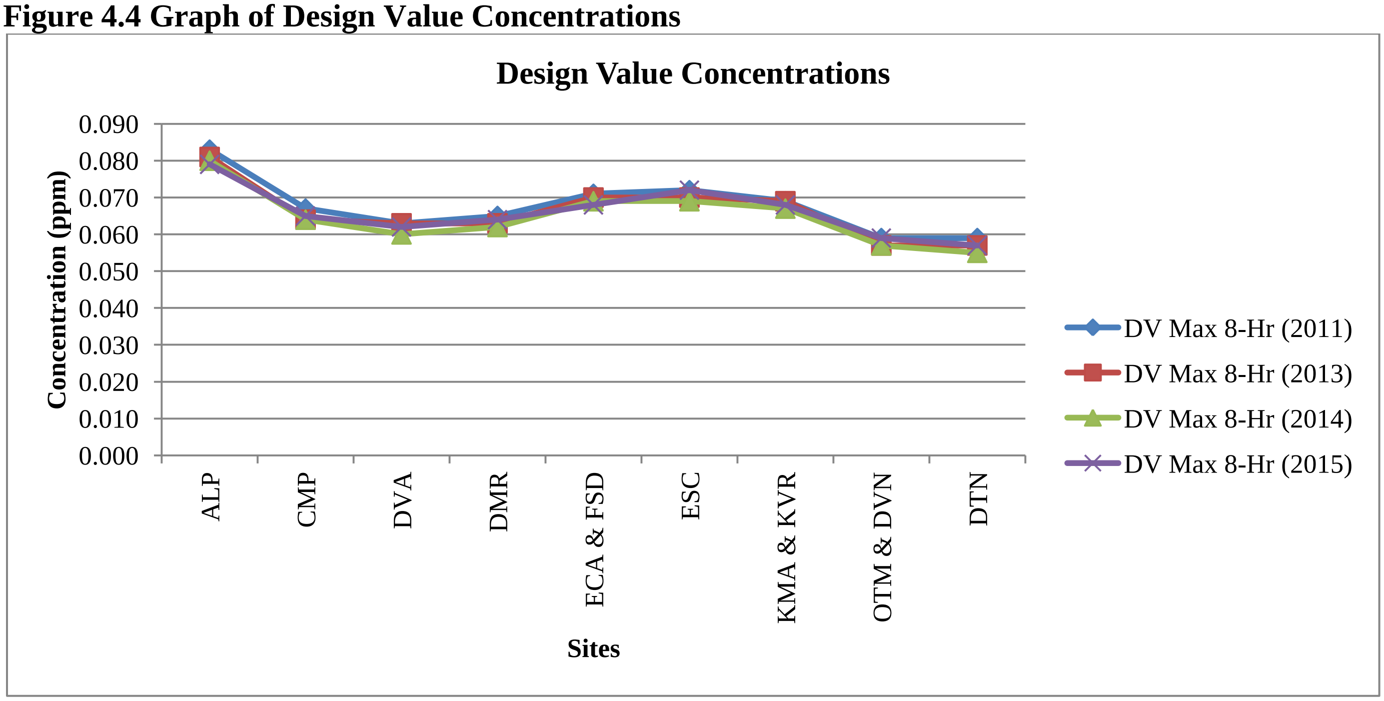
<u>Section 4.1.2 Ozone Measurements by Site, Design Values</u>

Table 4.2b lists the maximum ozone measurement for each ozone monitoring location. Figure 4.4 show the data graphically.

Table 4.2b Ozone Measurements by Site, Design Value

Site (name)		Design Value Maximum Concentration for 8-Hrs (ppm)				
		2008-2010	2009-2011	2010-2012	2011-2013	2012-2014
Alpine	ALP	0.088	0.083	0.081	0.080	0.079
Camp Pendleton	CMP	0.068	0.067	0.064	0.064	0.065
Chula Vista	CVA	0.070	0.063	0.063	0.060	0.062
Del Mar	DMR	0.068	0.065	0.063	0.062	0.064
El Cajon	ECA & FSD	0.075	0.071	0.070	0.069	0.068
Escondido	ESC	0.079	0.072	0.070	0.069	0.072
Kearny Villa Road	KMA & KVR	0.074	0.069	0.069	0.067	0.068
Otay Mesa	OTM & DVN	0.061	0.059	0.057	0.057	0.059
San Diego-Beardsley	DTN	0.060	0.059	0.057	0.055	0.057

Figure 4.4 Graph of Design Value Concentrations



Section 4.2.0 Ozone – Federal Design Criteria Requirements

Federal requirements for the number of ozone monitors are in 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 4.1 "Ozone (O_3) Design Criteria".

Section 4.2.1 Ozone - Design Value Criteria

40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 4.1 "Ozone (O_3) Design Criteria", subsection 4.1(a) lists the requirements needed to fulfill the Ozone (O_3) Design Criteria. The 8-Hour Design Value is based on the monitor that records the highest values (Table 4.5c), using EPA *Table D-2* from section 4.2.0. Tables 4.4a and 4.4b list these requirements for the SDAB.

Table 4.3a Ozone 8-hour Design Value, 2012-2014

Maximum 8-Hr Design Value (ppm)	Is the Maximum 8-Hr Design Value ≥ 85% of the NAAQS? (yes/no)	Is the Maximum 8-Hr Design Value < 85% of the NAAQS? (yes/no)	Does the Maximum 8-Hr Design Value Meet the NAAQS? (yes/no)
0.079	Yes	No	No

Table 4.3b Ozone Minimum Number of Monitors (Sites) Needed for 2014

MSA (name)	County (name)	Population from 2010 Census (#)	Minimum Number of Monitors (Sites) Required (#)	Number of Active Monitors (Sites) (#)	Number of Monitors (Sites) Needed (#)
San Diego	San Diego	3.2 million	2	9	None

Section 4.2.2 Ozone - Maximum Concentration

40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 4.1 "Ozone (O_3) Design Criteria", subsection 4.1(b) lists the requirements needed to fulfill the Maximum Concentration Site, which is based on the monitor that records the maximum concentration values (Table 4.4c).

Table 4.3c Ozone Maximum Concentration Site, 2012-2014

Maximum 8-Hr Design Value (ppm)	Maximum 8-Hr Design Value Site (name)	Maximum 8-Hr Design Value Site AQS ID (#)
0.079	Alpine (ALP)	06-073-1006

Section 4.3.0 Ozone - Rating Summary

Table 4.4 is a summary of the District's ozone monitor rating for the network instruments after using the EPA's Network Assessment tools for ozone.

Table 4.4 Ozone Monitoring Station Summary

	Overall Scoring	**COMMENTS**	**1.** Correlation	**2.** Removal	**3.** Area Served	**4.** 65 ppb Threshold	**4.** 70 ppb Threshold	**4.** 75 ppb Threshold	**5.** Internal
Alpine (ALP)	**63**	**1&2**: Ozone required for PAMS and Design Value **3:** Based on total population and population growth **4:** All 3 Threshold scenarios: high probability of exceedances	10	10	2	75%= 8	65%= 7	60%= 6	20
Camp Pendleton (CMP)	**72**	**1&2:** Ozone required for PAMS and Transport site **3:** Based on total population and surrounding population **4:** 2 of 3 Threshold scenarios: high probability of exceedances	10	10	10	55%= 6	40%= 4	25%= 3	29
Chula Vista (CVA)	**71**	**1&2:** Some of the highest asthma rates in the County **3:** Based on total population and population growth **4:** 1 of 3: high probability, 1 of 3: below average probability, 1 of 3: almost zero probability	10	10	8	50%= 5	30%= 3	5%= 1	34
Del Mar (DMR)	**21**	**1&2:** Will leave a 40 mile gap if removed **3:** Based on total population and zero growth **4:** 2 of 3 Threshold scenarios: high probability of exceedances	3	0	0	55%= 6	40%= 4	10%= 1	7
Otay Mesa-Donovan (DVN)	**58**	**1& 2:** Farthest south, registers transport from Mexico **3:** Based on total population and population growth **4:** Threshold scenarios: 1 of 3: high probability, 1 of 3: below average probability, 1 of 3: almost zero probability	8	8	7	45%= 5	15%= 2	5%= 1	27
El Cajon (ECA)	**87**	**1&2:** Ozone required for PAMS and NCore **3:** Based on total population and surrounding population **4:** All 3 Threshold scenarios: high probability of exceedance	10	5	7	75%= 8	65%= 7	60%= 6	44
Escondido (ESC)	**68**	**1&2:** Used to interpolate data for the surrounding cities **3:** Based on total population and surrounding population **4:** 2 of 3 Threshold scenarios: high probability of exceedances	9	5	8	65%= 7	45%= 5	35%= 4	30
San Diego-Beardsley (DTN)	**72**	**1&2:** EJ location, some of the highest asthma rates **3:** Based on total population and surrounding population **4:** 3 of 3 Threshold scenarios: low probability of exceedances	8	8	10	35%= 4	10%= 1	5%= 1	40
San Diego-Kearny Villa Rd. (KVR)	**64**	**1&2:** Required for PAMS and registers Downtown emissions **3:** Based on total population and surrounding population **4:** 2 of 3 Threshold scenarios: high probability of exceedances	7	7	6	65%= 7	60%= 6	35%= 4	27

The highest ranked sites for retention are those stations and associated ozone monitors that have a specific program or purpose, e.g., El Cajon is an NCore site, so any Network Assessment tool recommending removal will not be used. The Del Mar station has a low ranking and is recommended for decommissioning or relocation, based on monitor ranking alone. This task may be undertaken in the next few years. First, more required station relocations and start-ups must be completed. Once those are completed, a review of where to relocate the Del Mar station will be conducted.

Section 4.3.1 Ozone - Correlation Matrix

The correlation matrix analysis shows the correlation, relative difference, and distance between sites. The shape of the ellipses represents the Pearson Squared Correlation between sites with a circle representing zero correlation and a straight line representing perfect correlation; correlation between the sites represents the degree of relatedness. The correlation, however, does not indicate if one site measures concentrations substantially higher or lower than another; for this, the color of the ellipses represents the average relative difference. This analysis aids in determining sites that are redundant. Confounding factors affecting analysis include AQS site data with < 75% completion are not used.

The ozone correlation between sites in San Diego County is shown in Figure 4.5. Two site pairs result in correlations greater than 0.8 and relative differences less than 0.3 for ozone:

1. 06-073-1002 Escondido and 06-073-0003 El Cajon
2. 06-073-1008 Camp Pendleton and 06-073-1001 Del Mar

For ozone, this analysis shows that sites may generate comparable data. This result is expected for ozone, given the regional nature of the pollutant and the density/configuration of the network to have monitors located in population centers. Even if sites measure comparable ozone levels, the need for public reporting of health alerts and Air Quality Index (AQI) levels requires ozone reporting in highly populated communities. This configuration may cause some redundancy but is needed for public welfare. Sites with high correlation, small average differences, and close proximities can be considered redundant; only 06-73-1008 Camp Pendleton and 06-073-1001 Del Mar qualify.

1. The Escondido and El Cajon station are in completely different communities, topography, and register different air mass. Value would be lost by eliminating the ozone monitor at Escondido (the ozone monitor at El Cajon is required, because it is a PAMS and NCore station).

2. Both Camp Pendleton and Del Mar are along the Pacific Coast. The ozone monitor at Del Mar often measures the same transport air mass but at different times in the day and sometimes on a different day. If the Del Mar station was decommissioned, the next coastal ozone monitor is at 06-073-1010 Downtown, leaving a 40 mile gap in coverage (see Figure 4.5 for a pictorial representation of this gap). The District may investigate relocating this station in the La Jolla area, so coastal coverage can be maintained.

Table 4.5 (column 1, Correlation) summarizes the ranking for this section.

Figure 4.5 Ozone Correlation Matrix

Legend:

06-073-0003 El Cajon (ECA)
06-073-1001 Del Mar (DMR)
06-073-1002 Escondido (ESC)
06-073-1006 Alpine (ALP)
06-073-1008 Camp Pendleton (CMP)
06-073-1010 Downtown (DTN)
06-073-1011 Blvd (not a San Diego APCD air monitoring site)
06-073-1016 Kearny Villa Road (KVR)
06-073-1201 Pala (not a San Diego APCD air monitoring site)
06-073-2007 Otay Mesa (OTM) now 06-073-1014 Otay Mesa-Donovan (DVN)
06-073-0001 Chula Vista (CVA)

Section 4.3.2 Ozone - Removal Bias

This section discusses the determination of redundant sites. The bias estimation uses the nearest neighbor site to estimate the concentration at that location if the site was not there. A positive bias indicates that if the site being examined was removed, the neighboring site(s) would register higher values. The opposite indicates negative bias. Figure 4.6 is a pictorial representation of the ozone monitors in the network. The darker blue the circle signifies the more negative the bias, the darker red the circle signifies the more positive the bias, and white is neutral.

The Removal Bias between sites in San Diego County for ozone indicates three sites:

1. Escondido
2. El Cajon
3. Del Mar

The results of the Removal Bias test corroborate the results from the Correlation section. As stated earlier, this result is expected for ozone, given the regional nature of the pollutant and the density/configuration of the network to have monitors located in population centers. This configuration may cause some redundancy but is needed for public welfare.

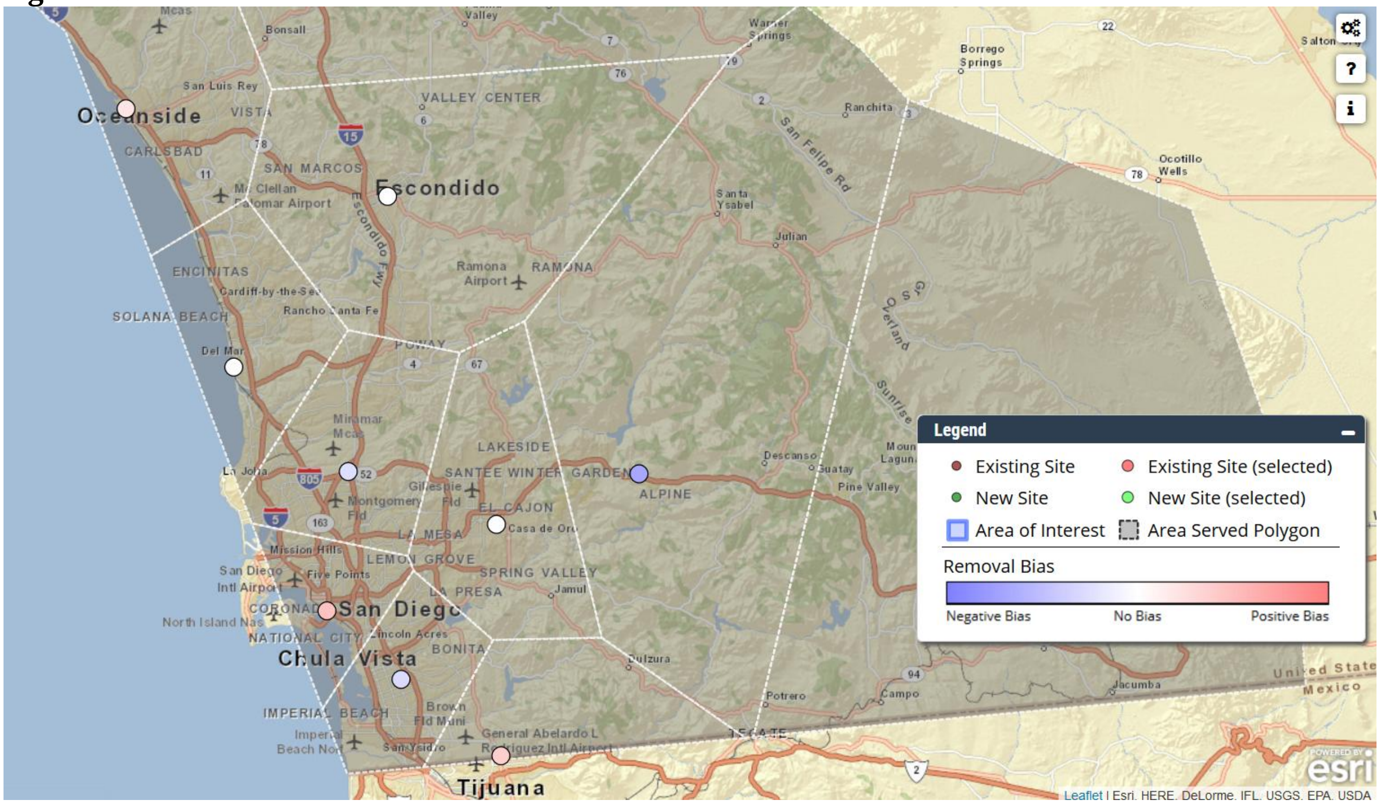
1. Escondido
   The Escondido ozone monitor is used to model the ozone concentrations along Route 78. This area is in the top 10 traffic counts for the County and has significantly different topography than the next closest station. Significant value would be lost if the Escondido ozone monitor was decommissioned.

2. El Cajon
   The ozone monitor at El Cajon is required, because it is a PAMS and NCore station.

3. Del Mar
   Both Del Mar and the next closest neighbor, Camp Pendleton, are along the Pacific Coast. The ozone monitor at Del Mar often measures the same transport air mass but at different times in the day and sometimes on a different day. If the Del Mar station was decommissioned, the next coastal ozone monitor is the Downtown station, creating a 40 mile gap in coverage (see Figure 4.4 for a pictorial representation of this gap).

Table 4.5 (column 2, Removal) summarizes the ranking for this section.

Figure 4.6 Removal Bias



Legend:

06-073-0003 El Cajon (ECA)
06-073-1001 Del Mar (DMR)
06-073-1002 Escondido (ESC)
06-073-1006 Alpine (ALP)
06-073-1008 Camp Pendleton (CMP)
06-073-1010 Downtown (DTN)
06-073-1011 Blvd (not a San Diego APCD air monitoring site)
06-073-1016 Kearny Villa Road (KVR)
06-073-1201 Pala (not a San Diego APCD air monitoring site)
06-073-2007 Otay Mesa (OTM) now 06-073-1014 Otay Mesa-Donovan (DVN)
06-073-0001 Chula Vista (CVA)

Section 4.3.3 Ozone - Area Served

The regions and area served by the monitors represent significant population conglomerations. Figure 4.7 is a pictorial representation of the area served by the ozone monitors in the air quality network. The elimination of any station will correspond to a decrease in coverage and a decrease in the District's ability to warn and inform the public of any health concerns.

The area east of Camp Pendleton and west of Escondido includes the communities of San Marcos and Vista. This area is one of the faster growing areas in the county. Ozone, nitrogen dioxide, and $PM_{2.5}$ concentrations have been shown to be derived from the measured concentrations from the Camp Pendleton and Escondido station ozone, nitrogen dioxide, and $PM_{2.5}$ monitors.

The area north of Escondido includes the communities of Bonsall and Fallbrook. This area has expanded, and its population has grown significantly over the years. The SCAQMD has monitors for ozone, nitrogen dioxide, PM_{10} and $PM_{2.5}$ in the Temecula Valley (the area north of Fallbrook), Elsinore, Norco/Corona, and Perris Valley. The ozone, nitrogen dioxide, PM_{10} and $PM_{2.5}$ concentrations for the general areas of Bonsall and Fallbrook can be derived from the Escondido and Temecula ozone, nitrogen dioxide, PM_{10} and $PM_{2.5}$ monitors.

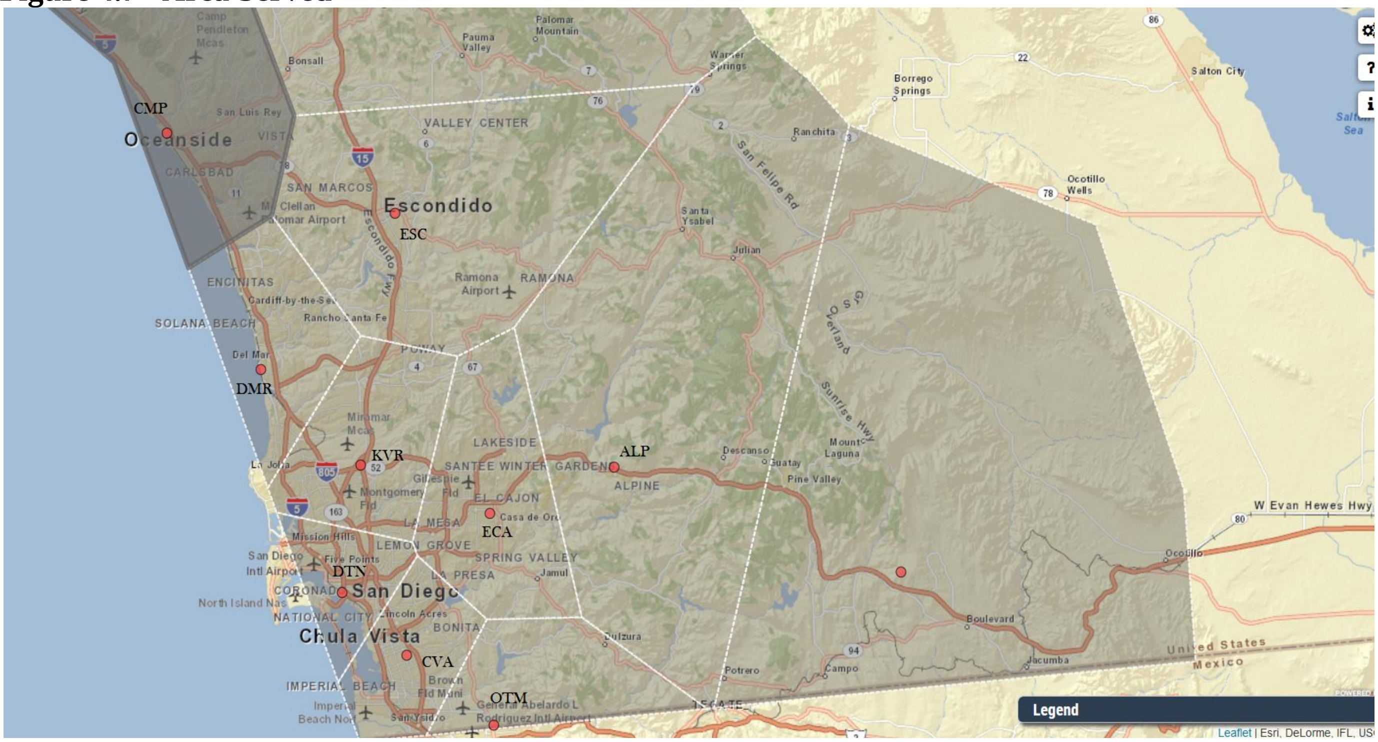
The areas east of the Alpine station have low population centers, low traffic count, and similar topography, so an additional ozone monitor in this area would add little informational value. Additionally, District studies have shown the measured concentrations to be the same (just time delayed) as Alpine.

The areas east of the Escondido station have low population centers, low traffic count, and similar topography, so an additional ozone monitor in this area would add little informational value. Additionally, District studies have shown the measured concentrations to be the same as at Escondido.

The area north of the Otay Mesa–Donovan station is one of the faster growing areas in the county. Some temporary monitoring may be undertaken between Otay Mesa and El Cajon, if modeling triggers a need to establish a presence.

Table 4.5 (column 3, Area Served) summarizes the ranking for this section.

Figure 4.7 Area Served



06-073-0003 El Cajon (ECA)
06-073-1001 Del Mar (DMR)
06-073-1002 Escondido (ESC)
06-073-1006 Alpine (ALP)
06-073-1008 Camp Pendleton (CMP)
06-073-1010 Downtown (DTN)
06-073-1011 Blvd (not a San Diego APCD air monitoring site)
06-073-1016 Kearny Villa Road (KVR)
06-073-1201 Pala (not a San Diego APCD air monitoring site)
06-073-2007 Otay Mesa (OTM) now 06-073-1014 Otay Mesa-Donovan (DVN)
06-073-0001 Chula Vista (CVA)

Section 4.3.4 Ozone - Surface Probability

Surface probability maps provide information on the spatial distribution of the highest value for a pollutant. It is the probability that exceedances may occur in certain geographical locations; not the probability that a monitor will exceed. These maps should not be used alone to justify a new monitor/air monitoring station location. Other materials should be used as well, for example demographics, area served, budgetary constraints, logistics, and other such concerns.

Figures 4.8-4.10 are pictorial representations of the areas of possible exceedances (red being the highest probability and green being the lowest), with the ambient air monitoring stations indicated by circles. The level of probability increases, depending on what maximum threshold is used. The possible thresholds are the current federal NAAQS of 75 ppb, the current State CAAQS of 70 ppb, and 65 ppb. The District has adequate coverage using all three thresholds.

If the threshold is set to 65 ppb, all District monitors will have a 35%-75% probability of exceedances.
If the threshold is set to 70 ppb, all District monitors will have a 10%-65% probability of exceedances.
If the threshold is set to 75 ppb, all District monitors will have a 5%-60% probability of exceedances.

Table 4.5 (columns 4a, 4b & 4c for 65, 70, & 75 ppb, respectively) summarizes the ranking for this section.

Figure 4.8a 65 ppb Threshold

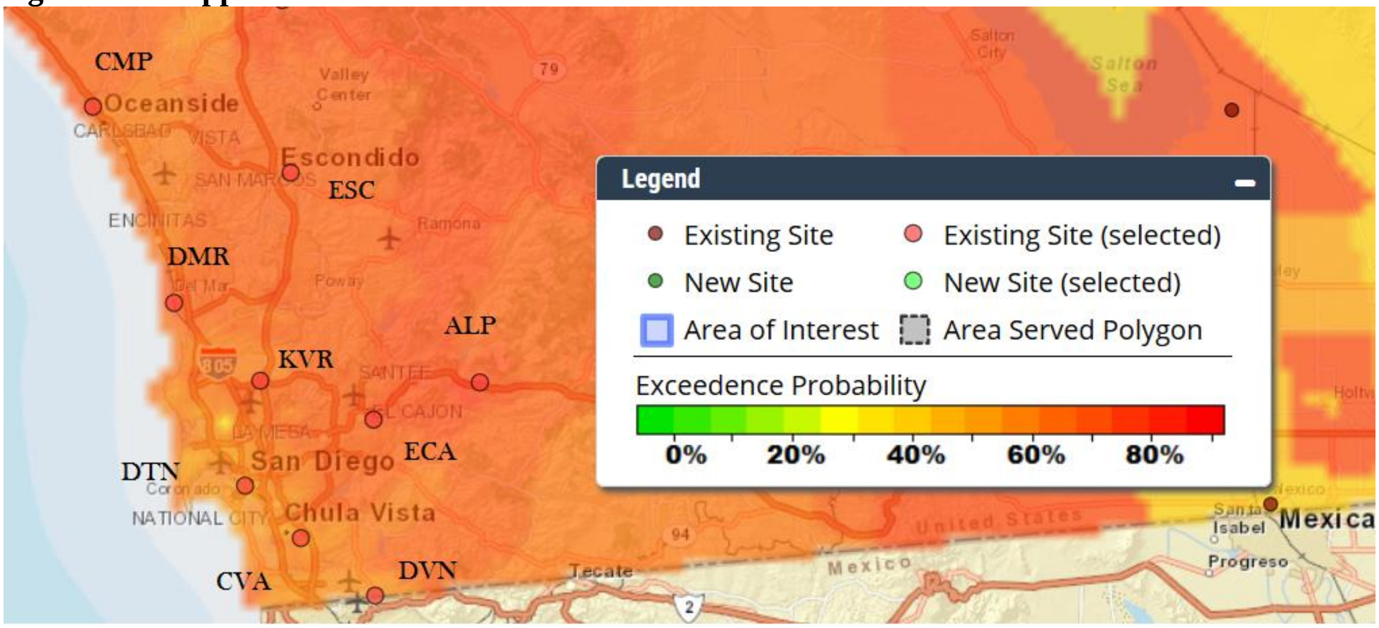


Figure 4.8b 65 ppb Threshold with Area Served Overlay

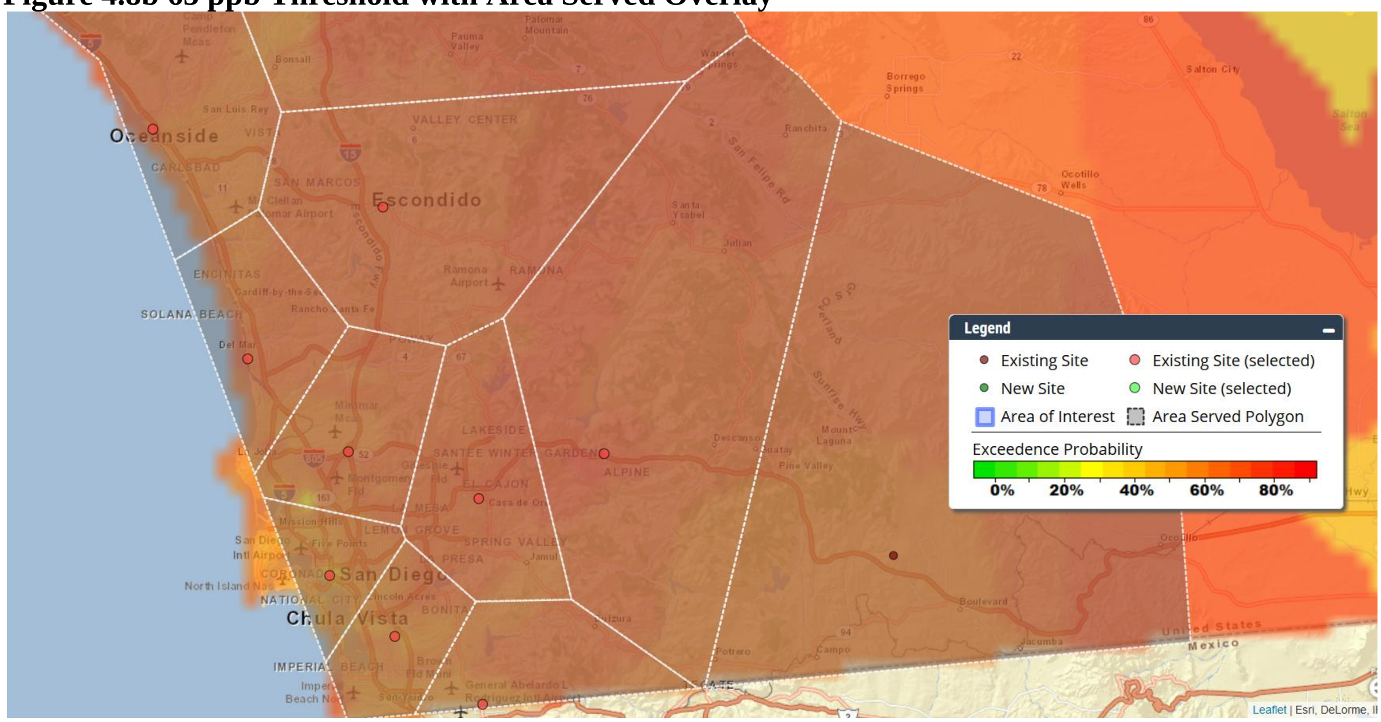


Figure 4.9a 70 ppb Threshold

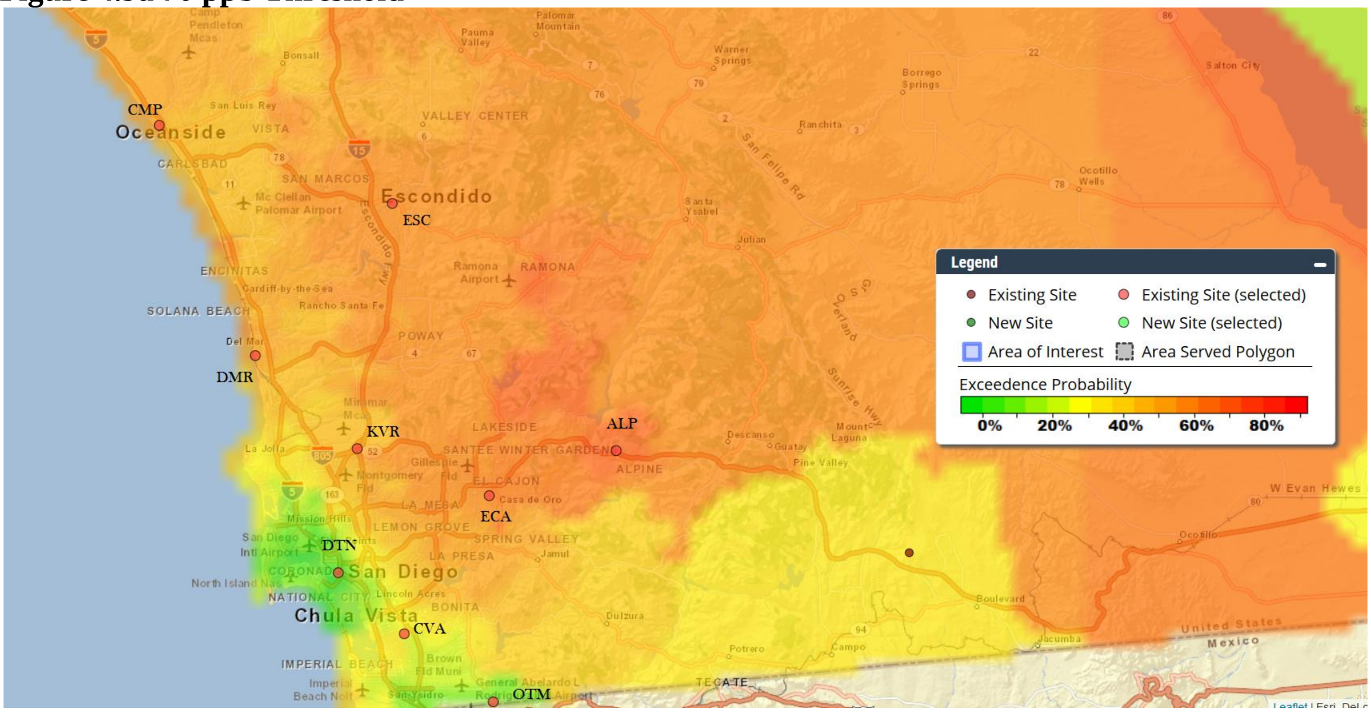


Figure 4.9b 70 ppb Threshold with Area Served Overlay

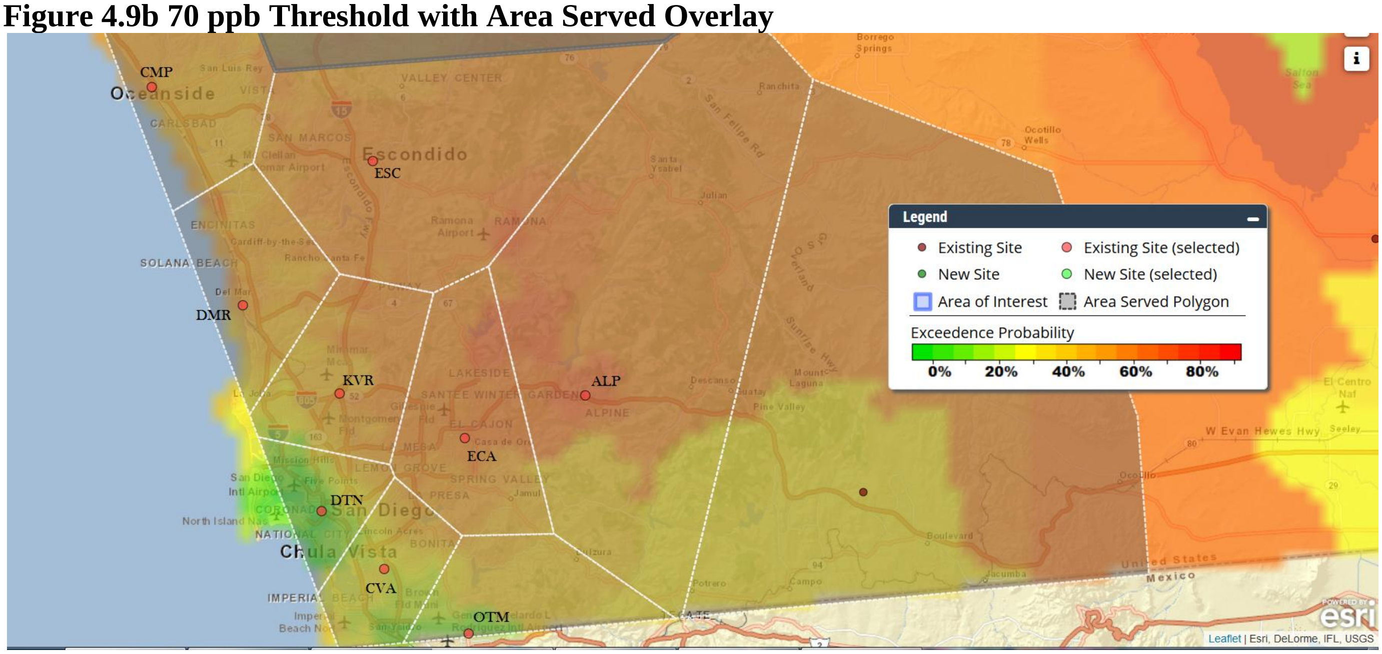


Figure 4.10a 75 ppb Threshold

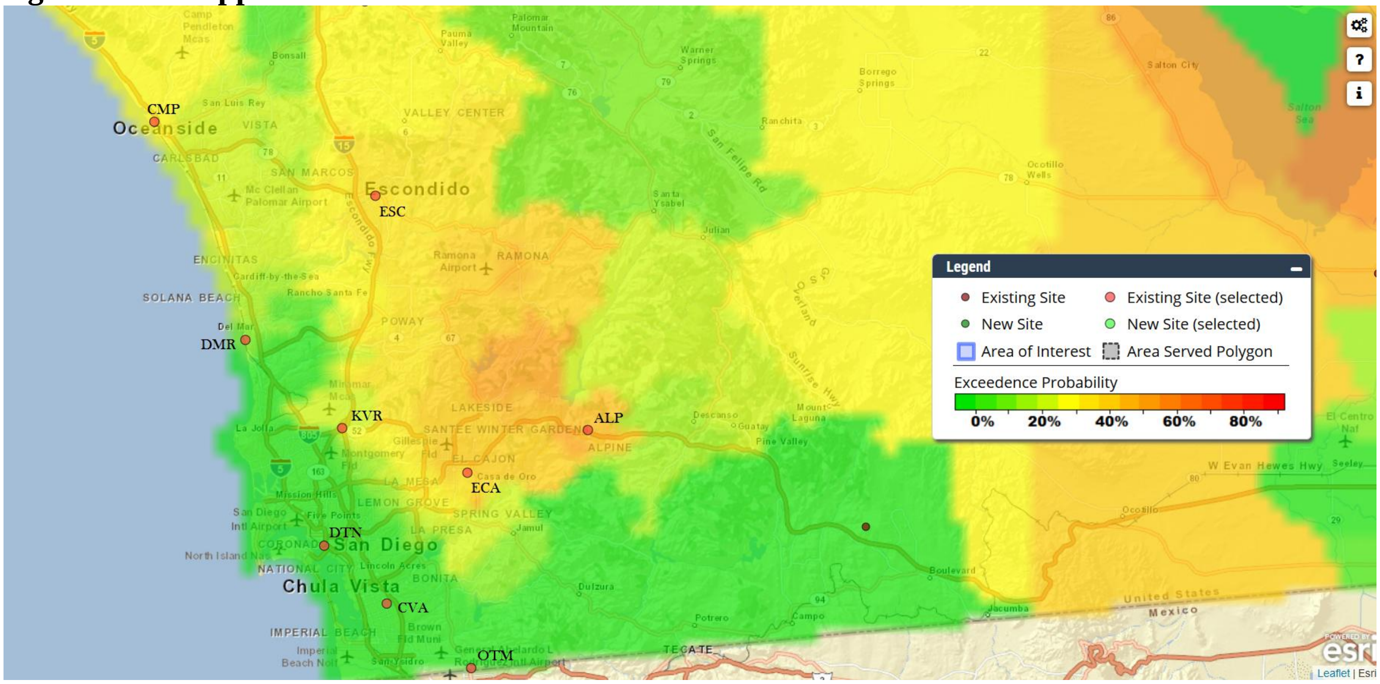
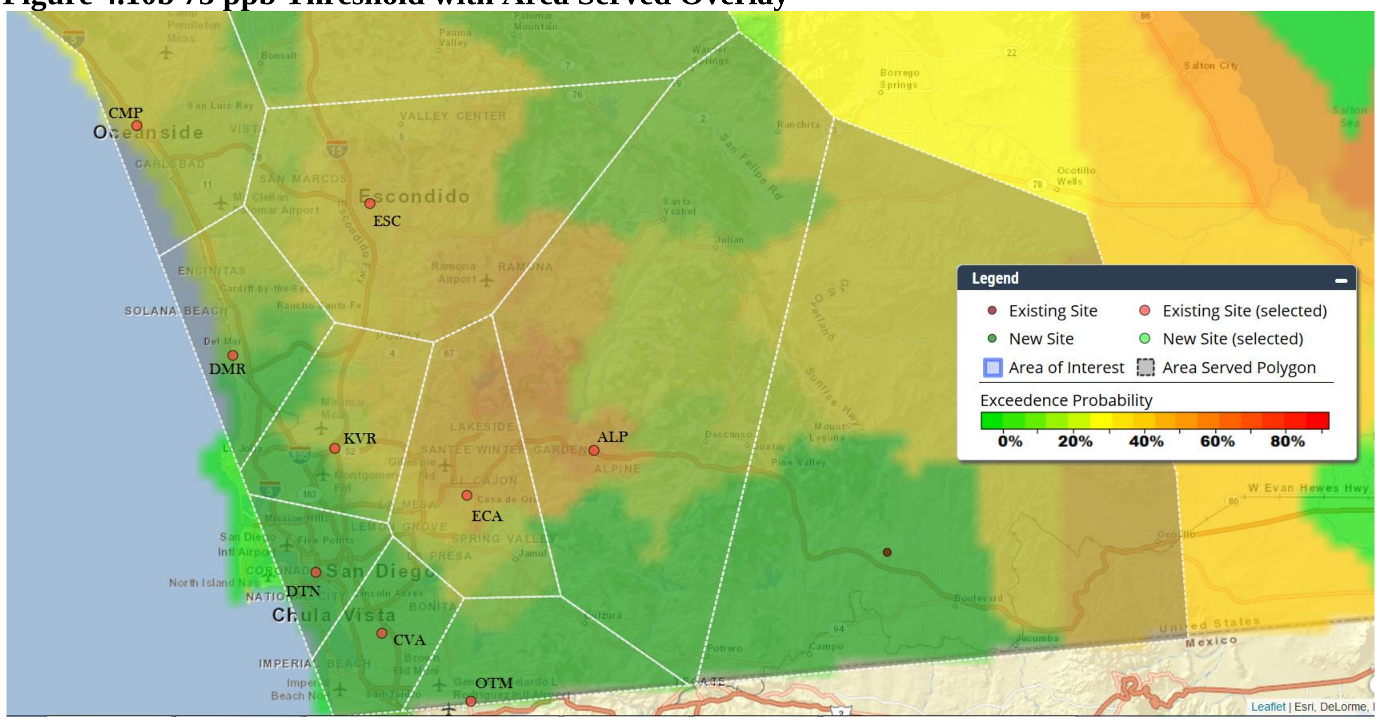


Figure 4.10b 75 ppb Threshold with Area Served Overlay



Section 4.3.5 Ozone - Internal District Criteria

Table 4.5 is a summary of the District's Internal Criteria used to justify the network monitors.

Table 4.5 Ozone Internal District Criteria

	Overall Scoring	**COMMENTS**	**1.** Total Monitors	**2.** Community Type	**3.** QA/QC Needs	**4.** Other
Alpine (ALP)	**20**	**1:** n/a **2:** Rural/bedroom **3:** Possibly PAMS **4:** PAMS and PM2.5 trends; recently moved	4	4	2	10
Camp Pendleton (CMP)	**29**	**1:** n/a **2:** Bedroom **3:** For PAMS **4:** PAMS and PM2.5 trends	5	6	10	8
Chula Vista (CVA)	**34**	**1:** n/a **2:** Mixed use **3:** PM10 and soon PM2.5 **4:** Toxics and PM2.5 trends; deck upgrade	7	7	10	10
Del Mar (DMR)	**7**	**1:** n/a **2:** Bedroom **3:** No need **4:** O3 trends	1	4	0	2
Otay Mesa-Donovan (DVN)	**27**	**1:** n/a **2:** Industrial becoming mixed use **3:** Possibly PM10 **4:** Toxics and PAMS trends; recently moved	6	7	4	10
El Cajon (ECA)	**44**	**1:** n/a **2:** Light industrial/mixed use **3:** With ARB **4:** PM2.5 and PAMS trends; recently moved	17	7	10	10
Escondido (ESC)	**30**	**1:** n/a **2:** Light industrial/mixed use **3:** Compare to Near-road **4:** PM2.5 and Toxics trends	9	9	8	8
San Diego-Beardsley (DTN)	**40**	**1:** n/a **2:** Heavy industrial/mixed use **3:** Compare to Near-road **4:** PM2.5, Toxics, and Carbon trends	10	10	10	10
San Diego-Kearny Villa Rd. (KVR)	**27**	**1:** n/a **2:** Mixed use **3:** PM2.5 **4:** PM2.5 and PAMS trends; recently moved	4	5	8	10

The overall ranking is also in Table 4.5 (column 5).

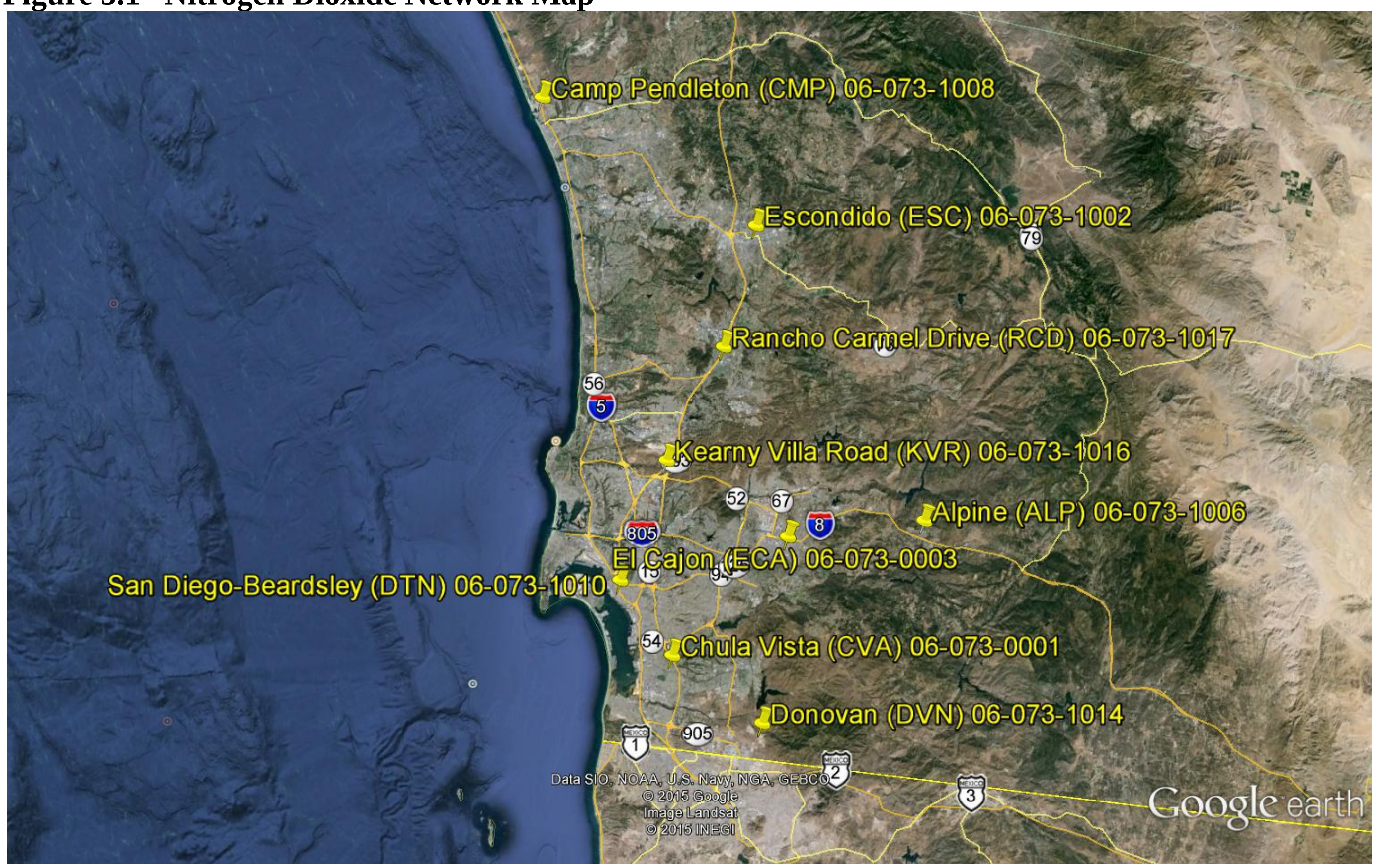
Chapter 5 Nitrogen Dioxide (NO_2) and NOy

Section 5.1.0 Nitrogen Dioxide - Introduction

Ambient level nitrogen dioxide was sampled on a continuous basis at locations throughout the SDAB (Figure 5.1). Reactive oxides of nitrogen (NOy) are sampled at the El Cajon location for the National Core (NCore) and Photochemical Assessment Monitoring Stations (PAMS) programs. There is no state or national standard for this pollutant.

- The Otay Mesa (OTM) station was permanently relocated to the Donovan State Prison area, this station is called Donovan (DVN).
- The El Cajon station was temporarily relocated to the Gillespie Field area off of Floyd Smith Dr.
- The Rancho Carmel Dr. (RCD) Near-road station was not operational until 2015, so no data from that station is in this report.

Figure 5.1 Nitrogen Dioxide Network Map



The reported concentrations reflect a mix of the two station moves listed above. Because the Donovan relocation is permanent, the maps and table parameters reflect the new site metadata (labeled as DVN). Because the Floyd Smith Dr. relocation is temporary, the maps and table parameters reflect the permanent site metadata (labeled as ECA).

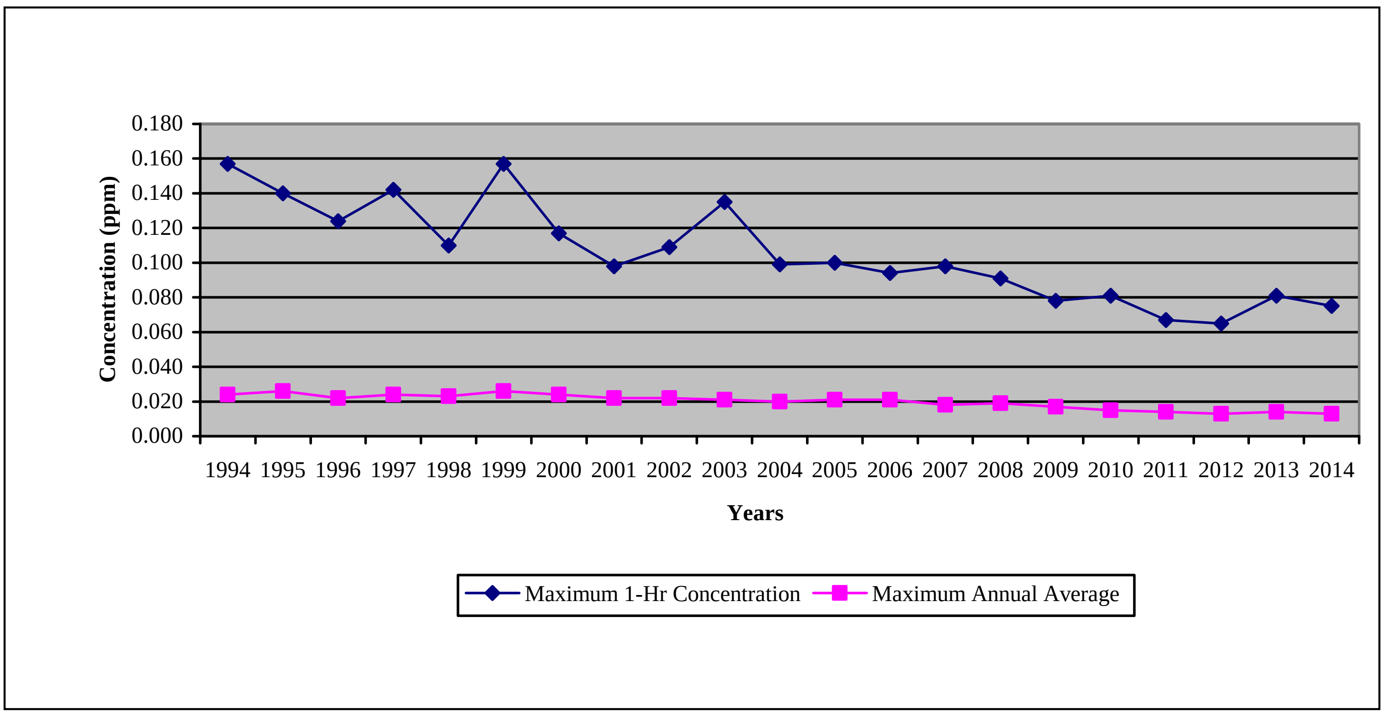
Section 5.1.0 Nitrogen Dioxide - Trends in the SDAB

As seen in Figure 5.2, emissions of NO_2 have decreased steadily over the years in the SDAB (Table 5.1). As with the State and the nation, the general downward trend is a result of improved emission control technology on mobile sources, and NO_2 emissions should continue to decrease. Note that the "Days above the National 1-Hr Standard" row reflects the nitrogen dioxide standard for that year. Please Note: The concentrations from Otay Mesa (border crossing) have been omitted from this table.

Table 5.1 Summary of Nitrogen Dioxide Concentrations, 1994-2014

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Maximum 1-Hr Concentration (ppm)	0.157	0.140	0.124	0.142	0.110	0.157	0.117	0.098	0.109	0.135	0.099	0.100	0.094	0.098	0.091	0.078	0.081	0.067	0.065	0.081	0.075
Maximum Annual Average (ppm)	0.024	0.026	0.022	0.024	0.023	0.026	0.024	0.022	0.022	0.021	0.020	0.021	0.021	0.018	0.019	0.017	0.015	0.014	0.013	0.014	0.013
Days above the National 1-Hr Standard (#)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 5.2 Nitrogen Dioxide Concentrations, 1994-2014



Section 5.1.1 Nitrogen Dioxide Measurements by Site

Table 5.2a lists the maximum nitrogen dioxide measurements and NOy-NO for each nitrogen dioxide monitoring location and NCore, respectively; Figure 5.3 shows the values graphically.

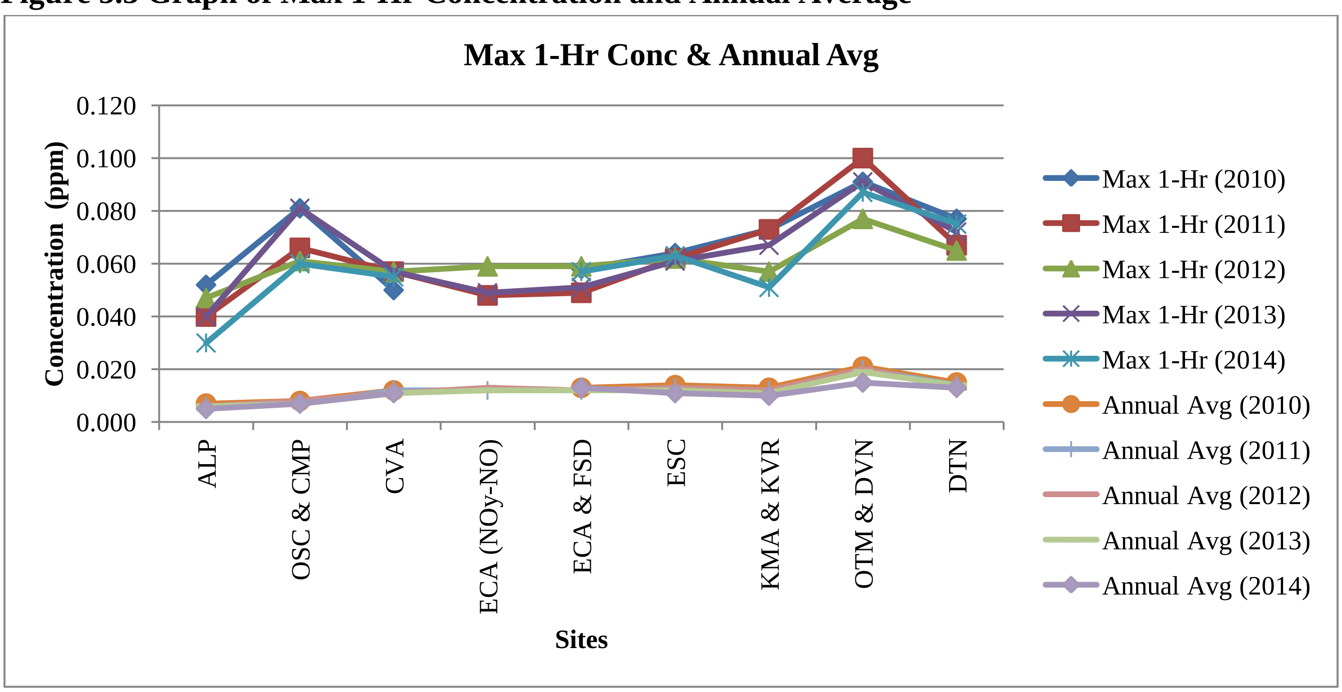
Table 5.2a Nitrogen Dioxide by Site, 2010-2014

Site (name)		Maximum Concentration for 1-Hr (ppm)					Annual Average (ppm)				
		2010	2011	2012	2013	2014	2010	2011	2012	2013	2014
Alpine	ALP	0.052	0.040	0.047	0.040	0.030	0.007	0.006	0.006	0.006	0.005
Camp Pendleton	OSC & CMP	0.081	0.066	0.061	0.081	0.060	0.008	0.007	0.008	0.007	0.007
Chula Vista	CVA	0.050	0.057	0.057	0.057	0.055	0.012	0.012	0.011	0.011	0.011
*El Cajon	ECA (NOy-NO)	**	0.048	0.059	0.049	**	**	0.012	0.013	0.012	**
El Cajon	ECA & FSD	0.058	0.049	0.059	0.051	0.057	0.013	0.012	0.012	0.012	0.013
Escondido	ESC	0.064	0.062	0.062	0.061	0.063	0.014	0.013	0.013	0.012	0.011
Kearny Villa Road	KMA & KVR	0.073	0.073	0.057	0.067	0.051	0.013	0.012	0.012	0.011	0.010
Otay Mesa	OTM & DVN	0.091	0.100	0.077	0.091	0.087	0.021	0.020	0.020	0.019	0.015
San Diego-Beardsley	DTN	0.077	0.067	0.065	0.072	0.075	0.015	0.014	0.013	0.014	0.013

*The NOy monitor does not have FRM designation, so it cannot be compared to the NAAQS.

** Not operational

Figure 5.3 Graph of Max 1-Hr Concentration and Annual Average



Section 5.1.2 Nitrogen Dioxide Measurements by Site, Design Value 2010-2014

Table 5.2b lists the maximum nitrogen dioxide measurements and NOy-NO for each nitrogen dioxide monitoring location and NCore, respectively; Figure 5.4 shows the Design Values (98 percentile Daily maximum) graphically.

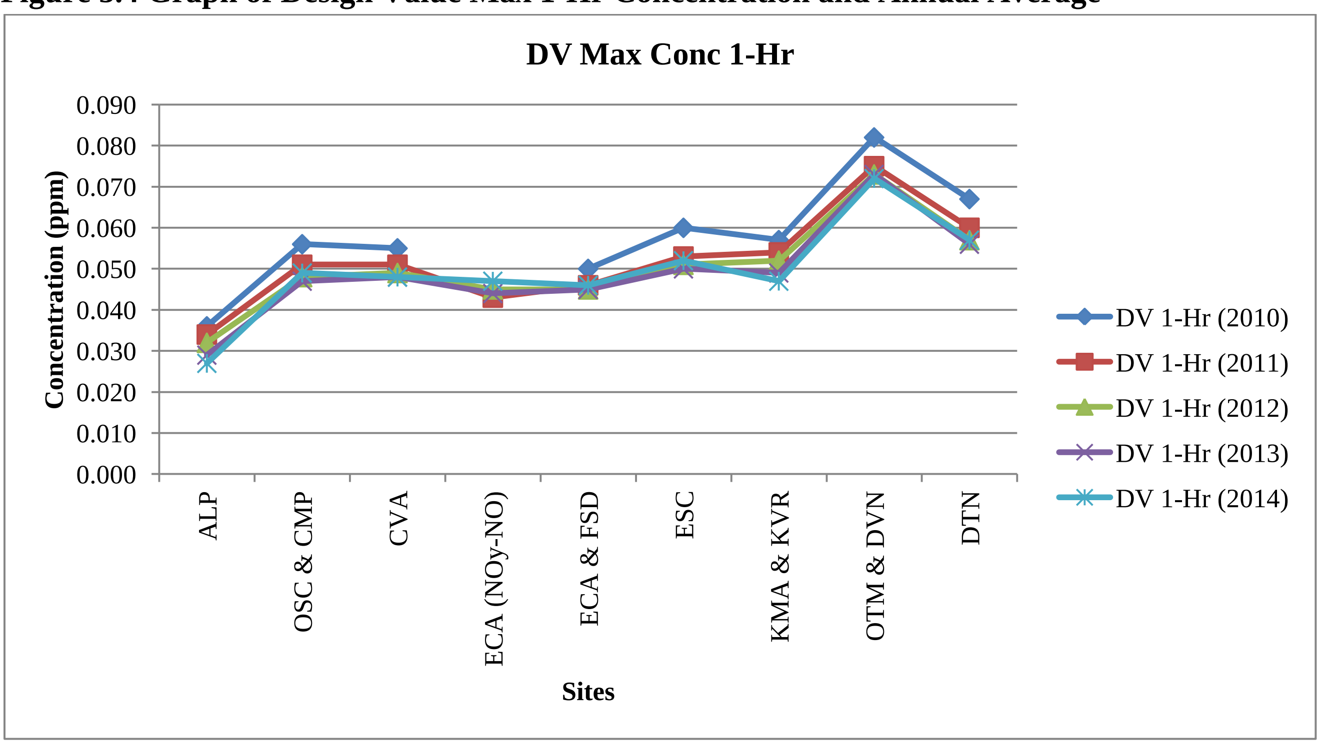
Table 5.2b Nitrogen Dioxide Design Value Measurements by Site

Site (name)		Design Value Maximum Concentration for 1-Hr (ppm)				
		2008-2010	2009-2011	2010-2012	2011-2013	2012-2014
Alpine	ALP	0.036	0.034	0.032	0.029	0.027
Camp Pendleton	OSC & CMP	0.056	0.051	0.048	0.047	0.049
Chula Vista	CVA	0.055	0.051	0.049	0.048	0.048
*El Cajon	ECA (NOy-NO)	**	0.043	0.045	0.044	0.047
El Cajon	ECA & FSD	0.050	0.046	0.045	0.045	0.046
Escondido	ESC	0.060	0.053	0.051	0.050	0.052
Kearny Villa Road	KMA & KVR	0.057	0.054	0.052	0.049	0.047
Otay Mesa	OTM & DVN	0.082	0.075	0.073	0.073	0.072
San Diego-Beardsley	DTN	0.067	0.060	0.057	0.056	0.057

*The NOy monitor does not have FRM designation, so it cannot be compared to the NAAQS.

** Not operational

Figure 5.4 Graph of Design Value Max 1-Hr Concentration and Annual Average



Section 5.2.0 Nitrogen Dioxide Federal Design Criteria Requirements

Federal requirements for the number of nitrogen dioxide monitors are discussed in the 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 4.3 "Nitrogen Dioxide (NO_2) Design Criteria".

The NCore/NOy requirements for the number of reactive oxides of nitrogen (NOy) monitors for the NCore pollutants are also in 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 3, "Design Criteria for NCore Sites", subsection (b). Note that only the passages applicable to the SDAB have been cited.

The Federal requirements for the number of NOy monitors for the PAMS program are in the 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 5 "Network Design for Photochemical Assessment Monitoring Stations (PAMS)", subsection 5.3. Note that only the passages applicable to the SDAB have been cited.

Section 5.2.1 Nitrogen Dioxide - Near-road Number of NO_2 Monitors

The requirements necessary to fulfill the NO_2 Near-road criteria are described in 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 4.3, "Nitrogen Dioxide (NO_2) Design Criteria", subsections 4.3.2 and 4.3.2(a)(1). Table 5.3a lists the minimum number of Near-road monitors required for the SDAB.

Table 5.3a Minimum Number of Near-Road Monitors Required

MSA (name)	County (name)	Population from 2010 Census (#)	Minimum Number of Monitors Required (#)	Are Additional Monitors Required (yes/no)	Minimum Number of Additional Monitors Required (#)	Total Number of Monitors Required (#)	Total Number of Active Monitors (#)	Total Number of Monitors Needed (#)
San Diego	San Diego	3.2 million	1	Yes	1	2	1	1 (see section 5.3.1.2)

Section 5.2.1.1 Nitrogen Dioxide - Near-road NO_2 Monitor Location (first site)

The first NO_2 Near-road location is off of Rancho Carmel Dr. (RCD), approximately 3.7 miles north of Poway Rd. NOx and meteorological parameters are measured there. This site has received EPA approval.

Section 5.2.1.2 Nitrogen Dioxide - Near-road NO_2 Monitor Location (second site)

The criteria for the second Near-road location are more flexible than the criteria for the first site. The second site is not necessarily the next location according to the Fleet Equivalency (FE) ranking. The EPA prescribes that the second site be selected so that it is differentiated from the first by one or more factors affecting traffic emissions and/or pollution transport, i.e., fleet mix, terrain, or geographic area, or by a different route, interstate, or freeway designation.

The EPA's primary recommendation for a second site is to attempt to have the second site with as many of the aforementioned characteristics different from the first site, without sacrificing the objective of measuring relative peak NO_2 concentrations. The District's attempts to establish a second Near-road NO_2 monitor site at two different locations were unsuccessful (see 2013 Annual Network Plan).

The proposed location for the second Near-road site is in Logan Heights off of Newton Ave. (see Table 5.6b for the Near-road matrix for Newton Ave.). While the traffic count is lower for this site than other possible non-Barrio areas, this location is in an Environmental Justice area, 1.1 miles downwind of an ambient air monitoring station (DTN), which has a Regional NOx monitor. The measured concentrations from the DTN station can be subtracted from this location to get a clearer pollution profile from the contribution from the road segment. In addition, the second site would be across from the shipyards, which operate diesel engines, so these emissions can also be measured. This site has received preliminary approval from the EPA.

Section 5.2.2 Nitrogen Dioxide - Area-wide NO_2 Monitors

40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 4.3, "Nitrogen Dioxide (NO_2) Design Criteria", subsection 4.3.3 lists the requirements needed to fulfill the Area-wide NO_2 monitoring criteria. The Area-wide monitor cannot also be the Regional Administrator monitor. Table 5.3b lists these requirements.

Table 5.3b NO_2 Area-Wide Monitor, 2014

MSA (name)	County (name)	Population from 2010 Census (#)	Maximum Expected Concentration Site (name)	Maximum Expected Concentration Site AQS ID (#)	Meet NAAQS? (yes/no)
San Diego	San Diego	3.2 million	Escondido (ESC)	06-073-1002	Yes

Section 5.2.3 Nitrogen Dioxide - Regional Administrator Required NO_2 Monitors

40 CFR Part 58-"Ambient Air Quality Surveillance", Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 4.3, "Nitrogen Dioxide (NO_2) Design Criteria", subsection 4.3.4 lists the requirements needed to fulfill the Regional Administrator NO_2 monitoring (RA-40) criteria. The Area-wide monitor cannot also be the Regional Administrator monitor. Table 5.3c lists these requirements.

Table 5.3c Regional Administrator Designated NO_2 Monitor, 2014

MSA (name)	County (name)	Population from 2010 Census (#)	Maximum Expected Concentration Site (name)	Maximum Expected Concentration Site AQS ID (#)	Meet NAAQS? (yes/no)
San Diego	San Diego	3.2 million	San Diego-Beardsley (DTN)	06-073-1010	Yes

Section 5.2.4 NOy-NCore Monitoring

40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 4.3, "Nitrogen Dioxide (NO_2) Design Criteria", subsection 4.3.6 lists the requirements needed to fulfill the trace level (NCore) NO_y monitoring criteria. These requirements are reiterated in the 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 3, "Design Criteria for NCore Sites", subsection (b). Table 5.3d lists these requirements. Please see the NCore section for additional details.

Table 5.3d Design Criteria for the Minimum Number of NCore NOy Monitors Required

MSA	County	Minimum Number of NCore NOy Monitors Required (#)	Number of Active NCore NOy Monitors (#)	Number of NCore NOy Monitors Needed (#)
San Diego	San Diego	1	1	None

Section 5.2.5 NOy-PAMS Monitoring

The 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 5 "Network Design for Photochemical Assessment Monitoring Stations (PAMS)", subsection 5.3 lists the requirements needed to fulfill the NOy-PAMS monitoring criteria. Table 5.3e lists these requirements.

Table 5.3e Design Criteria for the Minimum Number of PAMS NOy Monitors Required

Minimum Number of NOy Monitors Required Either at a Type I or Type III Site (#)	Number of Active Type I or Type III Site (#)	Number of Active NOy Monitors at a Type I or Type III Site (#)	Number of NOy Monitors Needed (#)	NOy Monitor Location (name)	NOy Monitor Location AQS ID (#)
1	2	1*	None	El Cajon* (ECA)	06-073-0003

* In 2011, the District was granted a waiver by the EPA Region IX Authority to designate the El Cajon location, instead of the Alpine location, as satisfying this requirement.

Section 5.3.0 NO/NO_2/NOx & NOy Monitor and Station Evaluation

Table 5.4 is a summary of the multilayered approach for the NO/NO_2/NOx monitors. No NOx monitor is recommended for decommissioning.

Table 5.4 NO/NO_2/NOx Monitor Summary Rating

	Overall Scoring	COMMENTS	1.Total Monitors	2. Community Type	3.QA/QC Needs	4.Other
Alpine (ALP)	**28**	**1:** n/a **2:** Rural/bedroom **3:** Possibly PAMS **4:** PAMS trends; recently moved	4	4	10	10
Camp Pendleton (CMP)	**27**	**1:** n/a **2:** Bedroom **3:** For PAMS **4:** PAMS trends	5	6	8	8
Chula Vista (CVA)	**30**	**1:** n/a **2:** Mixed use **3:** PM10 and soon PM2.5 **4:** Toxics; deck upgrade	7	7	6	10
Otay Mesa-Donovan (DVN)	**29**	**1:** n/a **2:** Industrial becoming mixed use **3:** Possibly PM10 **4:** Toxics and PAMS trends; recently moved	6	7	6	10
El Cajon (ECA)	**43**	**1:** n/a **2:** Light Industrial/mixed use **3:** With ARB **4:** NOy and PAMS trends; recently moved	17	7	10	10
Escondido (ESC)	**36**	**1:** n/a **2:** Light Industrial/mixed use **3:** Compare to Near-road at RCD **4:** PM2.5 and Toxics trends; designated an Area-wide monitor	9	9	6	10
Rancho Carmel Dr. (RCD)	**27**	**1:** n/a **2:** Bedroom **3:** Near-road **4:** Compare to ESC	2	9	6	10
San Diego-Beardsley (DTN)	**38**	**1:** n/a **2:** Heavy Industrial/mixed use **3:** Compare to Near-road **4:** PM2.5, Toxics, and Carbon trends; EJ site; designated a Regional monitor	10	10	8	10
Kearny Villa Rd. (KVR)	**27**	**1:** n/a **2:** Mixed use **3:** PM2.5 **4:** PAMS trends; recently moved	4	5	8	10
2^{ND} Near-road (Barrio)	**29**	**1:** n/a **2:** Heavy Industrial/mixed use **3:** Near-road **4:** Compare to ESC	3	10	6	10

Section 5.3.1 NO/NO_2/NOx Monitor and Station Evaluation

It is the practice of the District to use NO/NO_2/NOx instrumentation for ozone instrumentation quality control as another tool for data validation. NOx and O_3 have an inverse relationship. With high O_3 concentrations, the NOx concentrations will be proportionally lower. For example, if the data analyst sees what appears to be anomalous O_3 data, but the NOx monitors confirms a proportional inverse response, than the O_3 data is more than likely valid. In effect, the NOx monitors serve as an automated level I data review.

NOx monitors at the Near-road location(s) and those that have a designated purpose will be graded the highest; NOx monitors collocated at high O_3 locations and PAMS sites will be graded slightly lower than the previously mentioned NOx monitors. The remaining NOx monitors will be graded by the area served.

Section 5.3.2 NOy Monitor and Station Evaluation

There are no EPA Network Assessment tools for NOy. Because NOy monitoring is only required at the El Cajon station as part of the NCore and PAMS programs, no summary, such as the one provided by Table 5.7, is needed.

Since implementation, all measurements from the NOy instrument measure exactly the same concentrations as those from the collocated NOx instrument. The NOy values follow the same seasonal, diurnal, and special event patterns as the collocated NOx instrument. The yearly, monthly, weekly, daily, hourly, and minute averages are identical for the NOy and NOx instrumentation (see the 2014 Annual Network Plan for supporting documentation). As of yet, the data from the NOy monitor offer no added benefit to the San Diego air pollution monitoring network. Additionally, all facets of the NOy instrument are exceeding expensive for both parts and labor. Furthermore, the NOy monitor generates less usable valid data than the NOx monitor due to the additional QA/QC functions required for the NCore program, as well as the higher frequency of repairs and/or infrastructure replacement. The NOy instrument is a significant labor drain and the saved man-hours from the decommissioning of this instrument would alleviate the manpower strain on several programs. The District does not have the authority to decommission the NOy instrument, but we strongly recommend that the EPA grant the District a waiver from NOy monitoring and permission to decommission this instrument to save considerable funds in a dwindling budget. The savings can be spent on programs/monitors that offer added benefits to the District's air pollution monitoring network.

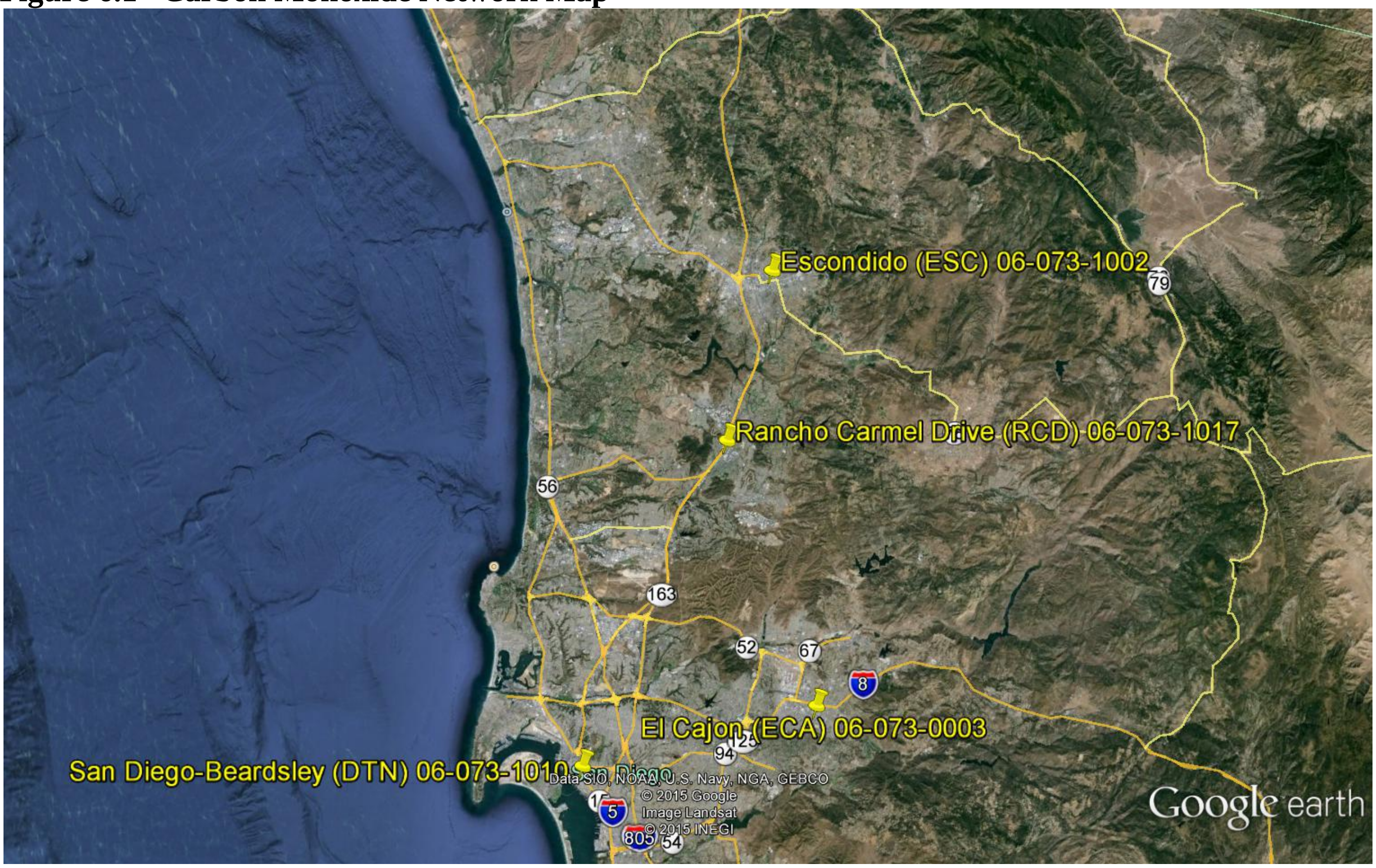
Chapter 6 Carbon Monoxide (CO)

Section 6.1.0 Carbon Monoxide – Introduction

Carbon monoxide (CO) is sampled on a continuous basis at four locations in the SDAB (Figure 6.1). Trace level CO was sampled at the El Cajon-NCore site.

- The El Cajon station was temporarily relocated to the Gillespie Field area off of Floyd Smith Drive.

Figure 6.1 Carbon Monoxide Network Map



The reported concentrations reflect a mix of the station move listed above. Because the Floyd Smith Drive relocation is temporary, the maps and table parameters reflect the permanent site metadata (labeled as ECA).

The CO monitor at Rancho Carmel Drive did not become operational until 2015, therefore there is no historical data to compare; furthermore, that monitor is required to fulfill the requirements for the Near-road regulations.

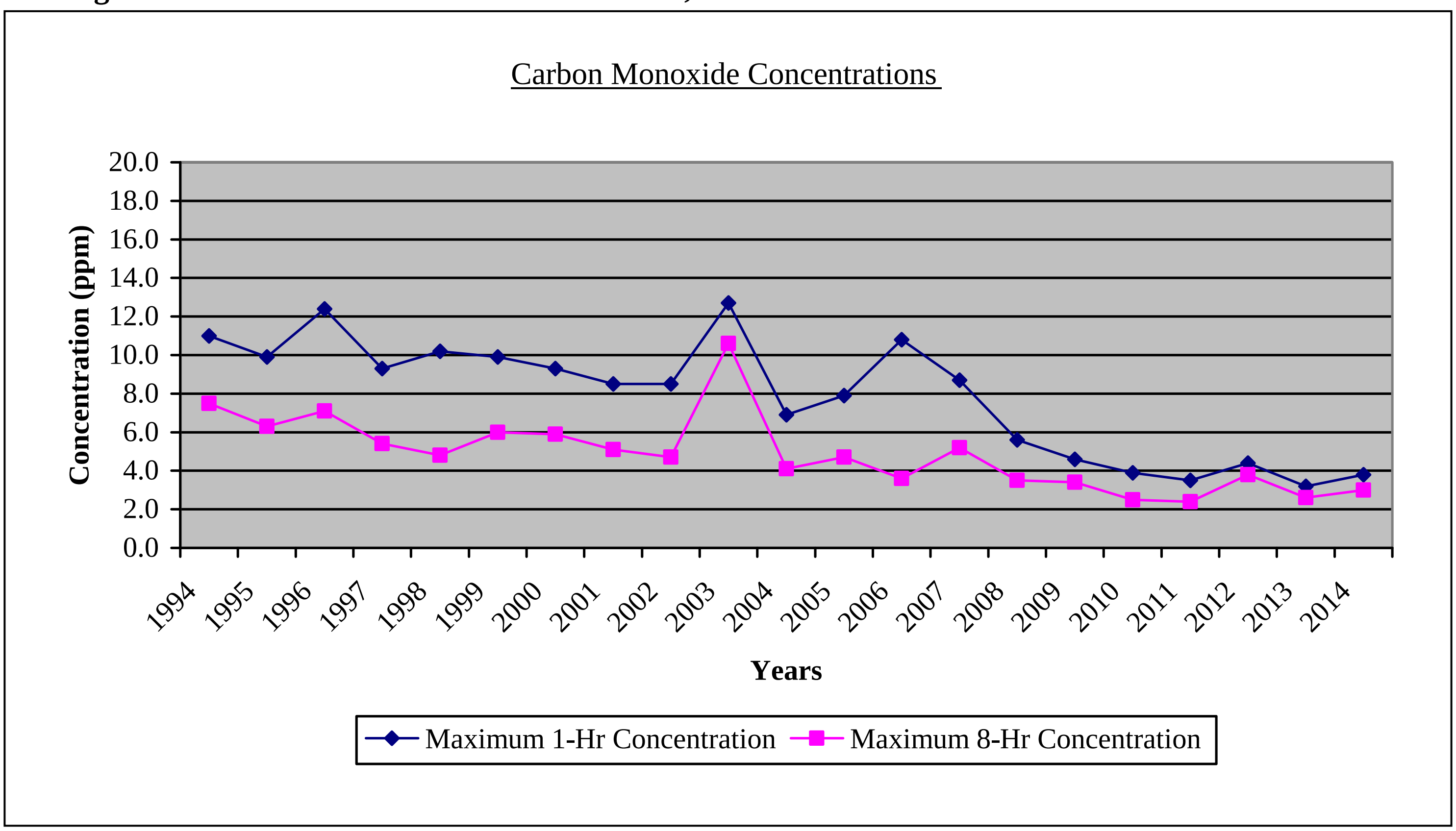
Section 6.1.0 Carbon Monoxide – Trends in the SDAB

The peak 8-Hr indicator for carbon monoxide has steadily decreased over the years (Table 6.1) and is shown graphically in Figure 6.2. In 2003, the wildfires in the County caused the SDAB to exceed the standards for CO, but these exceedances are considered an exceptional event and do not have a lasting impact in the air basin. Exceptional events are still tallied in the accounting for attainment status. Even with the last two wildfires in 2003 and 2007, the County still qualifies for attainment status. Note that the "Days above the National Standard" row in Table 6.1 reflects the carbon monoxide standards for that year.

Table 6.1 Summary of Carbon Monoxide Concentrations, 1994-2014

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Maximum 1-Hr Concentration (ppm)	11.0	9.9	12.4	9.3	10.2	9.9	9.3	8.5	8.5	12.7	6.9	7.9	10.8	8.7	5.6	4.6	3.9	3.5	4.4	3.2	3.8
Maximum 8-Hr Concentration (ppm)	7.5	6.3	7.1	5.4	4.8	6.0	5.9	5.1	4.7	10.6	4.1	4.7	3.6	5.2	3.5	3.4	2.5	2.4	3.8	2.6	3.0
Days above the National Standard (#)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 6.2 Carbon Monoxide Concentrations, 1994-2014



Section 6.1.1 Carbon Monoxide - Measurements by Site

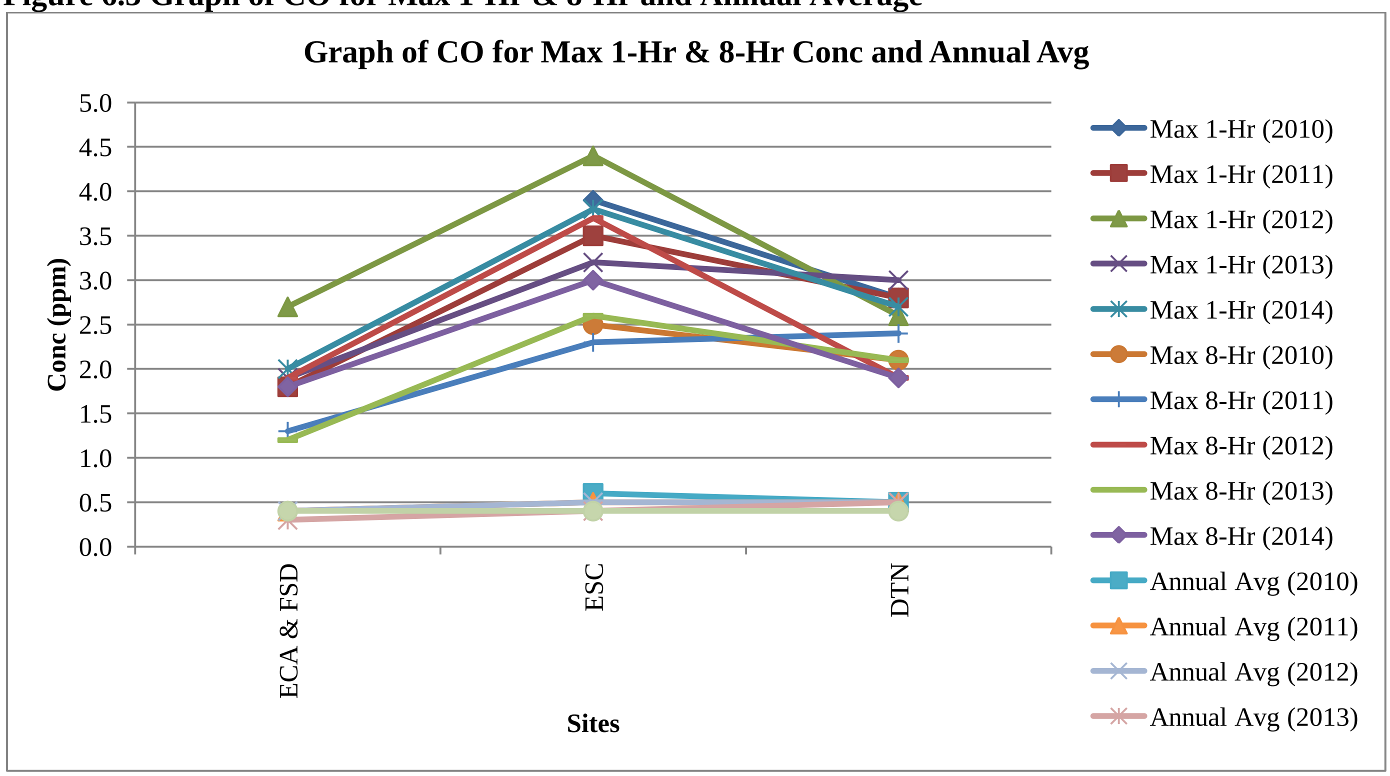
The CFR requires that for CO data to be used in regulatory determinations of compliance with the CO NAAQS, the CO samplers must be sited according to Federal Regulations. Table 6.2 lists the maximum carbon monoxide measurements for each carbon monoxide monitoring location and NCore. Figure 6.3 shows this information graphically.

Table 6.2 Carbon Monoxide by Site, 2010-2014

Site (name)		Maximum Concentration for 1-Hr (ppm)					Maximum Concentration for 8-Hr (ppm)					Annual Average (ppm)				
		2010	2011	2012	2013	2014	2010	2011	2012	2013	2014	2010	2011	2012	2013	2014
El Cajon	ECA & FSD	**	1.8	2.7	1.9	2.0	**	1.3	1.9	1.2	1.8	**	0.4	0.4	0.3	0.4
Escondido	ESC	3.9	3.5	4.4	3.2	3.8	2.5	2.3	3.7	2.6	3.0	0.6	0.5	0.5	0.4	0.4
San Diego-Beardsley	DTN	2.8	2.8	2.6	3.0	2.7	2.1	2.4	1.9	2.1	1.9	0.5	0.5	0.5	0.5	0.4

** Not operational

Figure 6.3 Graph of CO for Max 1-Hr & 8-Hr and Annual Average



Section 6.2.0 Carbon Monoxide – Federal Design Criteria Requirements

The Federal requirements for the number of carbon monoxide monitors are described in 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 4.2 "Carbon Monoxide (CO) Design Criteria". For the NCore pollutants, see 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 3, "Design Criteria for NCore Sites", subsection (b).

Section 6.2.1 Carbon Monoxide Design Criteria for Near-road Requirements

The requirements needed to fulfill Design Criteria for CO monitoring are described in 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 4.2 "Carbon Monoxide (CO) Design Criteria", subsection 4.2.1. Table 6.3a lists these requirements.

Table 6.3a Carbon Monoxide Minimum Number of Near-road Monitors Required

MSA (name)	County (name)	Population from 2010 Census (#)	Minimum Number of NO_2 Monitors Required (#)	Are Collocated CO Monitors Required (yes/no)	Minimum Number of Collocated CO Monitors Required (#)	Total Number of CO Monitors Required (#)	Total Number of Active CO Monitors (#)	Total Number of CO Monitors Needed (#)
San Diego	San Diego	3.2 million	2	Yes	1	1	1	0

Section 6.2.2 Carbon Monoxide –CO Trace Level Monitoring for NCore

CFR Part 58-"Ambient Air Quality Surveillance", Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 3, "Design Criteria for NCore Sites", subsection (b) describes the requirements needed to fulfill Design Criteria for CO trace level monitoring. Table 6.3b lists these requirements.

Table 6.3b Carbon Monoxide Design Criteria for NCore Requirements

MSA (name)	County (name)	Minimum Number of NCore CO-TLE Monitors Required (#)	Number of Active NCore CO-TLE Monitors (#)	Number of NCore CO-TLE Monitors Needed (#)	Meet NAAQS? (yes/no)
San Diego	San Diego	1	1	None	Yes

Section 6.2.3 Carbon Monoxide Design Criteria for State Implementation Plan (SIP)

The District is required to operate at least one non-NCore Carbon monoxide monitor to fulfill the State Implementation Plan (SIP). Table 6.3c lists this requirement.

Table 6.3c Carbon Monoxide Design Criteria for SIP Requirements

MSA (name)	County (name)	Minimum Number of Non-NCore CO Monitors Required for the SIPM (#)	Number of Actual Non-NCore CO Monitors (#)	Number of Non-NCore CO Monitors Needed (#)	Location of non-NCore CO SIP Monitor (name)	Meet NAAQS? (yes/no)
San Diego	San Diego	1	1	None	Downtown 06-073-1010	Yes

Section 6.3.0 CO Monitor and Station Evaluation Summary

The EPA does not have Network Assessment tools available for CO monitor and station comparison, so the District used a multilayered approach to evaluate the CO monitors. Table 6.4 is a summary of the multilayered approach for evaluating CO monitors and stations. No CO monitor is recommended for decommissioning.

Table 6.4 CO Monitor Summary Rating

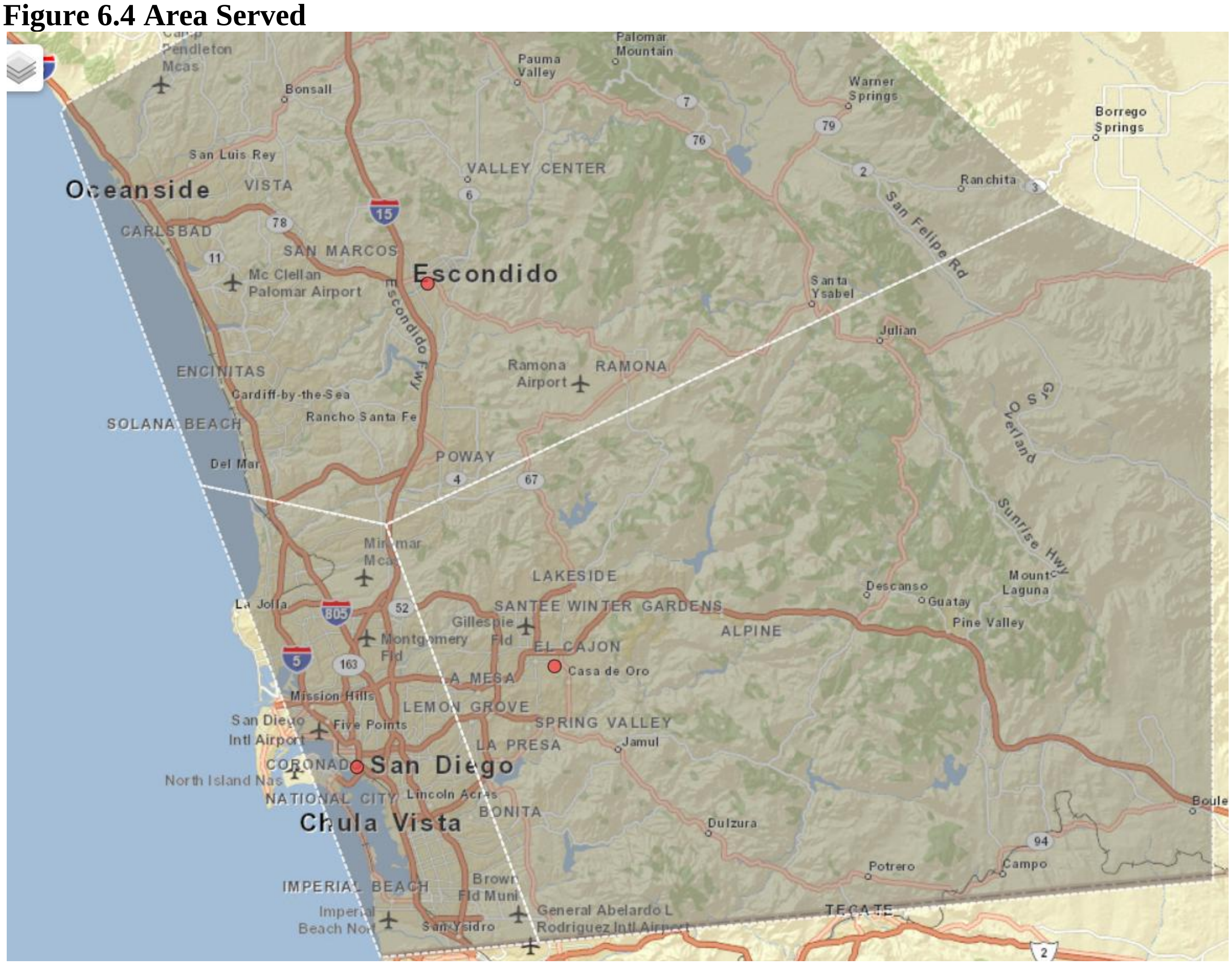
	Overall Scoring	**COMMENTS**	**1.**Total Monitors	**2.** Community Type	**3.**QA/QC Needs	**4.**Other
El Cajon (ECA)	**34**	**1:** n/a **2:** Light Industrial/mixed use **3:** n/a **4:** Required for NCore; recently moved	17	7	0	10
Escondido (ESC)	**34**	**1:** n/a **2:** Light Industrial/mixed use **3:** Compare to Near-road at RCD; Highest concentrations in the network **4:** For Exceptional Events for wildfires	9	9	7	8
Rancho Carmel Drive (RCD)	**27**	**1:** n/a **2:** Bedroom **3:** Compare to ESC **4:** Required for Near-road	2	9	6	10
San Diego-Beardsley (DTN)	**34**	**1:** n/a **2:** Heavy Industrial/mixed use **3:** Compare to Near-road **4:** EJ site and SIPM monitor	10	10	8	8
Proposed 2nd Near-road Site	**25**	**1:** n/a **2:** Mixed use **3:** PM2.5 **4:** PAMS trends; recently moved	2	5	8	10

Section 6.3.1 CO Monitor and Station Evaluation Explanation

Three of the four CO monitors currently in the air pollution monitoring network are either state or federally required at the El Cajon, Downtown, and Rancho Carmel Drive stations. The CO monitor at Escondido is the longest running one in the network. It is instrumental for trends analysis. In addition, it is located downwind of areas that have a high potential for wildfires (and did in 2003 and 2007). Figure 6.4 illustrates how much of the fire zone/wildfire areas are covered by the Escondido CO monitor. The data from this monitor help to establish "Special Event" exceptions for such occurrences. Additionally, the District will compare Near-road CO data to ambient CO data at Rancho Carmel Drive and Escondido, respectively. Lastly, the District will establish CO monitoring at the 2nd Near-road location, if it is in or near the Barrio Logan Downtown station.

With the addition of the 2nd Near-road CO monitor (which is not required), the District will have four (4) monitors as part of the ambient air monitoring network, which require a different calibration and audit frequency than the NCore CO instrumentation. Due to the EPA audit frequency requirements, there is a scheduling savings, logistically, if the network has four monitors. All non-NCore CO monitors will be retained.

Figure 6.4 Area Served



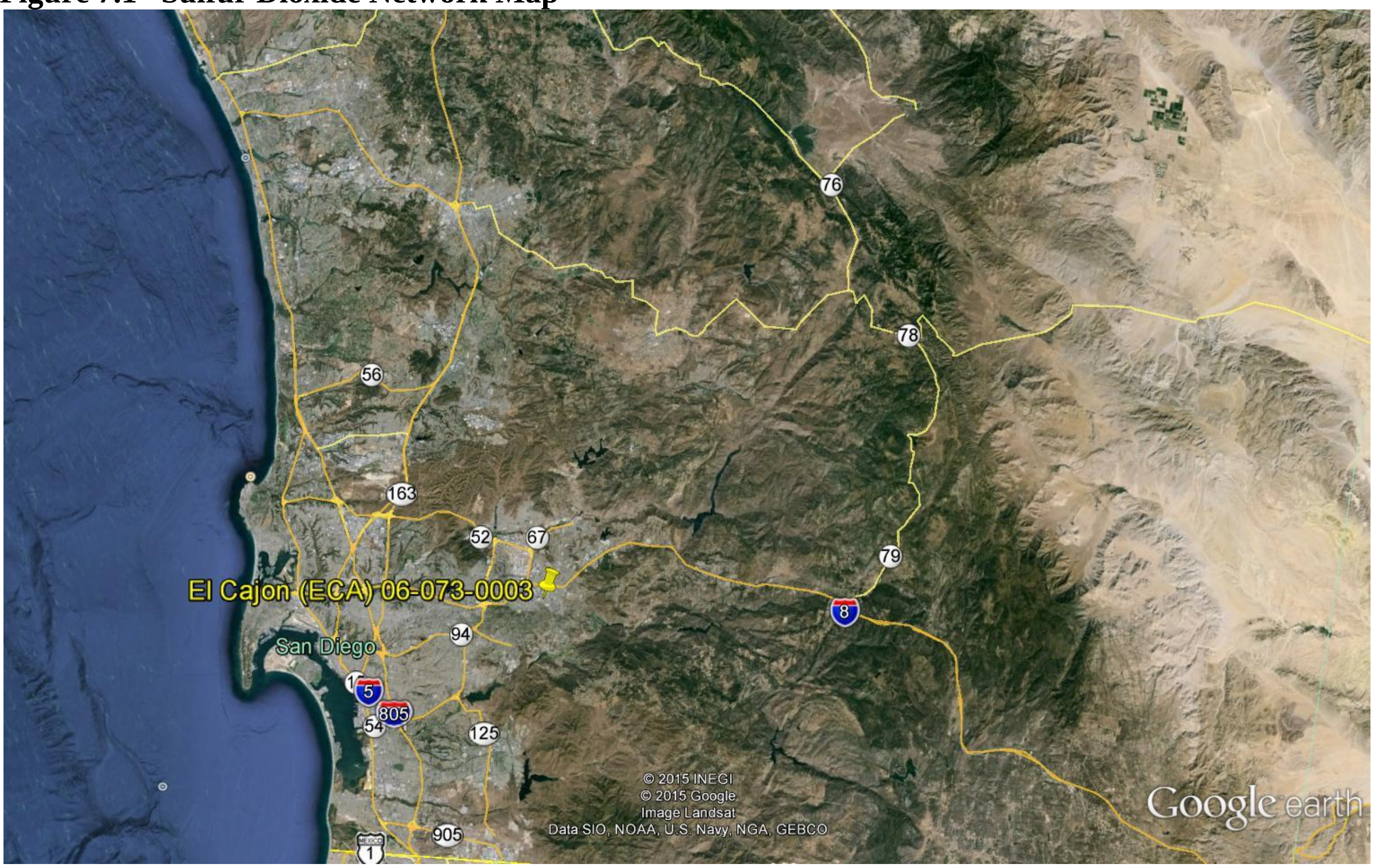
Chapter 7 Sulfur Dioxide (SO_2)

Section 7.0.0 Sulfur Dioxide Introduction

Only trace level sulfur dioxide is sampled at one location in the SDAB (Figure 7.1). Trace-level SO_2 was sampled at the El Cajon-NCore site. Please note:

- The El Cajon station was temporarily relocated to the Gillespie Field area off of Floyd Smith Drive; this station is called Floyd Smith Drive (FSD).

Figure 7.1 Sulfur Dioxide Network Map



The reported concentrations reflect a mix of the station move listed above. Because the Floyd Smith Drive relocation is temporary, the maps and table parameters reflect the permanent site metadata (labeled as ECA).

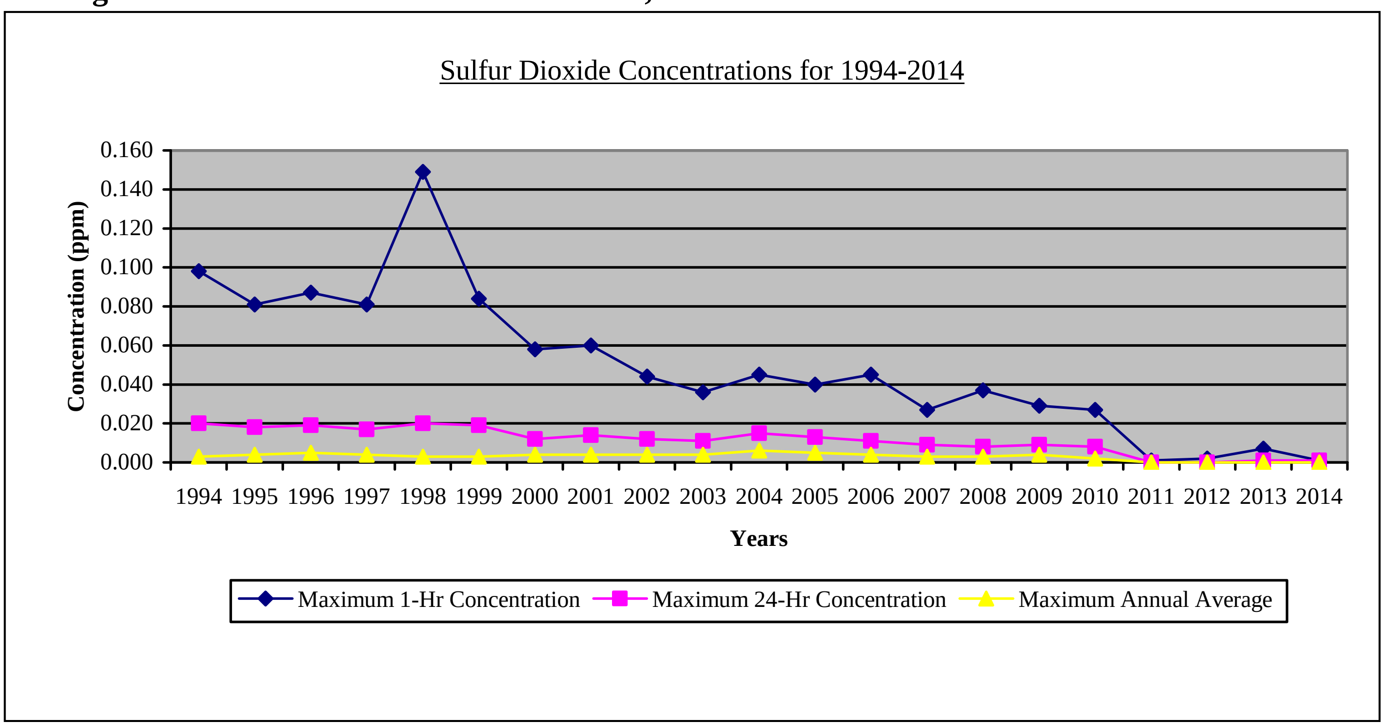
Section 7.1.0 Sulfur Dioxide Trends in the SDAB

Emissions of SOx have declined tremendously in California over the last 20 years. A major constituent of SOx is sulfur dioxide (SO_2). SO_2 emissions from stationary sources and from land-based on- and off-road gasoline and diesel-fueled engines and vehicles have decreased due to improved source controls and switching from fuel oil to natural gas for electric generation and industrial boilers. Note that the "Days above National Standard" row in Table 7.1 reflects the SO_2 standards for that year.

Table 7.1 Summary of Sulfur Dioxide Concentrations, 1994-2014

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Maximum 1-Hr Concentration (ppm)	0.098	0.081	0.087	0.081	0.149	0.084	0.058	0.060	0.044	0.036	0.045	0.040	0.045	0.027	0.037	0.029	0.027	0.001	0.002	0.007	0.001
Maximum 24-Hrs Concentration (ppm)	0.020	0.018	0.019	0.017	0.020	0.019	0.012	0.014	0.012	0.011	0.015	0.013	0.011	0.009	0.008	0.009	0.008	0.000	0.000	0.001	0.001
Maximum Annual Average (ppm)	0.003	0.004	0.005	0.004	0.003	0.003	0.004	0.004	0.004	0.004	0.006	0.005	0.004	0.003	0.003	0.004	0.002	0.000	0.000	0.000	0.000
Days above the National Standard (#)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 7.2 Sulfur Dioxide Concentrations, 1994-2014



Section 7.1.1 Sulfur Dioxide Measurements by Site, Yearly 2010 - 2014

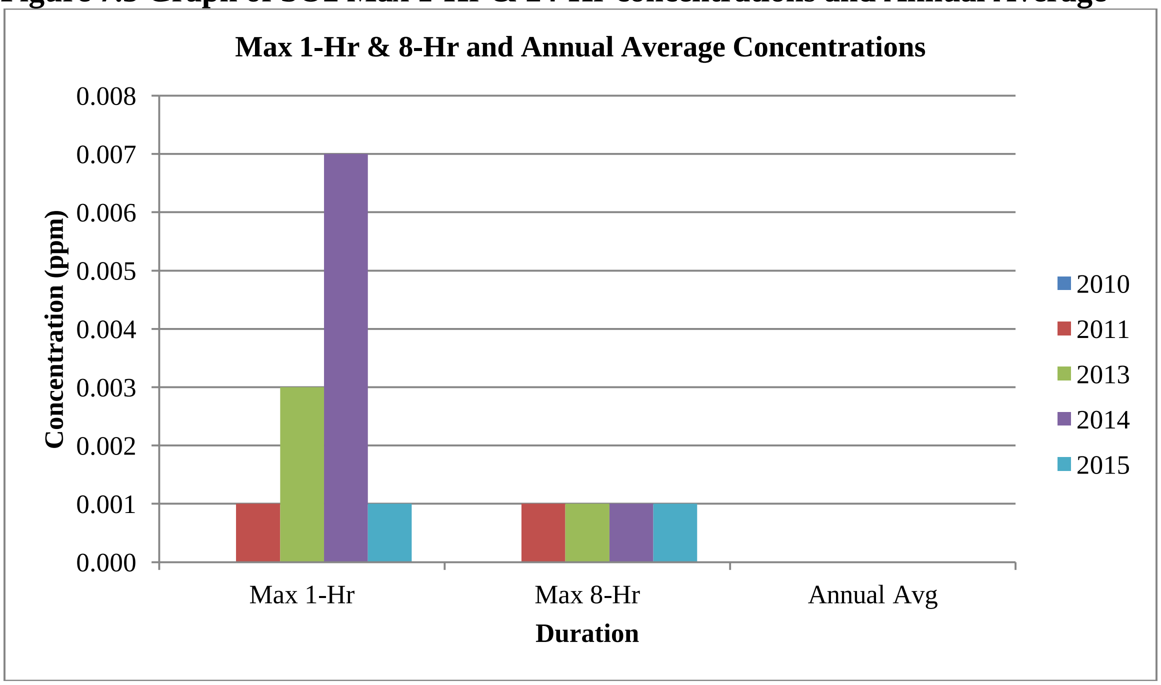
Table 7.2a lists the maximum sulfur dioxide measurements for the NCore monitoring location. Figure 7.3 shows this graphically.

Table 7.2a Sulfur Dioxide Measurements by Site, 2010 - 2014

Site (name)		Maximum Concentration for 1-Hr (ppm)					Maximum Concentration for 24-Hrs (ppm)					Annual Average (ppm)				
		2010	2011	2012	2013	2014	2010	2011	2012	2013	2014	2010	2011	2012	2013	2014
El Cajon	ECA & FSD	**	0.001	0.003	0.007	0.001	**	0.001	0.001	0.001	0.001	**	0.000	0.000	0.000	0.000

**Not operational

Figure 7.3 Graph of SO2 Max 1-Hr & 24-Hr concentrations and Annual Average



Section 7.1.2 Sulfur Dioxide Measurements by Site, Design Value

Table 7.2b lists the maximum sulfur dioxide measurements for the NCore monitoring location.

Table 7.2b Sulfur Dioxide Measurements by Site, Design Value 2012-2014

Site (site)	Site Abbreviation	Design Value (2012-2014) Maximum Concentration 1-Hr (ppm)
El Cajon	ECA	0.002

Section 7.2.0 Sulfur Dioxide Design Criteria Requirements from the Code of Federal Regulations

The Federal requirements for the number of sulfur dioxide monitors are described in 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 4.4 "Sulfur Dioxide (SO_2) Design Criteria".

The requirements for the number of sulfur dioxide monitors for the NCore pollutants are described in 40 CFR Part 58-"Ambient Air Quality Surveillance", Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 3, "Design Criteria for NCore Sites", subsection (b).

Section 7.2.1 Sulfur Dioxide Design Criteria

The requirements needed to fulfill the sulfur dioxide Design Criteria are described in 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 4.4 "Sulfur Dioxide (SO_2) Design Criteria", subsection 4.4.2. Tables 7.3a-7.3c list these requirements.

According to the latest National Emissions Inventory (NEI) EPA Sector Database for 2011, the SDAB is listed as having SO_2 emissions of 1,099.9504 Tons/yr (TPY). The population of San Diego County is estimated to be 3.2 million persons (MP).

Using the Population Weighted Emissions Index (PWEI) equation from paragraph 4.4.2 in the CFR:

$$\{ (3{,}200{,}000 \text{ million persons}) \times (1{,}100 \text{ tons/year of } SO_2) \} / (1{,}000{,}000) = 2{,}909 \text{ MP-TPY}$$

Table 7.3a Sulfur Dioxide Inventory for the SDAB, 2014

MSA (name)	County (name)	Population from 2010 Census (#)	Total SO_2 Emissions From NEI (TPY)	Calculated PWEI (MP-TPY)
San Diego	San Diego	3.2 million	1,100	2,909

Table 7.3b Sulfur Dioxide Design Criteria for Minimum Number of Ambient Level (non-NCore) Monitors Needed

Calculated PWEI (MP-TPY)	Are the Emissions <5,000 MP-TPY? (yes/no)	Number of Required Ambient Monitors (#)	Number of Active Ambient Monitors (#)	Number of Ambient Monitors Needed (#)
2,909	Yes	0	0	None

Section 7.2.2 Sulfur Dioxide Design Criteria for Trace Level Monitoring for NCore
CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 3, "Design Criteria for NCore Sites", subsection (b) lists the requirements needed to fulfill Design Criteria for SO_2 trace level monitoring.

Table 7.3c Sulfur Dioxide Design Criteria for the Minimum Number of Trace Level (NCore) Monitors Needed

MSA	County	Minimum Number of NCore Monitors Required (#)	Number of Active NCore Monitors (#)	Number of NCore Monitors Needed (#)	Met NAAQS? (yes/no)
San Diego	San Diego	1	1	None	Yes

Section 7.3.0 SO_2 Monitor and Station Evaluation Summary
The EPA does not have Network Assessment tools available for SO_2 monitor and station comparison; however, no further analysis is necessary, because the District already operates the minimum number of SO_2 monitors allowed/required by EPA.

Section 7.3.1 SO_2 Monitor and Station Evaluation Explanation
The NCore SO_2 monitor is required. The annual average is routinely below 1 ppb, the maximum 24-hr concentration is routinely below 5 ppb, and the maximum 1-hr concentration is routinely below 10 ppb. The limits are 30 ppb, 140 ppb, and 75 ppb, respectively. This monitor is federally required, but it is not locally needed in the network to established attainment. The monitor has been in operation for more than three years and shows consistently near zero concentrations, if the EPA is looking to reduce expenditures, the elimination of the NCore SO_2 monitor in the San Diego air pollution monitoring network would be a viable candidate.

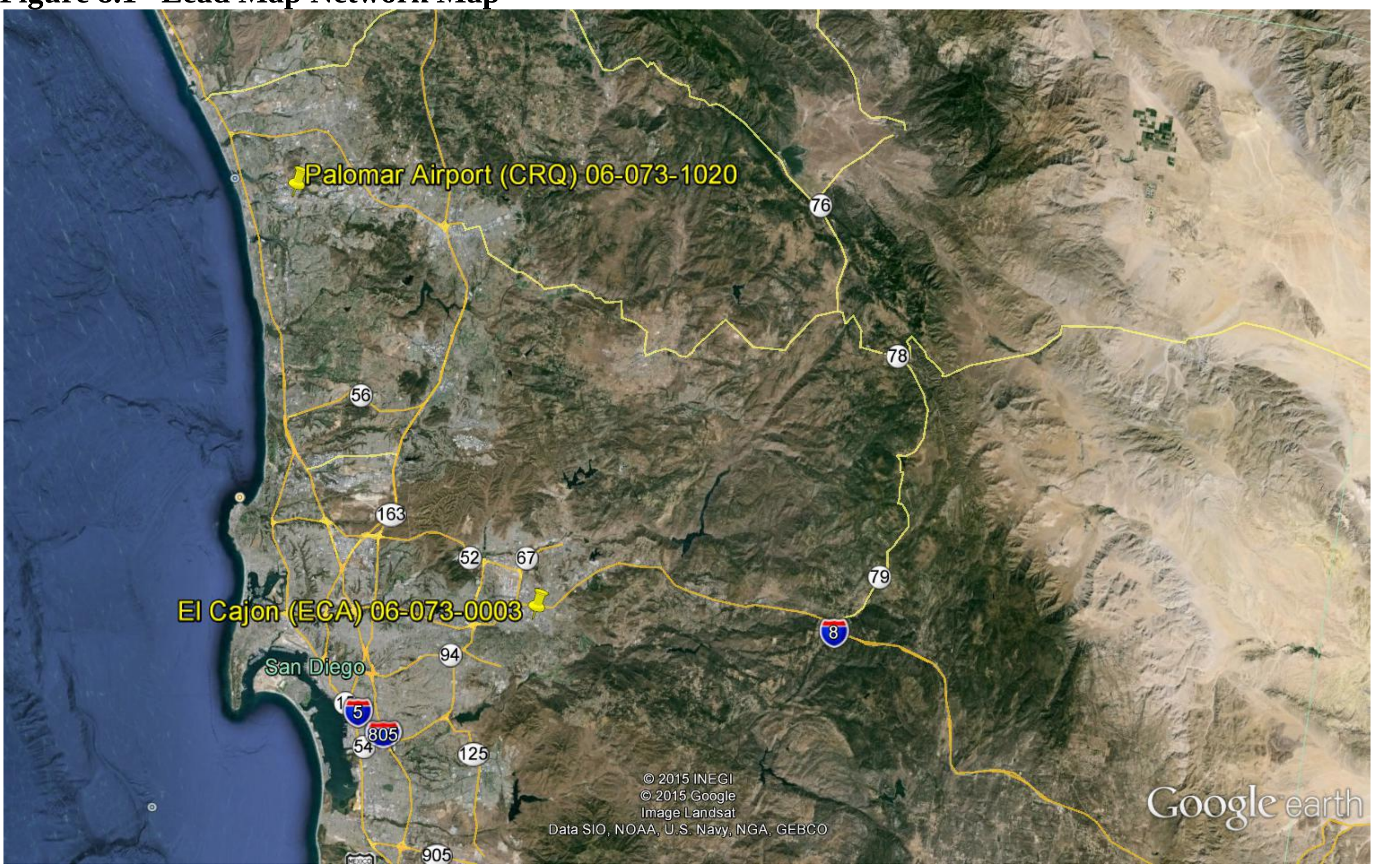
Chapter 8 Lead (Pb)

Section 8.0.0 Lead – Introduction

Lead (Pb) was sampled at two locations in the SDAB (Figure 8.1). Ambient level lead was sampled at the El Cajon location, as part of the NCore program. Source level lead was sampled at McClellan-Palomar airport. Please note:

- The El Cajon station was temporarily relocated to the Gillespie Field area off of Floyd Smith Drive; this station is called Floyd Smith Drive (FSD).

Figure 8.1 Lead Map Network Map



The reported concentrations reflect a mix of the station move listed above. Because the Floyd Smith Drive relocation is temporary, the maps and table parameters reflect the permanent site metadata (labeled as ECA).

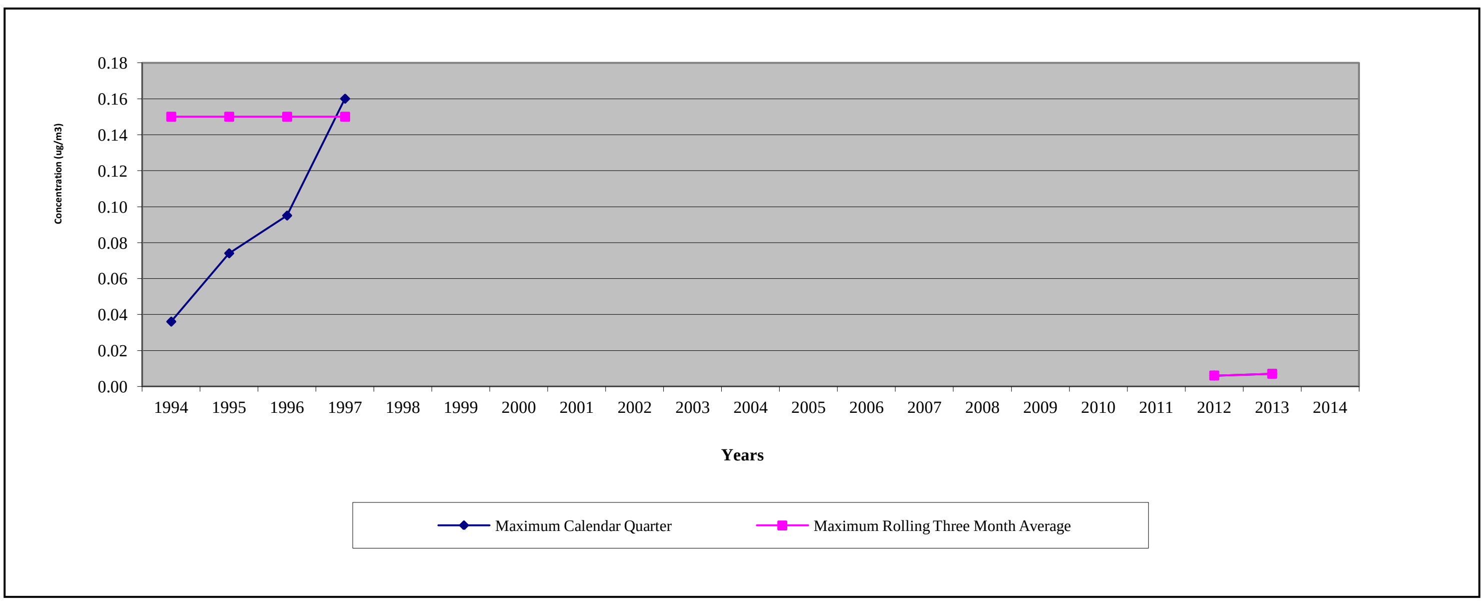
Section 8.1.0 Lead – Trends in the SDAB

The rapid decrease in lead emissions (Table 8.1) over the last 20 plus years can be attributed primarily to phasing out the lead in gasoline by the EPA and the ARB. This phase-out began during the 1970s, and subsequent regulations have eliminated all lead from the gasoline now sold in California for automotive vehicles. Note that Figure 8.2 and the "Days above the National Standard" row in Table 8.3 reflect the lead standard for that year. No Testing (NT) was conducted in the SDAB from 1997 until 2012. The measured concentrations for the 2012 are from the El Cajon (NCore) location, which is categorized as neighborhood scale and representative concentrations. Palomar Airport is a microscale/source oriented monitor.

Table 8.1 Lead Summary of Concentrations, 1994-2014

Maximum Rolling 3-Month Average	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
	0.150	0.150	0.150	0.150	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.006	0.007	
Days above the National Standard (#)	0	0	0	0	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	0	0	

Figure 8.2 Lead Concentrations, 1994-2014



Section 8.1.1 Lead - Measurements by Site

The CFR requires that for Pb data to be used in regulatory determinations of compliance with the Pb NAAQS, the Pb samplers must be sited according to Federal Regulations. Table 8.2 lists the maximum lead measurements for each lead monitoring location. Figure 8.3 show trends graphically.

Table 8.2 Lead Measurements by Site, 2010-2014

Site (name)		Maximum Rolling 3-Month Average ($\mu g/m^3$)					Number of Days Above the NAAQS (ppm)				
		2010	2011	2010	2011	2012	2010	2011	2012	2013	2014
El Cajon	ECA & FSD										
Palomar Airport	CRQ										

*Not operational

Figure 8.3 Lead Measurements by Site, 2010-2014

Section 8.2.0 Lead Design Criteria Requirements from the Code of Federal Regulations

The Federal requirements for the number of lead monitors are described in 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 4.5 "Lead (Pb) Design Criteria".

The requirements for the number of lead monitors for the NCore pollutants are described in 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 3, "Design Criteria for NCore Sites", subsection (b).

Section 8.2.1 Non-Airport Lead Design Criteria, Sources (non-Airport and non-NCore)

The requirements necessary to fulfill the non-airport Pb source Design Criteria are described in 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 4.5 "Lead (Pb) Design Criteria", subsection 4.5 (Table 8.3a lists these requirements).

Table 8.3a Lead Design Criteria for the Minimum Number of Source Level, non-NCore and non-Airport Monitors Needed Based on the NEI Database, 2014

MSA (name)	County (name)	Any Non-Airport Pb Sources >0.5 TPY? (yes/no)	Minimum Number of Ambient Monitors Required (#)	Number of Active Ambient Monitors (#)	Number of Ambient Monitors Needed (#)	Meet NAAQS? (yes/no)
San Diego	San Diego	No	None	None	None	Not Applicable

Section 8.2.2 Airport Lead Design Criteria

The requirements necessary to fulfill the airport Pb source Design Criteria are described in 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 4.5 "Lead (Pb) Design Criteria", subsection 4.5(a)(iii). The Airport testing was conducted in 2012 and concluded in 2013. Table 8.3b lists these requirements.

Table 8.3b Lead Design Criteria for the Minimum Number of Airport Monitors Needed

Minimum Number of Airport Monitors Required (#)	Number of Active Airport Monitors Tested (#)	Number of Airport Monitors Needed (#)	Airport Testing Concluded (yes/no)
2	2	None	*Yes

*In 2012, the District was required to monitor for airborne lead particulates at Gillespie Field and McClellan-Palomar Airport. The sampling at Gillespie Field has officially concluded, and no additional sampling is required. McClellan-Palomar Airport did not pass the minimum tolerances established by the EPA, which required the District to sample for lead until such a time as the measured concentrations are below the Federal standard (see the 2012 Annual Network Plan for greater discussion). Table 8.3c shows the maximum sampled concentrations at McClellan-Palomar Airport.

Table 8.3c Lead Design Criteria Summaries for the Airport Monitors, 2014

Source Sites (name)	Maximum 3-Month Average ($\mu g/m^3$)	Meet NAAQS? (yes/no)
Palomar Airport		

Additionally, if any airport exceeds 1.0 TPY for lead emissions, permanent sampling is required. According to the last National Emissions Inventory (NEI) inventory (2011), the SDAB has no airport Pb sources that will trigger any additional Pb-TSP monitoring (Table 8.3d).

Table 8.3d Lead Design Criteria for the Minimum Number of Ambient Level, non-NCore, Airport Monitors Needed based on the NEI Database, 2014

MSA (name)	County (name)	Any Airport Pb Sources >1.0 TPY? (yes/no)	Minimum Number of Ambient Monitors Required (#)	Number of Active Ambient Monitors (#)	Number of Ambient Monitors Needed (#)	Meet NAAQS? (yes/no)
San Diego	San Diego	No	None	None	None	Not Applicable

Section 8.2.3 NCore Lead Design Criteria

The requirements necessary to fulfill the NCore Pb source Design Criteria are described in 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 4.5 "Lead (Pb) Design Criteria", subsection 4.5(c) (Table 8.3e).

The Pb-NCore monitor was established to satisfy Federal requirements for the sampling of airborne lead particulate at NCore locations. The sampler is designated as Population Exposure, Neighborhood scale, and Representative concentrations of the area served.

Table 8.3e Lead Design Criteria for the Minimum Number of NCore Monitors Needed

MSA (name)	County (name)	Population from 2010 Census (#)	Minimum Number of NCore Pb Monitors Required (#)	Number of Active NCore Pb Monitors (#)	Number of NCore Pb Monitors Needed (#)	NCore Site (name)	NCore Site AQS ID Number (#)
San Diego	San Diego	3.2 million	1	1	None	El Cajon (ECA)	06-073-0003

The Pb-NCore monitor satisfies Federal requirements for the sampling of airborne lead particulate at NCore locations. The sampler is designated as Population Exposure, Neighborhood scale, and Representative concentrations of the area served. Table 8.3f lists the maximum NCore concentrations for the year.

Table 8.3f Lead Design Criteria Emission Summaries for the NCore Monitor

Source Sites (name)	Maximum 3-Month Average ($\mu g/m^3$)	Meet NAAQS 2014? (yes/no)
El Cajon (ECA) Floyd Smith Dr. (FSD)		

Section 8.3.0 Lead (Pb) Monitor and Station Evaluation
The EPA does not have any Network Assessment tools available for Pb sampler and station comparison; however, no further analysis is necessary, because the District already operates the minimum number of Pb samplers required by EPA.

Section 8.3.1 Lead (Pb) Monitor and Station Evaluation Explanation
The NCore Pb sampler is required. The annual average is routinely around ambient air background levels. This monitor is federally required, but it is not needed locally in the network to establish attainment. If the EPA is looking to reduce expenditures, the elimination of the NCore Pb sampler in the San Diego air pollution monitoring network would be a viable candidate.

Lead sampling at McClellan-Palomar Airport is required. The measured concentrations are slightly above ambient air background levels. If trends continue for three more years, the District will request a decommissioning of the lead sampling at Palomar Airport. Additionally, according to EPA sources, the elimination of lead from aviation gas will begin in 2017 and be completed by the end of 2018.

Chapter 9 Particulate Matter 2.5 µm ($PM_{2.5}$)

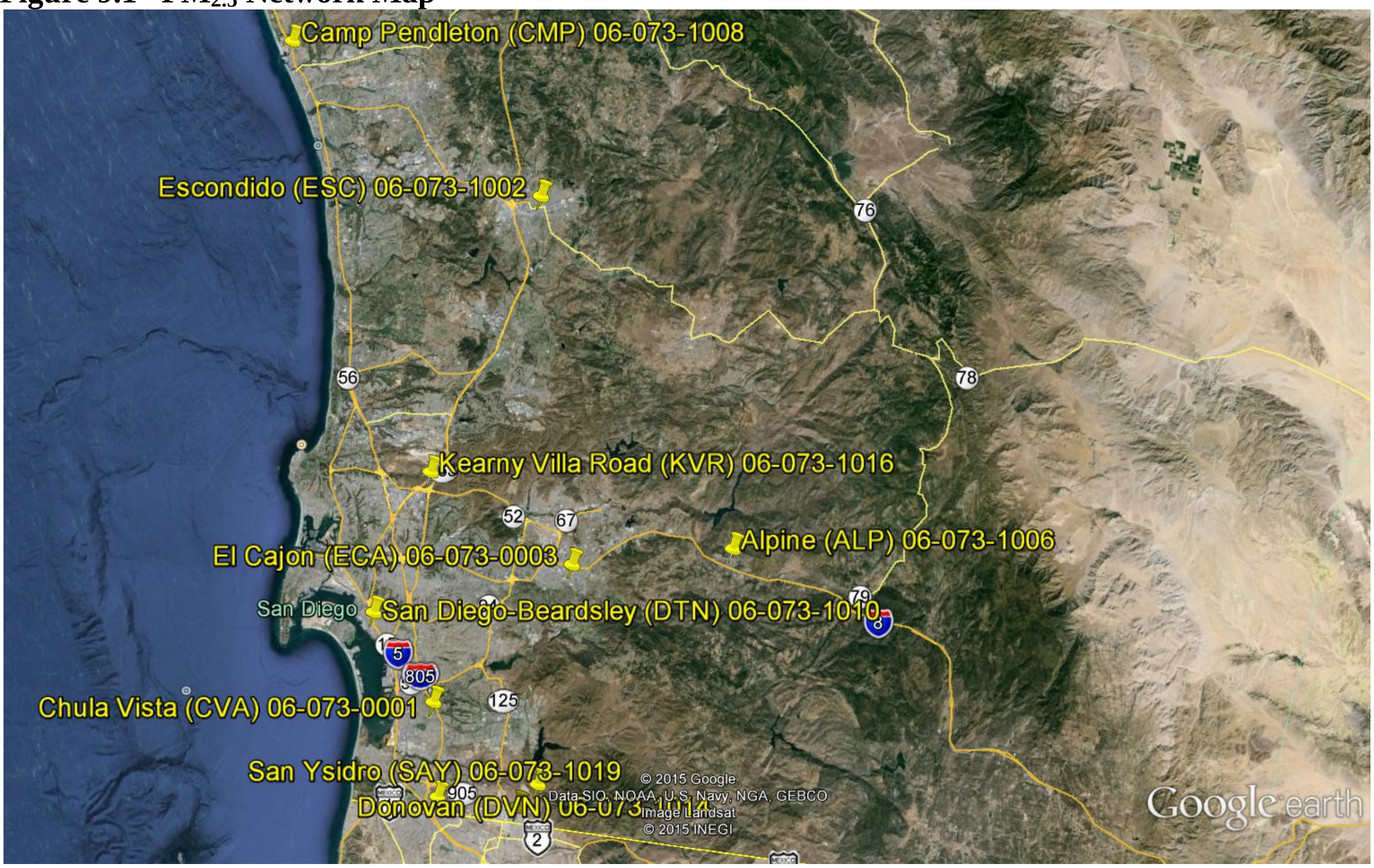
Section 9.0.0 $PM_{2.5}$ Introduction

$PM_{2.5}$ was sampled on both a continuous basis and sequentially (on a schedule set by the EPA) at several locations in the SDAB (Figure 9.1 & Table 9.1), and the resulting data were referenced to the $PM_{2.5}$ standards of the year, when applicable. The equipment is listed in Tables 9.1 and 9.2. Please note:

- The El Cajon station was temporarily relocated to the Gillespie Field area off of Floyd Smith Drive; this station is called Floyd Smith Drive (FSD).
- The Otay Mesa station was permanently relocated to the Donovan State Prison (DVN) area.

- $PM_{2.5}$ FRM/sequential samplers are at ESC, KVR, FSD/ECA, DTN, and CVA.
- $PM_{2.5}$ non-FEM/continuous samplers are at CMP, ESC, FSD/ECA, ALP, DVN, and DTN.
- $PM_{2.5}$-CSN samplers are at ESC and FSD/ECA.
- $PM_{2.5}$-STN samplers are at ESC and FSD/ECA.
- $PM_{2.5}$-Supplemental Speciation is at ESC, FSD/ECA, and DTN.

Figure 9.1 $PM_{2.5}$ Network Map



The reported concentrations reflect a mix of the two station moves listed above. Because the Donovan relocation is permanent, the maps and table parameters reflect the new site metadata (labeled as DVN). Because the Floyd Smith Drive relocation is temporary, the maps and table parameters reflect the permanent site metadata (labeled as ECA).

Section 9.1.0 $PM_{2.5}$ FRM Trends in the SDAB

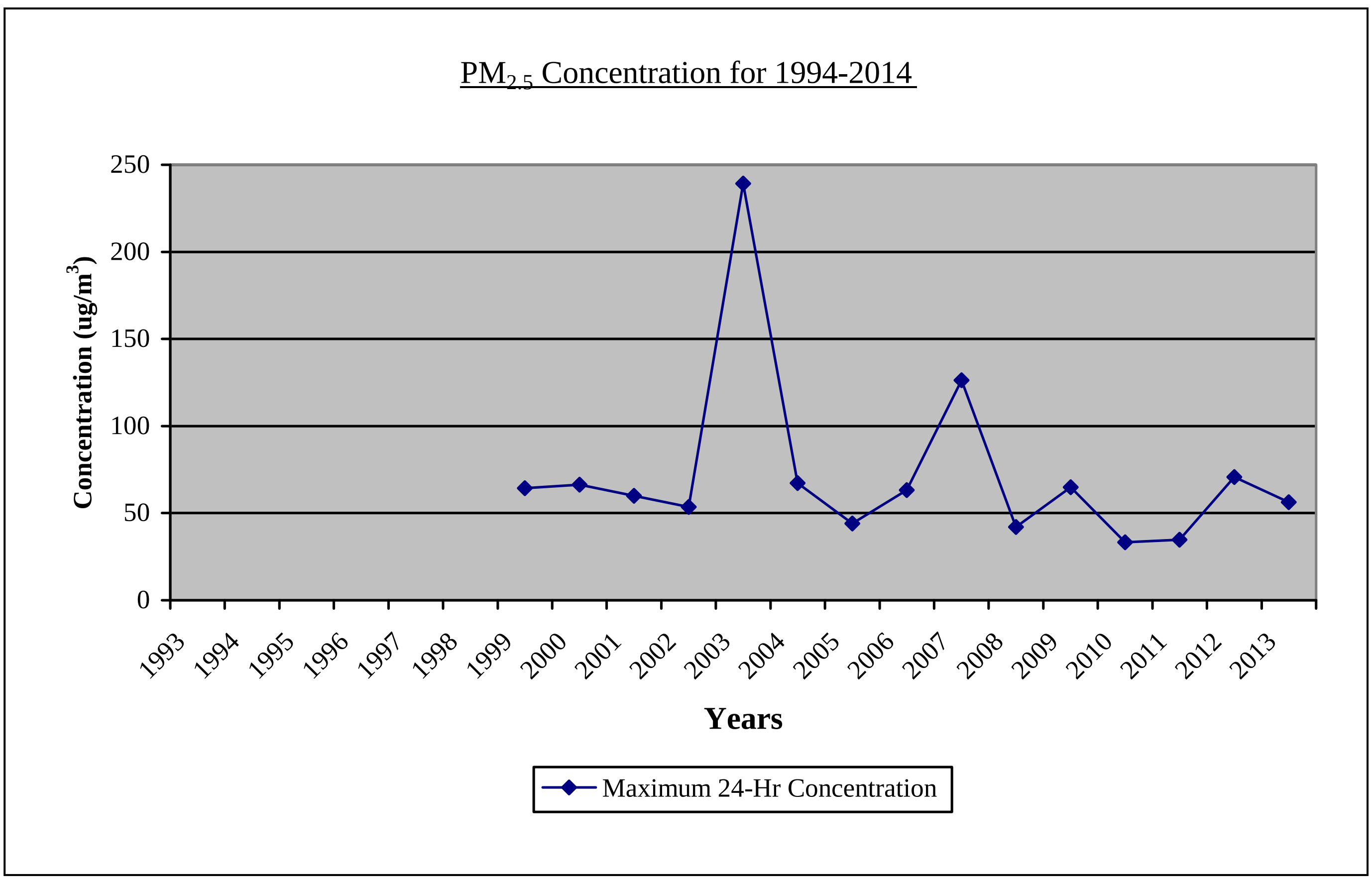
The annual average $PM_{2.5}$ FRM concentrations in the San Diego Air Basin have declined over the past decade, as shown in Table 9.1. The State annual average concentrations also decreased within this period. The maximum 24-Hr concentrations measured in 2003 and 2007 were due to severe wildfires that occurred in Southern California. The 98th percentile of 24-Hr $PM_{2.5}$ concentrations showed substantial variability within this period, a reflection of changes in meteorology and the influence of the 2003 and 2007 wildfires. Note that the "Days above the Standard" row in Table 9.3 reflects the $PM_{2.5}$ standard for that year. Figure 9.2 graphs the SDAB $PM_{2.5}$ trends over the years.

Table 9.1 $PM_{2.5}$ Summary of Concentrations, 1994-2014

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Maximum 24-Hr Concentration (µg/m^3)	*	*	*	*	*	64.3	66.3	60.0	53.6	239.2	67.3	44.1	63.3	126.2	42.0	64.95	33.3	34.7	70.7	56.3	36.7
Days above the National Std (#)	*	*	*	*	*	0	2	0	0	2	1	0	1	17	3	3	0	0	2	2	1

* The $PM_{2.5}$ standard was written in 1997 and the program was implemented in 1999

Figure 9.2 $PM_{2.5}$ Concentrations, 1994-2014



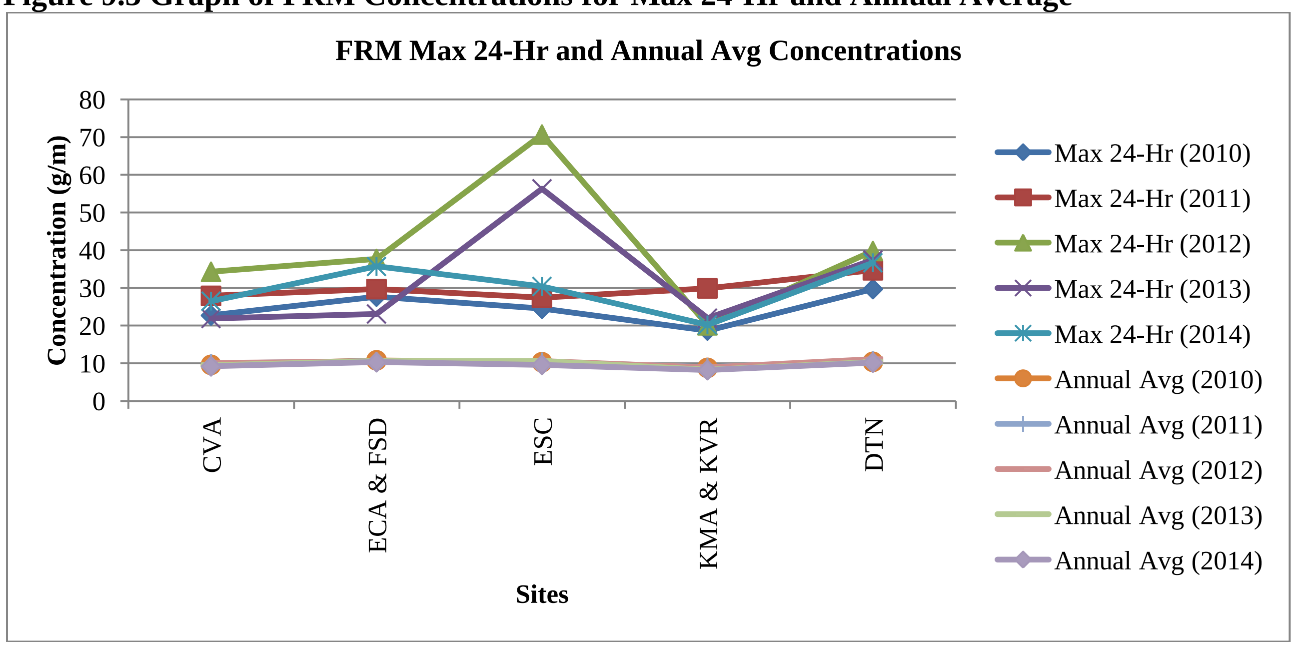
Section 9.1.1.1 $PM_{2.5}$ FRM/Manual Annual Measurements by Site

Table 9.2 lists the maximum $PM_{2.5}$ FRM measurements for each $PM_{2.5}$ FRM monitoring location. Figure 9.3 shows this graphically.

Table 9.2 $PM_{2.5}$ FRM/Manual Measurements by Site, 2010-2014

Site (name)		Maximum Concentration for 24-Hr (µg/m³)					Annual Average (µg/m³)				
		2010	2011	2012	2013	2014	2010	2011	2012	2013	2014
Chula Vista	CVA	22.7	27.9	34.3	21.9	26.5	9.6	10.0	10.1	9.5	9.2
El Cajon	ECA & FSD	27.7	29.7	37.7	23.1	35.7	10.8	10.6	10.5	10.6	10.3
Escondido	ESC	24.5	27.4	70.7	56.3	30.4	10.3	10.4	10.6	10.6	9.6
Kearny Villa Road	KMA & KVR	18.7	29.9	20.1	22.0	20.2	8.8	9.0	8.9	8.3	8.2
San Diego-Beardsley	DTN	29.7	34.7	39.8	37.4	36.7	10.4	10.8	11.1	10.3	10.2

Figure 9.3 Graph of FRM Concentrations for Max 24-Hr and Annual Average



Section 9.1.1.2 $PM_{2.5}$ FRM/Manual Design Value Measurements by Site

Tables 9.3a and 9.9.3b list the maximum $PM_{2.5}$ FRM Design Value measurements for each $PM_{2.5}$ FRM monitoring location with respect to the National Standard for the annual average and maximum 24-Hr concentrations. Figures 9.4 & 9.5 show this graphically.

Table 9.3a $PM_{2.5}$ FRM/Manual Design Value Measurements by Site (24-Hr), 2010-2014

Site (name)		Design Value Maximum Concentration for 24-Hr (µg/m³)									
		2008-2010	≥ 85% of the NAAQS	2009-2011	≥ 85% of the NAAQS	2010-2012	≥ 85% of the NAAQS	2011-2013	≥ 85% of the NAAQS	2012-2014	≥ 85% of the NAAQS
Chula Vista	CVA	23.9	No	20.7	No	21.0	No	20.0	No	20.2	No
El Cajon	ECA & FSD	25.2	No	22.4	No	22.2	No	21.2	No	24.0	No
Escondido	ESC	24.4	No	22.4	No	20.9	No	22.3	No	21.9	No
Kearny Villa Road	KMA & KVR	20.1	No	18.0	No	17.1	No	17.0	No	17.3	No
San Diego-Beardsley	DTN	25.4	No	23.6	No	23.2	No	22.1	No	22.8	No

Figure 9.4 Graph of FRM Concentrations for Design Value Max 24-Hr Concentrations

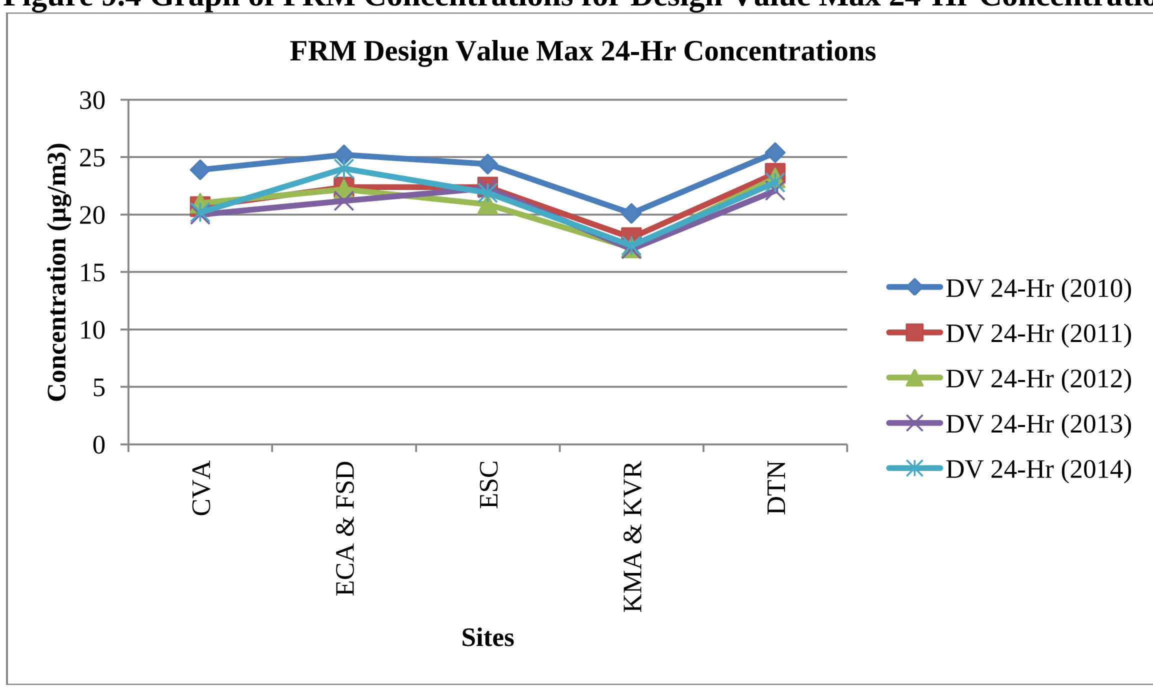
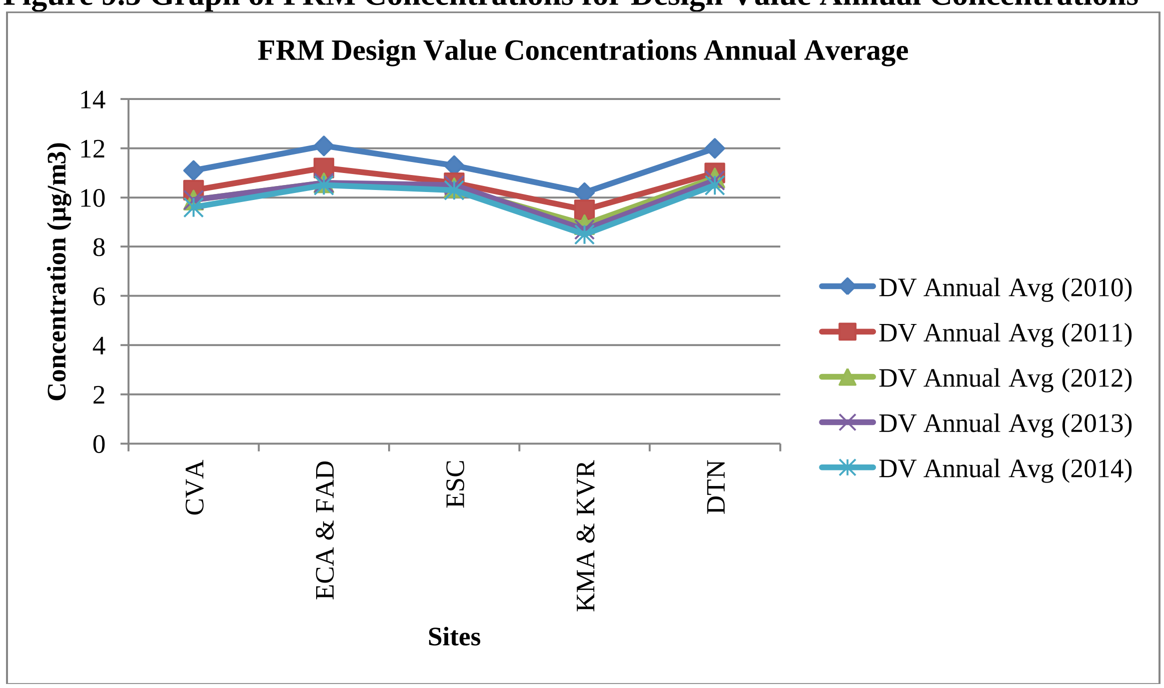


Table 9.3b $PM_{2.5}$ FRM/Manual Design Value Measurements by Site (Annual Average), 2010-2014

Site (name)		Design Value Annual Concentration (µg/m^3)									
		2008-2010	≥ 85% of the NAAQS	2009-2011	≥ 85% of the NAAQS	2010-2012	≥ 85% of the NAAQS	2011-2013	≥ 85% of the NAAQS	2012-2014	≥ 85% of the NAAQS
Chula Vista	CVA	11.1	Yes	10.3	Yes	9.9	No	9.9	No	9.6	No
El Cajon	ECA & FSD	12.1	Yes	11.2	Yes	10.6	Yes	10.6	Yes	10.5	Yes
Escondido	ESC	11.3	Yes	10.6	Yes	10.4	Yes	10.5	Yes	10.3	Yes
Kearny Villa Road	KMA & KVR	10.2	Yes	9.5	No	8.9	No	8.7	No	8.5	No
San Diego-Beardsley	DTN	12.0	Yes	11.0	Yes	10.8	Yes	10.7	Yes	10.5	Yes

Figure 9.5 Graph of FRM Concentrations for Design Value Annual Concentrations



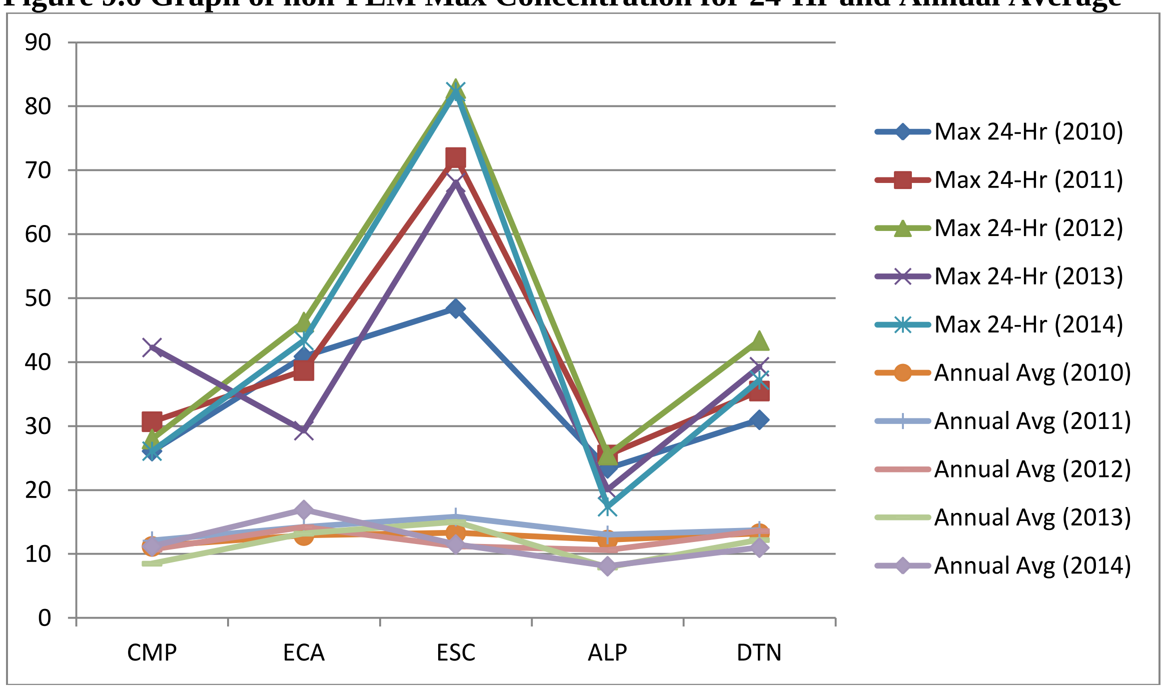
Section 9.1.2.1 $PM_{2.5}$ Non-FEM/Continuous Annual Measurements by Site

Table 9.4a lists the maximum $PM_{2.5}$ non-FEM measurements for each $PM_{2.5}$ continuous monitoring location. The $PM_{2.5}$ continuous sampler is not a regulatory monitor; therefore, its values cannot be compared to the standards. Figure 9.6 shows this graphically.

Table 9.4a $PM_{2.5}$ Non-FEM/Continuous Measurements by Site, 2010-2014

Site (name)		Maximum Concentration for 24-Hr (µg/m³)					Annual Average (µg/m³)				
		2010	2011	2012	2013	2014	2010	2011	2012	2013	2014
Camp Pendleton	CMP	26.1	30.7	28.0	42.3	26.1	11.2	12.1	10.7	8.5	11.2
El Cajon	ECA	40.9	38.7	46.3	29.3	43.4	12.9	14.2	14.2	13.2	16.9
Escondido	ESC	48.4	72.0	82.8	68.1	82.3	13.3	15.8	11.2	15.0	11.5
Alpine	ALP	23.4	25.5	25.5	20.1	17.4	12.2	13.0	10.6	7.9	8.1
San Diego-Beardsley	DTN	31.0	35.5	43.4	39.3	37.2	13.2	13.7	13.6	12.2	11.0

Figure 9.6 Graph of non-FEM Max Concentration for 24-Hr and Annual Average



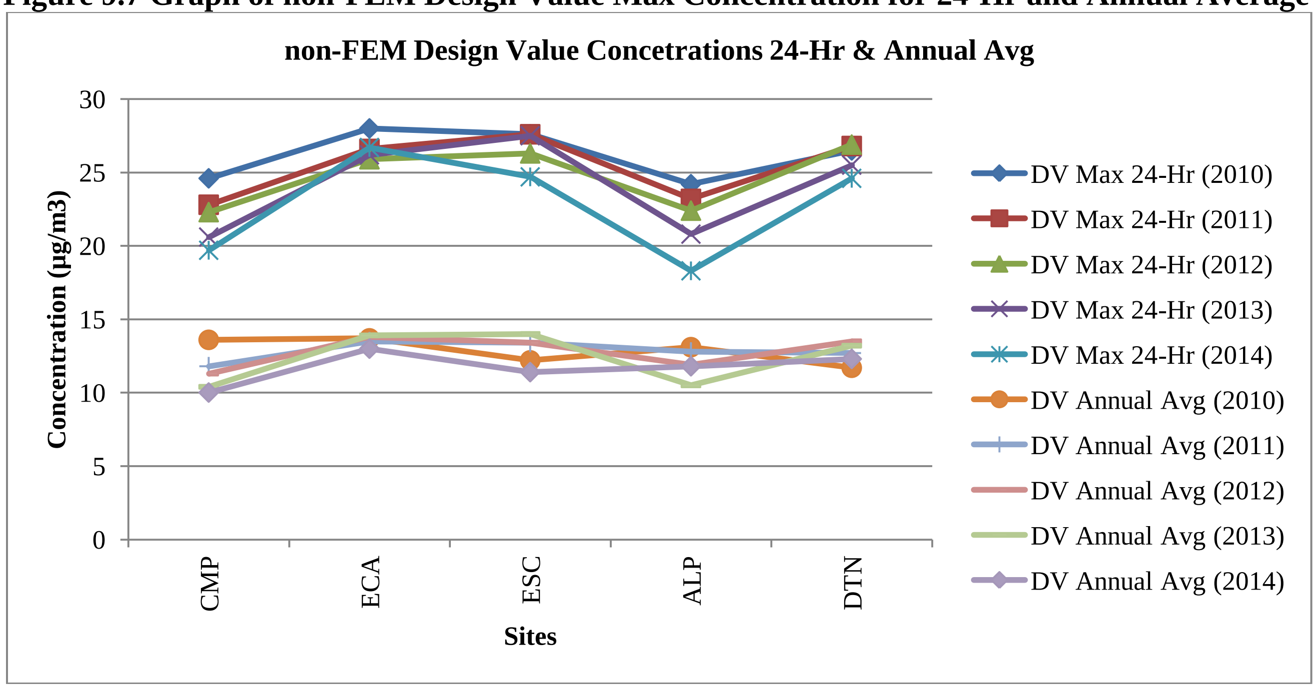
Section 9.1.2.2 $PM_{2.5}$ Non-FEM/Continuous Design Value Measurements by Site

Table 9.4b lists the maximum $PM_{2.5}$ non-FEM Design Value measurements for each $PM_{2.5}$ continuous monitoring location. The $PM_{2.5}$ continuous sampler is not a regulatory monitor; therefore, its values cannot be compared to the standards. Figure 9.7 shows this graphically.

Table 9.4b $PM_{2.5}$ Non-FEM/Continuous Design Value Measurements by Site (24-Hr & Annual Avg), 2014

Site (name)		Design Value Concentration 24-Hr (µg/m³)					Design Value Concentration Annual (µg/m³)				
		2008-2010	2009-2011	2010-2012	2011-2013	2012-2014	2008-2010	2009-2011	2010-2012	2011-2013	2012-2014
Camp Pendleton	CMP	24.6	22.8	22.3	20.6	19.7	13.6	11.8	11.3	10.4	10.01
El Cajon	ECA	28.0	26.6	25.9	26.2	26.7	13.7	13.5	13.8	13.9	13.0
Escondido	ESC	27.6	27.6	26.3	27.5	24.7	12.2	13.4	13.4	14.0	11.4
Alpine	ALP	24.2	23.2	22.4	20.8	18.3	13.1	12.8	11.9	10.5	11.8
San Diego-Beardsley	DTN	26.5	26.8	26.9	25.5	24.6	11.7	12.7	13.5	13.2	12.3

Figure 9.7 Graph of non-FEM Design Value Max Concentration for 24-Hr and Annual Average



Section 9.2.0 $PM_{2.5}$ Federal Design Criteria Requirements

The Federal requirements for the number of $PM_{2.5}$ monitors are described in the 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 4.7 "Fine Particulate Matter ($PM_{2.5}$) Design Criteria" and 4.8 "Coarse Particulate Matter (PM10−2.5) Design Criteria".

Section 9.2.1 $PM_{2.5}$ FRM/Manual Design Criteria

Subsection 4.7.1 of 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 4.7 "Fine Particulate Matter ($PM_{2.5}$) Design Criteria" lists the requirements needed to fulfill the $PM_{2.5}$ Design Criteria for sequential/FRM (manual) samplers, using *Table D-5*. Tables 9.5a-9.5b list these requirements.

Table 9.5a $PM_{2.5}$ FRM/Manual Annual Design Value, 2012-2014

Annual Design Value (µg/m³)	Annual Design Value Location (name)	Annual Design Value Site AQS ID (#)	Is the Annual Design Value ≥ 85% of the NAAQS? (yes/no)	Is the Annual Design Value < 85% of the NAAQS? (yes/no)	Does the Annual Design Value Meet the NAAQS? (yes/no)
10.5	San Diego (DTN)	06-073-1010	Yes	No	Yes

Table 9.5b $PM_{2.5}$ FRM/Manual 24-Hr Design Value, 2012-2014

24-Hr Design Value (µg/m³)	24-Hr Design Value Location (name)	24-Hr Design Value Site AQS ID (#)	Is the 24-Hr Design Value ≥ 85% of the NAAQS? (yes/no)	Is the 24-Hr Design Value < 85% of the NAAQS? (yes/no)	Does the 24-Hr Design Value Meet the NAAQS? (yes/no)
22.8	San Diego (DTN)	06-073-1010	No	Yes	Yes

Using EPA *Table D-5*

Table 9.5c Minimum Number of $PM_{2.5}$ FRM/Manual Monitors/Sites Required

MSA (name)	County (name)	Population from 2010 Census (#)	Minimum Number of FRM/Manual Monitors Required (#)	Number of Active Monitors (#)	Number of Monitors Needed (#)	Number of Active Primary Monitors (#)
San Diego	San Diego	3.2 million	3	5	None	5

Section 9.2.2 $PM_{2.5}$ (FRM/Manual) Design Criteria for the Site of Expected Maximum Concentration

Subsection 4.7.1(1) of 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 4.7 "Fine Particulate Matter ($PM_{2.5}$) Design Criteria" lists the requirements needed to fulfill the $PM_{2.5}$ Design Criteria for the population oriented area of expected maximum concentration for a $PM_{2.5}$ sequential/FRM (manual) sampler. Tables 9.6a - 9.6b list this requirement.

Table 9.6a Expected Maximum Annual Concentration Site using a FRM/Manual sampler

Site of Expected Maximum Concentration for Annual NAAQS (name)	Site of Expected Maximum Concentration for Annual NAAQS AQS ID (#)
San Diego-Beardsley	06-073-1010

Table 9.6b Expected Maximum 24-Hr Concentration Site using a FRM/Manual sampler

Site of Expected Maximum Concentration for 24-Hr NAAQS (name)	Site of Expected Maximum Concentration for 24-Hr NAAQS AQS ID (#)
Escondido	06-073-1002

Section 9.2.3 $PM_{2.5}$ (FRM/Manual) Design Criteria for the Site of Expected Poor Air Quality

Subsection 4.7.1(2) of 40 CFR Part 58-"Ambient Air Quality Surveillance", Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 4.7 "Fine Particulate Matter ($PM_{2.5}$) Design Criteria" lists the requirements needed to fulfill the $PM_{2.5}$ Design Criteria for the location of a station in an area of poor air quality. Table 9.7 lists this requirement.

Table 9.7 Site of Poor Air Quality to Locate a FRM/Manual sampler

Site of Poor Air Quality (name)	Site of Poor Air Quality AQS ID (#)
Escondido	06-073-1002

Section 9.2.4 $PM_{2.5}$ Design Criteria for Near-road Requirements

Subsection (b)(2) of 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 4.7 "Fine Particulate Matter ($PM_{2.5}$) Design Criteria" lists the requirements needed to fulfill $PM_{2.5}$ Design Criteria for the NO_2 Near-road program. Table 9.8 lists these requirements.

Table 9.8 $PM_{2.5}$ Minimum Number of Near-road Monitors Required

MSA (name)	County (name)	Population from 2010 Census (#)	Minimum Number of NO_2 Near-road Monitors Required (#)	Are Collocated $PM_{2.5}$ Monitors Required (yes/no)	Minimum Number of Collocated $PM_{2.5}$ Monitors Required (#)	Total Number of $PM_{2.5}$ Monitors Required (#)	Total Number of Active $PM_{2.5}$ Monitors (#)	Total Number of $PM_{2.5}$ Monitors Needed (#)
San Diego	San Diego	3.2 million	2	Yes	1	1	0	1

Section 9.2.5 $PM_{2.5}$ Continuous Network Design Criteria

Subsection 4.7.2 of 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 4.7 "Fine Particulate Matter ($PM_{2.5}$) Design Criteria" lists the requirements needed to fulfill the $PM_{2.5}$ Design Criteria for the minimum number of continuous/non-FEM samplers (see Tables 9.9a-9.9b).

Table 9.9a $PM_{2.5}$ Non-FEM/Continuous Samplers Design Criteria

Minimum Number of Required FRM/Manual Samplers Required (#)	Minimum Number of Required Continuous Samplers= (½ Minimum Number of) Required FRM/Manual Samplers Rounded Up (#)	Number of Active Continuous Samplers (#)	Number of Continuous Samplers Needed (#)
3	3 x (½) = 2	6	None

Table 9.9b Design Criteria for the Minimum Number of $PM_{2.5}$ Continuous Samplers Required to be Collocated with $PM_{2.5}$ FRM/Manual Samplers

Minimum Number of Continuous Samplers (Sites) Required to be Collocated with FRM/Manual Samplers (Sites) (#)	Number of Active Sites that have Continuous Samplers Collocated with FRM/Manual Samplers (Sites) (#)	Number of Continuous Sampler Sites that must be Collocated with FRM/Manual Samplers (Sites) Needed (#)	Locations of Continuous Samplers (Sites) Collocated with FRM/Manual Samplers (Sites) (name)	Locations of Continuous Samplers (Sites) Collocated with FRM/Manual Samplers (Sites) AQS ID (#)
1	3	None	El Cajon Escondido SD-Beardsley	06-073-0003 06-073-1002 06-073-1010

Section 9.2.6 $PM_{2.5}$ Speciation Network Design Criteria

There are two requirements for the STN & CSN networks. The first is to maintain the current speciation network as designed by the governing authorities and stated in 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 4.7 "Fine Particulate Matter ($PM_{2.5}$) Design Criteria", subsection 4.7.4.

The second requirement is that STN & CSN samplers must be sited at all NCore locations, as stated in 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 3, "Design Criteria for NCore Sites", subsection (b). Table 9.10 provides a summary of these two requirements.

Table 9.10 Design Criteria for $PM_{2.5}$ STN & CSN Samplers

Number of STN Samplers (Sites) (#)	Number of CSN Samplers (Sites) (#)	Location of CSN & STN Monitors (Sites) (name)	Location of CSN & STN Monitors (Sites) AQS ID (#)	Comments
2	2	El Cajon (ECA)	06-073-0003	NCore site requirement
		Escondido (ESC)	06-073-1002	Previously existing network site

Section 9.3.0 $PM_{2.5}$ (Non-speciated) - Rating Summary

Table 9.11 is a summary of the District's $PM_{2.5}$ sampler rating for the instruments in the network after using the EPA's Network Assessment tools for $PM_{2.5}$. For $PM_{2.5}$, the EPA Network Assessment Tools used samplers with parameter codes that equated to either an FRM or non-FEM $PM_{2.5}$ sampler for 2010-2014. $PM_{2.5}$ FRM samplers are manually loaded with a filter and run once every three days (1:3), and the filters are analyzed back at the laboratory; this process takes approximately 2-4 weeks. The $PM_{2.5}$ non-FEM samplers are near-real time reporting instrumentation. This technology has proven unreliable to be used for regulatory purposes. Currently, all FEM $PM_{2.5}$ samplers have been converted to non-FEM status, signifying that the data from the $PM_{2.5}$ non-FEM samplers are for public information and trends analysis uses only.

How does this change impact the Network Assessment? Only FRM samplers will be evaluated with the Network Assessment tools. In addition, all non-FEM $PM_{2.5}$ samplers will receive zero ratings for regulatory need. Because the non-FEM samplers now are designated for public information purposes, they will receive higher ratings for public information/health awareness need. For example, the Downtown sampler is in an industrial area, and thereby the need for near-real time data there is higher than the need for a near-real time sampler at Del Mar.

Table 9.11 $PM_{2.5}$ Monitor Summary Rating

	Overall Scoring	**COMMENTS**	**1.** Correlation	**2.** Removal	**3.** Area Served	**4.** Threshold	**5.** Internal
Alpine (ALP)	**49**	**1&2:** No correlation & high bias if removed **3:** Based on total population and population growth **4:** Low threshold	8	7	2	6	26
Camp Pendleton (CMP)	**61**	**1&2:** No correlation & high bias if removed **3:** Based on total population and surrounding population **4:** High threshold	8	7	10	9	27
Chula Vista (CVA)	**75**	**1&2:** Marginal correlation; bias if removed **3:** Based on total population and population growth **4:** High threshold	7	9	8	8	43
El Cajon (ECA)	**86**	**1&2:** No correlation & high bias if removed **3:** Based on total population and surrounding population **4:** Low Threshold	8	10	7	7	54
Escondido (ESC)	**73**	**1&2:** No correlation & high bias if removed **3:** Based on total population and surrounding population **4:** Low threshold	7	8	8	7	43
San Diego-Beardsley (DTN)	**86**	**1&2:** Marginal correlation; bias if removed **3:** Based on total population and surrounding population **4:** High threshold	7	10	10	9	50
San Diego-Kearny Villa Rd. (KVR)	**49**	**1&2:** No correlation & high bias if removed **3:** Based on total population and surrounding population **4:** moderate threshold	6	5	6	6	26
2nd Near-road (Barrio)	**37**	**1:** n/a **2:** Heavy Industrial/mixed use **3:** Highest PM site **4:** EJ area **5:** Public need	3	10	0	10	10
San Ysidro (SAY)	**31**	**1:** n/a **2:** Border crossing **3:** High PM site **4:** EPA request **5:** Public need	3	8	0	10	10
Otay Mesa-Donovan (DVN)	**28**	**1:** n/a **2:** Bedroom **3:** n/a **4:** EPA request **5:** Compare to SAY	6	6	0	7	9

Section 9.3.1 $PM_{2.5}$ (Non-speciated) - Correlation Matrix

The correlation matrix analysis shows the correlation, relative difference, and distance between sites. The shape of the ellipses represents the Pearson Squared Correlation between sites with a circle representing zero correlation and a straight line representing perfect correlation; the correlation between the sites represents the degree of relatedness. The correlation, however, does not indicate if one site measures concentrations substantially higher or lower than another; for this, the color of the ellipses represents the average relative difference. This analysis aids in determining sites that are redundant.

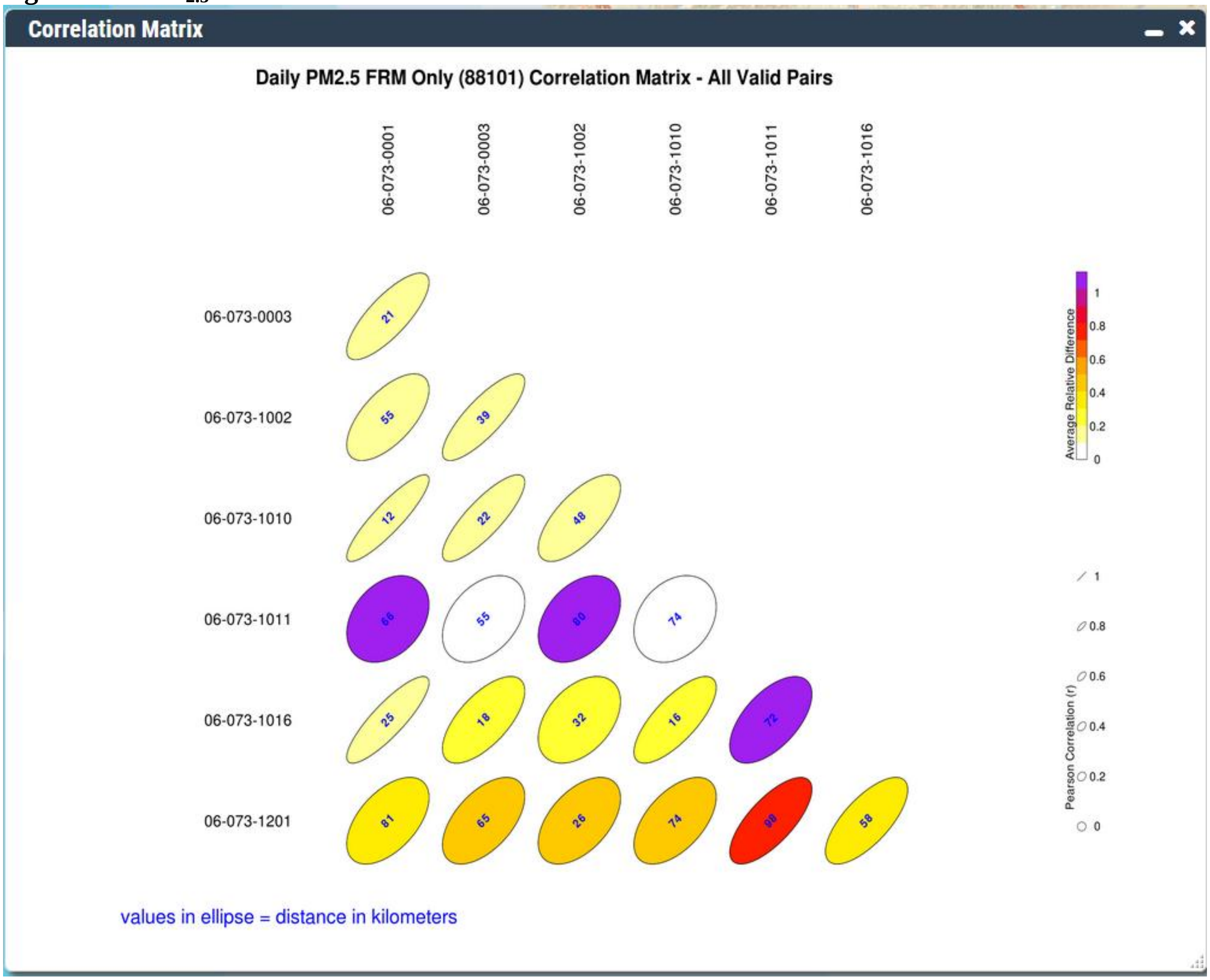
The $PM_{2.5}$ correlation between FRM sites in San Diego County is shown in Figure 9.8. The site pairs that result in correlations greater than 0.8 and relative differences less than 0.3 for $PM_{2.5}$ include the following:

1. 06-073-1010 Downtown (DTN) with 06-073-0001 Chula Vista (CVA) has marginal correlation.

This marginal correlation between DTN and CVA is not unexpected. CVA is approximately six miles downwind of the DTN station, and often other instruments correlate with DTN. The need for public reporting in highly populated communities requires that the District not decommission either $PM_{2.5}$ sampler. Both sites have the highest rates of respiratory ailments in the County. Additionally, the DTN sampler is designated as the highest concentration site and is in an EJ area. The Chula Vista site is the location of our QA sampler. There is no room on the decks of the other FRM locations to accommodate an additional FRM sampler, if we were to relocate these samplers.

This $PM_{2.5}$ sampler pair has correlation, small average difference, and close proximity, but no action will be undertaken for the reasons mentioned in the previous paragraph.

Figure 9.8 $PM_{2.5}$ Correlation Matrix



Legend:
06-073-0003 El Cajon (ECA)
06-073-1002 Escondido (ESC)
06-073-1010 Downtown (DTN)
06-073-1011 Blvd (not a San Diego APCD air monitoring site)
06-073-1016 Kearny Villa Road (KVR)
06-073-1201 Pala (not a San Diego APCD air monitoring site)
06-073-0001 Chula Vista (CVA)

Section 9.3.2 $PM_{2.5}$ (Non-Speciated) - Removal Bias

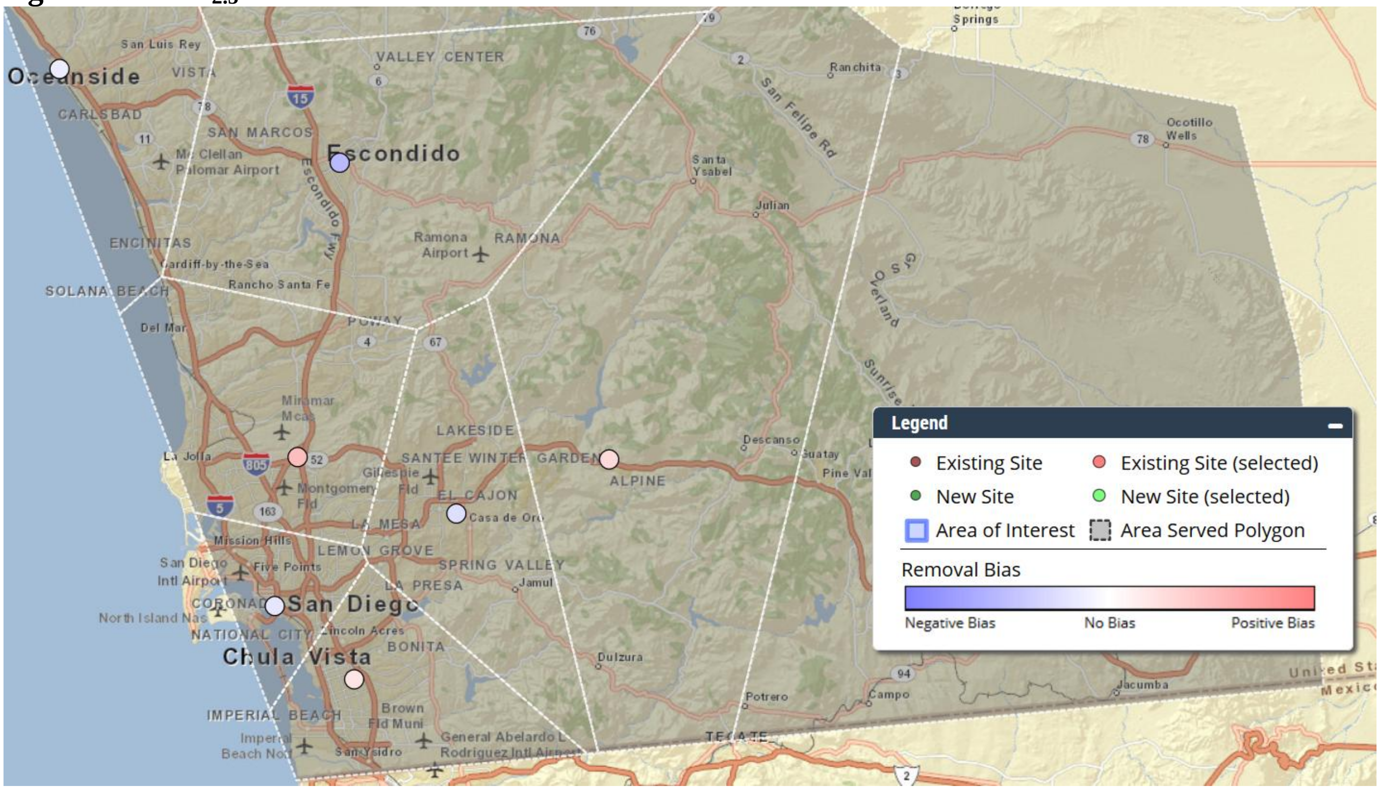
This section aims to determine redundant sites. The bias estimation uses the nearest neighbor site to estimate the concentration at that location if the site was not there. A positive bias indicates that if the site being examined was removed, the neighboring site(s) would register higher values. The opposite indicates a negative bias. Figure 9.9 is a pictorial representation of the $PM_{2.5}$ samplers in the network. The darker blue the circle, the more negative the bias; the darker red the circle, the more positive the bias; white is neutral. For Removal Bias, the Network Assessment tool takes into account both FRM and FEM $PM_{2.5}$ samplers.

The Removal Bias between sites in San Diego County for $PM_{2.5}$ indicates the following sites:

1. Camp Pendleton

The removal of the Camp Pendleton $PM_{2.5}$ sampler would leave two large gaps in the network. The $PM_{2.5}$ samplers at Camp Pendleton and Escondido are at opposite ends of SR 78, which connects the only north-south interstate highways in the SDAB. Additionally, both ends of SR78 are in the 10 most trafficked areas in the County. The data from the ESC and CMP stations are used to interpolate what the concentrations would be for the cities/communities between the stations. Furthermore, the next $PM_{2.5}$ sampler is 40 miles to the south at the Downtown station. The removal of the CMP $PM_{2.5}$ sampler would create an approximate 600 sq. mi. gap in the network. Lastly, this site is used to register transport from the South Coast air basin. The Camp Pendleton site is needed for many purposes.

Figure 9.9 $PM_{2.5}$ Removal Bias



Legend:

06-073-0003 El Cajon (ECA)
06-073-1002 Escondido (ESC)
06-073-1006 Alpine (ALP)
06-073-1008 Camp Pendleton (CMP)
06-073-1010 Downtown (DTN)
06-073-1011 Blvd (not a San Diego APCD air monitoring site)
06-073-1016 Kearny Villa Road (KVR)
06-073-1201 Pala (not a San Diego APCD air monitoring site)
06-073-0001 Chula Vista (CVA)

Section 9.3.3 $PM_{2.5}$ (Non-speciated) - Area Served

The regions and area served by the monitors represent significant population conglomerations. Figure 9.10 is a pictorial representation of the area served by the $PM_{2.5}$ samplers in the air quality network. The elimination of any station will correspond to a decrease in coverage and a decrease in the District's ability to warn and inform the public of any health concerns.

The area east of Camp Pendleton and west of Escondido includes the communities of San Marcos and Vista. This area is one of the faster growing areas in the county. The ozone, nitrogen dioxide, and $PM_{2.5}$ concentrations have been shown to be derived from the measured concentrations from the ozone, nitrogen dioxide, and $PM_{2.5}$ monitors at the Camp Pendleton and Escondido stations.

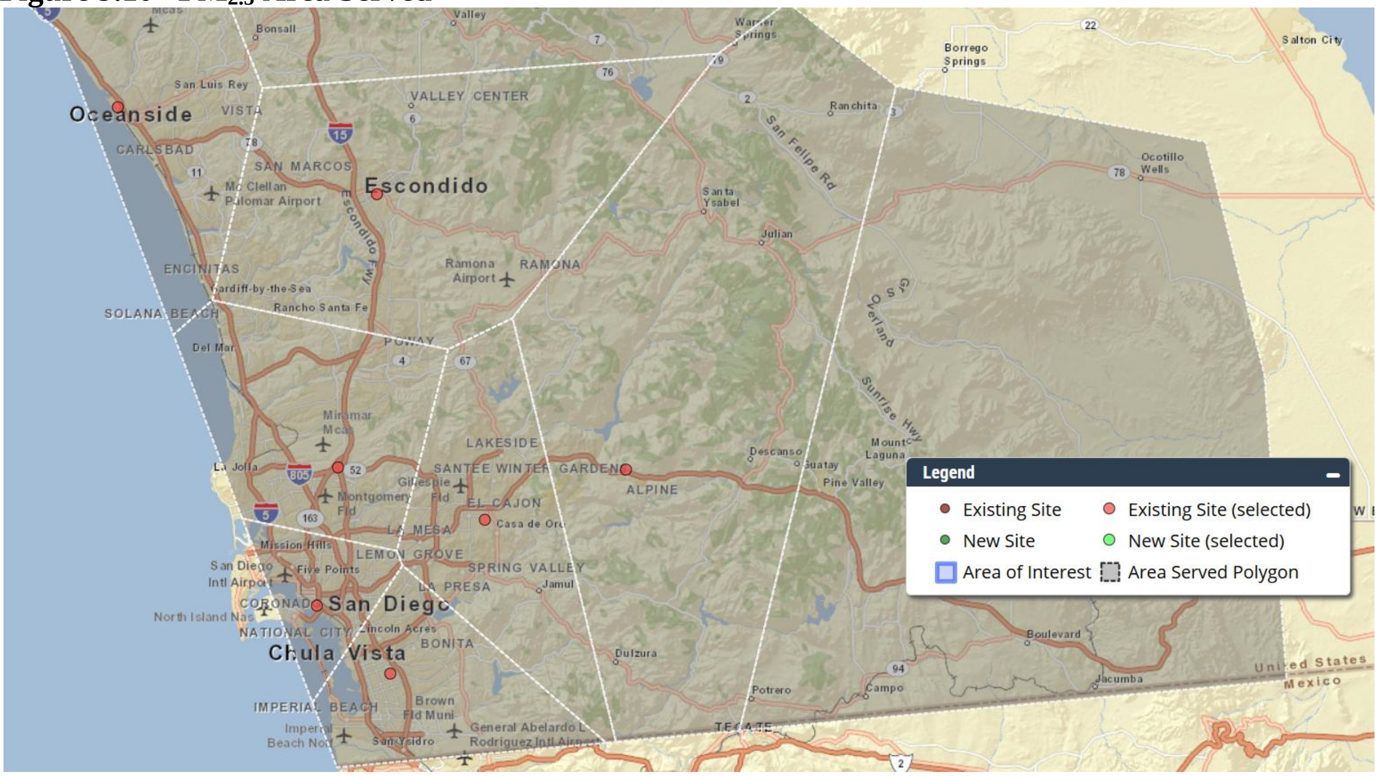
The area north of Escondido includes the communities of Bonsall and Fallbrook. This area has expanded, and its population has grown significantly over the years. The SCAQMD has monitors for ozone, nitrogen dioxide, PM_{10} and $PM_{2.5}$ in the Temecula Valley (the area north of Fallbrook), Elsinore, Norco/Corona, and Perris Valley. The ozone, nitrogen dioxide, PM_{10} and $PM_{2.5}$ concentrations for the Bonsall and Fallbrook general areas can be derived from the Escondido and Temecula ozone, nitrogen dioxide, PM_{10} and $PM_{2.5}$ monitors.

The areas east of the Alpine station have low population centers, low traffic count, and similar topography; thereby, an additional $PM_{2.5}$ monitor in this area would add little informational value.

The areas east of the Escondido station have low population centers, low traffic count, and similar topography; thereby, an additional $PM_{2.5}$ monitor in this area would add little informational value.

The area north of the Otay Mesa - Donovan station is one of the faster growing areas in the county. Some temporary monitoring may be undertaken between Otay Mesa and El Cajon, if modeling triggers a need to establish a presence.

Figure 9.10 $PM_{2.5}$ Area Served



Legend:

06-073-0003 El Cajon (ECA)
06-073-1002 Escondido (ESC)
06-073-1006 Alpine (ALP)
06-073-1008 Camp Pendleton (CMP)
06-073-1010 Downtown (DTN)
06-073-1011 Blvd (not a San Diego APCD air monitoring site)
06-073-1016 Kearny Villa Road (KVR)
06-073-1201 Pala (not a San Diego APCD air monitoring site)
06-073-0001 Chula Vista (CVA)

Section 9.3.4 $PM_{2.5}$ (Non-speciated) - Surface Probability

Surface probability maps provide information on the spatial distribution of the highest value for a pollutant. They illustrate the probability that exceedances may occur in certain geographical locations. These maps should not be used alone to justify a new monitor/air monitoring station location. Other materials should be used, such as demographics, area served, budgetary constraints, logistics, and other such concerns.

Figures 9.11a and 9.11b are pictorial representations of the areas with high need for coverage, based on the current NAAAQS (red being the highest need and green being the lowest) with the ambient air monitoring stations indicated by circles.

The need for coverage is 5%-45%, based on the current NAAQS with the higher percentage need located in the areas along Interstate 5 and in the City of San Diego.

Figure 9.11a $PM_{2.5}$ Need for Coverage Based on the Current NAAQS

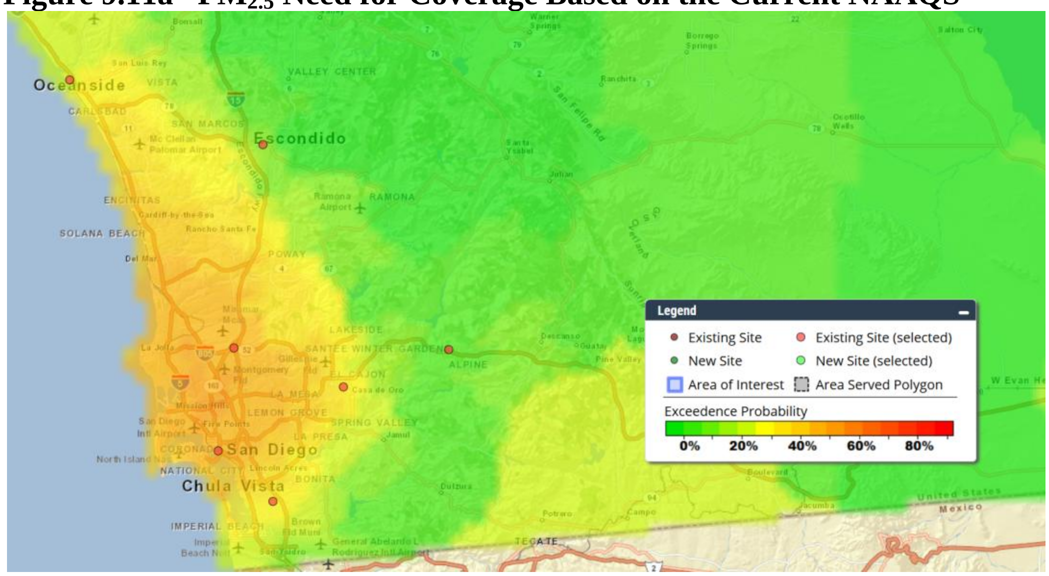
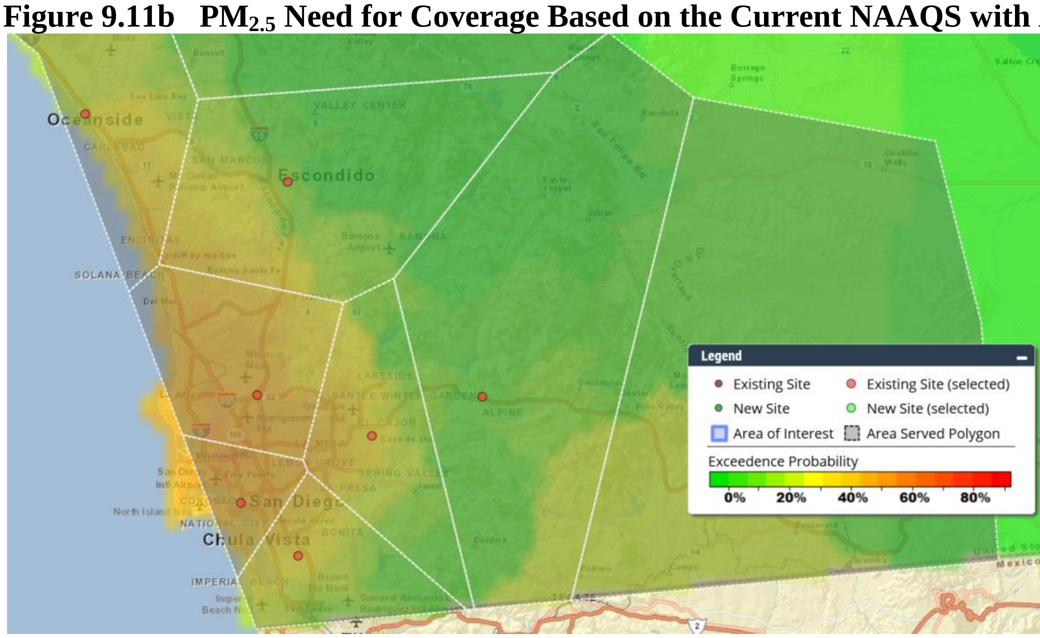


Figure 9.11b $PM_{2.5}$ Need for Coverage Based on the Current NAAQS with Area Served Overlay



Section 9.3.5 $PM_{2.5}$ (Non-speciated) - Rating Summary using District Tools

Table 9.12 is a summary of the District's $PM_{2.5}$ sampler rating for the instruments in the network after using the District's internal measuring tools.

Table 9.12 $PM_{2.5}$ Sampler Summary Rating using District Criteria

	Overall Scoring	**COMMENTS**	**1.** Total Monitors	**2.** Community Type	**3.** Regulatory Needs	**4.** non-Regulatory	**5.** Other
Alpine (ALP)	**26**	**1:** n/a **2:** Rural/bedroom **3:** n/a **4:** Needed for east County **5:** Trends; recently moved	4	4	0	8	10
Camp Pendleton (CMP)	**27**	**1:** n/a **2:** Bedroom **3:** n/a **4:** Only north coastal sampler **5:** Trends	5	6	0	8	8
Chula Vista (CVA)	**43**	**1:** n/a **2:** Mixed use **3:** Collocation site **4:** Highest asthma rates **5:** Deck upgrade	7	7	9	10	10
El Cajon (ECA)	**54**	**1:** n/a **2:** Light Industrial/mixed use **3:** Required for NCore **4:** Required for NCore **5:** Recently moved	17	7	10	10	10
Escondido (ESC)	**43**	**1:** n/a **2:** Light Industrial/mixed use **3:** High PM site **4:** Borderline EJ area **4:** Needed for adjacent communities	9	9	8	8	9
San Diego-Beardsley (DTN)	**50**	**1:** n/a **2:** Heavy Industrial/mixed use **3:** Highest PM site **4:** EJ area **5:** Public need	10	10	10	10	10
San Diego-Kearny Villa Rd. (KVR)	**26**	**1:** n/a **2:** Mixed use **3:** Cleanest site **4:** n/a **4:** Recently moved	4	5	7	0	10
2nd Near-road (Barrio)	**37**	**1:** n/a **2:** Heavy Industrial/mixed use **3:** Highest PM site **4:** EJ area **5:** Public need	3	10	0	10	10
San Ysidro (SAY)	**31**	**1:** n/a **2:** Border crossing **3:** High PM site **4:** EPA request **5:** Public need	3	8	0	10	10
Rancho Carmel Dr (RCD)	**34**	**1:** n/a **2:** Bedroom **3:** Near-road **4:** EPA request **5:** Compare to ESC	3	6	10	8	7
Otay Mesa-Donovan (DVN)	**28**	**1:** n/a **2:** Bedroom **3:** n/a **4:** EPA request **5:** Compare to SAY	6	6	0	7	9

Section 9.4.0 $PM_{2.5}$ (Speciated) - Rating Summary

The $PM_{2.5}$ speciation samplers are part of the EPA STN and CSN programs. They are located in El Cajon and Escondido. The Network Assessment tools were run for both sites, and the results are below:

1. Correlation
   There is no correlation between the two sites. This result is expected, because they are two distinct communities with completely different topography, influences, and purposes.
2. Removal Bias
   Because there are only two sites and there is no correlation, there is maximum bias if one is removed from the network.

The District has no control if a sampler should be decommissioned or not, but it is the District's recommendation to increase CSN sampling in the air basin. The District has two Ports-of-Entry (POE) with Mexico at San Ysidro and Otay Mesa (and a third POE is to be built east of Otay Mesa). The Otay Mesa border crossing is the busiest truck crossing in California and one of the busiest in the nation. This site should be expanded to include CSN monitoring for black carbon. The San Ysidro border crossing is the busiest POE in the world for cars and pedestrians. This location should be considered as a comparison study between two POEs designed for different purposes.

The Downtown station is located in a community zoned for mixed use. This station captures emissions from several sources: Interstates 5, 805, 15 and State Route 94, downtown San Diego, Lindbergh Field, North Island Naval Air Station, marine terminals, NASSCO shipyards, Continental Maritime shipyard, Southwest Marine, train yards, and harbor ship traffic. The area has significant heavy equipment use, operated by diesel engines. This site offers a unique challenge and should be included in the CSN program.

Table 9.13 is a summary of the ratings for the existing stations and synopses of the three projected stations.

Table 9.13 $PM_{2.5}$ (Speciated) Monitor Summary Rating using District Criteria

	Overall Scoring	**COMMENTS**	**1.** Correlation	**2.** Removal	**3.** Area Served	**4.** Threshold	**5.** Total Monitors	**6.** Community Type	**7.** Other
El Cajon (ECA)	**66**	**1&2:** No Correlation; extreme bias if removed **3:** Based on total population and surrounding population **4:** Moderate threshold **5:** n/a **6:** Mixed use **7:** Microcosm of East County; receptor site	10	10	7	7	17	7	8
Escondido (ESC)	**60**	**1&2:** No Correlation; extreme bias if removed **3:** Based on total population and surrounding population **4:** Low threshold **5:** n/a **6:** **7:** Microcosm of Northeast County; receptor site	10	10	8	5	9	9	9
San Diego-Beardsley (DTN)	**30**	**1-5:** n/a **6:** Heavy industry mixed with residences **7:** Environmental Justice area	n/a	n/a	n/a	n/a	10	10	10
Otay Mesa-Donovan (DVN)	**23**	**1-5:** n/a **6:** Mostly business; residences slowly moving in upwind **7:** One of the busiest heavy duty truck crossings in the nation	n/a	n/a	n/a	n/a	6	7	10
San Ysidro (SAY)	**16**	**1-5:** n/a **6:** Mixed used **7:** Busiest port of entry in the world; no permanent air monitoring station sited	n/a	n/a	n/a	n/a	n/a	7	9

Chapter 10 Particulate Matter 10 µm (PM_{10})

Section 10.0.0 PM_{10} Introduction

PM_{10} was sampled at six locations throughout the SDAB (Figure 10.1). There is a PM_{10} (Lo-Vol) sampler at the El Cajon location that is also part of the paired lo-vol samplers needed to calculate PMcoarse.
Please note:

- The Otay Mesa (OTM) station was permanently relocated to the Donovan State Prison area; this station is called Donovan (DVN).
- The El Cajon station was temporarily relocated to the Gillespie Field area off of Floyd Smith Drive; this station is called Floyd Smith Drive (FSD).

Figure 10.1 PM_{10} Overall Maps

The reported concentrations reflect a mix of the two station moves listed above. Because the Donovan relocation is permanent, the maps and table parameters reflect the new site metadata (labeled as DVN). Because the Floyd Smith Drive relocation is temporary, the maps and table parameters reflect the permanent site metadata (labeled as ECA).

Section 10.1.0 PM_{10} Trends in the SDAB

PM_{10} concentrations do not correlate well to growth in population or vehicle usage, and high PM_{10} concentrations do not always occur in high population areas. Emissions from stationary sources and motor vehicles form secondary particles that contribute to PM_{10} in many areas. Over this period, the three-year average of the annual average shows a large decrease; however, there is a great deal of variability from year-to-year. Much of this variability is due to the meteorological conditions rather than changes in emissions.

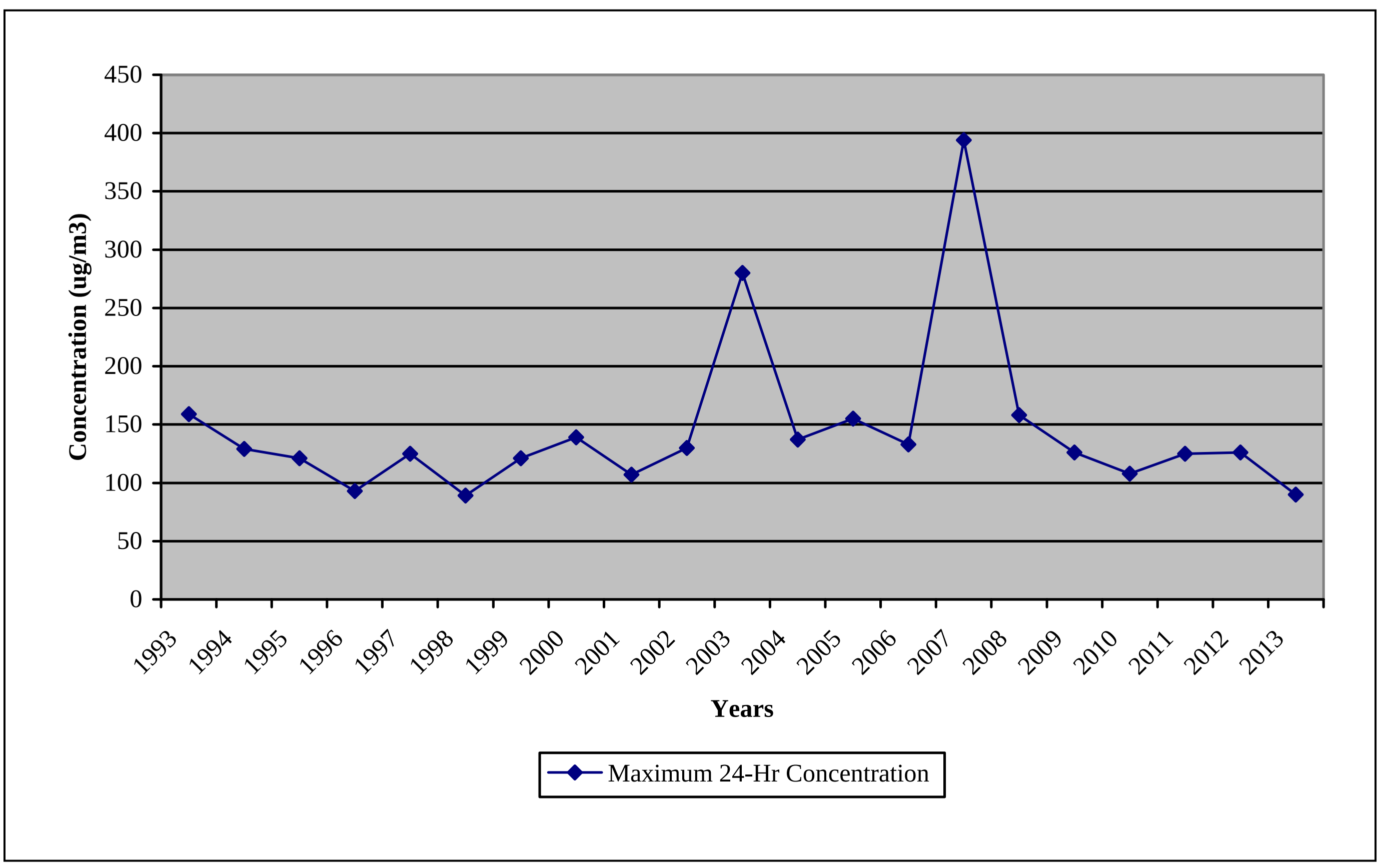
Due to the firestorms of 2003 and 2007, the annual averages exceeded the National 24-Hr standard for those years. The firestorms are considered exceptional events, and they do not have a lasting impact in the SDAB. Exceptional events are tallied in the accounting for attainment/non-attainment status. Even with the last two firestorms, the County still qualifies for attainment status.

There is a substantial amount of variability from year-to-year in the 24-Hr statistics. This variability is a reflection of the meteorology, sporadic nature of events such as wildfires, and changes in monitoring locations. Note that the "Days above the National 24-Hr Standard" row in Table 10.1 and Figure 10.2 reflect the PM_{10} standard for that year.

Table 10.1 PM_{10} Summary of Concentrations for the Last 20 Years

Maximum 24-Hr Concentration (µg/m^3)	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
	129	121	93	125	89	121	139	107	130	280	137	155	133	394	158	126	108	125	126	90	
Days above the National Standard (#)	0	0	0	0	0	0	0	0	0	1	0	1	0	2	1	0	0	0	0	0	

Figure 10.2 PM_{10} Concentrations, 1994-2014



Section 10.1.1 PM_{10} Measurements at STD Conditions by Site, 2010-2014

All data from the PM_{10} samplers are reported in standard (STD) conditions, as shown in Table 10.2a. The PM_{10} (Lo-Vol) sampler presents the data in Local Conditions (LC) and must be converted to STD conditions. Figure 10.3 shows these graphically.

Table 10.2a PM_{10} Measurements at STD Conditions by Site, 2010-2014

Site (name)		Maximum Concentration for 24-Hr (STD) (ppm)					Annual Average (STD) (ppm)				
		2010	2011	2010	2011	2012	2010	2011	2012	2013	2014
El Cajon	ECA & FSD										
Escondido	ESC										
San Diego-Beardsley	DTN										
Kearny Villa Rd	KVR										
Chula Vista	CVA										
Donovan	DVN										

Figure 10.3 PM_{10} Measurements at STD Conditions by Site, 2010-2014

Section 10.1.2 PM_{10} Measurements at Local Conditions by Site

Table 10.2b lists the data in LC. Note the NAAQS is written for STD conditions; therefore, the concentrations calculated to LC conditions are not comparable to the NAAQS. Figure 10.4 shows these graphically.

Table 10.2b PM_{10} Measurements at Local Conditions by Site, 2010-2014

Site (name)		Maximum Concentration for 24-Hr (LC) (ppm)					Annual Average (LC) (ppm)				
		2010	2011	2010	2011	2012	2010	2011	2012	2013	2014
El Cajon	ECA										
Escondido	ESC										
San Diego-Beardsley	DTN										
Kearny Villa Rd	KVR										
Chula Vista	CVA										
Donovan	DVN										

Figure 10.3 PM_{10} Measurements at LC Conditions by Site, 2010-2014

Section 10.2.0 PM_{10} Federal Design Criteria

The Federal requirements for the number of monitors for PM_{10} are described in the 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 4.6 "Particulate Matter (PM_{10}) Design Criteria".

Section 10.2.1 PM_{10} Design Criteria

Subsection 4.6 in 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 4.6 "Particulate Matter (PM_{10}) Design Criteria" lists the requirements needed to fulfill the PM_{10} Design Criteria for sequential samplers, from *Table D-4*. Tables 10.3a-10.3c list these requirements.

Table 10.3a Daily (24-Hr) Design Value, 2014

High Concentration Is the 24-Hr Design Value ≥ 120% of the NAAQS? (yes/no)	Medium Concentration Is the 24-Hr Design Value > 80% of the NAAQS? (yes/no)	Low Concentration Is the 24-Hr Design Value < 80% of the NAAQS? (yes/no)	Does the 24-Hr Design Value meet the NAAQS? (yes/no)

Table 10.3b PM_{10} Design Criteria for the Minimum Number of Samplers Required

MSA (name)	County (name)	2014 Population from 2010 Census (#)	Minimum Number of Sequential Samplers Required (#)	Number of Active Sequential Samplers (#)	Number of Sequential Samplers Needed (#)
San Diego	San Diego	3.2 million	2 – 4 (Low Concentration)	6*	None

The El Cajon (ECA) sampler is a Lo-Vol.

Table 10.3c PM_{10} Site of Expected Maximum Concentration

Site of Expected Maximum Concentration (name)	Site of Expected Maximum Concentration AQS ID (#)
Donovan	06-073-1014

Section 10.3.0 PM_{10} Sampler and Station Summary

The EPA does not have Network Assessment tools available for PM_{10} samplers and station comparison. The District used other means to ascertain the viability of the PM_{10} samplers. Table 10.4 is a summary of the multilayered approach for evaluating PM_{10} samplers and stations.

Table 10.4 PM_{10} Samplers Summary Rating

	Overall Scoring	COMMENTS	1.Total Monitors	2. Community Type	3.QA/QC Needs	4.Other
Chula Vista (CVA)	**34**	**1:** n/a **2:** Mixed use **3:** PM_{10} collocation site; has sequential $PM_{2.5}$ **4:** High asthma; deck upgrade	7	7	10	10
Otay Mesa-Donovan (DVN)	**33**	**1:** n/a **2:** Industrial becoming mixed use **3:** Expected maximum concentration site; has collocated continuous $PM_{2.5}$ **4:** Border crossing; recently moved	6	7	10	10
El Cajon (ECA)	**44**	**1:** n/a **2:** Light Industrial/mixed use **3:** Required for PMcoarse **4:** Recently moved	17	7	10	10
Escondido (ESC)	**32**	**1**: n/a **2:** Light Industrial/mixed use **3:** Has collocated continuous & sequential $PM_{2.5}$ **4:** In a borderline EJ area	9	9	6	8
San Diego-Beardsley (DTN)	**26**	**1:** n/a **2:** Heavy Industrial/mixed use **3:** Has collocated continuous & sequential $PM_{2.5}$ **4:** EJ site; Heavy Industrial; a high concentration site	10	10	6	10
Kearny Villa Rd. (KVR)	**24**	**1:** n/a **2:** Mixed use **3:** Has collocated sequential $PM_{2.5}$ **4:** Recently moved; a high concentration site	4	5	6	9

Section 10.3.1 PM_{10} Sampler and Station Evaluation Explanation

The District is required to operate 2-6 PM_{10} samplers. The District is required to operate the PM_{10} (Lo-Vol) sampler at the NCore station in El Cajon and the PM_{10} sampler at Donovan, because it represents the site of expected maximum concentration.

Below is a recommendation for the PM_{10} network:

1. KVR has a low ranking; investigate for decommissioning.
2. DTN has a low ranking; investigate for decommissioning.
3. ESC routinely has a high maximum concentration; therefore, the sampler should not be decommissioned.
4. CVA has a history of both a low annual average and low maximum concentration. This location is also the QA-collocation site. The primary sampler should be investigated for decommissioning, and the collocated sampler could then be relocated elsewhere.

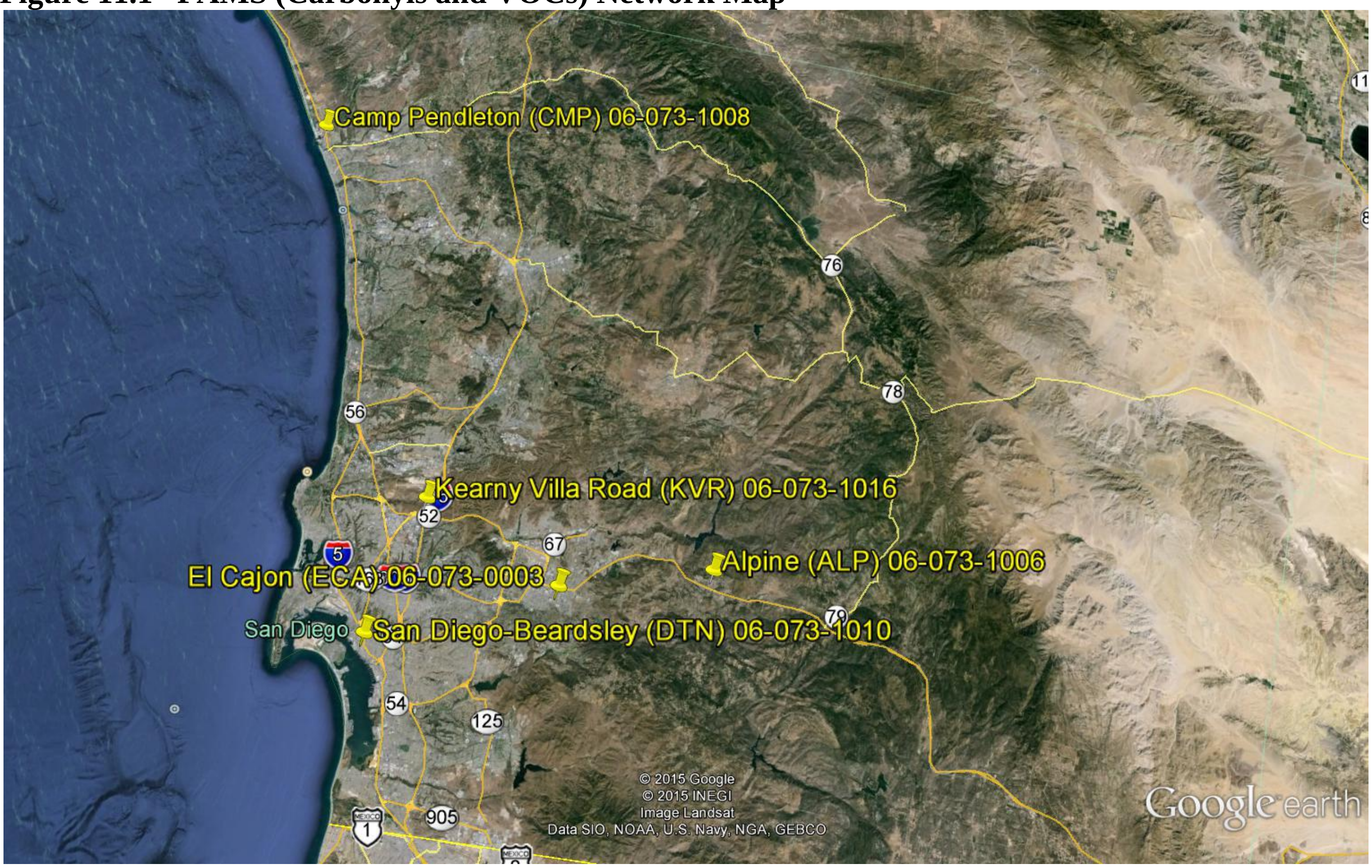
Chapter 11 Photochemical Assessment Monitoring Stations (PAMS)

Section 11.0.0 PAMS Monitor and Station Introduction

PAMS and PAMS-related sampling was conducted at four sites (see Figure 11.1). KVR is a PAMS-Carbonyl site, but due to irreparable failure of the sampler in late 2011, sampling there was halted. As of yet, there are no NAAQS standards to compare the data. Please note:

- The El Cajon station was temporarily relocated to the Gillespie Field area off of Floyd Smith Drive; this station is called Floyd Smith Drive (FSD).
- PAMS-VOC data are collected at CMP, ALP, and ECA.
- PAMS-Carbonyl data are collected at KVR and ECA.
- Unofficial PAMS-Carbonyl data are collected at DTN.

Figure 11.1 PAMS (Carbonyls and VOCs) Network Map



The range of compounds for the PAMS program is in excess of 50 different possible ozone precursors and other compounds (see Tables 11.1a and 11.1b). The toxicity is gauged by risk factors instead of limits.

The reported concentrations reflect a mix of the station move listed above. Because the Floyd Smith Drive relocation is temporary, the maps and table parameters reflect the permanent site metadata (labeled as ECA).

Table 11.1a PAMS VOC Parameter Codes

Compound	Parameter
Ethylene	43203
Acetylene	43206
Ethane	43202
Propylene	43205
Propane	43204
Isobutane	43214
Isobutylene	43270
1-Butene	43280
n-Butane	43212
trans-2-Butene	43216
cis-2-Butene	43217
Isopentane	43221
1-Pentene	43224
n-Pentane	43220
Isoprene	43243
Trans-2-pentene	43226
cis-2-Pentene	43227
2.2-Dimethylbutane	43244
Cyclopentane	43242
2.3-Cimethylbutane	43284
2-Methylpentane	43285
3-Methylpentane	43230
1-Hexene	43245
n-Hexane	43231
Methylcyclopentane	43262
2.4-Dimethylpentane	43247
Benzene	45201
cyclohexane	43248
2-Methylhexane	43263
2.3-Dimethylpentane	43291

Compound	Parameter
3-Methylhexane	43249
2.2.4-Trimethylpentane	43250
n-Heptane	43232
Methylcyclohexane	43261
2.3.4-Trimethylpentane	43252
Toluene	45202
2-Methylheptane	43960
3-Methylheptane	43253
n-Octane	43233
Ethylbenzene	45203
m-Xylene	45205
p-Xylene	45206
Styrene	45220
o-Xylene	45204
n-Nonane	43235
Isopropylbenzene	45210
n-Propylbenzene	45209
1-Ethyl 3-methylbenzene	45212
1-Ethyl 4-methylbenzene	45213
1.3.5-Trimethylbenzene	45207
1-Ethyl 2-methylbenzene	45211
1.2.4-Trimethylbenzene	45208
n-Decane	43238
1.2.3-Trimethylbenzene	45225
m-Diethylbenzene	45218
p-Diethylbenzene	45219
Undecane	43954
Total PAMS	43000
Total NMOC	43102

Table 11.1b PAMS Carbonyls Parameter Codes

Compound	Parameter
Formaldehyde	43502
Acetaldehyde	43503
Acetone	43551

Section 11.1.0 PAMS Monitor and Station Summary

The EPA does not have Network Assessment tools available for PAMS-VOC or PAMS-Carbonyl sampler and station comparison. The District used other means to ascertain the viability of the PAMS sites. Additionally, the EPA will re-engineer the PAMS-VOC program to be mandatory at NCore locations and subjective at non-NCore locations in the SDAB. Table 11.3 is a summary of the multilayered approach for evaluating PAMS-VOC samplers and stations.

Table 11.2 PAMS-VOC Sampler Summary Rating

	Overall Scoring	**COMMENTS**	**1.** PAMS Designation	**2.** Community Type	**3.** Ozone	**4.**Other
El Cajon (ECA)	**30**	**1:** PAMS II **2:** Light Industrial/mixed use **3:** Routinely tied for 2nd highest with ESC **4:** Required for NCore; recently moved	6	7	7	10
Alpine (ALP)	**32**	**1:** PAMS III **2:** Bedroom **3:** Ozone Design Value site **4:** Downwind and elevated from ECA	8	9	10	5
Camp Pendleton (CMP)	**33**	**1:** PAMS I **2:** Bedroom **3:** Routinely 3rd or 4th highest in the County **4:** Records transport from the South Coast Air Basin	7	10	8	8

Section 11.1.1 PAMS-VOC Samplers and Station Evaluation Explanation

The District recommends retaining PAMS-VOC samplers/analysis at the Camp Pendleton location (PAMS VOC will be required at ECA), once the EPA re-engineers the program.

Section 11.2.0 PAMS-Carbonyls Samplers Summary

Formaldehyde is the number one cancer driver in the United States. According to the EPA NATA database, formaldehyde is pervasive throughout the County. The District monitors for formaldehyde are in the PAMS-Carbonyl program. The EPA recognizes the need for monitoring formaldehyde more closely and will re-engineer the PAMS-Carbonyl program after the new PAMS-VOC requirements have been implemented. Because formaldehyde has such a deleterious effect on human health, the District has expanded the Carbonyl network to include the DTN station (and the DVN station by January 1, 2016) without federal funding. Table 11.4 is a summary of the multilayered approach for evaluating PAMS-Carbonyls samplers and stations.

Table 11.3 PAMS-Carbonyl Sampler Summary Rating

	Overall Scoring	COMMENTS	1. PAMS Designation	2. Community Type	3. NATA	4.Other
El Cajon (ECA)	**30**	**1:** PAMS II **2:** Light Industrial/mixed use **3:** Formaldehyde is the highest pollutant contribution at 46% **4:** Collocated with VOC	6	7	6	10
Kearny Villa Rd. (KVR)	**31**	**1:** PAMS III **2:** Bedroom **3:** Formaldehyde is the highest pollutant contribution at 49% **4:** Augments ECA	8	9	8	6
San Diego-Beardsley (DTN)	**24**	**1:** Unofficial PAMS, so no designation **2:** Heavy Industrial/mixed use **3:** Formaldehyde is the highest pollutant contribution at 41% **4:** EJ area; across from Near-road site	n/a	10	4	10
Otay Mesa-Donovan (DVN)	**28**	**1:** Unofficial PAMS, so no designation **2:** Heavy Industrial/becoming mixed use **3:** Formaldehyde is the highest pollutant contribution at 50% **4:** Border crossing	n/a	8	10	10
San Ysidro (SAY)	**24**	**1:** Unofficial PAMS, so no designation **2:** Mixed use **3:** Formaldehyde is the highest pollutant contribution at 41% **4:** Border crossing	n/a	10	4	10
Rancho Carmel Drive (RCD)	**27**	**1:** n/a **2:** Bedroom community **3:** Formaldehyde is the highest pollutant contribution at 49% **4:** 1st Near-road site	n/a	8	9	10
Escondido (ESC)	**25**	**1:** Unofficial PAMS, so no designation **2:** Mixed use with light industry **3:** Formaldehyde is the highest pollutant contribution at 45% **4:** Closest to 1st Near-road site	n/a	10	5	10
Newton Ave (NTA)	**23**	**1:** Unofficial PAMS, so no designation **2:** Heavy Industrial/mixed use **3:** Formaldehyde is the highest pollutant contribution at 40% **4:** 2nd Near-road site (projected site-not in place)	n/a	10	3	10

Section 11.2.1 PAMS-Carbonyls Samplers and Station Evaluation Explanation

The District recommends retaining PAMS-VOC samplers/analysis at the Camp Pendleton location (PAMS VOC will be required at ECA), once the EPA re-engineers the program.

If staffing is sufficient, the District will seek additional funding to expand the Carbonyl network. It will include sampling for formaldehyde at the two near-road locations and the ambient air monitoring stations closest to the near-road stations. If a permanent air monitoring station is established in the San Ysidro border crossing area, formaldehyde sampling is recommended for this location as well.

Chapter 12 Toxics Program

Section 12.0.0 Toxics Introduction

Toxics-related sampling was conducted at five sites: three SDAPCD sites and two CARB sites (Figure 12.1). As of yet, there are no NAAQS standards which to compare the data. Please note:

- The El Cajon station was temporarily relocated to the Gillespie Field area off of Floyd Smith Drive; this station is called Floyd Smith Drive (FSD).
- The Otay Mesa (OTM) station was permanently relocated to the Donovan State Prison area; this station is called Donovan (DVN).
- Toxics-VOC data were collected at DVN, DTN, and ESC.
- Toxics-Metals data were collected at DTN and DVN.
- Toxics-Metals, VOC, and Carbonyls data were collected at ECA and CVA for the CARB CA-TAC program.

Figure 12.1 Toxics Network Map

The reported concentrations reflect a mix of the two station moves listed above. Because the Donovan relocation is permanent, the maps and table parameters reflect the new site metadata (labeled as DVN). Because the Floyd Smith Drive relocation is temporary, the maps and table parameters reflect the permanent site metadata (labeled as ECA).

The range of defined compounds for the Toxics program is in excess of 100 different possible carcinogenic, irritant, and mutagenic chemicals. Their toxicities are gauged by risk factors rather than limits. The VOC analyzed compounds are in Table 12.1. Currently, Toxic-Metals are collected but not analyzed (analysis is projected to start by July 1, 2016).

Table 12.1 Toxics VOCs Parameters Codes

Compound	*Parameter*	*Compound*	*Parameter*
Dichlorodifluoromethane	43823	Toluene	45202
Chloromethane	43801	1,2-Dibromoethane	43843
4-Methyl-2-pentanone (MIBK)	43560	2-Methoxy-2-methylpropane	43372
Vinyl Chloride	43860	Chlorobenzene	45801
1,3-Butadiene	43218	Ethylbenzene	45203
Bromomethane	43819	m,p-Xylene	45109
Chloroethane	43812	Tetrachloroethene	43817
Trichlorofluoromethane	43811	1,1,2-Trichloroethane	43820
Acrolein	43505	Benzene	45201
Acetone	43551	1,1,1-Trichloroethane	43814
2-Methyl-1,3-butadiene	43243	Carbon Tetrachloride	43804
1,1-Dichloroethene	43826	cis-1,3-Dichloropropene	43831
Acrylonitrile	43704	1,2-Dichloroethane	43815
Methylene Chloride	43802	Trichloroethene	43824
Trichlorotrifluoroethane	43207	cis-1,2-Dichloroethene	43839
trans-1,2-Dichloroethene	43838	Chloroform	43803
1,1,2,2-Tetrachloroethane	43818	Naphthalene	45850
1,1-Dichloroethane	43813	1,2-Dichloropropane	43829
2-Butanone	43552	Chlorobenzene	45801
Bromoform	43806	trans-1,3-Dichloropropene	43830
Styrene	45220	Acetonitrile	43702
o-Xylene	45204	Vinyl acetate	43447
4-Ethyltoluene	45213	n-Hexane	43231
1,3,5-Trimethylbenzene	45207	Ethyl acetate	43209
1,2,4-Trimethylbenzene	45208	Methyl methacrylate	43441
1,3-Dichlorobenzene	45806	Dichlorotetrafluoroethane	43208
1,4-Dichlorobenzene	45807	Benzyl chloride	45809
1,2-Dichlorobenzene	45805	Hexachlorobutadiene	43844
1,2,4-Trichlorobenzene	45810		

Section 12.1.0 Toxics Monitors and Station Evaluation, Summary

The EPA does not have Network Assessment tools available for Toxic-VOC or Toxic-Metals sampler and station comparison. The District used other means to ascertain the viability of the Toxics sites. The District will not evaluate CARB Toxics sites. Table 12.2 is a summary of the Toxics-VOC findings.

Table 12.2 Toxic-VOC Sampler Summary Rating

	Overall Scoring	**COMMENTS**	**1.** Community Need	**2.** Community Type	**3.** NATA	**4.**Other
Escondido (ESC)	**33**	**1:** Downwind of agriculture fields **2:** Mixed use with light industry **3:** Average total risk: 68 million **4:** Closest to 1st Near-road site; northern most site	8	10	7	8
San Diego-Beardsley (DTN)	**40**	**1:** Requested by the community **2:** Heavy Industrial/mixed use **3:** Average total risk: 97 million **4:** EJ area; across from Near-road site	10	10	10	10
Otay Mesa-Donovan (DVN)	**32**	**1:** 2nd fastest growing area **2:** Heavy Industrial/becoming mixed use **3:** Average total risk: 64 million **4:** Downwind of San Ysidro and Otay border crossings	8	8	6	10
San Ysidro (SAY)	**43**	**1:** Requested by the community **2:** Mixed use **3:** Average total risk: 70 million **4:** Border crossing	8	10	7	8
Rancho Carmel Drive (RCD)	**30**	**1:** Highest trafficked area in the County **2:** Bedroom community **3:** Average total risk: 62 million **4:** 1st Near-road site	6	8	6	10
Newton Ave (NTA)	**36**	**1:** Requested by the community **2:** Heavy Industrial/mixed use **3:** Average total risk: 91 million **4:** 2nd Near-road site (projected site-not in place)	8	10	8	10

Average total risk is defined as a risk level of 1 in a million implies a likelihood that up to one person, out of one million equally exposed people would contract cancer if exposed continuously (24 hours per day) to the specific concentration over 70 years (an assumed lifetime). This risk would be an excess cancer risk that is in addition to any cancer risk borne by a person not exposed to these air toxics. Note that this assessment looks at lifetime cancer risks, which should not be confused with or compared to annual cancer risk estimates. If you would like to compare an annual cancer risk estimate with the results in this assessment, you would need to multiply that annual estimate by a factor of 70 or alternatively divide the lifetime risk by a factor of 70

Section 12.1.1 Toxic-VOC Samplers and Station Evaluation Explanation

The District recommends retaining all Toxic-VOC sampling locations. Once the EPA re-engineers the PAMS-VOC program and there is sufficient staffing, the District will seek funding to expand the network to include the two Near-road locations and San Ysidro (if a permanent air monitoring station is sited near the border crossing).

Section 12.1.2 Toxic-Metals Samplers and Station Summary

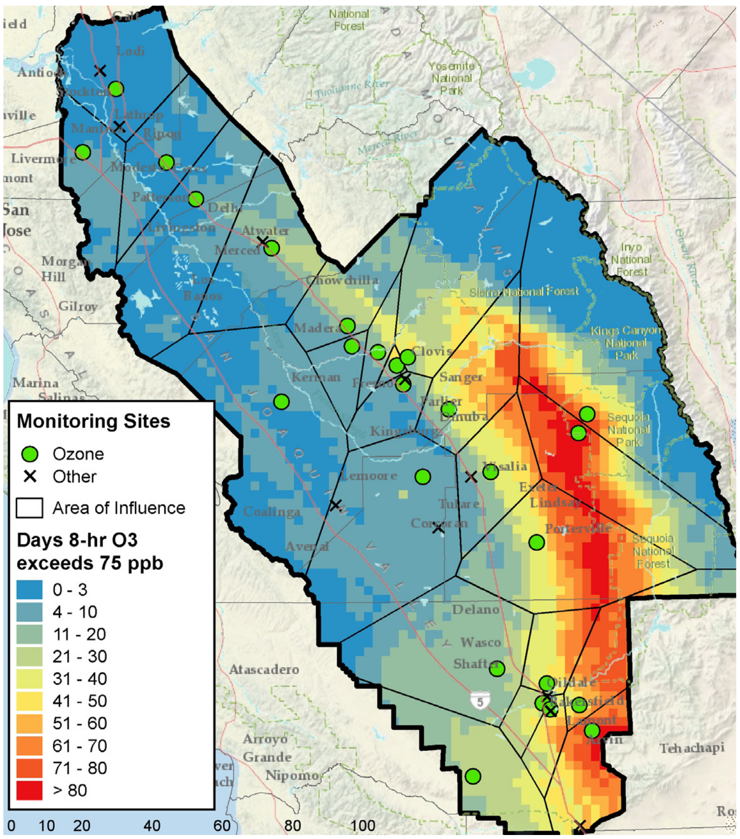
The District recommends retaining all Toxic-Metals sampling locations. Currently, Metals are collected but not analyzed. The program is projected to begin analysis by July 1, 2016. Once Metals analysis is established, the backlog of stored filters will be undertaken. Until this backlogged is relieved, no additional stations are recommended. Table 12.3 is a summary of the scoring for the Toxics-Metals program.

Table 12.3 Toxic-Metals Sampler Summary Rating

	Overall Scoring	**COMMENTS**	**1.** Community Need	**2.** Community Type	**3.** NATA	**4.**Other
Escondido (ESC)	**33**	**1:** Downwind of agriculture fields **2:** Mixed use with light industry **3:** Average total risk: 68 million **4:** Closest to 1st Near-road site; northern most site	8	10	7	8
San Diego-Beardsley (DTN)	**40**	**1:** Requested by the community **2:** Heavy Industrial/mixed use **3:** Average total risk: 97 million **4:** EJ area; across from 2nd Near-road site	10	10	10	10
Otay Mesa-Donovan (DVN)	**32**	**1:** 2nd fastest growing area **2:** Heavy Industrial/becoming mixed use **3:** Average total risk: 64 million **4:** Downwind of San Ysidro and Otay border crossings	8	8	6	10

San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

2015 Air Monitoring Network Assessment



San Joaquin Valley Air Pollution Control District

2015 Air Monitoring Network Assessment

September 17, 2015

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1 INTRODUCTION

The U.S. Environmental Protection Agency (EPA) drafted the National Ambient Air Monitoring Strategy (NAAMS), with the purpose of optimizing U.S. air monitoring networks to achieve (with limited resources) the best possible scientific value while continuing to protect public and environmental health. An important element of NAAMS is a plan for periodic network assessments at national, regional, and local levels. A network assessment includes (1) evaluation of air monitoring objectives and budget, (2) evaluation of a monitoring network's effectiveness and efficiency relative to its objectives and cost, and (3) recommendations for network reconfigurations and improvements. Per 40 CFR Part 58 Subpart B, Section 58.10, EPA expects that a multi-level network assessment will be conducted every five years, beginning in 2010. This report satisfies the network assessment requirement for the year 2015 (U.S. Environmental Protection Agency, 2005, 2006).

1.1 BACKGROUND

Ambient air monitoring objectives and demographic characteristics change over time, thus motivating air quality agencies to re-evaluate and reconfigure their monitoring networks. Several factors have prompted the changes in air monitoring objectives: improvement in air quality, changes in population distribution and behaviors, changes in air quality mandates, and advancements in the scientific understanding of air quality phenomena. As a result of these changes, air monitoring networks in some regions may have unnecessary, redundant, or ineffective monitoring locations for some pollutants, while other regions may lack necessary monitors altogether.

Changes in $PM_{2.5}$ and ozone National Ambient Air Quality Standards (NAAQS) and other air monitoring objectives are motivating air quality agencies to refocus their monitoring resources on pollutants of emerging interest or persistent challenge, such as particulate matter less than 2.5 microns ($PM_{2.5}$), ground-level ozone and precursor compounds, and air toxics. In addition, agencies are interested in designing networks to protect today's population and environment while maintaining a focus on long-term air quality trends. Moreover, agencies are using new air monitoring technologies and developing an improved scientific understanding of air quality issues.

Monitoring networks should be designed and configured to address multiple, interrelated air quality issues (i.e., a multipollutant approach) and to support other types of air quality studies (e.g., photochemical modeling and emission inventory assessments). Reconfiguring air monitoring networks to help meet the needs of current air quality research will enhance the network's value to stakeholders, scientists, and the general public. Performing an air monitoring network assessment involves re-evaluation of a network's effectiveness and efficiency relative to its objectives and costs, and making recommendations for network reconfigurations and improvements.

1.2 NETWORK ASSESSMENT OBJECTIVES

The San Joaquin Valley (SJV) is an area with rich agricultural resources, abundant industry, and a growing population. The San Joaquin Valley Air Pollution Control District

(District) seeks to ensure that its monitoring network is (1) capable of effectively characterizing air quality and meteorology in the region and (2) meeting its monitoring objectives. The objectives of the District's air monitoring network are to assure compliance with NAAQS, determine control strategy effectiveness, support air quality forecasting, provide information that helps inform the public of air quality conditions and potential public health risks, and support air quality modeling.

The objectives of this network assessment are to identify and recommend adjustments to the District's criteria pollutants, Photochemical Assessment Monitoring Stations (PAMS), and meteorological monitoring network that may be needed to address air quality improvements, emissions reductions, population increases, and the five-year network assessment requirements set forth by the EPA. These requirements address questions as to whether sites are appropriately located to accomplish the following:

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

Additionally, a network assessment can identify potentially redundant sites, areas where new sites may be needed, and evaluate new technologies that may add value to the air monitoring network.

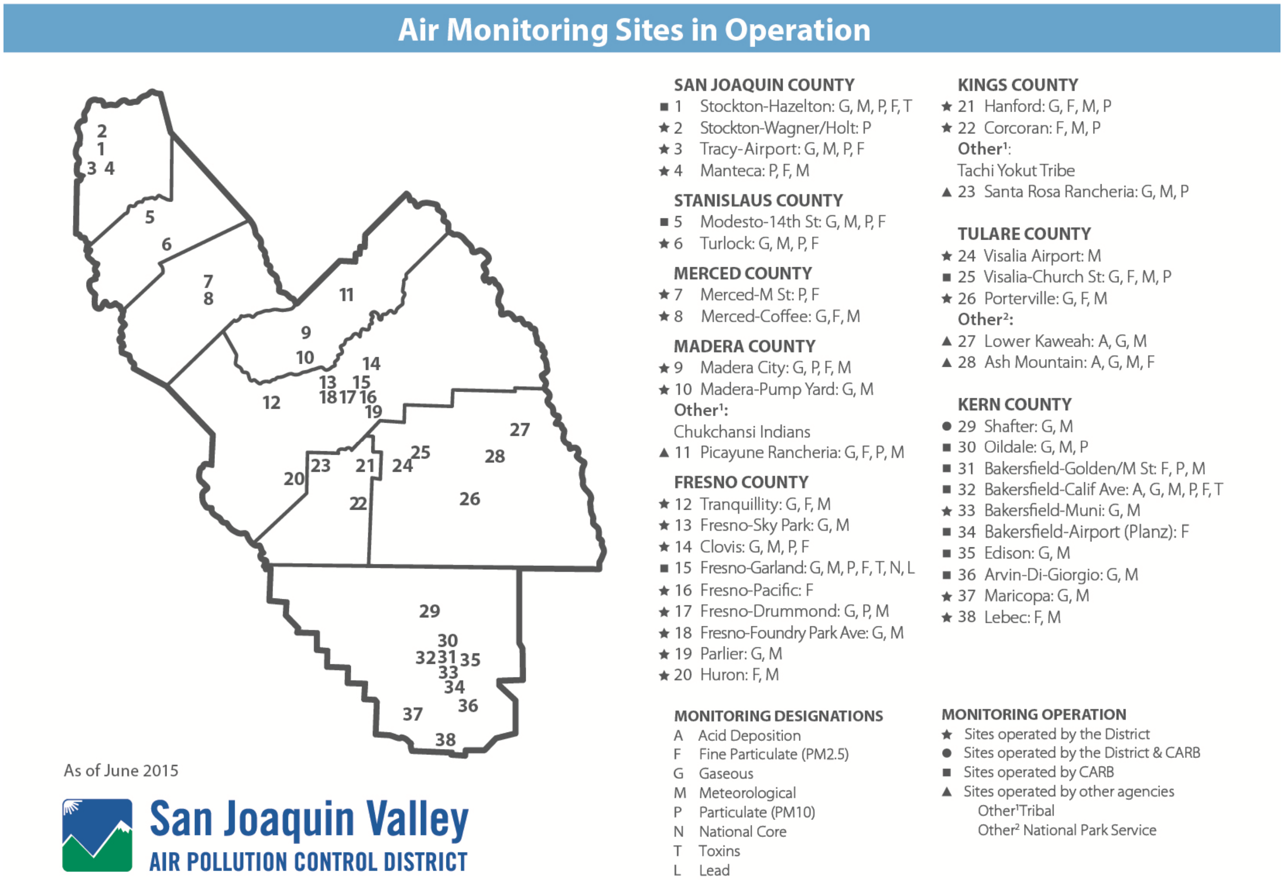
1.3 NETWORK OVERVIEW

The San Joaquin Valley covers an area of 23,490 square miles, and is home to one of the most challenging air quality problems in the nation. The Valley is designated nonattainment for federal PM2.5 and ozone standards, and is in attainment of the federal standards for lead (Pb), Nitrogen dioxide (NO_2), Sulfur dioxide (SO_2), and Carbon monoxide (CO). In addition, the Valley is an attainment/maintenance area for PM10. The Valley is home to approximately 4 million residents, and includes several major metropolitan areas, vast expanses of agricultural land, industrial sources, highways, and schools. To address the air quality needs of this expansive and diverse region, the District maintains a robust air monitoring program that meets federal requirements while providing vital information to the public.

The District's air monitoring network is a rich network that measures a variety of pollutants and has a long record of criteria pollutant data. Figure 1-1 is a map of the District's air monitoring network and the general network assessment study domain. In addition to the sites operated by the District, several other sites located in the SJV are operated by other jurisdictions (i.e., the California Air Resources Board – CARB, Tribal, and National Park Service). The map in Figure 1-1 below depicts the sites operated within the Valley as of

June 2015. Please note that the Picayune Rancheria tribal site is temporarily not operating as of 2015.

Figure 1-1. Map of Air Monitoring Sites Located in the San Joaquin Valley



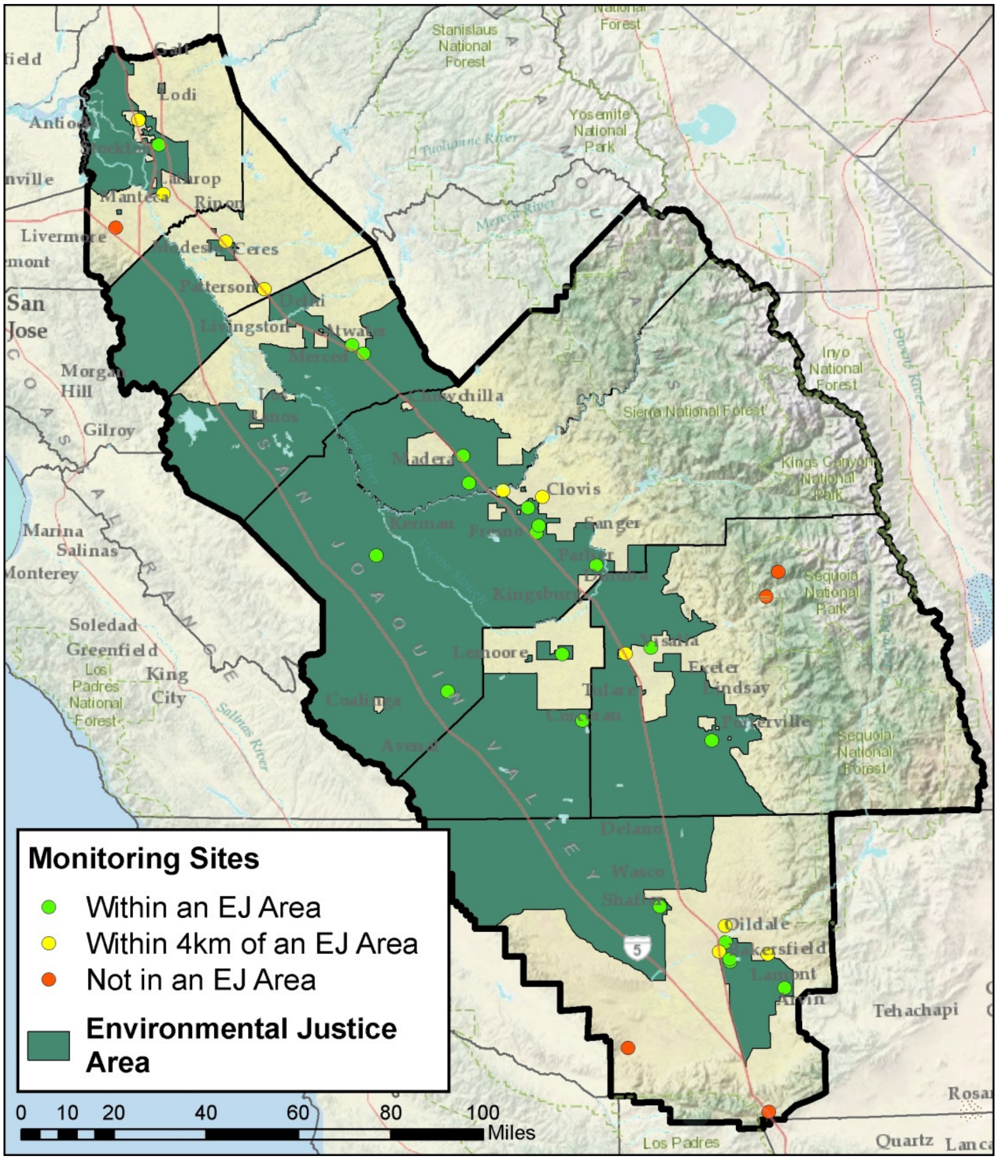
Environmental Justice Areas

The District has developed the Environmental Justice Strategy to identify and address any gaps in existing programs, policies and activities that may impede the achievement of environmental justice. This strategy is described in more detail at:

http://valleyair.org/Programs/EnvironmentalJustice/Amended%20EJ%20Strategy_June%202012.pdf

Figure 1-2 shows that a majority of the San Joaquin Valley air monitoring sites are within 4 km of an Environmental Justice designated area. The Tracy, Lebec, Maricopa, Sequoia – Lower Kaweah, and Sequoia – Ash Mountain air monitoring sites reside outside of Environmental Justice areas. 4 of the 5 sites listed above (excluding Maricopa) are placed in areas to either address transport between air basins or local residents special air qualty needs.

Figure 1-2. Proximity of San Joaquin Valley Air Monitoring Sites to Environmental Justice Areas



1.4 GUIDE TO THIS REPORT

The following sections of this report detail the analysis approach, findings, and recommendations from this network assessment. Section 2 includes a discussion of the technical approach and findings of the air monitoring network assessment. The technical approach and findings of the meteorological network assessment are discussed in Section 3.

2 TECHNICAL APPROACH AND FINDINGS OF THE AIR MONITORING NETWORK ASSESSMENT

The overall technical approach for conducting the network assessment of the District's criteria pollutant, PAMS, and meteorological monitoring network was divided into two main tasks: (1) performing the air monitoring network assessment and (2) performing the meteorological network assessment. The results of the air monitoring and meteorological analyses were first viewed independently and then synthesized and viewed holistically.

Table 2-1 lists the network assessment analyses that were used to address the monitoring objectives (as discussed in Section 1.2) and the following questions:

- Which sites provide the most value in terms of the number of pollutants measured, the length of data record, and data quality?
- Are sites appropriately located to determine the highest pollutant concentrations expected to occur in the area covered by the network?
- Are sites appropriately located to measure typical pollutant concentrations in areas of high population density?
- Are sites appropriately located to determine the impact of significant sources or source categories on air quality?
- Are sites appropriately located to determine general background concentration levels?
- Are sites appropriately located to determine the extent of regional pollutant transport among populated areas?
- Are sites appropriately located to measure air pollution impacts on visibility, vegetation damage, or other welfare-based impacts and to support secondary standards?
- Are there potentially redundant sites in the network?
- Are there areas where new sites may be needed?
- Are there new technologies that may add value to the air monitoring network?

The analyses listed in Table 2-1 are a subset of the analysis methods prescribed in the EPA's *Ambient Air Monitoring Network Assessment Guidance Document* (Raffuse et al., 2007).

Table 2-1. Summary of the Analyses Performed and the Monitoring Objectives or Questions Addressed

Objective or Question	Site-by-Site Analyses							Bottom-up Analyses		
	Data Above the Method Detection Limit (MDL)	Number of Parameters Measured	Length of Trend Record	Measured Concentrations	Deviation from NAAQS	Wind Rose Analyses	Correlation Analyses	Area-Served	Population Density/ Population Served/ Population Change	Emissions Served
Which sites provide the most value in terms of the number of pollutants measured, the length of data record, and data quality?	X	X	X							
Are sites appropriately located to determine the highest pollutant concentrations expected to occur in the area covered by the network?				X	X			X	X	
Are sites appropriately located to measure typical pollutant concentrations in areas of high population density?		X						X	X	
Are sites appropriately located to determine the impact of significant sources or source categories on air quality?										X
Are sites appropriately located to determine general background concentration levels?				X				X	X	X
Are sites appropriately located to determine the extent of regional pollutant transport among populated areas?				X				X	X	
Are sites appropriately located to measure air pollution impacts on visibility, vegetation damage, or other welfare-based impacts and to support secondary standards?								X		
Are there potentially redundant sites in the network?							X	X	X	
Are there areas where new sites may be needed?								X	X	X
Is the meteorological network adequate for characterizing regional surface and upper-air meteorology?		X				X	X			

A network assessment comprises several analysis methods that address specific objectives. The remainder of this section presents a summary of assessment recommendations (Section 2.1), a discussion of the technical approach and findings for the site-by-site and bottom-up analyses for the criteria pollutant network (Sections 2.2-2.4), and a discussion of the PAMS network (Section 2.5).

2.1 AIR MONITORING NETWORK ASSESSMENT AND RECOMMENDATIONS

The conclusions drawn from the monitoring network assessment are listed below. Methods, results, and discussions of these recommendations are provided in the assessment that follows.

Criteria Pollutants

- The current network accurately represents populated areas impacted by $PM_{2.5}$ and ozone pollution and meets regulatory requirements.
- Method Detection Limit (MDL) and data completion analyses reveal that the current criteria pollutant network sufficiently and accurately monitors criteria pollutants in the District.
- Tracy, Turlock, Madera-City, and Fresno–Drummond sites are the most valuable District operated sites for determining $PM_{2.5}$ and ozone NAAQS attainment.
- CARB-operated sites are important to monitoring Valley pollution. The District should implement comparable measurements at or near any discontinued CARB site in the future.
- Area- and population-served analyses of $PM_{2.5}$ and ozone monitoring networks prove that there are no redundant monitors.
- Population-served analysis indicates that the majority of District monitors are either in or within 4 km of Environmental Justice areas.
- There are some locations in the Valley, particularly the westside of Fresno and Kern Counties and the foothill region of Fresno and Madera Counties, which might benefit from additional PM2.5 and ozone monitoring if feasible in the future.
- Emissions-served analysis supports the addition of near-road nitrogen dioxide (NO_2) monitors along the highway 99 corridor, four of which are currently under development.
- Statistical correlation analysis among sites measuring $PM_{2.5}$ and ozone confirm the population- and emissions-served conclusions that the network is adequate.

PAMS

- Future changes to the EPA's PAMS monitoring requirements may reduce the number of PAMS sites operating in the District.
- Although MDL and data completion is low for some compounds, further analyses revealed that the current PAMS network sufficiently and accurately monitors the required compounds in the District.

- Photochemical modeling of 2007 ozone data supports that the current PAMS configuration is adequate.

Meteorology

- Statistical correlation analysis among sites measuring meteorological parameters indicates that there are no redundant monitors.
- Population-served analysis shows that the District's meteorological network is adequate.
- If feasible in the future, additional meteorological monitoring on the westside of Fresno and Kern counties and the foothill region of Fresno and Madera counties should be considered.
- There are a number of new, cost-effective and innovative technologies in upper and lower atmospheric monitoring in which the District can consider investing.

2.2 TECHNICAL APPROACH AND FINDINGS FOR THE AIR MONITORING NETWORK ASSESSMENT FOR CRITERIA POLLUTANTS

This section contains a description of the technical approach and discussion of criteria pollutant monitoring network analyses. The site-by-site analyses focus on assessing individual sites within the network and include a determination of the number of parameters monitored; the fraction of data reported; the fraction of data above the method detection limit (MDL); the measured concentrations; the deviation from NAAQS; and the length of trend record at each site. While sites operated by both the District and CARB were included in the site-by-site analyses, comments and recommendations were focused on only those sites operated by the District since the District has direct jurisdiction and the authority to implement site-specific recommendations.

2.2.1 Data Sources

The following data (and sources) were acquired and used to perform the air monitoring network assessment:

- **Air quality and PAMS data:** Air quality and PAMS data for 2013 was acquired from EPA's Air Quality System (AQS) (https://aqs.epa.gov/aqs/). The analyses in this report are based on monitored data from the year 2013 only.

- **Population data:** Spatially resolved population data (block-group polygons) were acquired from the U.S. Census Bureau for the SJV for 2010. Block-groups where converted to 1 km grid cells within a geographic information system (GIS). Since block-groups change for each decadal census, this normalization allowed population trends to be evaluated.

- **Emission Inventory data:** The most recent gridded emissions inventory was collected from CARB. Emissions are representative of a summer weekday in 2007.

2.2.2 Number of Parameters Monitored

Air quality monitoring sites with instruments that measure many pollutants and meteorological parameters are generally more valuable than sites that measure fewer parameters, assuming that the data collected are of high or similar quality. In addition, sites that measure several pollutants are generally more cost effective to operate. The District assessed and ranked each air quality and meteorological site by the number of parameters collected at each site. Figure 2-1 shows the number of parameters monitored. The height of each bar represents the total number of parameters monitored at that site. The parameters monitored at the PAMS and toxic sites are not individually counted in the chart below. Sites are ordered from left to right along the x-axis corresponding to their north to south geographic locations in the SJV.

The PAMS sites (Madera–Pump Yard, Clovis– Villa, Parlier, Bakersfield–Muni, and Shafter) are valuable sites because they measure the most parameters. Stockton-Hazelton, Fresno-Garland, and Bakersfield-California are important sites for criteria pollutants because they measure several parameters.

Figure 2-1. The Number of Parameters Monitored at Each Site

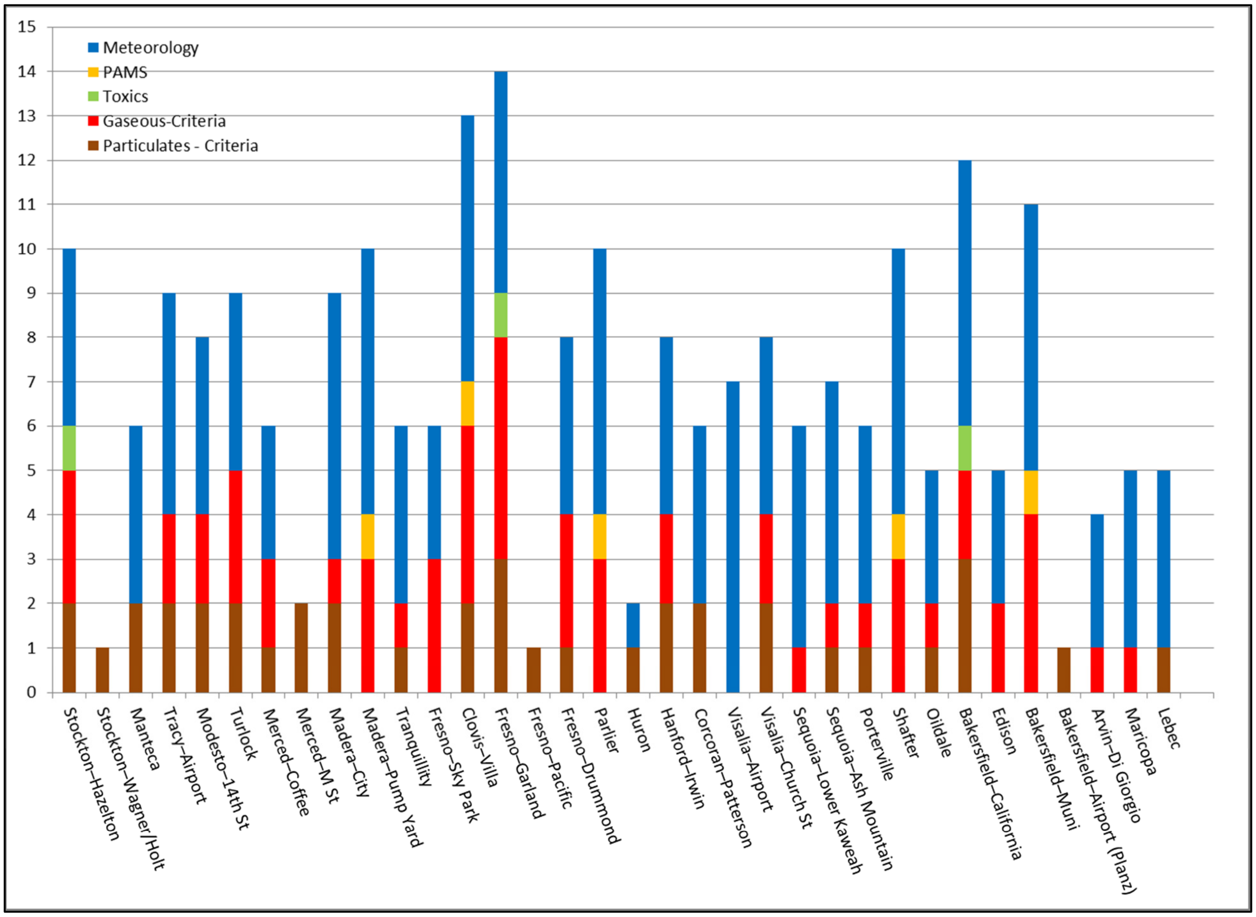
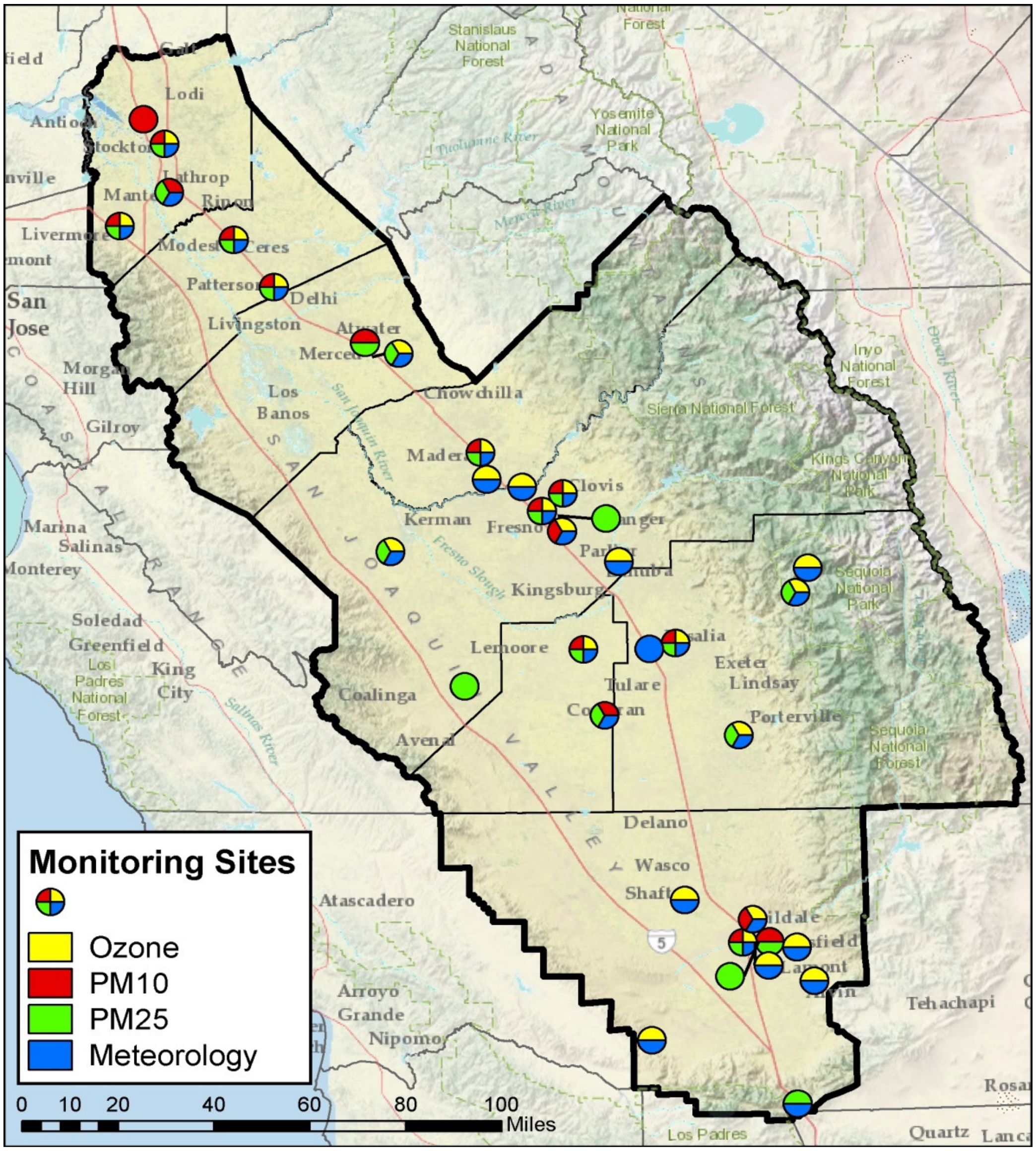


Figure 2-2 depicts the location of each monitor and the associated criteria pollutants measured (tribal monitors are not shown). Proper network analyses rely on the location of these monitoring sites relative to other monitors, nearby cities, influential geopraphic features, surrounding population, and meterology.

Figure 2-2. San Joaquin Valley Air Monitoring Sites



2.2.3 Data Completeness, Data Above MDL, Measured Concentrations, and Deviation from NAAQS Analyses

This section discusses the approach and results of several site-by-site analyses including data completeness, percent above the MDL, measured concentrations, and the deviation from the NAAQS.

Data Completeness

Sites with complete data sets are more valuable for air quality analysis and tracking than sites that have long periods of missing or invalidated data. Data completeness is a measure of the number of actual data records collected and reported at a monitoring site relative to the number of expected data records based on the sampling interval and frequency for a given parameter or pollutant. Data completeness is calculated by dividing the actual number of data records reported by the expected number of data records. The expected number of data records for a given pollutant is based on the length of monitoring season and the sampling frequency. For example, a continuous ozone monitor operating year-round would be expected to have 8,760 data records for one year of operation (1 measurement per hour x 24 hours x 365 days per year = 8,760).

Data completeness is presented as the percent of data records reported taking into account the sampling frequency. EPA recommends that data completeness of 85% is considered good for a given site, indicating that there are enough data to perform robust data analyses assuming the data are of high quality (Raffuse et al., 2007). Because of instrument calibration, data completeness will generally be 95-97% depending on how frequently an instrument is calibrated.

Percent Above the MDL

The MDL is a value at which a measured concentration is considered statistically distinguishable from zero. An assessment of the percent of data above the MDL is performed to identify the number of samples in a data set that are considered to have concentration values statistically distinguishable from zero. While samples below the MDL can be used for some purposes, such as stating that a concentration is below the MDL for comparison to NAAQS, they are not as useful for quantifying ambient concentrations, trends analysis, and/or air quality model validation. The percent above the MDL analysis provides an indicator of data quality and the usefulness of the data collected for performing air quality analyses.

Measured Concentrations

Measured concentrations analysis identifies sites that consistently measure high pollutant concentrations. For this analysis, the average and maximum concentration values were examined. Results of this analysis were used to determine whether each site is meeting its objective(s). For example, if the objective of a particular site is to measure high pollutant concentrations but that site routinely measures low concentrations, then we may conclude that the objective of the site should be changed or the site should be relocated to an area of high pollutant concentrations in order to meet its objective.

Deviation from NAAQS

The deviation from NAAQS analysis indicates sites that are important for monitoring NAAQS compliance. This analysis was not designed to determine attainment status, but rather to provide an estimate of whether concentrations observed at a particular site are close to the NAAQS. Sites routinely measuring concentration values close to the NAAQS are considered important for meeting the monitoring objective of determining NAAQS attainment. The deviation from the NAAQS is the difference between the pollutant-specific design value observed at the site and the NAAQS compliance value (e.g., 1-hr, 8-hr, 4^{th} highest maximum value, etc.). Small changes in measured pollutant concentrations can result in values above or below the NAAQS. In some cases, when information to determine the design value was not available, comparisons of the annual average or maximum pollutant concentrations were made. The deviation from NAAQS calculations presented here are not meant to be attainment calculations but general comparisons against the NAAQS to identify sites having measured values near (within 15% of) the NAAQS.

Summary and Discussion of Results

Tables 2-2 through 2-11 include a summary and discussion of the results of the analyses for data completeness, percent above MDL, measured concentrations, and deviation from NAAQS for sulfur dioxide, lead, ozone, nitrogen dioxide, PM_{10}, $PM_{2.5}$, and carbon monoxide for all sites in the SJV.

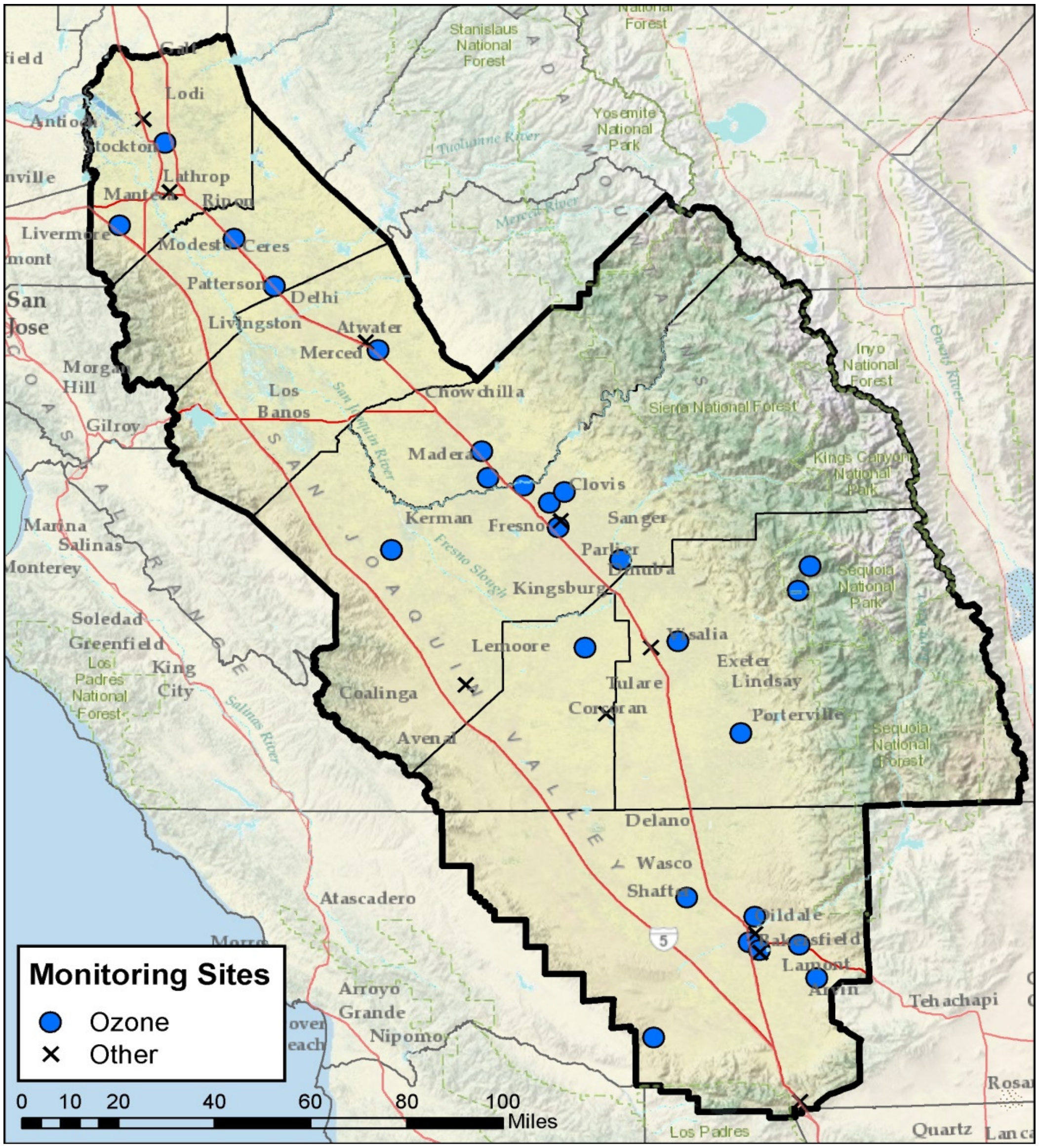
In Tables 2-2 through 2-11, the cells shaded in blue indicate the following:

- Percent complete – sites with a percent complete value less than 85%
- Percent above MDL – sites with a percent above MDL value less than 85%
- Deviation from NAAQS – sites with a deviation from NAAQS value that is within 15% of the NAAQS for the pollutant indicated.

Ozone (O_3)

Figure 2-3 shows the ozone monitoring network across the San Joaquin Valley. Overall, data completeness for 1-hr ozone is good. All sites with the exception of Tracy-Airport, Hanford-Irwin, and Bakersfield-Muni have data completeness of 80% or greater. Overall, the percent above MDL results are good. Several sites indicated in blue in Table 2-2 have percent above MDL values that are less than 85%; however, most of those values are greater than 80%, with the exception of Fresno-Garland at 79%. The low values at this site are worth noting because this site is in an urban area. Urban sites may measure chemically titrated ozone concentrations, which could account for the lower percent above MDL values.

Figure 2-3. Location of Ozone Monitoring Sites in the San Joaquin Valley



Deviation from NAAQS analysis indicates that all sites measure high ozone concentrations relative to the NAAQS for both the hourly and 8-hr average time intervals. Madera-City, Fresno-Sky Park, Clovis-Villa, Fresno-Drummond, Parlier, Porterville, Sequoia-Ash Mountain, Shafter, Bakersfield-California, Bakersfield-Muni, and Arvin-Di Giorgio are particularly valuable sites for measuring high concentrations.

Table 2-2. Summary of Data Completeness, Percent Above MDL, and Measured Concentrations Analyses for 1-Hr Ozone Data

1-Hour Ozone	% Complete	% Above MDL	Maximum Value	Deviation From NAAQS
Stockton-Hazelton	89	82	80	-45
Tracy-Airport	71	98	96	-29
Modesto-14th St	95	81	88	-37
Turlock	84	87	95	-30
Merced-Coffee	84	88	100	-25
Madera-City	84	95	121	-4
Madera-Pump Yard	84	91	100	-25
Tranquillity	93	96	87	-38
Fresno-Sky Park	85	93	114	-11
Clovis-Villa	86	86	123	-2
Fresno-Garland	95	79	103	-22
Fresno-Drummond	89	85	107	-18
Parlier	85	92	116	-9
Hanford-Irwin	79	92	104	-21
Visalia-Church St	94	84	95	-30
Sequoia-Lower Kaweah	81	100	106	-19
Sequoia-Ash Mountain	91	100	120	-5
Porterville	87	96	112	-13
Shafter	90	83	112	-13
Oildale	94	96	99	-26
Bakersfield-California	83	81	107	-18
Edison	95	99	101	-24
Bakersfield-Muni	80	88	109	-16
Arvin-Di Giorgio	95	97	109	-16
Maricopa	90	100	89	-36

Table reflects data for 2013.
Concentration data are reported in units of ppb.
Cells highlighted in blue in the % Complete column indicate sites with fewer than 85% of data reported as complete.
Ozone MDL = 5 ppb.
Cells highlighted in blue in the % Above MDL column indicate sites with fewer than 85% of data reported above the MDL.
Maximum value equals the 1-hr annual maximum.
The deviation from the NAAQS is the difference between the pollutant-specific design value observed at the site and the NAAQS 1-hour average compliance value of 125 ppb.
Cells highlighted in blue in the Deviation from NAAQS column indicate sites that are valuable for determining NAAQS attainment.

The deviation from NAAQS analysis for 8-hour average ozone in Table 2-3 indicates that Stockton–Hazleton, Tracy-Airport, Modesto-14th St, Merced-Coffee, Madera-City, Madera-Pump Yard, Tranquillity, Hanford-Irwin, Visalia-Church St, Sequoia-Lower Kaweah, Shafter, Oildale, and Maricopa are particularly important sites for determining NAAQS attainment because they measure concentration values that are close to (within 15%) the 8-hr ozone NAAQS. At Stockton-Hazleton and Modesto-14th St, the 3-yr averages of the 4th highest 8-hr daily maximum ozone measured concentrations were below the NAAQS.

Table 2-3. Summary of Data Completeness, Measured Concentrations, and Deviation from NAAQS Analyses for 8-Hr Average Ozone Data

8-Hour Ozone	% Complete	Maximum Value	4th Highest Value	Deviation From NAAQS
Stockton-Hazelton	97	67	67	-8
Tracy-Airport	97	82	79	+3
Modesto14thSt	99	82	75	0
Turlock	87	84	86	+11
Merced-Coffee	90	91	81	+6
Madera-City	85	101	84	+9
Madera-Pump Yard	89	88	79	+4
Tranquillity	97	78	77	+2
Fresno-Sky Park	90	100	88	+13
Clovis-Villa	94	104	94	+19
Fresno-Garland	99	93	89	+14
Fresno-Drummond	95	94	94	+19
Parlier	91	100	92	+17
Hanford-Irwin	85	98	84	+9
Visalia-Church St	99	84	80	+5
Sequoia -Lower Kaweah	99	89	85	+10
Sequoia-Ash Mountain	99	106	93	+18
Porterville	92	103	88	+13
Shafter	98	96	82	+7
Oildale	99	90	84	+9
Bakersfield-California	99	98	86	+11
Edison	99	86	86	+11
Bakersfield-Muni	87	102	87	+12
Arvin-Di Giorgio	99	94	89	+14
Maricopa	98	83	84	+9

Table reflects data for 2013.
Concentration data are reported in units of ppb.
Maximum value equals the 8-hr average annual maximum.
4th highest value is from 2011-2013.
The deviation from the NAAQS is the difference between the pollutant-specific design value observed at the site and the NAAQS 8-hour average compliance value of 75 ppb.
Cells highlighted in blue in the Deviation from NAAQS column indicate sites that are valuable for determining NAAQS attainment.

Nitrogen Dioxide (NO_2)

Figure 2-4 shows the location of the NO_2 sites in the San Joaquin Valley. The NO_2 analysis in Table 2-4 shows high percent above MDL values. While the Madera-Pump and Clovis-Villa sites have low data completeness, 48% and 73%, respectively, the measured concentrations and deviation from NAAQS analyses indicate that average NO_2 concentrations are well below the standard at all sites.

Figure 2-4. Location of NO_2 Monitoring Sites in the San Joaquin Valley

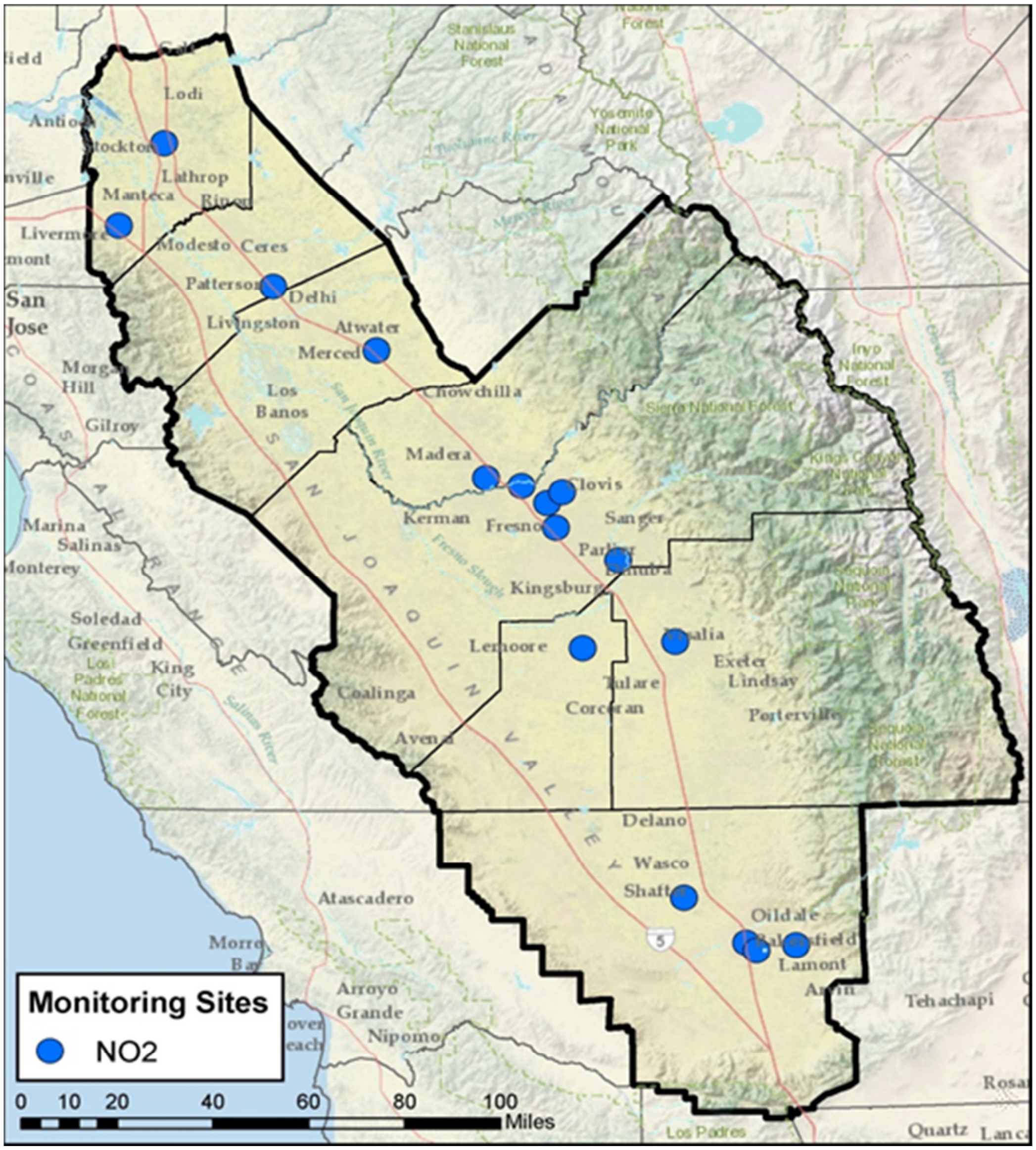


Table 2-4. Summary of Data Completeness, Percent above MDL, Measured Concentrations, and Deviation from NAAQS Analyses for NO_2

Site Name	% Complete	% Above MDL	Maximum Value	Mean Value	Deviation From NAAQS
Stockton-Hazelton	89	100	62	15.8	-37.2
Tracy-Airport	80	99	34	6.4	-46.6
Turlock	89	100	54	10.7	-42.3
Merced- Coffee	84	100	52	7.6	-45.4
Madera-Pump Yard	48	100	60	7.9	-45.1
Fresno-Sky Park	84	100	118	8.5	-44.5
Clovis-Villa	73	100	54	10.7	-42.3
Fresno-Garland	93	100	60	13.1	-39.9
Fresno-Drummond	85	100	64	13.9	-39.1
Parlier	88	100	41	11.4	-41.6
Hanford-Irwin	84	100	58	10.3	-42.7
Visalia-Church St	94	100	62	12.7	-40.3
Shafter	94	100	59	14.0	-39
Bakersfield-California	77	100	55	13.2	-39.8
Edison	90	95	47	6.3	-46.7
Bakersfield-Muni	87	100	65	14.2	-38.8

Table reflects data for 2013.
Concentration data are reported in units of ppb.
Cells highlighted in blue in the % Complete column indicate sites with fewer than 85% of data reported as complete.
Nitrogen dioxide MDL = 1 ppb.
Maximum value equals the 1-hr annual maximum concentration.
The deviation from the NAAQS is the difference between the pollutant-specific design value observed at the site and the NAAQS annual average compliance value of 53 ppb.

Particulate Matter (PM_{10})

Figure 2-5 shows the PM_{10} monitoring sites in the San Joaquin Valley. The summary of FRM PM_{10} monitoring data in Table 2-5 indicates that data completeness and percent above MDL are very good, with the exception of Bakersfield-California reporting a 59% data completeness. The highest observed maximum concentration of FRM PM_{10} occurred at Hanford-Irwin; which makes it the most valuable site for determining NAAQS attainment.

Figure 2-5. Location of PM10 Monitoring Sites in the San Joaquin Valley

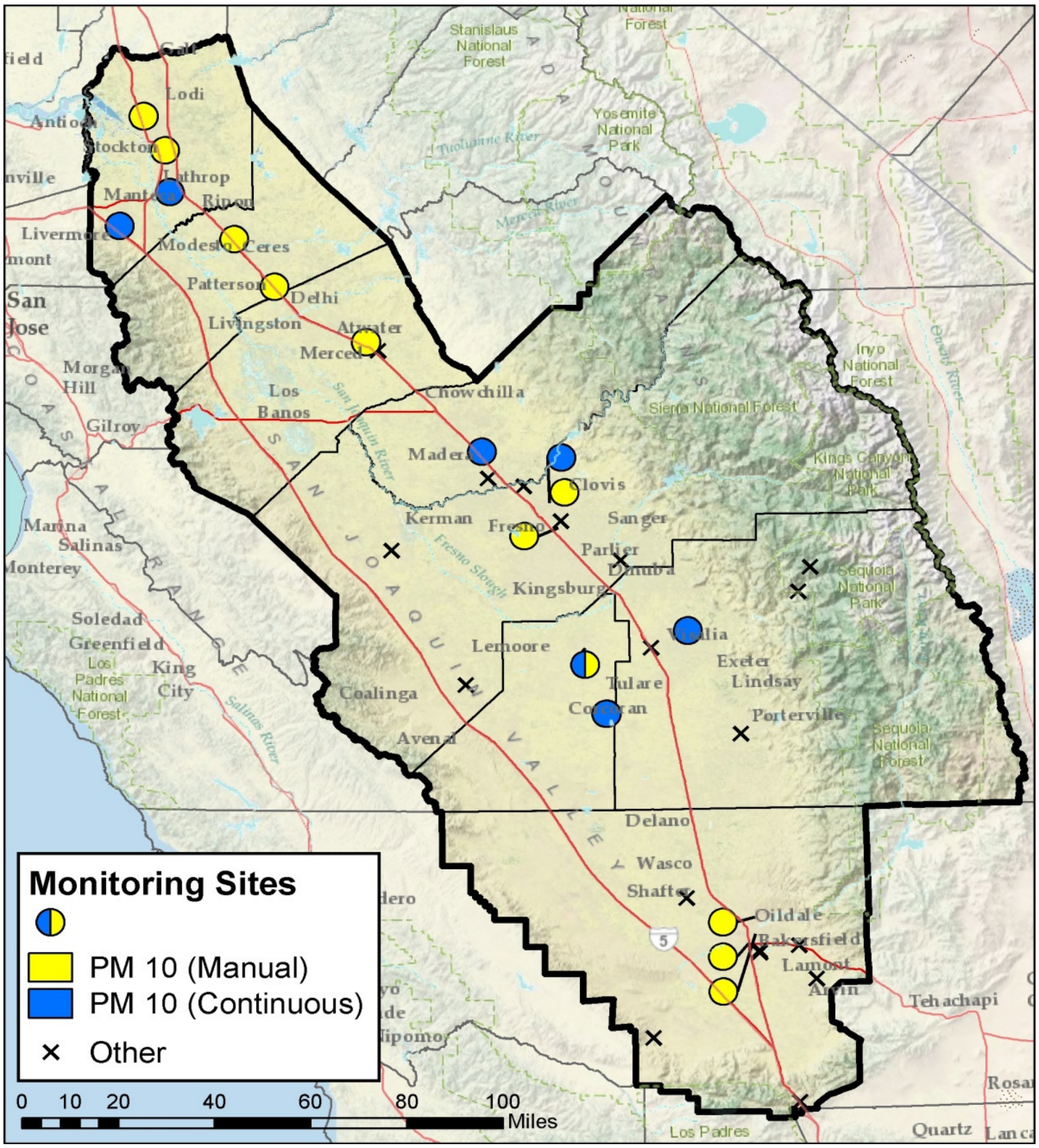


Table 2-5. Summary of Results of Data Completeness, Percent Above MDL, Measured Concentrations, and Deviation from NAAQS Analyses for Federal Reference Method (FRM) PM_{10} Measurements

Site Name	% Complete	% Above MDL	Maximum Value	Mean Value	Deviation from NAAQS
Stockton-Wagner/Holt	79	100	62	24.8	-92
Stockton-Hazleton	95	100	90	30.8	-64
Modesto-14th St	98	100	73	30.0	-81
Turlock	98	100	79	35.2	-75
Merced-M St	85	100	77	36.4	-77
Clovis-Villa	90	100	119	35.6	-35
Fresno-Drummond	93	100	138	44.0	-16
Hanford-Irwin	93	100	177	49.9	+23
Visalia-Church St	93	100	15	43.9	+1
Oildale	95	100	13	51.4	-20
Bakersfield-California	59	100	120	48.6	-34

Table reflects data for 2013.
Concentration data are reported in units of μg/m^3.
Cells highlighted in blue in the % Complete column indicate sites with fewer than 85% of data reported as complete.
PM_{10} MDL= 2 μg/m^3 for 24-hr filter-based monitors.
Maximum value equals the annual daily maximum concentration.
The deviation from the NAAQS is the difference between the pollutant-specific design value observed at the site and the NAAQS 24-hour average compliance value of 154 μg/m^3.
Cells highlighted in blue in the deviation from NAAQS column indicate sites that are valuable for determining NAAQS attainment.
Some values in this table may be due to exceptional weather conditions (driest year on record, severe prolonged stagnation periods, strong surface-based temperature inversions, lowest relative humidity). Table does not include values due to exceptional events as defined by EPA.

The summary of continuous PM_{10} monitoring data in Table 2-6 indicates that data completeness and percent above MDL are very good for PM_{10} in Table 2-6, with the exception of Modesto-14th St and Fresno-Garland, with 68% and 50% data completeness, respectively. The daily maximum 24-hr calculated PM_{10} concentrations are highest at Hanford-Irwin and Corcoran-Patterson, and these sites are the most valuable for determining NAAQS attainment.

Table 2-6. Summary of Data Completeness, Measured Concentrations, and Deviation from NAAQS Analyses for 1-Hr Continuous PM_{10}

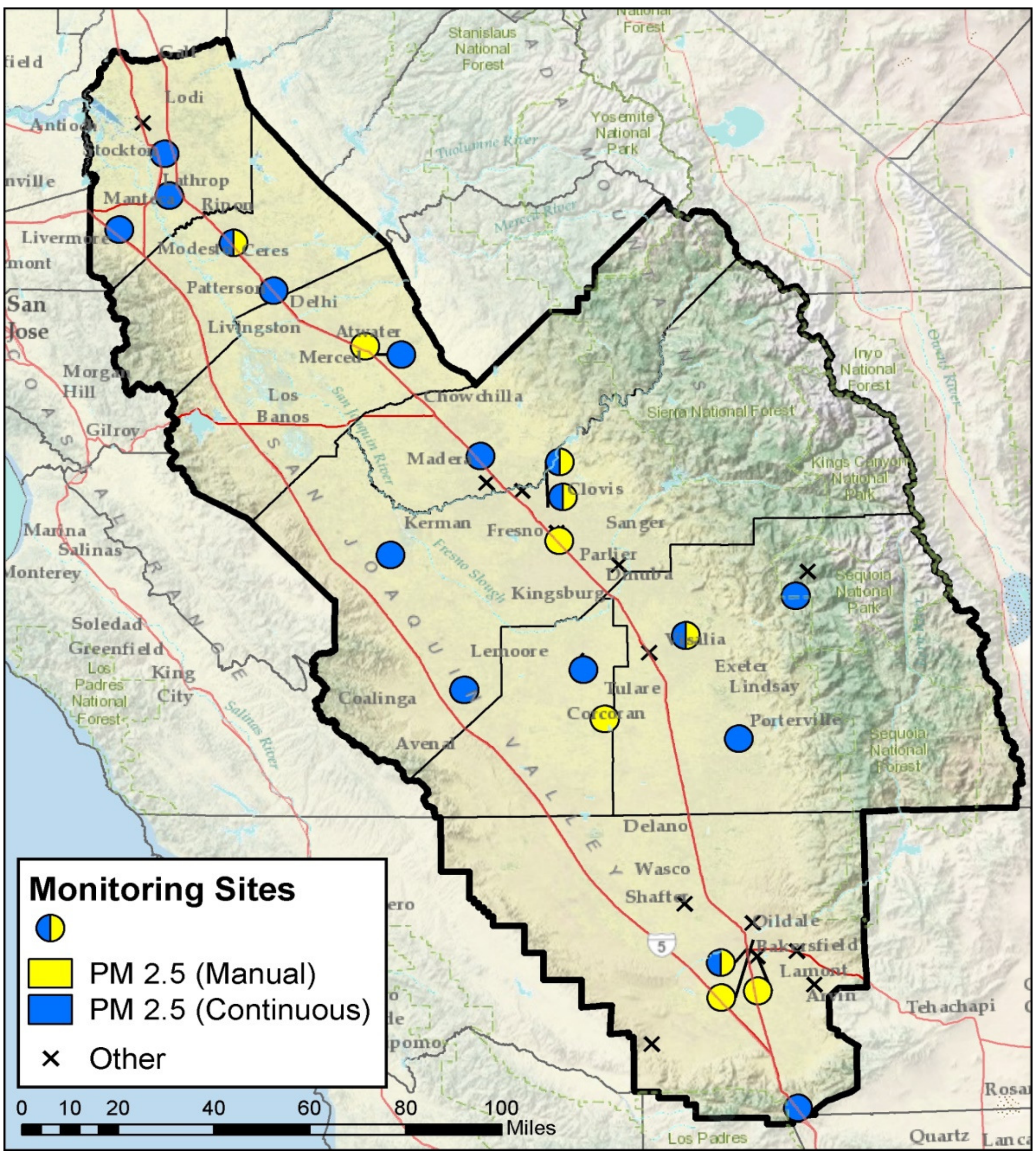
Site Name	% Complete	% Above MDL	Maximum Value	Mean Value	Deviation from NAAQS
Manteca	94	100	140	32.2	-14
Tracy-Airport	89	100	73	21.9	-81
Modesto-14th St*	68	100	92	62.3	-62
Madera-City	90	100	110	36.3	-44
Fresno-Garland	50	100	132	43.4	-22
Hanford-Irwin	76	100	173	47.3	+19
Corcoran-Patterson	88	100	184	46.2	+30

Table reflects data for 2013.
Concentration data are reported in units of μg/m^3.
Cells highlighted in blue in the % Complete column indicate sites with fewer than 85% of data reported as complete.
PM_{10} MDL = -50 μg/m^3 for Manteca, Tracy-Airport, Madera-City, Hanford-Irwin, and Corcoran-Patterson.
PM_{10} MDL = 4 μg/m^3 for Modesto 14th St, and Fresno-Garland.
Maximum value equals the 24-hr maximum value calculated from 1-hr data.
*- Modesto-14th St shows only December 2013 data
The deviation from the NAAQS is the difference between the pollutant-specific design value observed at the site and the NAAQS 24-hour average compliance value of 154 μg/m^3.
Cells highlighted in blue in the deviation from NAAQS column indicate sites that are valuable for determining NAAQS attainment.
Some values in this table may be due to exceptional weather conditions (driest year on record, severe prolonged stagnation periods, strong surface-based temperature inversions, lowest relative humidity). Table does not include values due to exceptional events as defined by EPA.

Particulate Matter ($PM_{2.5}$)

Figure 2-6 shows continuous and manual $PM_{2.5}$ monitors throughout the San Joaquin Valley. Table 2-7 reports that all FRM $PM_{2.5}$ 24-hr filter sites demonstrated good data completeness and percent above MDL. The measured concentrations and deviation from NAAQS analyses indicate that the concentrations are higher than the annual standard at all sites, except Merced M-St. The Modesto-14th and Merced M-St sites are valuable sites for determining NAAQS attainment. Analysis of continuous measurement $PM_{2.5}$ is reported in Table 2-8. All sites show good data completeness, except for Fresno-Garland, with data completeness at 49.5%. The measured concentrations and deviation from NAAQS analyses indicate that annual concentrations are higher than the standard at all sites with the exception of Manteca, which is below the standard.

Figure 2-6. Location of $PM_{2.5}$ Monitoring Sites in the San Joaquin Valley



Stockton-Hazleton, Manteca, Modesto-14th, and Merced-Coffee sites appear to be the most valuable for determining NAAQS attainment; however, note that the Deviation from NAAQS analysis is not meant to determine NAAQS compliance but to identify those sites that routinely measure concentrations close to the NAAQS.

Table 2-7. Summary of Data Completeness, Percent above MDL, Measured Concentrations, and Deviation from NAAQS Analyses for FRM $PM_{2.5}$ Measurements

Site Name	% Complete	% Above MDL	Maximum Value	Mean Value	Deviation from NAAQS
Modesto-14th St	94	98.8	60.7	13.6	+1.6
Merced-M St	90	100	68.9	11.1	-0.9
Clovis-Villa	77	96.4	103.4	16.4	+4.4
Fresno-Garland	95	99.75	86	15.5	+3.5
Fresno-Pacific	83	100	95.4	14.7	+2.7
Corcoran-Patterson	91	98.8	104	15.0	+3.0
Visalia-Church St	96	100	124.2	16.6	+4.6
Bakersfield-California	85	99.5	113.3	16.4	+4.4
Bakersfield-Airport (Planz)	93	100	167.3	17.3	+5.3

Table reflects data for 2013.
Concentration data are reported in units of $\mu g/m^3$.
Cells highlighted in blue in the % Complete column indicate sites with fewer than 85% of data reported as complete.
$PM_{2.5}$ MDL = 2 $\mu g/m^3$ for 24-hr. filter-based monitors.
Maximum value equals the maximum daily average value.

Mean Value data from 2011-2013. At sites where FRM/FEM data is present, data was combined according to 40 CFR Part 50, Appendix N.
The deviation from the NAAQS is the difference between the pollutant-specific design value observed at the site and the NAAQS annual average compliance value of 12.0 $\mu g/m^3$.
Cells highlighted in blue in the Deviation from NAAQS column indicate sites that are valuable for determining NAAQS attainment.

Table 2-8. Summary of Data Completeness, Percent above MDL, Measured Concentrations, and Deviation from NAAQS Analyses for 1-Hr Continuous $PM_{2.5}$ Measurements

Site Name	% Complete	% Above MDL	Maximum Value	Mean Value	Deviation from NAAQS
Stockton-Hazleton	94.5	100	62	13.9	+1.9
Manteca	97	98	54	10.2	-1.8
Tracy-Airport	86	89.1	56	7.5	
Modesto-14th St	98	97.5	83	13.6	+1.6
Turlock	95	97.4	75	15.6	+3.6
Merced-Coffee	98	98.6	75	13.3	+1.3
Madera-City	98	99.7	88	18.1	+6.1
Clovis-Villa	92	98.8	102	16.4	+4.4
Fresno-Garland	49.5	100	103	15.5	+3.5
Tranquillity	93	95.7	60	7.8	
Huron	90	96.4	72	13.7	
Hanford-Irwin	98	99.7	129	17.0	+5.0
Porterville	97	98.2	116	16.4	
Sequoia-Ash Mountain	77	100	25	8.5	
Lebec	97	83.0	42	7.7	

Table reflects data for 2013.

Concentration data are reported in units of $\mu g/m^3$.

Modesto-14th St, Fresno-Garland, Visalia-Church St, and Bakersfield-California real-time non-FEM $PM_{2.5}$ monitors not included in table above.

Cells highlighted in blue in the % Complete column indicate sites with fewer than 85% of data reported as complete.

$PM_{2.5}$ MDL = 2 $\mu g/m^3$ for 1-hr continuous monitors, except Sequoia-Ash Mountain monitor's MDL is -10 $\mu g/m^3$.

Cells highlighted in blue in the % Above MDL column indicate sites with fewer than 85% of data reported above the MDL.

Maximum value equals the 24-hr maximum value calculated from 1-hr data.

Mean Value data from 2011-2013. At sites where an FRM/FEM monitor is present, data was combined according to 40 CFR Part 50, Appendix N.

The deviation from the NAAQS is the difference between the pollutant-specific design value observed at the site and the NAAQS annual average compliance value of 12.0 $\mu g/m^3$.

Deviation from NAAQS column only shows sites that have an FEM monitor

Cells highlighted in blue in the Deviation from NAAQS column indicate sites that are valuable for determining NAAQS attainment.

Carbon Monoxide (CO)

As noted in 40 CFR 58 Appendix D Section 4.2, there are no minimum monitoring requirements for CO in the Valley except at near-road NO_2 monitors within Core Based Statistical Areas (CBSA) with a population of at least 1 million and at type 2 Photochemical Assessment Monitoring Stations (PAMS). As recommended by EPA to reduce redundancy, in the *2014 Air Monitoring Network Plan* the District evaluated non-mandatory CO monitoring sites and proposed the removal of three such sites in the Valley.

Figure 2-7 shows the location of the CO monitors in the San Joaquin Valley including the potential site closures. Stanislaus County currently has in operation two (2) CO monitors, located at the Modesto-14th and Turlock air monitoring sites. Due to the low CO concentrations in the SJV relative to the NAAQS and the new CO monitoring guidelines in 40 CFR 58 Appendix D Section 4.2, the District proposed the closure of the CO monitor at Turlock. The pollutant will continue to be measured in the county at the Modesto-14th site so as not to eliminate CO monitoring in the area.

Figure 2-7. Location of CO Monitoring Sites in the San Joaquin Valley, including proposed closures

Similarly Fresno County has in operation four (4) CO monitors, located at the Clovis, Fresno-Sierra Sky Park, Fresno-Garland, and Fresno-Drummond air monitoring sites.

The district similarly proposed closures of the CO monitors at Fresno-Sierra Sky Park and Fresno-Drummond. The pollutant will continue to be measured in the county at the Clovis site, as it is requires due to its status as a PAMS site, as well as at Fresno-Garland.

To support the findings, data completeness and deviation analysis was performed on all sites currently in operation. Table 2-9 demonstrates that data completeness and % above MDL for CO is good at all sites with the exception of Stockton-Hazelton and Modesto-14th which are14.9% above MDL. This is due to the low CO concentrations in the SJV relative to the NAAQS and the need for higher sensitivity instruments to achieve a higher percentage of data above MDL

Table 2-9. Summary of Data Completeness, Percent above MDL, Measured Concentrations, and Deviation from NAAQS Analyses for 8-Hr CO Measurements

Site Name	% Complete	% Above MDL	Maximum Value	Deviation From NAAQS
Stockton-Hazelton	82	14.9	1.8	-7.2
Modesto-14th St	92	14.9	2.1	-6.9
Turlock	85	100	1.6	-7.4
Fresno-Sky Park	88	100	2.3	-6.7
Clovis-Villa	86	100	1.7	-7.3
Fresno-Garland	94	94.5	2.3	-6.7
Fresno-Drummond	81	100	2.5	-6.5
Bakersfield-Muni	89	100	1.2	-7.8

Table reflects data for 2013
Concentration data are reported in units of ppm.
Cells highlighted in blue in the % Complete column indicate sites with fewer than 85% of data reported as complete.
CO MDL = 0.11 ppm at Fresno-Garland.
CO MDL = 0.5 ppm at Stockton-Hazelton and Modesto-14th
CO MDL = 0 ppm at Clovis-Villa and Bakersfield-Muni
CO MDL = 0.1 ppm at Turlock
CO MDL = 0.2 ppm Fresno-Sky Park and Fresno-Drummond
Cells highlighted in blue in the % Above MDL column indicate sites with fewer than 85% of data reported above the MDL.
Maximum value equals the 8-hr average maximum value at a site for 2013.
The deviation from the NAAQS is the difference between the pollutant-specific design value observed at the site and the NAAQS 8-hr. average compliance value of 9 ppm.

Sulfur Dioxide (SO_2) and Lead (Pb)

Figures 2-8 and 2-9 show the location of the SO_2 and Pb monitors, respectively.

Figure 2-8. Location of SO_2 Monitor in the San Joaquin Valley

Figure 2-9. Location of Pb Monitor in the San Joaquin Valley

Table 2-10 and Table 2-11 report good data completeness and % above MDL for SO_2

and Pb at the Fresno-Garland site. This is due to the low SO_2 and Pb concentrations in the SJV relative to the NAAQS.

Table 2-10. Summary of Data Completeness, Percent Above MDL, Measured Concentrations, and Deviation from NAAQS Analyses for 1-Hr SO_2 Measurements

Site Name	% Complete	% Above MDL	Maximum Value	Deviation From NAAQS
Fresno-Garland	94	80.6	7	-68

Table reflects data for 2013.
Concentration data are reported in units of ppb.
SO_2 MDL = 0.2 ppb.
Cells highlighted in blue in the % Above MDL column indicate sites with fewer than 85% of data reported above the MDL.
Maximum value equals the 1-hr average maximum value at a site for 2013.
The deviation from the NAAQS is the difference between the pollutant-specific design value observed at the site and the NAAQS 1-hr. average compliance value of 75 ppb.

Table 2-11. Summary of Data Completeness, Percent above MDL, Measured Concentrations, and Deviation from NAAQS Analyses for Pb Measurements

Site Name	% Complete	% Above MDL	Maximum Value	Deviation From NAAQS
Fresno-Garland	100	100	.01	-0.14

Table reflects data for 2013.
Concentration data are reported in units of $\mu g/m^3$.
Pb MDL = 0.001 $\mu g/m^3$.
Maximum value equals the 3-month rolling average at a site for 2013.
The deviation from the NAAQS is the difference between the pollutant-specific design value observed at the site and the NAAQS 3-month rolling average compliance value of 0.15 $\mu g/m^3$.

Toxics

Toxics monitoring in the SJV is conducted by the CARB at the sites of Stockton-Hazelton, Fresno-Garland, and Bakersfield-California. Figure 2-10 shows where the toxics monitoring sites are located in the San Joaquin Valley. The District operates several PAMS sites that measure selected toxics compounds during the summer. The PAMS network assessment will be discussed in more detail in Section 2.5.

Figure 2-10. Location of Toxics Monitoring Sites in the San Joaquin Valley

2.2.4 Length of Trend Record Analysis

Monitors that have long historical data records are valuable for tracking pollutant trends and control strategy effectiveness. For the length of trend record analysis, the number of years of data collection was summed by site and pollutant. Table 2-12 shows the trend length by site and pollutant. Several sites in the San Joaquin Valley have long data records for multiple parameters. Most notably, the Stockton-Hazelton, Modesto-14th St., Turlock, Madera-Pump Yard, Fresno-Sky Park, Clovis–Villa, Fresno-Garland, Fresno-Drummond, Parlier, Hanford-Irwin, Visalia-Church St., Shafter, and Bakersfield–California sites have been monitoring for more than a decade.

The numbers in Table 2-12 represent the number of years of data collected at each site. Sites with ten or more years of data are marked "10+" and highlighted green.

Table 2-12. Length of Monitoring Analysis (Number of Years) through 2013

Site Name	Ozone	1-hr PM_{10}	24-hr PM_{10}	1-hr $PM_{2.5}$	24-hr $PM_{2.5}$	NO_2	CO	PAMS	Pb	SO_2	Met
Stockton-Wagner/Holt	0	0	10+	0	0	0	0	0	0	0	0
Stockton-Hazelton	10+	0	10+	4	0	10+	1	0	0	0	10+
Tracy-Airport^	9	9	0	9*	0	0	0	0	0	0	9
Manteca	0	0	3	0	4	0	0	0	0	0	4
Modesto-14th St	10+	1	10+	4	10+	0	1	0	0	0	10+
Turlock	10+		8	8	0	10+	10+	0	0	0	10+
Merced-M St	0	0	10+	0	10+	0	0	0	0	0	0
Merced-Coffee	10+	0	0	5	0	10+	0	0	0	0	10+
Madera-City	4	4	0	4	0	0	0	0	0	0	4
Madera-Pump Yard	10+	0	0	0	0	10+	0	10+	0	0	10+
Fresno-Sky Park	10+	0	0	0	0	10+	10+	0	0	0	10+
Tranquillity	5	0	0	5	0	0	0	0	0	0	5
Clovis-Villa	10+	0	10+	6	2	10+	10+	10+	0	0	10+
Fresno-Garland[1]	10+	10+	10+	10+	10+	10+	10+	0	10+	10+	10+
Fresno-Pacific	0	0	0	0	10+	0	0	0	0	0	
Fresno-Drummond	10+	0	10+	0	0	10+	10+	0	0	0	10+
Parlier	10+	0	0	0	0	10+	0	10+	0	0	10+
Huron	0	0	0	5	0	0	0	0	0	0	4
Hanford-Irwin	10+	4	10+	4	0	10+	0	0	0	0	10+
Corcoran-Patterson	0	10+	0	8*	10+	0	0	0	0	0	10+
Sequoia-Lower Kaweah	10+	0	0	0	0	0	0	0	0	0	10+
Sequoia-Ash Mountain	10+	0	0	7*	0	0	0	0	0	0	10+
Visalia-Church St	10+	0	10+	10+	10+	10+	0	0	0	0	10+
Visalia-Airport^	0	0	0	0	0	0	0	0	0	0	10+
Porterville	4	0	0	4	0	0	0	0	0	0	4
Shafter	10+	0	0	0	0	10+	0	10+	0	0	10+
Oildale	10+	0	10+	0	0	9	0	0	0	0	10+
Bakersfield-California	10+	0	10+	10+*	10+	10+	0	0	10+	0	10+
Bakersfield-Muni	2	0	0	0	0	0.5	0.5	2	0	0	0.5
Bakersfield-Airport (Planz)	0	0	0	0	10+	0	0	0	0	0	0

Table 2-12. Length of Monitoring Analysis (Number of Years) through 2013 (continued)

Site Name	Ozone	1-hr PM_{10}	24-hr PM_{10}	1-hr $PM_{2.5}$	24-hr $PM_{2.5}$	NO_2	CO	PAMS	Pb	SO_2	Met
Edison	10+	0	0	0	0	10+	0	0	0	0	10+
Arvin-Di-Giorgio[2]	5	0	0	0	0	0	0	0	0	0	5
Maricopa	10+	0	0	0	0	0	0	0	0	0	10+
Lebec	0	0	0	5*	0	0	0	0	0	0	5

[1] In December 2011, CARB moved the Fresno-First air monitoring station to Garland Avenue which is two blocks north of the previous site. The District considers the Fresno-First site (060190008) and the Fresno-Garland site (060190011) the same site which serves as an NCore site. After the relocation was complete, monitoring resumed as it was prior to the move.
[2] Arvin Di Giorgio is the replacement site for the Arvin-Bear Mountain site. The Arvin-Bear Mountain site was operational from June 1989 to January 2010 and measured ozone, meteorology, and PAMS parameters. The site was closed due to expiration of the lease.
[*] Non-Regulatory $PM_{2.5}$ monitor.
[^] Site includes a lower air profiler.

2.3 AREA-SERVED, POPULATION-SERVED, POPULATION CHANGE, AND EMISSIONS-SERVED ANALYSES

The purpose of the area-served analysis is to estimate the spatial coverage of each monitoring site to identify potential spatial gaps or redundancies in the overall monitoring network. Performing the area-served analysis is a multi-step process. The first step in the area-served analysis was to compile a map of the air quality sites which included both the District sites and other agency sites within and surrounding the boundary, using GIS software, then apply Thiessen polygons to assign a zone of influence or representativeness to the area around a given point—in this case, a monitoring site. The polygon defines the area closest to each site.

After the area-served boundaries were developed for each site and pollutant, the population-served analysis was performed. The purpose of the population-served analysis was to determine the population coverage represented by each monitoring site and to identify the sites surrounded by the highest population densities. It is also of interest to examine those areas within the SJV that have undergone substantial growth over the past several years and to examine monitoring site locations relative to areas of population growth.

Taking the area- and population-served analyses one step further, an emissions-served analysis was performed. The emissions-served analysis examines the proximity of monitoring sites to emissions sources and emissions densities within each area-served boundary. This analysis was performed by overlaying spatially resolved emissions (or activity) data onto the area-served boundaries to investigate the potential emissions impacts on each monitoring site. The most recent gridded NO_x and $PM_{2.5}$ emissions data were collected from the California Air Resources Board. Emissions are representative of a summer weekday in 2007.

The following sections discuss the findings of the area-, population-, and emissions-served analyses for ozone and $PM_{2.5}$, the two criteria pollutants for which the District is currently designated non-attainment. Because an individual monitoring site may measure a number of pollutants, the analyses are performed by first identifying the pollutant-specific networks and then performing the analyses for each individual network. The results below are presented for each of the non-attainment pollutants in the Valley.

Figure 2-11. Population Change from 1990-2010 Relative to District Monitoring Sites

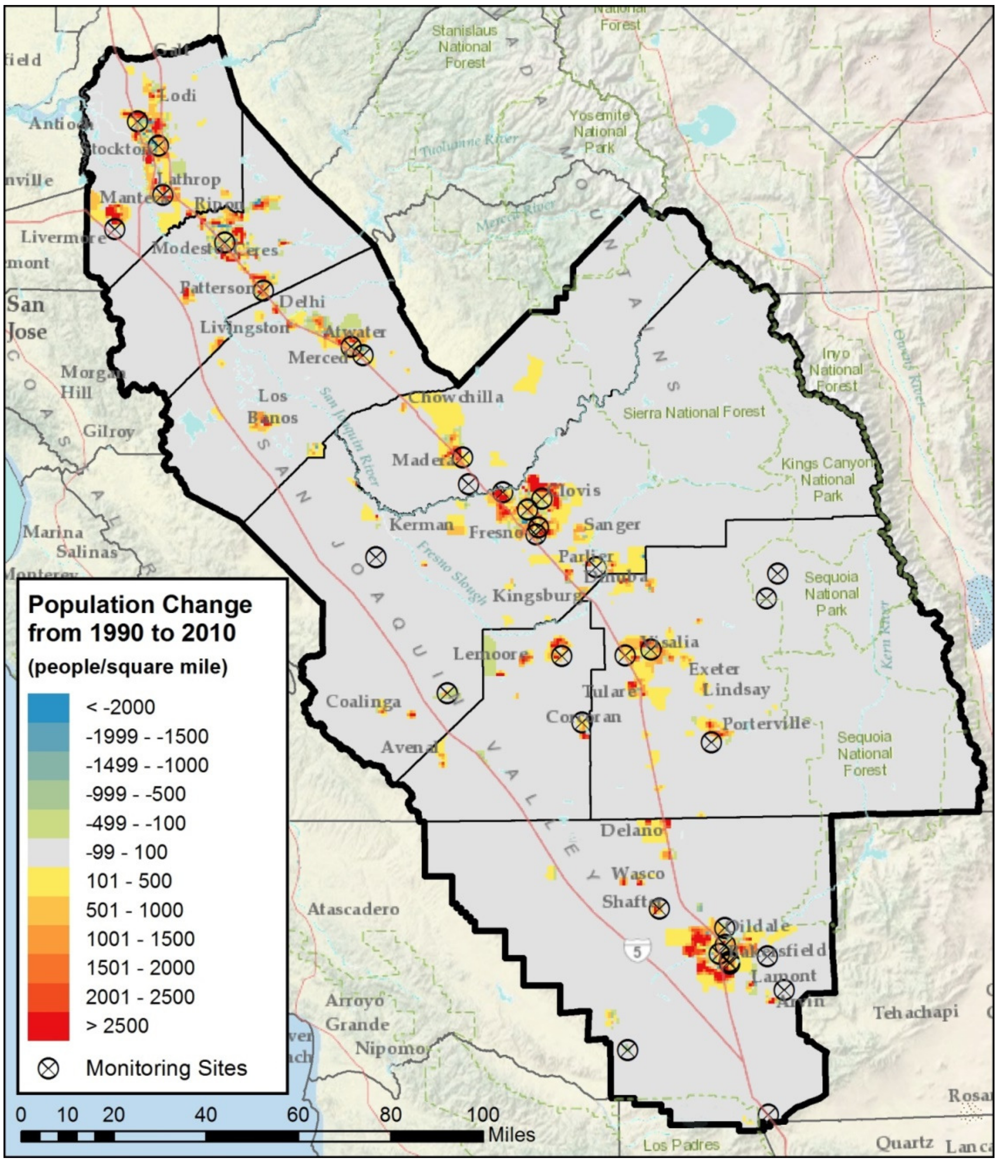


Figure 2-11 depicts the population change throughout the Valley and the proximity to all District monitoring sites. In many regions, areas that were once unpopulated are now fairly densely populated. As a result, human encroachment and associated increases in emissions activity may impact monitoring sites. These impacts can change site characteristics (e.g., a former rural site may now be an urban site). The results of the population change analysis indicate that the areas northeast of Clovis, west of Merced (Los Banos area), and west of Bakersfield all have high population growth. The most recent network additions at Madera and Manteca were placed in areas where population has continued to grow. As the Valley's population grows, the District will continually look for opportunities to expand the air monitoring network to continue to ensure adequate monitoring throughout the Valley.

2.3.1 Area and Emissions-served $PM_{2.5}$ Network

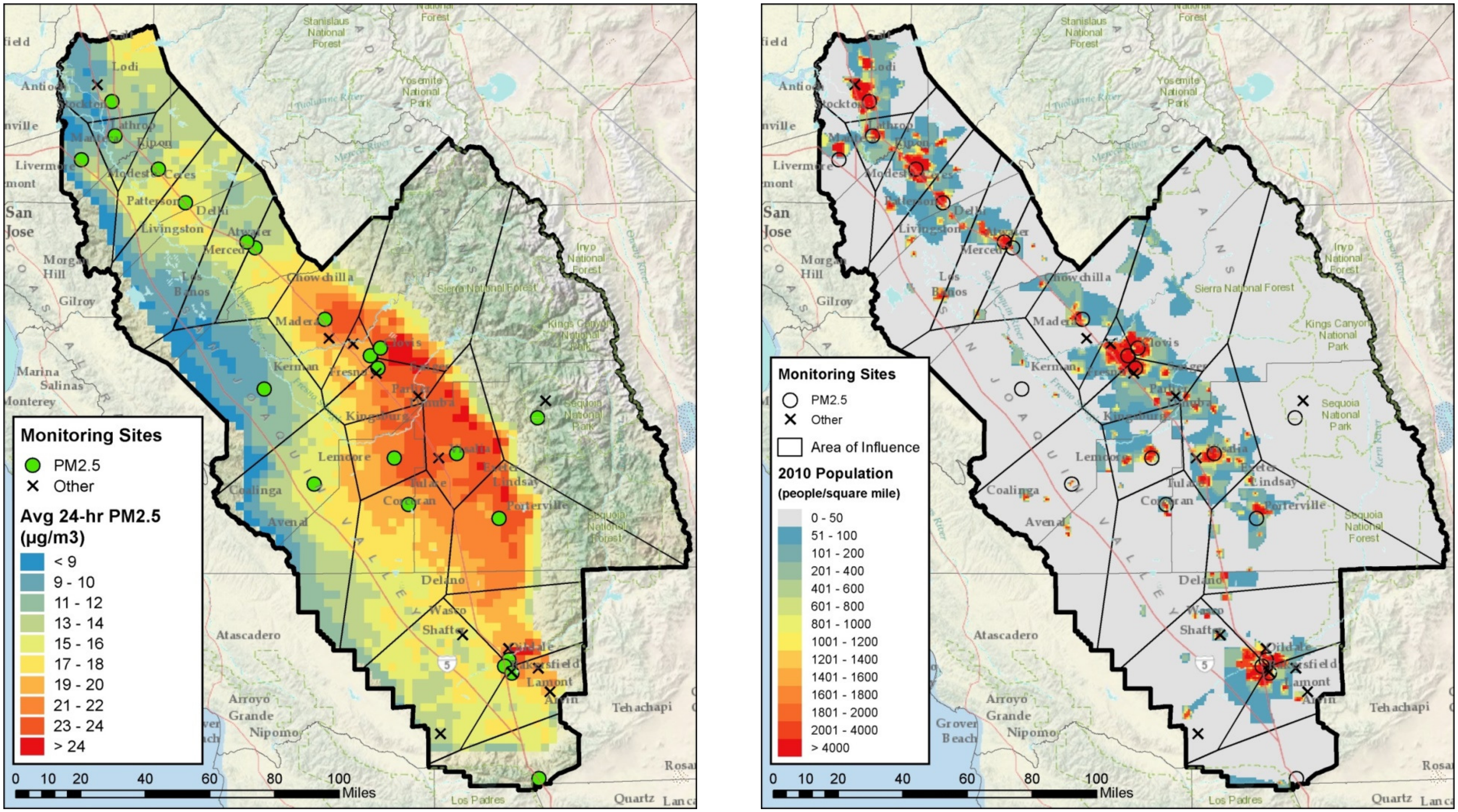
$PM_{2.5}$ monitoring in the SJV is aimed at measuring representative pollutant concentrations on both a neighborhood and an urban scale. By identifying area-served boundaries as they relate to average $PM_{2.5}$ concentrations, numbers of days $PM_{2.5}$ values exceed the NAAQS standard, and population density near the monitors, the District can determine the effectiveness of the current $PM_{2.5}$ network. Figures 2-12 and 2-13 depict the area of influence of the SJV $PM_{2.5}$ monitoring sites and the population density of each 1km^2 zone. Figure 2-12 compares the population density to the average $PM_{2.5}$ concentration in each zone. Figure 2-13 compares the population analysis to number of days each of the 4km^2 zones exceeds the $PM_{2.5}$ NAAQS of 35 µg/m^3.

From population density and $PM_{2.5}$ modeling analysis, the District can assess whether pollution in areas with significant populations is accurately represented by the nearest monitor. For example, the $PM_{2.5}$ monitor at Turlock serves a large, mostly unpopulated area that encompasses the City of Los Banos. Based upon analysis of the $PM_{2.5}$ concentrations represented in Figure 2-12, it is clear that the pollution levels are low in this populated pocket, so an additional site is unnecessary. An analysis of all the remaining $PM_{2.5}$ sites in the northern counties of San Joaquin, Stanislaus, Merced and Madera reveal that the $PM_{2.5}$ network covers the local populations and areas impacted by $PM_{2.5}$.

The Huron monitor in Fresno County has two population pockets within its area of influence, Coalinga and Avenal, which are also not near the monitor. If the District were to expand the $PM_{2.5}$ network in the future, it might be beneficial to capture emissions in southwest Fresno County. Further investigation would be necessary.

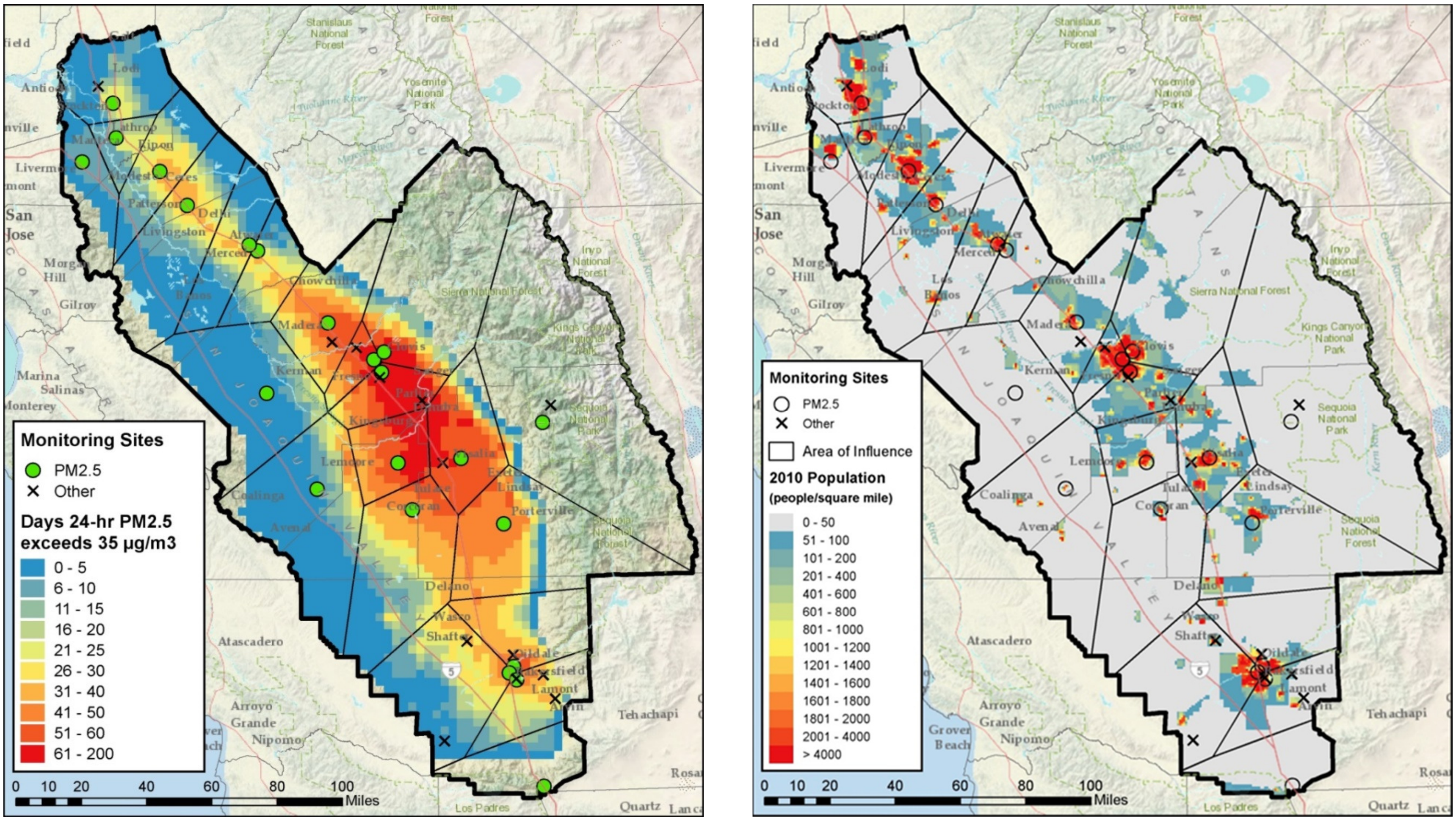
The monitor at Clovis-Villa serves a large area which includes the mountain region of Oakhurst, northeast of Clovis. If the District plans for future PM2.5 monitors, adding an Oakhurst site might provide useful information regarding local population exposure to PM2.5 pollution impacts in this populated area. Further investigation would be necessary. An analysis of all the remaining $PM_{2.5}$ sites in the southern counties of Fresno, Kings, Tulare, and Kern sufficiently cover the local populations and areas impacted by pollution.

Figure 2-12. On left, map of the areas served by the $PM_{2.5}$ monitoring sites in the San Joaquin Valley with the associated average 24-hr $PM_{2.5}$ concentrations for every $4km^2$ in the District on the valley floor. On right, map of the areas served by the $PM_{2.5}$ continuous monitoring sites in the San Joaquin Valley with the associated population/mi^2



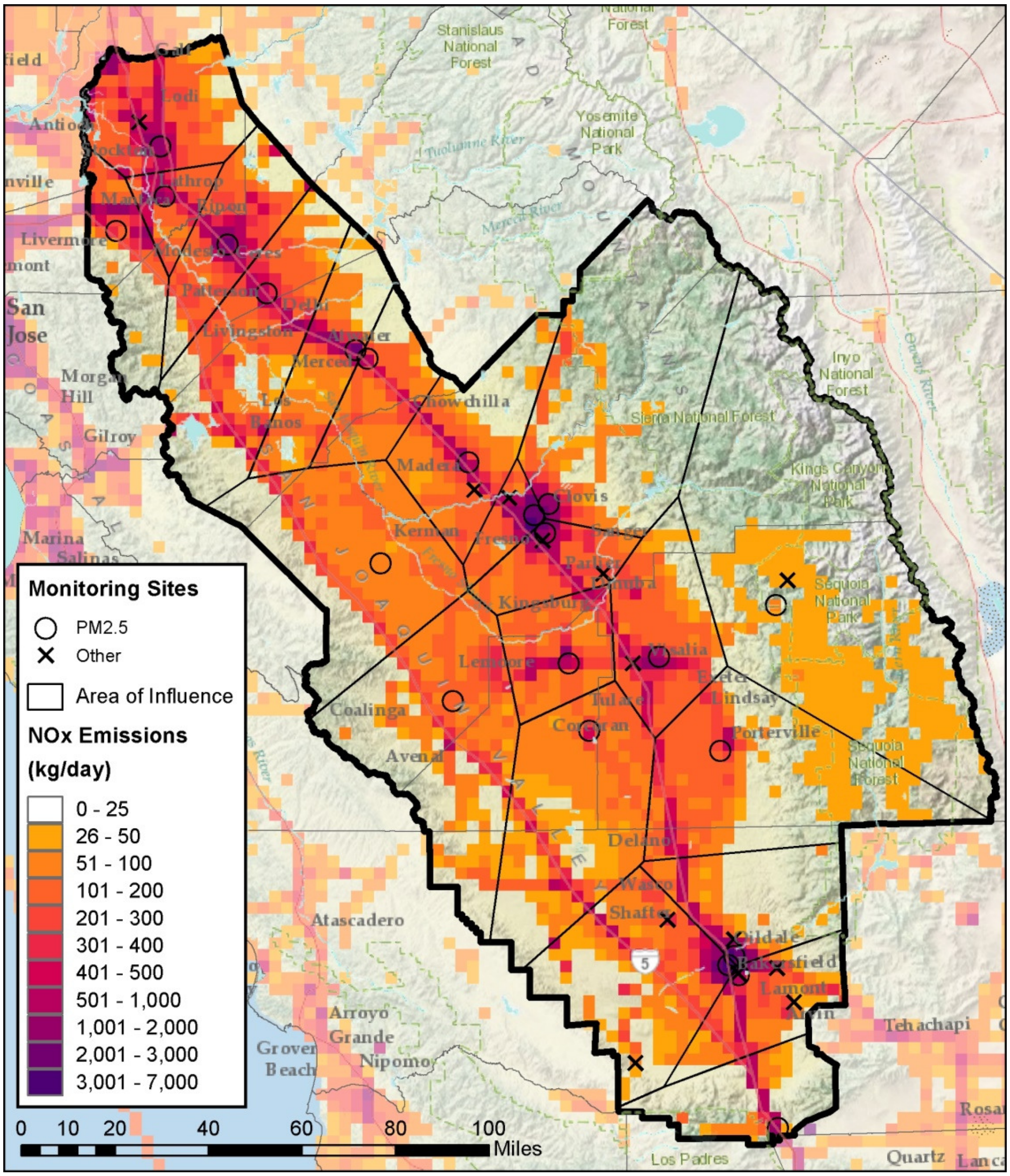
A similar analysis comparing regional population density to number of days over 35 µg/m^3 can give insight into whether significant populations are exposed to elevated pollution levels more frequently and help determine if an additional monitor is necessary to capture those concentrations more accurately. The District's analysis concludes that the network provides appropriate coverage for areas that may see frequent high concentrations of $PM_{2.5}$.

Figure 2-13. On left, map of the areas served by the $PM_{2.5}$ monitoring sites with the associated number days that the 24-hr $PM_{2.5}$ concentration exceeds the NAAQS. On right, map associated population/mi^2 for each area served



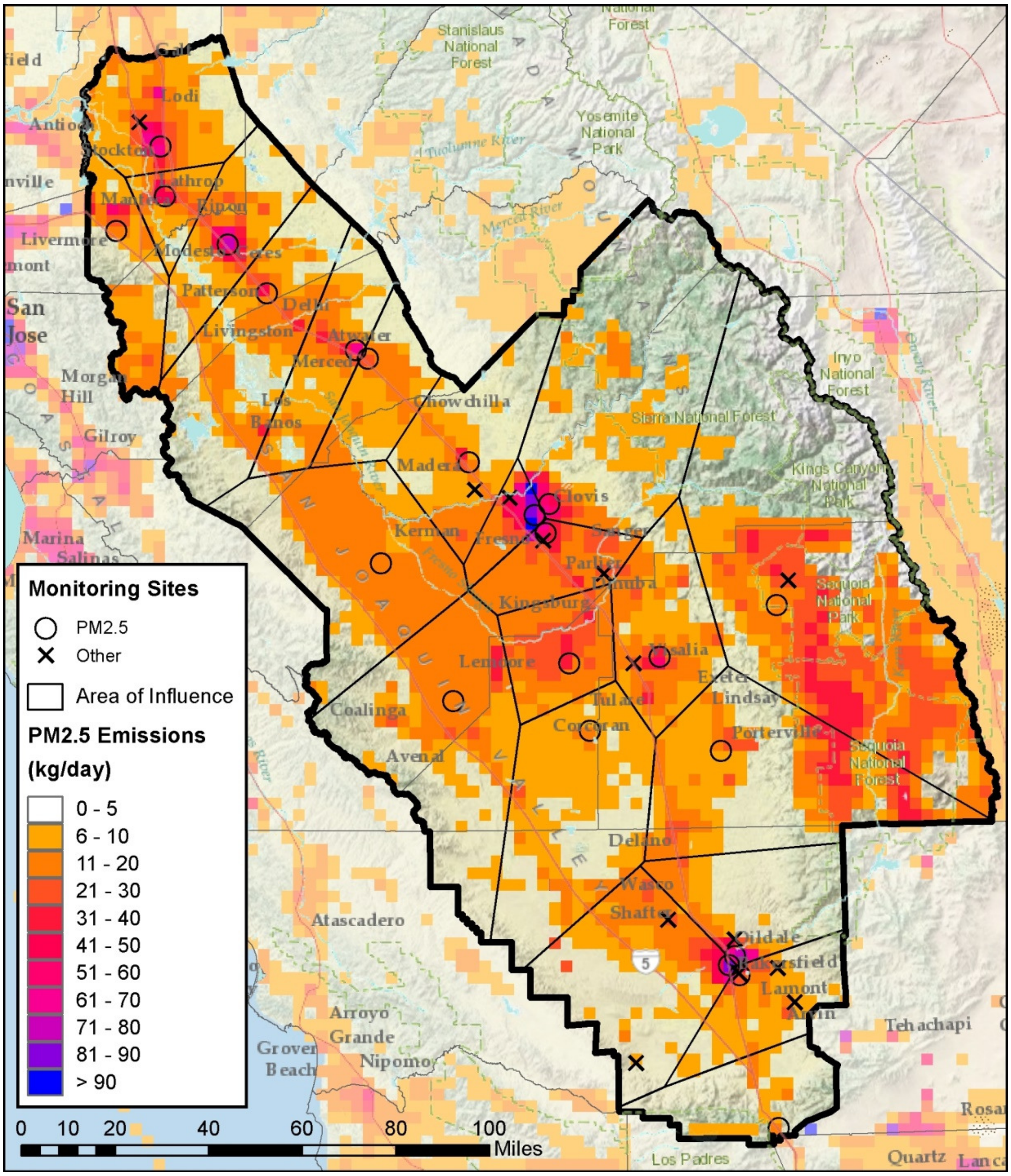
An emissions-served analysis of the $PM_{2.5}$ network can give further insight into whether locations which emit high pollution levels are accurately monitored. As expected, high NOx emissions are associated with freeways and largely-populated cities. As expressed above, and shown again in Figure 2-14 below, the large cities are appropriately served by this network. As for the emissions along the freeway, especially the 99 corridor, it was determined that additional monitors may be necessary in order to fully understand mobile-source NOx emissions in the valley. The District has four near-road NO_2 monitoring sites currently under development or construction to help fill the gaps indicated in the emissions-served map in Figure 2-14.

Figure 2-14. Map of NOx Emissions Assessed in Areas Served by $PM_{2.5}$ Monitors



Similarly, high $PM_{2.5}$ emissions are associated with freeways, largely-populated cities, as well as mountain regions where residential wood-burning and wildfires occur. As described in the population-served analysis, the large cities are appropriately served by the $PM_{2.5}$ network. Likewise, most areas with $PM_{2.5}$ emissions are captured by the current monitors.

Figure 2-15. Map of $PM_{2.5}$ Emissions Assessed in Areas Served by $PM_{2.5}$ Monitors



2.3.2 Area and Emissions-served Ozone Network

Like $PM_{2.5}$ monitoring, ozone monitoring in the SJV is aimed at measuring representative pollutant concentrations on both a neighborhood and an urban scale in order to better understand the local and regional causes, effects, and solutions to the non-attainment ozone problems faced by the District. By identifying area-served boundaries as they relate to maximum 1-hr ozone concentrations and numbers of days ozone values exceed the NAAQS standard, the district can determine the effectiveness of the current ozone network. Figures 2-16 and 2-17 depict the area of influence of the SJV ozone monitoring sites and the population density of each $4km^2$ zone. Figure 2-16 compares the population density to the maximum 8-hr ozone concentration in each of the $4km^2$ zone. Figure 2-17 compares the population analysis to number of days each zone exceeds the 8-hr NAAQS of 75 ppb ozone.

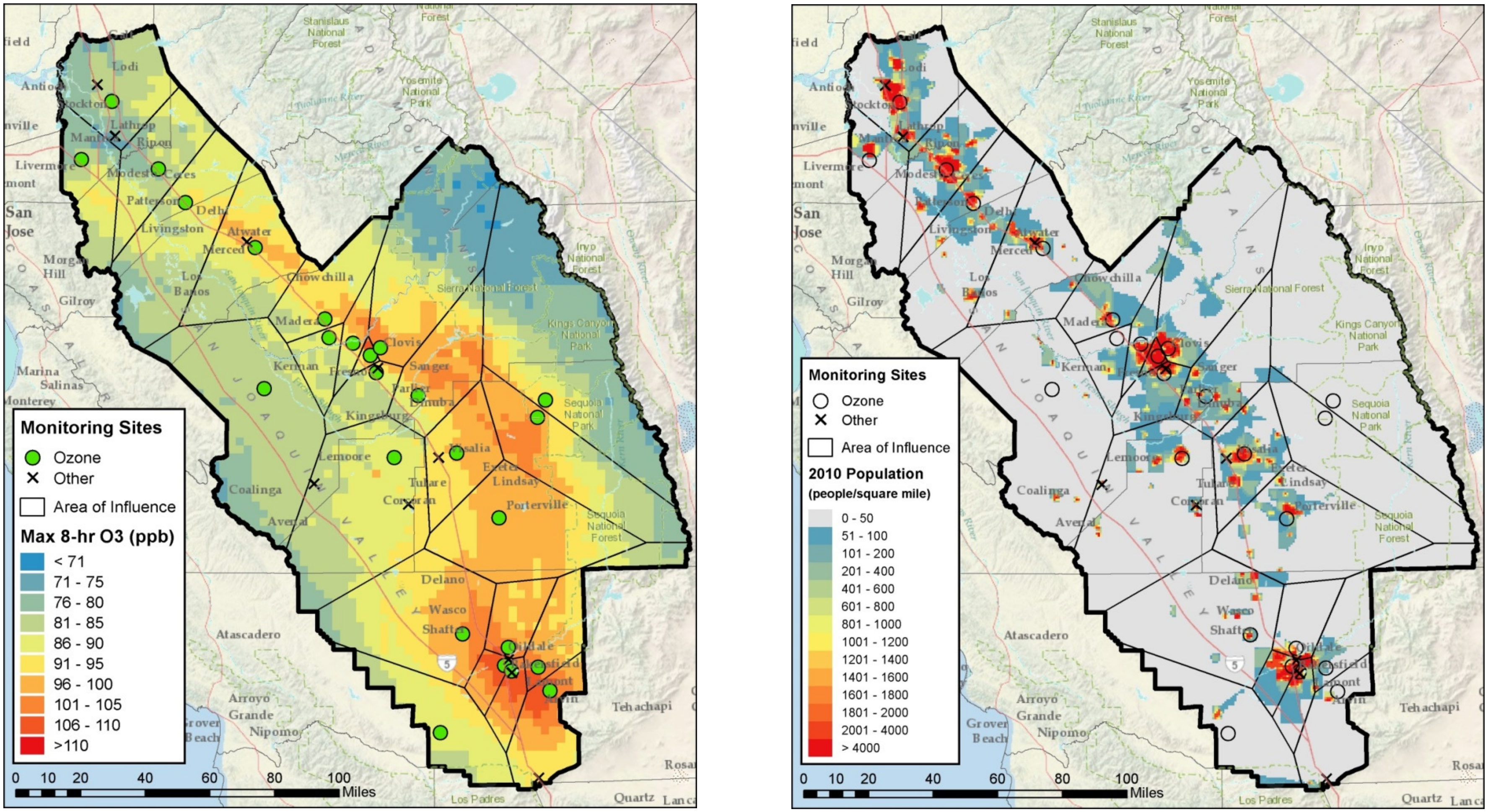
From population density and ozone modeling analysis, the District can assess whether areas with significant populations are accurately represented by their nearest monitor. Analysis of the ozone monitors in the northern counties of San Joaquin, Stanislaus, Merced, and Madera reveal that area and population are well-served. While it was mentioned that the site at Turlock serves a large area that encompasses the small local population of Los Banos, analysis of the modeled ozone concentrations in Figure 2-16 prove the pollutant concentrations are low so an additional site is not necessary.

There is a large grouping of ozone monitors located in the Fresno metropolitan area. The monitor at Clovis-Villa measures the gaseous and PM pollution parameters in the highly-populated area of Fresno County. As mentioned, this monitor is the closest to Oakhurst, a mountain community in Madera County. If the District plans for future ozone monitors, adding an Oakhurst site might provide useful information regarding local population exposure to ozone. Further investigation is necessary.

Further south, the Hanford site serves a vast area that encompasses many populated areas. The monitor is positioned far from a few small communities, including Corcoran to the south. Upon analysis of the modeled maximum 8-hr ozone concentrations in Figure 2-16, it appears that the pollution levels in Corcoran may sometimes vary from those in Hanford. As such, the ozone monitoring network may benefit from measuring ozone concentrations near Corcoran. Again, if network expansion occurs, the District could consider the addition of an ozone monitor at this already-existing site.

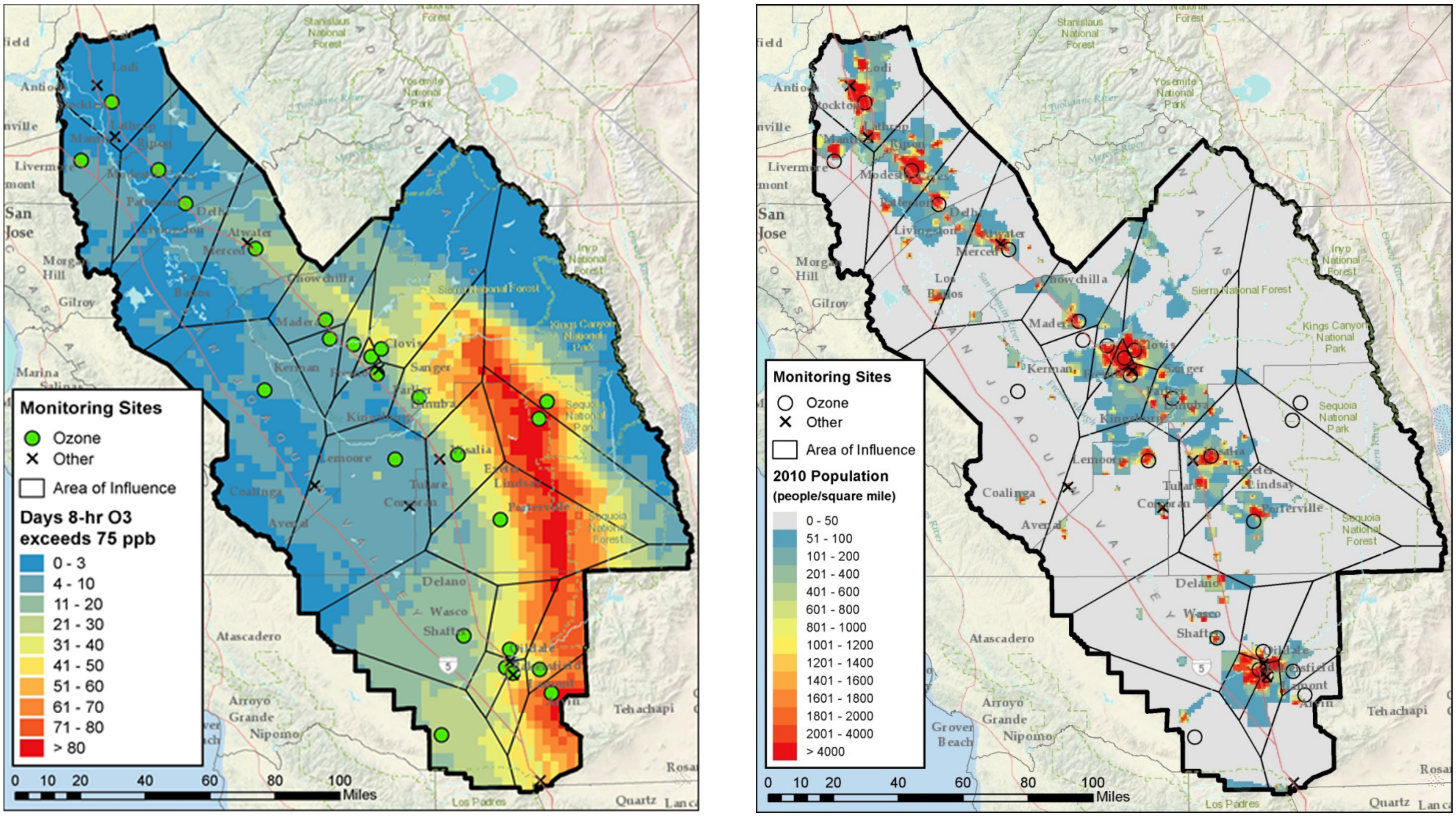
An assessment of all the remaining ozone sites in the southern counties of Fresno, Kings, Tulare, and Kern demonstrates that the network sufficiently covers the local populations and areas impacted by pollution.

Figure 2-16. On left, map of the areas served by the ozone monitoring sites in the San Joaquin Valley with the associated maximum 8-hr ozone concentrations in each zone in the District. On right, map of the areas served by the ozone monitoring sites in the San Joaquin Valley with the associated population/mi^2 for every 4km^2 zone in the District



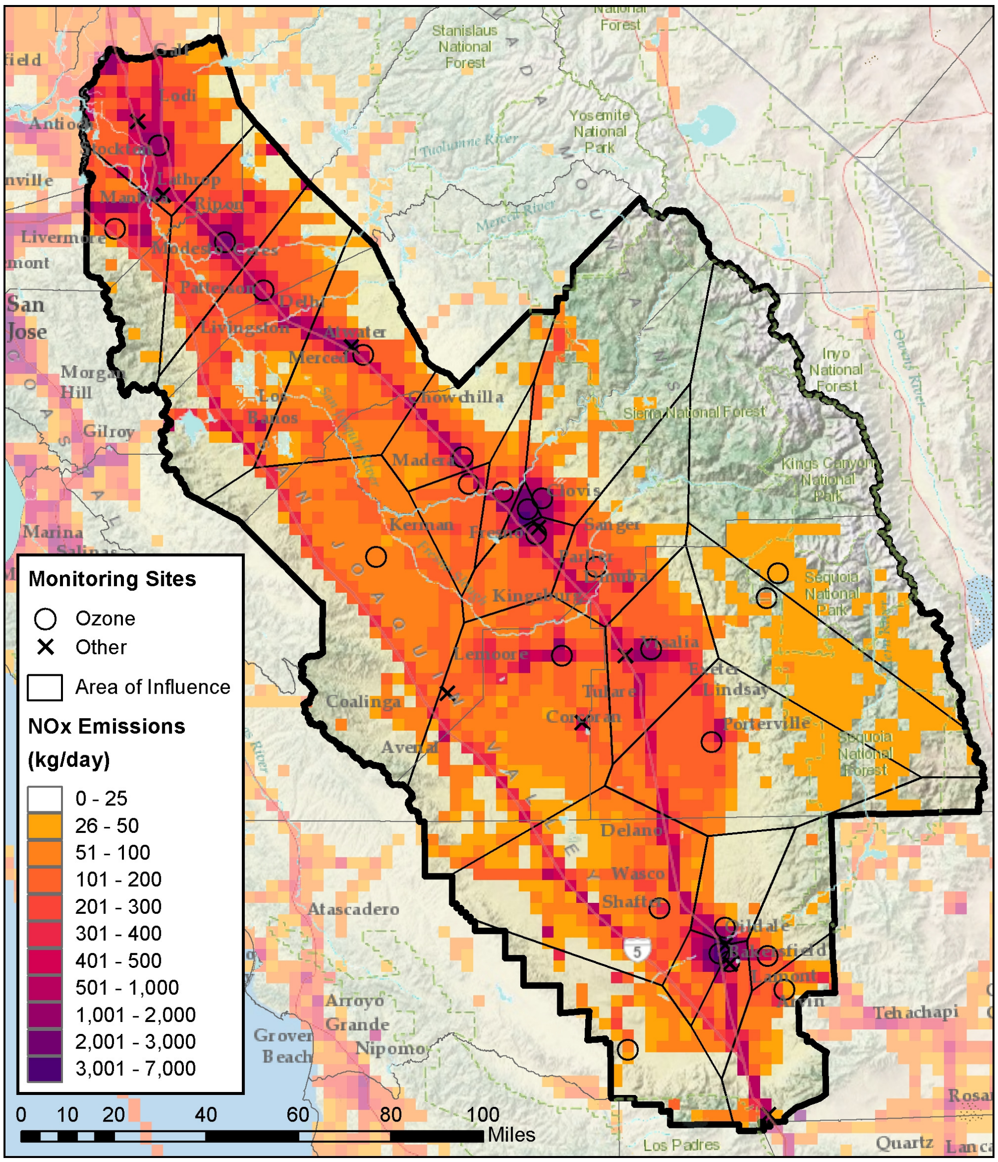
While the Turlock and Merced-Coffee monitors are positioned far from the city of Los Banos, modeled ozone concentrations (Figure 2-16) are low in this populated pocket. Furthermore, according to the analysis in Figure 2-17, there are likely fewer than three exceedance days in the area surrounding Los Banos, so an additional site is not necessary.

Figure 2-17. On left, map of the areas served by the Ozone monitoring sites in the SJV with the associated number days that the 8-hr ozone concentration exceeds the NAAQS in each zone. On right, map of the areas served by the ozone monitoring sites in the SJV with the associated population/mi^2 for every 4km^2 zone



An emissions-served analysis of the NOx compared to the ozone monitoring network can give further insight into whether locations that emit high pollution levels are accurately monitored. As mentioned above, high NOx emissions are associated with freeways and largely-populated cities. Figure 2-18 again confirms that the large cities are appropriately served by the ozone network. As for the emissions along the freeways, especially the 99 corridor, the District has four near-road NO_2 monitoring sites currently under development or construction to help fill the gaps indicated in the emissions-served map in Figure 2-18.

Figure 2-18. Map of NOx Emissions Assessed in Areas Served by Ozone Monitors



2.3.3 Site-to-Site Correlation Analyses

To identify possible redundancies in the pollutant monitoring network, the District ran Pearson correlation analyses for 24-hr $PM_{2.5}$ and 8-hr ozone concentrations using NetAssess, Ambient Air Monitoring Network Assessment Tool. The Pearson correlation coefficient (R) between site pairings shows how well the data agree. The R value is a measure of the linear relationship between two variables and ranges from -1.00 to 1.00. An R value of 1.00 means that there is a positive linear relationship between the data from two sites which might indicate a redundancy in the monitoring network for sites near each other. Figures 2-19 through 2-24 and Tables 2-13 and 2-14 below show the results of the correlation analyses. The eccentricity of the ellipses is proportional to how well the two sites correlate. An R value of 1.00 would be represented by a line while 0 would be a perfect circle. The distances between the sites are reported as kilometers in the center of the ellipses.

Figures 2-19, 2-20, and 2-21 are the 8-hr ozone correlation plots between sites in the northern, central, and southern San Joaquin Valley, respectively. Table 2-13 shows the R values for each correlation calculation. Figure 2-19 compares the northern SJV sites, all of which are spread apart. Due to the transport and formation components of ozone pollution which can cause a delay in ozone levels across a region, it would be expected that sites not near each other would not correlate as well as sites in the same metropolitan area. As such, many of the ellipses in Figure 2-19 are less linear and the average difference between the sites is greater than the sites closest together. As expected, the site furthest from all others, Stockton-Hazleton, shows the least correlation with the other sites. Additionally, as shown in the area- and emission-served analyses for ozone, there tends to be a southeastward trend in ozone pollution as the precursors are emitted, formed into ozone, and transported from the northern-most region down through the central monitors. Therefore, the central sites of Corcoran, Hanford, Tranquillity, and Fresno-Sky Park are more closely related than the distant northern sites.

For the central SJV monitors depicted in Figure 2-20, the Fresno area sites of Fresno-Garland, Fresno-Drummond, and Clovis correlated with one another well. Given their proximity and the regional nature of ozone pollution, we would expect that urban sites that are close together would approach R=1.00. Furthermore, the rural ozone sites of Parlier and Tranquillity don't correlate well with further sites. Similarly, the southern-most site in Figure 2-20 serves as a control group to demonstrate that a distant site will likely not see the same pollution levels.

The southern SJV monitors in Figure 2-21 continue with the trend. As mentioned, ozone pollution moves toward the southeast corner of the SJV, so sites in Kern County and southeastern Tulare County are likely to see a more even distribution of pollution levels. As expected, Porterville, Shafter, Arvin-Di Giorgio, Bakersfield-Muni, and Oildale have R values greater than 0.97 despite their distances. Furthermore, Hanford and Visalia, the sites that are upstream of the ozone transport, have R values less than 0.90.

Although many of the sites have R values greater than 0.95, this does not necessarily indicate that there are redundant sites. As discussed, ozone formation and transport is complex, so the local, short-lived differences between sites may not be captured in a simple correlation analysis. Additionally, the ozone network relies heavily on the spatial data obtained from these up and down stream monitoring site analyses. As described in the area- and emissions-served analysis section, these monitors are placed in strategic areas of large population or emissions and are therefore necessary components of the network.

Figures 2-22, 2-23, and 2-24 are the 24-hr average $PM_{2.5}$ correlation plots between sites in the northern, central, and southern San Joaquin Valley, respectively. Table 2-14 shows the R values for each correlation calculation. Unlike ozone, $PM_{2.5}$ pollution typically does not travel to distant sites and tends to be rather localized. As seen in all the $PM_{2.5}$ figures, the sites are much less agreeable and most R values are between 0.6 and 0.9 and don't necessarily increase with decreasing distance. Figure 2-22 compares the northern SJV sites, all of which are spread apart. The plots show that the R values are varied, which confirms the earlier assessment that each $PM_{2.5}$ monitor is a necessary part of the network. Figures 2-23 and 2-24 prove that this is also true for the central and southern sites, despite the closer proximity.

Figure 2-19. The 8-Hour Daily Maximum Ozone Concentrations Correlation Matrix for the Northern SJV Sites

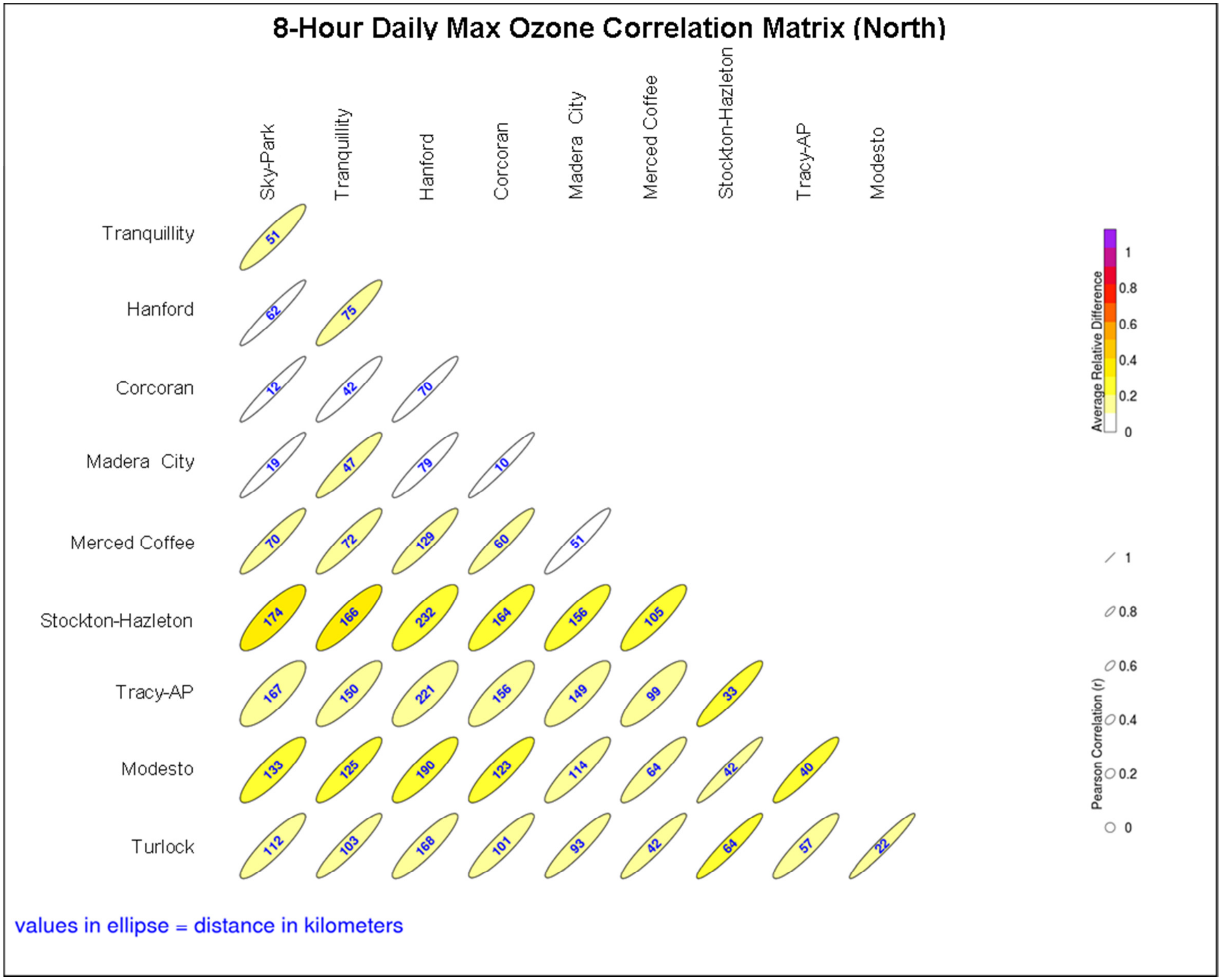


Figure 2-20. The 8-Hour Daily Maximum Ozone Concentrations Correlation Matrix for the Central SJV Sites

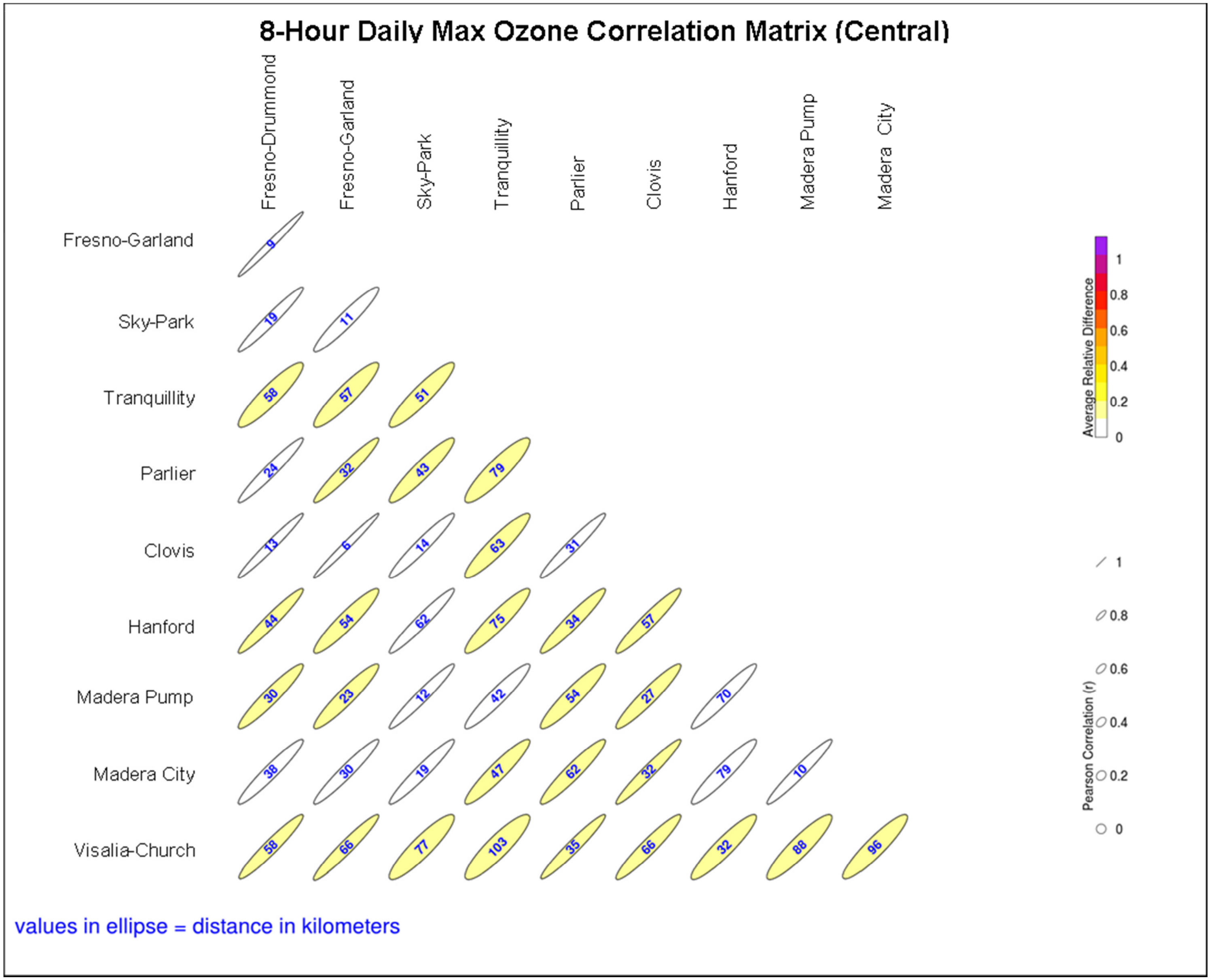


Figure 2-21. The 8-Hour Daily Maximum Ozone Concentrations Correlation Matrix for the Southern SJV Sites

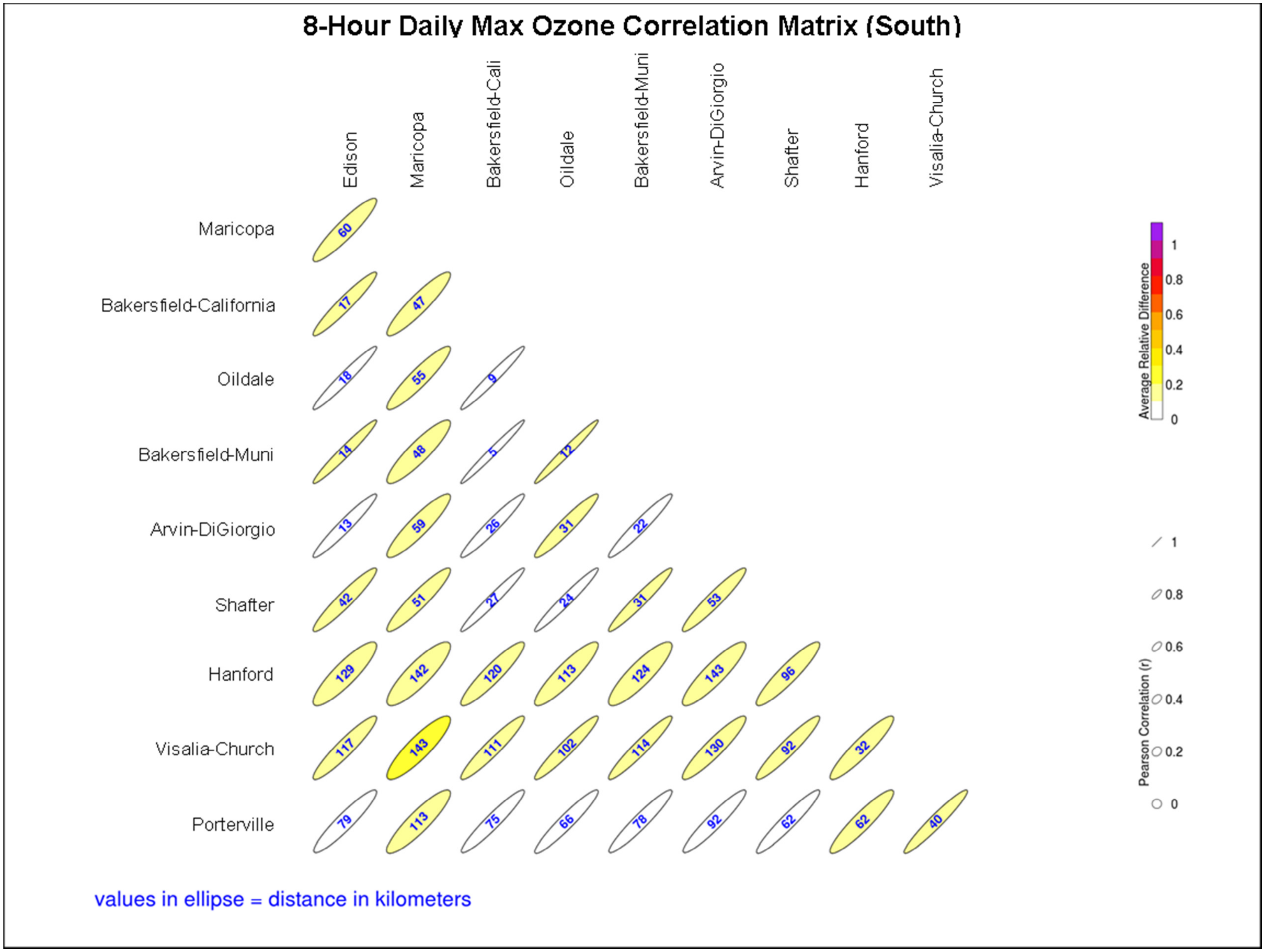


Table 2-13. 8-Hour Daily Max Ozone Pearson Correlations (r)

Sitename	Fresno-Drummond	Fresno-Garland	Fresno-SSP	Tranquillity	Parlier	Clovis	Edison	Maricopa	Bakersfield-Calif	Oildale	Bak-Muni	Arvin-DiGiorgio	Shafter	Hanford	Madera	Madera-City	Merced-Coffee	Stockton-Hazelton	Tracy-Airport	Modesto-14th	Turlock	SNP-Lower Kaweah	SNP-Ash Mountain	Visalia, Church
Fresno-Garland	0.99																							
Fresno-SSP	0.97	0.95																						
Tranquillity	0.91	0.92	0.92																					
Parlier	0.97	0.96	0.93	0.90																				
Clovis	0.98	0.99	0.96	0.93	0.97																			
Edison	0.92	0.92	0.88	0.86	0.92	0.92																		
Maricopa	0.89	0.88	0.86	0.87	0.87	0.89	0.92																	
Bakersfield-Calif	0.94	0.94	0.91	0.90	0.94	0.94	0.95	0.92																
Oildale	0.94	0.94	0.89	0.88	0.93	0.94	0.97	0.92	0.98															
Bak-Muni	0.93	0.94	0.86	0.85	0.92	0.94	0.97	0.90	0.99	0.98														
Arvin-DiGiorgio	0.91	0.91	0.88	0.87	0.93	0.92	0.96	0.91	0.96	0.95	0.96													
Shafter	0.93	0.94	0.91	0.92	0.94	0.94	0.95	0.93	0.98	0.97	0.96	0.95												
Hanford	0.96	0.93	0.97	0.93	0.95	0.95	0.88	0.86	0.92	0.90	0.88	0.90	0.92											
Madera	0.95	0.94	0.97	0.94	0.93	0.95	0.87	0.86	0.91	0.89	0.84	0.87	0.91	0.96										
Madera-City	0.96	0.96	0.96	0.94	0.95	0.97	0.87	0.84	0.93	0.91	0.89	0.89	0.92	0.94	0.97									
Merced-Coffee	0.93	0.92	0.94	0.92	0.91	0.92	0.87	0.84	0.90	0.89	0.86	0.86	0.89	0.93	0.94	0.95								
Stockton-Hazelton	0.86	0.87	0.83	0.87	0.82	0.86	0.80	0.75	0.84	0.83	0.80	0.79	0.84	0.84	0.86	0.87	0.88							
Tracy-Airport	0.82	0.84	0.81	0.86	0.79	0.83	0.78	0.76	0.81	0.80	0.79	0.77	0.81	0.81	0.83	0.84	0.85	0.93						
Modesto-14th	0.88	0.90	0.87	0.90	0.86	0.89	0.82	0.77	0.87	0.85	0.84	0.83	0.87	0.87	0.89	0.90	0.91	0.96	0.93					
Turlock	0.91	0.92	0.90	0.93	0.88	0.91	0.85	0.82	0.88	0.88	0.86	0.86	0.90	0.90	0.91	0.93	0.94	0.95	0.91	0.97				
SNP-Lower Kaweah	0.77	0.82	0.71	0.71	0.82	0.78	0.77	0.68	0.80	0.78	0.83	0.83	0.77	0.75	0.71	0.75	0.75	0.67	0.62	0.71	0.73			
SNP-Ash Mountain	0.87	0.89	0.82	0.80	0.90	0.87	0.89	0.83	0.89	0.89	0.92	0.91	0.87	0.84	0.80	0.83	0.84	0.73	0.70	0.76	0.80	0.92		
Visalia, Church	0.96	0.96	0.91	0.89	0.97	0.95	0.94	0.88	0.94	0.95	0.95	0.93	0.94	0.92	0.91	0.92	0.90	0.83	0.80	0.86	0.89	0.80	0.90	
Porterville	0.94	0.93	0.91	0.88	0.95	0.93	0.94	0.90	0.95	0.95	0.95	0.95	0.95	0.93	0.90	0.91	0.89	0.77	0.74	0.81	0.86	0.80	0.92	0.96

Figure 2-22. The 24-Hour Daily Average PM2.5 Concentrations Correlation Matrix for the Northern SJV Sites

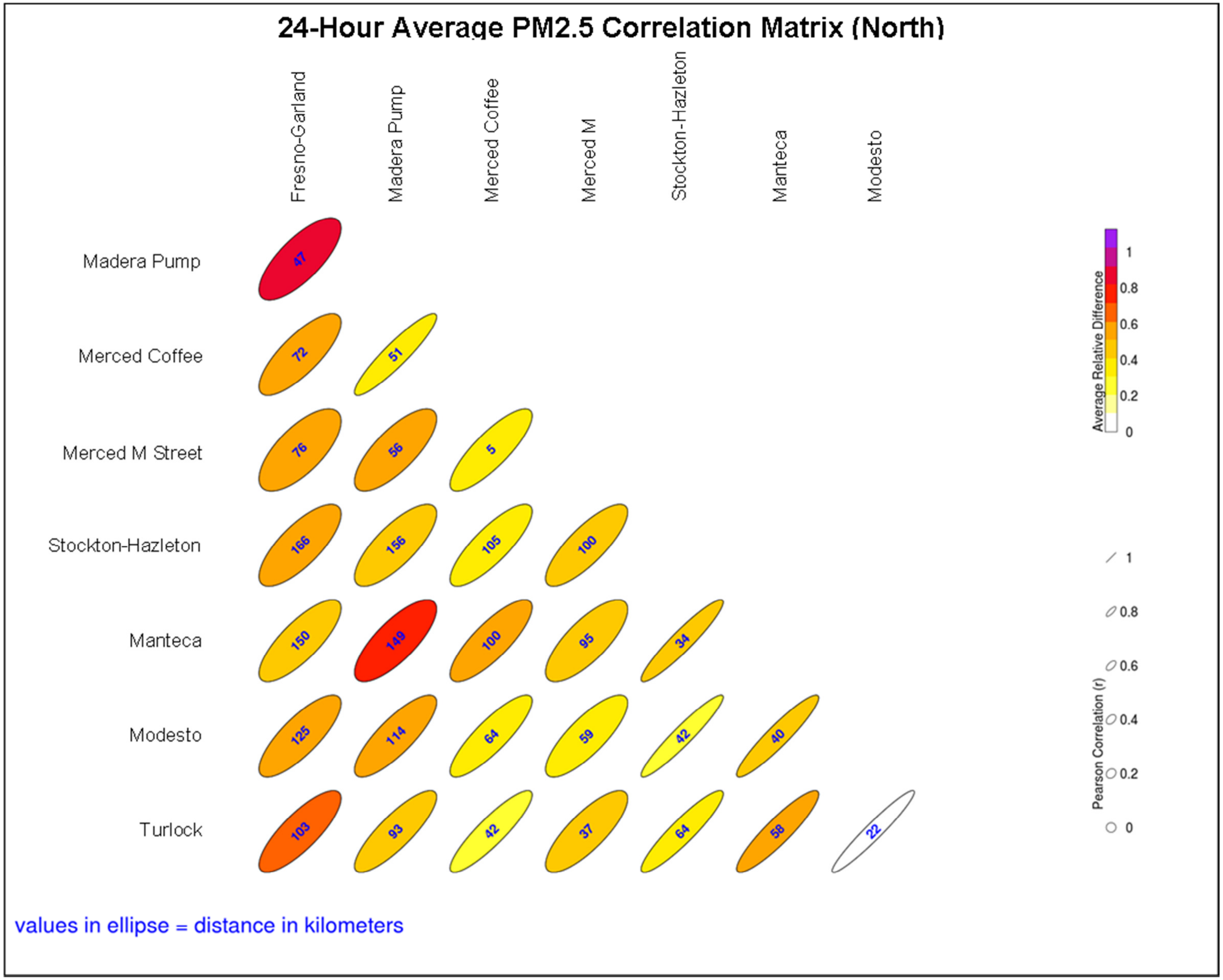


Figure 2-23. The 24-Hour Daily Average PM2.5 Concentrations Correlation Matrix for the Central SJV Sites

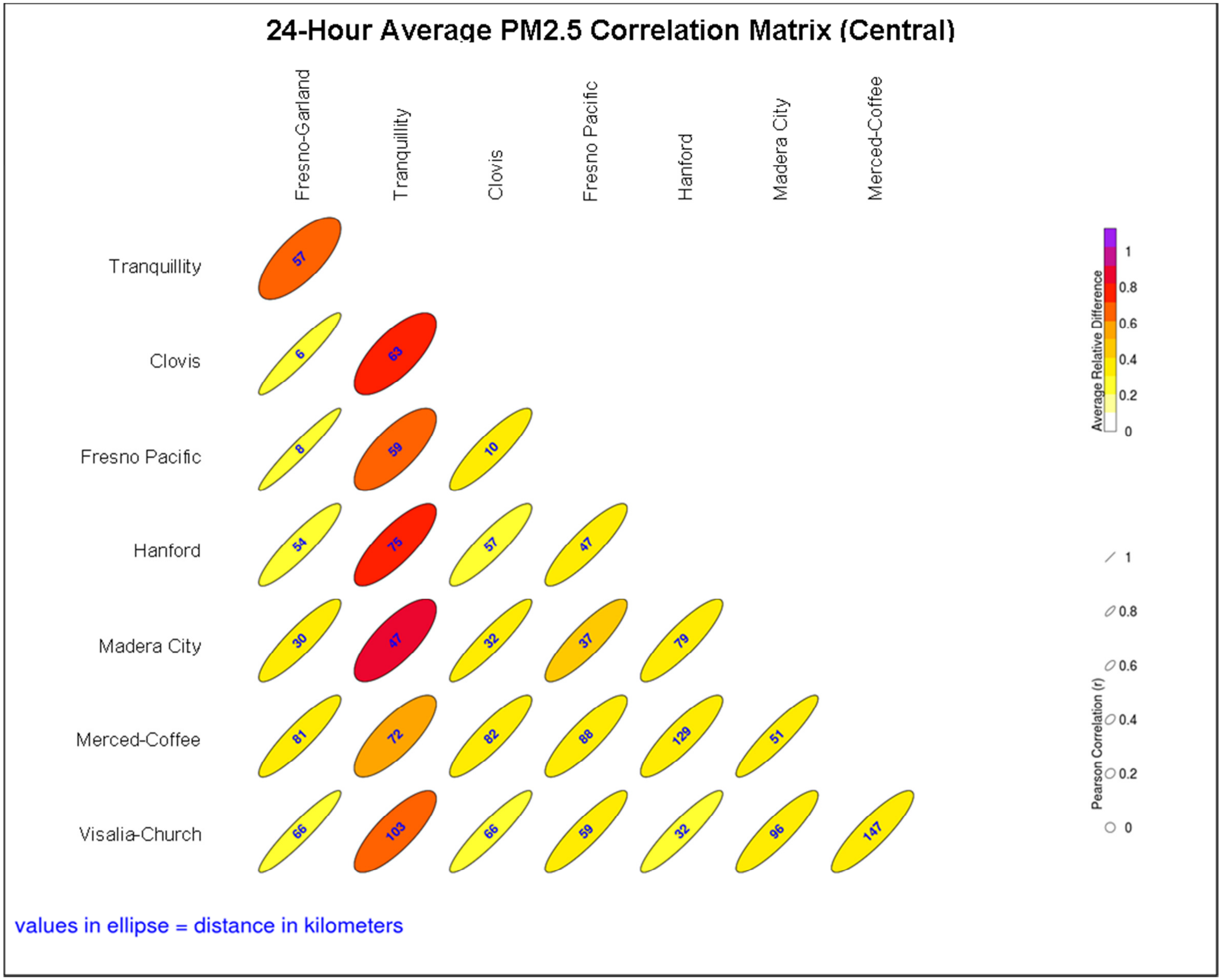


Figure 2-24. The 24-Hour Daily Average PM2.5 Concentrations Correlation Matrix for the Southern SJV Sites

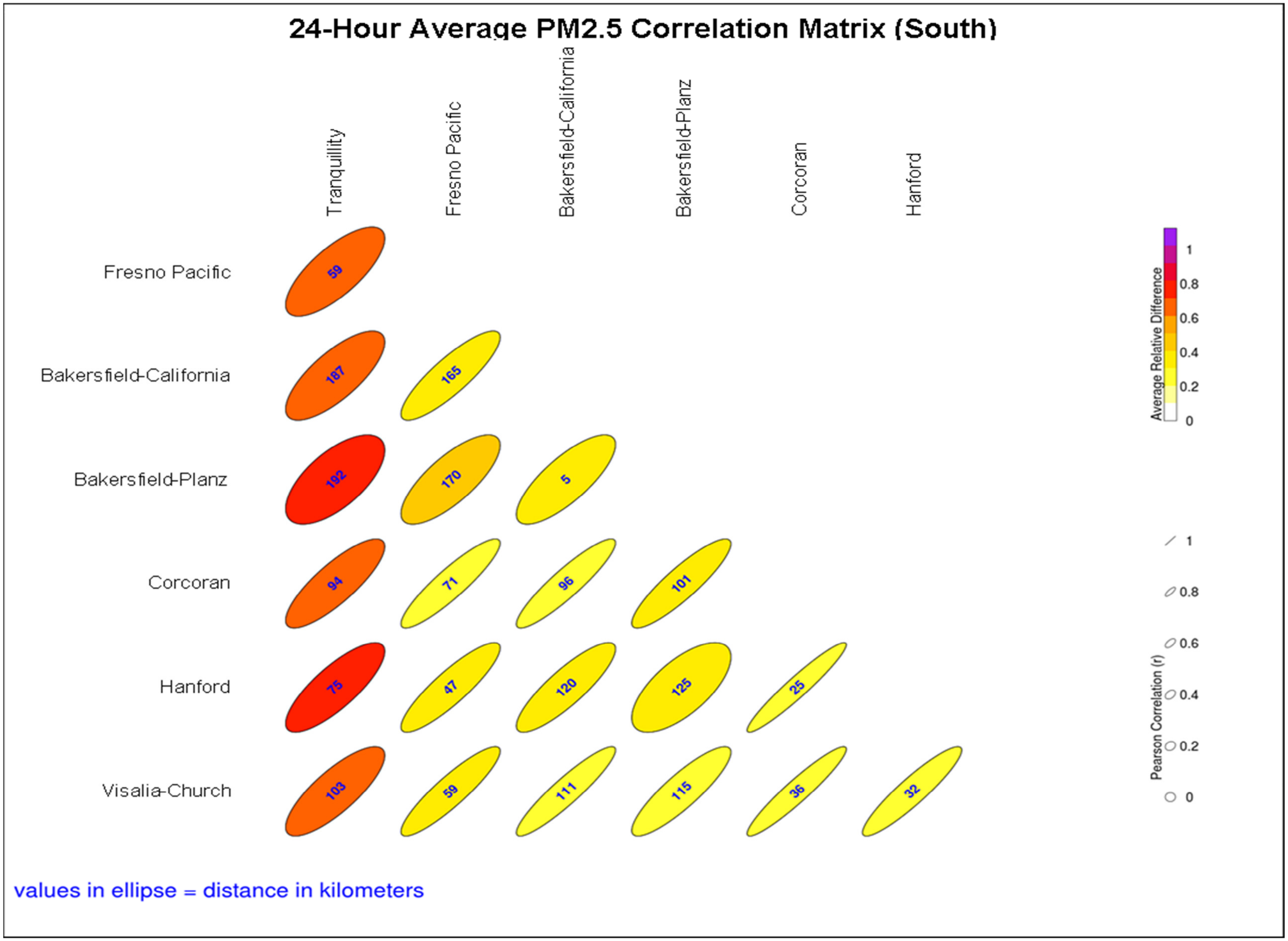


Table 2-14. 24-Hour Average PM2.5 Pearson Correlations (r)

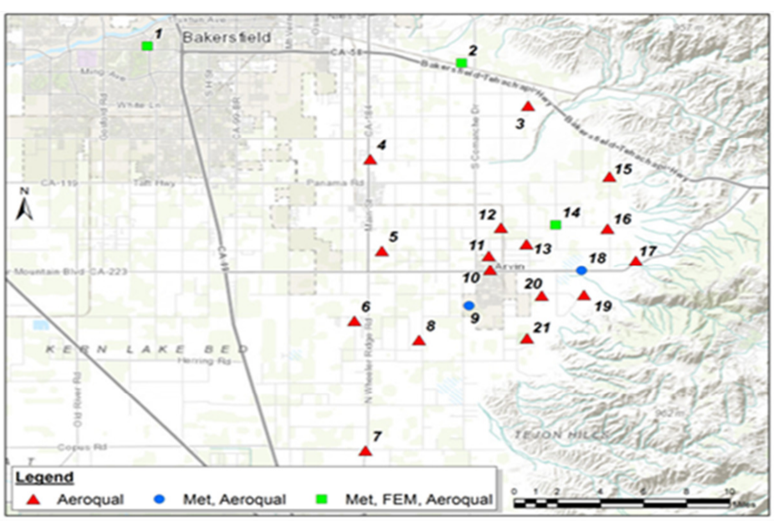
Sitename	Fresno-Garland	Tranquillity	Clovis	Fresno-Pacific College	Bakersfield-Calif	Bakersfield-Planz	Corcoran	Hanford	Madera-City	Merced-Coffee	Merced, M Street	Stockton-Hazelton	Manteca	Modesto-14th	Turlock
Tranquillity	0.73														
Clovis	0.94	0.72													
Fresno-Pacific College	0.96	0.74	0.89												
Bakersfield-Calif	0.86	0.75	0.83	0.86											
Bakersfield-Planz	0.68	0.65	0.62	0.76	0.78										
Corcoran	0.90	0.83	0.89	0.91	0.91	0.89									
Hanford	0.91	0.80	0.90	0.88	0.86	0.68	0.95								
Madera-City	0.90	0.75	0.93	0.87	0.81	0.62	0.87	0.88							
Merced-Coffee	0.91	0.78	0.89	0.87	0.78	0.62	0.91	0.87	0.92						
Merced, M Street	0.90	0.70	0.74	0.88	0.81	0.77	0.88	0.80	0.76	0.83					
Stockton-Hazelton	0.82	0.76	0.75	0.78	0.76	0.61	0.77	0.82	0.77	0.83	0.81				
Manteca	0.80	0.79	0.73	0.77	0.75	0.60	0.78	0.80	0.77	0.82	0.76	0.94			
Modesto-14th	0.87	0.80	0.80	0.82	0.79	0.62	0.83	0.86	0.82	0.86	0.81	0.95	0.94		
Turlock	0.89	0.81	0.85	0.85	0.78	0.61	0.86	0.89	0.85	0.89	0.80	0.92	0.91	0.96	
Visalia, Church	0.94	0.80	0.93	0.90	0.92	0.88	0.94	0.92	0.89	0.88	0.82	0.77	0.75	0.81	0.84

2.4 ARVIN SATURATION STUDY

The Arvin Saturation Study was an in-depth collection and investigation of ozone concentrations and patterns across the southeast valley portion of Kern County. In May 2013, the District contracted with Sonoma Technologies Inc. (STI) to conduct an ozone saturation study in the Arvin area. The purpose of this study was to measure the relative differences in ozone concentrations in Kern County with a focus on the Arvin area. A main driver behind the study was to assess the ozone network in the Bakersfield area and the region to the southeast of Bakersfield to observe whether the current network was adequate in capturing the peak concentrations. This analysis was especially important due to the closure of the long running Arvin-Bear Mountain ozone site in 2010 and the start-up of the Arvin-Di Giorgio replacement ozone site. The summary below provides a brief overview of this network assessment field study and analysis, which concluded that the current ozone network in the southeastern Kern County area is appropriately sited.

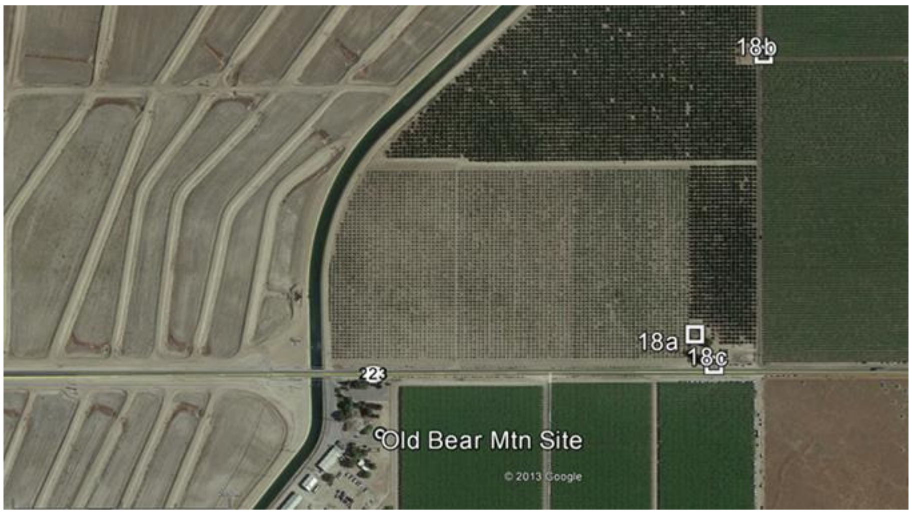
STI and their project partners (Providence Engineering and Environmental Group and Winegar Air Sciences) installed and operated a network of 23 temporary, small-scale ozone monitors (Aeroqual Series 500 ozone sensors) at 21 sites (see Figure 2-25) to collect ozone readings by the minute for approximately six weeks during the 2013 summer ozone season, beginning in mid-August until the end of September. The majority of the monitoring locations for this special study were clustered in and around the community of Arvin with a scattering of samplers farther from the community to examine ozone in the surrounding area. Three samplers were collocated at official air monitoring sites (including Di Giorgio) to continually ensure and verify accuracy of the samplers. Surface wind measurements were made at five sites: three permanent wind measurement locations at the ARB air monitoring stations (Bakersfield-California Street, Edison, and Di Giorgio), and two temporary locations established for this study near the Bear Mtn. site and at a site in the City of Arvin.

Figure 2-25. Saturation Study Monitor Locations



The District contacted the Arvin-Edison Water District requesting authorization for placement of one of the temporary monitors precisely at the same location as the former regulatory site; however, this request was denied. To represent the former regulatory monitoring location at Bear Mountain Road, two locations were selected 0.4 km (440 yards) east of the old regulatory site, with one sensor near the roadway and a second north of the roadway (see Figure 2-26). Other sites were established to capture ozone concentrations (1) to the west, where the sites would often be upwind of Arvin; (2) in Arvin, where most people in the area live; and (3) in and around the Bear Mtn. and Di Giorgio sites.

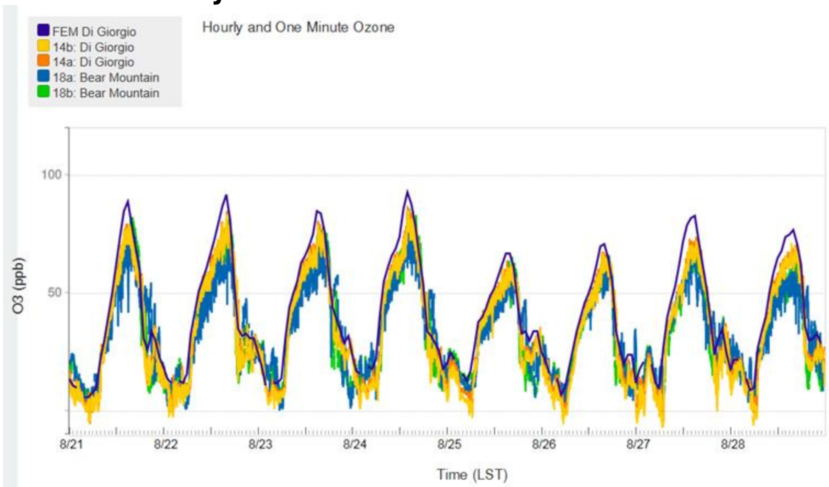
Figure 2-26. Bear Mountain Road Monitoring Sites



The picture above shows an aerial view around the old Bear Mountain regulatory monitoring site. Site 18a is about 440 m from the old Bear Mountain site. Site 18b is recessed from the road by about 300 m. Site 18c is the meteorological tower and is about 20 m from Site 18a.

All one-minute sensor data were transmitted in real time to STI's office and posted to a password-protected website for daily data review (see Figure 2-27). STI assured the quality of the data by reviewing time-series plots of ozone concentrations and sensor quality assurance metadata. Ozone concentrations (1-hr and 8-hr) were then calculated from the quality-controlled 1-minute data. Using the collocation measurements, STI calibrated the data to be near regulatory quality. Overall, data recovery rates were excellent at all sites. The ozone samplers functioned admirably during the study period and recorded hundreds of hours of ozone measurements that were effectively identical to measurements at the official monitoring sites.

Figure 2-27. Saturation Study Data Screenshot



This special study identified that the peak 1-hour and 8-hour locations varied from site to site each day. No specific site observed the highest value each day; and therefore, no specific site could be selected that would always observe the highest value. A return to the old Arvin-Bear Mountain site would not be justified as "selected to observe the peak value" as the site would not be expected to observe the peak value each day.

Additionally this special study showed that the old Arvin-Bear Mountain site was no longer the peak site in the area, even though the study was conducted during the time period when peak 1-hour ozone levels are expected. The parallel monitoring that showed that Arvin-Bear Mountain had a higher value than the Arvin-Di Giorgio site may reflect emissions and air quality patterns that no longer exist or, with absolute certainty, do not exist every year because emission levels have changed due to emission reduction strategies adopted by the District, ARB, and EPA.

In summary:

- If reductions of emissions have altered air quality to the point where the old Arvin-Bear Mountain is no longer the peak site; then a return to the old site is not justified.
- If air quality conditions are not as definitive and the old Arvin-Bear Mountain site may observe peak values on some years but not others; the case for return to the old Arvin-Bear Mountain site is not established because it would create an equivalent lack of monitoring for peak values at other sites which were shown to have higher values during the more recent year of special study monitoring.
- A wind shift of two (2) degrees from upwind areas, such as Bakersfield, will shift the peak by a one half of a mile (½) by the time the air parcel reaches either Arvin-Di Giorgio or Arvin-Bear Mountain. Since small variations in meteorology can create significant changes in how emissions are transported further downwind, the peak ozone location in the Arvin area is a moving target, and therefore the Arvin-Bear Mountain site is not expected to be the consistent peak.

The air quality improvement measured by this study in the Arvin area indicates that the federal 1-hour ozone standard is no longer exceeded at any of the sites in the study area. Therefore, site selection of an air monitoring station should be based on 8-hour maximums and the frequency of exceedances. This study indicates that Arvin-Di Giorgio is the site that better represents 8-hour exceedances and maximums than the old Arvin-Bear Mountain site.

2.4.1 Key Findings from the Arvin Saturation Study

With the successful completion of the saturation study, STI provided the District with a report that includes a number of findings and extensive supporting analysis (see Attachment A). Some of the key findings include:

1. The Arvin-Di Giorgio monitoring site is highly representative of worst-case high ozone concentrations in the Arvin area around the old Arvin-Bear Mountain monitor, and, in fact, Arvin-Di Giorgio generally measured higher concentrations than the Arvin-Bear Mountain sites.

    - On average, peak 1-hr ozone concentrations ranged from 3% - 15% higher at Arvin-Di Giorgio as compared to Arvin-Bear Mountain concentrations.
    - Arvin-Bear Mountain sites experienced fewer days exceeding the 8-hr ozone standard than the Arvin-Di Giorgio site. Concentrations exceeded the 8-hr standard six times at Arvin-Bear Mountain; whereas, concentrations exceeded the 8-hr standard at Arvin-Di Giorgio 11 times.

2. The Arvin-Di Giorgio monitoring site is highly representative of ozone concentrations measured in the City of Arvin. They are well-correlated and of essentially the same magnitude.

    - Relationships for high concentrations of ozone between the Arvin temporary monitors and official station monitors (Bakersfield-California, Arvin-Di Giorgio, and Edison) were evaluated, with the strongest correlation occurring between the City of Arvin and the Arvin-Di Giorgio monitoring station with an R^2 of 0.79.

3. Accurate equations were developed for predicting the City of Arvin's peak 1-hr and 8-hr ozone equations utilizing measurements from the air monitoring and meteorological network sites.

    - Predicted 1-hr and 8-hr ozone concentrations from the resulting equations versus the observed ozone were strongly correlated with an R^2 of about 0.92.

4. Accurate equations were developed for predicting Arvin-Bear Mountain's peak 1-hr and 8-hr ozone concentrations utilizing measurements from the air monitoring and meteorological network sites.

    - Predicted 1-hr and 8-hr ozone concentrations from the resulting equations versus the observed ozone were strongly correlated with an R^2 of about 0.90.

5. Strong gradients in peak 1-hr and 8-hr ozone concentrations are present within and around Arvin. Peak 1-hr ozone concentrations at each site on a given day can

vary by as much as 30 ppb. This suggests complex local wind flow patterns in and around the saturation study area.

6. The Arvin Saturation Study helped establish a clearer understanding of the diurnal patterns of ozone throughout the day in the Arvin area.

7. The temporary, small-scale sensors used for the Arvin Saturation Study were sufficiently accurate and precise to measure peak ozone concentrations and assess differences in ozone concentrations in and around Arvin.

The predictive equations that the Arvin Ozone Saturation Study produced can be used to calculate 1-hour ozone readings for Arvin-Bear Mountain, following the same procedures that are described in Attachment A (Arvin Ozone Saturation Study). The error for this predictive equation is 1 ppb. The 2012-2014 1-hour ozone design value generated by the predictive equation for Arvin-Bear Mountain is 102 ppb, which is attainment of the federal 1-hour ozone standard. See Table 2-15 for details.

Table 2-15. 2012-2014 Design Value for Arvin-Bear Mountain Using the Arvin Ozone Saturation Study Predictive Equation

Year	Date	Arvin-Di Giorgio (observed)	Arvin-Bear Mountain (calculated)
2012	July 11	122	110
2012	August 28	113	103
2012	August 13	111	102
2012	June 01	109	102
2012	August 10	109	99
2013	July 20	109	100
2013	September 13	106	99
2013	July 09	103	95
2013	July 19	103	95
2013	June 07	100	96
2014	September 11	109	101
2014	September 12	109	101
2014	June 09	108	101
2014	July 25	108	98
2014	June 30	105	not available[1]
Design Value 2012-2014		109	102

[1] The 12Z 500 MB height from Vandenberg Air Force Base, which is a key dependent variable, is missing for June 30, 2014.

2.5 TECHNICAL APPROACH AND FINDINGS FOR THE PAMS NETWORK ASSESSMENT

The PAMS program collects ambient air measurements in areas classified as serious, severe, or extreme ozone nonattainment, as required by Section 182(c)(1) of the Clean Air Act. The District is currently operating under the PAMS Alternative Network Plan Revision of April 21, 1995. PAMS are used to collect data for a target list of VOCs, nitrogen oxides (NO_x, NO_y), ozone, and surface and lower-air meteorological measurements. In 2006, EPA reduced minimum PAMS monitoring requirements to establish a network that meets the national objectives of the program while freeing up resources for states to tailor their networks to suit specific data needs.

2.5.1 Overview of the PAMS Network

The PAMS network was established in the mid-1990s in ozone nonattainment areas to provide information on the effectiveness of control strategies, emissions tracking, and trends. State and local air pollution control agencies are responsible for operation of the PAMS sites. The data collected at the PAMS sites include measurements of ozone, NO_x, CO, a target list of VOCs including several carbonyls, and surface and upper air meteorology.

The PAMS network design was developed specifically to characterize: 1) upwind and background ozone and ozone precursors; 2) ozone maximum precursor emissions; and 3) downwind ozone concentrations within a region for the purpose of understanding ozone precursor emissions, chemical transformation, patterns, and transport. PAMS sites are not specifically sited to monitor population exposure.

The PAMS network was designed to collect measurements at defined locations within an urban region to meet specific objectives based on a site's location relative to emissions and transport pathways. The site types and objectives are defined as follows:

- Type 1 – Upwind background ozone and precursors entering area of maximum precursor emissions
- Type 2 – Area of maximum ozone precursor emissions
- Type 3 – Site of maximum ozone occurring downwind from area of maximum precursor emission
- Type 4 – Extreme downwind monitoring sites

Two of the main goals of the PAMS network assessment are to 1) assess data quality; and 2) determine how well the PAMS sites are currently serving their objectives, that is, to determine if the PAMS sites actually meeting Type 1, 2, and 3 site objectives.

The District currently operates five PAMS monitoring sites; Madera-Pump Yard, Clovis-Villa, Parlier, Shafter, and Bakersfield-Muni. The District is required to have a Type 3 PAMS site in the Bakersfield MSA. The site was formerly located at the Arvin-Bear Mountain site, which is no longer in operation. The District will install Type 3 PAMS equipment when ARB establishes a permanent replacement site in the Arvin area that is capable of housing the PAMS equipment.

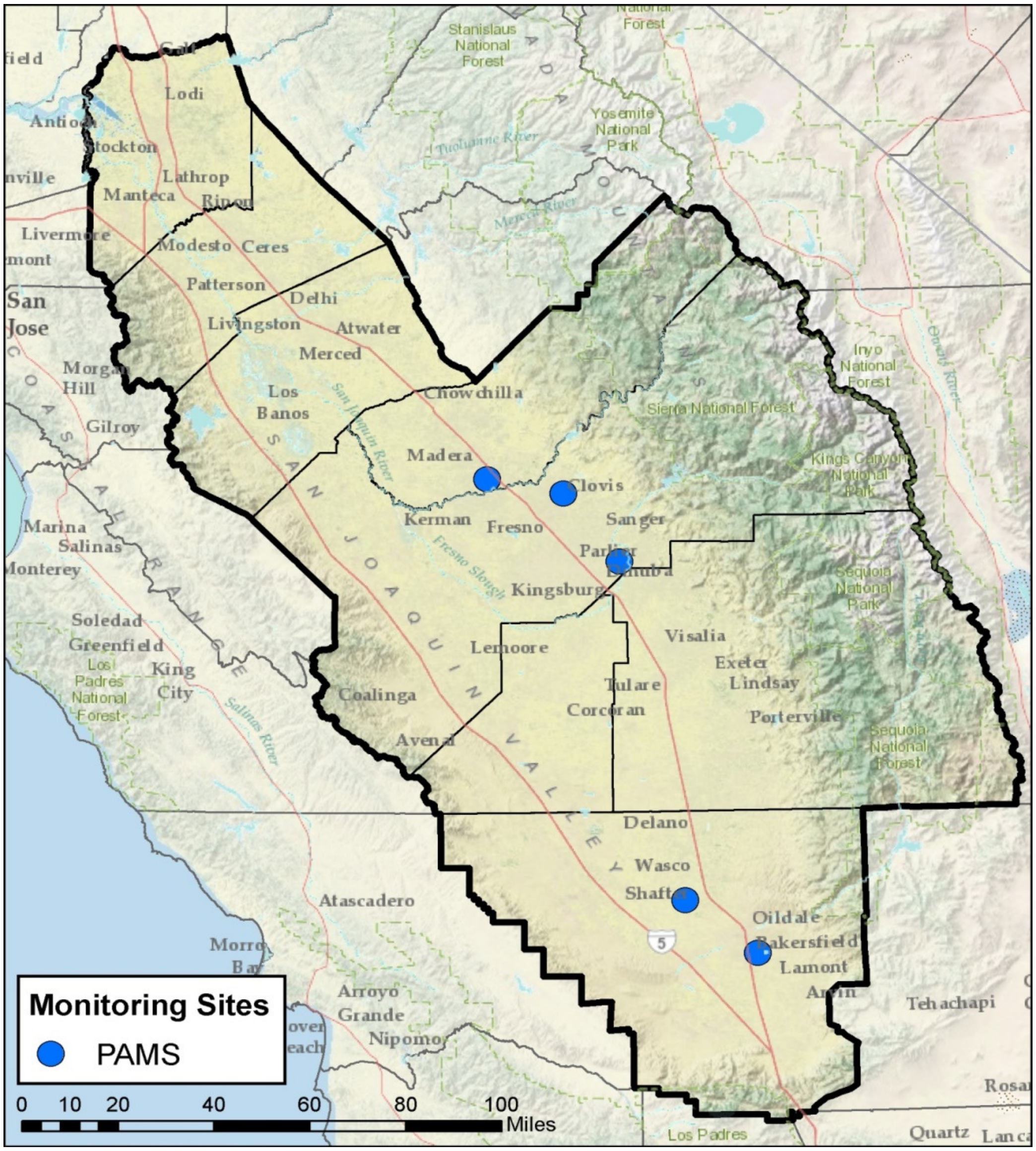
2.5.2 Recent PAMS Regulatory Changes

The U.S. Environmental Protection Agency (EPA) finalized revisions to the PAMS monitoring requirements on October 17, 2006 (71 FR 61236). The revisions greatly reduced the minimum PAMS requirements, which freed up resources and allowed states to tailor PAMS networks to suit their specific data needs. Overall, the changes significantly reduced the costs of the minimum PAMS monitoring requirements and allowed states to re-invest these savings in area-specific PAMS monitoring activities. Several changes specific to PAMS have been made as a result of the new monitoring rule:

- *Reduced number of required PAMS sites*. Only one Type 2 site is required per area, regardless of population, and Type 4 sites are not required. Only one Type 1 or one Type 3 site is required per area.
- *Reduced requirements for speciated VOC measurements*. Speciated VOC measurements are only required at Type 2 sites and one other site (either Type 1 or Type 3) per PAMS area.
- *Reduced carbon compound sampling*. Carbonyl compound sampling is required only in areas classified as serious or above for the 8-hr ozone standard.
- *Changed nitrogen monitoring*. Conventional NO2/NOx monitors are required only at Type 2 sites. High sensitivity NOy monitors is required at one site per PAMS area (either Type 1 or Type 3).
- *Additional CO monitoring*. High sensitivity CO monitors is required at Type 2 sites.

As of 2014, and in lieu of the current PAMS network design requirements, EPA is proposing to require that PAMS measurements are to be made at any existing NCore site in an ozone nonattainment area. When an existing NCore site is not as good a location for making PAMS measurements as an existing PAMS site, EPA recognizes that in limited situations it may be acceptable to continue monitoring at the existing PAMS site in support of ongoing research and to maintain trends information. Figure 2-28 shows the location of the PAMS sites in the San Joaquin Valley.

Figure 2-28. Location of PAMS Monitoring Sites in the San Joaquin Valley



2.5.3 PAMS Data Analyses

Several analyses are performed as part of the PAMS network assessment to address the objectives of the PAMS sites including the following: the percent above MDL (Table 2-16), the rate of data completeness (Table 2-17), the measured concentrations (Tables 2-18 and 2-19), the existence of trend patterns and maximum ozone locations (Figures 2-28 and 2-29).

Table 2-16. Summary of Percent above MDL for PAMS Sites

	% Above MDL by Site				
PAMS Target Compounds	Madera-Pump Yard	Clovis-Villa	Parlier	Shafter	Bakersfield-Muni
Trans-2-Pentene	4%	7%	9%	40%	17%
Trans-2-Butene	13%	6%	5%	19%	5%
Total NMOC		100%	100%	100%	100%
Toluene	13%	36%	32%	79%	84%
Styrene	33%	0%	0%	3%	22%
Propylene	96%	96%	90%	100%	99%
Propane	100%	100%	100%	100%	100%
P-Ethyltoluene	30%	40%	34%	72%	64%
P-Diethylbenzene	0%	0%	3%	15%	3%
O-Xylene	4%	4%	5%	21%	18%
O-Ethyltoluene	13%	16%	14%	38%	33%
N-Undecane	28%	19%	36%	62%	45%
N-Propylbenzene	57%	47%	47%	70%	55%
N-Pentane	91%	99%	98%	100%	100%
N-Octane	24%	32%	27%	74%	65%
N-Nonane	33%	32%	33%	72%	66%
N-Hexane	78%	97%	89%	100%	100%
N-Heptane	59%	82%	70%	100%	100%
N-Decane	13%	18%	15%	53%	44%
N-Butane	96%	100%	100%	100%	100%
M-Ethyltoluene	41%	66%	52%	91%	86%
Methylcyclopentane	59%	95%	80%	100%	99%
Methylcyclohexane	11%	27%	26%	81%	77%
M-Diethylbenzene	0%	1%	1%	0%	1%
M/P Xylene	3%	9%	6%	32%	32%
Isopropylbenzene	25%	71%	60%	46%	31%
Isoprene	65%	80%	40%	100%	78%
Isopentane	80%	87%	82%	96%	92%
Isobutane	87%	99%	97%	100%	100%
Formaldehyde		100%			100%
Ethylene	100%	100%	100%	100%	100%
Ethylbenzene	0%	1%	1%	4%	1%
Ethane	100%	100%	100%	100%	100%
Cyclopentane	2%	20%	13%	83%	64%
Cyclohexane	15%	36%	23%	64%	81%

Table 2-16. Summary of Percent above MDL for PAMS Sites (continued)

% Above MDL (continued)					
Site Name	**Madera-Pump Yard**	**Clovis-Villa**	**Parlier**	**Shafter**	**Bakersfield-Muni**
Cis-2-Pentene	2%	3%	3%	4%	4%
Cis-2-Butene	4%	1%	3%	6%	3%
Benzene	59%	85%	74%	98%	93%
Acetylene	100%	100%	100%	100%	100%
Acetone		64%			99%
Acetaldehyde		98%	100%	100%	100%
3-Methylpentane	54%	79%	64%	98%	99%
3-Methylhexane	22%	46%	34%	64%	88%
3-Methylheptane	4%	9%	5%	38%	49%
2-Methylpentane	59%	89%	68%	96%	97%
2-Methylhexane	22%	46%	38%	74%	91%
2-Methylheptane	22%	31%	33%	72%	72%
2,4-Dimethylpentane	7%	39%	34%	79%	93%
2,3-Dimethylpentane	13%	40%	35%	77%	95%
2,3-Dimethylbutane	24%	54%	36%	96%	96%
2,3,4-Trimethylpentane	9%	46%	35%	60%	97%
2,2-Dimethylbutane	7%	35%	24%	55%	58%
2,2,4-Trimethylpentane	74%	98%	93%	96%	99%
1-Pentene	13%	25%	20%	60%	27%
1-Butene	37%	31%	22%	57%	37%
1,3,5-Trimethylbenzene	24%	29%	20%	60%	55%
1,2,4-Trimethylbenzene	50%	68%	50%	83%	92%
Oxides of Nitrogen	11%	17%	96%	43%	45%
Nitric Oxide	1%	0%	8%	5%	4%
Ozone	98%	100%	99%	96%	97%

Table reflects data for June, July, and August 2013.
Cells highlighted in blue indicate sites with fewer than 85% of data reported above the MDL.
Blank cells indicate no data was collected.

Table 2-17. Summary of Data Completeness for PAMS Sites

	Percent Completeness				
Street Address	Madera-Pump Yard	Clovis-Villa	Parlier	Shafter	Bakersfield-Muni
Trans-2-Pentene	96%	92%	99%	98%	95%
Trans-2-Butene	96%	92%	99%	98%	95%
Total NMOC	0%	89%	72%	63%	66%
Toluene	96%	92%	98%	98%	95%
Styrene	13%	2%	28%	65%	6%
Propylene	96%	92%	99%	98%	95%
Propane	96%	92%	99%	98%	95%
P-Ethyltoluene	96%	92%	99%	98%	95%
P-Diethylbenzene	96%	92%	99%	98%	95%
O-Xylene	58%	89%	68%	98%	95%
O-Ethyltoluene	96%	92%	99%	98%	95%
N-Undecane	96%	92%	99%	98%	95%
N-Propylbenzene	96%	92%	99%	98%	95%
N-Pentane	96%	92%	99%	98%	95%
N-Octane	96%	92%	99%	98%	95%
N-Nonane	96%	92%	99%	98%	95%
N-Hexane	83%	92%	92%	98%	95%
N-Heptane	96%	92%	99%	98%	95%
N-Decane	96%	92%	99%	98%	95%
N-Butane	96%	92%	99%	98%	95%
M-Ethyltoluene	96%	92%	99%	98%	95%
Methylcyclopentane	96%	92%	99%	98%	95%
Methylcyclohexane	96%	92%	99%	98%	95%
M-Diethylbenzene	96%	92%	99%	98%	95%
M/P Xylene	67%	92%	81%	98%	95%
Isopropylbenzene	8%	9%	6%	27%	8%
Isoprene	96%	92%	99%	98%	95%
Isopentane	96%	92%	99%	98%	95%
Isobutane	96%	92%	99%	98%	95%
Formaldehyde		99%			99%
Ethylene	96%	92%	99%	98%	95%
Ethylbenzene	63%	89%	75%	98%	95%
Ethane	96%	92%	99%	98%	95%
Cyclopentane	96%	92%	99%	98%	95%
Cyclohexane	96%	92%	99%	98%	95%

Table 2-17. Summary of Data Completeness for PAMS Sites (continued)

Percent Completeness (Continued)					
Street Address	Madera-Pump Yard	Clovis-Villa	Parlier	Shafter	Bakersfield-Muni
Cis-2-Pentene	96%	92%	99%	98%	95%
Cis-2-Butene	96%	92%	99%	98%	95%
Benzene	96%	92%	99%	98%	95%
Acetylene	96%	92%	99%	98%	95%
Acetone		99%			99%
Acetaldehyde		29%	99%	71%	99%
3-Methylpentane	96%	92%	99%	98%	95%
3-Methylhexane	96%	92%	99%	98%	95%
3-Methylheptane	96%	92%	99%	98%	95%
2-Methylpentane	96%	92%	99%	98%	95%
2-Methylhexane	96%	92%	99%	98%	95%
2-Methylheptane	96%	92%	99%	98%	95%
2,4-Dimethylpentane	96%	92%	99%	98%	95%
2,3-Dimethylpentane	96%	92%	99%	98%	95%
2,3-Dimethylbutane	96%	92%	99%	98%	95%
2,3,4-Trimethylpentane	96%	92%	99%	98%	95%
2,2-Dimethylbutane	96%	92%	99%	98%	95%
2,2,4-Trimethylpentane	73%	91%	90%	98%	95%
1-Pentene	96%	92%	99%	98%	95%
1-Butene	96%	92%	99%	98%	95%
1,3,5-Trimethylbenzene	96%	92%	99%	98%	95%
1,2,3-Trimethylbenzene	96%	92%	99%	98%	95%
1,2,4-Trimethylbenzene	96%	92%	99%	98%	95%
Oxides of Nitrogen	28%	91%	91%	96%	85%
Nitric Oxide	14%	88%	90%	96%	47%
Nitrogen Dioxide	28%	91%	91%	96%	85%
Ozone	83%	80%	91%	95%	85%

Table reflects data for June, July, and August 2013.
Cells highlighted in blue indicate sites with fewer than 85% of data reported as complete.

Table 2-18. Maximum Concentration for PAMS Sites

Maximum Concentration (parts per billion carbon, ppbc)					
Street Address	**Madera-Pump Yard**	**Clovis-Villa**	**Parlier**	**Shafter**	**Bakersfield-Muni**
Trans-2-Pentene	0.2	0.6	0.4	0.8	2.1
Trans-2-Butene	0.7	10	0.3	1.6	0.3
Total NMOC	100	400	50	2210	450
Toluene	3.2	12.7	18.3	22.8	22.4
Styrene	1	0	0	2	1.2
Propylene	4.1	62.8	2.5	8.2	3.1
Propane	11.9	58	29	184	48.7
P-Ethyltoluene	0.5	1	0.7	1.2	1.4
P-Diethylbenzene	0.1	1.2	1.3	0.1	1.3
O-Xylene	1.7	1.4	7	4.3	2.3
O-Ethyltoluene	0.4	0.5	0.5	0.9	0.6
N-Undecane	0.4	3.4	0.6	2.6	0.6
N-Propylbenzene	0.5	0.8	0.7	0.8	0.6
N-Pentane	2.7	6.3	3.8	15.6	11.6
N-Octane	0.4	0.6	0.7	1.3	0.9
N-Nonane	0.4	3.2	1.7	2	0.7
N-Hexane	1	2.2	1.9	4.8	5.2
N-Heptane	0.7	1.6	1.4	3.7	3.1
N-Decane	0.3	4	0.5	6.2	0.7
N-Butane	3.5	26.1	7.6	22.1	24.5
M-Ethyltoluene	1	1.1	1.1	2.2	1.6
Methylcyclopentane	1	2	2.4	4.4	6.8
Methylcyclohexane	0.4	0.6	0.6	1.4	3.6
M-Diethylbenzene	0.1	0.3	0.2	0.1	0.2
M/P Xylene	2.7	4	6.8	13.3	6.7
Isopropylbenzene	0.3	0.5	0.5	3.2	0.3
Isoprene	0.8	10.8	1.1	3.6	2.2
Isopentane	2.4	22.7	8.6	24.6	23.9
Isobutane	10.9	23.4	17	74.8	15.6
Formaldehyde		4.5			5.9
Ethylene	3.8	8.2	3.4	3.2	5.2
Ethylbenzene	1.1	3.4	2.4	3.7	1.9
Ethane	8	49.3	9.4	16.2	26.1
Cyclopentane	0.2	8.8	0.5	1.7	1.8
Cyclohexane	0.7	3.1	3	2.9	3.8

Table 2-18. Summary of Maximum Concentration for PAMS Sites (continued)

Maximum Concentration (ppbc)					
Street Address	Madera-Pump Yard	Clovis-Villa	Parlier	Shafter	Bakersfield-Muni
Cis-2-Pentene	0.2	0.5	1.5	0.3	5.6
Cis-2-Butene	0.4	6.7	0.2	1.2	0.2
Benzene	3	2	3.3	14.8	2.3
Acetylene	1	2.8	6.2	2.7	4.4
Acetone		104.9			24.5
Acetaldehyde		4.8			19.3
3-Methylpentane	0.9	1.5	1.4	3.8	4.1
3-Methylhexane	1.1	3.6	2.6	5.1	4.1
3-Methylheptane	0.2	0.4	0.4	1	0.7
2-Methylpentane	2.2	3.2	3.5	8.3	9.2
2-Methylhexane	0.4	1.5	1.3	5	3.5
2-Methylheptane	2.2	0.7	0.9	1.1	1.1
2,4-Dimethylpentane	0.2	1.4	0.4	0.8	2.3
2,3-Dimethylpentane	0.2	2.6	1.4	1.5	3.3
2,3-Dimethylbutane	0.4	1.3	0.7	1.5	3
2,3,4-Trimethylpentane	0.3	0.7	0.5	0.5	4.6
2,2-Dimethylbutane	0.2	3.6	0.6	1.5	3.4
2,2,4-Trimethylpentane	0.9	1.9	5.1	1.6	10.8
1-Pentene	0.9	1.7	0.7	0.5	0.5
1-Butene	1.6	11.6	1.1	1.8	0.8
1,3,5-Trimethylbenzene	0.5	0.5	0.5	1.7	1
1,2,3-Trimethylbenzene	0.6	1.4	1.1	4.5	1.5
1,2,4-Trimethylbenzene	1	1.6	1.4	4.9	2.5
Oxides of Nitrogen	31.0	36.0	47.0	98.7	75.0
Nitric Oxide	13.0	15.0	34.0	66.5	40.0
Nitrogen Dioxide	4.8	28.0	24.0	58.5	51.0
Ozone	100	123	116	112	109

Table reflects data for June, July, and August 2013.

2.5.4 Discussion of the PAMS Network Assessment

The finding from the percent above MDL analysis shows that although approximately only one-third of the measured PAMS target compounds reported equal to or greater than 85% above the MDL, this indicates that only one-third of the PAMS target compounds are present in the atmosphere in any detectable amounts. Samples from an air basin containing all of the possible target compounds would not be expected. The data completeness analysis demonstrates that about 90% of the measured PAMS target compounds are equal to or greater than 85% complete, indicating that there is good sampling protocol, compound recovery, and identification for those compounds that were above the MDL. The above two analyses suggest that the sites in the SJV appear to be suitable for long-term trend analysis for ozone, total non-methane organic compounds (TNMOC), and for those ozone precursors that have a greater than 85% of data reported above the MDL and a greater than 85% completeness.

Table 2-19 shows the total parts per billion carbon (ppbc) of the Maximum Concentration of all PAMS Compounds the Northern PAMS sites (excluding the carbonyl compounds that were measured only at Type 2 sites). The data demonstrates that of the three sites, the Madera-Pump Yard had the lowest summed component value, which is appropriate for the upwind background site. Clovis-Villa had the highest summed component value at 195% greater than Madera-Pump, which is appropriate given it is an upwind, background site. Lastly, the Parlier site is substantially less than Clovis-Villa due to downwind dilution effects, but it is still 32% more than Madera-Pump, which again is appropriate for the downwind site.

Figures 2-29 and 2-30 depict photochemical modeling of 2007 data, from both PAMS and non-PAMS sites, used to support the attainment demonstration in the District's *2013 Plan for the Revoked 1-Hour Ozone Standard*. In these figures, Parlier is situated in the downwind plume of increased ozone concentrations from Clovis, as discussed above, but it is no longer in the area of the maximum ozone occurring downwind. According to Figure 2-29, the current areas of maximum downwind ozone would be northeast of Parlier in the vicinity of the towns of Navelencia and Orange Cove in Fresno County, and to the southeast of Parlier in the vicinity of the towns of Orosi and Lemon Cove in Tulare County. According to Figure 2-31, the area of maximum downwind ozone would be even further east and southeast of Parlier in areas of higher elevation. This change in areas of maximum downwind ozone concentrations is the result of successful implementation of control strategies and do not require the relocation of the PAMS Type 3 site. The site needs to remain in its current location for continuity in measuring and tracking the changes in emission and transport patterns over time.

Table 2-19. Summation of Maximum Concentration of all PAMS Compounds

(a) Fresno MSA

Site Type	1	2	3
Site Objective	Upwind background ozone and precursors	Area of maximum ozone precursor emissions	Site of maximum ozone occurring downwind
Location	Madera-Pump Yard	Clovis-Villa	Parlier
Ave. ppbc	334	988	442
> Site 1	-	195%	32%

(b) Bakersfield MSA

Site Type	1	2	3
Site Objective	Upwind background ozone and precursors	Area of maximum ozone precursor emissions	Site of maximum ozone occurring downwind
Location	Shafter	Bakersfield-Muni	Arvin
Ave. ppbc	3,050	1,025	Not Applicable
> Site 1		-66%	Not Applicable

Figure 2-29. Photochemical Modeling of 2007 data showing Maximum 8-Hour Average Ozone data

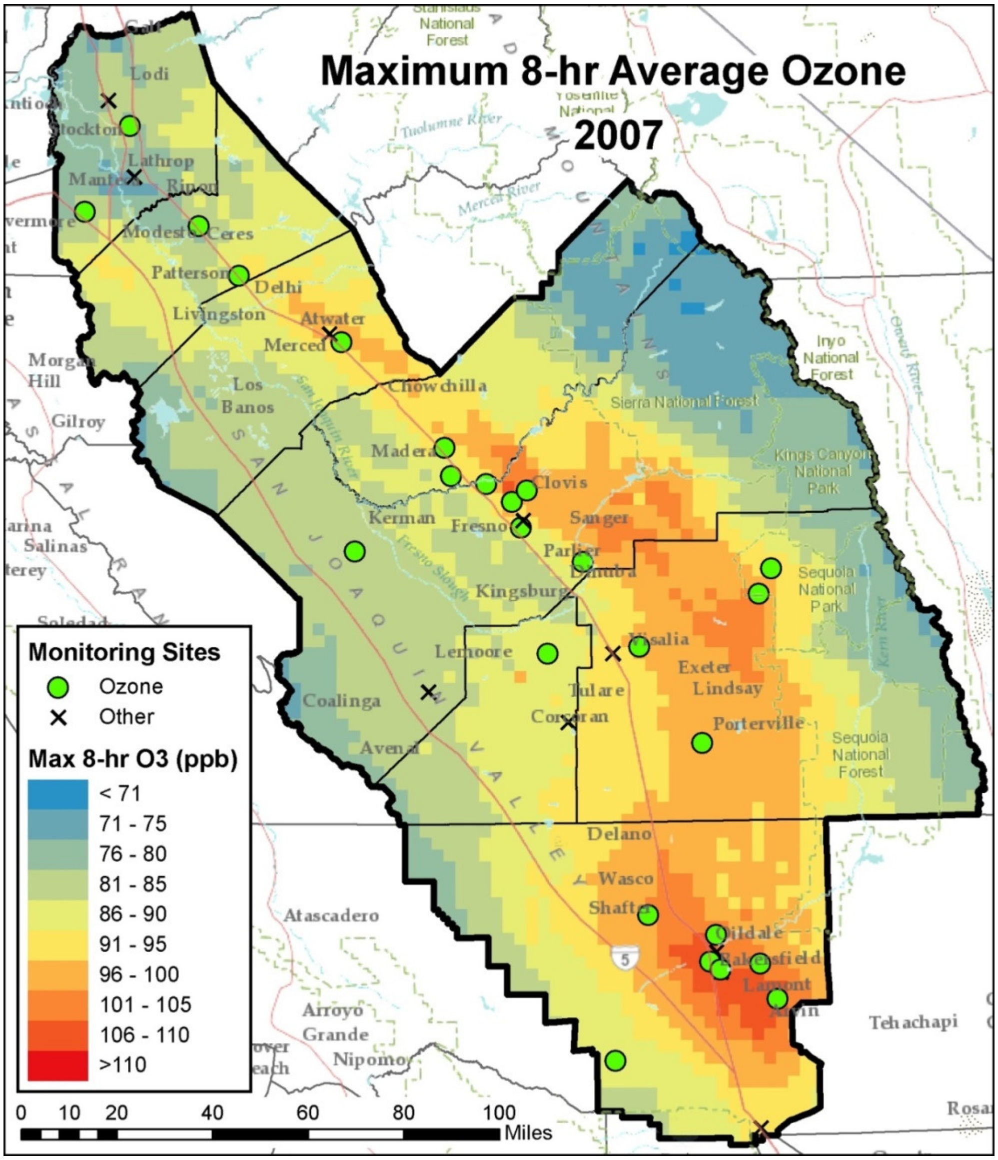


Figure 2-30. Photochemical Modeling of 2007 data showing Days 8-hour Ozone exceeds the NAAQS (75 ppb)

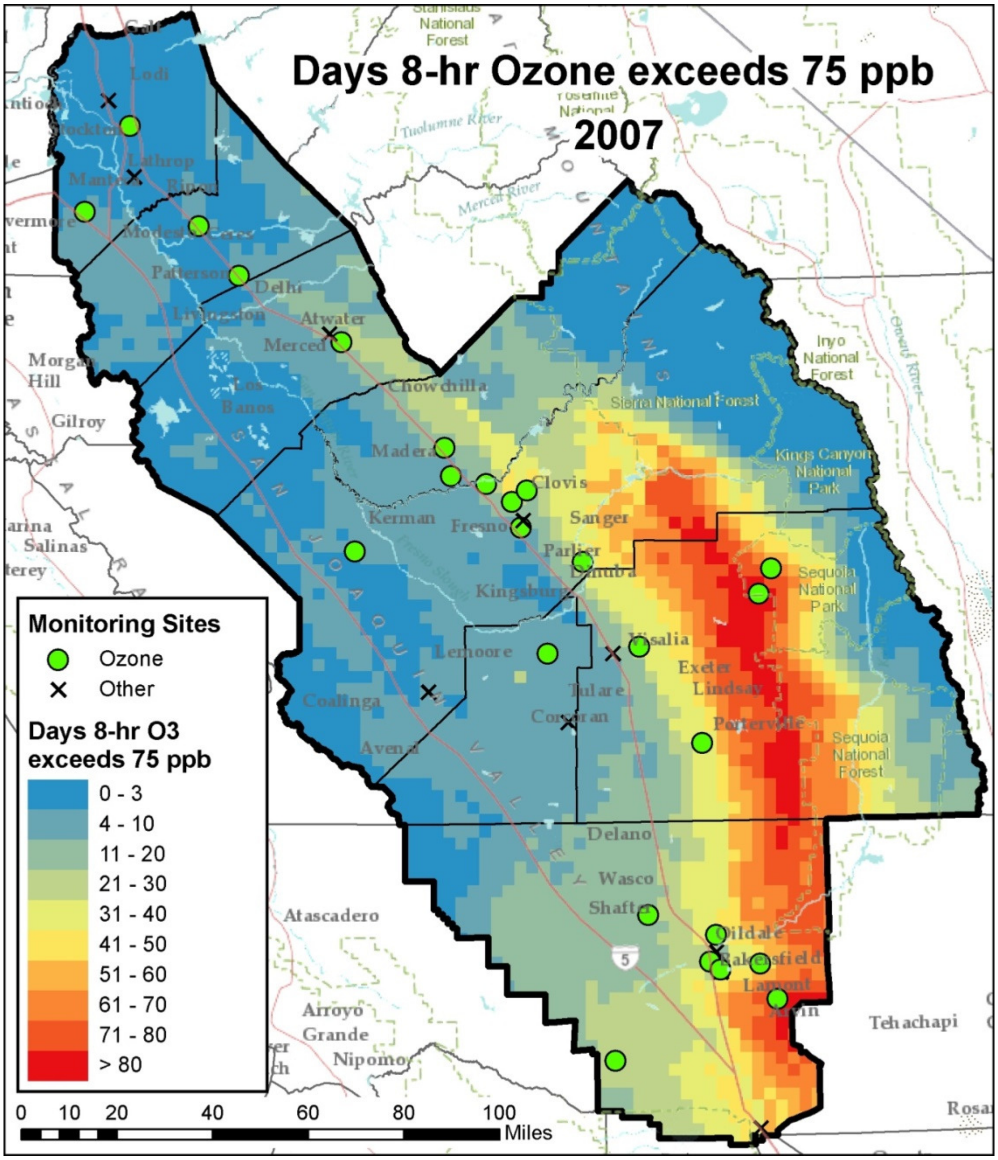
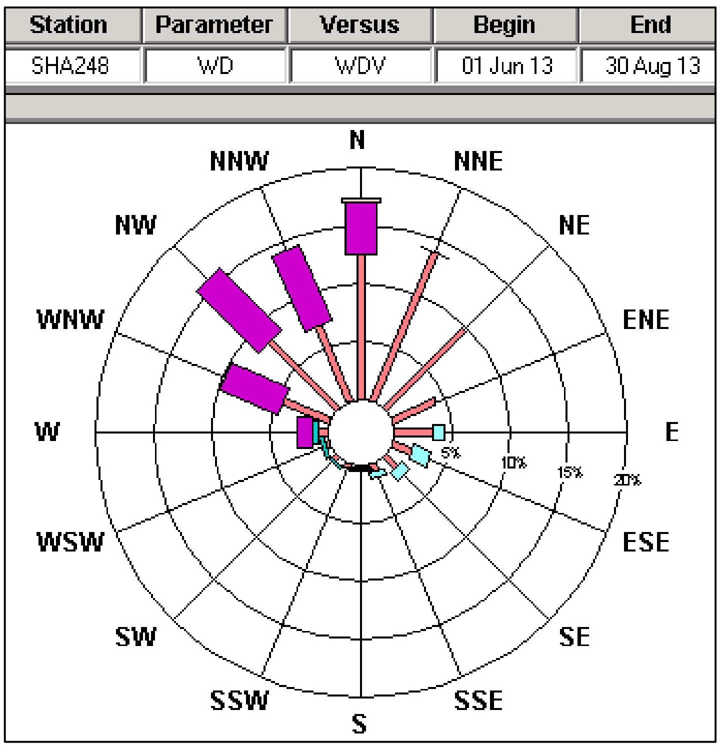


Table 2-19b reports the results for the Bakersfield MSA. The maximum ozone occurring at the downwind site Arvin-Di Giorgio does not currently collect PAMS data as the site consists of a temporary shelter with insufficient room for PAMS equipment. Figure 2-29 and Figure 2-30 show that Shafter has lower ozone concentrations than Bakersfield-Muni. The Figure 2-31 demonstrates that nearly 60% of Shafter’s wind flow is from the northwest and is upwind of Bakersfield-Muni.

Photochemical modeling in Figure 2-30 and 2-31 shows that the Arvin Type 3 site (when it is approved by ARB and a permanent structure built) will be positioned correctly for the maximum downwind ozone concentration.

Figure 2-31. Shafter Wind Rose from June 1, 2013 through August 30, 2013



3 TECHNICAL APPROACH AND FINDINGS FOR THE METEORLOGICAL NETWORK ASSESSMENT

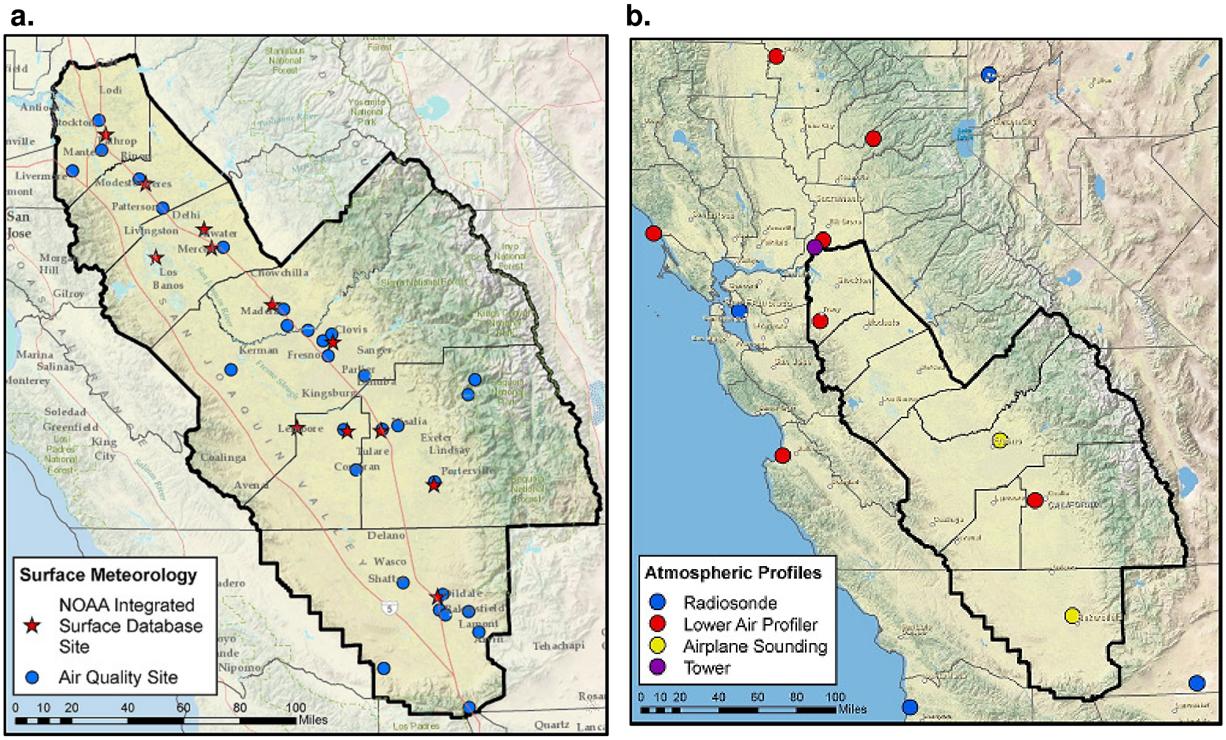
Accurate representation of the spatial and temporal characteristics of a region's meteorology is needed to understand the physical and chemical processes that influence air quality and to help determine ways to mitigate future air quality impacts. The main meteorological conditions that influence air quality include transport of pollutants by winds, recirculation of air by local wind patterns, horizontal dispersion of pollution by wind, variations in sunlight due to clouds and seasons, temperature, moisture, vertical mixing, and dilution of pollution within the atmospheric boundary layer.

A variety of meteorological parameters are measured for the various District programs affected by weather. Such programs include air quality forecasting, PAMS analysis, exceptional events reporting, long–term air pollution control planning, and pollutant trend assessment. These activities help protect public health and increase air quality awareness of what can be done to reduce air pollution.

Figure 3-1 shows a map of the surface meteorological sites and atmosphere profile sites operating in and around the San Joaquin Valley. The meteorological parameters measured by the surface network include outdoor temperature, wind speed, wind direction, barometric pressure, relative humidity, and solar radiation. The atmosphere profile sites measure wind speed, wind direction, temperature, barometric pressure and/or, relative humidity throughout the atmosphere.

Figure 3-1. Maps of the locations measuring various meteorological parameters within and around District Boundaries

a. **b.**

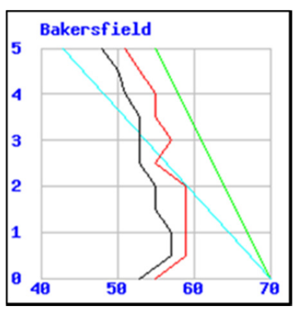


Atmospheric profiler sites:

Radiosondes launched twice a day are meteorological instrument packs suspended beneath a six foot wide hydrogen or helium balloon. Once the balloon is launched, meteorological measurements are recorded and transmitted to a ground receiver as the balloon ascends to high altitudes.
Source: NWS Radiosonde Observations - Factsheet
http://www.erh.noaa.gov/gyx/weather_balloons.htm

Lower air (atmosphere) profilers capture vertical temperature, wind speed, and direction profiles.
Wind Profilers Added to Vaisala Product Range
Source:
http://www.vaisala.com/Vaisala%20Documents/Vaisala%20News%20Articles/VN158/VN158_Wind_Profilers_Added_to_Vaisala_Product_Range.pdf

Airplane soundings are vertical temperature profiles, and sometimes other variables that are captured by a plane equipped with meteorological instruments. The measurements are taken during portions of the plane's ascent or descent flight track.



Source: *ESRL*/*GSD* Aircraft Data (AMDAR) Information
http://amdar.noaa.gov/FAQ.html#sounding

The meteorological tower at Walnut Grove measures temperature, wind speed, and direction from the surface up to 2,000 feet above ground level.
Source: Walnut Grove Tower Meteorological Data
http://tbsys.serveftp.net/wg/wgup/towerpro.htm

The goal of the meteorological network assessment presented in this section was to assess the number of meteorological parameters measured by the network, conduct wind rose and correlation analyses, and address the following questions:

- Are meteorological sites appropriately located to determine the extent of regional pollutant transport among populated areas?
- Are there potentially redundant meteorological sites in the network?
- Are there areas where new meteorological sites may be needed?
- Are there new technologies that may add value to the meteorological network?
- Is the meteorological network adequate for characterizing regional surface and lower atmosphere meteorology?

The remainder of this section describes the technical approach and findings of the meteorological network assessment.

3.1 SURFACE METEOROLOGICAL NETWORK ASSESSMENT

To evaluate the surface meteorological network, the District reviewed meteorological data obtained from the EPA's AQS and the National Climatic Data Center (NCDC). The data sets included relative humidity, barometric pressure, temperature, wind speed, and wind direction data collected in the San Joaquin Valley during 2013. The District used these data to determine meteorological data completeness and quality for each site.

3.1.1 Data Completeness

Data completeness was compiled using AMP430 AQS Report. Table 3-1 shows a summary of the data completeness by parameter for all sites in the San Joaquin Valley air basin and shows the operator of each site.

Table 3-1 shows 30 sites measuring meteorology in the San Joaquin Valley, the agencies operating those sites, and the 2013 meteorological data completeness. The findings were as follows:

- 6 of 9 sites had more than 85% data completeness for all of the meteorological parameters measured which included relative humidity, barometric pressure, temperature, wind speed, and wind direction.
- Data completeness for 9 of 12 sites measuring relative humidity was 95% or greater.
- Data completeness for 18 of 21 sites measuring barometric pressure was 99% or greater.
- Data completeness for 23 of 29 sites measuring temperature was 89% or greater.

- Data Completeness for 25 of 29 sites measuring wind speed and wind direction parameters 89% or greater.

Table 3-1. Data Completeness for Sites Measuring Meteorology in the San Joaquin Valley

Site Name	Site Operator	Data Completeness (%)				
		Relative Humidity	Barometric Pressure	Temperature	Wind Speed	Wind Direction
Stockton-Hazelton	CARB	99		99^	91*	91**
Manteca	SJVAPCD		100	100	99	99
Tracy-Airport	SJVAPCD		99	100	99	99
Modesto-14th St	CARB			100^	100*	100**
Turlock	SJVAPCD		99	99	99	99
Merced-Coffee	SJVAPCD			100	98	98
Madera–City	SJVAPCD	99	99	99	95	99
Madera-Pump Yard	SJVAPCD	100	100	98	100	100
Tranquillity	SJVAPCD		100	98	98	98
Fresno-Sky Park	SJVAPCD			96	100	100
Clovis-Villa	SJVAPCD	99	99	99	99	99
Fresno-Garland	CARB	63	70	71	100*	100**
Fresno–Drummond	SJVAPCD		100	100	100	100
Parlier	SJVAPCD	97	99	98	100	100
Huron	SJVAPCD		100			
Hanford-Irwin	SJVAPCD		100	89	100	100
Corcoran-Patterson	SJVAPCD		100	94	100	100
Visalia Airport	SJVAPCD	99	99	99	99	99
Visalia-Church St	CARB		33	41	41*	41**
Sequoia-Lower Kaweah	NPS	77		83	82*	82**
Sequoia-Ash Mountain	NPS	95		99	99*	99**
Porterville			100	100	99	99
Shafter	CARB	99	99	99	41	41
Oildale	CARB			100	100*	100**
Bakersfield-California Ave	CARB	41	41	41	80*	80**
Edison	CARB			100	100*	100**
Bakersfield-Muni	SJVAPCD	95	100	99	99	98
Arvin-Di Giorgio	CARB			75	89*	89**
Maricopa	SJVAPCD		99	99	99	99
Lebec	SJVAPCD		100	100	99	99

Table reflects data from 2013.
Gray cells – parameter not measured at the site
Yellow highlighted cells indicate data completeness below an 85% target.
* - Resultant Wind Speed ** - Resultant Wind Direction
^ - Virtual Temperature

3.1.2 Site-to-Site Correlation Analyses

To identify possible redundancies in the surface meteorological network, the District conducted Pearson correlation analyses for hourly outdoor temperature, relative humidity, and solar radiation from 2013 AQS data. The Pearson correlation coefficient (R) between site pairings shows how well the data agree. The R value is a measure of the linear relationship between two variables and ranges from -1.00 to 1.00. An R value of 1.00 means that there is a positive linear relationship between the data from two sites which could indicate a redundancy in the monitoring network for sites near each other. Figures 3-1 through 3-5 and Tables 3-2 through 3-6 below show the results of the correlation analyses.

Outdoor Temperature

The outdoor temperature correlations are quite good, and reflect the geographic and environmental characteristics of the San Joaquin Valley. As shown in Table 3-2 below, the correlations between the Clovis, Fresno-Drummond, and Fresno-Sky Park sites are particularly high (R = 1.00), because those three sites are all located near one another in the Fresno metropolitan area. These high correlation values indicate that further investigation into monitor redundancy in this area may be needed. The correlations for the foothill and mountain sites are also good, which are indicative of seasonal and climatic similarities at those sites.

Relative Humidity

Overall, the correlations for relative humidity for the valley floor and the mountain sites are good, but the range is also wider than the outdoor temperature correlations exhibited. Relative humidity can vary and change significantly depending on location, time of day, and season. Such variations in relative humidity can cause fluctuations in ozone and particulate concentrations that are challenging to forecast and evaluate. The variability among sites, as indicated by the large range of correlation values, demonstrates that there is little monitor redundancy.

Solar Radiation

The solar radiation correlations for the valley floor sites are very good and are representative of the daily diurnal pattern of daylight hours as well as effects of cloud cover and the seasonal changes in sun angle. Due to the regional nature of solar radiation, high correlation among sites is expected.

3.1.3 Discussion of Surface Meteorological Network Assessment

A comparison of surface meteorological parameters shows the expected amount of variability between sites. Temperature, humidity, and solar radiation measured at mountain sites tend to be more variable from site to site while the Valley floor sites all correlate well with one another, especially as the distance between the sites decreases. Correlation analysis between sites revealed a strong linear relationship between outdoor temperature readings among most Valley sites near one another. Outdoor temperatures tend to be regional and rarely differ by more than a few degrees across large portions of the valley. This might indicate that these monitors should be investigated for redundancy. Correlations for the remaining meteorological parameters reveal that there are no other redundant parameters in the District. Additionally, meteorological parameters such as wind speed and direction can be highly localized and short-lived, so the differences between sites may not be captured in a simple correlation analysis. Analyzing the pollutants and wind direction during high wind or localized pollution events is extremely important during exceptional events such as high winds or fires. It is therefore important to continue surface meteorological monitoring at the sites already in use.

Figure 3-2. Outdoor Temperature Correlations

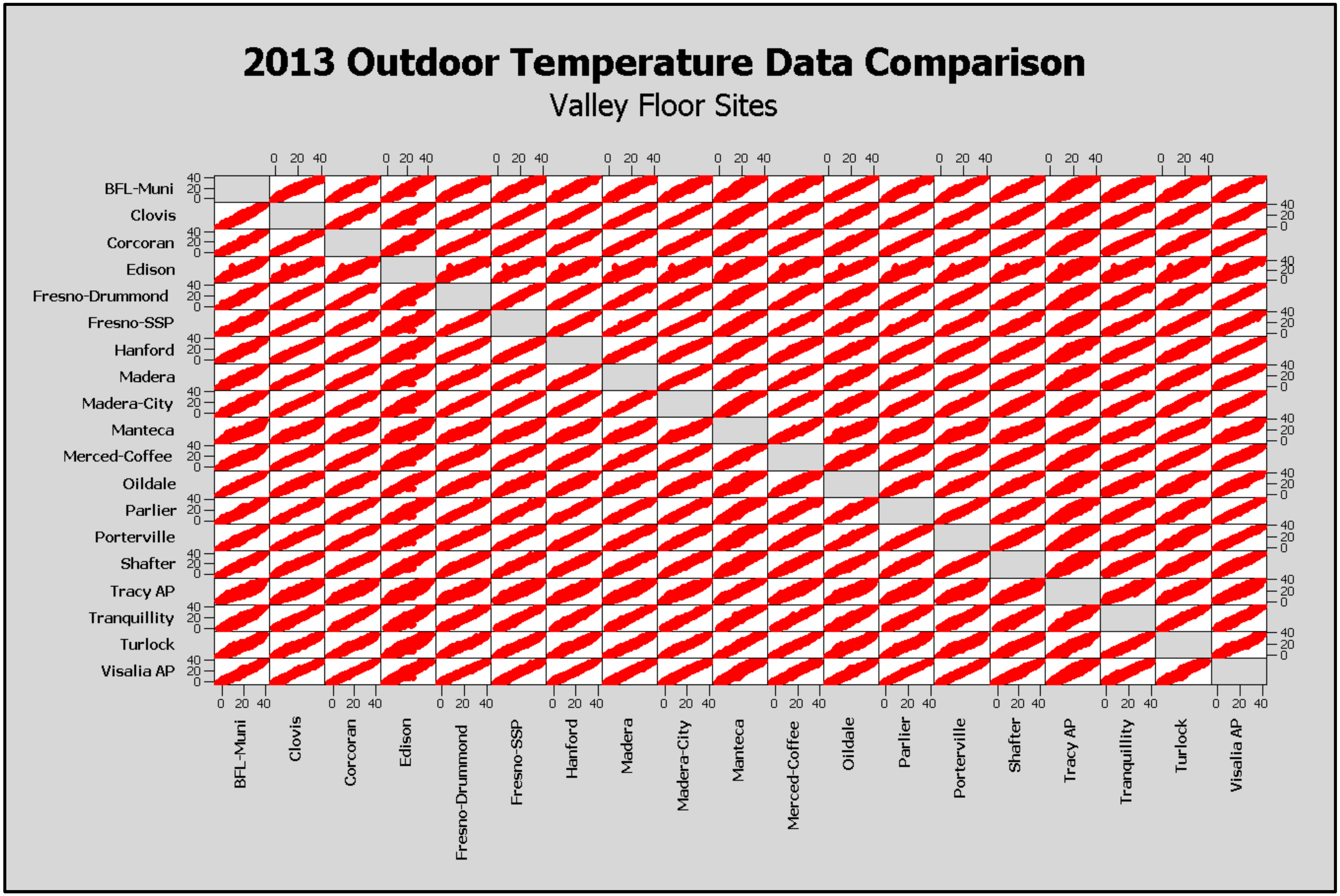


Table 3-2. Outdoor Temperature R Values for Valley Floor Sites

2013 Outdoor Temperature Data Comparison - Pearson Correlation Coefficients																		
Valley Floor Sites																		
	BFL-Muni	Clovis	Corcoran	Edison	Fresno-Drummond	Fresno-Sky Park	Hanford	Madera	Madera-City	Manteca	Merced-Coffee	Oildale	Parlier	Porterville	Shafter	Tracy AP	Tranquillity	Turlock
Clovis	0.99																	
Corcoran	0.99	0.99																
Edison	0.96	0.96	0.96															
Fresno-Drummond	0.99	1.00	0.99	0.95														
Fresno-Sky Park	0.98	1.00	0.99	0.97	0.99													
Hanford	0.98	0.99	0.99	0.95	0.99	0.99												
Madera	0.97	0.99	0.99	0.96	0.99	1.00	0.99											
Madera-City	0.98	1.00	0.99	0.96	1.00	1.00	0.99	0.99										
Manteca	0.95	0.97	0.97	0.94	0.97	0.97	0.97	0.97	0.97									
Merced-Coffee	0.98	0.99	0.99	0.96	0.99	0.99	0.99	0.99	1.00	0.98								
Oildale	0.99	0.99	0.98	0.97	0.98	0.98	0.98	0.97	0.98	0.95	0.97							
Parlier	0.99	0.99	0.99	0.96	0.99	0.99	0.99	0.99	0.99	0.96	0.99	0.98						
Porterville	0.99	0.99	0.99	0.97	0.99	0.99	0.98	0.98	0.99	0.96	0.98	0.99	0.99					
Shafter	0.98	0.99	0.99	0.98	0.98	0.99	0.98	0.98	0.99	0.96	0.98	0.98	0.99	0.99				
Tracy AP	0.93	0.95	0.95	0.91	0.95	0.95	0.95	0.95	0.95	0.98	0.96	0.94	0.94	0.94	0.93			
Tranquillity	0.97	0.99	0.99	0.96	0.99	0.99	0.99	0.99	0.99	0.98	0.99	0.97	0.98	0.98	0.98	0.96		
Turlock	0.97	0.98	0.98	0.95	0.98	0.99	0.98	0.99	0.99	0.99	0.99	0.97	0.98	0.97	0.97	0.97	0.99	
Visalia AP	0.99	0.99	1.00	0.96	0.99	0.99	0.99	0.99	0.99	0.96	0.99	0.99	1.00	0.99	0.98	0.95	0.98	0.98

Figure 3-3. Outdoor Temperature Correlations for the Foothill and Mountain Sites

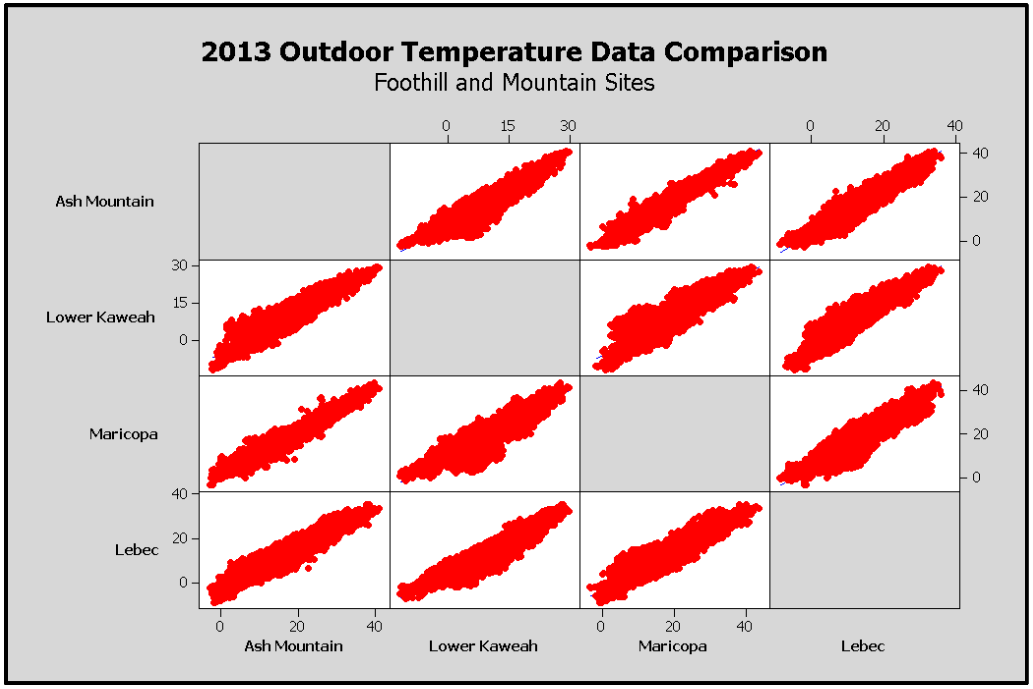


Table 3-3. Outdoor Temperature R Values for the Foothill and Mountain Sites

2013 Outdoor Temperature Data Comparison Pearson Correlation Coefficients Foothill and Mountain Sites			
	Ash Mountain	**Lower Kaweah**	**Maricopa**
Lower Kaweah	0.95		
Maricopa	0.98	0.92	
Lebec	0.96	0.93	0.94

Figure 3-4. Relative Humidity Correlations for Valley Floor Sites

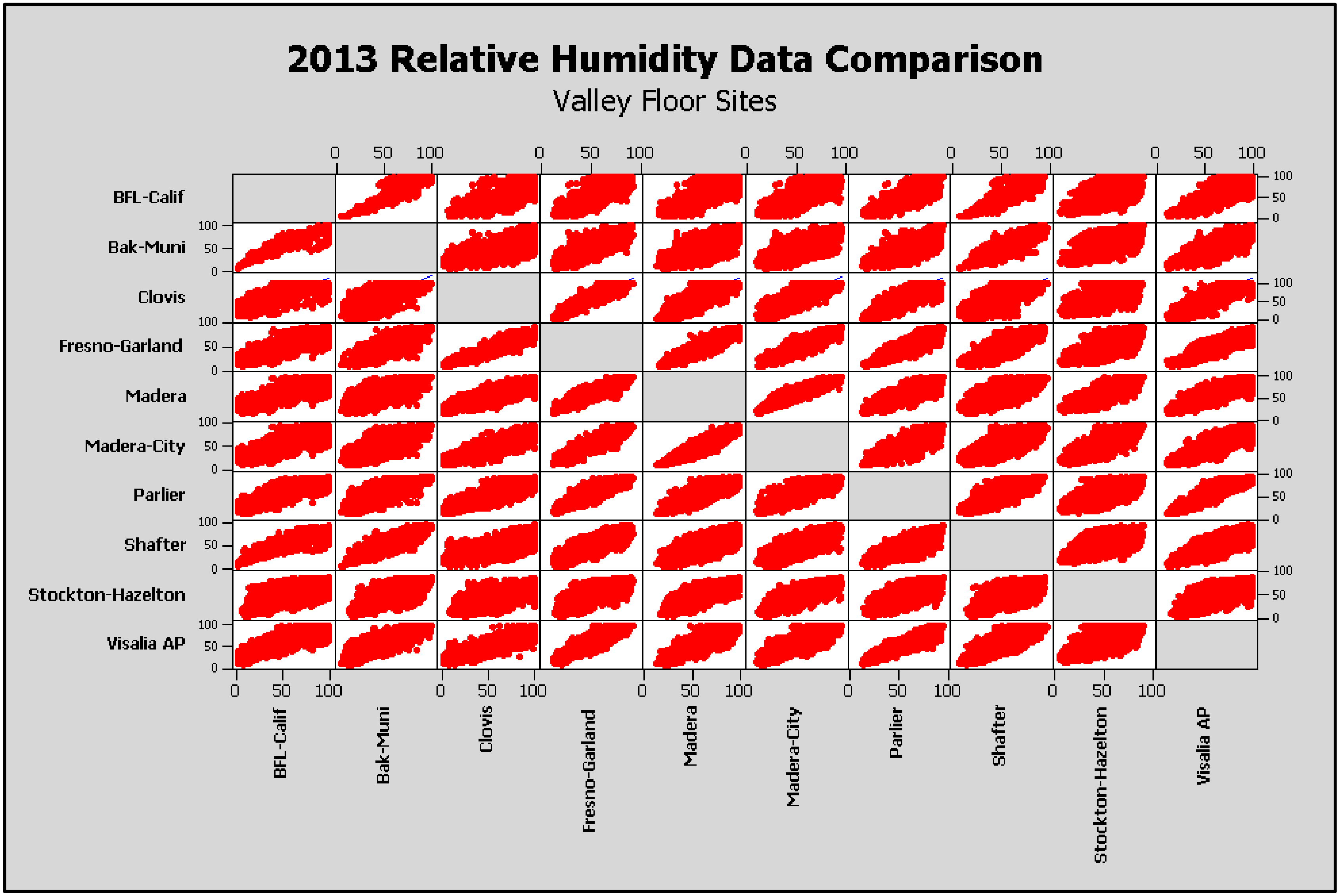


Table 3-4. Relative Humidity R Values for Valley Floor Sites

2013 Relative Humidity Data Comparison - Pearson Correlation Coefficients									
Valley Floor Sites									
	BFL-Calif	Bak-Muni	Clovis	Fresno-Garland	Madera	Madera-City	Parlier	Shafter	Stockton-Hazelton
Bak-Muni	0.97								
Clovis	0.85	0.83							
Fresno-Garland	0.90	0.90	0.93						
Madera	0.87	0.86	0.92	0.96					
Madera-City	0.87	0.89	0.92	0.97	0.97				
Parlier	0.89	0.88	0.92	0.94	0.92	0.92			
Shafter	0.94	0.94	0.84	0.92	0.90	0.90	0.90		
Stockton-Hazelton	0.77	0.78	0.81	0.85	0.88	0.88	0.79	0.83	
Visalia AP	0.90	0.90	0.92	0.95	0.93	0.94	0.96	0.90	0.80

Figure 3-5. Relative Humidity Correlations for the Ash Mountain and Lower Kaweah Sites

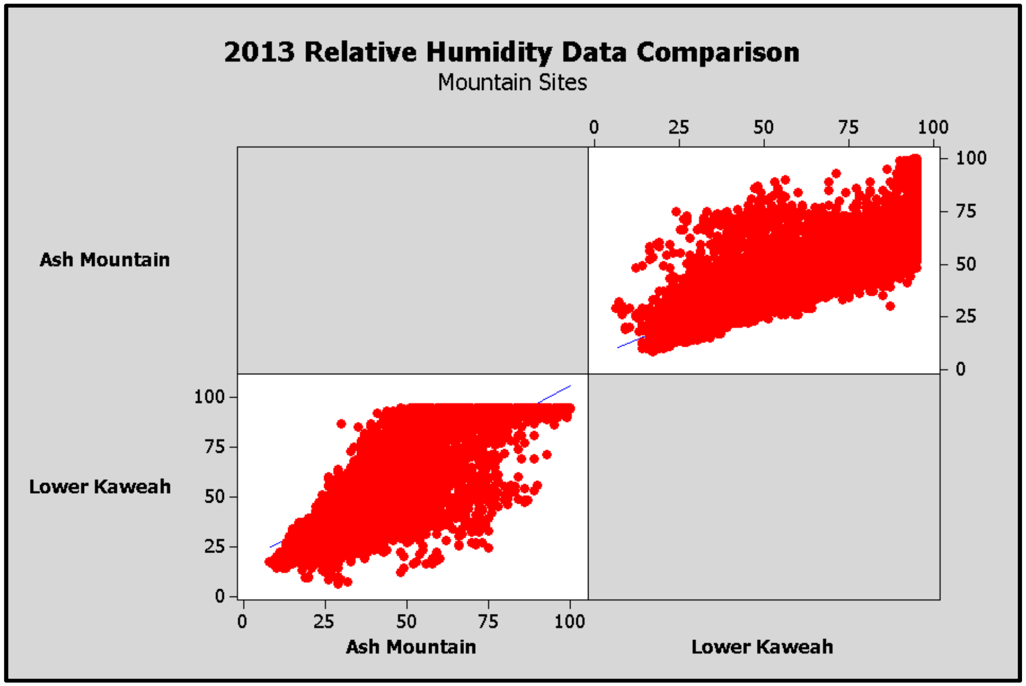


Table 3-5. Relative Humidity R Values for the Ash Mountain and Lower Kaweah Sites

2013 Relative Humidity Data Comparison Pearson Correlation Coefficients	
Foothill and Mountain Sites	
	Lower Kaweah
Ash Mountain	0.78

Figure 3-6. Solar Radiation Correlations for Valley Floor Sites

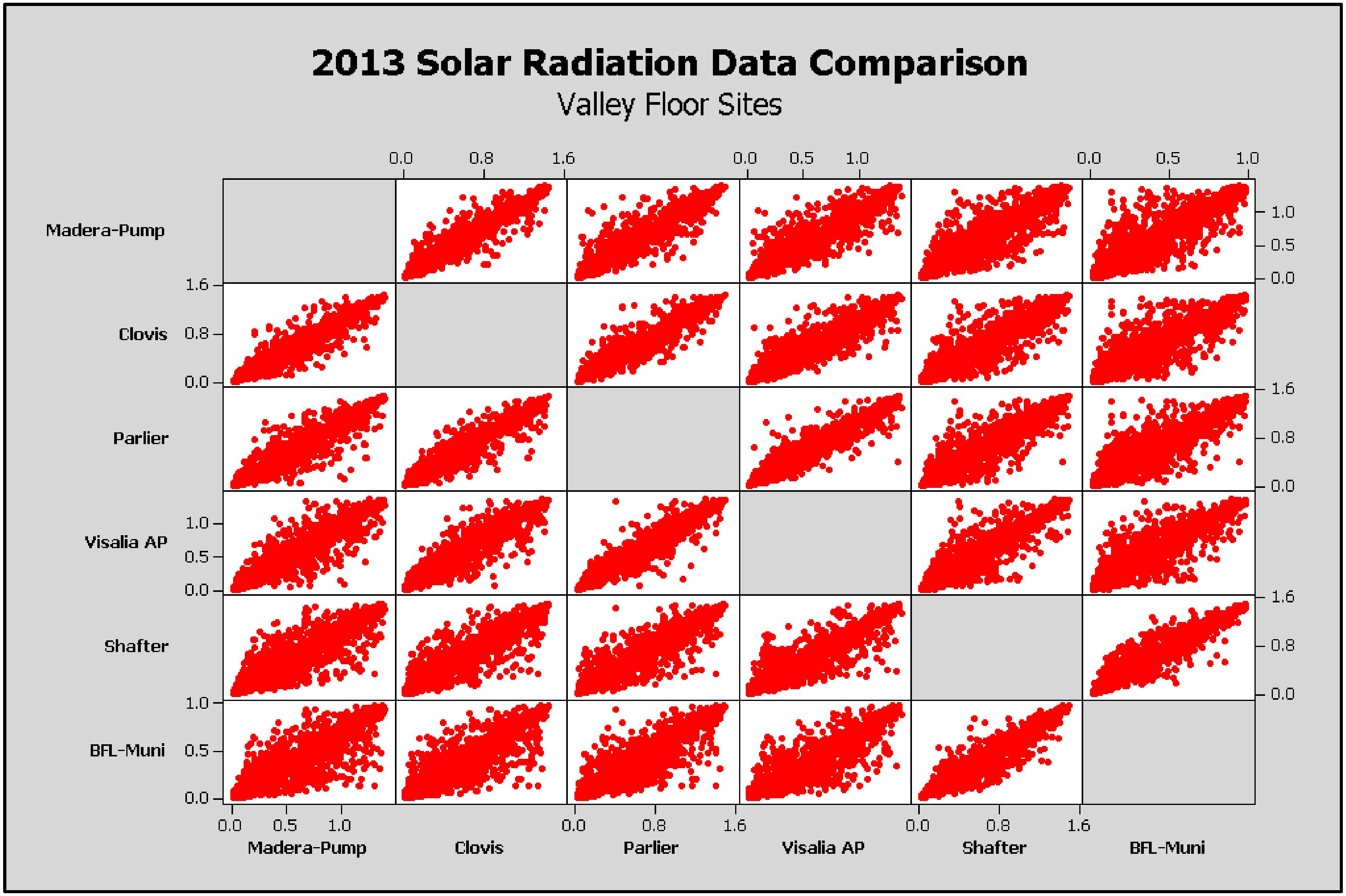


Table 3-6. Solar Radiation R Values for Valley Floor Sites

2013 Solar Radiation Data Comparison Pearson Correlation Coefficients					
Valley Floor Sites					
	Madera-Pump	Clovis	Parlier	Visalia AP	Shafter
Clovis	0.99				
Parlier	0.99	0.99			
Visalia AP	0.98	0.99	0.99		
Shafter	0.98	0.98	0.98	0.99	
BFL-Muni	0.97	0.98	0.98	0.98	0.99

3.1.4 Wind Rose Analyses

The ability of the surface meteorological network to represent the spatial and temporal variations of meteorological flow patterns that affect the San Joaquin Valley largely depends on site location. In 2010, Sonoma Technologies, Inc. (STI) conducted a detailed wind rose analysis which assessed the District's meteorological network's representativeness. The analysis is found in the District's *Ambient Air Quality Monitoring Network Assessment for the San Joaquin Valley*, which was submitted to the EPA with the *San Joaquin Valley Air Pollution Control District's Air Monitoring Network Plan* in July 2010. The District examined wind roses which showed prevailing wind directions at various locations and helped determine that the District's meteorological network is representative of the San Joaquin Valley air flow patterns.

All valley sites are located in or near populated areas and tend to be around the higher pollution regions. The meteorological sites currently in operation are appropriately located to determine the extent of regional pollutant transport among populated areas. The west side of the Valley may be underrepresented by surface meteorological sites. If feasible in the future, the addition of meteorological sites along the base of the foothills in western SJV could better capture the effects of up/downslope flows along the coastal range and marine-layer infiltration. As mentioned previously, a meteorological monitor located northeast of Clovis in the mountains near Oakhurst could assist in understanding local population exposure to pollutant concentrations.

3.2 LOWER ATMOSPHERE PROFILER NETWORK ASSESSMENT

In depth studies have shown that marine air intrusion, the Fresno Eddy, and the nocturnal jet are meteorological phenomena that directly influence air quality in the San Joaquin Valley. As mentioned in the previous section, a meteorological instrument known as a lower atmosphere profiler (LAP) captures these airflow patterns and provides useful data for air quality forecasting and analyses. A LAP is a remote sensing Doppler radar that produces a vertical and horizontal wind profile up to approximately 3,000 meters (9,842 feet) above ground level. The District currently operates two Vaisala LAP-3000 Wind Profilers that produce profiles ranging 60 – 3,000 meters above ground level. Each LAP also has an integrated Radio Acoustic Sounding System (RASS) which adds virtual temperature to the profile and increases the LAP's capabilities.

The District's LAPs are located at the Tracy and Visalia Airport sites. The LAP network meets the requirements outlined in 40 CFR Part 58 and adequately captures and represents the unique air flows in the SJV based the locations and the data measured by the profilers. Additionally, an in depth examination of the District's LAP network by STI in 2010 evaluated the profilers' location adequacy and data sufficiency. This evaluation was presented in the aforementioned 2010 Air Monitoring Network Assessment.

3.2.1 Technology Advancements

Sonic Anemometer

The District's surface meteorological network includes measuring wind speed and direction with cup anemometers. However an alternate instrument that is available is the sonic anemometer which is very cost effective. Sonic anemometers use ultrasonic sound waves to measure wind speed and direction. They have no moving parts and are maintenance-free. The District may investigate use of sonic anemometers in the future.
Source: Vaisala WINDCAPUltrasonic Sensor Technology
http://www.vaisala.com/Vaisala%20Documents/Technology%20Descriptions/WINDCAP_technology.pdf

Ceilometer

EPA is proposing revisions to measuring meteorology in the PAMS network, including requiring agencies to measure mixing heights using ceilometers. Ceilometers use lasers to measure cloud ceilings and mixing heights. According to Eresmaa et al., mixing heights are measured based on changes in particulate concentrations at the top of the boundary layer (2006). These instruments are more cost effective and have smaller footprints than LAPs. Once the rule is finalized, the District will investigate the cost effectiveness of added ceilometers to the PAMS network.

Sodar

Although EPA does not require measurement of upper air wind speed and direction, it recognizes that continuing operation of LAPs is appropriate as part of the Enhanced Monitoring Plan if an agency finds the data valuable.

A less expensive alternative to LAPs is the sodar (SOnic Detection And Ranging). Sodars use sound waves to measure vertical turbulence structure and wind profiles in the lower layer of the atmosphere. Some functions include:

- Measure wind up to 600 meters AGL
- Less noisy than LAPs
- Can run on solar power
- Can measure mixing heights depending on the model
- Operate unmanned
- Have high temporal and vertical resolution

Source: http://www.sodar.com/about_sodar.htm

For now, the District will continue to operate the LAPs but may also consider exploring the use of alternative meteorological measurement technology in the future.

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SLO COUNTY apcd | Air Pollution Control District
San Luis Obispo County

2015
Ambient Air Monitoring Network Assessment

Planning, Monitoring & Outreach Division
July 2015

Table of Contents

GLOSSARY AND LIST OF ACRONYMS:

Air Basin	An area with geographical or climatic conditions that result in a relatively physically homogeneous air mass.
APCD	Air Pollution Control District
ARB	California Air Resources Board
BAM	Beta Attenuation Monitor for particulate sampling
CFR	Code of Federal Regulation
	District San Luis Obispo County Air Pollution Control District
EPA	U.S. Environmental Protection Agency
FEM	Federal Equivalent Method particulate sample
FRM	Federal Reference Method particulate sampler
NAAMS	National Ambient Air Monitoring Strategy
NAAQS	National Ambient Air Quality Standard
NO_2	Nitrogen Dioxide
NO_X	Oxides of nitrogen
O_3	Ozone
ODSVRA	Oceano Dunes State Vehicular Recreation Area
PM_{10}	Particulate matter 10 microns or less in aerodynamic circumference
$PM_{2.5}$	Particulate matter 2.5 microns or less in aerodynamic circumference
SLAMS	State and Local Air Monitoring Stations
SLOCAPCD	San Luis Obispo County Air Pollution Control District
SO_2	Sulfur dioxide
WDV	Vector averaged wind direction
WSV	Vector averaged wind speed

1.0 INTRODUCTION

The San Luis Obispo County Air Pollution Control District (SLOCAPCD) 2015 Ambient Air Monitoring Network Assessment is an examination and assessment of the technical aspects of SLOCACPD's network of air pollution monitoring stations.

The EPA finalized an amendment to the ambient air monitoring regulations on October 17, 2006, adding a requirement for state and local monitoring agencies to conduct a network assessment once every five years [40 CFR 58.10(e)]. The purpose is to determine, at a minimum, if the network meets the monitoring objectives defined in 40 CFR 58.10 Appendix D, if new sites are needed, if existing sites may be discontinued, and whether new technologies are appropriate for incorporation into the ambient air monitoring network.

This requirement is an outcome of implementation of the National Ambient Air Monitoring Strategy (NAAMS). The purpose of the NAAMS is to optimize air monitoring networks to achieve, with limited resources, the best possible scientific value and protection of public and environmental health and welfare.

2.0 SAN LUIS OBISPO COUNTY REGIONAL DESCRIPTION

2.1 Geography

San Luis Obispo County constitutes a land area of approximately 3,616 square miles with varied vegetation, topography, and climate which creates a diversity of environmental conditions greater than its size would suggest. See Figure 1 for a detailed map of the county. The county is bordered by Monterey County to the north, Santa Barbara County to the south, and Kern County to the east, with the Pacific Ocean as the western border. From a geographical and meteorological standpoint, the County can be divided into three general regions: the Coastal Plateau, the Upper Salinas River Valley, and the East County. Air quality in each of these regions is characteristically different, with the physical features that divide them limiting the transport of pollutants between regions.

The Coastal Plateau is about five to ten miles wide and varies in elevation from sea level to about 500 feet. It is bounded on the northeast by the Santa Lucia Mountain Range, which extends almost the entire length of the County. Rising sharply to about 3,000 feet at its northern boundary, the Santa Lucia Range gradually winds southward away from the coast, finally merging into a mass of rugged features on the north side of Cuyama Canyon.

Figure 1 – Map of San Luis Obispo County

Until monitoring began in eastern San Luis Obispo County about 10 years ago, the highest ozone levels in the County were measured in the Upper Salinas River Valley. Transport of ozone precursors from the Coastal Plateau and from the San Joaquin Valley may contribute to this condition. This area of plains and low rolling hills is bounded on the west by the Santa Lucia Range and to the east by the Cholame Hills, a northern extension of the Temblor Range. Southward, the La Panza Range gradually rises east of Santa Margarita and runs roughly parallel to the coast, merging with the Caliente Range near the southern border of the County. Caliente Mountain, the highest peak in the County at 5,104 feet, is found in this range.

Eastern San Luis Obispo County is a large region by land area, but only one percent of the County population resides there. A significant portion of this area is a landlocked drainage basin called the Carrizo Plain, which lies between the La Panza and Caliente Ranges on the west and the Temblor Range to the east. These mountains join together to close the basin at the southeastern tip of the County. The Cholame Hills occupies the extreme northeastern portion of this region and, like the Temblors, lies adjacent to the San Joaquin Valley.

2.2 Climate and Weather

The climate of the County can be generally characterized as Mediterranean, with warm, dry summers and cooler, relatively damp winters. Along the coast, mild temperatures are the rule throughout the year due to the moderating influence of the Pacific Ocean. This effect is diminished inland in proportion to distance from the ocean or by major intervening terrain features, such as the coastal mountain ranges. As a result, inland areas are characterized by a considerably wider range of temperature conditions. Maximum summer temperatures average about 70 degrees Fahrenheit near the coast, while inland valleys are often in the high 90s. Minimum winter temperatures average from the low 30s along the coast to the low 20s inland.

Regional meteorology is largely dominated by a persistent high pressure area which commonly resides over the eastern Pacific Ocean. Seasonal variations in the strength and position of this pressure cell cause seasonal changes in the weather patterns of the area. The Pacific High remains generally fixed several hundred miles offshore from May through September, enhancing onshore winds and opposing offshore winds. During spring and early summer, as the onshore breezes pass over the cool water of the ocean, fog and low clouds often form in the marine air layer along the coast. Surface heating in the interior valleys dissipates the marine layer as it moves inland.

From November through April the Pacific High tends to migrate southward, allowing northern storms to move across the County. About 90% of the total annual rainfall is received during this period. Winter conditions are usually mild, with intermittent periods of precipitation followed by mostly clear days. Rainfall amounts can vary considerably among different regions in the County. In the Coastal Plain, annual rainfall averages 16 to 28 inches, while the Upper Salinas River Valley generally receives about 12 to 20 inches of rain. The Carrizo Plain is the driest area of the County with less than 12 inches of rain in a typical year.

Airflow around the County plays an important role in the movement and dispersion of pollutants. The speed and direction of local winds are controlled by the location and strength of the Pacific High pressure system and other global patterns, by topographical features, and by circulation patterns resulting from temperature differences between the land and sea. In spring and summer months, when the Pacific High attains its greatest strength, onshore winds from the northwest generally prevail during the day. At night, as the sea breeze dies, weak drainage winds flow down the coastal mountains and valleys to form a light, easterly land breeze.

In fall and winter during Santa Ana wind conditions in Southern California, pollutants may accumulate over the ocean for a period of one or more days and can then be carried onshore with the return of the sea breeze, where they combine with local emissions to cause high pollutant concentrations along the central coast.

Strong inversions can form at any time, and can trap pollutants near the surface, which can result in an increase in pollutant concentrations at SLO County monitoring stations.

2.3 Land Use, Population and Economics

The predominant land use in San Luis Obispo County is agriculture, with the production and processing of vegetable crops, wine grapes, dryland grains, and livestock as the major components. The southern and coastal areas of the County are primarily devoted to the production of row crops (strawberries, lettuce, broccoli, peas, and other vegetables) and vegetable transplants, although cattle ranching prevails along the north coast. Vineyards, grain production, livestock grazing, and horse ranching are the dominant land uses in the Upper Salinas River Valley; the East County Plain supports some cattle ranches and dryland grain farms. Much of the County's agricultural land is property committed to agricultural use for periods of up to 20 years under the Williamson Act. In 2013, agricultural acreage totaled approximately 1,118,555 acres, with a gross crop value of $960,710,000. Production in the animal industry was valued at $100,865,000 for the same period.

The largest change in agricultural uses in recent years has been a substantial increase in vineyard plantings for wine grapes. In 1998 there were 11,897 bearing acres; this increased to 36,248 bearing acres in 2013.

The County's urban areas exist as separate and uniquely distinct clusters of development. San Miguel, Templeton, Atascadero, Cambria, Cayucos, Los Osos, Oceano and Nipomo are primarily residential communities; of these Atascadero is the only incorporated city. In contrast, San Luis Obispo, Morro Bay, the Five Cities area and Paso Robles have a much broader mix of commercial and residential uses. Residential development has been limited in some areas of the County as a result of moratoriums, growth management issues, and resource constraints. The 2014 estimated population of the County was 279,083. The two largest cities in the County are San Luis Obispo at 46,377 (2013, estimated) and Paso Robles at 30,875 (2013, estimated).

The City of San Luis Obispo is the County seat and commercial center of the region. Commercial and industrial development has been growing steadily in the northern areas of the County, particularly in Atascadero and Paso Robles.

3.0 OVERVIEW OF NETWORK OPERATION

3.1 Air Monitoring Network Design - Objectives and Spatial Scales

Federal regulations require that a network of State and Local Air Monitoring Stations (SLAMS) be designed to meet a minimum of six basic ambient air monitoring objectives:

1. To determine the highest concentration expected to occur in the area covered by the network;
2. To determine representative concentrations in areas of high population density;
3. To determine the impact on ambient pollution levels of significant sources or source categories;
4. To determine general background concentration levels;
5. To determine the extent of regional pollutant transport among populated areas, and in support of secondary standards;
6. To determine the welfare-related impacts in more rural and remote areas (such as visibility impairment and effects on vegetation).

The goal in designing a SLAMS network is to establish monitoring stations that will provide data to meet these monitoring objectives. The physical siting of the air monitoring station must achieve a spatial scale of representativeness that is consistent with the monitoring objective. The spatial scale results from the physical location of the site with respect to the pollutant sources and categories. It estimates the size of the area surrounding the monitoring site that experiences uniform pollutant concentrations. The categories of spatial scale are:

- <u>Microscale</u> - An area of uniform pollutant concentrations ranging from several meters up to 100 meters.
- <u>Middle Scale</u> – uniform pollutant concentrations in an area of about 110 meters to 0.5 kilometer.
- <u>Neighborhood Scale</u> – an area with dimensions in the 0.5 to 4 kilometer range.
- <u>Urban Scale</u> – Citywide pollutant conditions with dimensions from 4 to 50 kilometers.

- Regional Scale – An entire rural area of the same general geography (this area ranges from tens to hundreds of kilometers).

Table 1: Relationship Among Monitoring Objectives and Scale of Representativeness.

Monitoring Objective	Appropriate Spatial Scale
Highest concentration	Micro, middle, neighborhood (sometimes urban)
Population	Neighborhood, urban
Source impact	Micro, middle, neighborhood
General/Background	Neighborhood, urban, regional
Regional transport	Urban, regional
Welfare-related impacts	Urban, regional

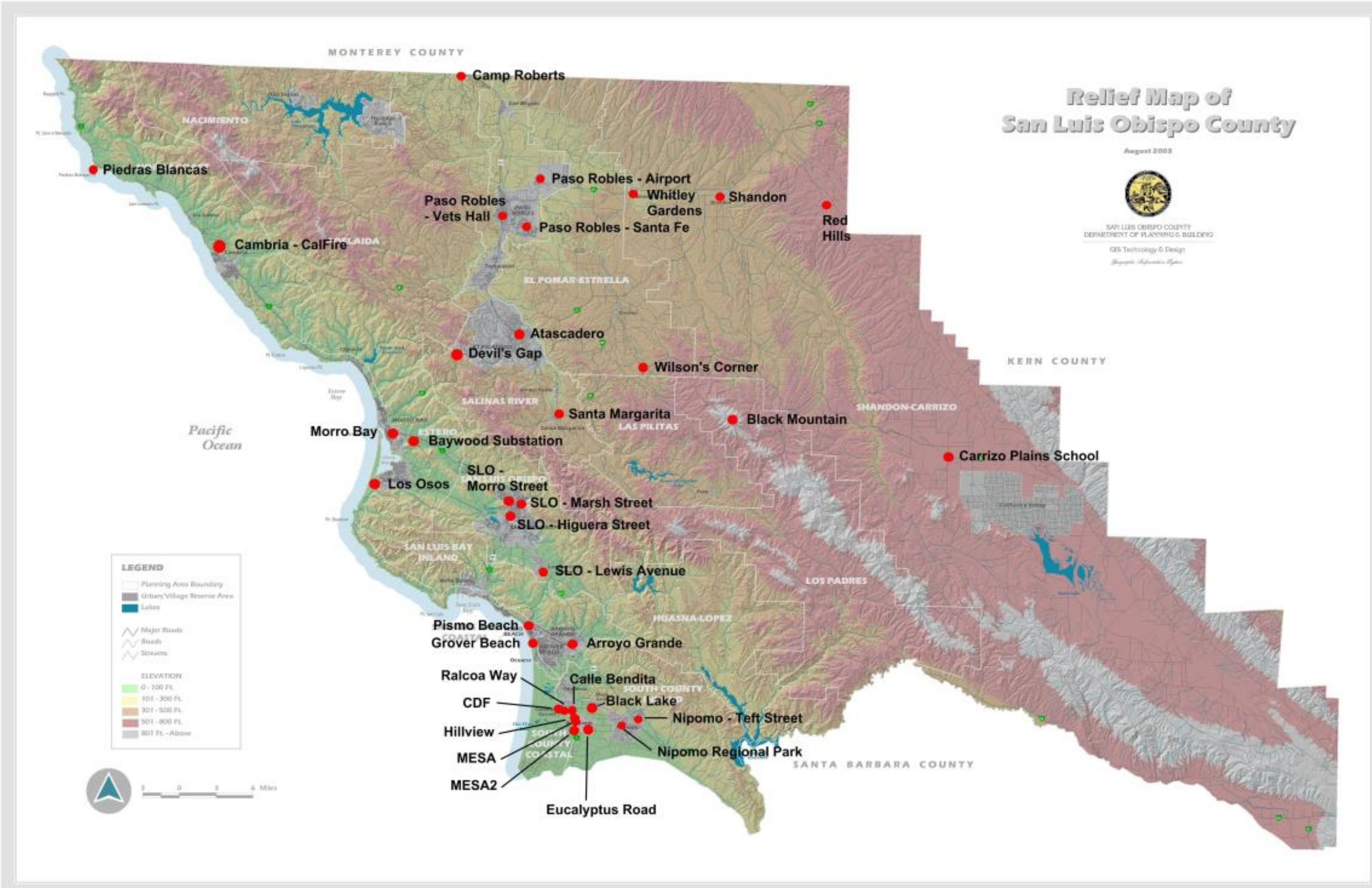


Figure 2: Historical Ambient Air Monitoring Locations in San Luis Obispo County

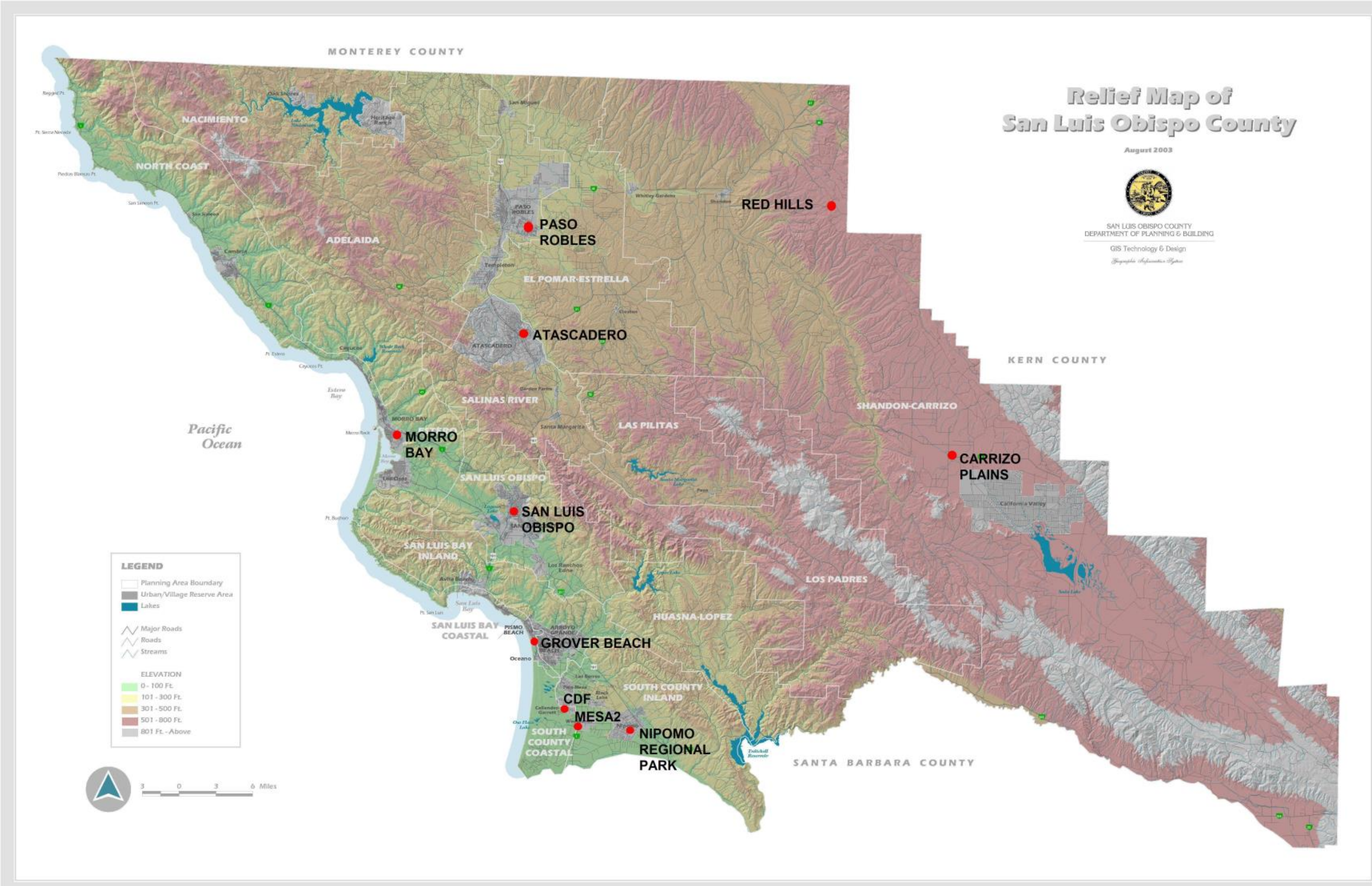


Figure 3: Ambient Air Monitoring Stations Operating in San Luis Obispo County in 2014/2015

3.2 Ambient Air Monitoring Network in San Luis Obispo County

Figure 2 shows a map of the most historical ambient air monitoring locations dating back to 1976. Some of these sites were operated for a year or less during the first few years when monitoring was conducted in the County in order to gauge the need for air quality surveillance at that location. Other sites were part of various studies the District has been involved in over the years such as the Central Coast Ozone Study, the San Joaquin Valley Air Quality Study/AUSPEX, the San Luis Obispo County Regional Ozone Study, and a number of smaller short-term monitoring efforts. The map also includes monitoring stations still in operation. From viewing the map it is clear that all of the populated areas and most of the rural portions of the County have had ambient air monitoring performed at some time in the past. Not included in the map are the more than 20 PM_{10} monitors that were temporarily deployed on the Nipomo Mesa in 2012 as part of the Community Monitoring Study.

Figure 3 shows a map of all currently operating ambient air monitoring stations in San Luis Obispo County. Table 2 lists these stations, the agency which operates them, the pollutant or meteorological parameters which are monitored at each location and the monitoring objective. The existing monitoring site locations are the result of years of sampling and evaluating data to determine the optimum network configuration. The SLOCACPD air monitoring network is a dynamic system that can and should change with changing conditions.

There are currently ten permanent ambient air monitoring stations in San Luis Obispo County. Eight of these stations are operated by the District as part of our SLAMS network. The ARB operates two stations in the County as part of their SLAMS network: one at Paso Robles and one in San Luis Obispo. In addition to these 10 stations, a PM_{10} monitor has recently begun collecting data in the Oso Flaco area of the Oceano Dunes State Vehicular Recreation Area. This special purpose monitor is owned by the State of California Department of Parks and Recreation and may be operated by the District. Its purpose is to fulfill the requirements of District Rule 1001.

3.2.1 Ozone Monitoring Network

All ambient air monitoring stations in the County monitor for ozone except for CDF, Mesa2, and Grover Beach (see Table 2). The SLAMS network in San Luis Obispo County thus features ozone monitors located in Atascadero, Red Hills, Carrizo Plains, Paso Robles, Morro Bay, San Luis Obispo, and Nipomo Regional Park.

Atascadero –SLOCAPCD has operated an ozone monitor in Atascadero since 1988. This station was moved in 2015 from a site located in the central business district of downtown Atascadero to a nearby city property. The original location was bounded on two sides by public schools, and the new site is adjacent to a community center. The monitor continues to be classified as population-oriented and neighborhood scale. It also records the highest ozone concentrations in the western San Luis Obispo attainment area. It provides a measurement of representative ozone concentration for the City of Atascadero. Ozone concentrations at this site exhibit strong diurnal fluctuations caused by titration of ozone by oxides of nitrogen from nearby mobile and residential sources. Measured concentrations at this site are similar to those recorded at Paso Robles, and are often the highest among the five ozone monitors in the western portion of the County that is classified as attaining the federal ozone standard. The highest ozone concentrations at Atascadero occur when there is transport of ozone and other pollutants into the County. Under these infrequent conditions, transported ozone enhanced by local pollutants can cause highly elevated concentrations.

Carrizo Plains – Operated by SLOCACPD since January 2006, this station monitors background levels and ozone transport on a regional scale. The monitor is located in an outbuilding at the Carrizo Plains Elementary School. The ozone concentrations recorded here are second only to Red Hills in concentration and persistence; it is located within the eastern San Luis Obispo County non-attainment area.

Morro Bay – Operated since 1975 by SLOCAPCD, this site provides regional scale and general/background ozone monitoring. Located in downtown Morro Bay, the monitor generally measures background levels of ozone from the predominant northwest winds blowing off of the Pacific Ocean. Under Santa Ana meteorological conditions, the site can record elevated ozone concentrations transported from urban areas in southern California. This is the closest monitor to the shore in the County and one of the longest operating; as such it is excellent for tracking long term trends in background levels of ozone.

Nipomo Regional Park (NRP) – Operated by SLOCAPCD since 1998, this station provides monitoring of background levels of ozone on a regional scale. Previously (1979 to 1996) ozone had been monitored in Nipomo on Wilson Street several miles away. The ozone concentrations measured at NRP are representative of interior portions of the Nipomo Mesa and are the highest recorded in the coastal region of San Luis Obispo County.

Paso Robles – Operated by ARB since 1974, this population-oriented neighborhood scale ozone monitor provides a representative ozone concentration for the suburban areas of the City of Paso Robles. The conditions under which elevated ozone levels occur and the location's prevailing winds are similar to Atascadero.

Red Hills – Operated by SLOCAPCD since 2000, this station is located on the summit of the Red Hills east of the community of Shandon at an elevation of about 2,000 feet. This regional scale site is often influenced by ozone transport from outside of the County and consistently records the highest and most persistent ozone concentrations in the network; its site type is thus regional and maximum concentration. In early 2012, the eastern portion of the County was designated as marginally non-attainment for the Federal 8-hr ozone standard based on the design value from this site.

San Luis Obispo – ARB has operated a population-oriented, neighborhood scale ozone monitor in the City of San Luis Obispo since 1970. The monitor has been at its current site since 2005. It provides a representative ozone concentration for the City of San Luis Obispo. The monitor is located in the urban area where ozone concentrations are significantly depleted by titration with local mobile and stationary NO_x sources. As a result the ozone concentrations recorded here are often lower than at Morro Bay.

As noted in Table 2, the SLAMS site types employed by the existing ozone network are:

1. Highest Concentration – The Red Hills station typically records the highest ozone concentrations in the County. High ozone levels tend to occur in the interior areas of the county during summer, or as a result of additional transported pollutants from regions outside of SLO County (SF Bay Area- San Joaquin Valley – Southern California). Among the sites in the western portion of the County, which is classified as attaining the ozone standard, Atascadero and Paso Robles measure the highest concentrations. In 2014, Atascadero had a higher design value than Paso Robles, but in early years Paso Robles has often been higher.
2. Population Exposure – The Paso Robles, Atascadero and San Luis Obispo monitors provide a good representation of the ozone levels in the larger cities of the County.
3. Source Impact – Because ozone is a secondary pollutant the effect of emissions from any single source are experienced five to seven hours later and often many miles distant. As a regional pollutant, monitoring for specific sources of ozone is not performed.
4. General/Background – The monitors at Morro Bay, Carrizo Plains and Nipomo Regional Park provide regional background ozone levels.
5. Regional Transport – The stations located at Carrizo Plains and Red Hills provide excellent surveillance of regional transport of ozone into the interior part of the County. Coastal monitoring stations have provided evidence in the past of regional transport of ozone over water from distant urban sources.

3.2.2 Nitrogen Dioxide Monitoring Network

The SLAMS network in San Luis Obispo County features nitrogen dioxide (NO_2) monitors at Atascadero, Morro Bay, and Nipomo Regional Park. NO_2 levels have always been well below the State and Federal standards at all locations in our County. For this reason NO_2 monitoring is most useful here as an indicator of depletion of ambient ozone through titration with nitric oxide. These monitors also serve long-term air quality surveillance roles.

Atascadero – Operated by SLOCAPCD since 1990 and relocated in 2015, this population-oriented monitor is considered neighborhood scale. This is the only NO_2 monitor in the Salinas River air basin in the County, and it records the highest NO, NO_2 and NO_x levels in the County. The monitor's location downtown has established a strong diurnal inverse relationship between ozone and NO_2 levels caused by local mobile sources and residential and commercial combustion of natural gas.

Morro Bay – Operated by SLOCAPCD since 2001 this monitor is neighborhood scale and was established to monitor emissions from the Morro Bay power plant, located less than a mile upwind. The plant permanently closed in February 2014.

Nipomo Regional Park – Operated by the SLOCAPCD since 1998, this monitor is regional in scale and is representative of background concentrations on the Nipomo Mesa. The site's location in a large natural area away from local or mobile sources makes it ideal for regional surveillance of NO_2.

The SLAMS sites in the existing NO_2 network are:

1. Highest Concentration – The Atascadero monitor historically has measured the highest NO_2 concentrations in the County. NO_2 levels are the result of titration of ambient ozone by local sources of nitric oxide and as a result values are always relatively low. Levels have never exceeded the 1-hr NO_2 standard (100 ppb), with annual maximum 1-hr concentrations typically around 50% of the standard.
2. General/Background – With no significant local sources present the monitors at Nipomo Regional Park and Morro Bay provide excellent information on background levels of NO_2.

Regional Transport and Welfare-Related impacts of NO_2 are not currently addressed by the District's SLAMS network and are not thought to be significant. With the closure of the Morro Bay power plant—the only potentially significant point source of NO_2 in the County—no monitors in the network are considered to be source-oriented. The San Luis Obispo-Paso Robles MSA, does not have any NO_2 sites for vulnerable populations, near-road NO_2 monitoring sites, or area-wide NO_2 sites.

Table 2: Ambient Air Quality Parameters Monitored and Site Types in San Luis Obispo County in 2014/2015

Site	Ozone[b]	Nitrogen Dioxide	Sulfur Dioxide	PM_{10}	$PM_{2.5}$	Wind[c]	Temp
Atascadero	P, C	P, C		P	P	X	X
Carrizo Plains	T, B					X	X
CDF				S, C	S, C	X	
Grover Beach						X	
Mesa2			S, C	S	S	X	X
Morro Bay	B	B				X	
Nipomo Regional Park (NRP)	B	B		B		X	X
Paso Robles [a]	P			P		X	X
San Luis Obispo [a]	P			P	P	X	X
Red Hills	T, C					X	X

Site Types: B = General/Background, C = Highest Concentration, P = Population Exposure, T = Regional Transport, S= Source Oriented, X = Parameter measured at this site. **Notes:** [a] Paso Robles and San Luis Obispo are operated by ARB; all other sites are operated by SLOCAPCD. [b] Atascadero is the highest concentration site for the western County attainment area, while Red Hills is the highest concentration site for the eastern County non-attainment area. [c] Wind speed, wind direction, and sigma theta.

3.2.3 Sulfur Dioxide Monitoring Network

The sulfur dioxide (SO_2) monitoring network in San Luis Obispo County currently consists of one station: Mesa2.

Mesa2 – Established in 1989 and operated by the SLOCAPCD since 2006, this monitor performs surveillance of a nearby oil refinery. It is considered middle scale and highest concentration for SO_2. Since it is located close to and downwind of a major source of SO_2 emissions, it is representative only of the immediate area. The station was sited to optimize surveillance of the refinery's nearby coke calciner, which has since been shut down. Nonetheless, the refinery remains the largest point source of SO_2 in the County, and during upsets this monitor can record concentrations approaching and sometimes exceeding the NAAQS. In addition to meeting NAAQS compliance objectives, this site is also vital for public information and emergency response.

The SLAMS SO_2 monitoring objectives met by the network are:

1. Highest Concentration – The monitor at Mesa2 records the highest SO_2 levels in the County.
2. Source Impact – The monitor at Mesa2 is invaluable in determining the SO_2 source impact upon the immediate region.

Monitoring objectives not addressed by the existing SO_2 network are: General/Background, Population, Regional Transport, and Welfare-Related. Historical SO_2 monitoring performed elsewhere in the County (at NRP from 1998-2006; Morro Bay, 1979-1995; Grover Beach, 1982-2004; and at decommissioned stations in Arroyo Grande "Ralcoa" (06-079-1005), 1991-2002, and "Mesa1" (06-079-3002), 1987-94) suggest that monitoring for these objectives is not needed. Furthermore, background levels of SO_2 in the County are believed to be negligible, since more than 98% of hourly SO_2 levels from Mesa2 were 1 ppb or less in 2014. As demonstrated in the 2015 Annual Network Plan for San Luis Obispo County, the Mesa2 monitor fulfills minimum monitoring requirements for the County.

3.2.4 PM_{10} and $PM_{2.5}$ Particulate Monitoring Network

The particulate monitoring network in San Luis Obispo County consists of six Federal Equivalent Method (FEM) PM_{10} monitors (Paso Robles, Atascadero, San Luis Obispo, Mesa2, CDF and Nipomo Regional Park) and four FEM $PM_{2.5}$ monitors (Atascadero, CDF, Mesa2 and San Luis Obispo). The PM_{10} network has been in place since 1988, and $PM_{2.5}$ samplers began operation in 1999 in response to the establishment of a new Federal standard for $PM_{2.5}$ in 1997. Originally all particulate monitoring in the County was performed as part of ARB's network, but eventually all monitors except those at Paso Robles and San Luis Obispo became part of the SLOCAPCD network.

Initially, all particulate sampling was conducted by filter-based Federal Reference Method (FRM) methods. With the advent of continuous monitoring technologies, all the FRM monitors in the County have been replaced with FEM monitors in recent years. These are continuous semi-real time monitors that report hourly PM concentrations. The hourly data has greatly improved the SLOCAPCD abilities to issue timely air quality forecast which is a significant benefit for the advancement of public health goals.

Atascadero – Operated by SLOCAPCD, PM_{10} monitoring has been conducted here since 1988, initially via a FRM and currently with a continuous FEM monitor. Collocated FRM $PM_{2.5}$ monitors began operation in 1999 and have since been replaced by a single FEM. All monitors are neighborhood in scale and representative of particulate concentrations in the City of Atascadero. As previously noted, the station was moved about 400 meters north of its original location in February 2015.

Mesa2 – PM_{10} sampling began at this site in 1991, and the monitors have been operated by the SLOCAPCD since 2006. This site initially featured collocated FRM PM_{10} samplers that were replaced by a single continuous FEM PM_{10} monitor in 2009. A continuous $PM_{2.5}$ FEM monitor was installed at the same time. This site monitors source impacts from the nearby oil refinery and coastal dunes. It is neighborhood scale. These monitors record some of the highest particulate levels in the County and are strongly influenced by the extensive coastal sand dunes and the Oceano Dunes State Vehicular Recreation Area (ODSVRA) located upwind.

CDF – Originally established for the SLOCAPCD's Nipomo Mesa Phase 2 Particulate Study, this site has become a permanent part of our SLAMS particulate network. The site features continuous FEM samplers for PM_{10} and $PM_{2.5}$, which are neighborhood in scale and measure source impacts from the ODSVRA. These monitors record the highest particulate levels in the County and are strongly influenced by the ODSVRA, located directly upwind. In 2012, extensive temporary monitoring on the Nipomo Mesa confirmed that this site is located within the one square mile sector of the study area that experiences the highest PM_{10} levels.[1]

Nipomo Regional Park – Operated at this location by SLOCAPCD since 1998, it replaced a site at Wilson Street in Nipomo that operated from 1990-96. The 1-in-6 day FRM PM_{10} sampler was replaced with a continuous FEM sampler in 2010. The monitor is regional in scale and is representative of PM_{10} concentrations on the Nipomo Mesa.

Paso Robles – Operated by ARB since 1991 this PM_{10} monitor is urban in scale and representative of the city of Paso Robles. The FRM sampler at this site was replaced with an FEM PM_{10} sampler in August 2009.

San Luis Obispo – Operated by ARB, a PM_{10} sampler has been in place since 1988, and a $PM_{2.5}$ sampler since 1999. ARB replaced the FRM samplers with continuous FEM instruments in 2011. These population-oriented monitors are neighborhood in scale and represent particulate concentrations in the City of San Luis Obispo.

4.0 STATISTICAL ANALYSIS

A variety of statistical tests were run to examine the comprehensiveness and suitability of the SLOCACPD monitoring network. All analyses, with the exception of the measured concentration statistics, were performed using the assessment tools provided by EPA and Lake Michigan Air

[1] San Luis Obispo County Air Pollution Control District, "South County Community Monitoring Project," January 2013. Available online: http://slocleanair.org/communitymonitoringproject

Directors Consortium.[2] As discussed in greater detail below, many of these tools fail to accurately capture the on-the-ground reality of air quality in the County. However for the sake of transparency, all results are included below.

4.1 Measured Concentration Analysis

Individual monitors are ranked based on the concentration of pollutants they measure. Monitors that measure high concentrations or have high design values are ranked higher than monitors that measure low concentrations. Results can be used to determine which monitors are less useful in meeting the monitoring objective of NAAQS compliance. Three-year average design values were calculated for the period 2012 to 2014 for ozone, NO_2, and $PM_{2.5}$. For PM_{10} the third highest 24-hour average for the period 2013 to 2014 was used, since some monitors had insufficient data for 2012. The results of the measured concentration analysis are presented in Tables 3, 4, 5, and 6.

4.1.1 Ozone Measured Concentration Analysis

For this pollutant, the District considers there to be three distinct air quality regions in the County: the Coastal Plateau, the Upper Salinas River valley, and eastern San Luis Obispo County. Of the three population-oriented monitors only Atascadero and Paso Robles are in the same air quality region. Although the sites are very similar, Atascadero tends to record higher concentrations of ozone than Paso Robles as shown in Table 3, below.

Three ozone monitors are classified as background-oriented monitors. All three of these monitors are in different air quality regions and provide unique information.

[2] Lake Michigan Air Director's Consortium. "NetAssess," http://ladco.github.io/NetAssessApp/index.html. Accessed May 2015.

Table 3: Ozone Measured Concentration Analysis

Site	Address	AQS Site Code	Design Value 2012-2014 (ppm)	Monitoring Objective	Spatial Scale	Rank
Red Hills	3601 Gillis Canyon Road	06-079-8005	0.076	Transport/Highest Concentration	Regional	1
Carrizo Plains	9640 Carrizo Highway	06-079-8006	0.070	Background	Regional	2
Atascadero	6005 Lewis Avenue	06-079-8001	0.063	Population	Neighborhood	3
Paso Robles	235 Santa Fe Avenue	06-079-0005	0.061	Population	Neighborhood	4
NRP	Nipomo Regional Park	06-079-4002	0.058	Background	Regional	5
San Luis Obispo	3220 South Higuera Street	06-079-2006	0.054	Population	Neighborhood	6
Morro Bay	Morro Bay Blvd & Kern	06-079-3001	0.053	Background	Regional	7

4.1.2 $PM_{2.5}$ Measured Concentration Analysis

For this pollutant, there are three air quality regions in the County: the South County Coastal Region, which is strongly influenced by the ODSVRA, the Upper Salinas River Valley, and the Coastal Plateau. Table 4 presents the ranking of $PM_{2.5}$ monitors. Although Atascadero ranked higher than San Luis Obispo in this analysis, the samplers are in different air quality regions. The CDF monitor measured higher concentrations than the Mesa2 monitor; both are source oriented monitors.

Table 4: $PM_{2.5}$ Measured Concentration Analysis

Site	Address	AQS Site Code	24 Hour Design Value 2012-2014 (ug/m^3)	Annual Design Value 2012-2014 (ug/m^3)	Monitoring Objective	Spatial Scale	Rank
CDF	2391 Willow Rd.	06-079-2007	30	11.6	Source	Neighborhood	1
Mesa2	1300 Guadalupe Road	06-079-2004	24	9.3	Source	Neighborhood	2
Atascadero	6005 Lewis Avenue	06-079-8001	20	6.4	Population	Neighborhood	3
San Luis Obispo	3220 South Higuera Street	06-079-2006	13	6.3	Population	Neighborhood	4

4.1.3 PM_{10} Measured Concentration Analysis

The air quality regions for PM_{10} are the same as those for $PM_{2.5}$. The analysis ranked monitors based on third highest measured concentration from 2013 to 2014. (Data for 2012 was omitted because not all monitors had complete data for this year). The two source-oriented monitors, CDF and Mesa2, are in place to perform surveillance of a significant area source of fine particulate at the ODSVRA; recently installed mitigation measures on the ODSVRA were sited to mainly influence the CDF monitor. As was the case with ozone, of the three population-oriented monitors only Atascadero and Paso Robles are in the same air quality region.

Table 5: PM_{10} Measured Concentration Analysis

Site	Address	AQS Site Code	3rd High 24 Hour (ug/m^3) 2013-2014	Monitoring Objective	Spatial Scale	Rank
CDF	2391 Willow Road, Arroyo Grande	06-079-2007	158	Source	Neighborhood	1
Mesa2	1300 Guadalupe Road, Arroyo Grande	06-079-2004	125	Source	Neighborhood	2
NRP	Nipomo Regional Park, Nipomo	06-079-4002	86	Background	Regional	3
Paso Robles	235 Santa Fe Avenue, Paso Robles	06-079-0005	79	Population	Urban	4
Atascadero	6005 Lewis Avenue, Atascadero	06-079-8001	59	Population	Neighborhood	5
San Luis Obispo	3220 South Higuera Street, San Luis Obispo	06-079-2006	41	Population	Neighborhood	6

4.1.4 NO_2 Measured Concentration Analysis

The air quality regions for NO_2 are the same as those for ozone. Table 6 presents the ranking of these monitors. The Morro Bay monitor is located just downwind of the Morro Bay Power Plant, which operated sporadically during the period in which these data were collected and closed permanently in 2014.

Table 6: NO_2 Measured Concentration Analysis

Site	Address	AQS Site Code	Design Value (ppb) 2012-2014	Monitoring Objective	Spatial Scale	Rank
Atascadero	6005 Lewis Avenue	06-079-8001	39	Population	Neighborhood	1
Morro Bay	Morro Bay Blvd & Kern	06-079-3001	32	Background	Neighborhood	2
NRP	Nipomo Regional Park	06-079-4002	27	Background	Regional	3

4.2 Monitor to Monitor Correlation Analysis

Concentrations at one monitor are compared to concentrations measured at other monitors to determine if their concentrations correlate temporally. Monitor pairs with Pearson correlation values near one (straight line in the figures) are highly correlated; monitor pairs with Pearson correlation values near zero (circle) 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 yellow color) measure similar ozone concentrations, while monitors with high average relative differences (red to blue color) measure significantly different concentrations.

Possibly redundant sites would exhibit fairly high correlations consistently and would have low average relative difference despite the distance between them. Usually it is expected that the correlation between sites will decrease as distance increases. However, for a regional air pollutant such as ozone, sites in the same airshed can have very similar concentrations and be highly correlated. More unique sites would exhibit the opposite characteristics. They would not be very well correlated with other sites and their relative difference would be higher than other site to site pairs.

4.2.1 Correlation of Ozone Monitors in San Luis Obispo County

Figure 4, below, depicts a correlation matrix comparing ozone monitors from San Luis Obispo and nearby monitors outside the County. The analysis reveals a significant correlation between ozone monitors located in southern coastal San Luis County and Santa Maria in northern Santa Barbara County. In interior San Luis Obispo County, Carrizo Plains and Red Hills show strong correlation. It is not surprising that a regional pollutant like ozone would show correlations within the same air basin. The analysis does show little correlation between monitors in the southern coastal region of San Luis Obispo with monitors in the interior.

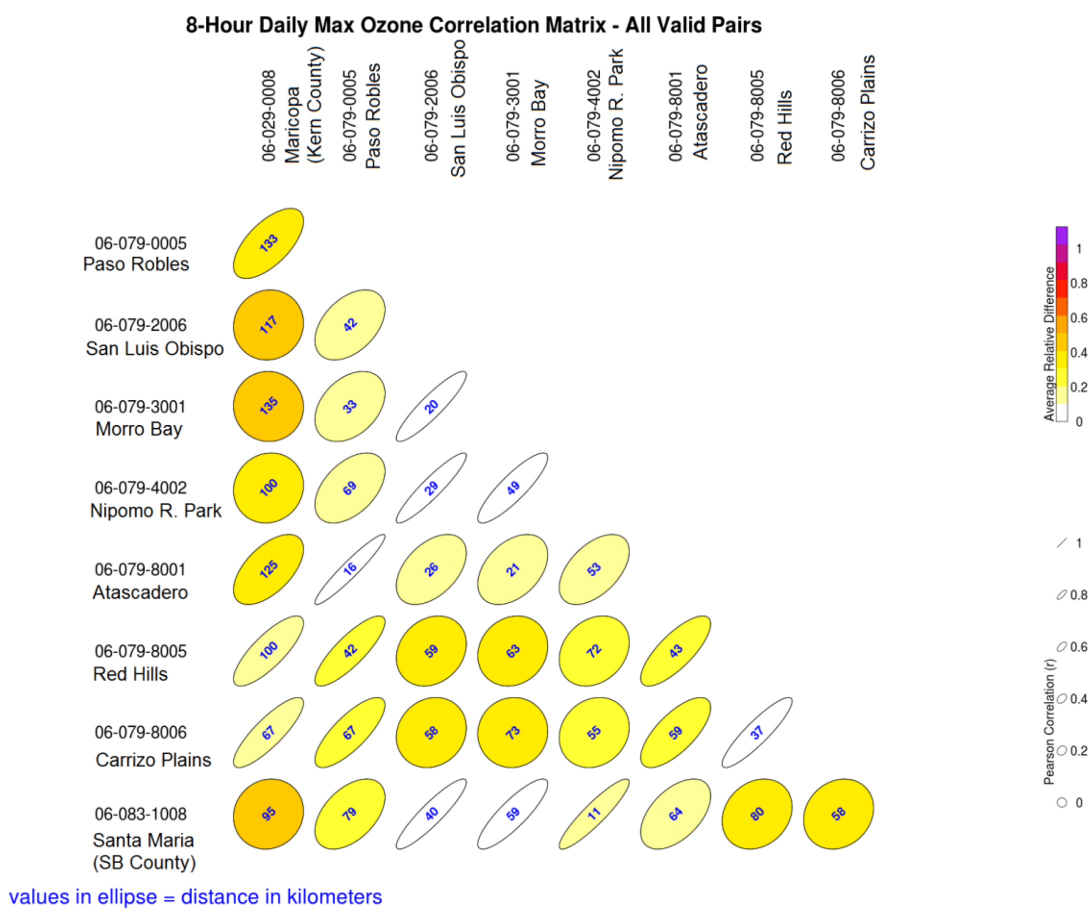


Figure 4: Correlation of Ozone Monitors in San Luis Obispo County

4.2.2 Correlation of $PM_{2.5}$ Monitors in San Luis Obispo County

Figure 5 depicts a correlation matrix comparing $PM_{2.5}$ monitors from San Luis Obispo and adjoining counties. The only two sites with any significant correlation are Mesa2 and CDF. It is not surprising as they are only located 2 km apart and both sites are largely influenced by the same PM source - coastal dunes.

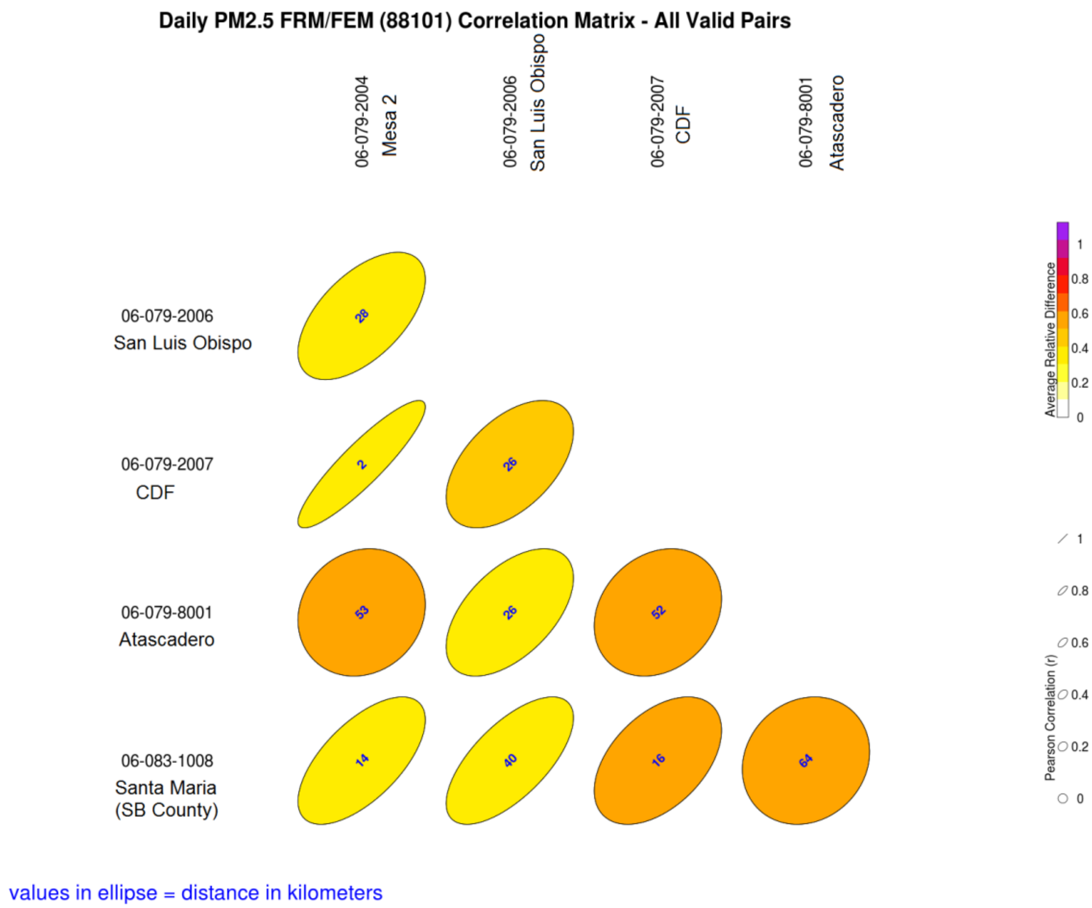


Figure 5: Correlation of FRM $PM_{2.5}$ Monitors in San Luis Obispo County

4.3 Removal Bias Analysis

The removal bias analysis is a tool used in determining possible redundant sites. The bias estimation uses the nearest monitoring site neighbors to each site to estimate the concentration at the location of the site if the site had never existed. This is done using the Voronoi Neighborhood Averaging algorithm with inverse distance squared weighting. The squared distance allows for higher weighting on concentrations at sites located closer to the site being examined. Terrain features, meteorology, and local sources are not included in the analysis. The bias was calculated for each day at each site by taking the difference between the predicted value from the interpolation and the measured concentration. A positive average bias would mean that if the site being examined was removed, the neighboring sites 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 site is smaller than the actual measured concentration. A site with no bias indicates that the estimated concentration at the location of the site matches the actual measured concentration. Sites with little to no bias are sites where removal could be considered.

4.3.1 Removal Bias Analysis for Ozone in San Luis Obispo County

The removal bias analysis presented in Figure 6 shows low average bias for the Atascadero and Paso Robles monitors, implying that concentrations at these locations are well predicted by the other monitors. However, the maximum and minimum daily relative bias between the predicted and measured concentrations at these sites is significant, indicating that while the mean relative bias is negligible, there are periods where there is significant relative bias between the actual and predicted concentration at these sites.

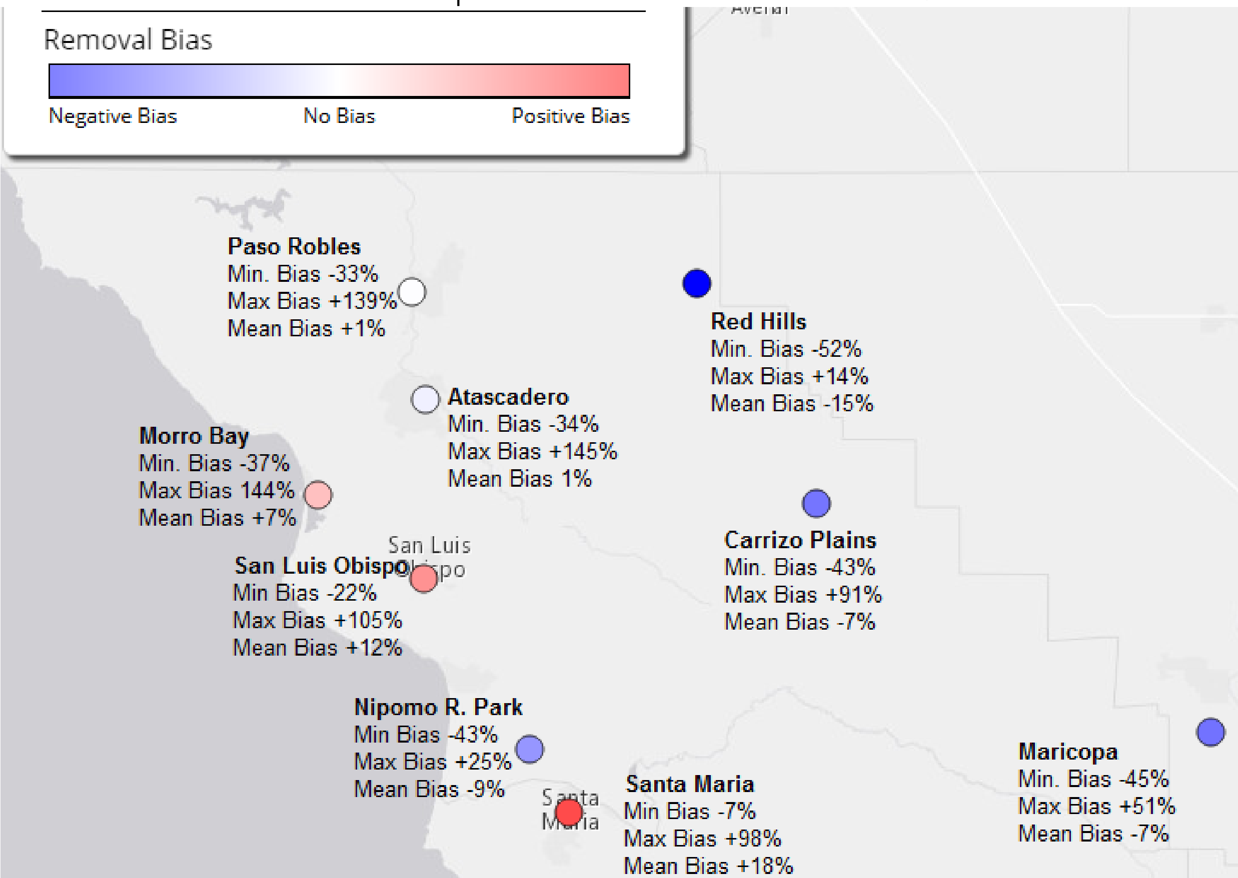


Figure 6: Removal Bias Analysis for Ozone

4.3.2 Removal Bias Analysis for $PM_{2.5}$ in San Luis Obispo County

The $PM_{2.5}$ removal bias analysis presented in Figure 7 shows significant relative bias between predicted and measured concentrations between all sites. This indicates that if any monitor was discontinued, concentrations at that site could not easily be predicted based on the levels measured at the remaining monitors.

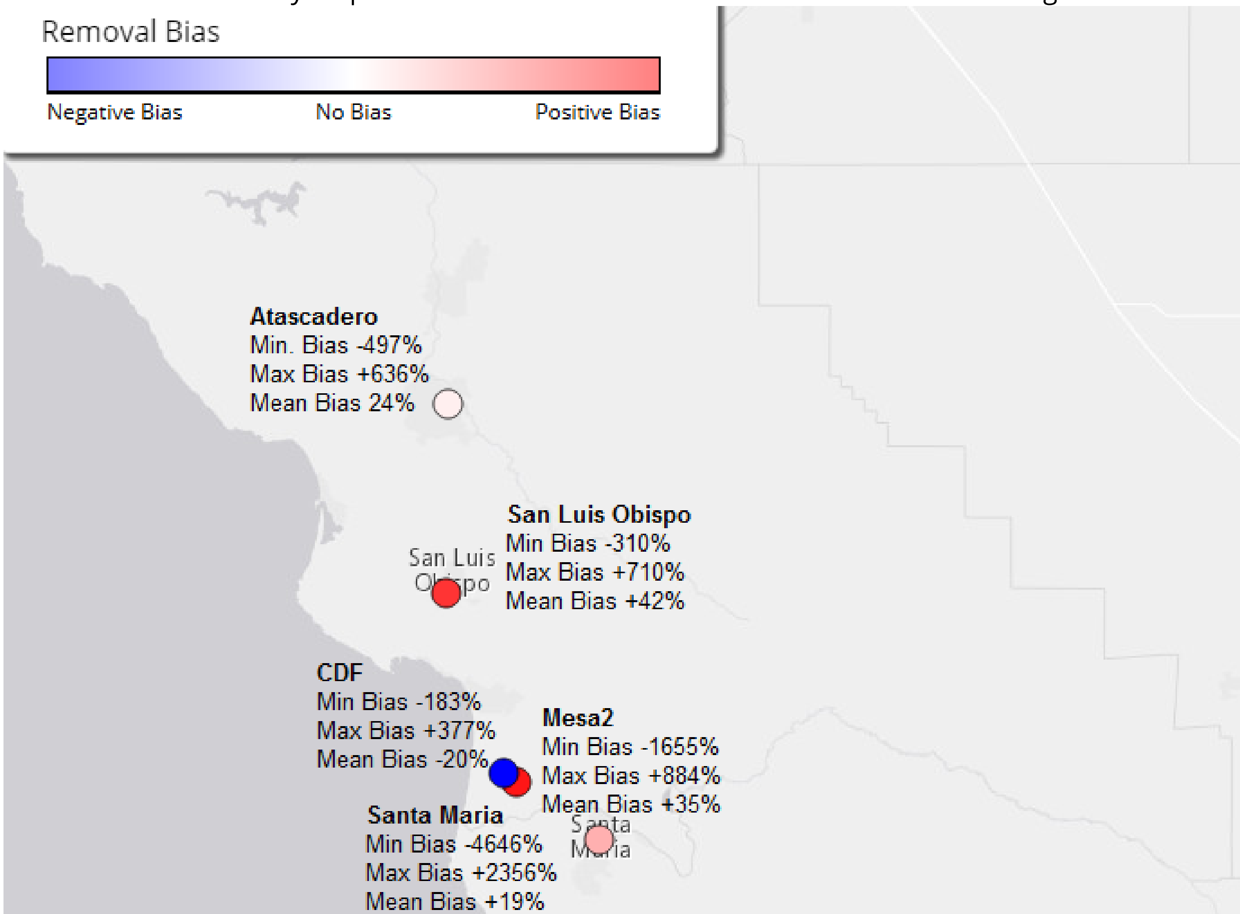


Figure 7: Removal Bias Analysis for PM2.5

4.4 Exceedance Probability Surface Maps

A significant goal of the network assessment is to determine if new sites are needed. In order to make that decision, it is helpful to have some 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 the pollutant of interest for the centroid of each census tract. These are statistical estimates from “fusing” modeling data and ambient monitoring data using Bayesian space-time methods.

These maps are intended to be used as a spatial comparison and not for probability estimates for a single geographic point or area. The probability estimates displayed on the map alone should not be used to justify a new monitor. The maps should be used in conjunction with existing monitoring data. This information, along with demographic and emissions data, could be used in a weight of evidence approach for proposing new monitor locations. It is important to note that in compiling the data to generate these maps, some details are lost in the fusing of modeling and monitoring data. For example, the ozone probability maps show a slightly higher probability of an exceedance occurring at the Carrizo Plains site than the Red Hills site, yet monitoring data from the two sites show the opposite. Another example is the $PM_{2.5}$ probability map, which shows low exceedance probability for the area of the CDF and Mesa2 monitors, while monitoring data show occasional exceedances of Federal PM Standards. It is therefore important to utilize these maps for general patterns, not absolute values.

4.4.1 Ozone Surface Probability Maps for San Luis Obispo County

In November 2014, EPA announced plans to lower the ozone standard from the current 75 ppb level to somewhere between 65 ppb and 70 ppb. At this time, it is unknown what level the revised standard will be set at, or if will change at all. Therefore surface probability maps were generated for the existing standard of 75 ppb for an 8 hour average, a potential new standard set at 70 ppb, and a potential new standard set at 65 ppb. These maps are presented as Figures 8, 9, and 10. All of the maps show low probability of finding a new site location in the coastal portion of San Luis Obispo County where ozone exceedances might be measured. The maps do show that it is the interior portion of San Luis Obispo County where there is greater probability of measuring ozone exceedances.

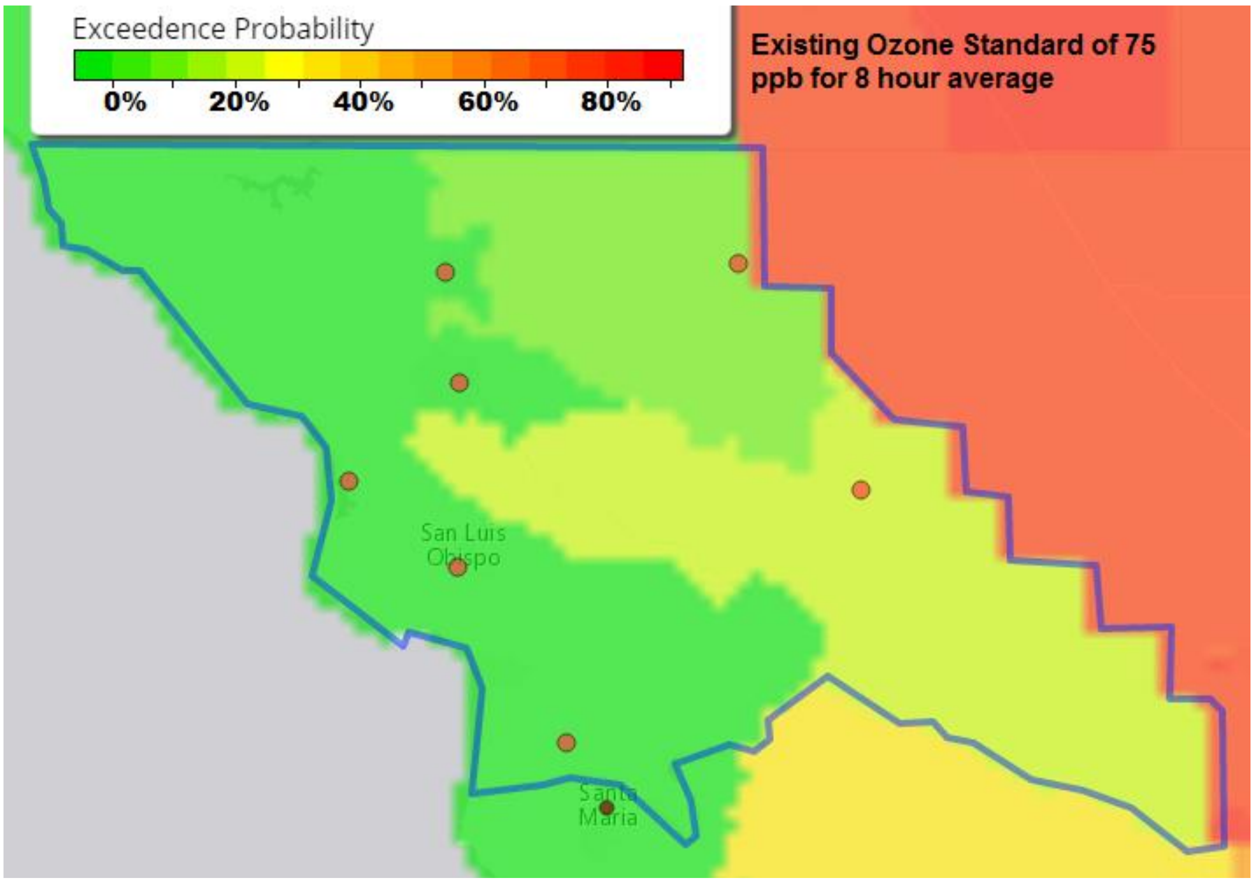


Figure 8: Surface Probability Map for Ozone Evaluated to Existing Standard

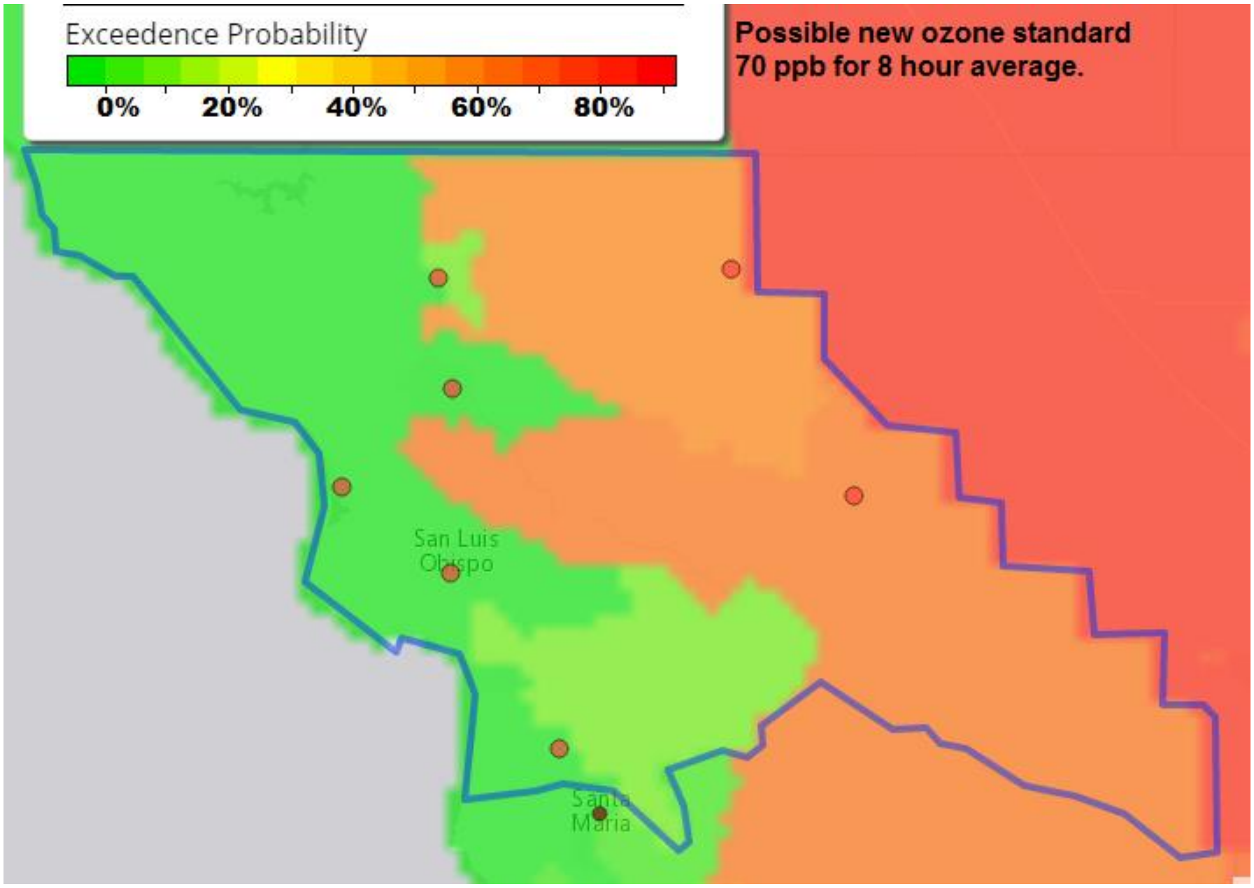


Figure 9: Surface Probability Map for Ozone Evaluated for Possible New Standard at 70ppb

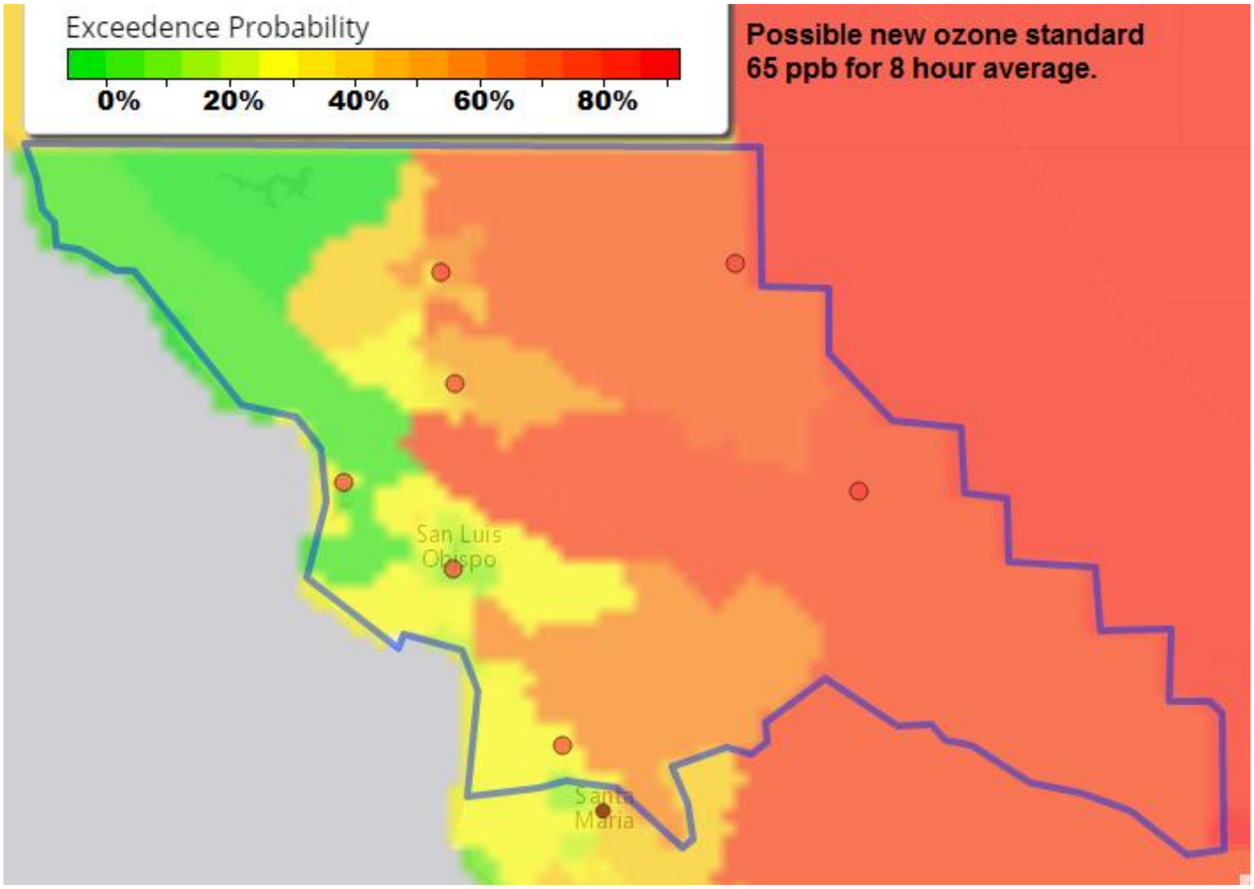


Figure 10: Surface Probability Map for Ozone Evaluated for Possible New Standard at 65ppb

4.4.2 $PM_{2.5}$ Surface Probability Map for San Luis Obispo County

The $PM_{2.5}$ probability map shows a similar patter as the ozone probability maps, with a low probability of measuring exceedances in the coastal region and higher probabilities in the eastern interior portions of San Luis Obispo County where there are few local sources of $PM_{2.5}$. The higher probability for this area is due to high $PM_{2.5}$ measurements recorded in the San Joaquin Valley (to the east), and their potential transport into San Luis Obispo County. The District has not performed $PM_{2.5}$ measurements east of Atascadero, but did measure PM_{10} at the Carrizo Plains site for one year, and found very low levels. Therefore, while the modeling shows a significant probability of exceeding the $PM_{2.5}$ standard in the eastern portion of San Luis Obispo County, monitoring data indicate a low likelihood in the southeast portion of the County, where the Carrizo Plains site is located.

It is interesting to note that this analysis shows a very low probability of exceeding the standard at the CDF and Mesa2 sites. Measurement data shows that these sites measure significantly higher values of $PM_{2.5}$ than any other site in the County, with the CDF site approaching the annual $PM_{2.5}$ standard.

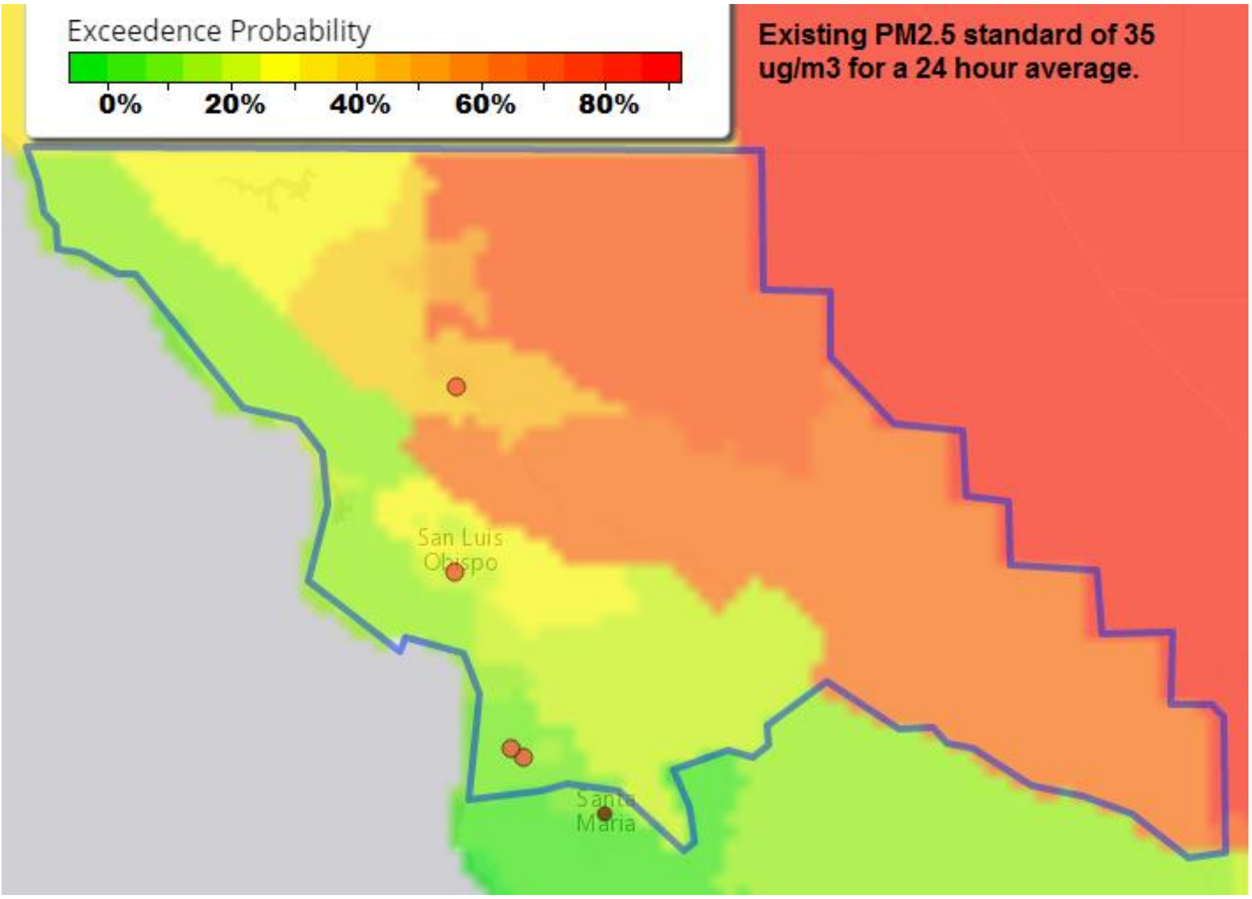


Figure 11: Surface Probability Map for $PM_{2.5}$

4.5 Area Served Analysis

This exercise uses a spatial analysis technique known as Voronoi or Thiessen polygons to approximate the area served by a monitoring site. The shape and size of each polygon is dependent on the proximity of the nearest neighboring air monitor to a particular site. While this technique provides an easy way to understand the general area and demographics represented by a particular monitoring site, it is important to understand that the polygons constructed by this analysis are based only on the distance to the nearby monitors, not on the area of representativeness for the monitor's data. Terrain, meteorology, and local pollution sources are not taken into account in this analysis. The AQI forecast map (Figure 12) developed by the district more accurately describes the area served by each monitoring station. Air quality forecast zones define geographical areas with relatively similar air quality characteristics that are represented by at least one of the air monitoring stations in SLO County. These forecast map polygons are different from the maps in Figures 13, 14, 15 and 16 in that the zone boundaries are defined by air quality characteristics, not distance from the nearest air monitoring station. The APCD issues daily air quality forecasts for each of these zones. Despite the limitations of the Voronoi/Thiessen polygon approach, understanding demographic distribution surrounding a monitor can be helpful in ensuring that a monitor is not removed that serves a historically underserved, vulnerable or disadvantaged segment of the population.
Figures 13, 14, 15 and 16 depict the results of this analysis for ozone, $PM_{2.5}$, PM_{10}, and NO_2 respectively. The demographic data displayed with each figure shows that the sites in the northern and southern portions of the County serve a slightly higher percentage of "other races"; however, there are no sites serving a high proportion of underserved, vulnerable or disadvantaged segments of the population. Data on age distribution shows that the Atascadero, Paso Robles, Mesa2, and CDF monitors serve a slightly higher proportion of children and the Morro Bay and Mesa2 monitors serve a slightly higher proportion of elderly. It would be important to consider monitors serving these sensitive populations prior to any consideration of removal of the monitor. Note that the San Luis Obispo PM_{10} monitor is not listed in this analysis due to data issues.

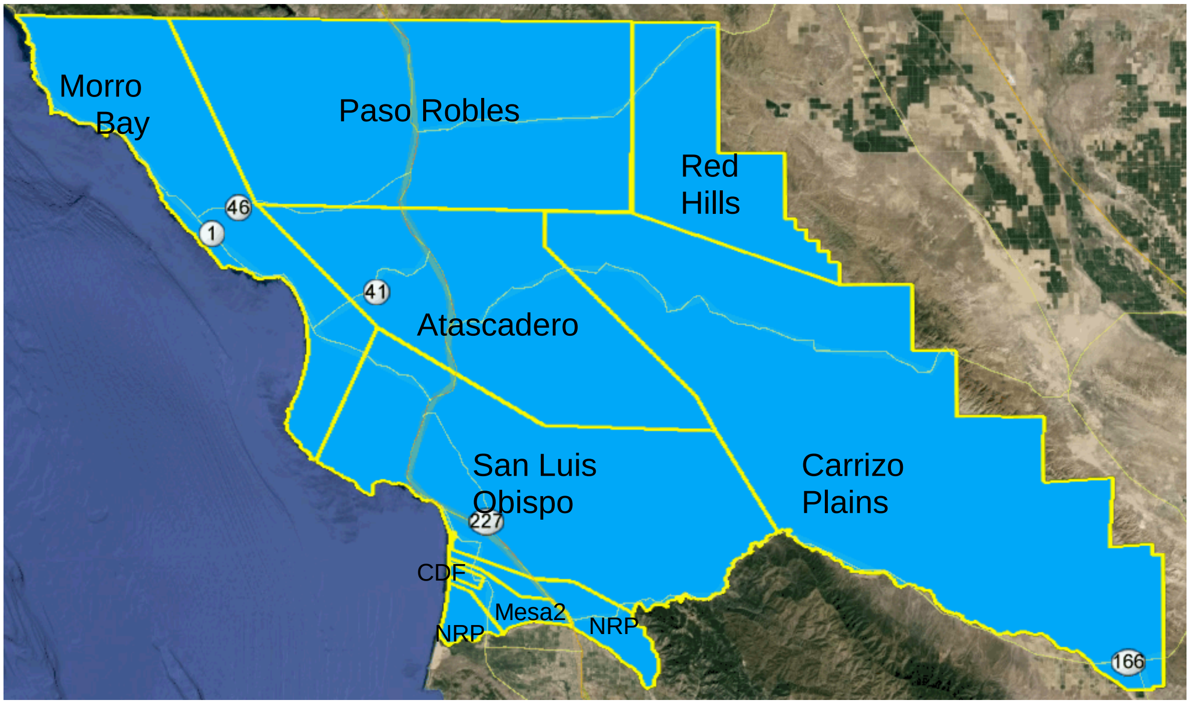
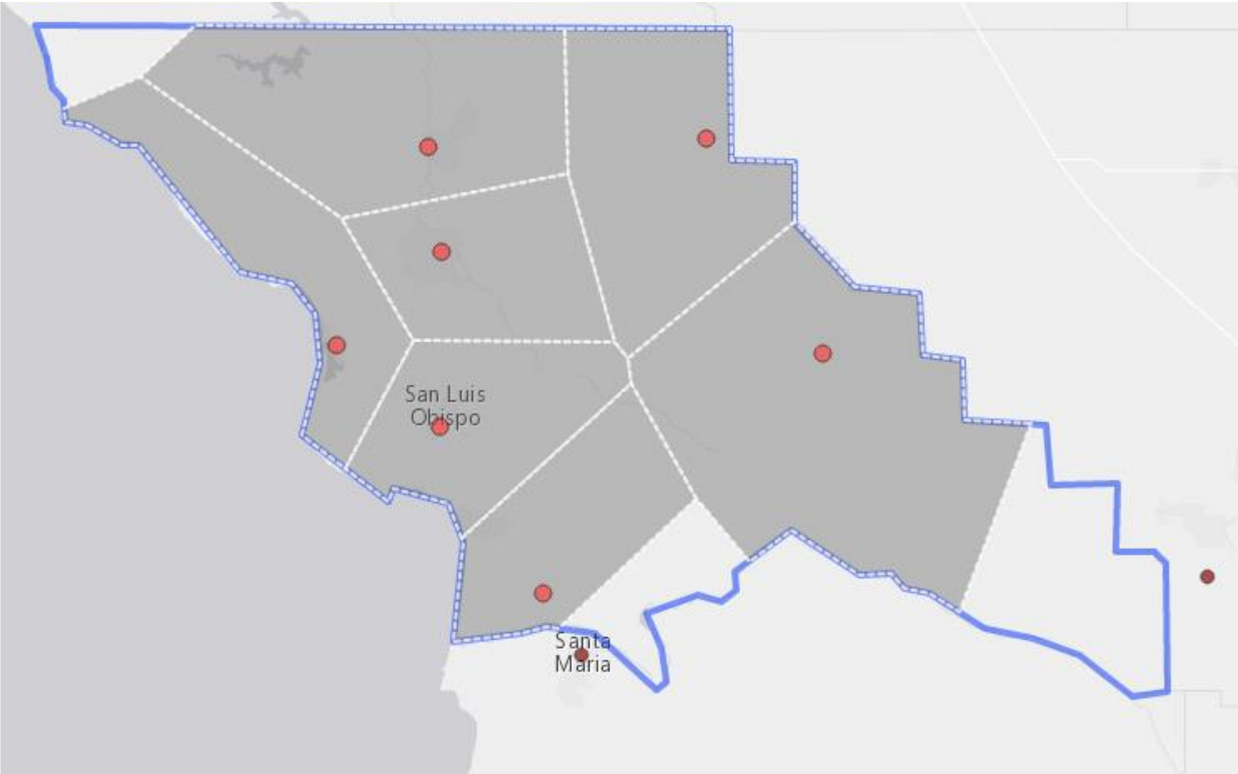


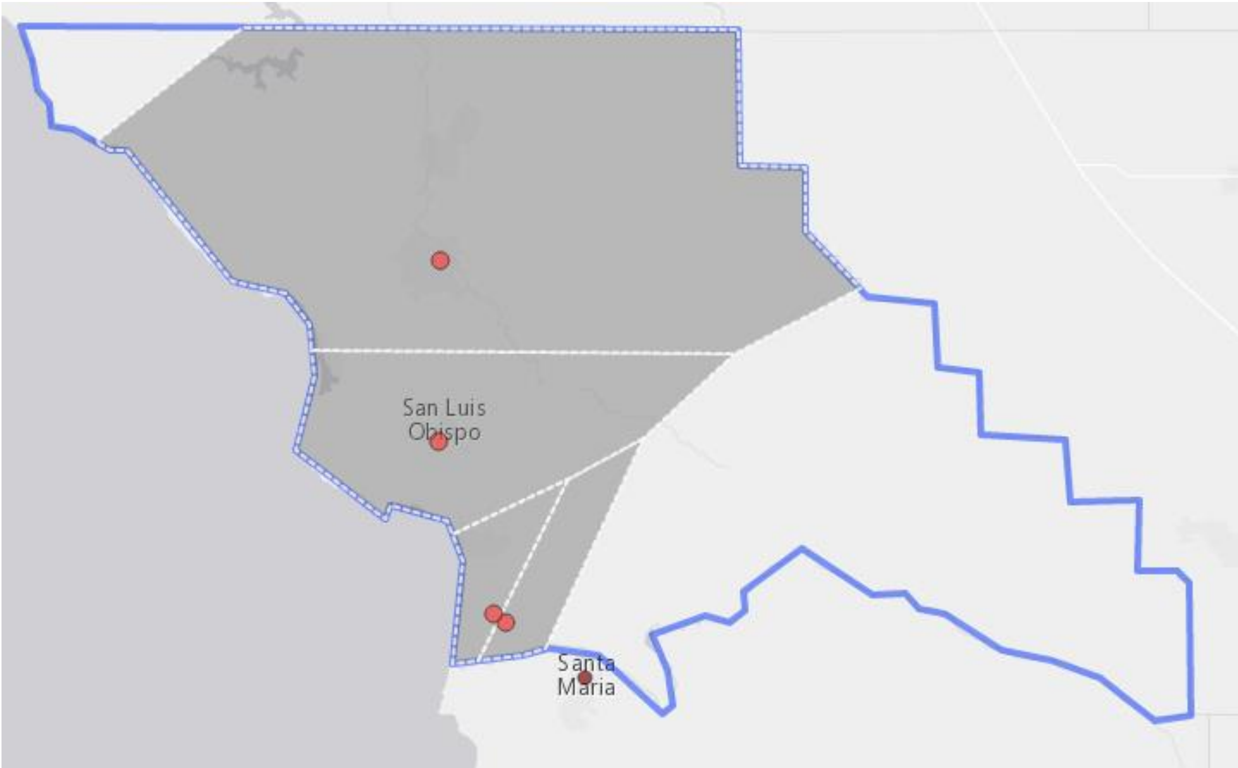
Figure 12: Air Quality Forecast Zones



Monitor	Total Population	White	Black	Native American	Asian	Pacific Islander	Other Race	Multiple Races	Male	Female	Area Km2	Spaital Scale of Monitor
Paso Robles	39088	79.5%	1.9%	1.2%	1.7%	0.2%	11.8%	3.7%	49.1%	50.9%	522	Urban
San Luis Obispo	74705	81.4%	4.4%	0.7%	4.9%	0.1%	4.6%	3.8%	56.0%	44.0%	293	Neighborhood
Morro Bay	31730	86.2%	0.5%	0.8%	3.6%	0.1%	5.7%	3.1%	48.8%	51.2%	320	Regional
Nipomo Regional Park	62435	79.7%	0.9%	1.1%	3.0%	0.1%	10.8%	4.4%	49.2%	50.8%	283	Regional
Atascadero	37962	87.1%	1.7%	1.1%	2.1%	0.2%	4.3%	3.5%	50.1%	49.9%	278	Neighborhood
Red Hills	10043	84.5%	0.9%	1.0%	0.8%	0.1%	9.2%	3.5%	50.0%	50.0%	431	Regional
Carrizo Plains	6550	87.8%	0.5%	1.3%	1.7%	0.1%	5.0%	3.6%	49.9%	50.1%	760	Regional

Monitor	Age <14	Age 15-24	Age 25-49	Age 50-64	Age 65-74	Age >75
Paso Robles	21.3%	13.3%	32.7%	19.1%	7.1%	6.6%
San Luis Obispo	9.2%	34.3%	28.1%	16.4%	5.8%	6.2%
Morro Bay	13.3%	10.7%	27.6%	26.7%	10.8%	10.9%
Nipomo Regional Park	18.3%	12.2%	30.2%	22.6%	9.0%	7.8%
Atascadero	18.0%	12.3%	32.4%	23.8%	7.2%	6.4%
Red Hills	18.7%	12.3%	30.1%	25.7%	8.2%	5.0%
Carrizo Plains	16.0%	11.9%	29.1%	28.3%	8.3%	6.4%

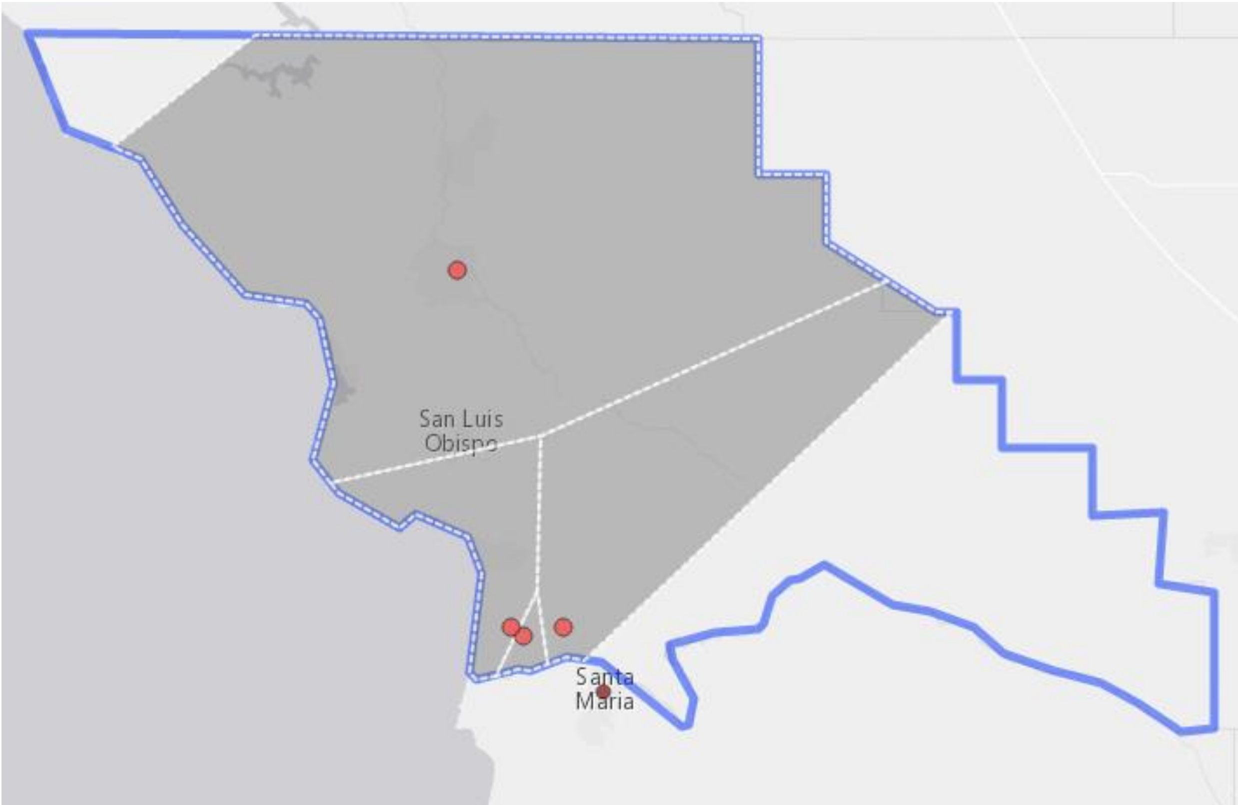
Figure 13: Area Served Plot and Demographic Data for Ozone Monitors in San Luis Obispo County



Monitor	Total Population	White	Black	Native American	Asian	Pacific Islander	Other Race	Multiple Races	Male	Female	Area Km2	Spaital Scale of Monitor
Mesa2	24672	77.6%	1.0%	1.1%	2.7%	0.2%	13.2%	4.3%	49.4%	50.6%	94	Neghborhood
San Luis Obispo	87759	82.8%	3.8%	0.6%	5.0%	0.1%	4.1%	3.5%	54.9%	45.1%	418	Neghborhood
CDF	38583	79.3%	1.0%	1.2%	3.4%	0.1%	10.3%	4.8%	48.8%	51.2%	74	Neghborhood
Atascadero	99812	83.6%	1.5%	1.1%	1.9%	0.2%	8.2%	3.5%	49.6%	50.4%	1512	Neghborhood

Monitor	Age <14	Age 15-24	Age 25-49	Age 50-64	Age 65-7	Age >75
Mesa2	19.2%	12.4%	29.4%	22.5%	9.6%	7.0%
San Luis Obispo	9.5%	30.7%	27.5%	18.3%	6.7%	7.3%
CDF	17.9%	12.4%	32.1%	21.6%	7.9%	8.1%
Atascadero	18.7%	12.4%	31.6%	22.5%	7.8%	6.9%

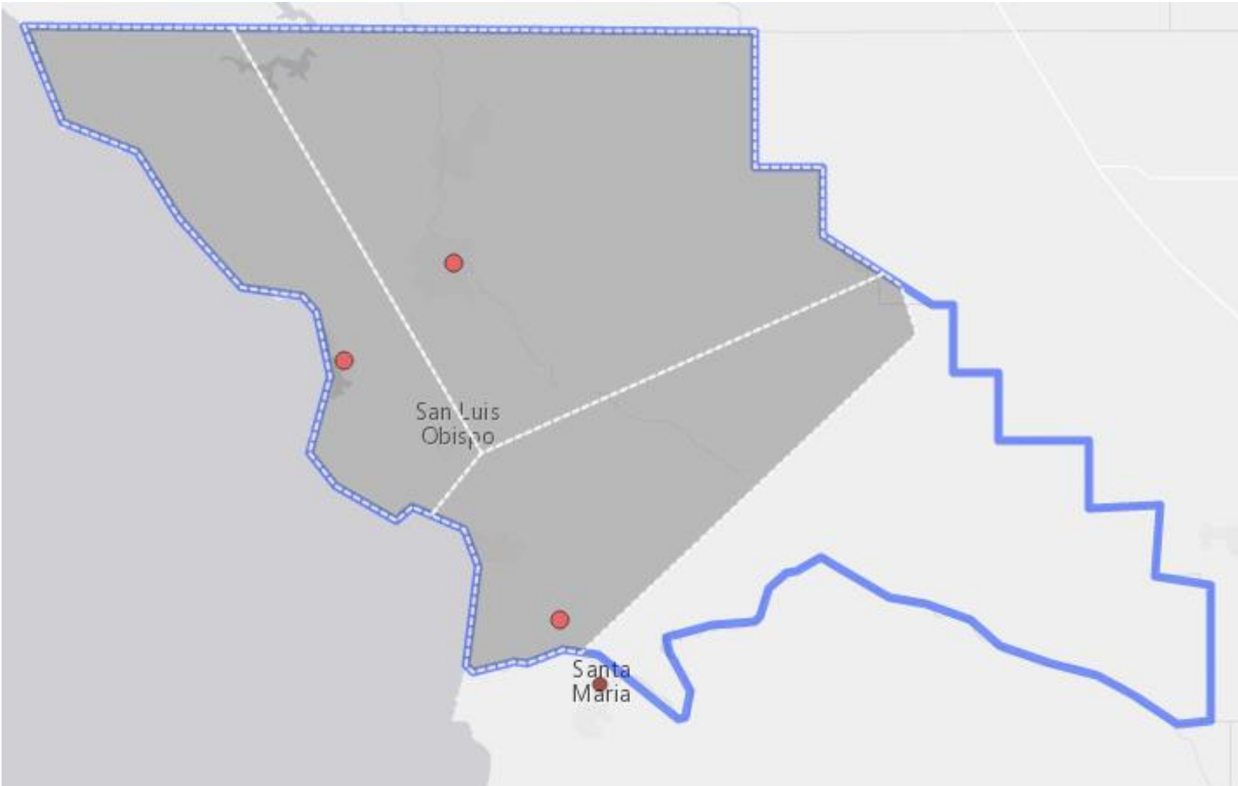
Figure 14: Area Served Plot and Demographic Data for $PM_{2.5}$ Monitors in San Luis Obispo County



Monitor	Total Population	White	Black	Native American	Asian	Pacific Islander	Other Race	Multiple Races	Male	Female	Area Km2	Spaital Scale of Monitor
Mesa2	8954	84.9%	0.9%	0.9%	3.0%	0.1%	6.6%	3.7%	49.4%	50.6%	16	Neghborhood
CDF	53945	82.2%	1.0%	1.0%	3.4%	0.1%	8.1%	4.2%	49.2%	50.8%	161	Neghborhood
Nipomo R. Park	20855	77.6%	0.9%	1.2%	2.4%	0.2%	13.5%	4.3%	49.6%	50.4%	504	Regional
Atascadero	175997	82.8%	2.7%	0.9%	3.3%	0.1%	6.6%	3.6%	52.1%	47.9%	1706	Neghborhood

Monitor	Age <14	Age 15-24	Age 25-49	Age 50-64	Age 65-74	Age >75
Mesa2	14.7%	9.4%	24.7%	27.7%	14.5%	8.9%
CDF	16.6%	12.9%	30.4%	22.8%	8.7%	8.6%
Nipomo R.	20.6%	13.2%	30.5%	21.8%	7.7%	6.2%
Atascadero	14.4%	21.3%	29.8%	20.3%	7.2%	7.0%

Figure 15: Area Served Plot and Demographic Data for PM_{10} Monitors in San Luis Obispo County



Monitor	Total Population	White	Black	Native American	Asian	Pacific Islander	Other Race	Multiple Races	Male	Female	Area Km2	Spaital Scale of Monitor
Morro Bay	74595	83.0%	4.1%	0.8%	3.7%	0.1%	5.1%	3.2%	54.4%	45.6%	585	Neghborhood
Nipomo R. Park	77679	80.7%	0.9%	1.1%	3.1%	0.1%	9.8%	4.3%	49.4%	50.6%	623	Regional
Atascadero	107477	83.1%	1.6%	1.0%	3.0%	0.2%	7.4%	3.8%	50.4%	49.6%	1286	Neghborhood

Monitor	Age <14	Age 15-24	Age 25-49	Age 50-64	Age 65-74	Age >75
Morro Bay	10.7%	18.6%	30.8%	22.4%	8.6%	8.8%
Nipomo R. Park	17.7%	12.6%	30.2%	22.7%	8.9%	7.9%
Atascadero	16.9%	22.6%	28.8%	19.2%	6.5%	5.9%

Figure 16: Area Served Plot and Demographic Data for NO_2 Monitors in San Luis Obispo County

5.0 SITUATIONAL ANALYSIS

This section examines the network taking into account research, policy and resource needs.

5.1 Risk of Future NAAQS Exceedances

The exceedance probability surface maps presented above (Figures 8-11) show that eastern San Luis Obispo County is most at risk for exceeding the current NAAQS standard for ozone; this result agrees with historical monitoring data. The $PM_{2.5}$ map also suggests that there is significant risk for exceeding the $PM_{2.5}$ 24-hr standard in this region, while predicting only a low exceedance probability for the Nipomo Mesa, a prediction that is contrary to the historical data.

Eastern San Luis Obispo County is sparsely populated, but the District operates two monitoring stations in this region to study the transport of pollutants from outside of the County. Back trajectory analysis of recent exceedances of the ozone NAAQS has demonstrated that ozone-laden air enters this part of the County from the San Joaquin Valley to the east. This is the only region of the County where ozone concentrations routinely exceed Federal standards. $PM_{2.5}$ has never been measured in this region, but it is possible that under transport conditions some parts of this area could experience exceedances of the $PM_{2.5}$ NAAQS standard.

On the Nipomo Mesa the State PM_{10} standard is exceeded frequently during blowing dust events, and the Federal PM_{10} standard is exceeded occasionally. The Nipomo Mesa is downwind of a significant source of wind-blown particulate in the ODSVRA. The District is currently working with the California Department of Parks and Recreation to find ways to mitigate emissions from the ODSVRA. During blowing dust events there is a significant amount of particulates in the $PM_{2.5}$ fraction, and during the most extreme events, $PM_{2.5}$ concentrations approach and occasionally exceed the 24-hour NAAQS standard at CDF and Mesa2. Additionally, the CDF annual $PM_{2.5}$ average for the period 2013-2015 may exceed the annual NAAQS standard. Until this source can be mitigated, the District maintains three monitoring locations at CDF, NRP and MESA2 that all measure particulate emissions. Wildfires and stagnant conditions can result in elevated $PM_{2.5}$ levels at all monitors in the County, though only rarely do such conditions result in exceedances of the NAAQS.

5.2 Criteria Allowing Reduction of Monitors

Requests to the EPA Regional Administrator to allow shut-down of criteria pollutant monitors are considered on a case by case basis, however 40CFR58.14(c)(1) provides guidance on what conditions would likely result in approval for shut-down of a criteria pollutant monitor. These conditions are described in the referenced CFR below:

40 CFR 58.14(c)(1):
Any $PM_{2.5}$, O_3, CO, PM_{10}, SO_2, Pb, or NO_2 SLAMS monitor which has shown attainment during the previous five years, that has a probability of less than 10 percent of exceeding 80 percent of the applicable NAAQS during the next three years based on the levels, trends, and variability observed in the past, and which is not specifically required by an attainment plan or maintenance plan. In a non-attainment or maintenance area, if the most recent attainment or maintenance plan adopted by the State and approved by EPA contains a contingency measure to be triggered by an air quality concentration and the monitor to be discontinued is the only SLAMS monitor operating in the non-attainment or maintenance area, the monitor may not be discontinued.

Statistical tests to determine what monitors in San Luis Obispo County have a probability of less than 10% of exceeding 80% of NAAQS were calculated and presented below in Table 7. Based on the results of the statistical tests, the following monitors would likely not be approved for shut-down by the EPA Regional Administrator due to failing to meet the requirements in 40CFR58.14(c)(1).

Ozone Monitors Not Meeting 40CFR58.14(c)(1)

1. Nipomo Regional Park
2. Atascadero
3. Paso Robles
4. Red Hills
5. Carrizo Plains

PM_{10} Monitors Not Meeting 40CFR58.14(c)(1)

1. CDF
2. Mesa2

PM_{10} Monitors with Insufficient Data to Shut Down

1. San Luis Obispo
2. Paso Robles

$PM_{2.5}$ Monitors Not Meeting 40CFR58.14(c)(1)

1. CDF
2. Mesa2

Table 7 – Calculations of 90% Confidence of Not Measuring > 80% of NAAQS

24-HOUR PM10 NAAQS

Site	Year 1 Max (ug/m3) 2010	Year 2 Max (ug/m3) 2011	Year 3 Max (ug/m3) 2012	Year 4 Max (ug/m3) 2013	Year 5 Max (ug/m3) 2014	90% Upper CI (ug/m3)	80% NAAQS (ug/m3)	Test
CDF	167	134	180	163	165	*177.9*	120	*FAIL*
Mesa2	139	119	146	132	150	*148.9*	120	*FAIL*
Nipomo Regional Park	40	62	75	107	93	*100.3*	120	*PASS*
Atascadero	35	75	62	59	69	*74.6*	120	*PASS*
San Luis Obispo	33	21		70	41	*65.8*	120	*Insufficient data*
Paso Robles				87	79	*108.2*	120	*Insufficient data*

Red Value Indicates Year Did Not Meet Completeness Requirement

Blue Value Indicates 1 in 6 Sampling

ANNUAL PM2.5 NAAQS

Site	Year 1 Design Value (ug/m3) 2010	Year 2 Design Value (ug/m3) 2011	Year 3 Design Value (ug/m3) 2012	Year 4 Design Value (ug/m3) 2013	Year 5 Design Value (ug/m3) 2014	90% Upper CI (ug/m3)	80% NAAQS (ug/m3)	Test
CDF	10	12	9.6	12.5	12.8	*12.8*	9.6	*FAIL*
Mesa2	8.2	8.3	8.1	9.7	10.2	*9.8*	9.6	*FAIL*
Atascadero	6.3	7.5	6	7.5	5.8	*7.4*	9.6	PASS
San Luis Obispo	5.5	6.7	6.2	6.8	6	*6.7*	9.6	PASS

24-Hour PM2.5 NAAQS

Site	Year 1 Design Value (ug/m3) 2010	Year 2 Design Value (ug/m3) 2011	Year 3 Design Value (ug/m3) 2012	Year 4 Design Value (ug/m3) 2013	Year 5 Design Value (ug/m3) 2014	90% Upper CI (ug/m3)	80% NAAQS (ug/m3)	Test
CDF	23.9	30.2	30	30.6	30	*31.6*	28	*FAIL*
Mesa2	22.4	20.8	24.6	24.8	21.3	*24.5*	28	PASS
Atascadero	16	22.2	15.7	23.2	20.2	*22.8*	28	PASS
San Luis Obispo	10.7	14.1	13.6	13.2	13.1	*14.2*	28	PASS

8-Hour Ozone NAAQS

Site	Year 1 Design Value (ppb) 2010	Year 2 Design Value (ppb) 2011	Year 3 Design Value (ppb) 2012	Year 4 Design Value (ppb) 2013	Year 5 Design Value (ppb) 2014	90% Upper CI (ppb)	80% NAAQS (ppb)	Test
Nipomo Regional Park	67	58	53	56	66	*65.9*	60	*FAIL*
Morrow Bay	53	47	49	50	60	*56.6*	60	PASS
San Luis Obispo	57	55	51	50	62	*59.6*	60	PASS
Atascadero	63	62	65	61	63	*64.2*	60	*FAIL*
Paso Robles	69	63	66	61	58	*67.5*	60	*FAIL*
Red Hills	83	75	81	75	73	*81.5*	60	*FAIL*
Carrizo Plains	77	77	75	67	68	*77.5*	60	*FAIL*

1-Hour SO2 NAAQS

Site	Year 1 Design Value (ppb) 2010	Year 2 Design Value (ppb) 2011	Year 3 Design Value (ppb) 2012	Year 4 Design Value (ppb) 2013	Year 5 Design Value (ppb) 2014	90% Upper CI (ppb)	80% NAAQS (ppb)	Test
Mesa2	4	4	5	53	4	*34.8*	60	PASS

1-Hour NO2 NAAQS

Site	Year 1 Design Value (ppb) 2010	Year 2 Design Value (ppb) 2011	Year 3 Design Value (ppb) 2012	Year 4 Design Value (ppb) 2013	Year 5 Design Value (ppb) 2014	90% Upper CI (ppb)	80% NAAQS (ppb)	Test
Nipomo Regional Park	26	28	26	30	25	*28.9*	80	PASS
Morrow Bay	28	32	35	31	31	*33.8*	80	PASS
Atascadero	36	37	40	37	41	*40.3*	80	PASS

5.3 Demographic Shifts

San Luis Obispo County is experiencing population growth, with most of this growth occurring in two areas: Paso Robles/Templeton and the Nipomo Mesa. Both of these fast-growing areas have an adequate complement of monitors for ozone, PM_{10} and $PM_{2.5}$, which are the pollutants of greatest concern. With a County population of 270,000 in 2010, population growth over the next 10 years would far exceed all reasonable estimates before the current network would no longer meet Federal minimum monitoring requirements. For example, per 40 CFR 58 Appendix D, a near-road NO_2 monitor would not be required until County population reached 500,000; additional PM_{10} monitors would not be required until population exceeded 1 million.

5.4 Scientific Research and Public Health

The Atascadero monitoring station has historical importance as a research site. The station has hosted a variety of special instrumentation and has played a important role in epidemiological and other studies.

The particulate monitoring network on the Nipomo Mesa has been expanded in recent years to address the public health risk from particulate emissions upwind at the ODSVRA. The network may be modified to meet the needs of air quality surveillance as we move forward with mitigating impacts from the State Park. Special monitoring studies have been performed in the area to better understand the relationship between natural impacts of wind-blown dust and impacts of off-road vehicle use as well as a study to map the plume of emissions from the dunes to better understand the level of impact on the downwind communities.

5.5 Other Circumstances

The San Luis Obispo and Paso Robles monitoring stations are operated by ARB. Although they are included in this assessment, they are not under the District's authority and may not be readily modified by the results of this analysis. We expect that ARB is performing its own network assessment which will address the technical aspects related to its stations. Also note that the CDF monitoring station is being used by the California Department of Parks and Recreation to fulfill some of their requirements under local rule 1001, and because of this the District receives funding from them to operate this station. Likewise, operation of the Mesa2 station is funded in part by the Santa Maria Refinery.

6.0 DISCUSSION AND CONCLUSIONS

The 2015 Annual Network Plan for San Luis Obispo County demonstrates that the air monitoring network in the County meets the minimum monitoring requirements specified in Federal regulations (40 CFR 58). The various analyses performed in this Network Assessment indicate that all monitors add value to the network and are necessary to adequately characterize air quality in the County. Furthermore, the network is anticipated to remain adequate as County population increases. As such, no network modifications are proposed at this time.

Nonetheless if Federal regulations, local priorities, emission sources, and/or District resources change significantly, network modifications may become necessary. For example, while the analysis of the probability of exceeding the NAAQS has its limitations, it does reveal a significant probability of exceeding the 24-hr $PM_{2.5}$ standard in eastern San Luis Obispo County. Therefore, should resources become available, adding a $PM_{2.5}$ monitor to an existing east County site would be desirable.

Not captured in any of these analyses, is monitoring intended for emergency response and public information in the event of an accident at Philips 66's Santa Maria Refinery. Particulates are already monitored at two nearby stations (CDF and Mesa2) and sulfur dioxide at one (Mesa2), but in the event of a catastrophic release, additional real-time monitoring of pollutants would be invaluable. Sulfur dioxide monitors could be installed at the CDF and NRP stations. Similarly, hydrogen sulfide monitoring could be considered for the residential area near the Price Canyon Oilfield.[3] Odor complaints are already common in this area; with oil production increasing and proposals for new housing developments nearby, the potential for exposure to hydrogen sulfide is increasing.

Wind-blown dust from the ODSVRA remains among the largest air pollution challenges in the County. As discussed in the 2015 Annual Network Plan, the available evidence suggests that the CDF monitor is optimally sited to characterize maximum ambient particulate levels downwind of the ODSVRA. Newly installed particulate matter mitigations (or mitigations installed in the future) could change this. For example, it is possible that the mitigations could selectively reduce particulate levels at CDF to such a degree that other areas would then experience higher particulate levels. This would necessitate establishing a new monitor in the new area of greatest impact.

It would also be valuable to establish a particulate monitor *within* the most emissive part of ODSVRA to determine PM_{10} exposure experienced by park visitors. While such a monitor would likely not be considered NAAQS comparable, it would nonetheless be important for public information and it would support research on emissions from the ODSVRA. Establishing such a monitor would of course require close cooperation with the California Department of Parks and Recreation.

Additional particulate monitors along the coast north of the ODSVRA might also be beneficial. PM_{10} monitors in Los Osos and/or Morro Bay would be useful for comparing emissions from other dune systems to those from the ODSVRA. $PM_{2.5}$ monitors in Morro Bay, Cayucos, and/or Cambria would be useful for evaluating wood smoke impacts from residential wood burning and the transport of smoke from wildfires.

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[3] An on-site H_2S is scheduled to begin operation later this year.

The analyses described above are also useful for prioritizing monitors to preserve in the event that changing priorities or funding levels necessitate shutting down some monitors that are currently active. For example, only one NO_2 monitor is required for the County. Atascadero measures the highest NO_2 levels and concentrations there rarely approach even 50% of the 24-hr NAAQS. Therefore, the Morro Bay and NRP monitors would be better candidates for removal, if the need were to arise. Similarly, the Grover Beach station only monitors meteorology and has no required monitors, so this would be a good candidate for removal.

The analyses described above show the $PM_{2.5}$ monitor in San Luis Obispo currently measures the lowest concentrations in the County and has the lowest probability of exceeding the NAAQS. This monitor, however, is located in the most populated city in the County, so it serves vital public information goals. Finally, the only ozone monitors that qualify for shutdown under 40 CFR 58.14(c)(1) are those in Morro Bay and San Luis Obispo.[4] These have a low probability of exceeding the ozone NAAQS, even if it is revised to 65 ppb. The Morro Bay monitor, however, is extremely useful for monitoring long term trends. In addition, the air quality forecast zones associated with these monitors serve large portions of the County population beyond the boundaries of both cities (Fig. 12).

As identified above, a number of enhancements to the existing monitoring network could be implemented to provide increased area coverage and additional data for priority pollutants in specific areas. Sufficient funding and staffing resources, however, are not available to install and maintain such enhancements, and the current network meets the minimum requirements to adequately characterize community and regional air quality countywide. Thus, the potential enhancements cited above are not proposed for implementation.

[4] Ozone levels are trending downward, but the ozone NAAQS is also likely to be revised downward, thus it is unlikely any additional sites would qualify for shutdown under 40 CFR 58.14(c)(1) in the foreseeable future.

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

July 1, 2015

Prepared by the

Santa Barbara County

Air Pollution Control District

Network Assessment of the Santa Barbara 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 (SBCAPCD) 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.

3. Support for air pollution research studies.

A variety of sites with different purposes are utilized to meet these goals. Typical site types are listed below:

a) Sites located to determine the highest concentrations expected to occur in the area covered by the network.
b) Sites located to measure typical concentrations in areas of high population density.
c) Sites located to determine the impact of significant sources or source categories on air quality.
d) Sites located to determine general background concentration levels.
e) Sites located to determine the extent of regional pollutant transport among populated areas; and in support of secondary standards.
f) Sites 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 sites are needed or existing sites can be terminated and whether new technologies are appropriate for incorporation into the ambient air monitoring network. The current SBCAPCD 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 2015 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 predominate land features of the county which 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. Rain storms 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 airflow 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 dies, and as air adjacent to the surface cools, it descends down the coastal mountain and mountain valleys resulting in light land breezes (from land to sea). This land/sea breeze cycle combined with local topography greatly influence 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 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 Pt. Conception to east-west south of Pt. Conception can cause counter-clockwise circulations (eddies) to form east of the Point. These eddies fluctuate from time-to-time and place-to-place often leading to highly variable winds along the southern coastal strip. Point Conception also marks the change in the prevailing surface winds from northwesterly north of Pt. Conception to southwesterly south of Pt. Conception.

Another type of wind regime that influences air quality in Santa Barbara is the "Santa Ana" wind condition. Santa Ana winds are dry northeasterly winds that occur primarily during the fall and winter months. These are warm, dry winds which descend down the slopes of a mountain range. Wind speeds associated with Santa Ana are generally 15-20 mph, though they can reach speeds in excess of 60 mph. During Santa Ana conditions, pollutants emitted in Santa Barbara, Ventura County, and the South Coast Air Basin (the Los Angeles region) are moved out to sea. These pollutants can then be moved 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 high ozone 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) which cap the pollutants that are emitted 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 North County where the prevailing winds are strong and persistent.

2.3 Santa Barbara County Population Distribution

The 2014 population of Santa Barbara County is estimated to be 440,668 according to the U. S. Census. This is a 3.9 percent increase from the year 2010 Census count of 423,895. The distribution of population by race and age (from 2010 census) is presented in Table 2-1 below.

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

Santa Barbara County Population Distribution by Race						
White	Black	Native American	Asian	Pacific Islander	Other Race	Multiple Races
69.6%	2.0%	1.3%	4.9%	0.2%	17.4%	4.6%

Santa Barbara County Population Distribution by Age					
Age <14	Age 15-24	Age 25-54	Age 55-64	Age 65-74	Age >75
18.9%	19.5%	37.7%	10.8%	6.6%	6.5%

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. Most of the forecasted growth in the next five years is predicted to occur in the north county: Buellton and Santa Maria. The Goleta valley area of the south coast is also predicted to see significant population growth.

3.0 Air Monitoring Network

The SBCAPCD and the California Air Resources Board (CARB) began monitoring air quality within the populated urban areas of Santa Barbara County in the early to mid-1970, as required under the 1970 federal Clean Air Act. Between the mid-1970 and the mid-1980, the number and location of monitoring stations did not change. No new large industrial sources of air pollution were permitted in the county during this period.

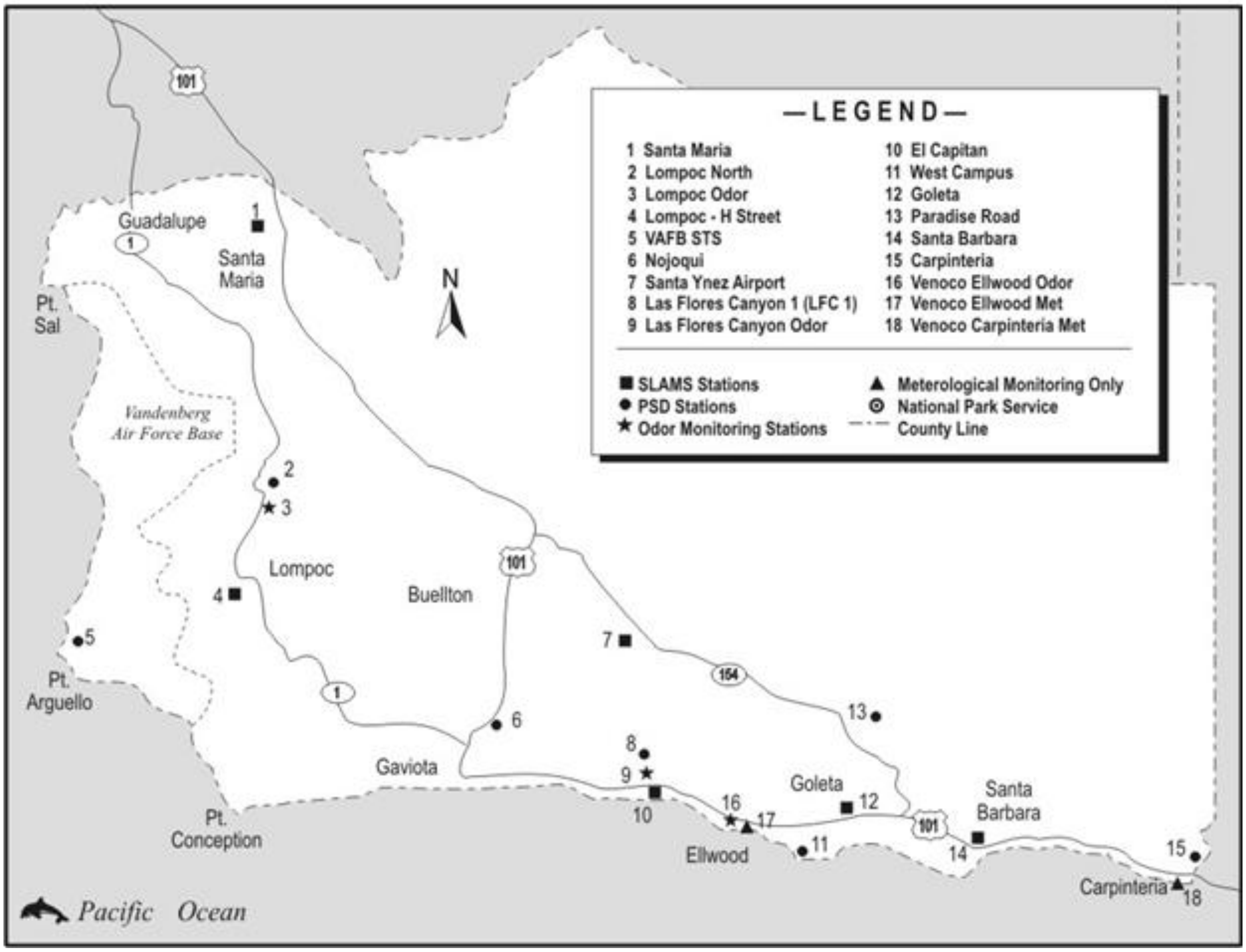
A number of changes occurred in the early to mid-1980 which resulted in an expansion of the monitoring network. First, Santa Barbara County adopted its New Source Review/Prevention of Significant Deterioration Rule, as required by the federal Clean Air Act Amendments of 1977, Part D. This rule guides all aspects of the SBCAPCD's air quality permitting program and includes federal requirements for air monitoring.

At the same time, a number of oil companies requested development permits from the County and the SBCAPCD 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 is used to determine baseline conditions and to provide input to computer models used to estimate air quality impacts. After construction, air monitoring is 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 requirements is to protect public health and welfare.

The next change came in the early 1990s when these major facilities were at peak operational capacity and reducing operations. The sites operating under the PSD program were evaluated and a number of them were allowed to shut down because there was enough data to characterize the emissions around the facilities.

Currently, there are 18 ambient air quality monitoring stations in operation within Santa Barbara County (Figure 3-1). The network consists of state and local air monitoring stations (SLAMS) and special purpose monitors (SPM). The sites are operated by the SBCAPCD, CARB or private contractors. The SPMs can be subdivided into PSD monitors (source specific monitors and regional air quality monitors), research, and safety monitors

Figure 3-1 – 2015 Map of Monitoring Network



The SLAMS sites were set up to monitor air quality in populated urban areas. The PSD stations monitor local impacts of specific industrial facilities. Regional PSD stations were also established to monitor cumulative impacts of large facilities on regional air quality in the county. A particular 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 located in areas of complex topography with complex meteorological conditions, for example, in separate canyons along the coast between Goleta and Gaviota, limiting the ability of a single station to represent multiple facilities.

3.1 SLAMS Sites

There are six SLAMS monitoring stations in operation within Santa Barbara County. They are located in Santa Barbara, Goleta, Lompoc, Santa Maria, El Capitan State Park, and at the Santa Ynez Airport. The CARB operates the downtown Santa Barbara and Santa Maria stations, while the SBCAPCD is responsible for the operation of the remaining sites. These sites have been operating in these areas since the late 70’s or early 80’s which have provided long term air quality trend data.

3.2 PSD Monitoring Sites

There are seven PSD sites which are set up to measure maximum pollutant concentrations, regional air quality, background levels or transport emissions. All of these sites are required to be operated by various permit to operate conditions.

The Paradise Road site is located downwind of the populated areas of northern Santa Barbara County. It is sited to measure the maximum ozone levels of the county. Las Flores Canyon site 1 (LFC1) is located in the foothills on the south side of the Santa Ynez Mountains and records maximum ozone levels in the southern section of the county.

Two sites were setup to measure the impacts from transport. Carpinteria is located in the southeastern portion of the county which measures transported pollutants from the Los Angeles basin. Nojoqui is located at the top of the Gaviota pass and is designed to measure the transport of pollutants between northern and southern portions of the county.

LFC1, Lompoc HS&P, and VAFB are three which serve dual purposes. They are sited downwind of major facilities to measure the impacts of those facilities on the local environment. However, ozone is also measured at these sites as part of the regional ozone monitoring network.

The West Campus site is set up to measure the impacts from oil storage tanks and barge loading/unloading activities. The data from this site is also used by UCSB researchers for various studies.

3.3 Odor Sites

There are three sites set up to measure odorous compounds which could potentially be emitted from certain oil and gas facilities. These sites typically measure hydrogen sulfide, and total reduced sulfur, wind and temperature. These three sites are LFC Odor, Ellwood Odor, and Lompoc Odor. These sites are required by permit to operate conditions for these facilities.

3.4 Meteorological Sites

Two sites are set up specifically for monitoring meteorological conditions. These two sites are Venoco Ellwood Met and Venoco Carpinteria Met. These sites measure wind speed, wind direction and temperature. The data from these sites are used to characterize where emissions from these facilities will be dispersed.

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: ozone, nitrogen dioxide, sulfur dioxide, carbon monoxide, particulate less than 10 microns and particulate less than 2.5 microns. The SBCAPCD monitors these pollutants at a number of locations to determine if we meet the 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/direction and temperature are also measured at each site to help characterize the source of the measured pollutants. This report is only evaluating the pollutants measured for comparison with the NAAQS.

4.1 Ozone Monitors

Ozone is monitored at twelve locations in the county. Santa Barbara, Goleta, Lompoc H Street, Santa Maria, Santa Ynez are located in the major populated areas of the county for population exposure. Paradise Road, LFC1, Lompoc HS&P, Nojoqui, Carpinteria, VAFBSTS and El Capitan were sited as part of a regional network. Carpinteria, Paradise Road and LFC1 have consistently measured the highest concentrations of ozone in the county. Paradise Road is north of the Santa Ynez mountain range and represents air in the north county while LFC1 and Carpinteria are south of the Santa Ynez mountain range and is representative of the foothill region of the south county.

4.1.1 Analysis of Ozone Measurements

Summary statistics were compiled for these sites and summarized in Table 4-1. The fourth highest eight hour ozone value was determined for each year from 2012 through 2014. These fourth highest values were averaged for each site and compared with the NAAQS standard of 0.075 ppm. The sites were ranked based on the percent of the standard.

Table 4-1
Ozone Summary

AQS #	STREET_ADDRESS	2012 4th Max ppm	2013 4th Max ppm	2014 4th Max ppm	3 year Average ppm	% of Std 0.075 ppm	Rank
06-083-1021	Carpinteria	0.063	0.065	0.076	0.068	91%	1
06-083-1025	Las Flores Canyon #1	0.07	0.059	0.07	0.066	88%	2
06-083-1014	Paradise Road	0.067	0.065	0.065	0.065	87%	3
06-083-4003	VAFB STS	0.058	0.058	0.069	0.061	81%	4
06-083-2011	Goleta	0.051	0.059	0.069	0.059	79%	5
06-083-3001	Santa Ynez Airport	0.056	0.057	0.063	0.058	77%	6
06-083-0011	Santa Barbara	0.054	0.055	0.066	0.058	77%	7
06-083-0008	El Capitan	0.054	0.057	0.065	0.058	77%	8
06-083-1018	Nojoqui	0.056	0.056	0.064	0.058	77%	9
06-083-1013	Lompoc HS&P	0.053	0.054	0.063	0.056	75%	10
06-083-2004	Lompoc H Street	0.053	0.054	0.063	0.056	75%	11
06-083-1008	Santa Maria	0.049	0.048	0.058	0.051	68%	12

There were no sites that exceeded the standard for the 2012-2014 period examined. The Carpinteria monitor was the highest with 91% of the current ozone standard. Overall, four stations were within 20% of the current ozone standard.

The EPA has announced a plan to revise the current ozone NAAQS in October 2015 with the new standard that is expected to be in a range of 0.070 ppm to 0.065 ppm. If it is lowered to 0.065 ppm, there would be up to three sites at 100 percent of the standard or above.

4.1.2 Correlation Analysis of Ozone Measurements

Correlation analysis compares the measurements from nearby sites to determine if concentrations correlate temporally. Figure 4-1 below presents a graphic representation of the correlation between ozone sites in Santa Barbara County and two sites in adjacent counties. The two sites from adjacent counties are Nipomo Regional Park (06-079-4002) in southern San Luis Obispo County, and Maricopa School (06-029-0008) in southwestern Kern County. These two sites are included in this analysis due to their close proximity to Santa Barbara County.

Monitor pairs with Pearson correlation values near one (strait line) are highly correlated, while monitor pairs with Pearson correlation values near zero (circle) 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 yellow color) measure similar ozone concentrations, while monitors with high average relative differences (red to blue color) measure significantly different ozone concentrations.

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

The site pairs with high correlation and low average difference and therefore potentially redundant are:

El Capitan/Nipomo R. P. (SLO County)
Lompoc H Street/Nipomo R. P. (SLO County)
Vandenberg STS/Nipomo R. P. (SLO County)
Vandenberg STS/Lompoc HSP
Santa Ynez/Nojoqui

The Maricopa monitor in southwest Kern County shows low correlation and relatively high average difference, indicating that the measurements at Maricopa are distinctly different than any ozone measurements in Santa Barbara County.

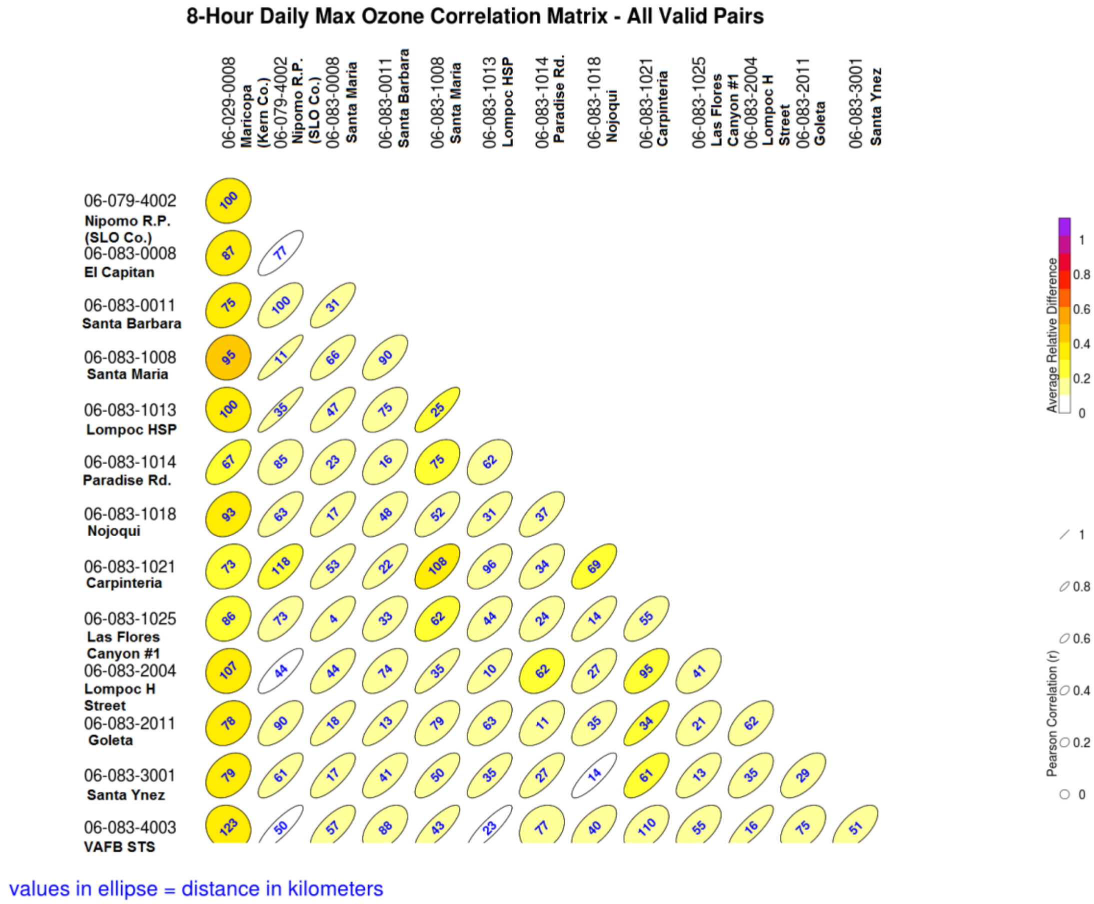


Figure 4-1 Ozone Correlation Analysis

4.1.3 Ozone Exceedance Probabilities Analysis

A significant goal of the network assessment is to determine if new sites are needed. In order to make that decision, it is helpful to have some 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 ozone 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.

This map is intended to be used as a spatial comparison and not for probability estimates for a single geographic point or area. The probability estimates displayed on the map alone should not be used to justify a new monitor. The maps should be used in conjunction with existing monitoring data. This information, along with demographic and emissions data, could be used in a weight of evidence approach for proposing new monitor locations. Figure 4-2 plots the probability of exceeding the current 8 hour ozone standard of 75ppb. This analysis shows low probability of exceeding the current ozone standard in the western coastal region of Santa Barbara County, with moderate probability on the southern coastal and interior regions of Santa Barbara County. This analysis methodology has limited capabilities to correctly predict measured concentrations as it does not distinguish the higher concentrations measured at LFC#1 from significantly lower measurements at El Capitan and the higher concentrations at Carpinteria from the Santa Barbara site.

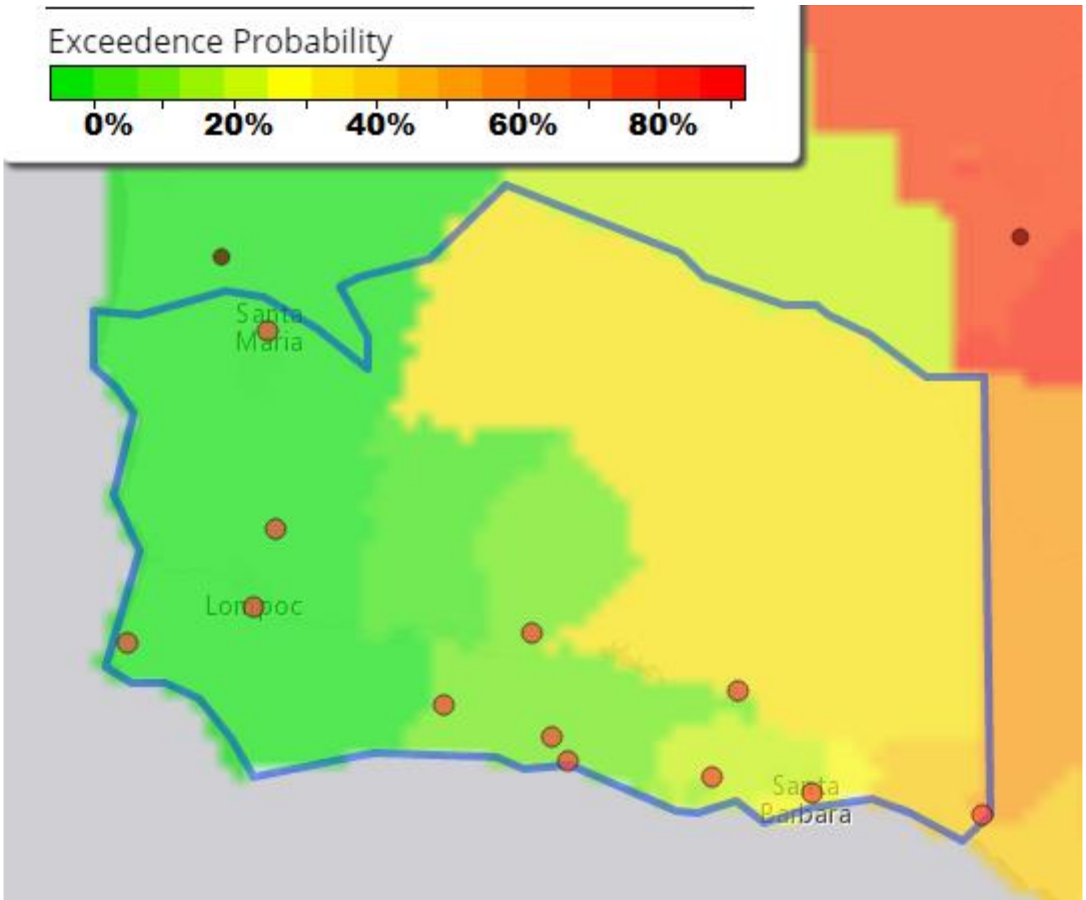


Figure 4-2 Surface Probability Plot for Exceeding the Existing Ozone Standard of 75ppb

EPA announced in November 2014 plans to lower the ozone standard from the current 75ppb level to between 65ppb and 70ppb, also with an 8 hour averaging period by October 2015. For comparison, Figure 4-3 plots the probability of exceeding a standard set at 65ppb for an 8 hour average. This analysis confirms the ozone measurement analysis finding that multiple sites will likely exceed a new standard set at 65 ppb. These exceeding sites will be located along the southern coast and interior of Santa Barbara County.

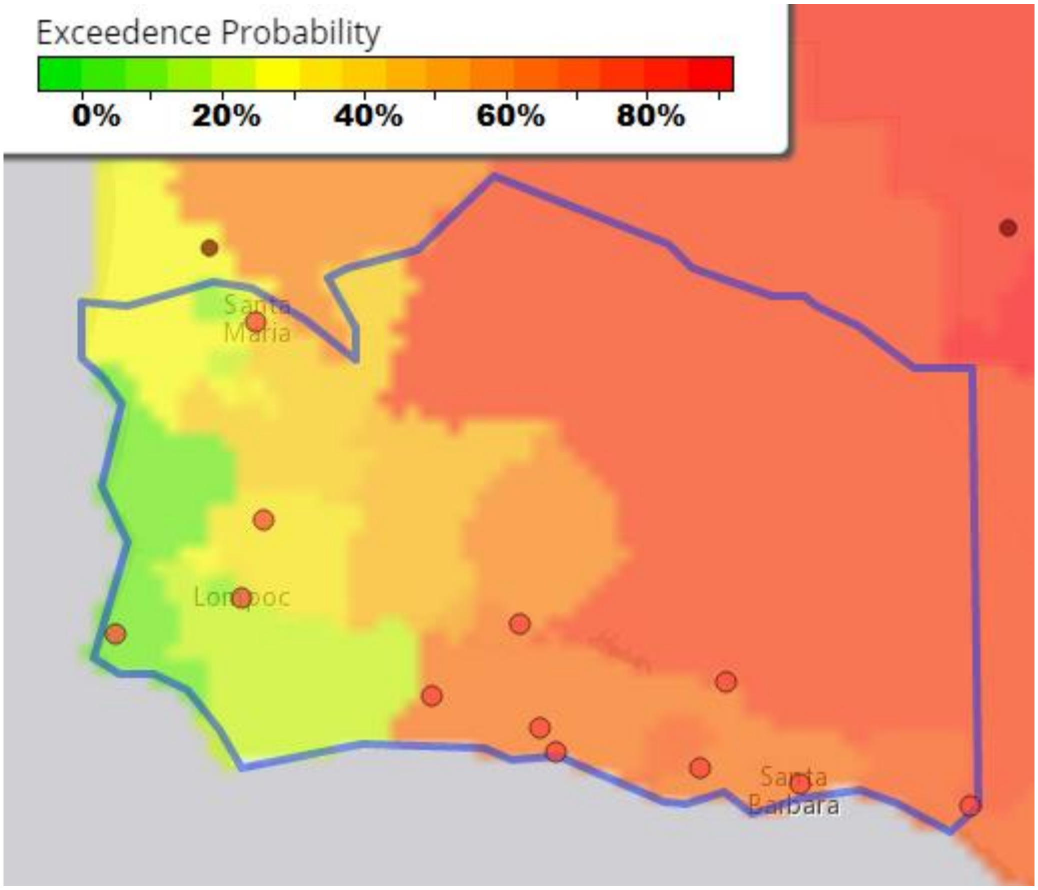
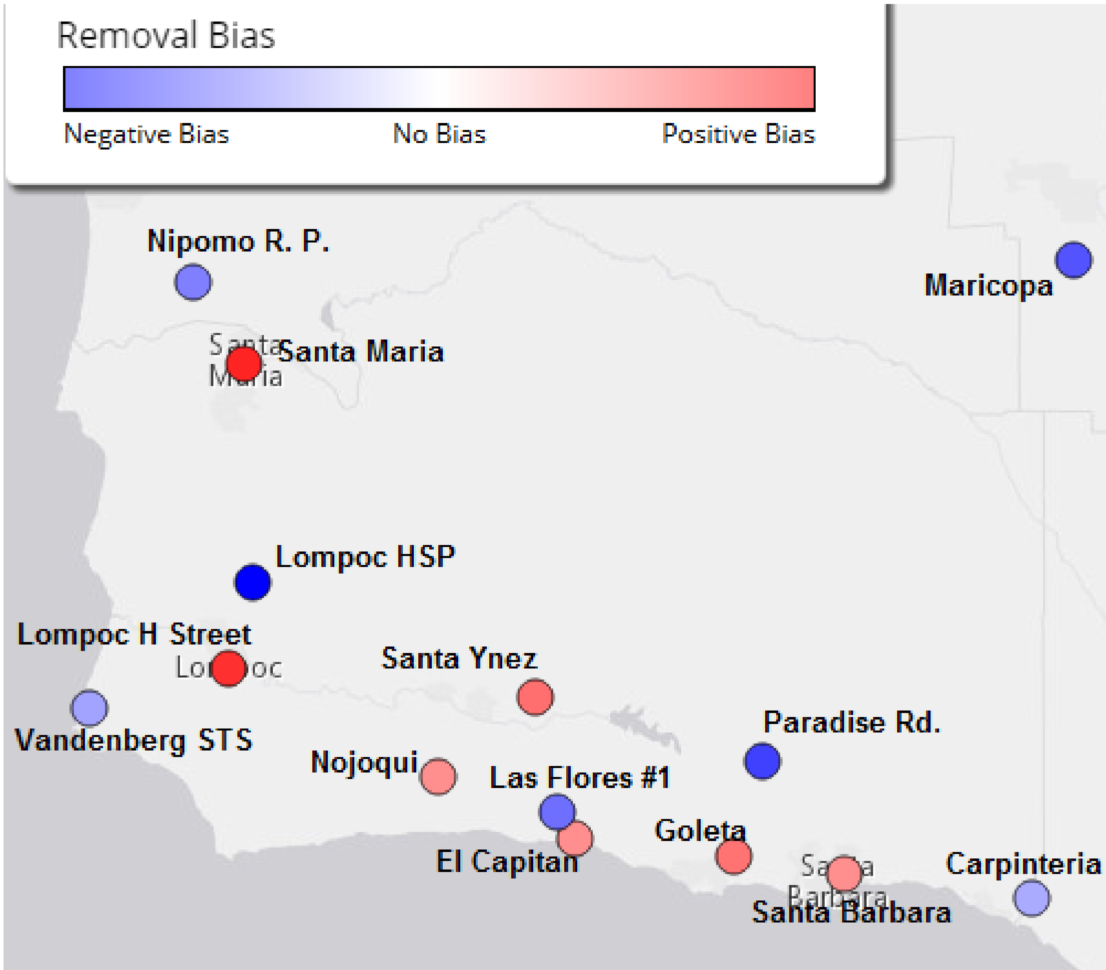


Figure 4-3 Surface Probability Plot for Exceeding an Ozone Standard of 65ppb

4.1.4 Ozone Removal Bias Analysis

The removal bias analysis is a tool used in determining possible redundant sites. The bias estimation uses the nearest neighbors to each site to estimate the concentration at the location of the site if the site had never existed. This is done using the Voronoi Neighborhood Averaging algorithm with inverse distance squared weighting. The squared distance allows for higher weighting on concentrations at sites located closer to the site being examined. The bias was calculated for each day at each site by taking the difference between the predicted value from the interpolation and the measured concentration. A positive average bias would mean that if the site being examined was removed, the neighboring sites 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 site is smaller than the actual measured concentration. A site with no bias, indicates that the estimated concentration at the location of the site matches the actual measured concentration. Sites with little to no bias are sites where removal could be considered. However, the analysis results indicate that using estimates from nearby sites in lieu of any existing site would introduce significant bias.



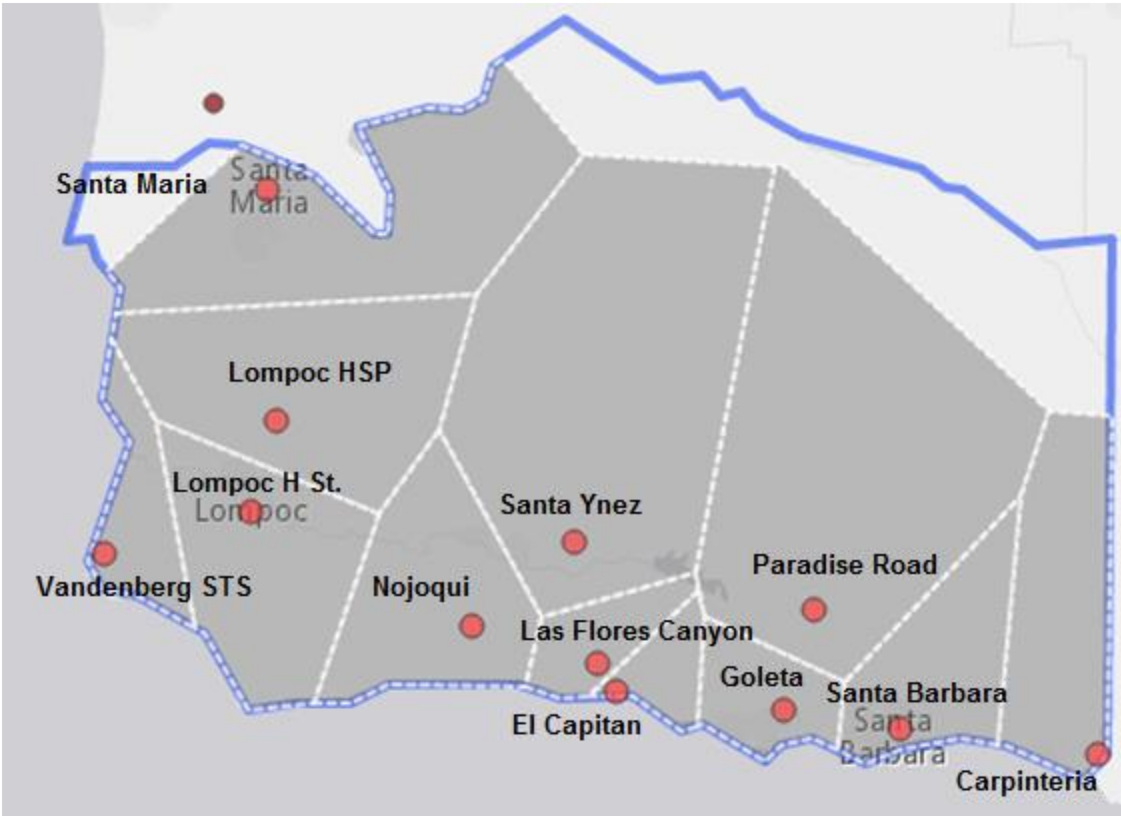
Site	Neighbors Included	Mean Relative Removal Bias (%)	Min Relative Removal Bias (%)	Max Relative Removal Bias (%)
Maricopa	8	-7	-45	51
Nipomo R. P.	4	-9	-43	25
El Capitan	7	8	-29	97
Santa Barbara	4	10	-20	156
Santa Maria	5	18	-7	98
Lompoc HSP	5	-15	-56	8
Paradise Rd.	8	-10	-50	45
Nojoqui	6	9	-36	71
Carpinteria	5	-4	-44	71
Las Flores Canyon #1	4	-8	-48	41
Lompoc H Street	3	16	-10	211
Goleta	4	12	-29	126
Santa Ynez	6	12	-28	181
Vandenberg STS	13	-5	-46	43

Figure 4-4 Removal Bias Analysis

4.1.5 Ozone Area Served Analysis

This analysis uses a spatial analysis technique known as Voronoi or Thiessen polygons to approximate the area served by a monitoring site. The shape and size of each polygon is dependent on the proximity of the nearest neighboring air monitor to a particular site. This technique provides an easy way to understand the general area and demographics represented by a particular monitoring site. 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 helpful in ensuring that a monitor is not removed that serves a historically underserved segment of the population or an area with a high proportion of sensitive population such as children and the elderly.

Figures 4-5, represent the results of this analysis for ozone. Overall, most sites racial and gender proportions mirror the overall county demographics (See table 2-1). The Lompoc H Street and Santa Maria sites serve a slightly higher proportion of "Other" (mostly Hispanic) and the Lompoc H Street site 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 serve a higher proportion of elderly than county wide age distribution.



Monitor	Total Population	White	Black	Native American	Asian	Pacific Islander	Other Race	Multiple Races	Male	Female	Area Km2	Spatial Scale of Monitor
El Capitan	Demographic Data Unavailable										89	Regional
Santa Barbara	96059	77.0%	1.4%	1.0%	3.2%	0.1%	13.5%	3.7%	49.4%	50.6%	296	Urban
Santa Maria	132726	62.2%	1.6%	1.7%	4.7%	0.2%	24.7%	4.9%	50.2%	49.8%	703	Urban
Lompoc HSP	11541	76.6%	3.4%	1.3%	4.7%	0.6%	8.1%	5.2%	49.6%	50.4%	606	Regional
Paradise Road	4441	88.4%	0.3%	0.7%	3.2%	0.1%	4.8%	2.6%	50.1%	49.9%	1228	Regional
Nojoqui	Demographic Data Unavailable										404	Regional
Carpinteria	17718	75.8%	0.7%	0.9%	2.4%	0.1%	16.4%	3.6%	49.2%	50.8%	389	Regional
Las Flores Canyon#1	8369	83.5%	0.4%	3.1%	2.2%	0.1%	7.3%	3.5%	50.9%	49.1%	128	Regional
Lompoc H Street	46201	62.1%	5.9%	1.7%	3.8%	0.5%	20.0%	6.1%	53.5%	46.5%	436	Neighborhood
Goleta	78588	70.8%	1.8%	0.8%	9.4%	0.1%	12.4%	4.7%	49.7%	50.3%	158	Urban
Santa Ynez	16800	84.3%	0.7%	1.0%	2.0%	0.1%	8.7%	3.1%	49.1%	50.9%	1227	Urban
Vandenberg STS	Demographic Data Unavailable										163	Regional

Monitor	Age <14	Age 15-24	Age 25-49	Age 50-64	Age 65-74	Age >75
El Capitan	Demographic Data Unavailable					
Santa Barbara	15.1%	15.1%	34.6%	19.9%	7.3%	7.9%
Santa Maria	24.7%	16.4%	33.1%	14.6%	5.4%	5.9%
Lompoc HSP	18.7%	12.8%	29.7%	20.7%	8.9%	9.1%
Paradise Road	17.1%	10.1%	26.3%	25.7%	10.7%	10.1%
Nojoqui	Demographic Data Unavailable					
Carpinteria	16.5%	13.1%	31.9%	23.2%	8.1%	7.2%
Las Flores Canyon#1	16.2%	12.9%	28.9%	25.4%	9.6%	7.0%
Lompoc H Street	22.6%	15.5%	36.8%	15.7%	5.0%	4.4%
Goleta	12.4%	35.6%	25.7%	14.3%	5.6%	6.3%
Santa Ynez	17.8%	13.0%	29.4%	23.4%	8.8%	7.7%
Vandenberg STS	Demographic Data Unavailable					

Figure 4-5 Ozone Area Served Analysis

4.2 Nitrogen Dioxide Monitors

Nitrogen Dioxide (NO2) is monitored at 11 locations in the county, every site that measures ozone except Santa Ynez. NO2 is sited in conjunction with the ozone monitors to characterize the precursors to ozone.

In February of 2010, a new 1 hour NAAQS was set at 100 ppb for NO2. The form of the standard is based on the three year average of the 98th percentile of the daily maximum 1-hour average.

4.2.1 Analysis of Nitrogen Dioxide Measurements

Table 4-2 shows the summary of the county's NO2 concentrations from 2012 – 2014 compared with this new standard. No sites in the county exceed the standard. Santa Barbara, Santa Maria and Goleta measure the highest concentrations. They are located in urban areas and are influenced by exhaust from automobile traffic.

Table 4-2
Nitrogen Dioxide Summary

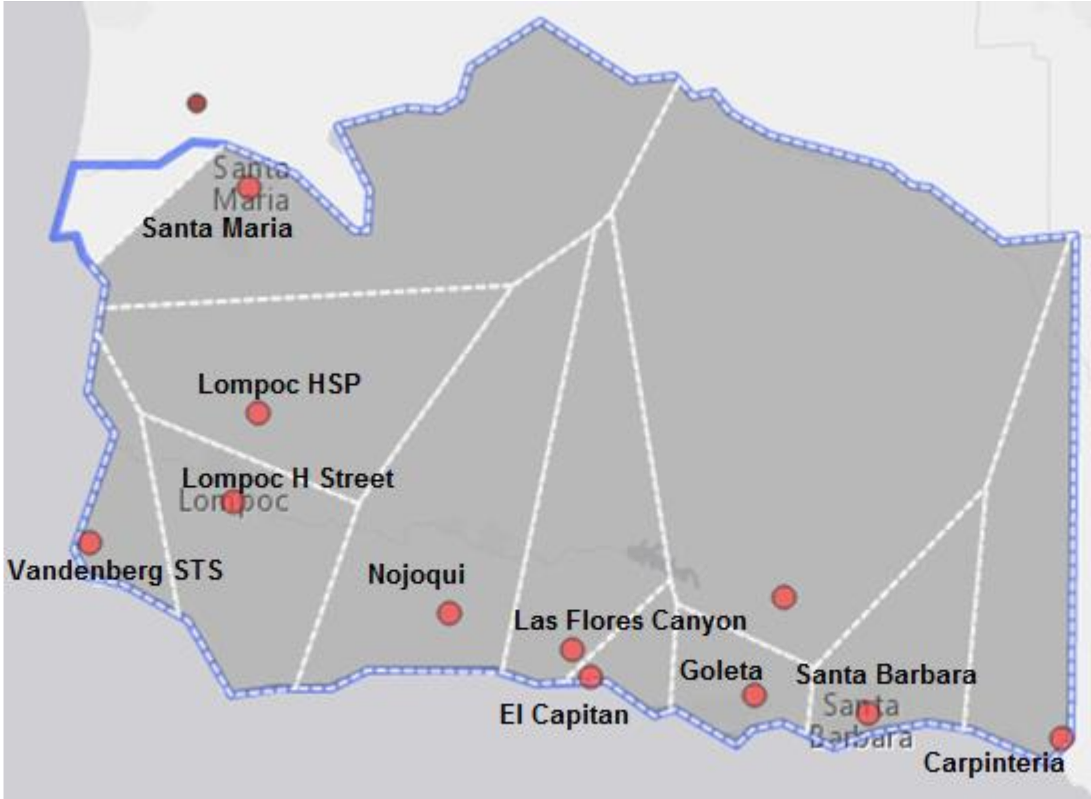
AQS #	STREET_ADDRESS	2012 98th ppb	2013 98th ppb	2014 98th ppb	3 Yr Avg 98th ppb	% of Std 100 %	Rank
06-083-0011	Santa Barbara	43	42	43	43	43%	1
06-083-1008	Santa Maria	33.4	37	34	35	35%	2
06-083-2011	Goleta	32	32	33	32	32%	3
06-083-2004	Lompoc H Street	26	26	23	25	25%	4
06-083-0008	El Capitan	23	21	25	23	23%	5
06-083-1018	Nojoqui	18	19	22	20	20%	6
06-083-1021	Carpinteria	12	12	18	14	14%	7
06-083-1025	Las Flores Canyon #1	15	13	11	13	13%	8
06-083-1013	Lompoc HS&P	8	10	8	9	9%	9
06-083-4003	VAFB STS	4	5	8	6	6%	10
06-083-1014	Paradise Road	5	4	6	5	5%	11

Lompoc H Street is the 4th highest followed by El Capitan and Nojoqui. El Capitan is located south of the 101 freeway and train track. Lompoc H Street is located in an urban area and Nojoqui is located near the 101 freeway at the top of a grade separating the North and South County. LFC1, Lompoc HS&P, VAFB STS and Paradise Road are located in rural settings which are sited as part of permit required regional network.

4.2.2 Nitrogen Dioxide Area Served Analysis

This analysis uses a spatial analysis technique known as Voronoi or Thiessen polygons to approximate the area served by a monitoring site. The shape and size of each polygon is dependent on the proximity of the nearest neighboring air monitor to a particular site. This technique provides an easy way to understand the general area and demographics represented by a particular monitoring site, 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 helpful in ensuring that a monitor is not removed that serves a historically underserved segment of the population or an area with a high proportion of sensitive population such as children and the elderly.

Figures 4-6, represent the results of this analysis for nitrogen dioxide. Because the nitrogen dioxide network of monitors is almost exactly the same as the ozone network, the area served analysis shows the same pattern. With the Lompoc H Street and Santa Maria sites serving a slightly higher proportion of "Other" (mostly Hispanic) and the Lompoc H Street site serving 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 and Las Flores Canyon #1 serve a higher proportion of elderly than county wide age distribution.



Monitor	Total Population	White	Black	Native American	Asian	Pacific Islander	Other Race	Multiple Races	Male	Female	Area Km2	Spaital Scale of Monitor
El Capitan	Demographic Data Unavailable										89	Regional
Santa Barbara	96059	77.0%	1.4%	1.0%	3.2%	0.1%	13.5%	3.7%	49.4%	50.6%	296	Neighborhood
Santa Maria	132726	62.2%	1.6%	1.7%	4.7%	0.2%	24.7%	4.9%	50.2%	49.8%	1019	Urban
Lompoc HSP	11541	76.6%	3.4%	1.3%	4.7%	0.6%	8.1%	5.2%	49.6%	50.4%	653	Neighborhood
Paradise Road	4441	88.4%	0.3%	0.7%	3.2%	0.1%	4.8%	2.6%	50.1%	49.9%	2030	Regional
Nojoqui	13569	83.0%	0.7%	1.2%	1.9%	0.1%	9.8%	3.3%	48.9%	51.1%	750	Regional
Carpinteria	17718	75.8%	0.7%	0.9%	2.4%	0.1%	16.4%	3.6%	49.2%	50.8%	458	Regional
Las Flores Canyon#1	11600	85.2%	0.5%	2.4%	2.3%	0.1%	6.4%	3.1%	50.6%	49.4%	491	Neighborhood
Lompoc H Street	46201	62.1%	5.9%	1.7%	3.8%	0.5%	20.0%	6.1%	53.5%	46.5%	436	Neighborhood
Goleta	78588	70.8%	1.8%	0.8%	9.4%	0.1%	12.4%	4.7%	49.7%	50.3%	158	Urban
Vandenberg STS	Demographic Data Unavailable										163	Neighborhood

Monitor	Age <14	Age 15-24	Age 25-49	Age 50-64	Age 65-74	Age >75
El Capitan	Demographic Data Unavailable					
Santa Barbara	15.1%	15.1%	34.6%	19.9%	7.3%	7.9%
Santa Maria	24.7%	16.4%	33.1%	14.6%	5.4%	5.9%
Lompoc HSP	18.7%	12.8%	29.7%	20.7%	8.9%	9.1%
Paradise Road	17.1%	10.1%	26.3%	25.7%	10.7%	10.1%
Nojoqui	18.7%	12.3%	30.7%	22.4%	8.2%	7.7%
Carpinteria	16.5%	13.1%	31.9%	23.2%	8.1%	7.2%
Las Flores Canyon#1	15.6%	13.6%	27.6%	26.0%	10.1%	7.1%
Lompoc H Street	22.6%	15.5%	36.8%	15.7%	5.0%	4.4%
Goleta	12.4%	35.6%	25.7%	14.3%	5.6%	6.3%
Vandenberg STS	Demographic Data Unavailable					

Figure 4-6 NO2 Area Served Analysis

4.3 Sulfur Dioxide Monitors

Sulfur Dioxide (SO2) is measured at six locations in the county. Lompoc H is located in an urban area (but nearby a potential sulfur dioxide source) while the other five sites are located in more rural settings which are installed as part of permit conditions for major oil and gas sources.

In June 2010, EPA established a new 1-hour NAAQS standard of 75 ppb for SO2. The standard is in the form of the 3-year average of the 99^{th} percentile of the annual distribution of daily maximum 1-hour average concentrations.

SBCAPCD is not impacted by the SO2 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 Sulfur Dioxide Measurements

Table 4-3 compares the county concentrations from 2012 – 2014 with this new standard. All of the sites are below the standard. All of the sites are located in areas near potential SO2 sources.

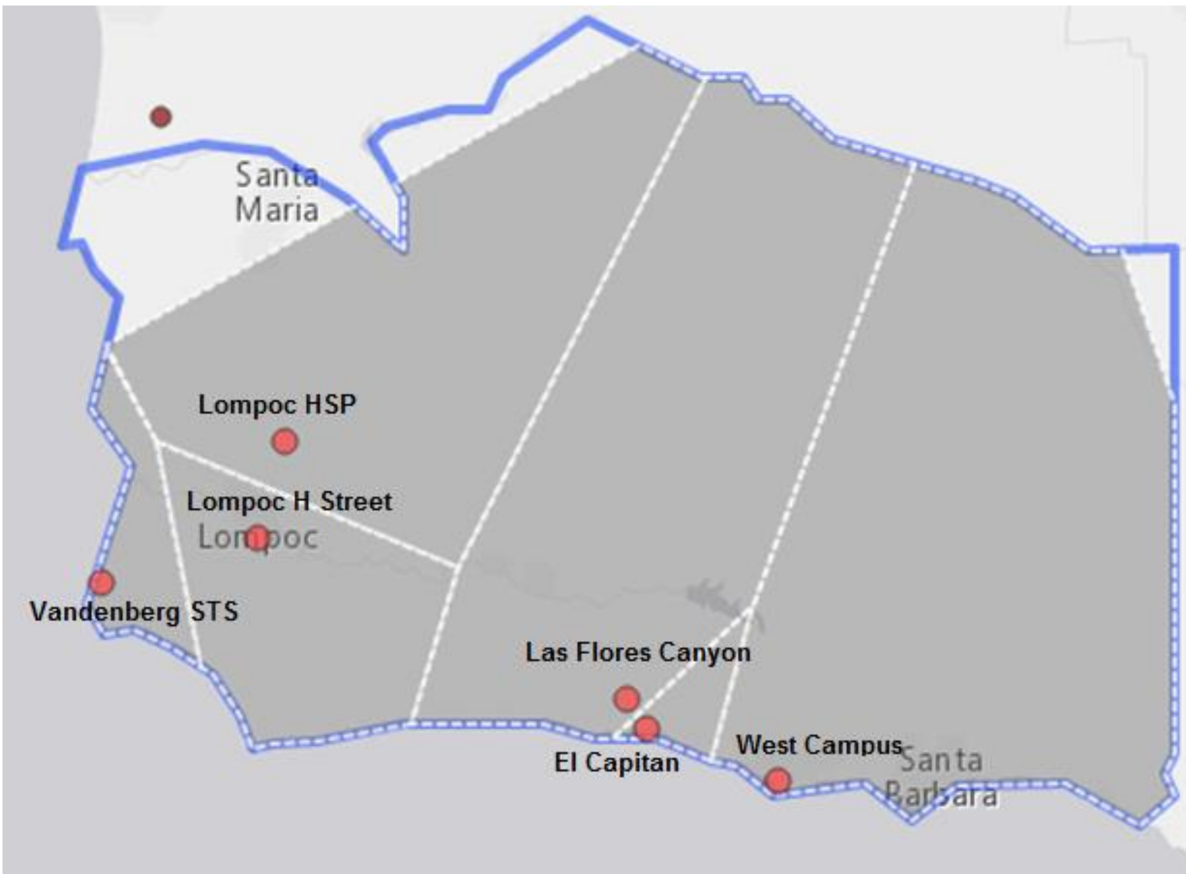
Table 4-3
Sulfur Dioxide Summary

AQS #	**STREET_ADDRESS**	**2012 99th ppb**	**2013 99th ppb**	**2014 99th ppb**	**3 Yr Avg ppb**	**% ofStd 75 %**	Rank
06-083-1025	Las Flores Canyon #1	63	7	5	25	33%	1
06-083-2004	Lompoc H Street	3	4	3	3	4%	2
06-083-1020	West Campus	2	2	4	3	4%	3
06-083-4003	VAFB STS	4	3	2	3	4%	4
06-083-0008	El Capitan	2	2	1	2	3%	5
06-083-1013	Lompoc HS&P	2	2	2	2	3%	6

4.3.2 Sulfur Dioxide Area Served Analysis

This analysis uses a spatial analysis technique known as Voronoi or Thiessen polygons to approximate the area served by a monitoring site. The shape and size of each polygon is dependent on the proximity of the nearest neighboring air monitor to a particular site. This technique provides an easy way to understand the general area and demographics represented by a particular monitoring site, 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 helpful in ensuring that a monitor is not removed that serves a historically underserved segment of the population or an area with a high proportion of sensitive population such as children and the elderly.

Figures 4-7, represent the results of this analysis for sulfur dioxide. The analyses shows that Lompoc H Street serves a slightly higher proportion of “other” and black residents than the overall racial demographics of the county. Additionally, Lompoc H Street serve a slightly higher percentage of children and Las Flores Canyon #1 serve a higher proportion of elderly than county wide age distribution.



Monitor	Total Population	White	Black	Native American	Asian	Pacific Islander	Other Race	Multiple Races	Male	Female	Area Km2	Spaital Scale of Monitor
El Capitan	Demographic Data Unavailable										80	Regional
Lompoc HSP	46978	80.7%	1.7%	1.2%	3.8%	0.3%	7.6%	4.6%	49.4%	50.6%	1456	Neighborhood
West Campus	200902	74.8%	1.5%	0.9%	5.6%	0.1%	12.9%	4.1%	49.5%	50.5%	2225	Neighborhood
Las Flores Canyon#1	17364	84.7%	0.6%	2.0%	2.0%	0.1%	7.8%	2.9%	49.8%	50.2%	1723	Neighborhood
Lompoc H Street	46201	62.1%	5.9%	1.7%	3.8%	0.5%	20.0%	6.1%	53.5%	46.5%	574	Neighborhood
Vandenberg STS	Demographic Data Unavailable										166	Neighborhood

Monitor	Age <14	Age 15-24	Age 25-49	Age 50-64	Age 65-74	Age >75
El Capitan	Demographic Data Unavailable					
Lompoc HSP	19.1%	13.3%	29.7%	21.3%	8.3%	8.3%
West Campus	14.2%	23.0%	30.7%	18.1%	6.8%	7.3%
Las Flores Canyon#1	15.9%	12.9%	27.9%	25.0%	10.0%	8.3%
Lompoc H Street	22.6%	15.5%	36.8%	15.7%	5.0%	4.4%
Vandenberg STS	Demographic Data Unavailable					

Figure 4-7 SO2 Area Served Analysis

4.4 Carbon Monoxide Monitors

Carbon Monoxide (CO) is measured at six locations in the county. Santa Barbara, Lompoc H Street, Santa Maria, and Goleta are located in the major urban areas in the county. LFC1 and VAFB STS are sited at part of permit conditions for major sources.

4.4.1 Analysis of Carbon Monoxide Measurements

Table 4-4 compares the county concentrations from 2012 – 2014 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 2012 – 2014. No site exceeds the standard with the highest reading being 6.6% of the standard at Santa Barbara.

Table 4-4
Carbon Monoxide Summary

		2012	2013	2014	3 Year Avg	% of Std	
		2nd Max	2nd Max	2nd Max	2nd Max	35	
AQS #	**STREET_ADDRESS**	**ppm**	**ppm**	**ppm**	**ppm**	**%**	**Rank**
06-083-0011	Santa Barbara	1.9	**2.5**	**2.5**	**2.30**	6.6%	1
06-083-1008	Santa Maria	1.9	**1.6**	**1.6**	**1.70**	4.9%	2
06-083-2004	Lompoc H Street	1.3	**1.4**	**1.9**	**1.53**	4.4%	3
06-083-2011	Goleta	1.2	**1**	**0.8**	**1.00**	2.9%	4
06-083-4003	VAFB STS	0.5	**0.9**	**1.5**	**0.97**	2.8%	5
06-083-1025	Las Flores Canyon #1	0.6	**0.5**	**0.5**	**0.53**	1.5%	6

4.4.2 Carbon Monoxide Area Served Analysis

This analysis uses a spatial analysis technique known as Voronoi or Thiessen polygons to approximate the area served by a monitoring site. The shape and size of each polygon is dependent on the proximity of the nearest neighboring air monitor to a particular site. This technique provides an easy way to understand the general area and demographics represented by a particular monitoring site, 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 helpful in ensuring that a monitor is not removed that serves a historically underserved segment of the population or an area with a high proportion of sensitive population such as children and the elderly.

Figures 4-8, represent the results of this analysis for carbon monoxide. The analyses shows that most sites represent the same racial proportions as the county, with the Lompoc H Street site serving a slightly higher proportion of "other". Additionally, Lompoc H Street and Santa Maria serve a slightly higher percentage of children and Las Flores Canyon #1 serve a higher proportion of elderly than county wide age distribution.

Monitor	Total Population	White	Black	Native American	Asian	Pacific Islander	Other Race	Multiple Races	Male	Female	Area Km2	Spaital Scale of Monitor
Santa Barbara	117873	77.0%	1.3%	1.0%	3.2%	0.1%	13.6%	3.7%	49.4%	50.6%	1548	Middle Scale
Santa Maria	140071	61.4%	1.6%	1.7%	4.7%	0.2%	25.5%	5.0%	50.2%	49.8%	1449	Middle Scale
Las Flores Canyon#1	17364	84.7%	0.6%	2.0%	2.0%	0.1%	7.8%	2.9%	49.8%	50.2%	1503	Neighborhood
Lompoc H Street	65547	67.1%	4.8%	1.6%	3.8%	0.4%	16.6%	5.6%	52.3%	47.7%	1049	Neighborhood
Goleta	83029	71.7%	1.8%	0.7%	9.1%	0.1%	11.9%	4.6%	49.7%	50.3%	964	Neighborhood
Vandenberg STS	Demographic Data Unavailable										182	Neighborhood

Monitor	Age <14	Age 15-24	Age 25-49	Age 50-64	Age 65-74	Age >75
Santa Barbara	15.3%	15.0%	34.1%	20.4%	7.4%	7.8%
Santa Maria	24.8%	16.4%	33.1%	14.5%	5.4%	5.8%
Las Flores Canyon#1	15.9%	12.9%	27.9%	25.0%	10.0%	8.3%
Lompoc H Street	21.6%	14.7%	35.0%	17.3%	5.9%	5.3%
Goleta	12.7%	34.3%	25.7%	14.9%	5.9%	6.5%
Vandenberg STS	Demographic Data Unavailable					

Figure 4-8 CO Area Served Analysis

4.5 Particulate (< 10 Microns)

Particulate less than 10 microns in diameter (PM10) is currently being measured in standard conditions at six locations in the county. The monitoring method at some of the sites was changed from a manual one in six day sampling method to continuous every day sampling during the period evaluated. Additionally, new continuous samplers at Santa Barbara and Santa Maria were initially configured to only produce data under local conditions, which do not allow comparisons to the Federal NAQQS PM10 standard that is based on standard conditions. These monitors at Santa Barbara and Santa Maria were later configured to also record data in standard conditions in mid-2013.

4.5.1 Analysis of PM10 Measurements

The standard for PM10 is based on the daily averages. The maximum daily concentration shall not exceed 150 ug/m3 more than once per year measured in standard conditions. Table 4-5 compares the PM10 data collected from 2012 – 2014 in the county. All sites are below the standard. Santa Maria is the highest where the concentrations are 46 percent of the standard.

Table 4-5
Particulate < 10 Microns Summary

AQS #	STREET_ADDRESS	2012 2nd Max ug/m3	2013 2nd Max ug/m3	2014 2nd Max ug/m3	3 Year Avg ug/m3	% of Std 150	Rank
06-083-1008	Santa Maria		68**	69	69	46%	1
06-083-0008	El Capitan	35*	51	91	59	39%	2
06-083-4003	VAFB STS	39*	55	65	53	35%	3

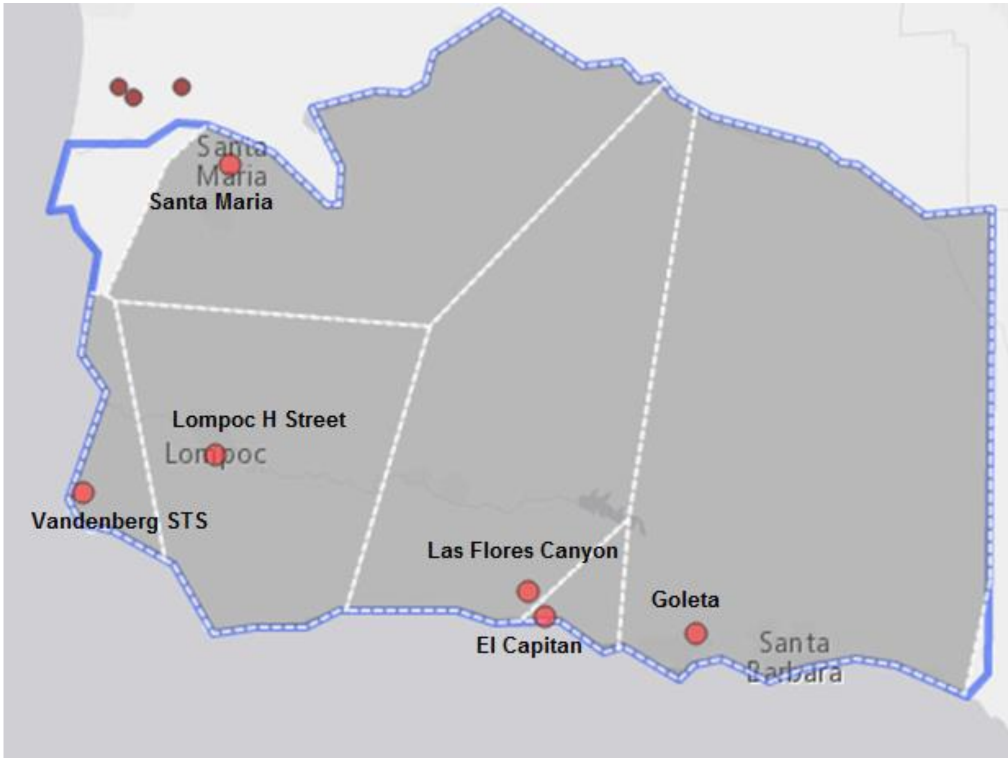
06-083-0011	Santa Barbara		52**	54	53	35%	4
06-083-2004	Lompoc H Street	50	48	59	52	35%	5
06-083-2011	Goleta	44	42	41	42	28%	6
06-083-1025	Las Flores Canyon #1	31*	45	43	40	26%	7

* Denotes one in six day sampling
** Denotes data completeness for the year was not met.

4.5.2 PM10 Area Served Analysis

This analysis uses a spatial analysis technique known as Voronoi or Thiessen polygons to approximate the area served by a monitoring site. The shape and size of each polygon is dependent on the proximity of the nearest neighboring air monitor to a particular site. This technique provides an easy way to understand the general area and demographics represented by a particular monitoring site, 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 helpful in ensuring that a monitor is not removed that serves a historically underserved segment of the population or an area with a high proportion of sensitive population such as children and the elderly.

Figures 4-9, represent the results of this analysis for PM10. The analyses shows that most sites represent the same racial proportions as the county, with the Santa Maria site serving a slightly higher proportion of “other”. Additionally, Lompoc H Street and Santa Maria serve a slightly higher percentage of children and Las Flores Canyon #1 serve a higher proportion of elderly than county wide age distribution.



Monitor	Total Population	White	Black	Native American	Asian	Pacific Islander	Other Race	Multiple Races	Male	Female	Area Km2	Spaital Scale of Monitor
El Capitan	Demographic Data Unavailable										93	Neighborhood
Santa Maria	132726	62.2%	1.6%	1.7%	4.7%	0.2%	24.7%	4.9%	50.2%	49.8%	1279	Neighborhood
Las Flores Canyon#1	17364	84.7%	0.6%	2.0%	2.0%	0.1%	7.8%	2.9%	49.8%	50.2%	1422	Neighborhood
Lompoc H Street	65547	67.1%	4.8%	1.6%	3.8%	0.4%	16.6%	5.6%	52.3%	47.7%	1049	Middle Scale
Goleta	200902	74.8%	1.5%	0.9%	5.6%	0.1%	12.9%	4.1%	49.5%	50.5%	2482	Neighborhood
Vandenberg STS	Demographic Data Unavailable										181	Neighborhood

Monitor	Age <14	Age 15-24	Age 25-49	Age 50-64	Age 65-74	Age >75
El Capitan	Demographic Data Unavailable					
Santa Maria	24.7%	16.4%	33.1%	14.6%	5.4%	5.9%
Las Flores Canyon#1	15.9%	12.9%	27.9%	25.0%	10.0%	8.3%
Lompoc H Street	21.6%	14.7%	35.0%	17.3%	5.9%	5.3%
Goleta	14.2%	23.0%	30.7%	18.1%	6.8%	7.3%
Vandenberg STS	Demographic Data Unavailable					

Figure 4-9 PM10 Area Served Analysis

4.6 Particulate (< 2.5 Microns)

Particulate less than 2.5 microns in diameter (PM2.5) is currently measured at four locations. All locations currently utilize continuous PM2.5 monitors. Prior to 2014 Goleta and Lompoc H Street PM2.5 monitors were both non-FEM monitors that could not be utilized for comparisons to the federal NAQQS PM2.5 standard. In 2014 the Lompoc H Street sampler was upgraded to a monitor with FEM status and in 2015 the Goleta sampler was upgraded to a monitor with FEM status. Santa Barbara County has requested from EPA these changes from non-FEM to FEM status.

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 ug/m3. Table 4-6 compares the concentrations from 2012 – 2014 to this standard. Santa Barbara is the highest site with 49 percent of the standard.

Table 4-6
Particulate < 2.5 Microns Summary

AQS #	STREET_ADDRESS	2012 98th ug/m3	2013 98th ug/m3	2014 98th ug/m3	3 YEAR AVG. 98% ug/m3	% of Std 35	Rank
06-083-0011	Santa Barbara	17.1	16	17.2	17	49%	1
06-083-1008	Santa Maria	16.8	15.9	15.2	16	46%	2
06-083-2004	Lompoc H Street			15.9	16	46%	3

4.6.2 Correlation Analysis of PM2.5 Measurements

Correlation analysis compares the measurements from nearby sites to determine if concentrations correlate temporally. Figure 4-10 below presents a graphic representation of the correlation between PM2.5 sites in Santa Barbara County and two sites in San Luis Obispo County. The two sites in San Luis Obispo County are Mesa2 (06-079-2004) and CDF (06-079-2007). Both of these sites are located to measure a significant source of windblown dust from the dunes upwind in Oceano. These two sites in San Luis Obispo County are included in this analysis due to their close proximity to Santa Barbara County.

Monitor pairs with Pearson correlation values near one (strait line) are highly correlated, while monitor pairs with Pearson correlation values near zero (circle) 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 yellow color) measure similar ozone concentrations, while monitors with high average relative differences (red to blue color) measure significantly different ozone concentrations.

Possible redundant sites would exhibit fairly high correlations consistently across all of their pairings and would have low average relative difference despite the distance. More unique sites would exhibit the opposite characteristics. They would not be very well correlated with other sites and their relative difference would be higher than other site to site pairs.

The Mesa2 and CDF sites in San Luis Obispo County show a high correlation with a relatively high average difference. This is not surprising as both monitors are sited to measure the same source of windblown dust. The other parings in this analysis show significant relative difference and a low degree of correlation. Note that the Lompoc H Street and Goleta monitors are not included in this analysis due to their recent addition to the PM2.5 FEM network.

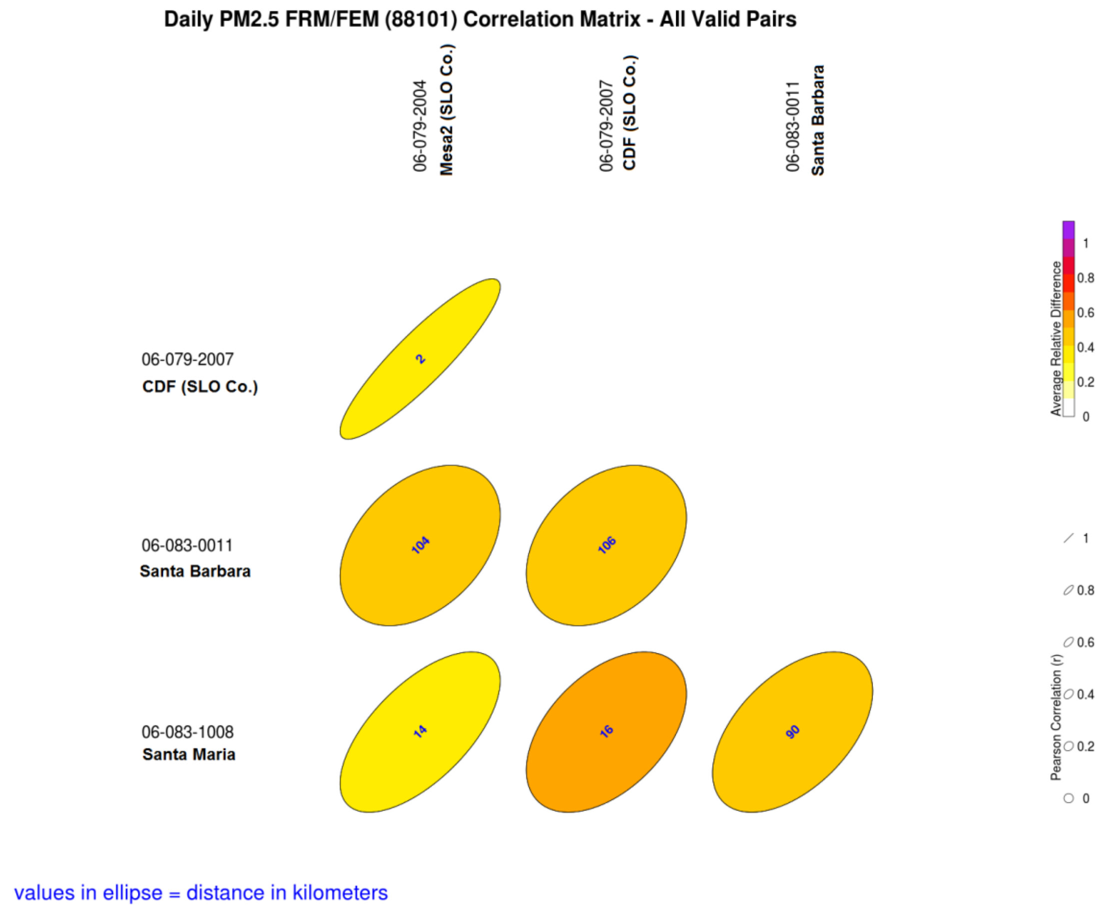


Figure 4-10 PM2.5 Correlation Analysis

4.6.3 PM2.5 Exceedance Probabilities Analysis

A significant goal of the network assessment is to determine if new sites are needed. In order to make that decision, it is helpful to have some 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 PM2.5 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.

This map is intended to be used as a spatial comparison and not for probability estimates for a single geographic point or area. The probability estimates displayed on the map alone should not be used to justify a new monitor. The maps should be used in conjunction with existing monitoring data. This information, along with demographic and emissions data, could be used in a weight of evidence approach for proposing new monitor locations. Figure 4-11 plots the probability of exceeding the PM2.5 daily standard of 35ug/m3.

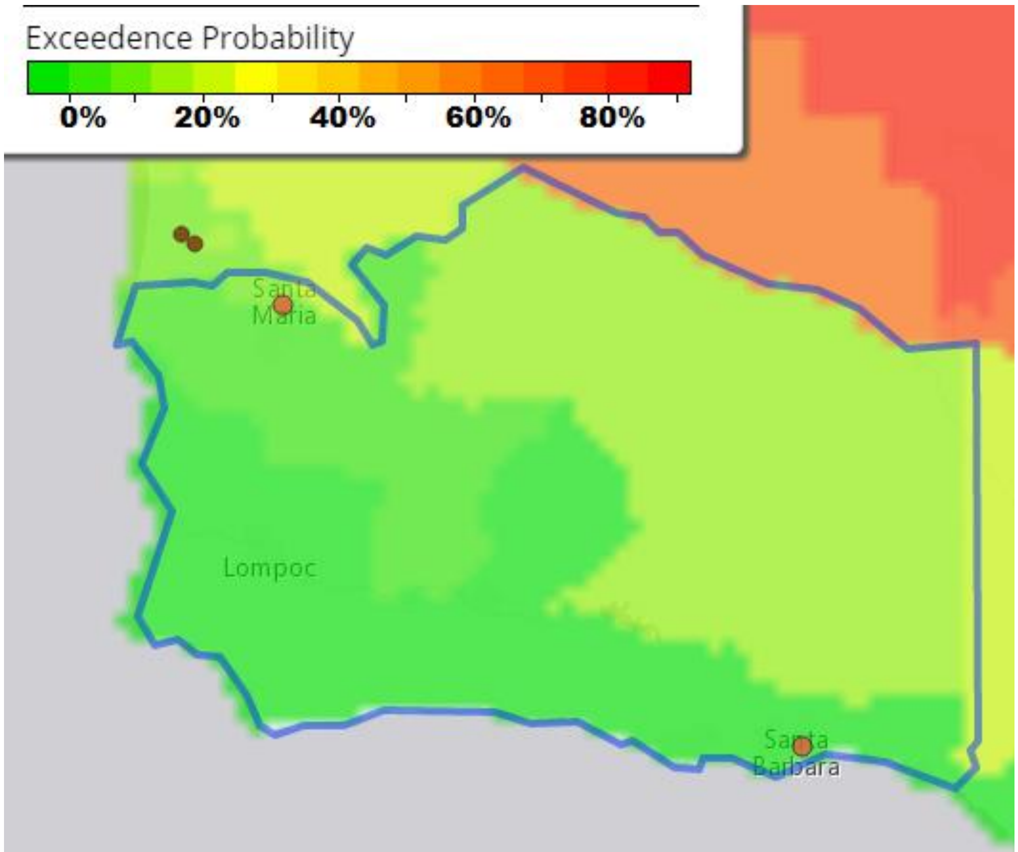
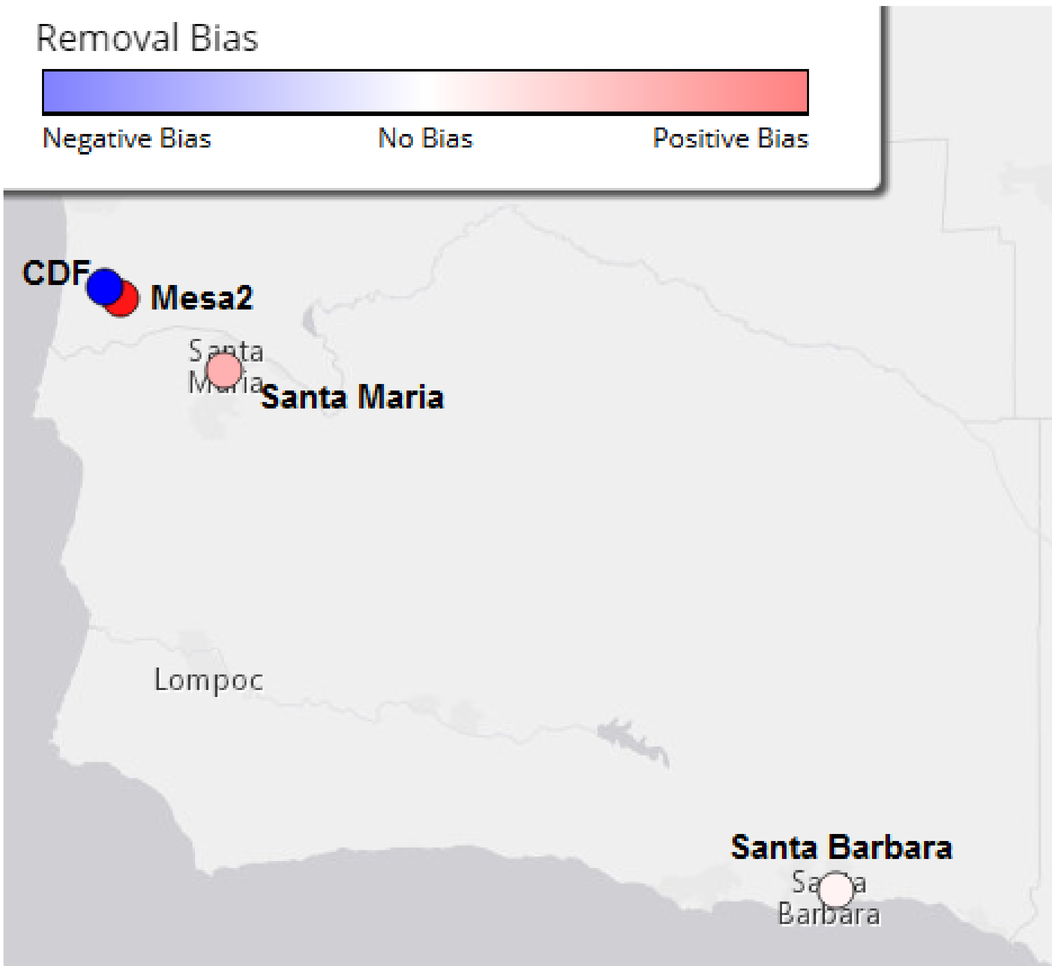


Figure 4-11 PM2.5 Exceedance Probability Map

4.6.4 PM2.5 Removal Bias Analysis

The removal bias analysis is a tool used in determining possible redundant sites. The bias estimation uses the nearest neighbors to each site to estimate the concentration at the location of the site if the site had never existed. This is done using the Voronoi Neighborhood Averaging algorithm with inverse distance squared weighting. The squared distance allows for higher weighting on concentrations at sites located closer to the site being examined. The bias was calculated for each day at each site by taking the difference between the predicted value from the interpolation and the measured concentration. A positive average bias would mean that if the site being examined was removed, the neighboring sites 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 site is smaller than the actual measured concentration. A site with no bias, indicates that the estimated concentration at the location of the site matches the actual measured concentration. Sites with little to no bias are sites where removal could be considered. Figure 4-12 presents the removal bias analysis for PM2.5. Note that the Goleta and Lompoc-H monitors are not included in this analysis due to their recent addition to the PM2.5 FEM network. While the relative bias statistics for this analysis show a large removal bias for each site analyzed, due to the relatively low concentrations, the actual removal bias is low for Santa Barbara, indicating that if the Santa Barbara PM2.5 monitor was removed, estimates of exposure based on nearby monitors for that area would show little bias relative to the concentrations measured in Santa Barbara.



Site	Neighbors Included	Mean Relative Removal Bias (%)	Min Relative Removal Bias (%)	Max Relative Removal Bias (%)
CDF (SLO Co.)	4	35	-1655	884
Mesa2 (SLO Co.)	5	-20	-183	377
Santa Barbara	8	12	-62	937
Santa Maria	6	19	-4646	2356

Figure 4-12 PM2.5 Removal Bias Analysis

4.6.5 PM2.5 Area Served Analysis

This analysis uses a spatial analysis technique known as Voronoi or Thiessen polygons to approximate the area served by a monitoring site. The shape and size of each polygon is dependent on the proximity of the nearest neighboring air monitor to a particular site. This technique provides an easy way to understand the general area and demographics represented by a particular monitoring site, 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 helpful in ensuring that a monitor is not removed that serves a historically underserved segment of the population or an area with a high proportion of sensitive population such as children and the elderly.

Figures 4-13, represent the results of this analysis for PM2.5. The analyses shows that both sites serve demographic similar to the overall county, with the Santa Maria monitor serving a slightly higher proportion of "other". Additionally, Santa Maria serve a slightly higher percentage of children than county wide age distribution.

Monitor	Total Population	White	Black	Native American	Asian	Pacific Islander	Other Race	Multiple Races	Male	Female	Area Km2	Spaital Scale of Monitor
Santa Barbara	208406	75.2%	1.5%	1.0%	5.4%	0.1%	12.7%	4.0%	49.6%	50.4%	3196	Neighborhood
Santa Maria	204037	64.4%	2.6%	1.6%	4.3%	0.3%	21.7%	5.1%	50.8%	49.2%	3164	Neighborhood

Monitor	Age <14	Age 15-24	Age 25-49	Age 50-64	Age 65-74	Age >75
Santa Barbara	14.3%	22.5%	30.5%	18.5%	7.0%	7.2%
Santa Maria	23.5%	15.7%	33.6%	15.7%	5.7%	5.8%

Figure 4-13 PM2.5 Area Served Analysis

5.0 Data Users

Data is collected from all of the monitoring sites and stored in a data base by a central data acquisition system (DAS) located at the SBCAPCD office. Internet connections were added to all 18 sites 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. Ozone, PM10, PM2.5, wind and temperature data are posted to the SBCAPCD website hourly. This data is posted as AQI values and engineering units. Ozone and PM2.5 data are also sent to the AIRNOW system hourly for AQI reporting on a national scale. All hourly values are sent to CARB's AQMIS system for reporting data on a state wide level. Wind and temperature data are sent to 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 AQS data base for compliance with the NAAQS. CARB retrieves data from the AQS to determine compliance with State of California standards which are typically more protective than the NAAQS. Periodically throughout the year, the SBCAPCD will receive various data requests. A UCSB researcher is using hydrocarbon and wind data to study oil and gas seeps in the ocean off of our coast. Other researchers will use wind data to study beach erosion or sand migrations. Other data users are National Weather Service, US Fish and Game, and private consultants.

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 assured data is submitted for compliance purposes and data is readily available and utilized for research and or general air quality purposes.

The analysis in this report for the ozone network shows all monitors measured concentrations are currently below the existing ozone NAQQS standard. However, with pending revisions to the standard, many of these sites measurements will be near or above the standard as demonstrated by the exceedance probabilities analysis. The correlation analysis showed that the Nipomo Regional Park site in southern San Luis Obispo County could be used to represent the measurements from El Capitan, Lompoc H Street, and Vandenberg STS sites. Additionally, the correlation analysis suggested that the Vandenberg STS/Lompoc HSP and Santa Ynez/Nojoqui site pairs have some redundancy. The removal bias analysis showed that estimates of ozone based on neighboring sites in lieu of continued measurement could include significant bias in these estimates.

Based on the overall analysis of the ozone monitoring network, no new sites appear warranted at this time. While this analysis suggests removal of some ozone monitors might be accomplished without seriously 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. Some complicating factors are that some of these monitors are a required permit condition and would require re-evaluation of the source permit to allow removal of a monitor, and some monitors are operated by CARB who would be responsible for decisions on discontinuing monitoring. However, should lack or resources require removal of some portion of the ozone network, the analysis in this report suggests the following list (in order of elimination) of monitors could be considered for removal:

1) Santa Maria
2) Nojoqui
3) Lompoc H Street
4) El Capitan

The nitrogen dioxide network meets to network goals outlined in Section 1. These monitors measure concentrations significantly below the NAQQS standard at all stations. However, these monitors were sited with ozone monitors to provide measurement of ozone precursors for any future research and modeling efforts, so removal of any nitrogen dioxide monitors is not being considered at this time. Should an ozone monitor be removed from the ozone network, the corresponding nitrogen dioxide monitor could also be considered for removal.

The sulfur dioxide network meets the network goals outlined in Section 1. All sites in the sulfur dioxide network measure concentrations significantly below the NAAQS, but are sited for surveillance of nearby potential sulfur dioxide sources. Therefore, no reductions to the sulfur dioxide network are proposed at this time.

The carbon monoxide network meets the network goals outlined in Section 1. All monitors measure significantly below the NAAQS. The Vandenberg STS and Las Flores Canyon #1 monitors are part of a permit condition for a major source and are useful surveillance tools. While reductions to the carbon monoxide network are not being considered at this time, should resource restraints require a reduction, the Lompoc H Street and Goleta monitors could be considered for elimination.

Both the PM10 and PM2.5 particulate monitoring networks meet the network goals outlined in Section 1. No new sites are considered at this time as both networks measurements are well below the NAAQS and the PM2.5 exceedance probability analysis demonstrate a low probability for other locations measurements exceeding the NAQQS. Reductions to the networks are not being considered as both networks provide very valuable information to the public during wildfires that occur increasingly in Santa Barbara County.

Analysis of demographic data served by each monitor showed 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 and Las Flores Canyon #1 serve a slightly 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 sites needs to take into consideration that these sites serve a higher proportion of the sensitive population.

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT FIVE YEAR NETWORK ASSESSMENT

July 2015

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Table of Contents

I. INTRODUCTION

A periodic Network Assessment of the South Coast Air Quality Management District (SCAQMD) Ambient Air Monitoring Network is required by Federal Regulations as a key tool to help ensure that criteria pollutants are measured in important locations and that monitoring resources are used in the most effective and efficient manner to meet the needs of multiple stakeholders. Network assessments provides technical consideration for modernizing data and measurement quality objectives, assess if new technologies are appropriate, assess network design to identify geographic areas where network coverage should be increased or decreased and the types of measurements deployed based on changes in the population and/or emissions. The U.S. Environmental Protection Agency (EPA) requires that local agencies perform an assessment of the air quality surveillance system every 5 years to determine, at a minimum, if the network meets the monitoring objectives defined in 40 CFR § 58 Appendix D, but as additional goal to evaluate the current status of the air monitoring network relative to the current and future SCAQMD monitoring needs. This report describes the assessment of the Ambient Air Monitoring Network operated by SCAQMD and fulfills the requirements for a periodic network review as listed in Title 40, Part 58, Section 10 of the Code of Federal Regulations (40 CFR § 58.10). Regulation requires that the report be submitted to the EPA by July 1, 2015.

SCAQMD HISTORY

Early efforts to control air pollution in California began in Los Angeles with legislation during April 1945 by the Los Angeles County Board proposing counties establish Air Pollution Control Boards. The bill was approved and signed into law on June 10, 1945 and the Los Angeles County Air Pollution Control District was established in October 1947. Orange County, San Bernardino, and Riverside Air Pollution Control Districts were formed by 1957. Realizing that air pollution was a regional problem, the four counties merged to form the SCAQMD in 1977. Geographically, SCAQMD encompasses 10,743 square miles and The South Coast Air Basin (SCAB) is the second most populated area in the United States. Southern California consistently records the highest levels of ozone (O3) and particulates in the nation. As the local air pollution control agency, SCAQMD is responsible for controlling air quality emissions from various sources to meet National Ambient Air Quality Standards (NAAQS) as well as ambient air quality standards established by the California Air Resources Board (CARB). Periodically, SCAQMD Board develops and adopts an Air Quality Management Plan, which provides the guideline for actions that can be taken to bring the SCAB into compliance with State and Federal clean air standards. To assess air quality, SCAQMD operates 40 permanent air monitoring sites (Table 1) in the SCAB and a portion of the Salton Sea Air Basin in Coachella Valley. This area includes Orange County and the non-desert portions of Los Angeles, Riverside, and San Bernardino Counties. The air quality data from the monitoring network is used for assessing compliance to Federal and State air quality standards, developing control strategies and regulations to meet those standards, and providing public information on current and forecasted air quality.

SCAQMD also operates numerous temporary monitoring sites for shorter-term objectives such as air toxic studies, community-based monitoring, and compliance with air quality regulations.

MONITORING NETWORK HISTORY

The earliest air monitoring station was operated by the Los Angeles County Air Pollution Control District at 5201 Santa Fe St. before being relocated to the agency's headquarters at 434 South San Pedro in 1955. The oldest monitoring location still in existence is located in Azusa and opened in 1957. The newest permanent site was added in 2015 at the 60 Freeway Near Road site. Table 1 provides a list of monitoring locations, EPA Air Quality System (AQS) site codes, and the pollutants measured at each site. Table 2 provides monitoring objectives and the spatial scale of representativeness for monitors at each site. Table 3 describes the monitoring purpose for monitors at each site. Table 4 describes the monitoring objective, purpose, and spatial scale for continuous particulate analyzers at each site. Monitoring Objectives are defined as:

> *Background Level* monitoring is used to determine general background levels of air pollutants as they enter the SCAB.
>
> *High Concentration* monitoring is conducted at sites to determine the highest concentration of an air pollutant in an area within the monitoring network. A monitoring network may have multiple high concentration sites (i.e., due to varying meteorology year to year).
>
> *Pollutant Transport* is the movement of a pollutant between air basins or areas within an air basin. Transport monitoring is used to assess and mitigate upwind areas when a transported pollutant affects neighboring downwind areas. Also, transport monitoring is used to determine the extent of regional pollutant transport among populated areas and to rural areas.
>
> *Population Exposure* monitoring is conducted to represent the air pollutant concentrations a populated area is exposed to.
>
> *Representative Concentration* monitoring is conducted to represent the air quality concentrations for a pollutant expected to be similar throughout a geographical area. These sites do not necessarily indicate the highest concentrations in the area for a particular pollutant.
>
> *Source Impact* monitoring is used to determine the impact of significant sources or source categories of air quality emissions on ambient air quality. The air pollutant sources may be stationary or mobile.
>
> *Trend Analysis* monitoring is useful for comparing and analyzing air pollution concentrations over time. Usually, trend analyses show the progress or lack of progress in improving air quality for an area over a period of many years.
>
> *Site Comparison* monitoring is used to assess the effect on measured pollutant levels of moving a monitoring location a short distance (usually less than two miles). Some monitoring stations become unusable due to development, change of lease terms, or eviction. In these cases, attempts are made to conduct concurrent monitoring at the old and new site for a period of at least one year in order to compare pollutant concentrations.

Real Time Reporting/Modeling is used to provide data to the EPA's AIRNOW system, which reports conditions for air pollutants on a real time basis to the general public. Data is also used to provide accurate and timely air quality forecast guidance to residents of the South Coast basin.

Multiple purposes for measuring a pollutant at a particular site are possible. There is some overlap between monitoring objectives as defined by the EPA and given in Table 2, and the monitoring purposes provided in Table 3.

A brief description of the network for each criteria pollutant monitored and monitoring program is provided below:

Ozone

The SCAQMD operates 29 sites where ozone (O3) measurements are made as part of the Air Monitoring Network. Figure 1 shows the spatial distribution of these sites.

Carbon Monoxide

Ambient carbon monoxide (CO) monitors measure concentrations at 23 locations. Figure 2 shows the spatial distribution of these sites.

Nitrogen Dioxide

The nitrogen dioxide (NO2) network consists of 23 sites. These sites are mostly located in areas of highest NO2 concentration. The spatial distribution of NO2 monitors is shown in Figure 3.

Sulfur Dioxide

Sulfur dioxide (SO2) monitors are located at 6 sites. Figure 4 shows the spatial distribution of the sites.

Particulate Lead

Total suspended particulate (TSP) lead (Pb) measurements are collected at 14 sites as part of the network. Five sites are source-oriented and the remaining 9 sites are population-oriented. The spatial distribution of these sites is shown in Figure 5.

PM10

Size-selective inlet high volume samplers are operated at 19 sites to meet the requirements for PM10 Federal Reference Method (FRM) sampling. Of the 19 sites, 13 also include continuous PM10 analyzers. Figure 6 shows the spatial distribution of the sampling sites.

PM2.5

A network of 17 FRM samplers was first implemented in January 1999. Since then, the network has expanded to include 19 sites depicted in Figure 7 and listed in Table 5. Continuous PM2.5 Met One Beta Attenuation Monitors (BAMs) were first deployed in 2001. Sixteen continuous PM2.5 monitors are now operating in the Basin.

PM2.5 speciation sampling is also a part of the SCAQMD PM2.5 monitoring program. The network includes two Speciation Trends Network (STN) samplers and four permanent SCAQMD speciation monitoring locations.

A more detailed description of each criteria pollutant network can be found in the most recent copy of the SCAQMD Network Plan (http://www.aqmd.gov/home/library/clean-air-plans/monitoring-network-plan).

The following is a brief description of specific programs that are operated within the Ambient Air Monitoring Network:

Photochemical Assessment Monitoring Stations (PAMS)

The PAMS network was initiated in June 1994 and consists of seven air monitoring locations. To address regulatory changes, site-specific observations from the recent National PAMS Network Assessment, and to address potential synergies between programs, SCAQMD made changes in June 2009 to the PAMS monitoring network based on specific recommendations.

SCAQMD made the following changes in June 2009 to the PAMS monitoring network:

- Burbank was reclassified from Type 2/1 to Type 2. This change addressed the National PAMS Network Assessment observation that Burbank should be reclassified to a Type 2 precursor site. The recommendation is consistent with the heavily urbanized/industrialized area, which is impacted by high levels of O3 precursor emissions.
- Santa Clarita was reclassified as Type 3 from Type 2. Although the National PAMS Network Assessment observed that Santa Clarita was consistent with a Type 2 site, recent data was more consistent with a Type 3 maximum O3 concentration site rather than a Type 2 O3 precursor site.
- Banning was relocated to Los Angeles (Main). The National PAMS Network Assessment observed that Banning had the lowest O3 concentrations of all the Type 2 sites and should be reclassified to a Type 3 or 4 site. Instead, to create synergies between programs, SCAQMD relocated the Banning PAMS site to the Los Angeles (Main) site as Type 2. This satisfies the EPA recommendation for use of the same monitoring platform and equipment to meet the objectives of multiple programs. Los Angeles (Main) is also a National Air Toxics Trends Station (NATTS), a future National Core Multi-pollutant Monitoring Station (NCore), and an STN site.
- Azusa was reclassified from Type 3 to Type 2. This proposed change addresses the National PAMS Network Assessment observation that Azusa has high Volatile Organic Compounds (VOC) and Oxides of Nitrogen (NOx) concentrations, with lower O3 concentrations. The site now more closely resembles a Type 2 O3 precursor site.
- Upland was relocated to the Rubidoux site. The National PAMS Network Assessment observed that Upland was no longer consistent with a Type 4 site and recommended reclassification to Type 3. SCAQMD relocated the Upland PAMS site to Rubidoux as a Type 3 location where synergies can be created among the

National Air Toxics Trends Station (NATTS), National Core Multi-pollutant Monitoring Station (NCore), and the STN programs.

- LAX Hastings and Pico Rivera remained unchanged.

Currently, manual VOC canisters are in operation at the Azusa, LAX Hastings, Rubidoux, Los Angeles (Main) and Santa Clarita air monitoring stations. Prior to 2015, during the intensive season from July 1 until September 30, VOC canisters were run every three hours for a period of twenty-four hours every 3rd day and a twenty-four hour sample was run every 6th day. During the non-intensive season from October 1 through June 30, twenty-four hour VOC canister samples were run every 6th day.

SCAQMD upper air meteorological monitoring stations are established at Los Angeles International Airport (LAX), Ontario International Airport (ONT), Moreno Valley (MOV) at the Moreno Valley Municipal Water Treatment Plant in Riverside County, Irvine (IRV) at the University of California Research and Extension Center, and Pacoima at Whiteman Airport (WHP). The upper air stations use a combination of remote sensing and surface meteorological instrumentation, including the Scintec (formerly Radian/URS and Vaisala) LAP-3000 radar wind profiler with a Radio Acoustic Sounding System (RASS), the Atmospheric Systems Corporation (formerly AeroVironment Inc.) mini Sodar acoustic wind profiler, and tower-mounted meteorological measurements of wind, pressure, temperature, relative humidity, solar radiation, and ultraviolet radiation. Due to the age of the LAX upper air instrumentation and costly component failures, SCAQMD has replaced the LAX radar wind profiler instrumentation with that from Whiteman Airport. Surface meteorology and mini-Sodar instruments are still operational at the Whiteman Airport upper air station.

On November 25, 2014, the EPA proposed to strengthen the National Ambient Air Quality Standards (NAAQS) for ground-level ozone, based on extensive scientific evidence about ozone's effects. Proposed changes to the rule include PAMS monitoring requirements in 40 CFR § 58 which includes recommendations made by the PAMS national working group. Proposed changes include (Cavendar, U.S. EPA, 2015):

– Reduce number of required sites to 1 per area but expand PAMS applicability to all O3 non-attainment areas
– Require PAMS at NCore sites in O3 non-attainment areas but allow for Regional approval of alternative site (e.g., existing type 2 PAMS sites)
– Require sites to collect hourly VOC data
– Require sites to collect carbonyls (formaldehyde, etc.)
– Require sites to measure “true NO2” in addition to current NOy
– Change requirement for upper air meteorology to requirement for measuring mixing height

The proposed rule closed for comment and the final form of the rule is expected to be released later in 2015. SCAQMD is putting efforts and resources towards the developing the revised program and has switched to the PAMS schedule listed in Table 6.

NATTS

The NATTS program was developed to fulfill the need for long-term hazardous air pollutant (HAP) monitoring data of consistent quality nationwide. SCAQMD has conducted several air toxics measurement campaigns in the past, which demonstrated the variety and spatial distribution of air toxics sources across SCAB. A single air toxics measurement site cannot reflect the levels and trends of air toxics throughout the Basin. For this reason, two NATTS sites are used to characterize the South Coast Basin's air toxics levels. The first site is a central urban core site in Los Angeles that reflects concentrations and trends due primarily to urban mobile source emissions. A second, more rural, inland site at Rubidoux captures the transport of pollutants from a variety of upwind mobile and industrial sources in the most populated areas of the air basin. NATTS monitoring began in February 2007 and continues at the Los Angeles (Main) and Rubidoux air monitoring sites.

NCore

In October 2006, U.S. EPA issued final amendments to the ambient air monitoring regulations for criteria pollutants. These amendments are codified in 40 CFR parts 53 and 58. One of the most significant changes in the regulations was the requirement to establish National Core (NCore) multi-pollutant monitoring stations. These stations provide data on several pollutants at lower detection limits and replace the National
Air Monitoring Station (NAMS) networks that have existed for several years. Stations were required to be operational by January 1, 2011. The NCore Network addresses the following monitoring objectives:

- Timely reporting of data to the public through AIRNow, air quality forecasting, and other public reporting mechanisms
- Support development of emission strategies through air quality model evaluation and other observational methods
- Accountability of emission strategy progress through tracking long-term trends of criteria and non-criteria pollutants and their precursors
- Support long-term health assessments that contribute to ongoing reviews of the National Ambient Air Quality Standards (NAAQS)
- Compliance through establishing nonattainment/attainment areas by comparison with the NAAQS
- Support multiple disciplines of scientific research, including; public health, atmospheric and ecological

To meet this objectivves, SCAQMD has installed trace level analyzers for CO, NOy, SO2 and Continuous FEM BAM PM2.5 in Rubidoux and Los Angeles (Main), both of which are existing Speciation Trends Network (STN) and NATTS sites.

NETWORK ASSESSMENTS

Regulatory Requirements

The earliest air monitoring sites in the United States were established over 50 years ago with sites added to the national network as needed to fulfill Federal monitoring requirements and other objectives. Since the time of inception, air quality, population, and behaviors have changed, and there is a general need for re-evaluation of the overall network design and objectives. Recognizing this need, the U.S. EPA finalized an amendment to the ambient air monitoring regulations on October 17, 2006 to address the issue. In the amendment, the U.S. EPA required State and local air monitoring agencies to conduct a network assessment once every five years, with the first assessment due by July 1, 2010, and every five years thereafter.

> The state or where applicable local agency shall perform and submit to the EPA Regional Administrator an assessment of the air quality surveillance system every 5 years to determine, at a minimum, if the network meets the monitoring objectives defined in 40 CFR § 58 Appendix D, whether new sites are needed, whether existing sites are no longer needed and can be terminated, and whether new technologies are appropriate for incorporation into the Ambient Air Monitoring Network. The Network Assessment must consider the ability of existing and proposed sites to support air quality characterization for areas with relatively high populations of susceptible individuals, and for any sites that are being proposed for discontinuance. The assessment must also consider the effect on data users other than the agency itself, such as nearby States and Tribes or health effects studies. For PM2.5, the assessment must also identify needed changes to population-oriented sites. The state or where applicable local agency must submit a copy of this year assessment along with a revised annual network plan to the Regional Administrator. (40 CFR § 58.10d 236)

Air monitoring networks must be designed to meet three basic objectives according to 40 CFR § 58. First, they must provide air pollution data to the general public in a timely manner. Second, they must support compliance with ambient air quality standards shown in Table 7, and third, support research studies on health effects assessments. In order to achieve these goals, networks must meet the 40 CFR § 58 Appendix D, Network Design, and Appendix E, Probe/Monitoring Path Siting Criteria.

Network Design Criteria

Ambient air monitoring network design is specified by U.S. EPA and include monitoring objectives and general criteria, as outlined in 40 CFR § 58 Appendix D. Each objective is related to a specific type of air monitoring site, and air monitoring networks must be designed for each criteria pollutant and must meet specific objectives. Monitoring objectives and corresponding scales of representativeness are shown in Table 8.

Minimum Number of Sites

As a general requirement, the U.S. EPA specifies the minimum numbers of sites required in a network based on the latest census population data and design value concentrations for specific criteria pollutants.

The SCAQMD jurisdictional boundary encompasses two Metropolitan Statistical Areas (MSAs) and two Core Based Statistical Areas (CBSAs) whose boundaries and codes mirror those of the MSAs as defined by the U.S. Office of Management and Budget. Los Angeles-Long Beach-Anaheim MSA\CBSA (Code 31080) has an estimated population of 13,131,431 and the Riverside-San Bernardino-Ontario MSA\CBSA (Code 40140) has an estimated population of

4,380,878 according to U.S. Census estimates for 2013. The minimum number of monitors for each pollutant is based on MSA population as described in 40 CFR § 58 Appendix D. The SCAQMD is a Primary Quality Assurance Organization (PQAO) and the network exceeds the minimum monitoring requirements for all criteria pollutants.

Minimum numbers of pollutant monitors may be required for a specific program such as PAMS (Table 9) or NCore. The final number of sites in a network is subject to U.S. EPA Regional Administrator approval via the Annual Network Plan.

Probe Siting Criteria

Once a site has been selected based on monitoring objective and spatial scale, the site must also meet specific siting criteria for each spatial scales and each pollutant as specified in 40 CFR § 58 Appendix E. These criteria include the placement of the pollutant measuring device inlet probe, spacing from minor sources of pollution, spacing from obstructions to the monitoring probe, spacing from trees, spacing from roadways, probe material and residence time.

Horizontal and Vertical Placement

Inlet probes must be placed both horizontally and vertically so that at least 90 percent of the area over which pollutants are being measured and averaged is 1 meter from walls or any supporting structure. For measurement of particulates, a minimum of 2 meters is required. Inlet probes must also be placed between 2 and 15 meters above the ground level for all criteria pollutants at the neighborhood scale. Particulate probe inlets at middle and micro scale are to be between 2 and 7 meters above ground level. Near roadway, and CO micro scale measurements are to be 3 +/- ½ meters above ground level. A summary of horizontal and vertical placement is shown in Table 10.

Spacing from Minor Sources

Spacing requirements are dependent upon the monitoring objective. If the objective is to measure the *impact* of a stationary source's primary pollutant emissions, then the probe may be located close to the source and be classified as a micro-scale site. A micro-scale site typically represents an area up to 100m in size. If the objective is to measure pollutants over a larger area such as a neighborhood or city, then the monitoring location should be located away from minor sources of pollutants so as not to impact air quality data collected at the site. Particulate matter sites should not be located in unpaved areas where windblown dust can influence data collected. Special attention should be placed on horizontal and vertical probe placement from furnace or incineration flues to prevent scavenging of O3 by NO and O3 reactive hydrocarbons.

Spacing from Obstructions

Buildings and other obstacles may scavenge SO2, O3, or NO2 and restrict airflow for any pollutant measured. To prevent this influence, the probe must have unrestricted airflow and be located away from obstacles. The distance from an obstacle to the probe should be twice the height that the obstacle protrudes above the inlet. For particulate sampling, a minimum of 2 meters separation is required between monitors, walls, parapets, and structures.

Spacing from Trees

Trees can scavenge SO2, O3, and NO2 by adsorption and provide a surface for particle deposition. Trees also act as obstructions and special attention should be made to adhere to correct spacing. To reduce interference, the probe inlet should be at least 10m from the drip line of the tree. For micro-scale sites, no trees should exist between the probe inlet and the source being measured.

Spacing from Roadways

O3 and NO2 in particular are susceptible to interference from roadway emissions. When siting monitors for neighborhood scale and urban scales, it is important to minimize roadway interference. Recommended spacing from roadways for O3, NO2, CO, and PM samplers are summarized in Tables 11, 12, and Figure 8.

EPA Guidance and Memos

To facilitate the Network Assessment, the EPA issued guidance for local air quality agencies. During March 1998, the EPA Office of Air Quality Planning and Standards (OAQPS) issued State and Local Air Monitoring Stations (SLAMS), National Air Monitoring Stations (NAMS) and Photochemical Assessment Monitoring Stations (PAMS) Network Review Guidance. Guidance advocated examination of compliance with Network Design Criteria, monitoring objectives, and minimum number of sites required. Guidance also recommended examination of 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria. In February 2007, the EPA issued Ambient Air Monitoring Network Assessment Guidance, which included analytical techniques for assessments of Ambient Air Monitoring Networks. In the guidance, the EPA summarized the context of network assessments, provided an overview of requirements in 40 CFR § 58, and an overview of the assessment process. The EPA provided suggested steps in the assessment process and technical approaches including identification of monitoring needs, correlation analysis, and population change in order to asses high and low value monitors. The final suggested step in the guidance was to suggest changes to the network, obtain input from State, Federal, and local stakeholders, and revise recommendations based on input. At the 2014 National Air Monitoring Conference, a session was held to discuss updated guidelines for the network assessment.

TABLE 1. List of Monitoring Sites

	Location	AQS No.	Pollutants Monitored	Start Date
1	Anaheim	060590007	CO,NO2,O3,PM10,PM2.5	08/01
2	Anaheim Route 5 Near Road[2]	060590008	CO, NO2	01/14
3	ATSF (Exide)	060371406	Pb	01/99
4	Azusa	060370002	CO,NO2,O3,PM10,PM2.5	01/57
5	Banning Airport	060650012	NO2,O3,PM10, PM2.5	04/97
6	Big Bear	060718001	PM2.5	02/99
7	Burbank[1]	060371002	CO,NO2,SO2,O3,PM10,PM2.5	10/61
8	Closet World (Quemetco)	060371404	Pb	10/08
9	Compton	060371302	CO,NO2,O3,Pb,PM2.5	01/04
10	Costa Mesa	060591003	CO,NO2,SO2,O3	11/89
11	Crestline	060710005	O3,PM10	10/73
12	Fontana	060712002	CO,NO2,SO2,O3,PM10,PM2.5,SO4	08/81
13	Glendora	060370016	CO,NO2,O3,PM2.5,PM10	08/80
14	Indio	060652002	O3,PM10,PM2.5	01/83
15	La Habra	060595001	CO,NO2,O3	08/60
16	Lake Elsinore	060659001	CO,NO2,O3,PM2.5,PM10	06/87
17	LAX Hastings	060375005	CO,NO2,O3,PM10,Pb,SO4	04/04
18	Long Beach (Hudson)	060374006	CO, NO2,SO2,O3,PM10	01/10
19	Long Beach Route 710 Near Road[2]	060374008	NO2, PM2.5	01/15
20	Long Beach (North)	060374002	PM2.5	10/62
21	Long Beach (South)	060374004	PM10,Pb,PM2.5,SO4	06/03
22	Los Angeles (Main St.)	060371103	CO,NO2,SO2,O3,PM10,Pb,PM2.5,SO4	09/79
23	Mira Loma (Van Buren)	060658005	CO,NO2,O3,PM10,PM2.5	11/05
24	Mission Viejo	060592022	CO,O3,PM10,PM2.5	06/99
25	Norco	060650003	PM10	12/80
26	Ontario Fire Station[1]	060710025	PM10,PM2.5	01/99
27	Ontario Etiwanda Near Road[2]	060710026	CO, NO2	06/14
28	Ontario Route 60 Near Road[2]	060710027	NO2, PM2.5	01/15
29	Palm Springs	060655001	CO,NO2,O3,PM10,PM2.5	04/71

[1] Site terminated in 2014.
[2] New site in 2014.

TABLE 1. (cont) List of Monitoring Sites

	Location	AQS No.	Pollutants Monitored	Start Date
29	Pasadena	060372005	CO, NO2, O3, PM2.5	04/82
30	Perris	060656001	O3,PM10	05/73
31	Pico Rivera #2	060371602	CO,NO2,O3,Pb,PM2.5,SO4,PM10	09/05
32	Pomona	060371701	CO,NO2,O3	06/65
33	Redlands	060714003	O3,PM10	09/86
34	Rehrig (Exide)	060371405	Pb	11/07
35	Reseda	060371201	CO,NO2,O3,PM2.5	03/65
36	Riverside (Magnolia) [1]	060651003	CO,NO2,Pb,PM10,PM2.5,SO4	10/72
37	Rubidoux	060658001	CO,NO2,SO2,O3,PM10,Pb,PM2.5,SO4	09/72
38	San Bernardino	060719004	CO,NO2,O3,PM10,Pb,PM2.5	05/86
39	Santa Clarita	060376012	CO,NO2,O3,PM10,PM2.5	05/01
40	SA Recycling[2]	Unavailable	TSP, Cr6	06/12
41	Saul Martinez Elementary[2]	060652005	PM10, H2S	01/11
42	Temecula	060650016	O3, PM2.5	06/10
43	Uddelholm (Trojan Battery)	060371403	Pb	11/92
44	Upland	060711004	CO,NO2,O3,Pb,PM2.5,PM10,SO4	03/73
45	West Los Angeles	060370113	CO,NO2,O3	05/84

[1] Site terminated in 2014.

[2] New site in 2014.

TABLE 2. FRM/FEM Criteria Pollutant Spatial Scales and Site Type

SPATIAL SCALE	SITE TYPE
MI – Microscale	HC – Highest Concentration
MS – Middle Scale	PE – Population Exposure
NS – Neighborhood Scale	IM – Source Oriented (Impact)
US – Urban Scale	BK – General Background

Location	CO	NO2	SO2	O3	Manual PM10	Manual PM2.5	Pb
Anaheim	NS/PE	US/PE		NS/PE	NS/PE	NS/PE	
Anaheim Route 5 Near Road[2]	MI/HC	MI/HC					
ATSF (Exide)							MI/IM
Azusa	NS/PE	US/PE		US/HC	NS/PE	NS/PE	
Banning Airport		NS/PE		NS/PE	NS/PE		
Big Bear						NS/PE	
Burbank [1]	NS/HC	NS/PE	NS/PE	US/HC	NS/PE	NS/PE	
Closet World (Quemetco)							MI/IM
Compton	MS/HC	MS/PE		NS/PE		NS/PE	NS/PE
Costa Mesa	NS/PE	NS/PE	NS/PE	NS/PE			
Crestline				NS/HC	NS/PE		
Fontana	NS/PE	US/PE	NS/PE	US/PE	NS/HC	NS/PE	
Glendora	NS/PE	NS/PE		NS/HC			
Indio				NS/PE	NS/HC	NS/PE	
La Habra	NS/PE	US/PE		NS/PE			
Lake Elsinore	NS/PE	NS/PE		NS/PE			
LAX Hastings	MS/PE/BK	MS/PE/BK	NS/PE/BK	NS/PE/BK	NS/PE/BK		NS/PE/BK
Long Beach (Hudson)	NS/HC	NS/PE	NS/HC	NS/PE	NS/PE		
Long Beach (North)						NS/HC	
Long Beach Route 710 Near Road[2]		MI/HC				MI/HC	
Los Angeles (Main St.)	NS/PE	NS/HC	NS/PE	NS/PE	NS/PE	NS/HC	NS/PE
Mira Loma (Van Buren)	NS/PE	NS/PE		NS/PE	NS/HC	NS/HC	
Mission Viejo	NS/PE			NS/PE	NS/PE	NS/PE	
Norco					NS/PE		
Ontario Fire Station [1]					NS/HC	NS/PE	
Ontario Etiwanda Near Road[2]	MI/HC	MI/HC					
Ontario Route 60 Near Road[2]		MI/HC				MI/HC	
Palm Springs	NS/PE	NS/PE		NS/PE	NS/PE	NS/PE	
Pasadena	MS/PE	MS/HC		NS/PE		NS/PE	
Perris				NS/PE	NS/PE		
Pico Rivera #2	NS/PE	NS/HC		NS/HC		NS/PE	NS/PE
Pomona	MI/PE	MS/PE		NS/HC			
Redlands				NS/PE	NS/PE		
Rehrig (Exide)							MI/IM
Reseda	NS/PE	US/PE		US/HC		NS/PE	
Riverside [1]	MI/HC	US/PE				NS/HC	MI/HC
Rubidoux	NS/PE	US/PE	NS/PE	US/HC	NS/HC	NS/HC	NS/PE
San Bernardino	MS/PE	US/PE		NS/HC	NS/HC	NS/PE	NS/PE
Santa Clarita	NS/PE	NS/PE		US/HC	NS/PE		
South Long Beach					NS/HC	NS/HC	NS/HC
SA RECYCLING							HC/IM
Temecula				NS/HC			
Uddelholm (Trojan Battery)							MI/IM
Upland	NS/PE	NS/PE		NS/PE			NS/PE
West Los Angeles	NS/PE	MS/HC		NS/PE			

[1] Site terminated in 2014.

[2] New site in 2014.

TABLE 3. FRM/FEM Criteria Pollutant Monitoring Purposes

MONITORING PURPOSE

BK – Background	RC – Representative Concentration
HC – High Concentration	RM – Real-Time Reporting/Modeling
TP – Pollutant Transport	TR – Trend Analysis
EX – Population Exposure	CP – Site Comparisons
SO – Source Impact	CO - Collocated

Location	CO	NO2	SO2	O3	Manual PM10	Manual PM2.5	Pb
Anaheim	TR	TR/RC		TR	TR/RC	TR/EX	
Anaheim Route 5 Near Road[2]	SO/HC	SO/HC					
ATSF (Exide)							SO
Azusa	TR	TR/RC		TR	TR	TR/EX	
Banning Airport		TP/RC		TP	TP		
Big Bear						EX/SO/TP	
Closet World (Quemetco)							SO
Burbank [1]	TR	TR/RC	TR	TR	TR/RC	TR/EX	
Compton	TR/HC	TR/RC		TR/RC		EX/RC	EX
Costa Mesa	RC	TR/RC	TR	RC			
Crestline				HC	TP/RC		
Fontana	RC	TP/RC	TR	RC	HC	EX/TP	
Glendora	RC	TR/RC		HC			
Indio				TP	HC/CO	TP/EX	
La Habra	RC	TR/RC		RC			
Lake Elsinore	TP/RC	TP/RC		TP/RC			
LAX Hastings	BK	BK	BK	BK	BK		BK
Long Beach (Hudson)	TR	TR/RC	TR/HC	TR	TR/RC		
Long Beach (North)						EX/HC	
Long Beach Route 710 Near Road[2]		SO/HC				SO/HC	
Los Angeles (Main St.)	SO/RC	SO/HC	TR	TR/RC	TR/RC/CO	EX/HC/CO	EX/CO
Mira Loma (Van Buren)	TR/RC	TR/RC		TR/HC	HC	EX/HC/CO	
Mission Viejo	RC			TR/RC	TR/RC	EX/RC	
Norco					TR/RC		
Ontario Fire Station [1]					HC/CO	EX/RC	
Ontario Etiwanda Near Road[2]	SO/HC	SO/HC					
Ontario Route 60 Near Road[2]		SO/HC				SO/HC	
Palm Springs	TP/RC	TP/RC		TP	TP/HC	EX/TP	
Pasadena	TR/RC	TR/HC		TR/RC		EX/RC	
Perris				TP	TR		
Pico Rivera #2	RC	HC		HC		EX/RC	EX
Pomona	RC	RC		HC			
Redlands				TP/RC	TP/RC		
Rehrig (Exide)							SO/CO
Reseda	RC	TR/RC		HC		EX/RC	
Riverside [1]	HC	TR/RC				EX/HC	EX/CO
Rubidoux	TR/RC	TR/RC	TR	TR/HC	TR/HC/CO	EX/TR/HC/CO	EX
San Bernardino	TR/RC	TP/RC		TR/HC	TR/HC	EX/TR	EX
Santa Clarita	RC	TP/RC		TP/HC	RC	EX/RC	
South Long Beach					HC	EX/SO	EX
SA RECYCLING							SO/HC
Uddelholm (Trojan Battery)							SO
Temecula				TR/HC			
Upland	RC	TR/RC		TR/RC			EX
West Los Angeles	RC	TR/HC		RC			

[1] Site terminated in 2014.
[2] New site in 2014.

TABLE 4. Continuous PM_{10}/$PM_{2.5}$ Monitoring Purpose, Site Type and Spatial Scales

SITE TYPE

HC – High Concentration
PE – Population Exposure
BK - Background

SPATIAL SCALE

MI – Microscale
NS – Neighborhood Scale

INSTRUMENT TYPE

TEOM
BAM (NON-FEM)
BAM (FEM)

MONITORING PURPOSE

SO – Source Impact
TP – Pollutant Transport
TR – Trend Analysis
RM – Real-Time Reporting/Modeling
SPM – Special Purpose Monitoring
CO - Collocated

Location	Continuous PM10				Continuous PM2.5				PM10–2.5
	Type	Purpose	Site Type	Scale	Type	Purpose	Site Type	Scale	Active
Anaheim	BAM/FEM	RM/TR	PE	NS	BAM/FEM	RM/TR	PE	NS	
Banning Airport					BAM/NON-FEM	RM	PE	NS	
Burbank[1]	TEOM/FEM	RM/TR	PE	NS	BAM/FEM	RM/TR	PE	NS	
Crestline					BAM/NON-FEM	RM	PE	NS	
Glendora	BAM/FEM	RM	PE	NS	BAM/NON-FEM	RM	PE	NS	
Indio	TEOM/FEM	RM	HC	NS					
Lake Elsinore	TEOM/FEM	RM	PE	NS	BAM/NON-FEM	RM	PE	NS	
Long Beach Route 710 Near Road[2]					BAM/FEM	RM/SO			
Los Angeles (Main St.)	BAM/FEM	RM/TR	PE	NS	BAM/FEM	RM	HC	NS	Yes
Mira Loma (Van Buren)	BAM/FEM	RM	HC	NS	BAM/FEM	RM	HC	NS	
Ontario Route 60 Near Road[2]					BAM/FEM	RM/SO			
Palm Springs	TEOM/FEM	RM/TP	HC	NS					
Reseda					BAM/NON-FEM	RM	PE	NS	
Riverside[1]	BAM/FEM	RM	HC	NS	BAM/NON-FEM	RM	HC	NS	
Rubidoux	TEOM/FEM	RM/TR	HC	NS	BAM/FEM & NON-FEM	RM/TR/CO	HC	NS	Yes
San Bernardino	TEOM/FEM	RM/TR	HC	NS					
Santa Clarita					BAM/NON-FEM	RM	PE	NS	
Saul Martinez Elementary	TEOM/FEM	RM/CO	PE	NS					
South Long Beach					BAM/FEM	RM/SO	PE	NS	
Temecula					BAM/NON-FEM	RM	PE	NS	
Upland	BAM/FEM	RM	PE	NS	BAM/NON-FEM	RM	PE	NS	

[1] Site terminated in 2014.
[2] New site in 2014.

TABLE 5. Manual $PM_{2.5}$ FRM Monitoring Stations Assigned Site Numbers

Location	Site Code	ARB No.	AQS No.	Start Date	Schedule
Anaheim	ANAH	30178	060590007	01/03/99	Daily
Azusa	AZUS	70060	060370002	01/04/99	1-in-3
Big Bear	BGBR	36001	060718001	02/08/99	1-in-6
Burbank[1]	BURK	70069	060371002	Closed	
Compton	COMP	70112	060371302	11/08	1-in-3
Fontana	FONT	36197	060712002	01/03/99	1-in-3
Indio	INDI	33157	060652002	01/30/99	1-in-3
Long Beach (North)	LGBH	70072	060374002	01/03/99	Daily
Long Beach Route 710 Near Road[2]	W710	70032	060374008	01/01/15	Daily
Los Angeles "A" (Main St.)	CELA	70087	060371103	01/03/99	Daily
Los Angeles "B" (Main St.)	CELA	70087	060371103	01/06/99	1-in-6
Mira Loma (Van Buren) "A"	MRLM	33165	060658005	11/09/05	Daily
Mira Loma (Van Buren) "B"	MRLM	33165	060658005	03/08/12	1-in-6
Mission Viejo	MSVJ	30002	060592022	06/15/99	1-in-3
Ontario Fire Station[1]	ONFS	36025	060710025	Closed	
Ontario Route 60 Near Road[2]	60NR	36036	060710027	01/01/15	Daily
Palm Springs	PLSP	33137	060655001	12/26/99	1-in-3
Pasadena	PASA	70088	060372005	03/04/99	1-in-3
Pico Rivera #2	PICO	70185	060371602	09/12/05	1-in-3
Reseda	RESE	70074	060371201	01/24/99	1-in-3
Riverside[1]	RIVM	33146	060651003	Closed	
Rubidoux "A"	RIVR	33144	060658001	01/03/99	Daily
Rubidoux "B"	RIVR	33144	060658001	01/03/99	1-in-6
San Bernardino	SNBO	36203	060719004	01/03/99	1-in-3
South Long Beach	SLGB	70110	060374004	06/20/03	Daily

[1] Closed in 2014.
[2] New in 2014

TABLE 6. PAMS Network

			January 1 to December 31		
Site Type	Date Established as PAMS	Site / AQS ID#	VOC	Carbonyl	Additional Requirements
1	04/01/2004	LAX Hastings (replaced Hawthorne)	1 x 24 hr sample every 6^{th} day	No Sampling	
2	06/01/1995	Azusa	1 x 24 hr sample every 6^{th} day	No Sampling	NO/NOx required
2	07/01/1997	Burbank	1 x 24 hr sample every 6^{th} day	1 x 24 hr sample every 6^{th} day	
2	06/01/2009	Los Angeles (Main)	1 x 24 hr sample every 6^{th} day	1 x 24 hr sample every 6^{th} day	Trace level CO required at one type 2 site.
2	08/01/2005	Pico Rivera #2	1 x 24 hr sample every 6^{th} day	1 x 24 hr sample every 6^{th} day	
3	06/09/2009	Rubidoux	1 x 24 hr sample every 6^{th} day	No Sampling	NOy required
3	05/01/2001	Santa Clarita	1 x 24 hr sample every 6^{th} day	1 x 24 hr sample every 6^{th} day	

MONITORING OBJECTIVES:
1 – Upwind and background characterization site (type 1 or 3)
2 – Maximum O3 precursor emissions impact site or above 8 hr zone
3 – Maximum O3 concentration site
4 – Extreme downwind monitoring site

MONITORING REQUIREMENTS:
One type 1 or type 3 site required per area

One type 2 site required per area

No type 4 required

REDUCED REQUIREMENTS:
Speciated VOC only required at type 2 and one other

Carbonyl only required in areas classified as serious

NO/NOx required only at type 2
NOy required at one site per PAMS area (type 1 or 3)

TABLE 7. Ambient Air Quality Standards

Ambient Air Quality Standards						
Pollutant	Averaging Time	California Standards [1]		National Standards [2]		
		Concentration [3]	Method [4]	Primary [3,5]	Secondary [3,6]	Method [7]
Ozone (O_3)	1 Hour	0.09 ppm (180 μg/m^3)	Ultraviolet Photometry	—	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	0.070 ppm (137 μg/m^3)		0.075 ppm (147 μg/m^3)		
Respirable Particulate Matter (PM10)[8]	24 Hour	50 μg/m^3	Gravimetric or Beta Attenuation	150 μg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 μg/m^3		—		
Fine Particulate Matter (PM2.5)[8]	24 Hour	—	—	35 μg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 μg/m^3	Gravimetric or Beta Attenuation	12.0 μg/m^3	15 μg/m^3	
Carbon Monoxide (CO)	1 Hour	20 ppm (23 mg/m^3)	Non-Dispersive Infrared Photometry (NDIR)	35 ppm (40 mg/m^3)	—	Non-Dispersive Infrared Photometry (NDIR)
	8 Hour	9.0 ppm (10 mg/m^3)		9 ppm (10 mg/m^3)	—	
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m^3)		—	—	
Nitrogen Dioxide (NO_2)[9]	1 Hour	0.18 ppm (339 μg/m^3)	Gas Phase Chemiluminescence	100 ppb (188 μg/m^3)	—	Gas Phase Chemiluminescence
	Annual Arithmetic Mean	0.030 ppm (57 μg/m^3)		0.053 ppm (100 μg/m^3)	Same as Primary Standard	
Sulfur Dioxide (SO_2)[10]	1 Hour	0.25 ppm (655 μg/m^3)	Ultraviolet Fluorescence	75 ppb (196 μg/m^3)	—	Ultraviolet Flourescence; Spectrophotometry (Pararosaniline Method)
	3 Hour	—		—	0.5 ppm (1300 μg/m^3)	
	24 Hour	0.04 ppm (105 μg/m^3)		0.14 ppm (for certain areas)[10]	—	
	Annual Arithmetic Mean	—		0.030 ppm (for certain areas)[10]	—	
Lead[11,12]	30 Day Average	1.5 μg/m^3	Atomic Absorption	—	—	High Volume Sampler and Atomic Absorption
	Calendar Quarter	—		1.5 μg/m^3 (for certain areas)[12]	Same as Primary Standard	
	Rolling 3-Month Average	—		0.15 μg/m^3		
Visibility Reducing Particles[13]	8 Hour	See footnote 13	Beta Attenuation and Transmittance through Filter Tape	No National Standards		
Sulfates	24 Hour	25 μg/m^3	Ion Chromatography			
Hydrogen Sulfide	1 Hour	0.03 ppm (42 μg/m^3)	Ultraviolet Fluorescence			
Vinyl Chloride[11]	24 Hour	0.01 ppm (26 μg/m^3)	Gas Chromatography			

TABLE 8. Relationship Between Monitoring Objective/Site Type and Scale of Representativeness

Monitoring Objective/Site Type and Scale of Representativeness	
Highest concentration	Micro, middle, neighborhood (sometimes urban for secondary formed pollutants such as ozone)
Population oriented	Neighborhood, urban
Source Impact	Micro, middle, neighborhood
Background and regional transport	Urban, regional
Welfare based	Urban, regional

TABLE 9. Minimum Monitoring Requirements for PAMS

(Note: Refer to section 4.5 of Appendix D of 40 CFR Part 58.)

Area	Type	# Required PAMS Sites	# Active PAMS Sites	# PAMS Sites Needed
SCAQMD Monitoring Area	1 or 3	1	3	0
	2	1	4	0
	4	0	0	0
	Upper Air Meteorology	1	5	0

TABLE 10. Horizontal and Verticle Inlet Probe Placement

Measurement	Spacing from obstructions	Inlet probe height
All neighborhood scale criteria pollutants	>1 m	2 - 15 m
Middle and micro scale particulate pollutants[1]	>2 m	2 - 7 m
Near roadway microscale CO	> 1 m	3 +/- 1/2 m

[1] 2 m apart for flow rates > 200 lpm and 1 m apart for flow rates < 200 lpm

TABLE 11 Minimum Seperation Between Nearest Traffic Lane and Probe Inlet

Roadway Average DailyTraffic	O3 & NO2 at neighborhood and urban scale
≤ 1,000	10
10,000	20
15,000	30
20,000	40
40,000	60
70,000	100
> 110,000	250

TABLE 12 Minimum Separation Between Nearest Traffic Lane and Probe Inlet

Roadway Average DailyTraffic	CO at neighborhood scale
≤ 10,000	10
15,000	25
20,000	45
30,000	80
40,000	115
50,000	135
> 60,000	150

FIGURE 1. Locations of Ozone Monitors

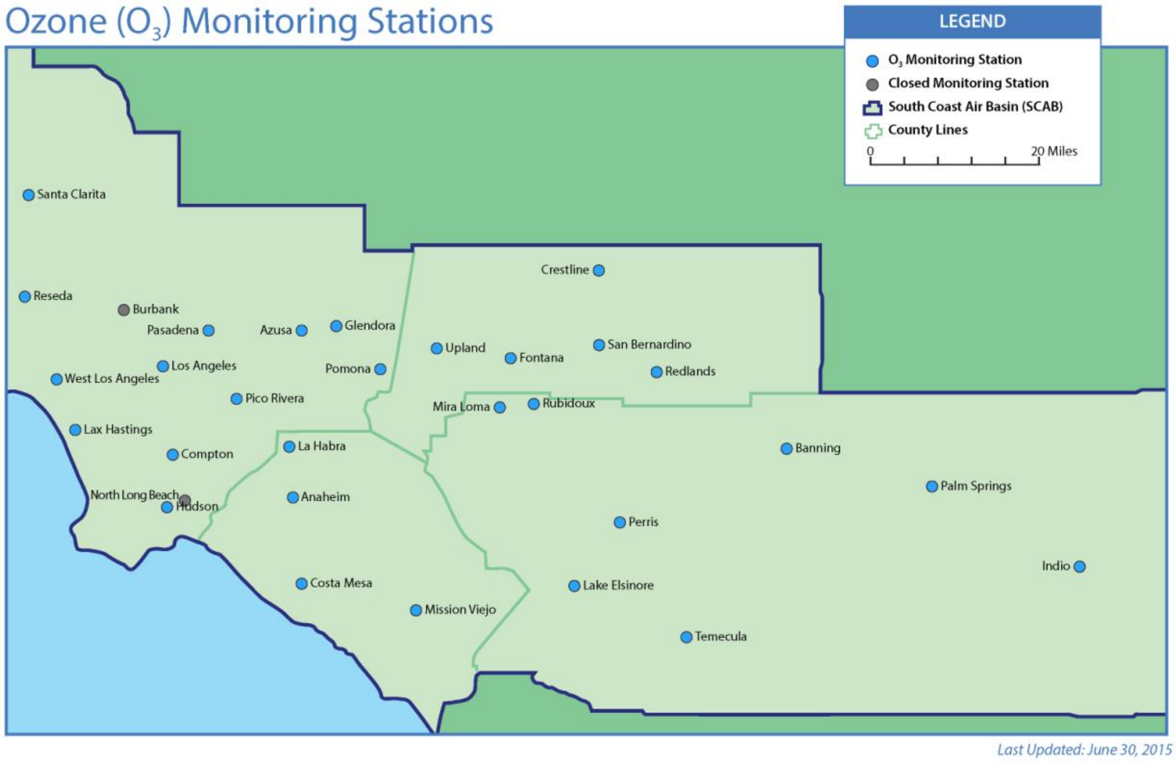


FIGURE 2. Locations of Carbon Monoxide Monitors

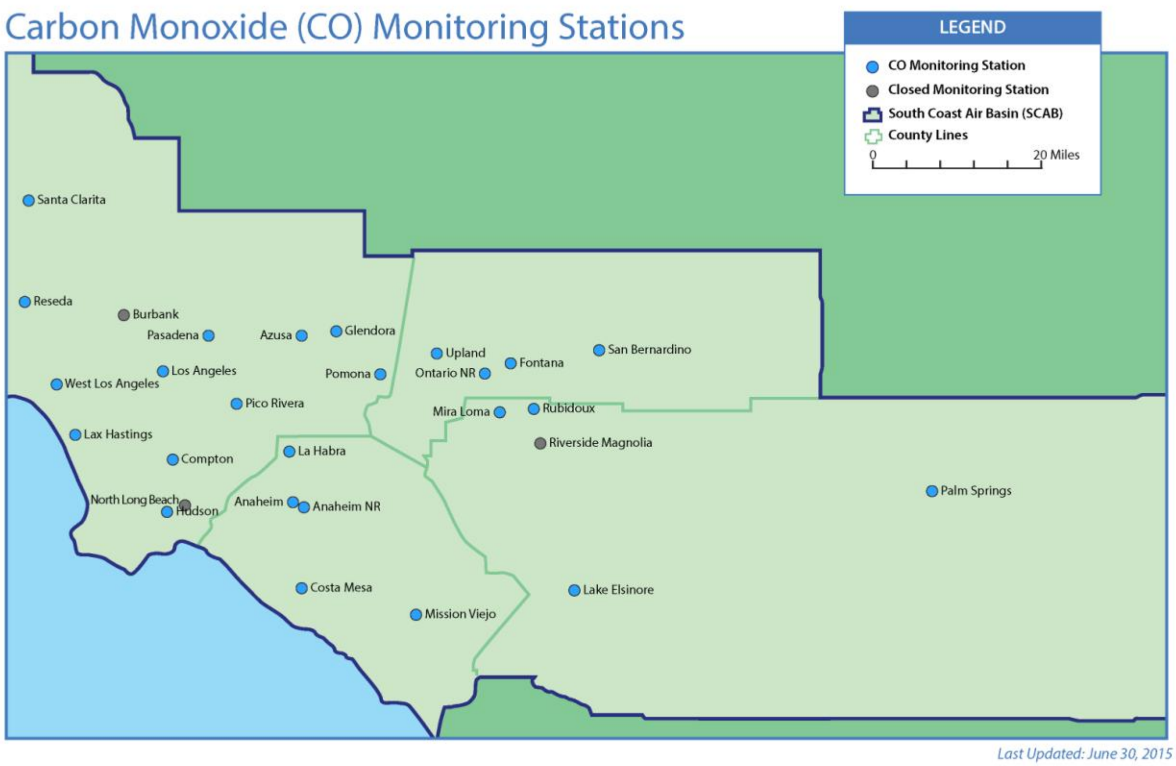


FIGURE 3. Locations of Nitrogen Dioxide Monitors

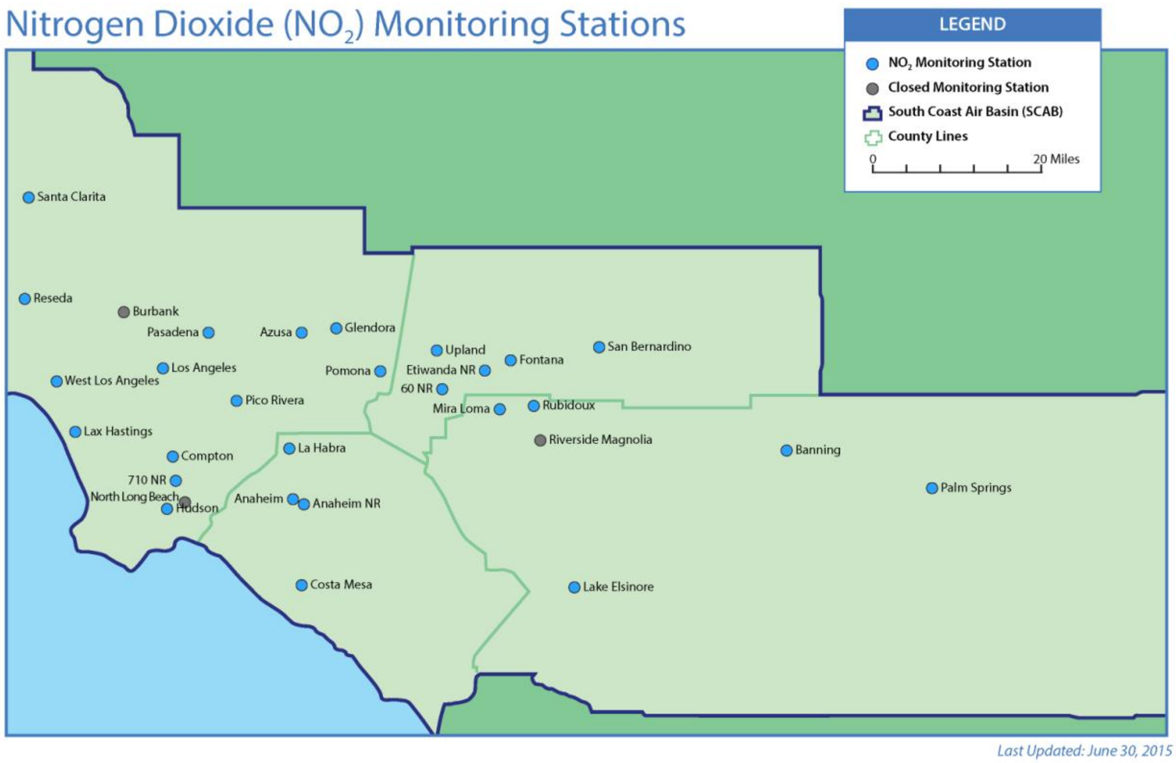


FIGURE 4. Locations of Sulfur Dioxide Monitors

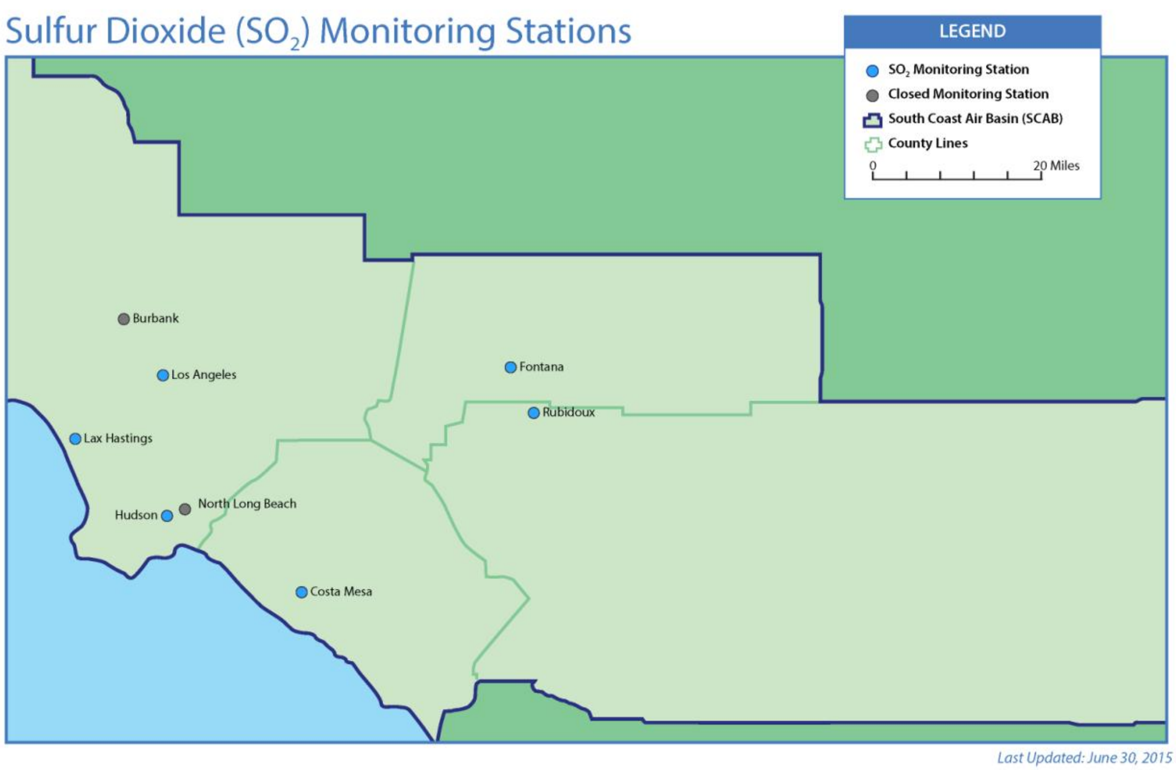


FIGURE 5. Locations of Lead Monitors

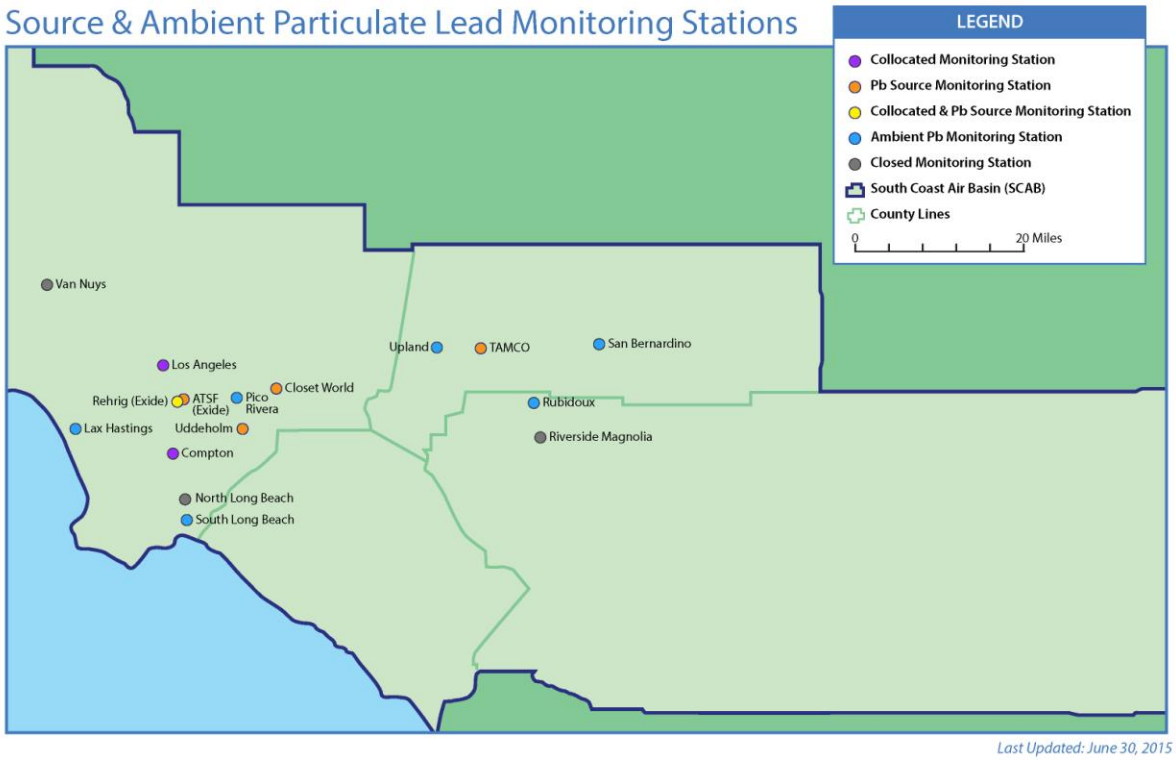


FIGURE 6. Locations of PM10 Monitors

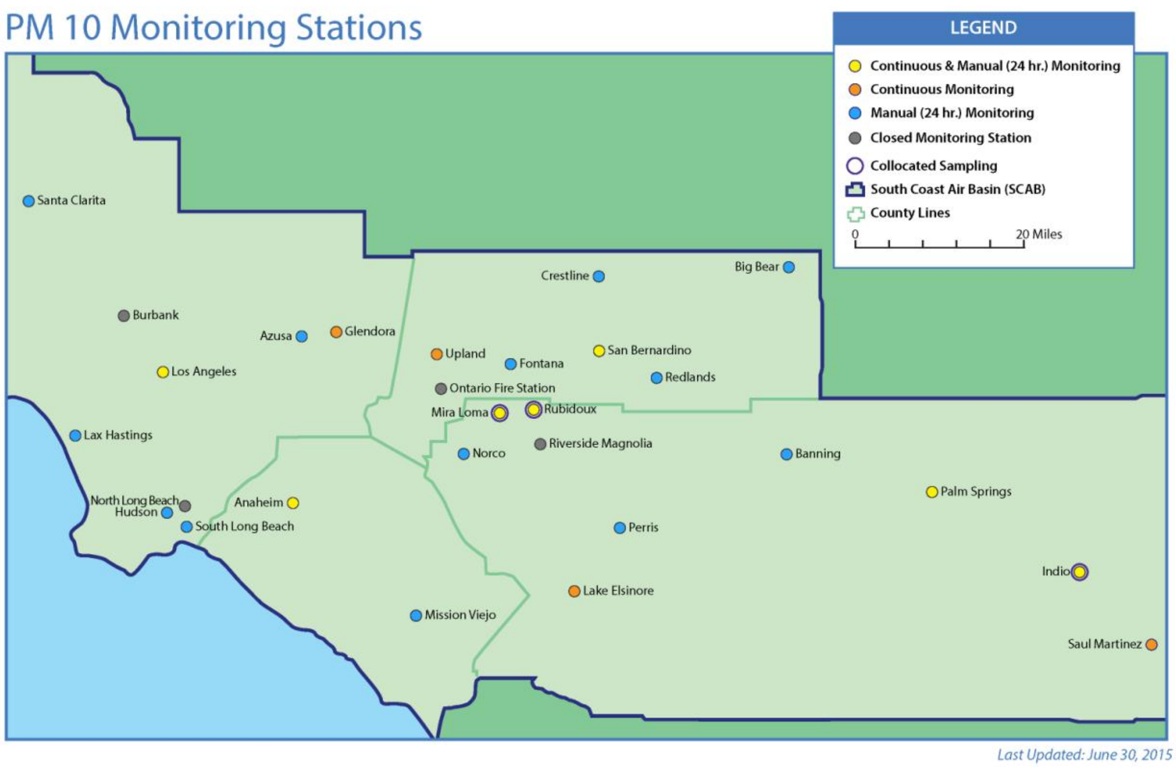


FIGURE 7. Locations of PM2.5 Monitors

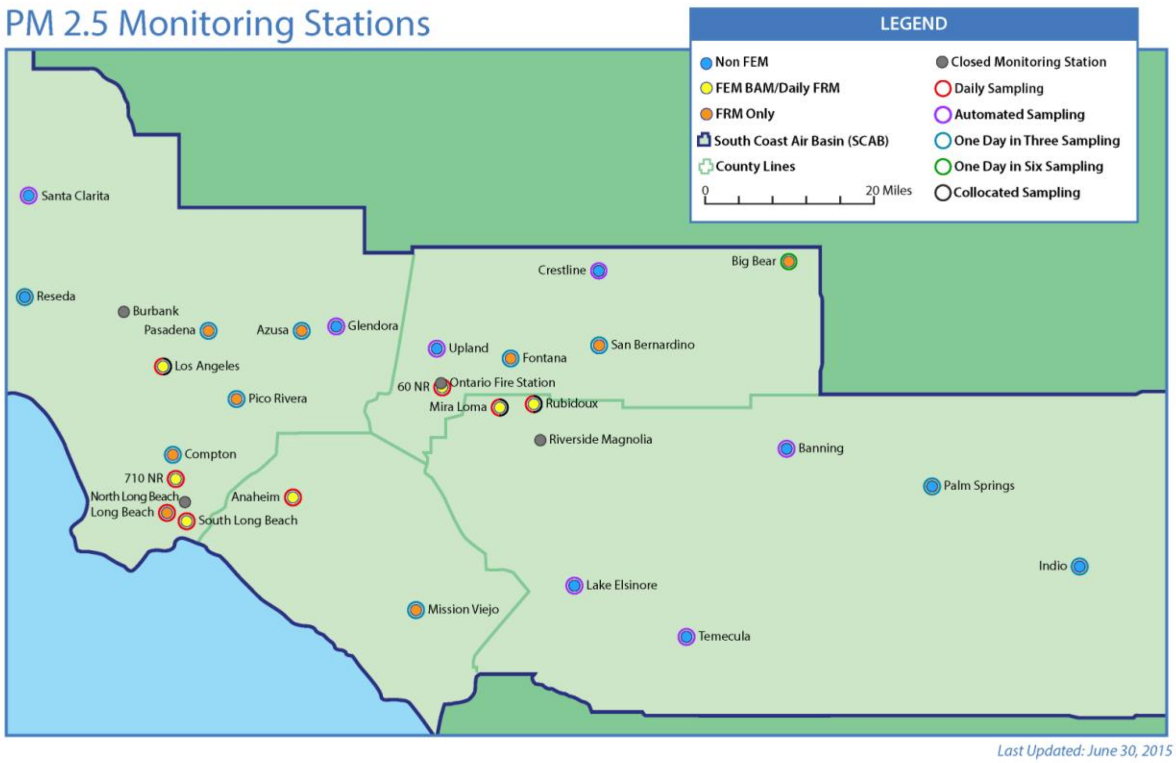
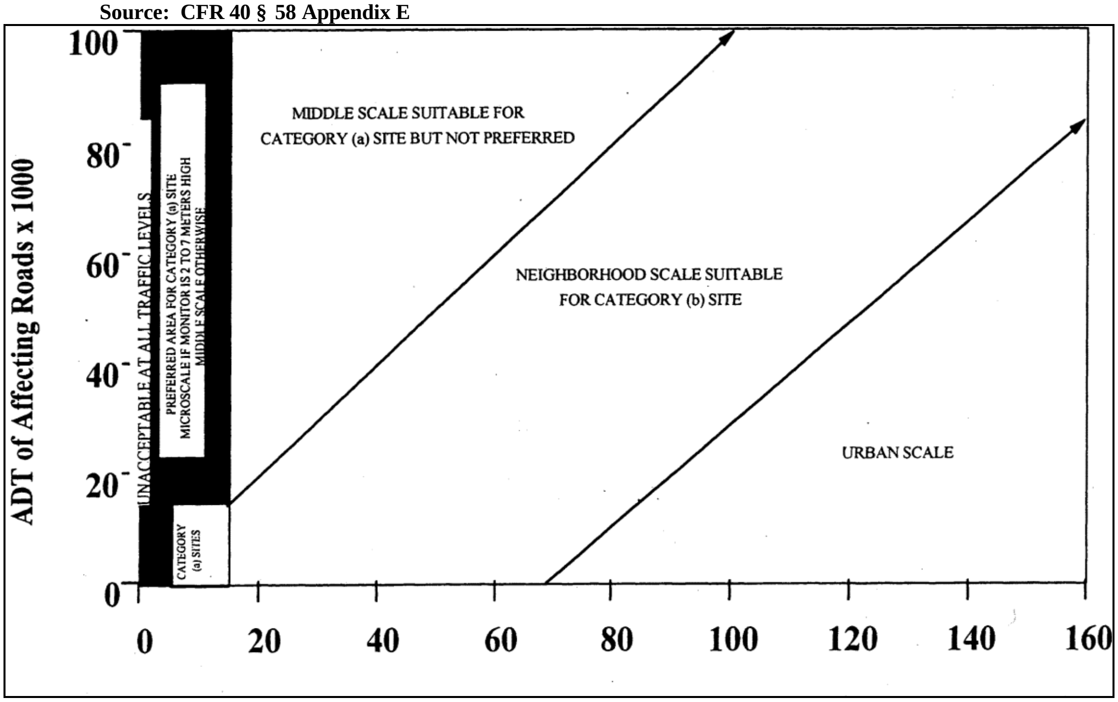


FIGURE 8. Distance of PM Samplers to Nearest Traffic Lane in meters

Source: CFR 40 § 58 Appendix E



II. SITE ASSESSMENTS

OVERVIEW

This section describes the process that was undertaken for assessing individual sites in the SCAQMD monitoring network. It describes criteria used to assess sites, which include site history, security of future occupancy, infrastructure, monitoring objectives, probe siting criteria, data uses, and cost. The assessment criteria also include potential synergies that are considered in assessing the importance of a monitoring site.

SITE ASSESSMENT CRITERIA DESCRIPTIONS

Site History/Longevity

Many sites in the SCAQMD network have been in operation for more than 20 years. Establishing historical data trends over a period of time assists in determining the effectiveness of control measures.

Security of Future Occupancy

Many of the sites in the SCAQMD network are established at properties that are leased on a monthly or annual basis. Many sites are located at municipal properties where continuance of the current agreement will not change in the foreseeable future. There are however, locations where property owner needs such as refusal to establish long term lease, expansion of facilities, remodeling, or increases in rent make security of future occupancy uncertain.

Infrastructure

Consideration of the infrastructure at air monitoring locations is a crucial part of the site assessment. The condition of the building, electrical capabilities, data communication capabilities, and space for expansion are evaluated.

Probe and Monitoring Path Criteria

The earliest monitoring stations were established in the late 1950’s and since that time urban development and changes in land use, population, and air quality trends have affected monitoring objectives and the probe/monitoring path siting criteria so that air pollution data may no longer adequately represent the intended area. Requirements for Probe and Monitoring Path Siting Criteria includes an examination of the horizontal and vertical probe placement, spacing of the probe from obstructions, spacing of the probe in relation to minor sources, and spacing of the probe from roadways based on the individual criteria pollutant spatial scale of representativeness and Average Daily Traffic (ADT).

Non-NAAQS Data Uses

Besides NAAQS compliance status evaluation and progress demonstrations, data from AQMD air monitoring stations is used for real-time public notification of air pollution events, air quality forecasting, and the analysis and modeling for strategic plan development, including the preparation of the Air Quality Management Plan (AQMP). Due to the large population in Southern California and the complexity of the geography and meteorology, a relatively large number of air monitoring stations are needed to adequately describe air quality and meteorology in AQMD's jurisdiction. As a whole, the SCAQMD air monitoring network successfully meets the needs for planning, public notification, and forecasting purposes.

Public Notification

Data from the criteria pollutants that are measured continuously are available to the public in near real time, through the AQMD, U.S. EPA AirNow, and California Air Resourced Board websites, as well as through the AQMD Interactive Voice Response (IVR) automated phone system. Warnings of current air pollution events that occur are transmitted to the public via the AQMD website, fax, email, recorded phone messages, and press releases. The U.S. EPA EnviroFlash alert system is used to alert subscribers of measured unhealthy air quality by email, RSS feeds or Twitter alerts. At this time, air quality notifications are primarily driven by PM2.5 and summertime O3 measurements, although PM10 episodes can also occur occasionally during exceptional events (e.g., natural windblown dust events, wildfires, and fireworks displays). A robust real-time network is needed to support the accurate mapping of data and transmittal of episodic health information for the large population and geographic diversity of the SCAB and the Coachella Valley.

Air Quality Forecasting

AQMD provides daily air quality forecasts to the public, predicting day-in-advance concentrations and Air Quality Index (AQI) values of O3, PM2.5, PM10, CO, and NO2 for 38 source-receptor areas throughout SCAQMD's jurisdiction. The forecasts are disseminated to the public through the SCAQMD and U.S. EPA AirNow websites, the SCAQMD IVR phone system, and through the news media, as well as by subscription via fax, email, RSS feeds, and Twitter (using EnviroFlash). SCAQMD also provides high wind/windblown dust forecasts for the Coachella Valley for SCAQMD Rule 403.1, agricultural and wildland prescribed fire burn forecasts and, starting in November 2010, residential wood burning forecasts. SCAQMD air quality forecast tools utilize forecaster experience, empirical/statistical models, and prognostic grid models. Current and historical air quality and meteorological data are critical to the forecasting process. The SCAQMD measurements are used to develop the empirical models and to provide current inputs during daily forecast preparation. The monitoring data is also used to evaluate and refine the prognostic grid models.

Air Quality Planning

AQMD measurements are important for the air quality planning process, including strategic plan development to demonstrate future year attainment of the NAAQS. Current levels and historic air quality trends are documented as a component of the AQMP and reasonable further progress analyses. Meteorological and air quality models are used to simulate representative past episodes or longer periods, as compared to measured air quality data throughout the region. Emissions are then be adjusted in the model for future years, based on projected population, business growth, infrastructure and the effect of control measures, to evaluate the efficacy of potential emissions control strategies. A relatively dense monitoring network of pollutants and their precursors is needed throughout the modeling domain to adequately evaluate the ability of the models to simulate air quality.

Health Studies
Support for air pollution research studies is prime objective in assessing the value of an air monitoring location. Air pollution data collected is used to supplement data collected by researchers working on health effects assessments. Sites used as platforms for scientific studies, involved with health or welfare impacts, measurement methods development, or used as collaborative efforts with researchers are considered here due to their important role in supporting the air quality management program.

Environmental Justice (EJ)
Following the SCAQMD Board's EJ initiatives in October 1997, the SCAQMD has been a leader in identifying and addressing community EJ concerns, particularly as raised by low income, ethnic minority communities who may be disproportionately impacted by localized emissions and mobile source pollutants. In support of the program, toxics monitoring and periodic health effects studies take place at air monitoring locations throughout the network. Support of these studies is taken into consideration while determining the value of an air monitoring location.

Investment Cost
Assessment of the cost to relocate a site in the case of lease loss, safety, siting issues or other issues that could force a site to move is an important factor in determining the value of a monitoring location. Cost assessment takes into account the availability of sampling locations in the area, as well as the cost of rent and the number of monitors at the sampling site in order for the ambient measurements conducted to meet probe and Monitoring Path Siting Criteria.

Synergies
Consideration of potential synergies between monitoring programs and external objectives are taken into account while establishing the value of the monitoring location. Establishing synergies between monitoring programs such as NCore, PAMS, NATTS, Health Studies, and SCAQMD EJ programs enhance the value of the monitoring location. Synergies that are external to the air monitoring network that are taken into consideration while determining the value of the site include use of facilities by SCAQMD field inspection personnel for office space and data communications.

INDIVIDUAL SITE ASSESSMENTS

Over the last twenty years, population, sources of pollution, ambient levels of pollution, and the surveillance air monitoring network have been modified and may no longer represent the original network design monitoring objectives. The effects of these factors as well as data and monitoring needs are assessed by site. Measurements taken at each air monitoring site, AQS number, and date of inception are shown in Table 1. The Probe and Monitoring Path Assessment is shown in Table 13 and is summarized in Tables 14 and 15.

Anaheim

The Anaheim site was established at its current location at 1630 Pampas Lane in August 2001 after moving from 1010 Harbor Blvd. due to sale of the Orange County Agricultural Department facility where the site had resided since 1981. SCAQMD currently holds a 5 year lease with the Anaheim School District for the current monitoring location and does not anticipate any changes in the near future. The infrastructure of the facility requires attention. The current monitoring platform began as a temporary location, and therefore was not supported adequately. The monitoring platform needs to be removed, and supported properly with a cement base. Concurrently, the compound in which the site is housed needs to be expanded and electrical wiring upgraded to accommodate the necessary changes to meet Probe and Monitoring Path Siting Criteria path criteria. The site does not currently meet 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria, specifically spacing from trees requirement and probe distance from traffic lane. Spacing from trees for all pollutants should be at least 10 m and distance from traffic land should be a minimum of 10 m and 15 m respectively for gaseous and particulate pollutants. Distances are shown in Table 13. Non-NAAQS data uses include modeling and forecasting of daily pollution levels for public information. Synergies between air monitoring programs include speciated PM2.5 sampling, Radnet program, EJ, and regional toxics air monitoring studies. The site investment cost to meet Probe and Monitoring Path Siting Criteria is high due to the number of instruments at the site, cost of rent in the area, and length of service.

Anaheim Near Road
The Anaheim Near Road site was established at its current location at 812 W. Vermont St. in January 2014 as required SCAQMD currently holds a three year lease with the property owner for the current monitoring location and does not anticipate any changes in the near future. The site meets 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria, specifically probe distance from traffic lane. Distances are shown in Table 13.

ATSF (Exide)
The ATSF site was established at its current location in January 1999 to monitor Pb source emissions from the Exide facility in the City of Commerce. Currently an agreement with the owners of the property for air monitoring and do not anticipate any changes in the near future. The infrastructure is adequate and probe siting criteria meets requirements for source impact siting. The investment cost is low, but there are currently no better locations in the area.

Azusa
The Azusa site was established at its current location in January 1957. SCAQMD currently holds a five year lease for the monitoring location and does not anticipate any changes in the near future. The infrastructure meets the needs of the air monitoring network. The site is in compliance with 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria. Non-NAAQS data uses include modeling and forecasting of daily pollution levels for public information. Synergies between air monitoring programs include PAMS, CARB, and administrative synergies include use of office space for Air Quality Inspectors. The investment cost for the site is high due to the number of instruments at the site, cost of rent in the area, and length of service.

Banning Airport

The Banning Airport site was established at its current location during April 1997, after moving from the Banning-Alessandro air monitoring location. SCAQMD holds a four year lease with the airport for this monitoring location and does not anticipate any changes in the near future. The infrastructure of the facility meets the needs of the air monitoring network. The site meets 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria. Non-NAAQS data uses include modeling and forecasting of daily pollution levels for public information. Administrative synergies include use of office space for Air Quality Inspectors. The investment cost for the site to meet Probe and Monitoring Path Siting Criteria is high due to the number of instruments at the site, cost of rent in the area, and length of service.

Big Bear

The Big Bear site was established at its current location in February 1999 to assess PM2.5 winter wood smoke. SCAQMD currently has a two year agreement with airport management and do not anticipate any changes in the near future. The infrastructure is adequate and meets 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria. The investment cost for the location is low, and there have been no exceedances of the PM2.5 standard, however the cost to maintain the site is high due to the distant location.

Burbank

The Burbank site was established at its current location at 228 West Palm Avenue during October 1961. During July 2015, the lease was terminated at the request of the property owner. SCAQMD is working with the City of Burbank, and Los Angeles County to find a suitable site in the neighboring area to relocate. Non-NAAQS data uses for the site included modeling and forecasting of daily pollution levels for public information. Synergies between air monitoring programs include PAMS, other Federal Program Monitoring, Regional Toxics studies, and CARB Toxics monitoring. Administrative synergies include use of office space for Air Quality Inspectors. The investment cost for the site to meet Probe and Monitoring Path Siting Criteria will be higher than the previous location due to the high cost of rent in the area and number of monitors.

Closet World (Quemetco)

The Closet World site was established at its current location in October 2008 to monitor Pb source emissions from the Quemetco facility in the City of Industry. Currently there is an agreement with the owners of the property to allow for air monitoring and SCAQMD does not anticipate any changes in the near future. The infrastructure is adequate and probe siting criteria meets requirements for source impact siting. The investment cost is low due to a single instrument at the site.

Compton

The Compton site was established at its current location at 700 North Bullis Road in January 2004 after moving from the Lynwood site due to inadequate site infrastructure. SCAQMD currently holds a 10 year lease with the City of Compton for the current monitoring location and do not anticipate any changes in the near future. The infrastructure of the site meets the needs of the air monitoring network. The site meets requirements of 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria, for spacing from roadways, trees, and obstructions. Non-NAAQS data uses include modeling and forecasting of daily pollution levels for public information. Administrative synergies include use of office space for Air Quality Inspectors. The investment cost for the site is high due to the number of instruments at the site and cost of rent in the area.

Costa Mesa
The Costa Mesa site was established at its current location in November 1989. SCAQMD currently holds a five year lease with the owners for the current monitoring location and does not anticipate any changes in the near future. The site lacks adequate space to expand to include particulate sampling. The site meets requirements of 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria, for spacing from roadways, trees, and obstructions. Non-NAAQS data uses include modeling and forecasting of daily pollution levels for public information. Administrative synergies include use of office space for Air Quality Inspectors. The investment cost for the site is significant; however, finding a site that can accommodate particulate sampling could add value to the network.

Crestline
The Crestline site was established at its current location at Lake Gregory in October 1973. SCAQMD is currently negotiating a five year lease for the current monitoring location with the San Bernardino County Regional Parks Department, but does not anticipate any changes in the near future. The infrastructure of the facility is in the process of being upgraded. The current monitoring platform is outdated and lacks sufficient space. The site does not currently meet 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria, specifically spacing from trees requirement. Distances are shown in Table 13. A waiver has been requested in the 2015 Annual Network Plan. Non-NAAQS data uses include modeling and forecasting of daily pollution levels for public information. The investment cost for the site is high due to the number of instruments at the site, cost of rent, and length of service.

Fontana
The Fontana site was established at its current location at 14360 Arrow Highway during August 1981. Currently a month to month lease is held with San Bernardino County Fire for the monitoring location. The fire station is in the process of moving which may impact station operations after October, 2015. However SCAQMD has been offered space at the new facility. The current infrastructure meets the needs of the air monitoring network; however, there is no room for further expansion. The site is in compliance with 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria, however, the adjacent property is a large dirt lot which contains vegetation which can potentially cause siting problems in the coming years, if the same location is held. Non-NAAQS data uses include modeling and forecasting of daily pollution levels for public information. Synergies between air monitoring programs include speciated PM2.5 sampling, Radnet program, EJ, and Regional Toxics Air Monitoring Studies. The investment cost for the site is high due to the number of instruments at the site, cost of rent in the area, and length of service.

Glendora
The Glendora site was established at its current location at 840 E. Laurel during August 1980. Currently a month to month lease is held with the city of Glendora for the monitoring location and there is concern about the future stability of remaining at the location. The current

monitoring platform is housed in a structure which requires attention. The site was established by CARB in a now outdated housing. The monitoring platform needs to be removed, and supported properly with a cement base. The compound in which the site is housed needs to be expanded and electrical wiring upgraded to accommodate the necessary changes to meet Probe and Monitoring Path Siting Criteria path criteria. The site is in compliance with 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria; however, the area is surrounded by a vacant dirt lot which can have an impact on particulate readings. Distances are shown in Table 13. Non-NAAQS data uses include modeling and forecasting of daily pollution levels for public information. Synergies between air monitoring programs include the Federal Program Monitoring program, regional toxics studies, and regional health studies. The investment cost is high due to the number of instruments at the site, cost of rent in the area, and length of service.

Indio

The Indio site was established at its current location at 46-990 Jackson Street during January 1983. SCAQMD currently holds a month to month lease with the city of Indio and does not anticipate any changes in the near future. The current monitoring platform was recently upgraded to a new platform. The site complies with 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria; a study has been completed to determine if the nearby dirt lot used as parking has an impact on particulate readings. Results show a less than 10% difference between monitors at site and a nearby location, distances from instrumentation to dirt lot are shown in Table 13. Non-NAAQS data uses include modeling and forecasting of daily pollution levels for public information. The investment cost is high due to the number of instruments at the site, cost of rent in the area, and length of service.

La Habra

The La Habra site was established at its current location at 621 West Lambert Road during August 1960. SCAQMD currently holds a month to month lease with the city of La Habra and does not anticipate any changes in the near future. The site lacks adequate space to expand to include particulate sampling and the monitoring structure requires attention. The site does not currently meet 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria, specifically spacing from trees requirement and probe distance from traffic lane. Spacing from trees for all pollutants should be at least 10 m and distance from traffic land should be a minimum of 10m and 15m respectively for gaseous and particulate pollutants. Distances are shown in Table 13. Non-NAAQS data uses include modeling and forecasting of daily pollution levels for public information. Synergies between air monitoring programs include speciated PM2.5 sampling, Radnet program, and regional toxics air monitoring studies. The investment cost for the site is high due to the number of instruments at the site, cost of rent in the area, and length of service.

Lake Elsinore

The Lake Elsinore site was established at its current location at 506 West Flint St. during June 1987. SCAQMD currently holds a four year lease with the City of Lake Elsinore for the monitoring location and does not anticipate any changes in the near future. The infrastructure meets the needs of the air monitoring network. The site complies with 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria; however, the adjacent property contains vegetation which can potentially cause siting problems in the coming years. Non-NAAQS data uses include modeling and forecasting of daily pollution levels for public information. Synergies between air monitoring programs include regional health studies. The investment cost for the site to meet Probe and Monitoring Path Siting Criteria is high due to the number of instruments at the site, cost of rent in the area, and length of service.

LAX Hastings

The LAX Hastings site was established at its current location at 7201 W. Westchester Parkway during April 2004. The site was established to replace the Hawthorne air monitoring location located on the grounds of Anza Elementary School in Hawthorne. SCAQMD currently holds a month to month lease with Los Angeles International Airport for the monitoring location and does not anticipate any changes in the near future. The infrastructure meets the needs of the air monitoring network; however, there is no room for further expansion within the current compound. The site complies with 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria. Non-NAAQS data uses include modeling and forecasting of daily pollution levels for public information. Synergies between air monitoring programs include PAMS and regional toxics air monitoring studies. The investment cost for the site will be significant due to the number of samplers and the current low cost lease.

Long Beach (Hudson)

The Long Beach (Hudson) site was added as part of the MATES IV study. As part of the action to provide enhanced coverage, the Long Beach (Hudson) site has remained, collecting Ozone, Carbon Monoxide, Nitrogen Dioxide, Sulfur Dioxide, and particulate data to represent the Long Beach area. An annual lease is held with Long Beach Unified School District for the monitoring location, but an assessment is being conducted for potential consolidation with nearby sites. The infrastructure meets the needs of the air monitoring network; however, there is no room for further expansion within the current compound. The site does not currently meet 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria, specifically probe distance from traffic lane. Distance from traffic lane should be a minimum of 10 m and 15 m respectively for gaseous and particulate pollutants. Distances are shown in Table 13. Non-NAAQS data uses include modeling and forecasting of daily pollution levels for public information. The investment cost for the site will be significant due to the current low cost lease.

Long Beach Near Road

The Long Beach near road site was established at its current location at 5895 Long Beach Blvd in January 2015 as required. SCAQMD currently holds a two year lease with the property owner for the current monitoring location and does not anticipate any changes in the near future. The site meets 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria, specifically probe distance from traffic lane. Distances are shown in Table 13.

Long Beach (North)

The North Long Beach site was established at 3648 N Long Beach Blvd during October 1961. During July 2015, the lease was terminated at the request of the property owner. SCAQMD is working with the City of Long Beach, and Long Beach Department of Public Health to find a suitable site within one mile to relocate. Non-NAAQS data uses include modeling and forecasting of daily pollution levels for public information. Synergies between air monitoring programs include Speciated PM2.5, Regional Health Studies, EJ, Regional Toxics studies, and

CARB Toxics monitoring. The investment cost for the site is high due to the number of instruments, cost of rent in the area, and length of service.

South Long Beach

The South Long Beach site was established at its current location at 1305 E Pacific Coast Highway during June 2003 to monitor particulate influence from port activities. SCAQMD currently has an agreement to monitor with the Long Beach City College for the current monitoring location and does not anticipate any changes in the near future. The infrastructure of the facility meets the needs of particulate sampling, but there are no facilities for continuous analyzers and no room for expansion. The site does not currently meet 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria, specifically spacing from obstructions surrounding the instrumentation. Distances are shown in Table 13. Non-NAAQS data uses include modeling and forecasting of daily pollution levels for public information. There are no synergies between air monitoring programs or use of office space by inspectors. The investment cost for the site is low due to the number of samplers but can be mitigated by consolidation with a nearby site.

Los Angeles (Main Street)

The Los Angeles Main Street site was established at its current location at 1630 North Main Street in September 1979. SCAQMD currently holds a month to month lease with the Los Angeles Department of Water and Power (LAW) for the current monitoring location and does not anticipate any changes in the near future. The infrastructure of the facility has been recently updated. The site is currently in compliance with 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria. Non-NAAQS data uses include modeling and forecasting of daily pollution levels for public information. Synergies between air monitoring programs include speciated PM2.5 sampling, PAMS, STN, NATTS, NCORE, EJ, regional health studies, regional toxics studies, and CARB Toxics monitoring. The investment cost for the site is high due to the number of instruments at the site, cost of rent in the area, and length of service.

Mira Loma (Van Buren)

The Mira Loma Van Buren was established at its current location at 5130 Poinsettia Drive during November 2005. This location served as a replacement for the Mira Loma Jurupa site due to the location's poor instrument siting and infrastructure. SCAQMD currently has a no cost agreement with the Jurupa Unified School District for the monitoring location and does not anticipate any changes in the near future. The site complies with the requirements of 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria. Non-NAAQS data uses include modeling and forecasting of daily pollution levels for public information. Synergies between air monitoring programs include regional health studies and regional toxics studies.

Mission Viejo

The Mission Viejo site was established at its current location at 26081 Via Pera during June 1999. SCAQMD currently holds a five year lease with the El Toro Water District for the monitoring location and does not anticipate any changes in the near future. The infrastructure meets the needs of the air monitoring network; however, there is no room for further expansion within the current compound. The site complies with 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria. Non-NAAQS data uses include modeling and forecasting of daily pollution levels for public information. The investment cost would be significant due to the number of samplers and the current low cost lease.

Norco

The Norco site was established at its current location on the grounds of the Naval Surface Warfare Center in December 1980 to examine O3 and particulates. SCAQMD currently has a month to month contract and does not anticipate any changes in the near future. The infrastructure of the facility meets the needs of particulate sampling. The site complies with 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria. The cost to maintain the site is high, with a technician traveling to the site to maintain a single instrument. Non-NAAQS data uses include modeling and forecasting of daily pollution levels for public information. There are no synergies between air monitoring programs or use of office space by inspectors. The investment cost for the site is low to a single instrument at the site. This cost can be further mitigated by consolidation with a nearby site.

Ontario Fire Station

The Ontario Fire Station site was established at its current location at 1408 E. Francis during January 1999. During July 2015, the lease was terminated at the request of the property owner. There are no synergies between air monitoring programs or use of office space by inspectors. The investment cost for the site is high due to the number of samplers. SCAQMD is considering mitigating loss of location by consolidation with a nearby site.

Ontario Etiwanda Near Road

The Ontario Near Road site was established at its current location at NW Corner Interstate 10 & Etiwanda in July 2014 to meet near road requirement for monitoring. SCAQMD currently holds a three year lease with the State of California for the current monitoring location and does not anticipate any changes in the near future. The site meets 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria, specifically probe distance from traffic lane. Distances are shown in Table 13.

Ontario Route 60 Near Road

The Ontario Near Road site was established at its current location at 2330 S. Castle Harbour in January 2015 to meet near road requirement for monitoring. SCAQMD currently holds a three year lease with the property owner for the current monitoring location and does not anticipate any changes in the near future. The site meets 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria, specifically probe distance from traffic lane. Distances are shown in Table 13.

Palm Springs

The Palm Springs site was established at its current location at 590 Racquet Club Road during April 1971. SCAQMD currently holds a four year lease with the City of Palm Springs for the current monitoring location and does not anticipate any changes in the near future. The infrastructure of the facility currently meets the needs of the monitoring network, but there is no room for future expansion. The site does not currently meet 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria, specifically spacing from obstructions and probe distance from traffic lane. Distances are shown in Table 13. Non-NAAQS data uses include modeling and forecasting of daily pollution levels for public information. There are no synergies between air monitoring programs or use of office space by inspectors. The investment cost for the site will be high due to number of analyzers and length of service.

Pasadena

The Pasadena site was established at its current location at 752 Wilson Ave during April 1982. SCAQMD currently holds a month to month lease with the California Institute of Technology for the current monitoring location and does not anticipate any changes in the near future. The infrastructure of the facility was recently upgraded. The site does not currently meet 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria, specifically spacing from trees requirement. Spacing from trees for all pollutants should be at least 10 m. Distances are shown in Table 13. Non-NAAQS data uses include modeling and forecasting of daily pollution levels for public information. There are no synergies between air monitoring programs or use of office space by inspectors. The investment cost for the site will be higher due to the number of samplers, length of service, and cost of space in the area.

Perris

The Perris site was established at its current location at 237 North D Street during May 1973. SCAQMD currently holds a month to month lease for the current monitoring location with Riverside County and does not anticipate any changes in the near future. The infrastructure of the facility requires attention. The current monitoring platform is housed in a structure, which is in need of repair. The site does not currently meet 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria, specifically spacing from obstructions. Distances are shown in Table 13. Non-NAAQS data uses include modeling and forecasting of daily pollution levels for public information. There are no synergies between air monitoring programs or use of office space by inspectors. The investment cost for the site will be higher than the current location, which is at no cost due to its location on a public facility.

Pico Rivera #2

The Pico Rivera #2 site was established at its current location at 4144 San Gabriel River Parkway in September 2005 after moving from 3713-B San Gabriel River Parkway due to influences from surrounding facilities. SCAQMD currently holds a two year lease with the Whittier Utility Authority; however the facility is undergoing construction and arrangements are being made to relocate the monitoring platform within the facility. The infrastructure of the facility meets the needs of the air monitoring network. The site complies with 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria. Distances are shown in Table 13. Non-NAAQS data uses include modeling and forecasting of daily pollution levels for public information. Synergies between air monitoring programs include PAMS and Regional Toxics studies. The investment cost for the site is high due to the number of samplers, length of service and cost of space in the area.

Pomona

The Pomona Fire Station site was established at its current location at 924 Garey Ave in June 1965 to investigate CO emissions from motor vehicles. SCAQMD currently holds a three year lease and does not anticipate any changes in the near future. The site does not currently meet 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria, specifically spacing from roadway for O3 and NO2. Distances are shown in Table 13. Non-NAAQS data uses include modeling and forecasting of daily pollution levels for public information. There are no synergies between air monitoring programs; however, calibration and repair technicians use office space. The investment cost for the site is high due to the number of samplers and length of service, but this can be mitigated by consolidation with a nearby sites.

Redlands
The Redlands site was established at its current location at 500 Deerborn Ave during September 1986. SCAQMD currently holds a five year lease with the City of Redlands and does not anticipate any changes in the near future. The infrastructure has recently been upgraded to a new monitoring platform. The site meets 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria distances, and are shown in Table 13. Non-NAAQS data uses include modeling and forecasting of daily pollution levels for public information. There are no synergies between air monitoring programs or use of office space. The investment cost for the site will be higher than the current location, which is on a public facility.

Rehrig (Exide)
The Rehrig site was established at 4010 E. 26th Street in the City of Vernon during October 2007 to monitor Pb source emissions from the Exide facility in the City of Vernon. SCAQMD currently has an agreement with the owners of the property to allow for sampling and does not anticipate any changes in the near future. The infrastructure is adequate and probe siting criteria meets requirements for source impact siting.

Reseda
The Reseda site was established at its current location at 18330 Gault Street during March 1965. SCAQMD currently hold a five year lease with the owners of the monitoring location and does not anticipate any changes in the near future. The infrastructure of the facility is adequate. The site however does not currently meet 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria, specifically spacing from traffic lane for O3 and NO2. Distances are shown in Table 13. Non-NAAQS data uses include modeling and forecasting of daily pollution levels for public information. There are no synergies between air monitoring programs; however, administrative synergies include use of office space for Air Quality Inspectors. The investment cost for the site will be higher than the current location due to the high cost of rent in the area, number of monitors, and length of service.

Riverside (Magnolia)
The Riverside site was established at its current location at 7002 Magnolia Avenue during October 1972 by CARB to investigate CO emissions from motor vehicles. During July 2015, the lease was terminated at the request of the property owner. Synergies between air monitoring programs include health studies research; administrative synergies include use of office space for Air Quality Inspectors. The investment cost for the site is high due to the number of samplers SCAQMD is considering mitigating loss of location by consolidation with a nearby site.

Rubidoux
The Rubidoux site was established at its current location at 5888 Mission Boulevard during September 1972. SCAQMD currently holds a three year lease with Southern California Edison

for the current monitoring location and does not anticipate any changes in the near future. The infrastructure of the facility has been recently updated and meets the need of monitoring network. The site is currently in compliance with 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria. Non-NAAQS data uses include modeling and forecasting of daily pollution levels for public information. Synergies between air monitoring programs include speciated PM2.5 sampling, PAMS, STN, NATTS, NCORE, CARB Toxics monitoring, and regional toxics air monitoring studies. The investment cost for the site will be higher than the current location due to the number of monitors, length of service, and cost of rent in the area.

San Bernardino

The San Bernardino site was established at its current location at 24302 East 4th Street during May 1986. SCAQMD currently holds a three year lease with the City of San Bernardino Unified School District and does not anticipate any changes in the near future. The infrastructure of the facility requires attention. The current monitoring platform is housed in a structure that is outdated. Money has been set aside for a new monitoring platform, but basic infrastructure is lacking and the compound in which the site is housed needs to be expanded. The site complies with 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria with criteria shown in Table 13. Non-NAAQS data uses include modeling and forecasting of daily pollution levels for public information. Synergies between air monitoring programs include EJ and regional toxics studies. The investment cost for the site will be higher than the current location due to the number of instruments, length of service, and cost of rent in the area.

Santa Clarita

The Santa Clarita site was established at its current location at 22224 Placerita Canyon Road during May 2001 after moving from 24875 San Fernando Road at the request of Los Angeles County Fire Station #73. SCAQMD currently has an agreement with Los Angeles County for space and does not anticipate any changes in the near future. The infrastructure of the facility meets the needs of the air monitoring network. The site complies with 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria. Distances are shown in Table 13. Non-NAAQS data uses include modeling and forecasting of daily pollution levels for public information. Synergies between air monitoring programs include PAMS and Regional Toxics studies. The investment cost for the site is high due to the number of samplers, length of service, and cost of space in the area.

SA Recycling

The SA Recycling site was established at 8822 Etiwanda Ave. in Rancho Cucamonga during June 2012 to monitor Pb source emissions from the TAMCO facility. SCAQMD currently has an agreement with the owners of the property to allow for sampling and does not anticipate any changes in the near future. The infrastructure is adequate and siting criteria meets requirements for source impact siting.

Saul Martinez Elementary

The Saul Martinez site was established at 65705 Johnson St. in Mecca during January 2011 as a special monitoring site. This site was upgraded in 2013 for establishing a more permanent presence. The primary objective of this monitoring site is to place monitoring resources at a

Salton Sea location where peak hydrogen sulfide concentrations are expected to occur, and also measure PM10. The monitoring sites will provide data that can be used to assess population exposures in case of odor events and for comparison to the state standard for hydrogen sulfide. SCAQMD currently has an agreement with the owners of the property to allow for sampling and does not anticipate any changes in the near future. The infrastructure is adequate and siting criteria meets requirements for source impact siting.

Temecula
The Temecula site was established at its current location at Lake Skinner MWD Facilities during July 2010. SCAQMD currently holds an open ended lease with MWD for the current monitoring location and does not anticipate any changes in the near future. The infrastructure meets the needs of the monitoring network and complies with 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria. Non-NAAQS data uses include modeling and forecasting of daily pollution levels for public information. There are no synergies between air monitoring programs and the site is restricted to operations personnel only.

Uddelholm
The Uddelholm site was established at 9313 Santa Fe Springs Road in the City of Santa Fe Springs during October 1992 to monitor Pb source emissions from the Trojan Battery facility. SCAQMD currently has an agreement with the owners of the property to allow for sampling and does not anticipate any changes in the near future. The infrastructure is adequate and probe siting criteria meets requirements for source impact siting.

Upland
The Upland site was established at its current location at 1350 San Bernardino Road during March 1973. SCAQMD currently holds a month to month lease with the Upland Cascade Mobile Home Park for the monitoring location and does not anticipate any changes in the near future. The monitoring platform is adequate for the current location and the site is in compliance with 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria. Non-NAAQS data uses include modeling and forecasting of daily pollution levels for public information. Synergies between air monitoring programs include the regional health studies. The investment cost for the site will be high due to potential higher rent, number of samplers, and length of service. This can be mitigated by consolidating the site with nearby air monitoring locations.

West Los Angeles
The West Los Angeles site was established at its current location at Wilshire and Sawtelle Boulevards on the grounds of the Veterans Administration Hospital during May 1984. SCAQMD currently has a monthly agreement with the VA Administration to monitor and there could be changes in the near future dependent upon VA policies. The infrastructure of the facility requires attention. The current monitoring platform is housed in a structure that is outdated. The site complies with 40 CFR § 58 Appendix E Probe and Monitoring Path Siting Criteria with criteria shown in Table 13. Non-NAAQS data uses include modeling and forecasting of daily pollution levels for public information. There are no synergies between air monitoring programs or use of office space. The investment cost for the site will be higher than the current location due to the number of instruments, length of service, and cost of rent in the area.

TABLE 13. Probe and Monitoring Path Siting

Metric		Horizontal and vertical placement from structure	Spacing from minor sources	Spacing from obstructions	Spacing from trees (m)		Probe distance from traffic lane (m)		ADT Volume (Vehicle/day)	Probe material and sample residence time
Station	Pollutant	(m)	(m)	(m)	Actual	Required	Actual	Required		(Sec)
Anaheim	O3	1	None	None	**6**	>10	**7.5**	>10	<500	7.4
	CO	1	None	None	**6**	>10	**7.5**	>10	<500	6.4
	NO2	1	None	None	**6**	>10	**7.5**	>10	<500	7.5
	PM10	2	None	None	11	>10	**10.5**	>100	<500	NA
	PM2.5	1	None	None	**8**	>10	**10**	>15	<500	NA
Anaheim Near Road	NO2	1	None	None	15	>10	9	<20	695776	6.0
	CO	1	None	None	15	>10	9	<20	695776	6.0
ATSF	Pb	2	None	None	None	>10	250	>10	38513	NA
Azusa	O3	1	26 [1]	None	23	>10	14.5	>10	<10001000	7.9
	CO	1	26 [1]	None	23	>10	14.5	>10	<1000100	6.7
	NO2	1	26 [1]	None	23	>10	14.5	>10	<1000	8.5
	PM10	2	26 [1]	None	23	>10	18.5	>100	<1000	NA
	PM2.5	1	26 [1]	None	23	>10	15.8	>100	<1000	NA
Banning	O3	1	60 [2]	47	None		80	>1010	<2000	8.2
	NO2	1	60 [2]	47	None		80	>1010	<2000	9.1
	PM10	2	60 [2]	47	None		80	>1010	<2000	NA
Big Bear	PM2.5	1	None	32	36	>10	114	>15	2876	NA
Compton	O3	1	None	None	16	>10	16.36	>10	<1000	7.6
	CO	1	None	None	16	>10	16.36	>10	<1000	8.7
	NO2	1	None	None	16	>10	16.36	>10	<1000	8.2
	PM2.5	1	None	None	13	>10	21	>15	<1000	NA
	Pb	2	None	None	17	>10	23	>15	<1000	NA
Closet World	Pb	2	None	None	None	>10	3030	>10	20000	NA
Compton	O3	1	None	None	17	>10	13	>10	1000	6.0
	CO	1	None	None	17	>10	13	>10	1000	6.0
	NO2	1	None	None	17	>10	13	>10	1000	6.0
	Pb	2	None	None	17	>10	13	>10	1000	NA
Costa Mesa	O3	1	None	None	18	>10	34	>20	<2000	6.7
	CO	1	None	None	18	>10	34	>10	<2000	7.4
	NO2	1	None	None	18	>10	34	>20	<2000	8.8
	SO2	1	None	None	18	>10	34	NA	<2000	9.5
Crestline	O3	1	None	None	**9**	>10	55	>20	<8000	10
	PM10	2	None	None	**8**	>10	55	>15	<8000	NA
	PM2.5	2	None	None	**7**	>10	55	>15	<8000	NA

[1] Welding shop [2] Propeller airplane exhaust

TABLE 13. Probe and Monitoring Path Siting (cont)

Metric: Station	Metric: Pollutant	Horizontal and vertical placement from structure (m)	Spacing from minor sources (m)	Spacing from obstructions (m)	Spacing from trees (m): Actual	Spacing from trees (m): Required	Probe distance from traffic lane (m): Actual	Probe distance from traffic lane (m): Required	ADT Volume (Vehicle/ day)	Probe material and sample residence time (sec)
Fontana	O3	1	9 [3,4]	None	19	>10	92	>30	12500	5.5
	CO	1	9 [3,4]	None	19	>10	92	>25	12500	5.1
	NO2	1	9 [3,4]	None	19	>10	92	>30	12500	6.0
	SO2	1	9 [3,4]	None	19	>10	92	NA	12500	6.5
	PM10	2	9 [3,4]	None	14	>10	86	>15	12500	NA
	PM2.5	1	9 [3,4]	None	16	>10	86	>15	12500	NA
Glendora	O3	1	None	None	16	>10	121	>20	1834	7.6
	CO	1	None	None	16	>10	121	>10	1834	7.0
	NO2	1	None	None	16	>10	121	>20	1834	7.8
	PM10	2	6 [3]	None	16	>10	121	>15	1834	NA
	PM2.5	1	6 [3]	None	16	>10	121	>15	1834	NA
Indio	O3	1	6 [3]	60	None		88	>40	16528	12.5
	PM10	2	6 [3]	60	None		88	>17	16528	NA
	PM2.5	1	6 [3]	60	None		88	>17	16528	NA
La Habra	O3	1	28 [5]	None	3	>10	40	>100	66200	7.5
	CO	1	28 [5]	None	3	>10	40	>150	66200	6.1
	NO2	1	28 [5]	None	3	>10	40	>100	66200	7.4
Lake Elsinore	O3	1	None	None	17	>10	50	>20	<2000	5.1
	CO	1	None	None	17	>10	50	>10	<2000	5.1
	NO2	1	None	None	17	>10	50	>20	<2000	5.7
	PM10	2	None	None	10	>10	50	>15	<2000	NA
	PM2.5	1	None	None	10	>10	50	>15	<2000	NA
LAX Hastings	O3	1	600 [6]	None	20	>10	85	>20	<2000	6.1
	CO	1	600 [6]	None	20	>10	85	>10	<2000	6.5
	NO2	1	600 [6]	None	20	>10	85	>20	<2000	6.8
	PM10	2	600 [6]	None	16	>10	92	>15	<2000	NA
	Pb	2	600 [6]	None	16	>10	92	>15	<2000	NA

[3] Unpaved parking
[4] Diesel nearby
[5] Refueling station nearby
[6] Airport runway nearby

TABLE 13. Probe and Monitoring Path Siting (cont)

Metric		Horizontal and vertical placement (m)	Spacing from minor sources (m)	Spacing from obstructions (m)	Spacing from trees (m)		Probe distance from traffic lane (m)		ADT Traffic Volume	Probe material and sample residence time
Station	Pollutant				Actual	Required	Actual	Required	(Vehicles/ Day)	(sec)
Long Beach (Hudson)	O3	1	None	None	5050	>10	55	>1010	<1000	6.9
	CO	1	None	None	5050	>10	55	>10	<10001 000	6.1
	NO2	1	None	None	5050	>10	55	>10	<10001 000	8.4
	SO2	1	None	None	5050	>10	55	>1010	<10001 000	8.9
	PM10	2	None	None	5050	>10	55	>10	<10001 000	NA
Long Beach 710 Near Road	NO2	1	None	None	None		20	20-50	192000	6.0
	PM2.5	1	None	None	None		20	20-50	192000	NA
Long Beach (South)	PM10	2	None	20	None		86	>15	<10000	NA
	PM2.5	1	None	20	None		86	>15	<10000	NA
	Pb	2	None	20	None		86	>15	<10000	NA
Los Angeles (Main St.)	O3	1	45	30	None		71	>40	15276	7.1
	CO	1	45	30	None		71	>45	15276	7.2
	NO2	1	45	30	None		71	>40	15276	7.6
	SO2	1	45	30	None		71	NA	15276	9.5
	PM10	2	27	52	None		51	>15	15276	NA
	PM2.5	1	27	52	None		51	>15	15276	NA
	Pb	2	27	52	None		51	>15	15276	NA
Mira Loma (Van Buren)	O3	1	None	None	36	>10	14	>10	<1000	6.7
	CO	1	None	None	36	>10	14	>10	<1000	5.9
	NO2	1	None	None	36	>10	14	>10	<1000	7.0
	PM10	2	None	None	40	>10	15	>15	<1000	NA
	PM2.5	2	None	None	40	>10	15	>15	<1000	NA
Mission Viejo	O3	1	None	None	None		138	>20	<2000	11.4
	CO	1	None	None	None		138	>10	<2000	11.1
	PM10	2	None	None	None		175	>15	<2000	NA
	PM2.5	1	None	None	None		175	>15	<2000	NA
Norco	PM10	2	None	None	29	>10	25	>15	<500	NA
Ontario Etiwanda Near Road	NO2	1	None	None	None		49	<50	646804	6.0
	CO	1	None	None	None		49	<50	646804	6.0
Ontario Route 60 Near Road	NO2	1	None	None	None		10	20-50	215000	6.0
	PM2.5	1	None	None	None		10	20-50	215000	NA

[7] Fire training facility

TABLE 13. Probe and Monitoring Path Siting (cont)

Metric		Horizontal and vertical placement (m)	Spacing from minor sources (m)	Spacing from obstructions (m)	Spacing from trees (m)		Probe distance from traffic lane (m)		ADT Traffic Volume (Vehicles/ Day)	Probe material and sample residence time (sec)
Station	Pollutant				Actual	Required	Actual	Required		
Palm Springs	O3	1	None	None	22	>10	**17**	>20	<5000	9.3
	CO	1	None	None	22	>10	17	>10	<5000	8.3
	NO2	1	None	None	22	>10	**17**	>20	<5000	9.5
	PM10	2	None	3	19	>10	20	>15	<5000	NA
	PM2.5	1	None	3	19	>10	**13**	>15	<5000	NA
Pasadena	O3	1	None	None	**6**	>10	66	>20	<5000	6.7
	CO	1	None	None	**6**	>10	66	>10	<5000	6.1
	NO2	1	None	None	**6**	>10	66	>20	<5000	6.7
	PM2.5	1	None	None	**6**	>10	70	>15	<5000	NA
Perris	O3	1	None	7	30	>10	74	>60	39500	7.4
	PM10	2	None	7	30	>10	74	>40	39500	NA
Pico Rivera	O3	1	9 [3]	None	30	>10	41	>40	<20000	6.8
	CO	1	9 [3]	None	30	>10	**41**	>45	<20000	6.7
	NO2	1	4 [3]	None	30	>10	41	>40	<20000	6.5
	PM2.5	1	4 [3]	None	27	>10	35	>20	<20000	NA
	Pb	2	4 [3]	None	27	>10	35	>20	<20000	NA
Pomona	O3	1	None	None	None		**7**	>60	25000	7.4
	CO (µs)	1	None	None	None		7	2-10	25000	7.0
	NO2	1	None	None	None		**7**	>60	25000	8.2
Redlands	O3	1	2 [3]	None	2020	>10	26	>20	4709	88.2
	PM10	2	2 [3]	None	10	>10	26	>15	4709	NA
Rehrig	Pb	2	None	None	None		205	>10	20291	NA
Reseda	O3	1	10 [8]	None	2525	>10	**16**	>20	<2000	6.7
	CO	1	10 [8]	None	2525	>10	16	>10	<2000	6.0
	NO2	1	10 [8]	None	2525	>10	**16**	>20	<2000	7.8
	PM2.5	1	10 [8]	None	2525	>10	19	>15	<2000	NA
Rubidoux	O3	1	None	38	10	>10	119	>40	<20,000	4.7
	CO	1	None	38	10	>10	119	>45	<20,000	5.6
	NO2	1	None	38	10	>10	119	>40	<20,000	7.6
	SO2	1	None	38	10	>10	119	>10	<20,000	7.5
	PM10	2	None	18	10	>10	119	>20	<20,000	NA
	PM2.5	1	None	20	10	>10	119	>20	<20,000	NA
	Pb	2	None	18	10	>10	119	>20	<20,000	NA

[3] Unpaved parking

[8] Print shop

TABLE 13. Probe and Monitoring Path Siting (cont)

Metric: Station	Metric: Pollutant	Horizontal and vertical placement (m)	Spacing from minor sources (m)	Spacing from obstructions (m)	Spacing from trees (m)		Probe distance from traffic lane (m)		ADT Traffic Volume (Vehicles/ Day)	Probe material and sample residence time (sec)
					Actual	Required	Actual	Required		
San Bernardino	O3	1	None	None	14	>10	23	>20	<2500	7.9
	CO	1	None	None	14	>10	23	>10	<2500	7.4
	NO2	1	None	None	14	>10	23	>20	<2500	8.7
	PM10	2	None	None	19	>10	16	>15	<2500	NA
	PM2.5	1	None	None	19	>10	16	>15	<2500	NA
	Pb	2	None	None	19	>10	16	>15	<2500	NA
Santa Clarita	O3	1	None	None	30	>10	91	>20	<5000	6.6
	CO	1	None	None	30	>10	91	>10	<5000	6.0
	NO2	1	None	None	30	>10	91	>20	<5000	6.5
	PM10	2	None	None	30	>10	91	>15	<5000	NA
	PM2.5	1	None	None	30	>10	91	>15	<5000	NA
SA Recycling	Pb	2	None	None	None	None	205	>10	20291	NA
Saul Martinez	PM10	2	None	None	None	None	150	>10	>500	NA
Temecula	O3	1	450 [10]	30 [9]	60	>10	1056	>20	6500	77.0
	PM2.55	2	450 [10]	30 [9]	60	>10	1056	>15	6500	NANA
Uddelholm	Pb	2	None	None	None	None	25	>10	30000	NA
Upland	O3	1	None	None	19	>10	80	>20	<10000	9.5
	CO	1	None	None	19	>10	80	>10	<10000	8.4
	NO2	1	None	None	19	>10	80	>20	<10000	8.7
	PM10	2	None	None	12	>10	80	>15	<10000	NA
	PM2.5	1	None	None	12	>10	80	>15	<10000	NA
	Pb/SO4	2	None	None	12	>10	80	>15	<10000	NA
West Los Angeles	O3	1	None	None	45	>10	23	>20	<10000	7.5
	CO	1	None	None	45	>10	23	>10	<10000	6.9
	NO2	1	None	None	45	>10	23	>20	<10000	7.9

[9] Microwave tower

[10] Water treatment facility

TABLE 14 Individual Site Assesment Summary

	Site Longevity (Years)	Security of Future Occupancy	Infrastructure				Probe and Monitoring Path Criteria		Data Use Other Than NAAQS	Cost to Move	Synergies Gained
			Building	Electricity	Communications	Space	Obstructions	Distance from Traffic Lane			
Anaheim	14	Secure	Inadequate	Inadequate	Adequate	Inadequate	Obstructed	Inadequate	Yes	High	No
Anaheim Near Road	2	Secure	Adequate	Adequate	Adequate	Adequate	Unobstructed	Adequate	Yes	High	Yes
ATSF	15	Secure	Adequate	Adequate	Adequate	Adequate	Unobstructed	Adequate	No	Low	No
Azusa	58	Secure	Adequate	Adequate	Adequate	Adequate	Unobstructed	Adequate	Yes	Low	Yes
Banning Airport	18	Secure	Adequate	Adequate	Adequate	Adequate	Unobstructed	Adequate	Yes	High	Yes
Big Bear	16	Secure	Adequate	Adequate	Adequate	Adequate	Unobstructed	Adequate	No	Low	No
Closet World	7	Secure	NA	Adequate	NA	Adequate	Unobstructed	Adequate	No	Low	No
Compton	11	Secure	Adequate	Adequate	Adequate	Adequate	Unobstructed	Adequate	Yes	High	Yes
Costa Mesa	26	Secure	No	No	Adequate	No	Unobstructed	Adequate	Yes	High	Yes
Crestline	42	Secure	No	No	Adequate	Adequate	Unobstructed	Adequate	Yes	High	No
Fontana	34	Secure	Adequate	Adequate	Adequate	No	Obstructed	Adequate	Yes	High	Yes
Glendora	35	No	No	Adequate	Adequate	No	Unobstructed	Adequate	Yes	Low	Yes
Indio	32	Secure	No	Adequate	Adequate	No	Obstructed	Adequate	Yes	High	No
La Habra	55	Secure	No	No	No	No	Obstructed	Inadequate	No	High	No
Lake Elsinore	28	Secure	Adequate	Adequate	Adequate	Adequate	Unobstructed	Adequate	Yes	High	Yes
LAX Hastings	11	Secure	Adequate	Adequate	Adequate	No	Unobstructed	Adequate	Yes	High	Yes
Long Beach (Hudson)	53	Secure	Adequate	Adequate	Adequate	Adequate	Obstructed	Inadequate	Yes	High	Yes
Long Beach 710 NR	1	Secure	Adequate	Adequate	Adequate	Adequate	Unobstructed	Adequate	Yes	High	Yes
Long Beach (South)	12	Secure	NA	Adequate	NA	Inadequate	Obstructed	Adequate	Yes	High	No
Los Angeles (Main Street)	36	Secure	No	No	No	No	Unobstructed	Adequate	Yes	High	Yes
Mira Loma (Van Buren)	10	Secure	Adequate	Adequate	Adequate	Adequate	Unobstructed	Adequate	Yes	High	Yes
Mission Viejo	16	Secure	Adequate	Adequate	Adequate	No	Unobstructed	Adequate	No	High	No

TABLE 14. Individual Site Assesment Summary (cont)

	Site Longevity	Security of Future Occupancy	Infrastructure				Probe and Monitoring Path Criteria		Data Use Other Than NAAQS	Cost to Move	Synergies Gained
			Building	Electricity	Communications	Space	obstructed	Distance from Traffic Lane			
Norco	35	Secure	NA	Adequate	NA	Inadequate	Unobstructed	Adequate	No	Low	No
Ontario Etiwanda NR	2	Secure	Adequate	Adequate	Adequate	Adequate	Unobstructed	Adequate	Yes	High	Yes
Ontario Route 60 NR	1	Secure	Adequate	Adequate	Adequate	Adequate	Unobstructed	Adequate	Yes	High	Yes
Palm Springs	44	Secure	Adequate	Adequate	Adequate	Inadequate	Obstructed	Inadequate	No	High	No
Pasadena	33	Secure	Inadequate	Adequate	Adequate	Inadequate	Obstructed	Adequate	No	High	No
Perris	42	Secure	Inadequate	Adequate	Adequate	Inadequate	Obstructed	Adequate	No	High	No
Pico Rivera #2	10	Secure	Adequate	Adequate	Adequate	Adequate	Unobstructed	Adequate	Yes	High	Yes
Pomona	50	Secure	Inadequate	Adequate	Adequate	Inadequate	Unobstructed	Inadequate	No	High	No
Redlands	29	Secure	Inadequate	Adequate	Adequate	Adequate	obstructed	Adequate	No	High	No
Rehrig (Exide)	8	Secure	NA	Adequate	NA	Adequate	Unobstructed	Adequate	No	Low	No
Reseda	50	Secure	Adequate	Adequate	Adequate	Adequate	Unobstructed	Inadequate	No	High	No
Riverside (Magnolia)	43	Secure	Adequate	Adequate	Adequate	Inadequate	Obstructed	Inadequate	Yes	High	Yes
Rubidoux	43	Secure	Adequate	Adequate	Adequate	Adequate	Unobstructed	Adequate	Yes	High	Yes
San Bernardino	29	Secure	Inadequate	Adequate	Adequate	Inadequate	Unobstructed	Adequate	Yes	High	Yes
Santa Clarita	14	Secure	Adequate	Adequate	Adequate	Adequate	Unobstructed	Adequate	Yes	High	Yes
SA Recycling	1	Secure	Adequate	Adequate	Adequate	Adequate	Unobstructed	Adequate	Yes	High	Yes
Saul Martinez	2	Secure	Adequate	Adequate	Adequate	Adequate	Unobstructed	Adequate	Yes	High	Yes
Temecula	6	Secure	Adequate	Adequate	Adequate	Adequate	Unobstructed	Adequate	No	High	No
Uddelholm (Trojan Battery)	23	Secure	NA	Adequate	Adequate	Adequate	Unobstructed	Adequate	No	Low	No
Upland	42	Secure	Inadequate	Adequate	Adequate	Adequate	Unobstructed	Adequate	Yes	High	Yes
West Los Angeles	31	Secure	Inadequate	Adequate	NA	Adequate	Unobstructed	Adequate	Yes	High	No

Table 15. Summary of Siting Considerations

Site	Issue	Description
Anaheim*	Spacing from trees - proximity to tree s/b > 10 m from dripline	Anaheim is 6 m from palm tree.
	Probe distance from traffic lane	O_3 CO and NO_2 are 7.5 m s/b $\geq$ 10 m; PM10 and PM2.5 are 10 m s/b $\geq$ 15 m for neighborhood scale
Azusa	Spacing from minor sources	Azusa is 26 m down wind from welding shop.
Banning	Spacing from minor sources	Banning is 60 m from leaded gasoline aircraft runway.
Crestline*	Spacing from trees - proximity to tree s/b > 10 m from dripline	Crestline is 8 m from pine tree.
Fontana	Spacing from minor sources	Fontana is 9 m from regularly idling diesel exhaust and unpaved parking. Particulate monitoring should not be located in unpaved areas.
Glendora	Spacing from minor sources	Glendora is 3 m from unpaved parking. Particulate monitoring should not be located in unpaved areas.
La Habra	Spacing from minor sources	La Habra is 28 m from refueling facility.
	Spacing from trees - proximity to tree s/b > 10 m from dripline	La Habra is 3 m from cypress.
	Probe distance from traffic lane	O_3 and NO_2 are 40 m s/b $\geq$ 100 m; CO is 40 m s/b $\geq$ 150 m for neighborhood scale
Long Beach (Hudson)*	Probe distance from traffic lane	O_3 and NO_2 are 8 m s/b $\geq$ 40 m; P
Palm Springs	Spacing from obstructions	Palm Springs is 3 m from building that exceeds height requirement for particulates.
	Probe distance from traffic lane	O_3 and NO_2 are 17 m s/b $\geq$ 20 m
Pasadena*	Spacing from trees - proximity to tree s/b > 10 m from dripline	Pasadena is 6 m from tree.
Pico Rivera	Spacing from minor sources	Pico Rivera is 4 m from unpaved parking. Particulate monitoring should not be located in unpaved areas.
	Probe distance from traffic lane	CO is 41 m s/b $\geq$ 45 m
Pomona*	Probe distance from traffic lane	O_3 and NO_2 are 7 m s/b $\geq$ 60 m; CO is microscale
Redlands-	Spacing from minor sources	Redlands is 2 m from unpaved parking. Particulate monitoring should not be located in unpaved areas.
	Spacing from trees - proximity to tree s/b > 10 m from dripline	Redlands is 8 m from tree.
Reseda	Spacing from minor sources	Reseda is 10 m from print shop.
	Probe distance from traffic lane	O_3 and NO_2 are 16 m s/b $\geq$ 20 m
Riverside-	Probe siting - inlet probe height	Riverside roadside microscale CO > 3 +/- 1/2 m requirement
	Probe distance from traffic lane	NO_2 is 27 m s/b $\geq$ 60 m; particulate are 28 m s/b $\geq$ 42 m except Pb (microscale)

*Waiver requested (2015) – Site has moved or Closed

III. NETWORK ASSESSMENT

OVERVIEW

This section describes the process for assessing individual pollutant networks and monitoring programs in the SCAQMD monitoring network. The criteria for assessing the networks include the examination of overall network monitoring objectives, the spatial scales of representativeness, the minimum number of monitors required by regulation, and correlation analyses to determine redundancy or gaps within each network.

NETWORK ASSESSMENT CRITERIA DESCRIPTIONS

The criteria used for network assessment are described below. They include an assessment of monitoring objectives and spatial scales relative to 40 CFR § 58 Appendix D criteria. Another criterion was a correlation analysis as suggested by the U.S. EPA, to identify redundant sites or geographical areas that may need additional sites within a monitoring network. Finally, the network was evaluated against the regulatory requirements for the minimum number of monitors using the latest census data available.

Monitoring Objectives

Over the last twenty years, population, sources of pollution, ambient levels of pollution, and the SCAQMD air monitoring network have been modified. A periodic reassessment of monitoring objectives will help ensure that the current network design meets the original and any new monitoring objectives.

Ambient air monitoring network design is specified, at a minimum, by the U.S. EPA and includes monitoring objectives and general criteria as outlined in 40 CFR § 58 Appendix D. Each pollutant measured at each air monitoring site is related to a specific monitoring objective. Depending on pollutant, air monitoring networks are designed to meet all or a subset of the following objectives:

- *Highest concentrations* expected to occur in the geographical area covered by the network.
- *Representative concentrations in areas of high population density* in the geographical area covered by the network.
- *Impact* of significant sources or source categories of pollution such as refineries or specific area sources such as residential fuel combustion.
- *Background* concentration levels, usually located upwind of the air monitoring network.
- *Regional transport* of pollution to areas outside of the monitoring network usually located downwind of the air monitoring network.
- The last type of site required measures air pollution impacts on visibility, vegetation damage or other *welfare based* impacts.

Spatial Scale of Representativeness

Each monitoring objective or site type is also related to a specific spatial scale of representativeness as shown in Table 8. The goal in deciding on a location for a monitor is to correctly match the spatial scale of representativeness with the monitoring objective for the site being established. Spatial scale of representativeness is the physical dimension of the air parcel being represented by the air monitoring location. Spatial scales are defined as:

- Microscale – represents concentrations in an area ranging from several meters to 100 meters.
- Middle scale – represents concentrations in an area from 100 meters to .5 kilometers.
- Neighborhood scale – represents concentrations in an area that has uniform land use and is .5 kilometers to 4.0 kilometers.
- Urban scale – represents concentrations in an area the size of a city, from 4 to 50 kilometers in size. Influence from sources of pollution may prevent homogenous representation of a pollutant on an urban scale.
- Regional scale – represents concentrations in a homogenous geographical area without large sources of pollution, usually tens to hundreds of kilometers in size.

Planning Model Calculation Frequency

Monitoring results are used routinely for tracking trends, NAAQS statistics, and input for computational models that conduct forecasting, emissions inventory, trajectories, trends, compliance to the NAAQS, pollution gradients, and population exposure for attainment demonstrations. Data typically has more value the more often and depending on the type of decision the data analysis is supporting. Maps were generated for each pollutant that showed the relative usage of the data for each station giving stronger consideration for attainment modeling demonstrations. Forecasting uses data from all available sites and geographical distribution is a consideration for representation.

Correlation Analysis

For the network assessment, based on the guidelines provided by U.S. EPA, various analytical techniques are utilized. In order to identify potential redundancies and to demonstrate adequacy of existing monitoring sites, various statistical analyses were performed. For a site-by-site comparison, concentrations measured at each monitor are compared to concentrations measured at other monitors in the network to determine if concentrations correlate temporally. This is accomplished by calculating Pearson correlation coefficients (r^2) between each monitoring pair. Monitor pairs that correlate well, with correlation coefficient values near unity (e.g. $r^2 > 0.8$) could be redundant. Monitors that do not correlate well with other monitors however, exhibit unique temporal concentration variation relative to other monitors and are likely to be more important for assessing local emissions, transport, and spatial coverage. The correlation between two sites quantitatively describes the degree of relatedness between the measurements made at two sites. The correlation, however, may indicate whether a pair of sites is related, but it does not indicate if one site consistently measures pollutant concentrations at levels substantially higher or lower than the other. For this purpose, the average relative difference between sites measured concentrations at each pairs are calculated where the daily relative difference is defined as:

$$\frac{abs(s1-s2)}{avg(s1,s2)}$$

Where $s1$ and $s2$ represent the concentrations at sites one and two in the pairing, *abs* is the absolute difference between the two sites and *avg* is the average of the two site concentrations. The average relative difference between the two sites is an indicator of the overall measurement similarity between the two sites. Site pairs with a lower average relative difference are more similar to each other than pairs with a larger difference.

The site-by-site correlation and average relative difference may differ for each pollutant. In order to identify potential redundant sites that can be removed and also to determine specific monitors that are not contributing useful information that can be removed from the site or be relocated, this analysis is performed for each pollutant. Usually, it is expected that correlation between sites will decrease as distance increases. However, for a regional air pollutant such as O3, sites in the same air shed can have very similar concentrations and be highly correlated. Conversely, more unique sites will tend to exhibit the opposite characteristics. They will not be very well correlated with other sites and their relative difference would be higher than other site-to-site pairs.

Note that results from such a correlation analysis are just one criteria in assessing the value of sites within a network. Other site-specific or network design factors, such as health studies, EJ, inter-program synergies, long-term trends, and logistical constraints may add value to a site even if the measured concentrations are similar to other nearby sites.

Minimum number of monitors
As a general requirement, the U.S. EPA specifies the minimum numbers of sites required in a criteria pollutant network based on the latest census population data. These are minimum requirements and the total number of sites necessary to adequately satisfy all monitoring objectives may be higher. Discontinuing operations within existing monitoring networks, even if not required by regulation, is usually subject to U.S. EPA Regional Administrator approval. The final number of sites required may be more than the regulatory minimums dependent upon U.S. EPA Regional Approval of Annual Network Plans.

The SCAQMD jurisdictional boundary encompasses two Metropolitan Statistical Areas (MSA) as defined by the U.S. Office of Management and Budget and the U.S. Census Bureau. The Los Angeles-Long Beach-Santa Ana MSA (Code 31100) had a population of 12,365,627 based on the year 2000 U.S. Census. The Riverside-San Bernardino-Ontario MSA (Code 40140) had a population of 3,254,821 in 2000. The minimum number of monitors for each pollutant is based on MSA population and measured concentrations as described in 40 CFR § 58 Appendix D. The SCAQMD network exceeds the minimum monitoring requirements for all criteria pollutants.

POLLUTANT NETWORK ASSESSMENTS

Ozone (O3)
O3 is formed when the precursor gases VOC and NOx react in the atmosphere with sunlight. Emissions from VOC and NOx sources are frequently trapped in the South Coast Basin by the

surrounding mountains and a persistent inversion layer. This leads to high ozone values, especially during the summer and early fall months.

Regulatory Requirement

Local agencies must operate O3 monitoring sites at various locations depending upon population and O3 design values relative to the NAAQS. Ambient air quality standards for O3 have been set by both the State and Federal governments and continue to be made more stringent. The current ambient air quality standards for O3 are included in Table 7. To assess compliance with Federal and State standards, SCAQMD operates 29 sites with O3 measurements as part of the Air Monitoring Network. Figure 1 shows the spatial distribution of these sites.

Monitoring Objective

The majority of the O3 monitoring network sites have been designated as population exposure monitoring locations as depicted in Table 16. Sites downwind of the formation of O3 such as Santa Clarita, Crestline, Banning, Perris, Rubidoux, and San Bernardino areas tend to have much higher concentrations. For the period of 2009 to 2014 all counties of the Basin exceeded the current 8-hour ozone standard (0.075 ppm). The exceedances were counted as number of station days that exceeded the 8-hour O3 standard, so multiple exceedances within a single day at a station were not counted. The sites that recorded the highest frequency of exceedances include Crestline, Redlands, San Bernardino, Banning Airport, Palm Springs, Perris, Riverside-Rubidoux, and Fontana. Conversely, background site designations are typically coastal areas. The following sites recorded the lowest frequency of exceedances of O3 standard: LAX Hastings, North Long Beach, La Habra, Anaheim, Costa Mesa, Pico Rivera, Port of Long Beach, Central Los Angeles and Compton. Other factors such as nearby roadways may also contribute to low O3 levels at Central Los Angeles and Compton.

Figure 9 presents the number of station days that exceeded the 8-hour O3 standard at each site for the period of 2009-2014. In this period, the lowest number of exceedances in the basin were recorded in 2014, with the most decline recorded in the Riverside county. The lowest number of exceedances in this period, were recorded at North Long Beach and the Port of Long Beach, followed by LAX-Hastings, Anaheim and Compton which are more representative of background concentrations. As mentioned earlier, population trends show increasing development and population in the inland area. In general, sites in the O3 monitoring network in the Riverside and San Bernardino Counties provide high value information.

FIGURE 9. Station Days that Exceeded the 8-Hour Ozone Standard (2009-2014)

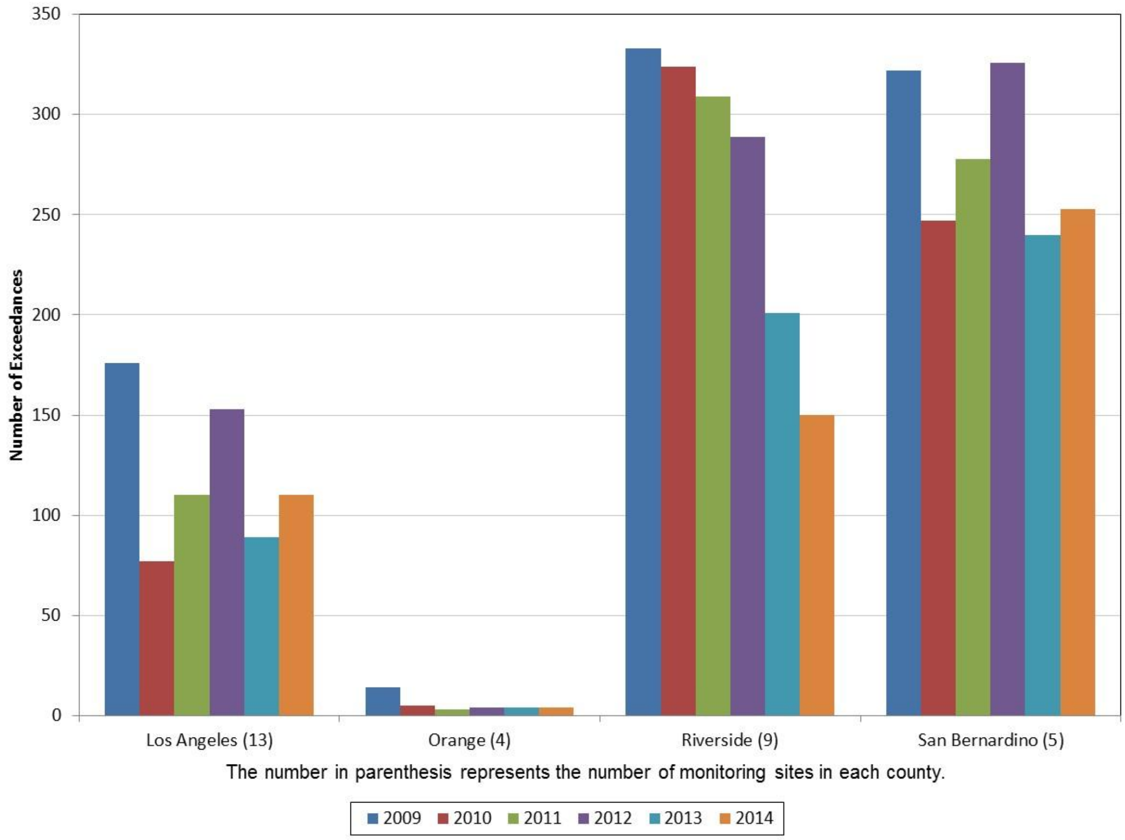


TABLE 16. Ozone Network Design

Station	Monitoring Objective	Spatial Scale	Site Consistent with Monitoring Objective
Anaheim	Population Oriented	Neighborhood	Yes
Azusa	High Concentration	Urban	Yes
Banning Airport	Population Oriented	Neighborhood	Yes
Burbank	High Concentration	Urban	Closed
Compton	Population Oriented	Neighborhood	Yes
Costa Mesa	Population Oriented	Neighborhood	Yes
Crestline	High Concentration	Neighborhood	Yes
Fontana	Population Oriented	Urban	Yes
Glendora	High Concentration	Neighborhood	Yes
Indio	Population Oriented	Neighborhood	Yes
La Hebra	Population Oriented	Neighborhood	Yes
Lake Elsinore	Population Oriented	Neighborhood	Yes
LAX-Hastings	Population Oriented	Middle	Yes
Long Beach, Port	Population Oriented	Neighborhood	Closed
Los Angeles	Population Oriented	Neighborhood	Yes
Mira Loma	Population Oriented	Neighborhood	Yes
Mira Loma School	Population Oriented	Neighborhood	Closed
Mission Viejo	Population Oriented	Neighborhood	Yes
North Long Beach	Population Oriented	Middle	Closed
Palm Springs	Population Oriented	Neighborhood	Yes
Pasadena	Population Oriented	Neighborhood	Yes
Perris	Population Oriented	Neighborhood	Yes
Pico Rivera	Population Oriented	Neighborhood	Yes
Pomona	High Concentration	Middle	Yes
Redlands	High Concentration	Neighborhood	Yes
Reseda	High Concentration	Urban	Yes
Riversida - Rubidoux	High Concentration	Urban	Yes
San Bernardino	High Concentration	Neighborhood	Yes
Santa Clarita	High Concentration	Urban	Yes
Temecula	High Concentration	Neighborhood	Yes
Upland	Population Oriented	Neighborhood	Yes
West Los Angeles	Population Oriented	Middle	No

Spatial Scale of Representativeness

Monitoring objectives are matched with specific spatial scales of representativeness as shown in Table 8. When compared to the U.S. EPA criteria, some potential changes in monitoring objectives may be possible within the SCAQMD O3 network. Individual site assessments of the Spatial Scale of Representativeness for O3 are shown in Table 16.

Planning Model Calculation Frequency

Figure 10 shows the usage for the O3 monitors in the South Coast Basin. Sites in northern San Bernardino are important, noted by the number of exceedances and the current and predicted design value sites to be located there. Along the San Gabriel Mountains (Azusa and Glendora) and in Santa Clarita present other areas where high O3 can be formed. Santa Clarita was identified as an area that was disproportionally impacted by O3, and the subregion was subject to a standalone analysis (*Santa Clarita Subregional Analysis*, SCAQMD, November 2004). Lastly, Reseda and Long Beach provide the regular western boundary for the Basin.

Figure 10. Estimated Model Calculation Frequency per Site for O3

Correlation Analysis

The correlation analysis shows the correlation and relative difference in Figures 11 and 12. The correlation chart presents the Pearson Squared Correlation between sites; also red cells representing zero correlation and green cells representing perfect correlation. Correlation between the sites represents the degree of relatedness. The correlation however, does not indicate if one site measures concentrations substantially higher or lower than another, for this Figure 12 presents the average relative difference, with green cells representing lowest average relative difference and red cells representing the highest average relative difference. This analysis aids in determining sites that are redundant. The data completion is also presented in each chart.

The correlation analysis was performed for the 8-hour O3 maximum concentrations, as well as the hourly O3 concentrations. However, since the national air quality standard for 1-hour O3 was revoked by the EPA and was replaced by the more health protective 8-hour O3 standard, the correlation analysis herein are focused on 8-hour ozone concentrations. O3 correlation for the period of 2009-2014 between sites in Los Angeles, Orange, Riverside, and San Bernardino counties are shown in Figure 4. Site pairs with correlations greater than 0.8 and relative differences less than 0.3 for O3 are highlighted in dark green in Figure 13 which are:

North Long Beach	Long Beach, Port
Azusa	Burbank Pomona Pasadena Glendora Upland Fontana
Burbank	Pomona Pico Rivera Los Angeles Pasadena
Reseda	Santa Clarita
Pomona	Pasadena Glendora Riverside-Rubidoux Mira Loma School* Mira Loma Upland Fontana San Bernardino
Pico Rivera	La Hebra
Los Angeles	Pasadena
Pasadena	Glendora
Santa Clarita	San Bernardino Redlands
Glendora	Mira Loma School* Upland Fontana San Bernardino
Anaheim	La Hebra
Palm Springs	Indio Banning Airport
Riverside Rubidoux	Perris Mira Loma School* Mira Loma Upland Fontana San Bernardino

	Redlands
Perris	Lake Elsinore Banning Airport Crestline San Bernardino Redlands
Mira Loma School*	Mira Loma Upland Fontana San Bernardino Redlands
Mira Loma	Upland Fontana San Bernardino Redlands
Upland	Fontana San Bernardino Redlands
Crestline	San Bernardino Redlands
Fontana	San Bernardino Redlands
San Bernardino	Redlands

The correlation analysis of both the 1-hour and 8-hour O3 yields similar results. This analysis shows that for O3, many sites generate comparable data. This result is expected for ozone given the regional nature of the pollutant and the density of the current network. Even if sites measure somewhat comparable ozone levels, the need for public reporting of health alert and AQI levels necessitates a relatively dense ozone network to capture spatial variability. Clusters of sites with generally highest correlations, small average differences, and close proximities include Fontana/Redlands/San Bernardino/Rubidoux, Azusa/Glendora/Pomona/Upland/Fontana, and Anaheim/La Habra.

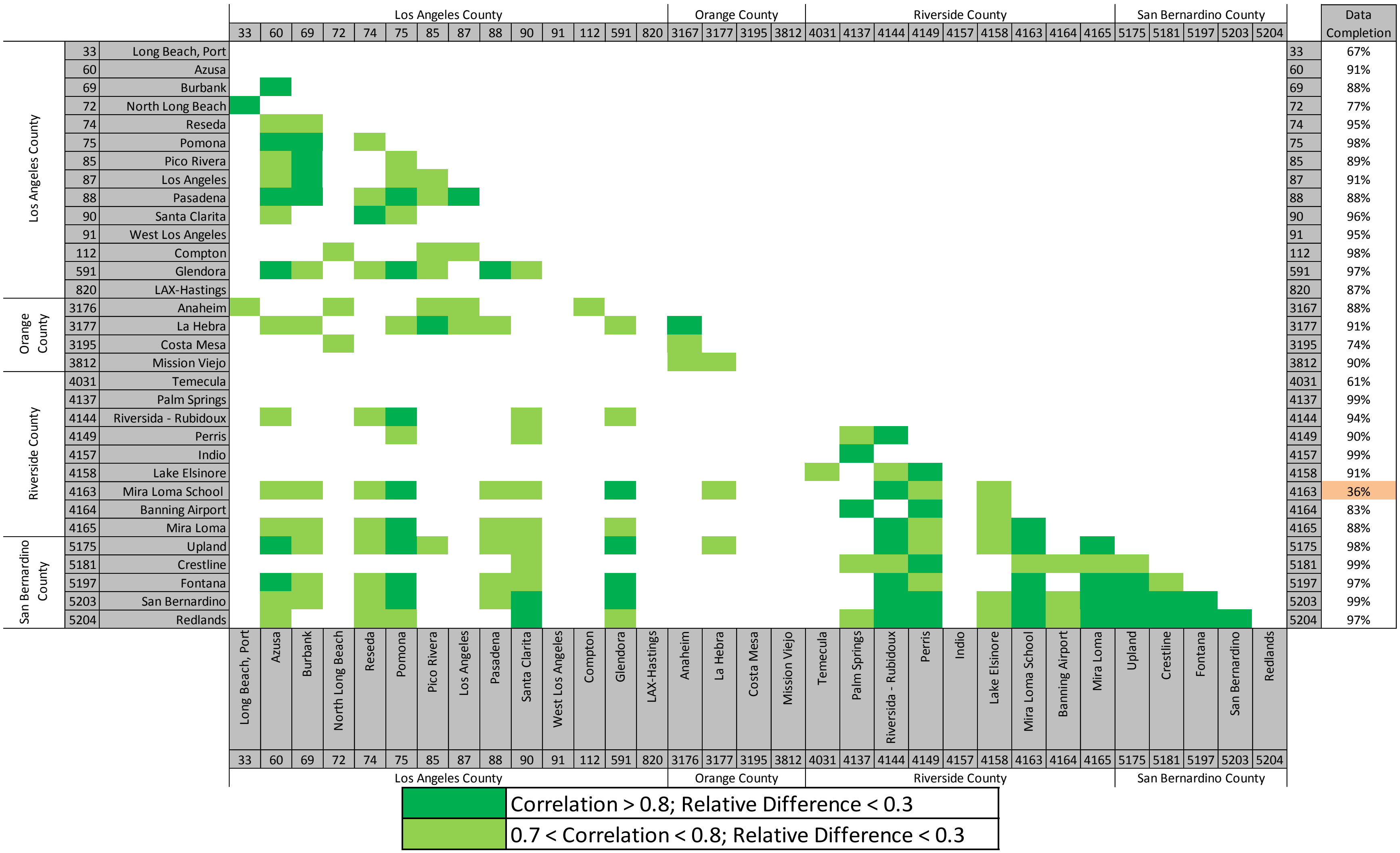
Figure 11. Ozone Correlation Matrix Chart

			Los Angeles County														Orange County				Riverside County									San Bernardino County						Data
			33	60	69	72	74	75	85	87	88	90	91	112	591	820	3167	3177	3195	3812	4031	4137	4144	4149	4157	4158	4163	4164	4165	5175	5181	5197	5203	5204		Completion
Los Angeles County	33	Long Beach, Port																																	33	67%
	60	Azusa	0.4																																60	91%
	69	Burbank	0.5	0.8																															69	88%
	72	North Long Beach	0.8	0.5	0.6																														72	77%
	74	Reseda	0.4	0.7	0.7	0.5																													74	95%
	75	Pomona	0.5	0.9	0.8	0.5	0.8																												75	98%
	85	Pico Rivera	0.7	0.8	0.8	0.7	0.6	0.8																											85	89%
	87	Los Angeles	0.7	0.7	0.8	0.7	0.7	0.7	0.8																										87	91%
	88	Pasadena	0.4	0.9	0.9	0.5	0.8	0.8	0.8	0.8																									88	88%
	90	Santa Clarita	0.3	0.7	0.7	0.4	0.8	0.7	0.6	0.6	0.7																								90	96%
	91	West Los Angeles	0.6	0.5	0.6	0.6	0.5	0.5	0.6	0.7	0.5	0.3																							91	95%
	112	Compton	0.6	0.5	0.6	0.7	0.5	0.6	0.7	0.7	0.6	0.4	0.6																						112	98%
	591	Glendora	0.4	0.9	0.8	0.4	0.7	0.9	0.7	0.7	0.8	0.8	0.4	0.5																					591	97%
	820	LAX-Hastings	0.6	0.3	0.4	0.6	0.3	0.3	0.5	0.5	0.4	0.2	0.7	0.6	0.2																				820	87%
Orange County	3176	Anaheim	0.7	0.6	0.7	0.7	0.6	0.7	0.7	0.7	0.6	0.4	0.6	0.7	0.6	0.6																			3167	88%
	3177	La Hebra	0.7	0.8	0.8	0.7	0.7	0.8	0.8	0.8	0.7	0.6	0.6	0.7	0.7	0.5	0.84																		3177	91%
	3195	Costa Mesa	0.7	0.3	0.5	0.7	0.3	0.4	0.5	0.6	0.4	0.2	0.6	0.6	0.3	0.6	0.73	0.57																	3195	74%
	3812	Mission Viejo	0.6	0.6	0.6	0.6	0.5	0.6	0.7	0.6	0.6	0.4	0.5	0.6	0.6	0.4	0.76	0.77	0.62																3812	90%
Riverside County	4031	Temecula	0.3	0.5	0.5	0.4	0.6	0.6	0.5	0.5	0.6	0.5	0.4	0.5	0.5	0.3	0.55	0.56	0.41	0.64															4031	61%
	4137	Palm Springs	0.3	0.5	0.5	0.4	0.5	0.6	0.5	0.4	0.4	0.6	0.3	0.4	0.5	0.3	0.45	0.49	0.27	0.37	0.54														4137	99%
	4144	Riversida - Rubidoux	0.4	0.7	0.7	0.4	0.8	0.8	0.6	0.6	0.7	0.7	0.4	0.5	0.8	0.3	0.6	0.68	0.33	0.55	0.64	0.65													4144	94%
	4149	Perris	0.3	0.6	0.6	0.3	0.7	0.7	0.5	0.5	0.6	0.7	0.3	0.4	0.7	0.2	0.49	0.57	0.28	0.46	0.64	0.76	0.81												4149	90%
	4157	Indio	0.4	0.4	0.5	0.4	0.4	0.5	0.4	0.4	0.4	0.5	0.3	0.4	0.4	0.3	0.46	0.48	0.28	0.36	0.45	0.82	0.55	0.59											4157	99%
	4158	Lake Elsinore	0.3	0.6	0.6	0.4	0.7	0.7	0.5	0.5	0.6	0.7	0.4	0.4	0.6	0.2	0.52	0.59	0.3	0.54	0.74	0.68	0.74	0.81	0.54										4158	91%
	4163	Mira Loma School	0.4	0.8	0.8	0.4	0.8	0.9	0.7	0.7	0.8	0.7	0.5	0.5	0.8	0.3	0.67	0.74	0.43	0.64	0.68	0.64	0.84	0.78	0.56	0.75									4163	36%
	4164	Banning Airport	0.2	0.5	0.5	0.3	0.6	0.6	0.4	0.4	0.5	0.7	0.3	0.3	0.6	0.2	0.39	0.47	0.2	0.36	0.61	0.83	0.68	0.83	0.63	0.77	0.66								4164	83%
	4165	Mira Loma	0.4	0.7	0.7	0.4	0.8	0.8	0.6	0.6	0.7	0.8	0.4	0.5	0.8	0.3	0.6	0.7	0.34	0.57	0.67	0.65	0.89	0.79	0.55	0.75	0.88	0.65							4165	88%
San Bernardino County	5175	Upland	0.4	0.9	0.8	0.5	0.8	0.9	0.7	0.7	0.8	0.8	0.4	0.5	0.9	0.3	0.6	0.74	0.35	0.59	0.59	0.6	0.82	0.76	0.5	0.71	0.86	0.65	0.85						5175	98%
	5181	Crestline	0.2	0.6	0.6	0.3	0.6	0.7	0.4	0.4	0.5	0.7	0.3	0.3	0.7	0.2	0.41	0.5	0.2	0.35	0.5	0.72	0.73	0.8	0.58	0.68	0.71	0.78	0.73	0.73					5181	99%
	5197	Fontana	0.3	0.8	0.7	0.4	0.8	0.8	0.6	0.6	0.7	0.8	0.3	0.5	0.8	0.2	0.53	0.66	0.28	0.5	0.54	0.59	0.84	0.76	0.47	0.68	0.87	0.65	0.86	0.88	0.74				5197	97%
	5203	San Bernardino	0.3	0.8	0.7	0.4	0.8	0.8	0.6	0.6	0.7	0.8	0.3	0.4	0.8	0.2	0.51	0.65	0.27	0.49	0.59	0.66	0.85	0.82	0.53	0.74	0.87	0.73	0.86	0.88	0.82	0.89			5203	99%
	5204	Redlands	0.3	0.7	0.7	0.4	0.7	0.8	0.6	0.5	0.7	0.8	0.3	0.4	0.8	0.2	0.49	0.6	0.24	0.44	0.62	0.72	0.85	0.86	0.58	0.77	0.83	0.79	0.85	0.84	0.85	0.86	0.93		5204	97%
			Long Beach, Port	Azusa	Burbank	North Long Beach	Reseda	Pomona	Pico Rivera	Los Angeles	Pasadena	Santa Clarita	West Los Angeles	Compton	Glendora	LAX-Hastings	Anaheim	La Hebra	Costa Mesa	Mission Viejo	Temecula	Palm Springs	Riversida - Rubidoux	Perris	Indio	Lake Elsinore	Mira Loma School	Banning Airport	Mira Loma	Upland	Crestline	Fontana	San Bernardino	Redlands		
			33	60	69	72	74	75	85	87	88	90	91	112	591	820	3176	3177	3195	3812	4031	4137	4144	4149	4157	4158	4163	4164	4165	5175	5181	5197	5203	5204		
			Los Angeles County														Orange County				Riverside County									San Bernardino County						

Figure 12. Ozone Relative Difference Chart

County	ID	Site	33	60	69	72	74	75	85	87	88	90	91	112	591	820	3176	3177	3195	3812	4031	4137	4144	4149	4157	4158	4163	4164	4165	5175	5181	5197	5203	5204	ID	Data Completion
Los Angeles	33	Long Beach, Port																																	33	67%
	60	Azusa	0.25																																60	91%
	69	Burbank	0.28	0.03																															69	88%
	72	North Long Beach	0.06	0.19	0.22																														72	77%
	74	Reseda	0.40	0.16	0.13	0.35																													74	95%
	75	Pomona	0.29	0.05	0.01	0.24	0.11																												75	98%
	85	Pico Rivera	0.11	0.14	0.17	0.05	0.30	0.19																											85	89%
	87	Los Angeles	0.08	0.17	0.20	0.02	0.33	0.21	0.03																										87	91%
	88	Pasadena	0.27	0.03	0.00	0.22	0.13	0.02	0.17	0.20																									88	88%
	90	Santa Clarita	0.47	0.23	0.19	0.41	0.06	0.18	0.36	0.39	0.20																								90	96%
	91	West Los Angeles	0.19	0.05	0.09	0.14	0.21	0.10	0.09	0.12	0.08	0.28																							91	95%
	112	Compton	0.08	0.17	0.20	0.02	0.33	0.21	0.03	0.00	0.19	0.39	0.11																						112	98%
	591	Glendora	0.39	0.15	0.12	0.34	0.01	0.10	0.29	0.32	0.12	0.07	0.20	0.32																					591	97%
	820	LAX-Hastings	0.21	0.04	0.07	0.15	0.20	0.09	0.10	0.13	0.07	0.26	0.01	0.13	0.19																				820	87%
Orange	3176	Anaheim	0.17	0.08	0.11	0.11	0.24	0.13	0.06	0.09	0.11	0.30	0.03	0.09	0.23	0.04																			3176	88%
	3177	La Hebra	0.16	0.08	0.12	0.11	0.25	0.13	0.06	0.08	0.11	0.31	0.03	0.08	0.24	0.05	0.01																		3177	91%
	3195	Costa Mesa	0.19	0.06	0.09	0.13	0.22	0.10	0.08	0.11	0.09	0.28	0.00	0.11	0.21	0.02	0.02	0.03																	3195	74%
	3812	Mission Viejo	0.28	0.04	0.00	0.23	0.13	0.01	0.18	0.20	0.01	0.19	0.09	0.20	0.12	0.07	0.11	0.12	0.09																3812	90%
Riverside	4031	Temecula	0.44	0.20	0.16	0.38	0.03	0.15	0.33	0.36	0.17	0.03	0.25	0.36	0.04	0.23	0.27	0.28	0.25	0.16															4031	61%
	4137	Palm Springs	0.52	0.28	0.25	0.47	0.12	0.24	0.42	0.45	0.26	0.06	0.33	0.44	0.13	0.32	0.36	0.37	0.34	0.25	0.09														4137	99%
	4144	Riversida - Rubidoux	0.45	0.21	0.18	0.40	0.05	0.16	0.35	0.38	0.18	0.01	0.26	0.38	0.06	0.25	0.29	0.30	0.27	0.18	0.02	0.07													4144	94%
	4149	Perris	0.47	0.23	0.20	0.41	0.07	0.18	0.37	0.39	0.20	0.00	0.28	0.39	0.08	0.27	0.31	0.31	0.29	0.19	0.03	0.06	0.02												4149	90%
	4157	Indio	0.43	0.19	0.16	0.38	0.03	0.15	0.33	0.36	0.16	0.03	0.24	0.36	0.04	0.23	0.27	0.28	0.25	0.16	0.00	0.09	0.02	0.04											4157	99%
	4158	Lake Elsinore	0.39	0.15	0.11	0.33	0.02	0.10	0.28	0.31	0.12	0.08	0.20	0.31	0.01	0.18	0.22	0.23	0.20	0.11	0.05	0.14	0.07	0.08	0.05										4158	91%
	4163	Mira Loma Shool	0.37	0.13	0.09	0.31	0.04	0.08	0.27	0.29	0.10	0.10	0.18	0.29	0.03	0.16	0.20	0.21	0.18	0.09	0.07	0.16	0.09	0.10	0.07	0.02									4163	36%
	4164	Banning Airport	0.53	0.30	0.26	0.48	0.13	0.25	0.43	0.46	0.27	0.07	0.35	0.46	0.14	0.33	0.37	0.38	0.35	0.26	0.10	0.01	0.08	0.07	0.10	0.15	0.17								4164	83%
	4165	Mira Loma	0.41	0.16	0.13	0.35	0.00	0.12	0.30	0.33	0.14	0.06	0.22	0.33	0.01	0.20	0.24	0.25	0.22	0.13	0.03	0.12	0.05	0.07	0.03	0.02	0.04	0.13							4165	88%
San Bernardino	5175	Upland	0.38	0.14	0.10	0.32	0.03	0.09	0.28	0.30	0.11	0.09	0.19	0.30	0.02	0.17	0.21	0.22	0.19	0.10	0.06	0.15	0.08	0.09	0.06	0.01	0.01	0.16	0.03						5175	98%
	5181	Crestline	0.54	0.31	0.28	0.49	0.15	0.26	0.44	0.47	0.28	0.08	0.36	0.47	0.16	0.34	0.38	0.39	0.36	0.27	0.11	0.03	0.10	0.08	0.12	0.17	0.18	0.01	0.15	0.17					5181	99%
	5197	Fontana	0.42	0.18	0.15	0.37	0.02	0.13	0.32	0.34	0.15	0.05	0.23	0.34	0.03	0.22	0.26	0.26	0.24	0.14	0.02	0.10	0.03	0.05	0.01	0.04	0.05	0.12	0.02	0.04	0.13				5197	97%
	5203	San Bernardino	0.42	0.18	0.14	0.36	0.02	0.13	0.32	0.34	0.15	0.05	0.23	0.34	0.03	0.21	0.25	0.26	0.23	0.14	0.02	0.11	0.04	0.05	0.02	0.03	0.05	0.12	0.01	0.04	0.13	0.00			5203	99%
	5204	Redlands	0.50	0.27	0.23	0.45	0.11	0.22	0.40	0.43	0.24	0.04	0.32	0.43	0.12	0.30	0.34	0.35	0.32	0.23	0.07	0.02	0.06	0.04	0.07	0.12	0.14	0.03	0.10	0.13	0.04	0.09	0.09		5204	97%
			Long Beach, Port	Azusa	Burbank	North Long Beach	Reseda	Pomona	Pico Rivera	Los Angeles	Pasadena	Santa Clarita	West Los Angeles	Compton	Glendora	LAX-Hastings	Anaheim	La Hebra	Costa Mesa	Mission Viejo	Temecula	Palm Springs	Riversida - Rubidoux	Perris	Indio	Lake Elsinore	Mira Loma Shool	Banning Airport	Mira Loma	Upland	Crestline	Fontana	San Bernardino	Redlands		
			33	60	69	72	74	75	85	87	88	90	91	112	591	820	3176	3177	3195	3812	4031	4137	4144	4149	4157	4158	4163	4164	4165	5175	5181	5197	5203	5204		
			Los Angeles														Orange				Riverside									San Bernardino						

Figure 13. Ozone Sites with High Correlation and Low Relative Difference



O3 Minimum Monitoring Requirement

The minimum number of O3 sites required is based upon the Metropolitan Statistical Area (MSA) population and the most recent 3-year design value as shown in Table 17.

TABLE 17 Minimum Monitoring Requirements for Ozone.

(Note: Refer to section 4.1 and Table D-2 of Appendix D of 40 CFR Part 58.)

MSA	Counties	Population and Census Year	8-hr Design Value (ppb) DV, Years[1]	Design Value Site (name AQS ID0	Monitors Required	Monitors Active	Monitors Needed
30180	Los Angeles Orange	13,131,431 2013	97 2012-2014	Santa Clarita 060376012	4	16	0
40140	San Bernardino Riverside	4,380,878 2013	102 2012-2014	Redlands 060714003	3	13	0

[1]DV Years – The three years over which the design value was calculated.

Monitors required for SIP or Maintenance Plan: 29

Carbon Monoxide

Carbon monoxide (CO) is a colorless, odorless gas that is formed when carbon in fuel is not burned completely. It is a component of motor vehicle exhaust, which contributes about 56 percent of all CO emissions nationwide. In cities, 85 to 95 percent of all CO emissions may come from motor vehicle exhaust. The highest levels of CO in ambient air typically occur during the colder months of the year when inversion conditions are more frequent. SCAQMD operates 26 sites with CO measurements as part of the AQMD air monitoring network. Figure 5 shows the spatial distribution of these sites.

Regulatory Requirement

Starting in the early 1970's, the EPA set national standards that have considerably reduced emissions of CO and other pollutants from motor vehicles. Since 1970, CO emissions from on-road vehicles have been reduced by over 40 percent. The greatest reductions have been in emissions from cars (nearly 60 percent).

Currently, there is no minimum requirement for the number of CO monitoring sites. Continued operation of existing SLAMS, FRM, or FEMS is required until discontinuation is approved by the EPA Regional Administrator. Where SLAMS CO monitoring is ongoing, at least one site must be a maximum concentration site for the monitoring network.

Monitoring Objective

The CO monitoring network is depicted in Figure 2. The majority of the CO monitoring network sites are designated as population exposure sites. Review of the 2009 – 2014 data indicates that Compton and Port of Long Beach sites recorded the highest 24-hour average for CO as 4.7 ppm and 3.3 ppm respectively. The highest CO concentration recorded in 2008 was measured at Lynwood air monitoring site which was replaced in 2008 by the Compton location due to unstable infrastructure and after concurrent sampling showed that CO levels were comparable at the two sites. The lowest recorded values include Mission Viejo, Lake Elsinore, Santa Clarita, Fontana and Palm Springs. The majority of sites remain on the west side where highest CO concentrations are measured and population growth has remained relatively stagnant. CO measurements in general are of lower value given the attainment status of the Basin and the low design values. However, since CO does contribute to the photochemical ozone formation in SCAB, albeit at rates much smaller than that of other precursors such as VOCs and NOx and that there is the prospect of new CO NAAQS add value to tracking long-term CO trends and spatial variability.

Table 18. CO Network Design

Station	Monitoring Objective	Spatial Scale	Site Consistent with Monitoring Objective
Anaheim	High Concentration	Neighborhood	Yes
Azusa	Population Oriented	Neighborhood	Yes
Burbank	Population Oriented	Neighborhood	Closed
Compton	High Concentration	Middle	Yes
Costa Mesa	Population Oriented	Neighborhood	Yes
Fontana	Population Oriented	Neighborhood	Yes
Glendora	Population Oriented	Neighborhood	Yes
La Hebra	Population Oriented	Neighborhood	Yes
Lake Elsinore	Population Oriented	Neighborhood	Yes
LAX-Hastings	Population Oriented	Middle	Yes
Long Beach, Port	Population Oriented	Neighborhood	Closed
Los Angeles	Population Oriented	Neighborhood	Yes
Mira Loma	Population Oriented	Neighborhood	Yes
Mira Loma School	Population Oriented	Neighborhood	Closed
Mission Viejo	Population Oriented	Neighborhood	Yes
North Long Beach	Population Oriented	Micro	Closed
Palm Springs	Population Oriented	Neighborhood	Yes
Pasadena	Population Oriented	Middle	Yes
Pico Rivera	Population Oriented	Neighborhood	Yes
Pomona	Population Oriented	Micro	Yes
Reseda	Population Oriented	Neighborhood	Yes
Riverside - Downtown	Population Oriented	Micro	Closed
Rubidoux	Population Oriented	Middle	Yes
San Bernardino	Population Oriented	Middle	Yes
Santa Clarita	Population Oriented	Neighborhood	Yes
Upland	Population Oriented	Neighborhood	Yes
West Los Angeles	Population Oriented	Neighborhood	Yes

Spatial Scale of Representativeness

Most sites are consistent with the appropriate CO spatial scale of representativeness for the monitoring objective.

Planning Model Calculation Frequency

Figure 14 shows the usage for the CO monitors in the South Coast Basin. The sites used most frequently are the ones that are near the most heavily trafficked roadways and along the corridor of the Goods Movement.

Figure 14. Estimated Model Calculation Frequency per Site for CO

Correlation Analysis

CO correlation for the period of 2009 to 2014, between sites in Los Angeles, Orange, Riverside, and San Bernardino counties are shown in Figure 15. Figure 16 presents the average relative difference between sites in the basin. Site pairs with correlations greater than 0.8 and relative differences less than 0.3 for CO are highlighted in dark green in Figure 17 and are:

North Long Beach	Long Beach, Port Compton
Anaheim	La Habra
Mira Loma	Mira Loma School*

The correlation analysis also shows that for CO, a cluster with a relatively high level of correlation (greater than 0.7) and a low average relative difference is present in the Los Angeles county.

Figure 15. CO Correlation Matrix Chart

County	ID	Site	33	60	69	72	74	75	85	87	88	90	91	112	591	820	3176	3177	3195	3812	4137	4144	4146	4158	4163	4165	5175	5197	5203	ID	Data Completion
Los Angeles	33	Long Beach, Port																												33	74%
	60	Azusa	0.04																											60	99%
	69	Burbank	0.7	0.19																										69	89%
	72	North Long Beach	0.92	0.04	0.76																									72	77%
	74	Reseda	0.51	0.19	0.72	0.52																								74	98%
	75	Pomona	0.47	0.28	0.7	0.55	0.54																							75	99%
	85	Pico Rivera	0.66	0.19	0.77	0.74	0.59	0.58																						85	100%
	87	Los Angeles	0.61	0.26	0.78	0.61	0.59	0.64	0.73																					87	99%
	88	Pasadena	0.48	0.21	0.7	0.58	0.5	0.62	0.61	0.57																				88	87%
	90	Santa Clarita	0.13	0.21	0.24	0.15	0.32	0.24	0.18	0.18	0.16																			90	99%
	91	West Los Angeles	0.46	0.25	0.64	0.5	0.54	0.53	0.55	0.61	0.44	0.24																		91	99%
	112	Compton	0.86	0.06	0.71	0.86	0.48	0.55	0.72	0.63	0.58	0.12	0.48																	112	99%
	591	Glendora	0	0.36	0.04	0.01	0.04	0.12	0.02	0.04	0.07	0.12	0.06	0.01																591	99%
	820	LAX-Hastings	0.52	0.05	0.52	0.58	0.38	0.35	0.42	0.42	0.4	0.13	0.36	0.53	0															820	97%
Orange	3176	Anaheim	0.66	0.12	0.72	0.71	0.58	0.58	0.72	0.65	0.58	0.16	0.51	0.67	0.02	0.43														3176	99%
	3177	La Hebra	0.66	0.12	0.72	0.71	0.58	0.58	0.72	0.65	0.58	0.16	0.51	0.67	0.02	0.43	1													3177	99%
	3195	Costa Mesa	0.67	0.02	0.62	0.68	0.48	0.44	0.54	0.45	0.5	0.11	0.32	0.63	0	0.37	0.67	0.67												3195	98%
	3812	Mission Viejo	0.28	0.12	0.41	0.36	0.33	0.37	0.35	0.32	0.35	0.1	0.28	0.28	0.03	0.27	0.46	0.46	0.35											3812	99%
Riverside	4137	Palm Springs	0.02	0.01	0.04	0.02	0.04	0.04	0.03	0.03	0.04	0.03	0.03	0.02	0	0.02	0.05	0.05	0.04	0.03										4137	99%
	4144	Rubidoux	0.28	0.37	0.48	0.3	0.57	0.57	0.46	0.53	0.37	0.29	0.45	0.3	0.09	0.26	0.41	0.41	0.22	0.26	0.02									4144	100%
	4146	Riverside - Downtown	0.47	0.29	0.66	0.51	0.65	0.69	0.58	0.6	0.53	0.3	0.58	0.46	0.11	0.35	0.59	0.59	0.42	0.38	0.04	0.68								4146	99%
	4158	Lake Elsinore	0.04	0.13	0.18	0.1	0.13	0.15	0.1	0.1	0.1	0.12	0.12	0.06	0.07	0.06	0.08	0.08	0.06	0.08	0.05	0.18	0.18							4158	99%
	4163	Mira Loma School	0.48	0.2	0.64	0.48	0.66	0.65	0.62	0.53	0.52	0.26	0.45	0.4	0.05	0.36	0.6	0.6	0.48	0.49	0.14	0.63	0.72	0.34						4163	37%
	4165	Mira Loma	0.42	0.27	0.64	0.46	0.68	0.67	0.55	0.53	0.55	0.28	0.53	0.43	0.08	0.3	0.56	0.56	0.41	0.4	0.04	0.68	0.76	0.21	0.85					4165	98%
San Bernardino	5175	Upland	0.26	0.36	0.44	0.32	0.42	0.56	0.42	0.47	0.42	0.27	0.32	0.3	0.2	0.19	0.38	0.38	0.26	0.26	0.03	0.5	0.55	0.15	0.54	0.48				5175	99%
	5197	Fontana	0.23	0.38	0.43	0.25	0.46	0.56	0.35	0.39	0.4	0.29	0.4	0.23	0.2	0.15	0.34	0.34	0.24	0.29	0.05	0.49	0.6	0.2	0.58	0.62	0.56			5197	98%
	5203	San Bernardino	0.36	0.27	0.58	0.39	0.63	0.49	0.49	0.49	0.39	0.31	0.38	0.34	0.08	0.29	0.47	0.47	0.35	0.3	0.04	0.62	0.64	0.17	0.67	0.67	0.54	0.5		5203	98%
			Long Beach, Port	Azusa	Burbank	North Long Beach	Reseda	Pomona	Pico Rivera	Los Angeles	Pasadena	Santa Clarita	West Los Angeles	Compton	Glendora	LAX-Hastings	Anaheim	La Hebra	Costa Mesa	Mission Viejo	Palm Springs	Rubidoux	Riverside - Downtown	Lake Elsinore	Mira Loma School	Mira Loma	Upland	Fontana	San Bernardino		
			33	60	69	72	74	75	85	87	88	90	91	112	591	820	3176	3177	3195	3812	4137	4144	4146	4158	4163	4165	5175	5197	5203		
			Los Angeles														Orange				Riverside						San Bernardino				

Figure 16. Carbon Monoxide Relative Difference Chart

			33	60	69	72	74	75	85	87	88	90	91	112	591	820	3176	3177	3195	3812	4137	4144	4146	4158	4163	4165	5175	5197	5203		Data Completion
Los Angeles	33	Long Beach, Port																												33	74%
	60	Azusa	0.49																											60	99%
	69	Burbank	0.05	0.44																										69	89%
	72	North Long Beach	0.2	0.3	0.15																									72	77%
	74	Reseda	0.07	0.42	0.02	0.13																								74	98%
	75	Pomona	0.23	0.27	0.18	0.03	0.16																							75	99%
	85	Pico Rivera	0.14	0.36	0.09	0.06	0.07	0.09																						85	100%
	87	Los Angeles	0.04	0.53	0.09	0.25	0.12	0.27	0.18																					87	99%
	88	Pasadena	0.23	0.27	0.18	0.03	0.16	0	0.09	0.27																				88	87%
	90	Santa Clarita	0.71	0.24	0.67	0.53	0.65	0.5	0.58	0.75	0.5																			90	99%
	91	West Los Angeles	0.42	0.07	0.37	0.22	0.35	0.19	0.28	0.46	0.2	0.31																		91	99%
	112	Compton	0.25	0.72	0.3	0.45	0.32	0.47	0.39	0.2	0.47	0.92	0.65																	112	99%
	591	Glendora	0.62	0.14	0.58	0.43	0.55	0.4	0.49	0.66	0.41	0.1	0.21	0.84																591	99%
	820	LAX-Hastings	0.24	0.26	0.19	0.04	0.17	0.01	0.1	0.28	0.01	0.49	0.18	0.48	0.39															820	97%
Orange	3176	Anaheim	0.19	0.31	0.14	0.01	0.12	0.04	0.05	0.23	0.04	0.54	0.24	0.43	0.44	0.05														3176	99%
	3177	La Hebra	0.19	0.31	0.14	0.01	0.12	0.04	0.05	0.23	0.04	0.54	0.24	0.43	0.44	0.05	0													3177	99%
	3195	Costa Mesa	0.4	0.1	0.35	0.2	0.33	0.17	0.26	0.44	0.17	0.34	0.02	0.63	0.24	0.16	0.21	0.21												3195	98%
	3812	Mission Viejo	0.73	0.26	0.68	0.54	0.66	0.52	0.6	0.77	0.52	0.02	0.33	0.93	0.12	0.51	0.56	0.56	0.36											3812	99%
Riverside	4137	Palm Springs	0.82	0.37	0.78	0.65	0.76	0.62	0.7	0.86	0.62	0.13	0.44	1.02	0.23	0.61	0.66	0.66	0.46	0.11										4137	99%
	4144	Rubidoux	0.22	0.28	0.17	0.01	0.14	0.02	0.08	0.26	0.01	0.51	0.21	0.46	0.42	0.03	0.03	0.03	0.18	0.53	0.64									4144	100%
	4146	Riverside - Downtown	0.28	0.22	0.23	0.08	0.21	0.05	0.14	0.32	0.05	0.45	0.14	0.52	0.36	0.04	0.09	0.09	0.12	0.47	0.58	0.06								4146	99%
	4158	Lake Elsinore	0.8	0.34	0.76	0.62	0.74	0.6	0.68	0.84	0.6	0.11	0.42	1	0.21	0.59	0.64	0.64	0.44	0.09	0.03	0.61	0.55							4158	99%
	4163	Mira Loma School	0.29	0.21	0.24	0.09	0.22	0.06	0.15	0.33	0.06	0.44	0.13	0.53	0.35	0.05	0.1	0.1	0.11	0.46	0.57	0.08	0.01	0.54						4163	37%
	4165	Mira Loma	0.38	0.12	0.33	0.17	0.3	0.15	0.24	0.42	0.15	0.36	0.05	0.61	0.26	0.14	0.19	0.19	0.02	0.38	0.49	0.16	0.1	0.46	0.09					4165	98%
San Bernardino	5175	Upland	0.35	0.15	0.3	0.14	0.27	0.12	0.21	0.39	0.12	0.39	0.08	0.58	0.29	0.11	0.16	0.16	0.05	0.41	0.52	0.13	0.07	0.49	0.06	0.03				5175	99%
	5197	Fontana	0.49	0	0.45	0.3	0.42	0.27	0.36	0.53	0.27	0.24	0.08	0.72	0.14	0.26	0.31	0.31	0.1	0.26	0.37	0.28	0.22	0.34	0.21	0.12	0.15			5197	98%
	5203	San Bernardino	0.33	0.17	0.28	0.13	0.26	0.1	0.19	0.37	0.1	0.41	0.1	0.56	0.31	0.09	0.14	0.14	0.07	0.42	0.53	0.11	0.05	0.51	0.04	0.05	0.02	0.17		5203	98%
			Long Beach, Port	Azusa	Burbank	North Long Beach	Reseda	Pomona	Pico Rivera	Los Angeles	Pasadena	Santa Clarita	West Los Angeles	Compton	Glendora	LAX-Hastings	Anaheim	La Hebra	Costa Mesa	Mission Viejo	Palm Springs	Rubidoux	Riverside - Downtown	Lake Elsinore	Mira Loma School	Mira Loma	Upland	Fontana	San Bernardino		
			33	60	69	72	74	75	85	87	88	90	91	112	591	820	3176	3177	3195	3812	4137	4144	4146	4158	4163	4165	5175	5197	5203		
			Los Angeles														Orange				Riverside						San Bernardino				

FIGURE 17. Carbon Monoxide Sites with High Correlation and Low Relative Difference

			33	60	69	72	74	75	85	87	88	90	91	112	591	820	3176	3177	3195	3812	4137	4144	4146	4158	4163	4165	5175	5197	5203		Data Completion
Los Angeles	33	Long Beach, Port																												33	74%
	60	Azusa																												60	99%
	69	Burbank																												69	89%
	72	North Long Beach																												72	77%
	74	Reseda																												74	98%
	75	Pomona																												75	99%
	85	Pico Rivera																												85	100%
	87	Los Angeles																												87	99%
	88	Pasadena																												88	87%
	90	Santa Clarita																												90	99%
	91	West Los Angeles																												91	99%
	112	Compton																												112	99%
	591	Glendora																												591	99%
	820	LAX-Hastings																												820	97%
Orange	3176	Anaheim																												3176	99%
	3177	La Hebra																												3177	99%
	3195	Costa Mesa																												3195	98%
	3812	Mission Viejo																												3812	99%
Riverside	4137	Palm Springs																												4137	99%
	4144	Rubidoux																												4144	100%
	4146	Riverside - Downtown																												4146	99%
	4158	Lake Elsinore																												4158	99%
	4163	Mira Loma School																												4163	37%
	4165	Mira Loma																												4165	98%
San Bernardino	5175	Upland																												5175	99%
	5197	Fontana																												5197	98%
	5203	San Bernardino																												5203	98%
			Long Beach, Port	Azusa	Burbank	North Long Beach	Reseda	Pomona	Pico Rivera	Los Angeles	Pasadena	Santa Clarita	West Los Angeles	Compton	Glendora	LAX-Hastings	Anaheim	La Hebra	Costa Mesa	Mission Viejo	Palm Springs	Rubidoux	Riverside - Downtown	Lake Elsinore	Mira Loma School	Mira Loma	Upland	Fontana	San Bernardino		
			33	60	69	72	74	75	85	87	88	90	91	112	591	820	3176	3177	3195	3812	4137	4144	4146	4158	4163	4165	5175	5197	5203		
			Los Angeles														Orange				Riverside						San Bernardino				

Minimum Number of Sites Required

For the CO monitoring network, the requirement is that one site is deployed at a site designated as maximum concentration (Compton). All others may be considered for closure by demonstrating either attainment has been reached and expected to be maintained, a monitor is consistently low relative to other monitors, a monitor has not measured a violation with NAAQS, a monitor has siting issues, a monitor is upwind of the urban area, or a site has logistical problems beyond agency control.

For the near road network, one CO monitor is required to operate collocated with one required near-road NO_2 monitor, in CBSAs having a population of 1,000,000 or more persons. If a CBSA has more than one required near-road NO_2 monitor, only one CO monitor is required to be collocated with a near-road NO_2 monitor within that CBSA. Table 19 shows that SCAQMD air monitoring network exceeds the required minimum numbers of CO monitors.

TABLE 19. Minimum Monitoring Requirements for CO

(Note: Refer to section 4.2 of Appendix D of 40 CFR Part 58.)

CBSA	Population and Census Year	#Required Near Road Monitors[1]		#Active Near Road Monitors[2]	#Required Area Wide Monitors	#Active Area Wide Monitors
30180	13,131,431 2013	1		1	0	16
40140	4,380,878 2013	1		1	0	7

[1]Required beginning January 1, 2015

[2]Required sites to be active by January 1, 2015; to be collocated with near road NO2 sites.

Monitors required for SIP or Maintenance Plan: 23 (area wide), 2 (near road)

EPA Regional Administrator-required monitors per 40 CFR 58, Appendix D 4.4.2: 0

Nitrogen Dioxide

Nitrogen dioxide (NO2) is one of a group of highly reactive gases known as "oxides of nitrogen," or "nitrogen oxides” (NOx). Some NO2 is emitted directly but most NO2 forms in the atmosphere from the NO emissions from cars, trucks, buses, power plants, and any high-temperature combustion process. In addition to contributing to the formation of ground-level O3 and fine particle pollution, NO2 is linked with a number of adverse effects on the respiratory system. The SCAQMD operates 23 sites as part of the NO2 monitoring network. The spatial distribution of NO2 monitors is shown in Figure 3. Review of 1992 through 20014 data indicates that the annual NAAQS for NO2 was not exceeded.

Regulatory Requirement

As of 2009, there was no minimum requirement for the number of NO2 monitoring sites. Continued operation of existing SLAMS sites is required until discontinuation is approved by the U.S. EPA Regional Administrator. Where SLAMS NO2 monitoring is ongoing, at least one site must be a maximum concentration site for the monitoring network.

On February 9, 2010, EPA revised the NO2 NAAQS requiring monitoring where maximum NO2 concentrations were expected to occur, including within 50 meters of major roadways, as well as monitors sited to measure the area-wide NO2 concentrations that occur more broadly across communities. To accomplish this, a two-tiered monitoring network is proposed for the

NO2 NAAQS. One tier (the near-road network) will reflect the much higher NO2 concentrations that occur near-road and the second-tier (area-wide) characterizes the NO2 concentrations that occur in a larger area such as neighborhood or urban areas.

Monitoring Objective

The majority of the NO2 monitoring network is designated as population exposure sites. A review of data (Figure 18) indicates that the highest 24-hour concentrations in the 2009 to 2014 period were recorded at the Port of Long Beach, Central Los Angeles, and North Long Beach monitoring locations and the lowest concentrations were recorded at the Palm Springs and Lake Elsinore sites. The North Long Beach, Compton, and Central LA sites are more representative of high concentration sites than population exposure. The remainder of the sites are representative of population exposure. Monitors are distributed primarily in the western portion of the basin where higher NO2 levels are expected. Given the attainment status of the basin and the low ambient levels, these monitors are generally of lower value. However, the new 2010 NAAQS and monitoring requirements add value in terms of long-term trends and spatial variability.

FIGURE 18. Nitrogen Dioxide Quartile Analysis

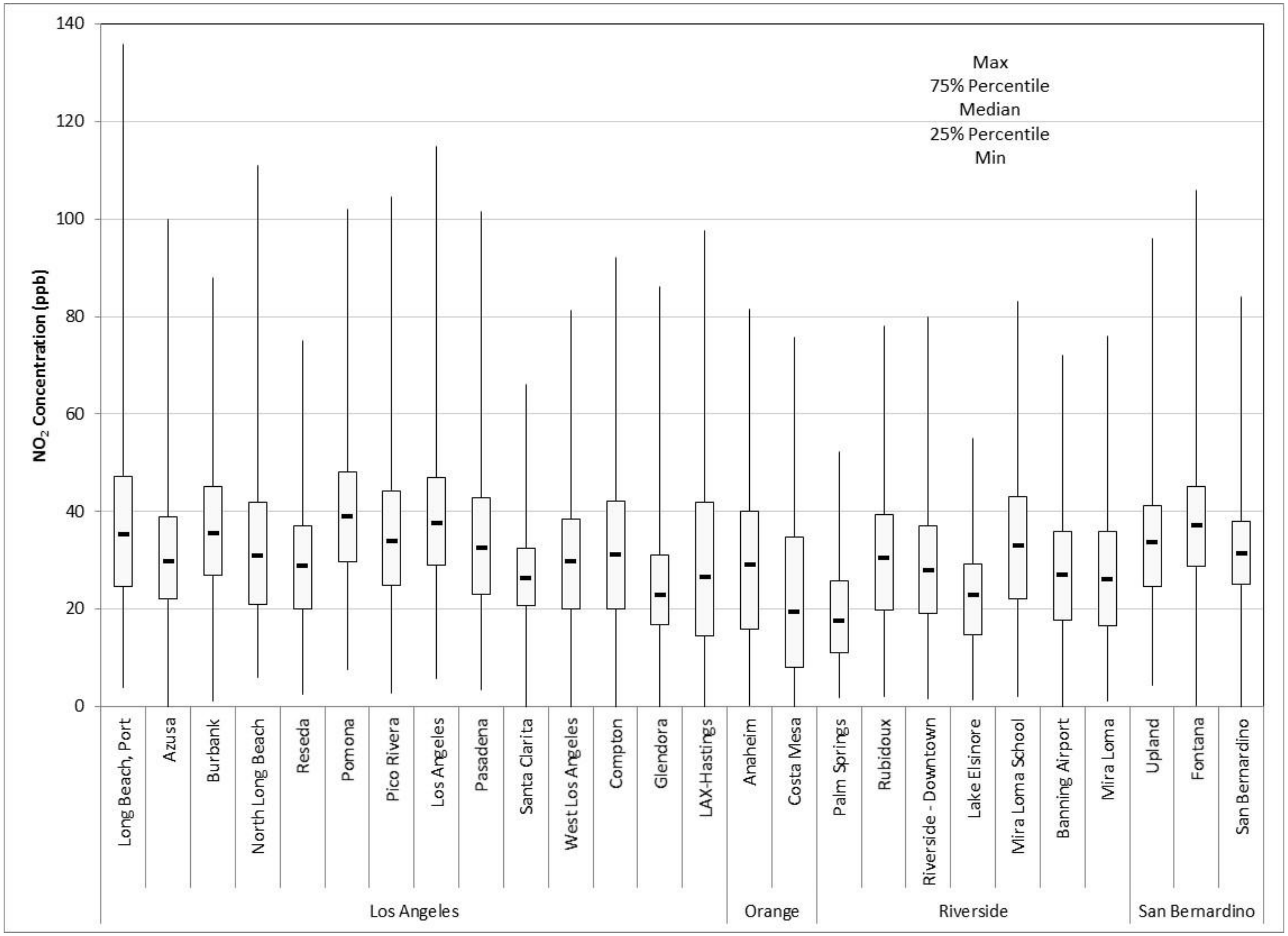


TABLE 20. NO2 Network Design

Station	Monitoring Objective	Spatial Scale	Site Consistent with Monitoring Objective
Anaheim	Population Oriented	Urban	Yes
Azusa	Population Oriented	Urban	Yes
Banning Airport	Population Oriented	Neighborhood	Yes
Burbank	Population Oriented	Neighborhood	Closed
Compton	High Concentration	Middle	Yes
Costa Mesa	Population Oriented	Neighborhood	Yes
Fontana	Population Oriented	Urban	Yes
Glendora	Population Oriented	Neighborhood	Yes
Lake Elsinore	Population Oriented	Neighborhood	Yes
LAX-Hastings	Population Oriented	Middle	No
Long Beach, Port	Population Oriented	Middle	Closed
Los Angeles	High Concentration	Neighborhood	Yes
Mira Loma	Population Oriented	Neighborhood	Yes
Mira Loma School	Population Oriented	Neighborhood	Closed
North Long Beach	High Concentration	Middle	Closed
Palm Springs	Population Oriented	Neighborhood	Yes
Pasadena	Population Oriented	Neighborhood	Yes
Pico Rivera	Population Oriented	Neighborhood	Yes
Pomona	Population Oriented	Middle	No
Reseda	Population Oriented	Urban	Yes
Riverside - Downtown	Population Oriented	Urban	Closed
Rubidoux	Population Oriented	Urban	Yes
San Bernardino	Population Oriented	Urban	Yes
Santa Clarita	Population Oriented	Neighborhood	Yes
Upland	Population Oriented	Neighborhood	Yes
West Los Angeles	Population Oriented	Neighborhood	Yes

Spatial Scale of Representativeness

Most sites were consistent with NO2 spatial scale of representativeness. Comparison of Table 20 with U.S. EPA criteria showed that the LAX Hastings, and Pomona sites could be designated at spatial scales that are more consistent with monitoring objectives. A waiver is being submitted as part of the 2015 Annual Network Plan. The remainder of the sites are representative of population-oriented sites at the neighborhood scale.

Planning Model Calculation Frequency

Figure 19 shows the usage for the NO2 monitors in the South Coast Basin. The sites used most frequently, similarly to CO, are the ones that are near the most heavily trafficked roadways and along the corridor of the Goods Movement.

FIGURE 19. Estimated Model Calculation Frequency per Site for NO2

Correlation Analysis

NO2 correlation for the period of 2009 to 2014, between sites in Los Angeles, Orange, Riverside, and San Bernardino counties are shown in Figure 18. Figure 19 presents the average relative difference between sites in the SCAB. Site pairs with correlations greater than 0.8 and relative differences less than 0.3 for NO2 are highlighted in dark green in Figure 20 and are:

North Long Beach	Long Beach, Port
Anaheim	Costa Mesa
Mira Loma	Mira Loma School*

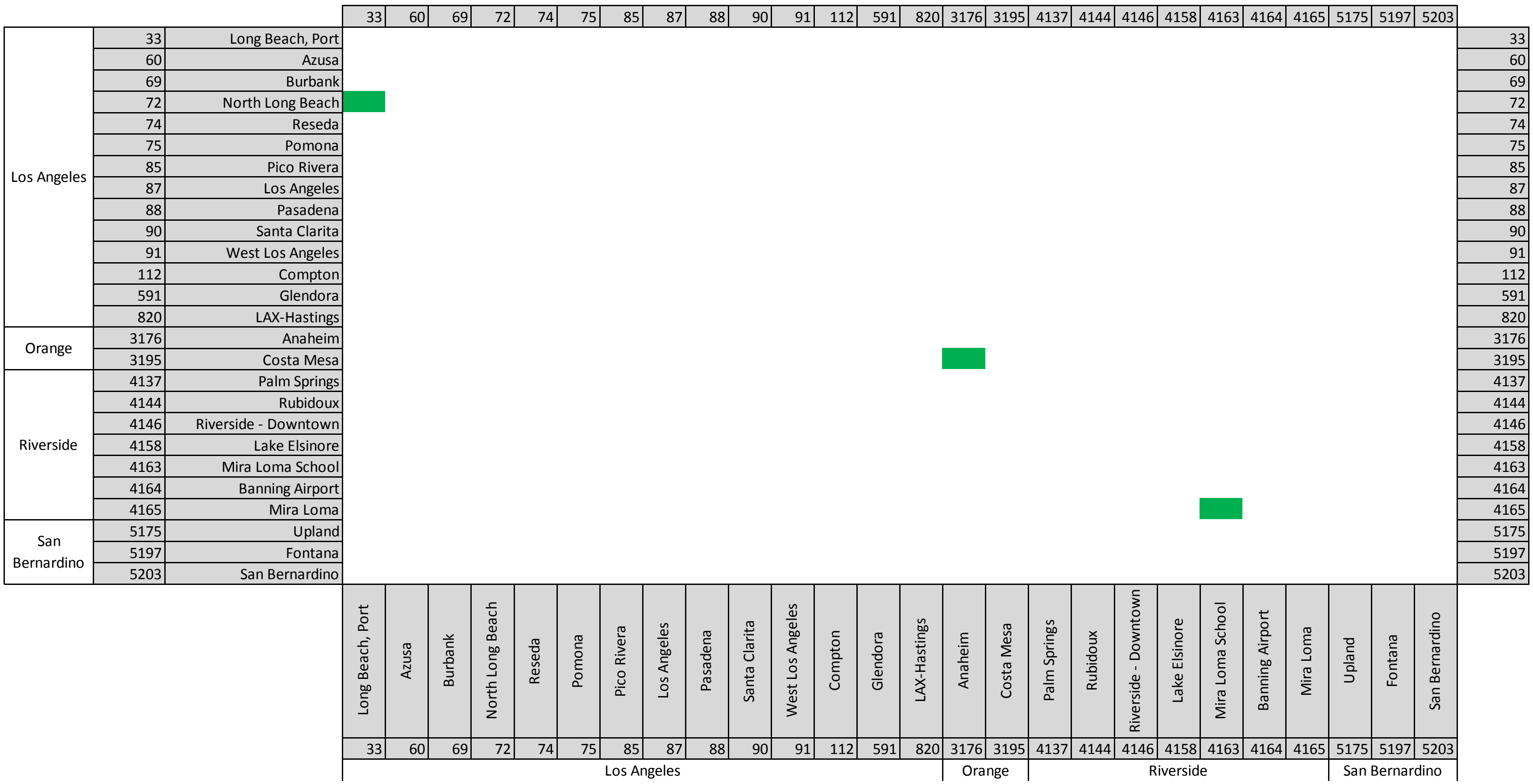
FIGURE 20. Nitrogen Dioxide Correlation Matrix Chart

			33	60	69	72	74	75	85	87	88	90	91	112	591	820	3176	3195	4137	4144	4146	4158	4163	4164	4165	5175	5197	5203	
Los Angeles	33	Long Beach, Port																											33
	60	Azusa	0.22																										60
	69	Burbank	0.54	0.42																									69
	72	North Long Beach	0.81	0.26	0.52																								72
	74	Reseda	0.41	0.41	0.64	0.46																							74
	75	Pomona	0.49	0.54	0.68	0.49	0.58																						75
	85	Pico Rivera	0.69	0.41	0.69	0.67	0.56	0.67																					85
	87	Los Angeles	0.55	0.44	0.71	0.57	0.54	0.68	0.68																				87
	88	Pasadena	0.57	0.47	0.73	0.56	0.59	0.72	0.73	0.73																			88
	90	Santa Clarita	0.11	0.36	0.25	0.13	0.36	0.28	0.21	0.24	0.27																		90
	91	West Los Angeles	0.51	0.23	0.54	0.5	0.54	0.47	0.59	0.55	0.51	0.15																	91
	112	Compton	0.76	0.23	0.56	0.74	0.49	0.5	0.72	0.59	0.6	0.13	0.6																112
	591	Glendora	0.1	0.65	0.31	0.14	0.29	0.39	0.24	0.28	0.33	0.34	0.12	0.12															591
	820	LAX-Hastings	0.61	0.11	0.45	0.51	0.36	0.33	0.54	0.41	0.44	0.07	0.6	0.65	0.05														820
Orange	3176	Anaheim	0.71	0.2	0.54	0.66	0.48	0.52	0.72	0.5	0.59	0.11	0.59	0.73	0.09	0.64													3176
	3195	Costa Mesa	0.7	0.12	0.46	0.62	0.38	0.38	0.62	0.38	0.5	0.09	0.51	0.7	0.05	0.67	0.82												3195
Riverside	4137	Palm Springs	0.36	0.21	0.33	0.34	0.34	0.29	0.38	0.27	0.39	0.19	0.28	0.37	0.17	0.35	0.39	0.42											4137
	4144	Rubidoux	0.46	0.43	0.61	0.5	0.61	0.69	0.62	0.59	0.62	0.27	0.51	0.51	0.27	0.41	0.54	0.44	0.39										4144
	4146	Riverside - Downtown	0.52	0.4	0.66	0.53	0.6	0.69	0.63	0.6	0.63	0.23	0.55	0.55	0.28	0.43	0.58	0.5	0.36	0.78									4146
	4158	Lake Elsinore	0.37	0.43	0.49	0.36	0.48	0.56	0.47	0.46	0.53	0.37	0.34	0.37	0.35	0.24	0.36	0.3	0.36	0.59	0.54								4158
	4163	Mira Loma School	0.59	0.35	0.63	0.53	0.62	0.58	0.62	0.58	0.62	0.25	0.51	0.53	0.21	0.4	0.59	0.51	0.42	0.76	0.73	0.51							4163
	4164	Banning Airport	0.2	0.36	0.34	0.26	0.37	0.42	0.32	0.33	0.39	0.33	0.22	0.21	0.34	0.13	0.23	0.18	0.35	0.41	0.4	0.5	0.39						4164
	4165	Mira Loma	0.47	0.39	0.58	0.54	0.62	0.64	0.61	0.54	0.58	0.25	0.49	0.53	0.26	0.42	0.57	0.49	0.42	0.79	0.73	0.55	0.85	0.42					4165
San Bernardino	5175	Upland	0.4	0.58	0.58	0.39	0.51	0.69	0.53	0.53	0.61	0.36	0.34	0.39	0.53	0.24	0.38	0.3	0.34	0.61	0.61	0.65	0.55	0.48	0.56				5175
	5197	Fontana	0.17	0.48	0.41	0.22	0.47	0.52	0.33	0.37	0.38	0.38	0.2	0.18	0.45	0.09	0.19	0.11	0.24	0.53	0.47	0.53	0.51	0.48	0.55	0.63			5197
	5203	San Bernardino	0.25	0.52	0.46	0.29	0.44	0.51	0.37	0.39	0.46	0.4	0.26	0.26	0.48	0.15	0.22	0.18	0.29	0.53	0.51	0.53	0.43	0.48	0.47	0.61	0.62		5203
			Long Beach, Port	Azusa	Burbank	North Long Beach	Reseda	Pomona	Pico Rivera	Los Angeles	Pasadena	Santa Clarita	West Los Angeles	Compton	Glendora	LAX-Hastings	Anaheim	Costa Mesa	Palm Springs	Rubidoux	Riverside - Downtown	Lake Elsinore	Mira Loma School	Banning Airport	Mira Loma	Upland	Fontana	San Bernardino	
			33	60	69	72	74	75	85	87	88	90	91	112	591	820	3176	3195	4137	4144	4146	4158	4163	4164	4165	5175	5197	5203	
			Los Angeles														Orange		Riverside							San Bernardino			

FIGURE 21. Nitrogen Dioxide Relative Difference Chart

			33	60	69	72	74	75	85	87	88	90	91	112	591	820	3176	3195	4137	4144	4146	4158	4163	4164	4165	5175	5197	5203	
Los Angeles	33	Long Beach, Port																											33
	60	Azusa	0.16																										60
	69	Burbank	0.02	0.14																									69
	72	North Long Beach	0.13	0.03	0.11																								72
	74	Reseda	0.24	0.08	0.22	0.11																							74
	75	Pomona	0.05	0.22	0.07	0.18	0.3																						75
	85	Pico Rivera	0.06	0.11	0.04	0.07	0.19	0.11																					85
	87	Los Angeles	0.04	0.2	0.06	0.17	0.28	0.02	0.09																				87
	88	Pasadena	0.11	0.05	0.09	0.02	0.13	0.16	0.05	0.15																			88
	90	Santa Clarita	0.32	0.16	0.3	0.19	0.08	0.37	0.26	0.35	0.21																		90
	91	West Los Angeles	0.23	0.07	0.21	0.1	0.01	0.29	0.18	0.27	0.12	0.09																	91
	112	Compton	0.15	0.02	0.13	0.02	0.1	0.2	0.09	0.18	0.04	0.17	0.09																112
	591	Glendora	0.4	0.24	0.38	0.27	0.16	0.45	0.34	0.43	0.29	0.08	0.17	0.25															591
	820	LAX-Hastings	0.26	0.1	0.24	0.13	0.02	0.32	0.21	0.3	0.15	0.06	0.03	0.12	0.14														820
Orange	3176	Anaheim	0.25	0.08	0.23	0.12	0	0.3	0.19	0.28	0.14	0.07	0.01	0.1	0.15	0.02													3176
	3195	Costa Mesa	0.5	0.34	0.48	0.38	0.26	0.55	0.45	0.53	0.39	0.19	0.27	0.36	0.11	0.25	0.26												3195
Riverside	4137	Palm Springs	0.66	0.51	0.64	0.54	0.43	0.7	0.6	0.69	0.56	0.36	0.44	0.52	0.28	0.41	0.43	0.17											4137
	4144	Rubidoux	0.22	0.06	0.2	0.09	0.03	0.27	0.16	0.25	0.11	0.1	0.01	0.07	0.18	0.05	0.03	0.29	0.45										4144
	4146	Riverside - Downtown	0.26	0.1	0.24	0.13	0.02	0.31	0.2	0.29	0.15	0.06	0.03	0.11	0.14	0	0.01	0.25	0.41	0.04									4146
	4158	Lake Elsinore	0.5	0.35	0.48	0.38	0.27	0.55	0.45	0.54	0.4	0.19	0.28	0.36	0.11	0.25	0.26	0	0.17	0.29	0.25								4158
	4163	Mira Loma School	0.12	0.04	0.1	0.01	0.12	0.17	0.06	0.16	0.01	0.2	0.11	0.03	0.28	0.14	0.13	0.38	0.55	0.1	0.14	0.39							4163
	4164	Banning Airport	0.32	0.16	0.3	0.2	0.08	0.38	0.27	0.36	0.22	0.01	0.09	0.18	0.08	0.06	0.08	0.18	0.35	0.11	0.07	0.19	0.21						4164
	4165	Mira Loma	0.33	0.17	0.31	0.2	0.09	0.38	0.27	0.36	0.22	0.01	0.1	0.18	0.07	0.07	0.08	0.18	0.35	0.11	0.07	0.18	0.21	0					4165
San Bernardino	5175	Upland	0.11	0.05	0.09	0.02	0.13	0.17	0.05	0.15	0	0.21	0.12	0.03	0.29	0.15	0.14	0.39	0.55	0.11	0.15	0.4	0.01	0.21	0.22				5175
	5197	Fontana	0	0.16	0.02	0.13	0.24	0.06	0.05	0.04	0.11	0.32	0.23	0.14	0.39	0.26	0.24	0.5	0.65	0.21	0.26	0.5	0.12	0.32	0.33	0.11			5197
	5203	San Bernardino	0.15	0.01	0.13	0.02	0.09	0.2	0.09	0.19	0.04	0.17	0.08	0	0.25	0.11	0.1	0.36	0.52	0.07	0.11	0.36	0.03	0.18	0.18	0.04	0.15		5203
			Long Beach, Port	Azusa	Burbank	North Long Beach	Reseda	Pomona	Pico Rivera	Los Angeles	Pasadena	Santa Clarita	West Los Angeles	Compton	Glendora	LAX-Hastings	Anaheim	Costa Mesa	Palm Springs	Rubidoux	Riverside - Downtown	Lake Elsinore	Mira Loma School	Banning Airport	Mira Loma	Upland	Fontana	San Bernardino	
			33	60	69	72	74	75	85	87	88	90	91	112	591	820	3176	3195	4137	4144	4146	4158	4163	4164	4165	5175	5197	5203	
			Los Angeles														Orange		Riverside							San Bernardino			

FIGURE 22. Nitrogen Dioxide Sites with High Correlation and Low Relative Difference



Minimum Number of Sites Required

For the NO2 area wide monitoring network, there must only be one site designated as maximum concentration. All others may be considered for closure by demonstrating either attainment has been reached and expected to be maintained, a monitor is consistently low relative to other monitors, a monitor has not measured a violation with NAAQS, a monitor has siting issues, a monitor is upwind of the urban area, or a site has logistical problems beyond agency control.

The Regional Administrator in collaboration with SCAQMD identified the Los Angeles (Main), Long Beach (North) and San Bernardino sites from the existing area-wide monitoring network to meet this requirement (58.10[a][5]). On September 30, 2013, the continuous monitors including NO2 were discontinued at Long Beach (North) due to termination of the lease by owner. SCAQMD is proposing re-designation of Compton as a RA 40 site.

Near-road monitoring requires that within the NO2 network, there must be one microscale near-road NO2 monitoring station in each CBSA with a population of 500,000 or more persons to monitor a location of expected maximum hourly concentrations sited near a major road with high AADT. The summary of the minimum NO2 monitoring requirements is shown in Table 21.

TABLE 21 Minimum Monitoring Requirements for NO2

(Note: Refer to section 4.3 of Appendix D of 40 CFR Part 58.)

CBSA	Population and Census Year	Max AADT Counts (2013)[1]	# Required Near Road Monitors[2]	#Active Near Road Monitors	#Additional Near Road Monitors Needed	#Required Area Wide Monitors	#Active Area Wide Monitors	#Additional Area wide Monitors Needed
30180	13,131,431 2013	377,000 2013	2	2	0	1	15	0
40140	4,380,878 2013	267,000 2013	2	2	0	1	8	0

[1]Max AADT Counts – 2013 is the latest data available from CA DOT

[2]Four required beginning January 1, 2015.

Monitors required for SIP or Maintenance Plan: 13 (area wide), 4 (near road)

Monitors Required for PAMS: 7

EPA Regional Administrator-required monitors per 40 CFR 58, Appendix D 4.3.4: 3

Sulfur Dioxide

Sulfur dioxide (SO2) is one of a group of highly reactive gasses known as oxides of sulfur (SOx). The largest sources of SO2 emissions are from fossil fuel combustion at power plants and other industrial facilities. Smaller sources of SO2 emissions include industrial processes such as extracting metal from ore and the burning of high sulfur containing fuels by locomotives, large ships, and non-road equipment. SCAQMD operates SO2 monitors at eight sites. Figure 4 shows the spatial distribution of the sites. The monitors are clustered mostly in the areas where SO2 sources may be located. The federal standard has not been exceeded in the basin for nearly 30 years.

Regulatory Requirement

The EPA first set standards for SO2 in 1971. The EPA set a twenty-four hour primary standard at 140 ppb and an annual average standard at 30 ppb (to protect health). The EPA also set a 3-hour average secondary standard at 500 ppb. Continued operations of existing SLAMS sites are required until discontinuation is approved by The U.S. EPA Regional Administrator. Where SLAMS SO2 monitoring is ongoing, at least one site must be designated a maximum concentration site.

On June 2, 2010, the EPA strengthened the primary NAAQS for SO2. The EPA is also revising the ambient air monitoring requirements for SO2. States will need to adjust the existing monitoring network in order to ensure that monitors meeting the new network design regulations are sited and operational by January 1, 2013.

The final monitoring regulations require monitors to be placed in Core Based Statistical Areas (CBSAs) based on a population weighted emissions index for the area. The final rule requires:

- 3 monitors in CBSAs with index values of 1,000,000 or more;
- 2 monitors in CBSAs with index values less than 1,000,000 but greater than 100,000; and
- One monitor in CBSAs with index values greater than 5,000.

Monitoring Objective

All SO2 monitors are designated as population oriented with the exception of North Long Beach, which was designated as high concentration as shown in Table 22. A review of the annual data (Figure 23) shows that the maximum 24-hour concentration in the 2009 to 2014 period was 0.04 ppm at North Long Beach and Port of Long Beach, and the next highest concentration was 0.02 ppm at LAX Hastings; the remaining sites were generally below the threshold for the monitoring instrumentation. The majority of the SO2 sites are in the western portion of the Basin. This is appropriate, even though the population growth has occurred inland, because the majority of SO2 sources are oil refineries located near the coast. The replacement station for North Long Beach should remain a high concentration site and the inland locations are appropriately designated as population oriented.

TABLE 22. SO2 Network Design

Station	Monitoring Objective	Spatial Scale	Site Consistent with Monitoring Objective
Burbank	Population Oriented	Neighborhood	Closed
Costa Mesa	Population Oriented	Neighborhood	Yes
Fontana	Population Oriented	Neighborhood	Yes
LAX-Hastings	High Concentrations	Neighborhood	Yes
Long Beach, Port	High Concentrations	Neighborhood	Closed
Los Angeles	Population Oriented	Neighborhood	Yes
North Long Beach	High Concentrations	Neighborhood	Closed
Rubidoux	Population Oriented	Neighborhood	Yes

Spatial Scale of Representativeness
All SO2 spatial scales of representativeness were consistent with the monitoring objectives as shown in Table 22.

Correlation Analysis
SO2 correlation for the period of 2009 to 2014, between sites in Los Angeles, Orange, Riverside, and San Bernardino counties are shown in Figure 24. Figure 24 presents the average relative difference between sites in the SCAB. Site pairs generally show weak correlations, while measured concentrations are typically in the same range in all monitoring sites, with highest concentrations observed in Burbank and Central Los Angeles sites.

FIGURE 23. Sulfur Dioxide Quartile Analysis

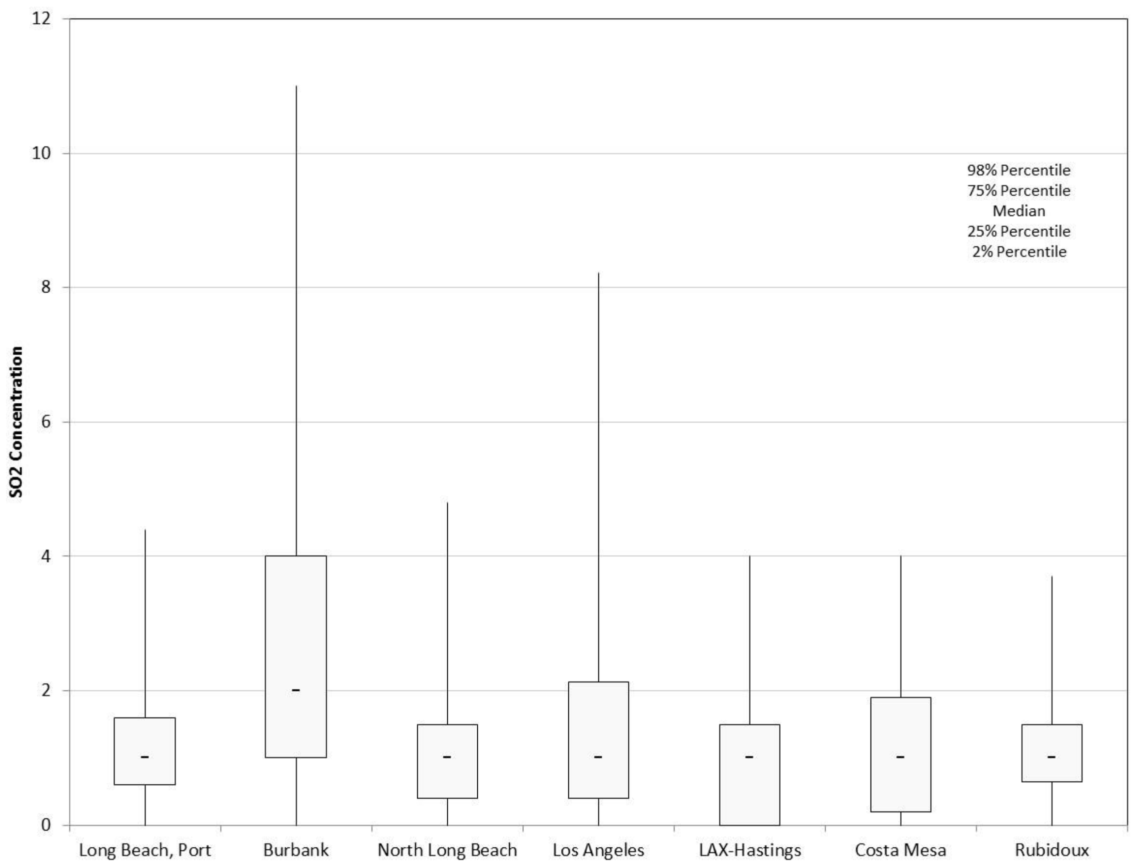


FIGURE 24. Sulfur Dioxide Correlation Matrix and Relative Difference Charts

		33	69	72	87	820	3195	4144	5197		Data Completion	Average	Standard Deviation	Max
33	Long Beach, Port									33	71%	3.59	3.44	43.3
69	Burbank	0.04								69	82%	1.20	1.26	14.9
72	North Long Beach	0.18	0.04							72	71%	2.84	2.88	40
87	Los Angeles	0.04	0.07	0.02						87	91%	1.19	1.20	12
820	LAX-Hastings	0.06	0.03	0.05	0.04					820	91%	1.75	2.21	25.9
3195	Costa Mesa	0.09	0.07	0.13	0.05	0.17				3195	89%	1.05	1.14	9.5
4144	Rubidoux	0.01	0.04	0.07	0.03	0.12	0.22			4144	98%	1.12	1.25	17.6
5197	Fontana	0.02	0.07	0.08	0.08	0.04	0.11	0.09		5197	91%	1.16	0.95	12.3
		Long Beach, Port	Burbank	North Long Beach	Los Angeles	LAX-Hastings	Costa Mesa	Rubidoux	Fontana					
		33	69	72	87	820	3195	4144	5197					

		33	69	72	87	820	3195	4144	5197		Data Completion	Average	Standard Deviation	Max
33	Long Beach, Port									33	71%	3.59	3.44	43.3
69	Burbank	1								69	82%	1.20	1.26	14.9
72	North Long Beach	0.23	0.81							72	71%	2.84	2.88	40
87	Los Angeles	1.01	0.01	0.82						87	91%	1.19	1.20	12
820	LAX-Hastings	0.69	0.37	0.47	0.38					820	91%	1.75	2.21	25.9
3195	Costa Mesa	1.09	0.14	0.92	0.12	0.5				3195	89%	1.05	1.14	9.5
4144	Rubidoux	1.05	0.07	0.87	0.06	0.44	0.07			4144	98%	1.12	1.25	17.6
5197	Fontana	1.02	0.04	0.84	0.02	0.41	0.1	0.03		5197	91%	1.16	0.95	12.3
		Long Beach, Port	Burbank	North Long Beach	Los Angeles	LAX-Hastings	Costa Mesa	Rubidoux	Fontana					
		33	69	72	87	820	3195	4144	5197					

Minimum number of sites required

SO2 minimum monitoring requirements are based upon the Population Weighted Emissions Index calculation and are shown in Table 23. Network design requirements included new minimum requirements be determined by the Population Weighted Emissions Index (PWEI).

The PWEI shall be calculated by States for each CBSA they contain or share with another State or States for use in the implementation of or adjustment to the SO2 monitoring network. The PWEI shall be calculated by multiplying the population of each CBSA, using the most current census data or estimates, and the total amount of SO2 in tons per year emitted within the CBSA area, using an aggregate of the most recent county level emissions data available in the National Emissions Inventory (NEI) for each county in each CBSA. The resulting product shall be divided by one million, providing a PWEI value, the units of which are million persons-tons per year. For any CBSA with a calculated PWEI value equal to or greater than 1,000,000, a minimum of three SO2 monitors are required within that CBSA. For any CBSA with a calculated PWEI value equal to or greater than 100,000, but less than 1,000,000, a minimum of two SO2 monitors are required within that CBSA and for any CBSA with a calculated PWEI value equal to or greater than 5,000, but less than 100,000, a minimum of one SO2 monitor is required within that CBSA.

TABLE 23 Minimum Monitoring Requirements for SO2

(Note: Refer to section 4.4 of Appendix D of 40 CFR Part 58.)

CBSA	Counties	Total SO2[1] [tons/year]	Population Weighted Emissions Index[2] [million persons-tons per year]	#Active Near Road Monitors	#Required Area Wide Monitors	#Active Area Wide Monitors	#Additional Area wide Monitors Needed
30180	Los Angeles Orange	6102.45 2013	80,134	0	1	4	0
40140	San Bernardino Riverside	2307.02 2013	10,107	0	1	2	0

[1]Using latest NEI data 2013, available on EPA website: http://www.epa.gov/ttn/chief/net/2013inventory.html

[2]Calculated by multiplying CBSA population and total SO2 and dividing product by one million.

Monitors required for SIP or Maintenance Plan: 6

EPA Regional Administrator-required monitors per 40 CFR 58, Appendix D 4.4.3: 0

As shown, for the SO2 monitoring network, there must be one site per CBSA which should be designated as maximum concentration. All others may be considered for closure by demonstrating either attainment has been reached and expected to be maintained, a monitor is consistently low relative to other monitors, a monitor has not measured a violation with NAAQS, a monitor has siting issues, a monitor is upwind of the urban area, or a site has logistical problems beyond agency control. SCAQMD exceeds the minimum requirement for SO2 monitors while the Federal standard has not been exceeded for nearly 38 years.

Lead

Lead (Pb) is a metal found naturally in the environment as well as in manufactured products. The major sources of Pb emissions have historically been motor vehicles (such as cars and trucks) and industrial sources. As a result of the EPA's regulatory efforts to remove Pb from gasoline, emissions of Pb from the transportation sector dramatically declined between 1980 and 1999, and levels of Pb in the air decreased by 94 percent between 1980 and 1999. Today, the highest levels of Pb in air are usually found near lead-acid battery manufacturers and recyclers. Other stationary sources are waste incinerators, utilities, and lead smelters. Total Suspended Particulate (TSP) measurements are collected at 15 sites as part of the SCAQMD monitoring network; five of the sites are source-oriented microscale Pb sites, and 10 sites measure population-oriented ambient Pb. The spatial distribution of these sites is shown in Figure 5.

Regulatory Requirement

On November 12, 2008, the EPA issued final revisions to the NAAQS standards for Pb. New network design requirements were implemented for monitoring sources of Pb (source-oriented monitoring) and urban Pb monitoring (non-source oriented). To meet this requirement, a new source-oriented site was established on January 1st, 2010 at the Van Nuys Airport and monitoring will continue at existing sites near the Exide (Vernon), Quemetco (City of Industry), and the Trojan Battery (Santa Fe Springs) facilities.

Non source-oriented monitors are located in urban areas to gather information on general population Pb exposure. Starting January 1, 2011, one non source-oriented monitor is required in each CBSA with a population > 500,000 as determined by the most recent census data. SCAQMD's current Pb monitoring network exceeds the minimum required monitoring specified as part of the final revision to the NAAQS for Pb.

Monitoring Objective

The current Pb monitoring network is shown in Figure 5. All of the non-source-oriented Pb monitoring network sites are population-oriented with the exception of the Riverside and South Long Beach sites which are designated as high concentration locations. The Pb monitoring network was put in place when leaded gasoline was still being used in automobiles. With the mainstream use of unleaded gasoline, concentrations of Pb have decreased with no clear high concentration site. Therefore, all of the non-source-oriented Pb monitoring can be re-designated as population-oriented monitoring locations. The source-oriented sites are appropriately considered source impact sites. Figure 25 shows the source-oriented sites show the higher Pb concentrations in the network.

FIGURE 25. Lead Quartile Analysis

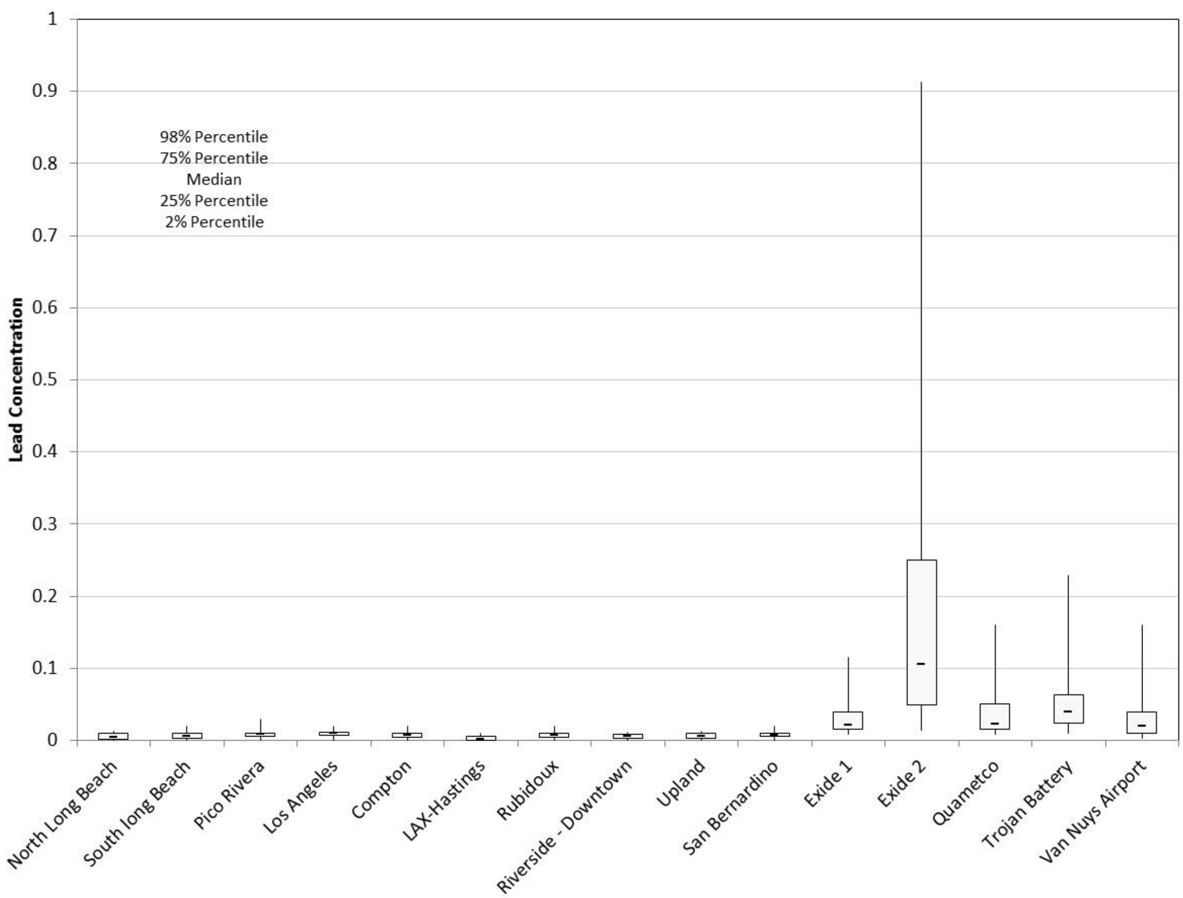


TABLE 24 Pb Network Design

Station	Monitoring Objective	Spatial Scale	Site Consistent with Monitoring Objective
Compton	Population Oriented	Neighborhood	Yes
Exide 1	Source Impact	Micro	Yes
Exide 2	Source Impact	Micro	Yes
LAX-Hastings	Population Oriented	Neighborhood	Yes
Los Angeles	Population Oriented	Neighborhood	Yes
North Long Beach	Population Oriented	Neighborhood	Closed
Pico Rivera	Population Oriented	Neighborhood	Yes
Quametco	Source Impact	Micro	Yes
Riverside - Downtown	Population Oriented	Neighborhood	Closed
Rubidoux	Population Oriented	Neighborhood	Yes
San Bernardino	Population Oriented	Neighborhood	Yes
South long Beach	Population Oriented	Neighborhood	Yes
Trojan Battery	Source Impact	Micro	Yes
Upland	Source Impact	Micro	Yes
Van Nuys Airport	Source Impact	Micro	Yes

Spatial Scale of Representativeness

The proper scale for the five source-oriented sites is microscale. The scale for the non-source-oriented sites should be neighborhood scale or greater as shown in Table 24.

Correlation Analysis

Pb correlation for the period of 2009 to 2014, between sites in Los Angeles, Orange, Riverside, and San Bernardino counties are shown in Figure 26. Figure 27 presents the average relative difference between sites in the SCAB. Site pairs generally show weak correlations. Pb concentrations at the non-source-oriented Pb monitoring network sites are typically low while highest Pb concentrations were measured at the near-source sites.

FIGURE 26. Lead Correlation Matrix

		72	77	85	87	112	820	4144	4146	5175	5203	1	2	3	4	5	
Fixed Sites	North Long Beach																72
	South long Beach	0.35															77
	Pico Rivera	0.15	0.07														85
	Los Angeles	0.21	0.16	0.13													87
	Compton	0.29	0.18	0.12	0.12												112
	LAX-Hastings	0.23	0.1	0.04	0.08	0.2											820
	Rubidoux	0.25	0.1	0.13	0.23	0.11	0.08										4144
	Riverside - Downtown	0.09	0.11	0.07	0.19	0.07	0.03	0.27									4146
	Upland	0.08	0.09	0.05	0.21	0.06	0.02	0.25	0.38								5175
	San Bernardino	0.11	0.13	0.14	0.22	0.09	0.03	0.28	0.29	0.36							5203
Near Source Sites	Exide 1	0.09	0.06	0.08	0.09	0.03	0	0.09	0.02	0.04	0.03						1
	Exide 2	0.06	0.06	0.05	0.06	0.03	0	0.03	0.02	0.03	0.03	0.2					2
	Quametco	0	0.01	0.03	0.05	0.01	0.03	0.02	0.04	0.06	0.05	0.14	0.12				3
	Trojan Battery	0.01	0	0	0	0	0.03	0	0.01	0.01	0	0.03	0.03	0.04			4
	Van Nuys Airport	0.01	0	0	0	0	0	0.03	0	0	0.01	0.01	0.05	0.03	0		5
		72	77	85	87	112	820	4144	4146	5175	5203	1	2	3	4	5	
		North Long Beach	South long Beach	Pico Rivera	Los Angeles	Compton	LAX-Hastings	Rubidoux	Riverside - Downtown	Upland	San Bernardino	Exide 1	Exide 2	Quametco	Trojan Battery	Van Nuys Airport	
		Fixed Sites										Near Source Sites					

FIGURE 27. Lead Relative Difference Chart

		72	77	85	87	112	820	4144	4146	5175	5203	1	2	3	4	5	
Fixed Sites	North Long Beach																72
	South long Beach	0.22															77
	Pico Rivera	0.54	0.33														85
	Los Angeles	0.62	0.42	0.09													87
	Compton	0.45	0.23	0.1	0.19												112
	LAX-Hastings	0.45	0.66	0.93	1	0.86											820
	Rubidoux	0.27	0.05	0.28	0.37	0.18	0.7										4144
	Riverside - Downtown	0.05	0.17	0.49	0.57	0.4	0.5	0.22									4146
	Upland	0.16	0.06	0.38	0.47	0.29	0.61	0.11	0.11								5175
	San Bernardino	0.38	0.17	0.16	0.25	0.07	0.8	0.12	0.33	0.22							5203
Near Source Sites	Exide 1	1.47	1.36	1.16	1.1	1.22	1.65	1.33	1.45	1.39	1.26						1
	Exide 2	1.9	1.88	1.83	1.82	1.85	1.94	1.87	1.9	1.88	1.86	1.43					2
	Quametco	1.54	1.45	1.27	1.21	1.32	1.7	1.42	1.52	1.47	1.36	0.17	1.34				3
	Trojan Battery	1.65	1.57	1.42	1.38	1.47	1.77	1.55	1.63	1.59	1.5	0.44	1.18	0.28			4
	Van Nuys Airport	1.45	1.34	1.14	1.08	1.2	1.64	1.31	1.43	1.37	1.24	0.03	1.45	0.2	0.48		5
		72	77	85	87	112	820	4144	4146	5175	5203	1	2	3	4	5	
		North Long Beach	South long Beach	Pico Rivera	Los Angeles	Compton	LAX-Hastings	Rubidoux	Riverside - Downtown	Upland	San Bernardino	Exide 1	Exide 2	Quametco	Trojan Battery	Van Nuys Airport	
		Fixed Sites										Near Source Sites					

Minimum Number of Sites Required

EPA criteria specify the minimum number of sites required in an air monitoring network based on NCore requirements (Table 25), MSA population, and for sources that report a certain threshold of Pb emissions. Local Agencies are required to conduct Pb monitoring in each CBSA with a population equal to or greater than 500,000 people. At a minimum, there must be one non-source oriented SLAMS site located to measure neighborhood scale Pb concentrations in urban areas impacted by re-entrained dust from roadways, closed industrial sources of Pb, hazardous waste sites, construction and demolition projects and other fugitive sources of Pb. Additionally, local Agencies are required to conduct ambient air Pb monitoring, at a minimum, there must be one source oriented SLAMS site located to measure the maximum Pb concentration in ambient air resulting from sources of Pb, which emit 1.0 or more tons per year based on the latest National Emission Inventory or other justifiable methods or data and shown in Table 26. The information shows that the SCAQMD air monitoring network significantly exceeds the required minimum numbers of samplers for Pb.

TABLE 25. Minimum Monitoring Requirements for Pb at NCore

(Note: Refer to section 4.5 of Appendix D of 40 CFR Part 58.)

NCore Site (name, AQS ID)	CBSA	Population and Census Year	# Required Monitors	# Active Monitors	# Additional Monitors Needed
Los Angeles (Main Street) 060371103	30180	13,131,431 2013	1	1	0
Rubidoux 060658001	40140	4,380,878 2013	1	1	0

TABLE 26. Source Oriented Pb Monitoring (Including Airports)

(Note: Refer to section 4.5 of Appendix D of 40 CFR Part 58.)

[1]Consider data from past three years.

[2]Data found at http://www.epa.gov/ttn/chief/net/2011inventory.html (5/1/2015)

Monitors Required for SIP or Maintenance Plan: 5

EPA Regional Administrator required monitors per 40 CFR 58, Appendix D 4.5(C) c: 0

Source Name	Address	Pb Emissions[1] (tons per year)	Emission Inventory Source[2] and Data Year	Max 3-Month Design Value[1] [ug/m3]	Design Value Date(third month, year)	# Required Monitors	# Active Monitors	# Additional Monitors Needed
Long Beach Airport Daugherty Field	4100 E Donald Douglas Dr, Long Beach, CA 90808	0.8	NEI 2011	Unavailable	Unavailable	Pending 5 year assessment	0	0
Van Nuys Airport	16461 Sherman Way, Van Nuys, CA 91406	0.68	NEI 2011	0.06	7; 2012	0	0	0
TAMCO	12459-B Arrow Route, Rancho Cucamonga, CA 91739	0.42	NEI 2011	Unavailable	Unavailable	0	1	0
Exide Technologies	2700 S Indiana St, Vernon, CA 90058	0.1	NEI 2011	0.46	7; 2011	1	2	0
Trojan Battery	9440 Ann St., Santa Fe Springs, CA 90670	0.00556	NEI 2011	0.11	4; 2011	0	1	0
Quemetco Inc.	720 S 7th Ave, City Of Industry, CA 91746	0.0048	NEI 2011	0.11	7; 2010	0	1	0

TABLE 27. Minimum Monitoring Requirements for Pb, Non Source, Non NCore Monitoring

(Note: Refer to section 4.5 of Appendix D of 40 CFR Part 58.)

CBSA	ɔpulation and Census Year	nnual Design Value g/m3], DV & Years[1]	Required Area Wide Monitors	‡ Active Area Wide Monitors	Additional Monitors Needed
30180	13,131,431 2013	0.01, 2012-2014	0	4	0
40140	4,380,878 2013	0.01, 2012-2014	0	2	0

[1]DV Years – The three years over which the design value was calculated.

PM10

Particulate matter (PM), is a complex mixture of microscopic particles and liquid droplets. Particle pollution is made up of a number of components, including ions (such as nitrates and sulfates), organic chemicals, elemental carbon, metals, and soil or dust particles.

The size of particles is directly linked to their potential for causing health problems. The U.S. EPA regulates particles that are 10 micrometers (μm) in diameter or less (PM10) because these particles generally pass through the throat and nose and enter the lungs. Once inhaled, these particles can affect the heart, lungs and cause serious health effects. "Inhalable coarse particles," are defined as larger than 2.5 μm but smaller than 10 μm in diameter.

Regulatory Requirement

The nation's air quality standards for particulate matter were first established in 1971 and were not significantly revised until 1987, when the EPA changed the indicator of the standards to regulate inhalable particles smaller than or equal to 10 μm in diameter. PM10 measurements contain both fine (PM2.5) and coarse particles. In 2006, the U.S. EPA revoked the annual PM10 standard because the available evidence did not suggest a link between long-term exposure to PM10 and health problems. The 24-hour PM10 NAAQS was retained as well as minimum monitoring requirements for PM10 based on MSA population and PM10 design value as specified in 40 CFR § 58 Appendix D.

To meet this requirement, size-selective inlet high-volume samplers are operated at 21 sites to meet the requirements for PM10 FRM sampling. In addition, PM10 continuous FEM analyzers are operated at 13 sites providing hourly particulate concentration measurements. Figure 13 shows the spatial distribution of the sampling sites. Real-time monitors, for the most part, are clustered in the high concentration areas, with two located in the desert area where wind-blown crustal material can cause exceedances of the twenty-four hour standard during high wind events. Real time PM10 monitors provide information that support regional dust advisories, provide secondary information about high winds, and support ongoing health studies in the region. All PM10 FRM monitors currently operate on a one-in-six day schedule with the exception of Indio and Rubidoux, the maximum concentration sites in each air basin, which operate on an enhanced frequency one-in-three day schedule as required by 40 CFR § 58.12(e). The continuous PM10 FEM monitors also provide a daily record of PM10 values at many of the higher concentration sites.

Monitoring Objective

The majority of the PM10 sites are designated as population exposure sites as shown in Table 26. The 2009-2014 data shows that Indio reported the highest concentrations in the South Coast Basin at 298 $\mu g/m^3$ on August 18, 2014, and 159 $\mu g/m^3$ on August 23rd, 2013. This site began operation in 2006 and is designated as the maximum concentration site requiring enhanced monitoring frequency as per 40 CFR § 58.12(e). The third highest concentration in the Basin at 147 $\mu g/m^3$ was recorded at Mira Loma and based on recent years monitoring data (Figure 28), this site will be designated as another maximum concentration site and a continuous PM10 FEM BAM installed at the site provides the required enhanced monitoring frequency. The remainder of the PM10 sites are consistent with population exposure at the neighborhood scale. Figure 14 shows the distribution of the PM10 monitors. Sites are concentrated inland, where particulate concentrations tend to be higher. Mira Loma began operation in 2006, and previous to that, Rubidoux was designated as the maximum concentration site requiring enhanced monitoring frequency as per 40 CFR § 58.12(e) based on 2000-2005 monitoring data. This assessment concludes that based on recent years monitoring data, Mira Loma will be designated the maximum concentration site and the required enhanced monitoring frequency will be provided by a continuous PM10 FEM BAM recently installed at the site. The remainder of the PM10 sites are consistent with population exposure at the neighborhood scale. Sites are concentrated inland, where particulate concentrations tend to be higher.

FIGURE 28. PM10 Quartile Analysis

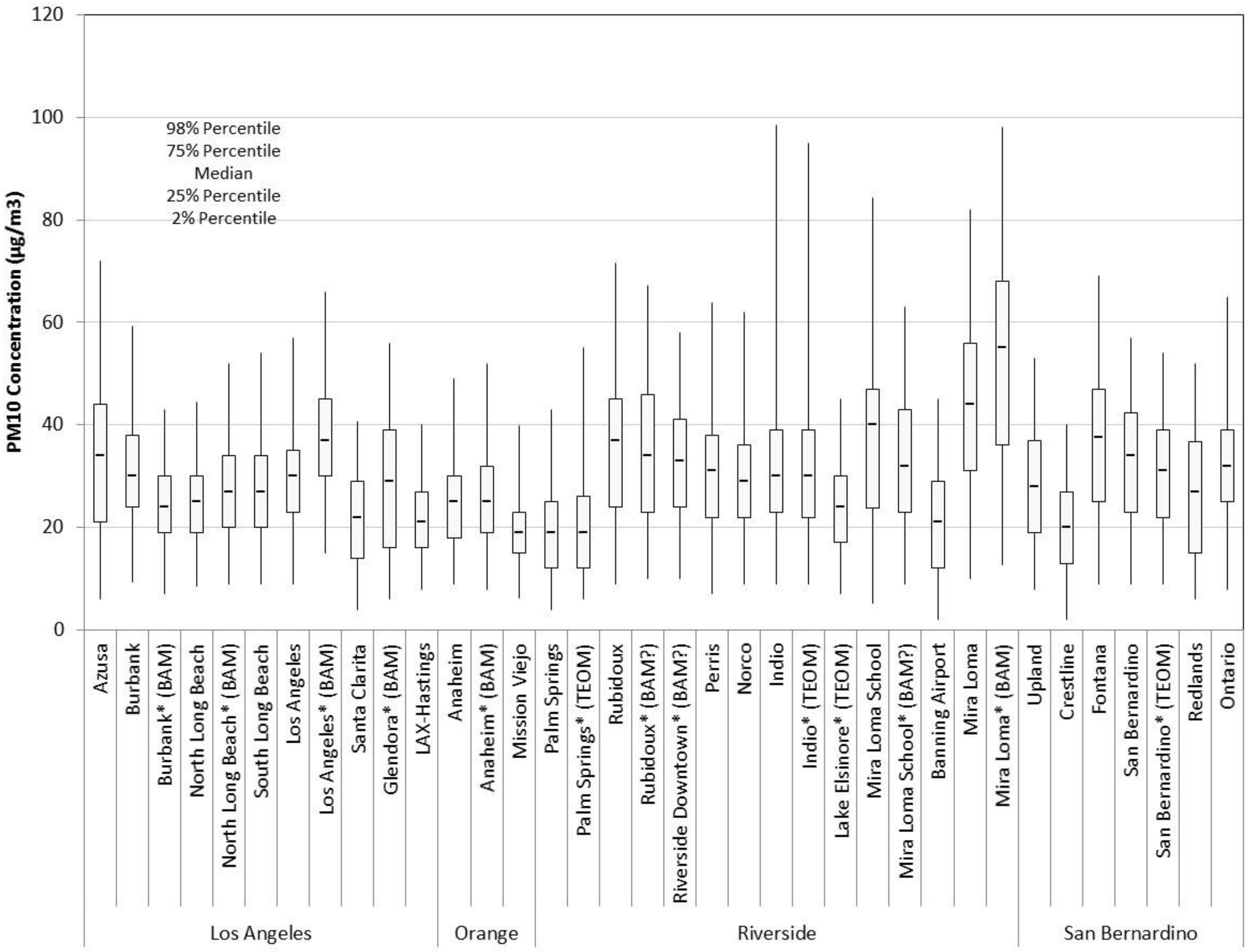


TABLE 26. PM10 Network Design

Station	Monitoring Objective	Spatial Scale	Site Consistent with Monitoring Objective
Anaheim	Population Oriented	Neighborhood	Yes
Azusa	Population Oriented	Neighborhood	Yes
Banning Airport	Population Oriented	Neighborhood	Yes
Burbank	Population Oriented	Neighborhood	Closed
Crestline	Population Oriented	Neighborhood	Yes
Fontana	Population Oriented	Neighborhood	Yes
Indio	Population Oriented	Neighborhood	Yes
LAX-Hastings	Population Oriented	Neighborhood	Yes
Los Angeles	Population Oriented	Neighborhood	Yes
Mira Loma	High Concentration	Neighborhood	Yes
Mira Loma School	High Concentration	Neighborhood	Closed
Mission Viejo	Population Oriented	Neighborhood	Yes
Norco	Population Oriented	Neighborhood	Yes
North Long Beach	Population Oriented	Neighborhood	Closed
Ontario	Population Oriented	Neighborhood	Yes
Palm Springs	Population Oriented	Neighborhood	Yes
Perris	Population Oriented	Neighborhood	Yes
Redlands	Population Oriented	Neighborhood	Yes
Rubidoux	Population Oriented	Neighborhood	Yes
San Bernardino	Population Oriented	Neighborhood	Yes
Santa Clarita	Population Oriented	Neighborhood	Yes
South Long Beach	Population Oriented	Neighborhood	Yes

Spatial Scale of Representativeness

The vast majority of sites showed consistency between the spatial scale of representativeness and monitoring objective.

Correlation Analysis

PM10 correlation for the period of 2009 to 2014, between sites in Los Angeles, Orange, Riverside, and San Bernardino counties are shown in Figure 29. Figure 30 presents the average relative difference between sites in the SCAB. Site pairs with correlations greater than 0.8 and relative differences less than 0.3 for PM10 are highlighted in dark green in Figure 31 and are:

North Long Beach	South Long Beach
Riverside-Rubidoux	Mira Loma

The highest correlations were found between North and South Long Beach sites, and between Rubidoux and Mira Loma (Van Buren), where highest 24-hr PM10 concentrations were measured (Figure xx4). Even the North Long Beach and Mira Loma (Van Buren) were shut down, the analysis supports that PM10 representation is still reasonable for those areas, especially since the Mira Loma (Jurupa) station was also deployed.

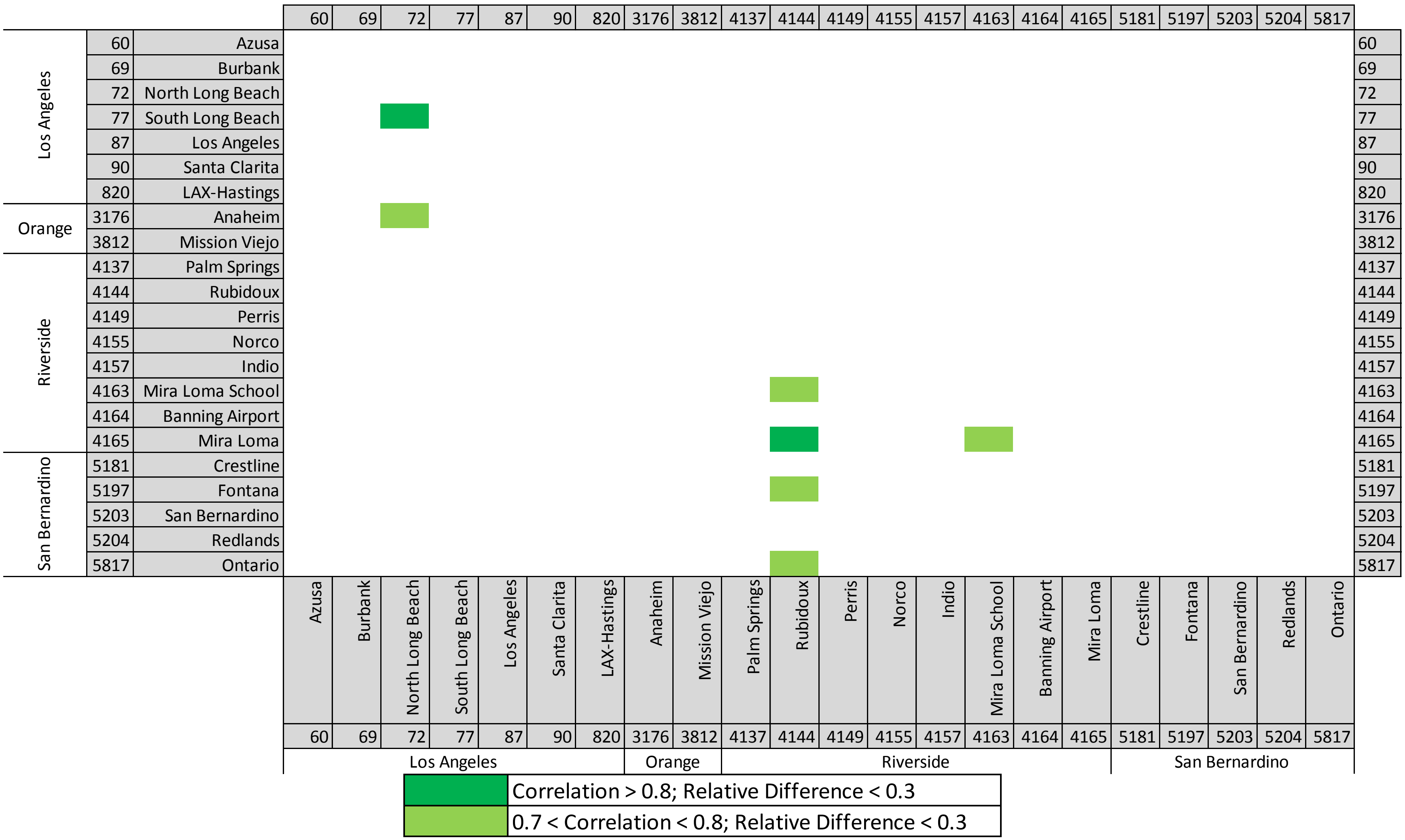
FIGURE 29. PM10 Correlation Matrix Chart

County	ID	Site	60	69	72	77	87	90	820	3176	3812	4137	4144	4149	4155	4157	4163	4164	4165	5181	5197	5203	5204	5817	ID
Los Angeles	60	Azusa																							60
	69	Burbank	0.33																						69
	72	North Long Beach	0.16	0.53																					72
	77	South Long Beach	0.1	0.39	0.83																				77
	87	Los Angeles	0.39	0.6	0.5	0.4																			87
	90	Santa Clarita	0.46	0.3	0.09	0.05	0.3																		90
	820	LAX-Hastings	0.12	0.39	0.58	0.56	0.44	0.12																	820
Orange	3176	Anaheim	0.22	0.46	0.73	0.64	0.49	0.12	0.46																3176
	3812	Mission Viejo	0.37	0.47	0.49	0.38	0.52	0.33	0.38	0.6															3812
Riverside	4137	Palm Springs	0.14	0.04	0.02	0	0.05	0.24	0.02	0.02	0.09														4137
	4144	Rubidoux	0.49	0.5	0.24	0.15	0.5	0.49	0.17	0.39	0.49	0.14													4144
	4149	Perris	0.49	0.41	0.32	0.23	0.49	0.4	0.25	0.39	0.51	0.19	0.59												4149
	4155	Norco	0.32	0.47	0.42	0.35	0.49	0.26	0.31	0.58	0.53	0.06	0.61	0.58											4155
	4157	Indio	0.14	0.05	0.03	0.01	0.03	0.15	0.02	0.01	0.07	0.5	0.11	0.15	0.05										4157
	4163	Mira Loma School	0.53	0.42	0.33	0.3	0.48	0.39	0.2	0.64	0.39	0.29	0.7	0.61	0.64	0.29									4163
	4164	Banning Airport	0.36	0.2	0.04	0.01	0.18	0.53	0.05	0.06	0.24	0.33	0.42	0.3	0.19	0.2	0.42								4164
	4165	Mira Loma	0.43	0.42	0.23	0.15	0.44	0.41	0.15	0.42	0.46	0.1	0.82	0.55	0.69	0.06	0.78	0.29							4165
San Bernardino	5181	Crestline	0.19	0.24	0.17	0.11	0.23	0.39	0.12	0.14	0.23	0.16	0.37	0.29	0.22	0.1	0.27	0.31	0.34						5181
	5197	Fontana	0.58	0.35	0.12	0.08	0.4	0.57	0.13	0.29	0.41	0.17	0.75	0.53	0.44	0.14	0.58	0.45	0.64	0.36					5197
	5203	San Bernardino	0.46	0.34	0.14	0.11	0.36	0.47	0.15	0.37	0.42	0.12	0.68	0.43	0.38	0.08	0.57	0.44	0.52	0.3	0.66				5203
	5204	Redlands	0.41	0.2	0.01	0	0.2	0.63	0.04	0.04	0.25	0.26	0.53	0.31	0.18	0.16	0.37	0.67	0.36	0.34	0.61	0.58			5204
	5817	Ontario	0.49	0.52	0.36	0.28	0.53	0.29	0.23	0.49	0.49	0.05	0.71	0.53	0.63	0.05	0.52	0.2	0.66	0.22	0.62	0.46	0.26		5817
			Azusa	Burbank	North Long Beach	South Long Beach	Los Angeles	Santa Clarita	LAX-Hastings	Anaheim	Mission Viejo	Palm Springs	Rubidoux	Perris	Norco	Indio	Mira Loma School	Banning Airport	Mira Loma	Crestline	Fontana	San Bernardino	Redlands	Ontario	
			60	69	72	77	87	90	820	3176	3812	4137	4144	4149	4155	4157	4163	4164	4165	5181	5197	5203	5204	5817	
			Los Angeles							Orange		Riverside								San Bernardino					

FIGURE 30. PM10 Relative Difference Chart

County	ID	Site	60	69	72	77	87	90	820	3176	3812	4137	4144	4149	4155	4157	4163	4164	4165	5181	5197	5203	5204	5817	ID
Los Angeles	60	Azusa																							60
	69	Burbank	0.10																						69
	72	North Long Beach	0.32	0.22																					72
	77	South Long Beach	0.20	0.09	0.13																				77
	87	Los Angeles	0.13	0.03	0.20	0.07																			87
	90	Santa Clarita	0.44	0.35	0.13	0.25	0.32																		90
	820	LAX-Hastings	0.44	0.34	0.13	0.25	0.32	0.00																	820
Orange	3176	Anaheim	0.29	0.19	0.03	0.09	0.16	0.16	0.16																3176
	3812	Mission Viejo	0.54	0.44	0.23	0.35	0.42	0.10	0.10	0.26															3812
Riverside	4137	Palm Springs	0.52	0.42	0.21	0.33	0.40	0.08	0.08	0.24	0.02														4137
	4144	Rubidoux	0.05	0.15	0.37	0.25	0.18	0.49	0.49	0.34	0.58	0.57													4144
	4149	Perris	0.09	0.02	0.24	0.11	0.04	0.36	0.36	0.20	0.46	0.44	0.14												4149
	4155	Norco	0.15	0.04	0.18	0.05	0.02	0.30	0.30	0.15	0.40	0.38	0.20	0.06											4155
	4157	Indio	0.00	0.10	0.32	0.19	0.12	0.44	0.44	0.29	0.53	0.52	0.05	0.08	0.14										4157
	4163	Mira Loma School	0.09	0.20	0.41	0.29	0.22	0.53	0.53	0.38	0.62	0.61	0.04	0.18	0.24	0.10									4163
	4164	Banning Airport	0.46	0.36	0.14	0.27	0.34	0.02	0.02	0.18	0.08	0.06	0.51	0.38	0.32	0.46	0.55								4164
	4165	Mira Loma	0.24	0.34	0.55	0.43	0.37	0.67	0.67	0.52	0.76	0.74	0.19	0.33	0.39	0.25	0.15	0.68							4165
San Bernardino	5181	Crestline	0.52	0.42	0.20	0.33	0.39	0.08	0.08	0.23	0.02	0.01	0.56	0.43	0.38	0.51	0.60	0.06	0.74						5181
	5197	Fontana	0.08	0.18	0.40	0.27	0.20	0.52	0.51	0.36	0.61	0.59	0.03	0.16	0.22	0.08	0.02	0.53	0.17	0.59					5197
	5203	San Bernardino	0.02	0.08	0.30	0.17	0.11	0.42	0.42	0.27	0.52	0.50	0.07	0.06	0.12	0.02	0.12	0.44	0.27	0.49	0.10				5203
	5204	Redlands	0.25	0.15	0.07	0.05	0.12	0.20	0.20	0.04	0.30	0.28	0.30	0.16	0.11	0.25	0.34	0.22	0.49	0.27	0.32	0.23			5204
	5817	Ontario	0.05	0.06	0.28	0.15	0.08	0.40	0.40	0.25	0.50	0.48	0.10	0.04	0.10	0.04	0.14	0.42	0.29	0.47	0.12	0.02	0.21		5817
			Azusa	Burbank	North Long Beach	South Long Beach	Los Angeles	Santa Clarita	LAX-Hastings	Anaheim	Mission Viejo	Palm Springs	Rubidoux	Perris	Norco	Indio	Mira Loma School	Banning Airport	Mira Loma	Crestline	Fontana	San Bernardino	Redlands	Ontario	
			60	69	72	77	87	90	820	3176	3812	4137	4144	4149	4155	4157	4163	4164	4165	5181	5197	5203	5204	5817	
			Los Angeles							Orange		Riverside								San Bernardino					

FIGURE 31. PM10 Sites with High Correlation and Low Relative Difference



Minimum Number of Sites Required

EPA criteria specify the minimum number of sites required in an air monitoring network based on MSA population and design value. Population data was taken from the 2013 census to determine the required number of samplers for the SCAB and are shown in Table 27. The information shows that the SCAQMD air monitoring network significantly exceeds the minimum required number of samplers for PM10.

Table 27 Minimum Monitoring Requirements for PM10

(Note: Refer to section 4.6 and Table D-4 of Appendix D of 40 CFR Part 58.)

MSA	Counties	Population and Census Year	2014 Max Concentration [ug/m3]	Max Concentration site (name AQS ID)	# Required Monitors	# Active Monitors	# Additional Monitors Needed
30180	Los Angeles Orange	13,131,431 2013	98	Azusa 060370002	2-4 Low Conc	8	0
40140	San Bernardino Riverside	4,380,878 2013	136[1]	San Bernardino 060719004	4-8 Med Conc	11	0

Monitors required for SIP or Maintenance Plan: 19

[1]Excluding high concentration at Indio (298 ug/m3, on 8/18/2014.)

PM2.5

Particulate matter, also known as particle pollution or PM, is a complex mixture of extremely small particles and liquid droplets. Particle pollution is made up of a number of components, including ions (such as nitrates and sulfates), organic chemicals, elemental carbon, metals, and soil or dust particles. Fine particles, such as those found in smoke and haze, are 2.5 μm in diameter and smaller. These particles can be directly emitted from sources such as mobile sources, meat cooking and forest fires, or they can form when gases emitted from power plants, industries, and automobiles react in the air.

Regulatory Requirement

The nation's air quality standards for particulate matter were first established in 1971 and were not significantly revised until 1987, when the EPA changed the indicator of the standards to regulate inhalable particles smaller than or equal to 10 um in diameter. Ten years later, after a lengthy review, the EPA revised the PM standards, setting separate standards for fine particles (PM2.5) based on their link to serious health problems including increased symptoms, hospital admissions, emergency room visits, and premature death for people with heart and lung disease. The regulation also required local agencies to operate a minimum number of PM2.5 monitoring sites as specified in 40 CFR § 58 Appendix D.

In December 2012, the EPA revised the primary annual PM2.5 standard from 15 μg/m3 to 12 μg/m3 for the protection of public health. The EPA retained the 1997 secondary annual PM2.5 standard of 15 μg/m3 during the 2012 review of the standards. Also, a requirement to add PM2.5 to previously established required Near Road NO2 sites with a revised deadline of 2015 deployment.

The current number of PM2.5 FRM sampling sites remains at 19 and is depicted in Figure 7. Prior to 2009, a network of continuous PM2.5 monitors was in operation, although they did not have FEM status. In January 2009, a network of seven PM2.5 FEM monitors were deployed and designated as Special Purpose Monitors (SPM) in order to provide time for comparison to collocated FRM samplers. A network of ten non-FEM PM2.5 continuous monitors continues operation.

Monitoring Objective

Most PM2.5 sites are designated as population exposure at the neighborhood scale. Review of 2009-2014 data shows that Mira Loma, Rubidoux, Central Los Angeles, Compton, Ontario and Fontana recorded the highest concentrations of PM2.5. This is consistent with their current designation as high concentration. The lowest value recorded was at the Palm Springs monitoring location, which is more consistent with a regional transport site rather than a population-oriented site.

Table 28 PM2.5 Network Design

Station	Monitoring Objective	Spatial Scale	Site Consistent with Monitoring Objective
Anaheim	Population Oriented	Neighborhood	Yes
Azusa	Population Oriented	Neighborhood	Yes
Big Bear Lake	Population Oriented	Neighborhood	Yes
Burbank	Population Oriented	Neighborhood	Closed
Compton	Population Oriented	Neighborhood	Yes
Fontana	Population Oriented	Neighborhood	Yes
Indio	Population Oriented	Neighborhood	Yes
Los Angeles	High Concentration	Neighborhood	Yes
Mira Loma	Population Oriented	Neighborhood	Yes
Mission Viejo	Population Oriented	Neighborhood	Yes
North Long Beach	High Concentration	Neighborhood	Closed
Ontario	Population Oriented	Neighborhood	Yes
Palm Springs	Population Oriented	Neighborhood	Yes
Pasadena	Population Oriented	Neighborhood	Yes
Pico Rivera	Population Oriented	Neighborhood	Yes
Reseda	Population Oriented	Neighborhood	Yes
Riverside - Downtown	High Concentration	Neighborhood	Closed
Riversida - Rubidoux	High Concentration	Neighborhood	Yes
San Bernardino	Population Oriented	Neighborhood	Yes
South Long Beach	Population Oriented	Neighborhood	Yes

Spatial Scale of Representativeness

All PM2.5 spatial scales of representativeness were consistent with the monitoring objectives as shown in Table 28.

Planning Model Calculation Frequency

Figure 32 shows the usage for the PM2.5 measurements in the South Coast Basin. The sites used most frequently are towards the Riverside and San Bernardino sites, which are the ones that are the recent, current and predicted design values for the PM2.5 annual standard. Other sites include ones near the port and goods movement activity, and for background (South Long Beach).

FIGURE 32. Estimated Model Calculation Frequency per Site for PM2.5

Correlation Analysis

PM2.5 correlation for the period of 2009 to 2014, between sites in Los Angeles, Orange, Riverside, and San Bernardino counties are shown in Figure 33. Figure 34 presents the average relative difference between sites in the SCAB. Data for 2009 was used because data up to 2008 was previously used in the SCAQMD 5 Year Network Assessment submitted in 2010, and data for 2014 was the most recent complete data set for the SCAQMD PM2.5 monitoring network. Site pairs with correlations greater than 0.8 and relative differences less than 0.3 for PM2.5 are highlighted in dark green in Figure 20 and are:

North Long Beach	South Long Beach Compton Anaheim
South Long Beach	Compton
Pico Rivera	Los Angeles Anaheim
Los Angeles	Pasadena
Riverside-Rubidoux	Riverside Downtown* Indio Mira Loma Fontana San Bernardino
Riverside Downtown*	Mira Loma San Bernardino

Site pairs with correlations greater than 0.7 and less than 0.8, and relative differences less than 0.3 for PM2.5 are highlighted in light green in Figure 35. This analysis shows that a number of clusters have a high level of PM2.5 correlation and a low average relative difference.

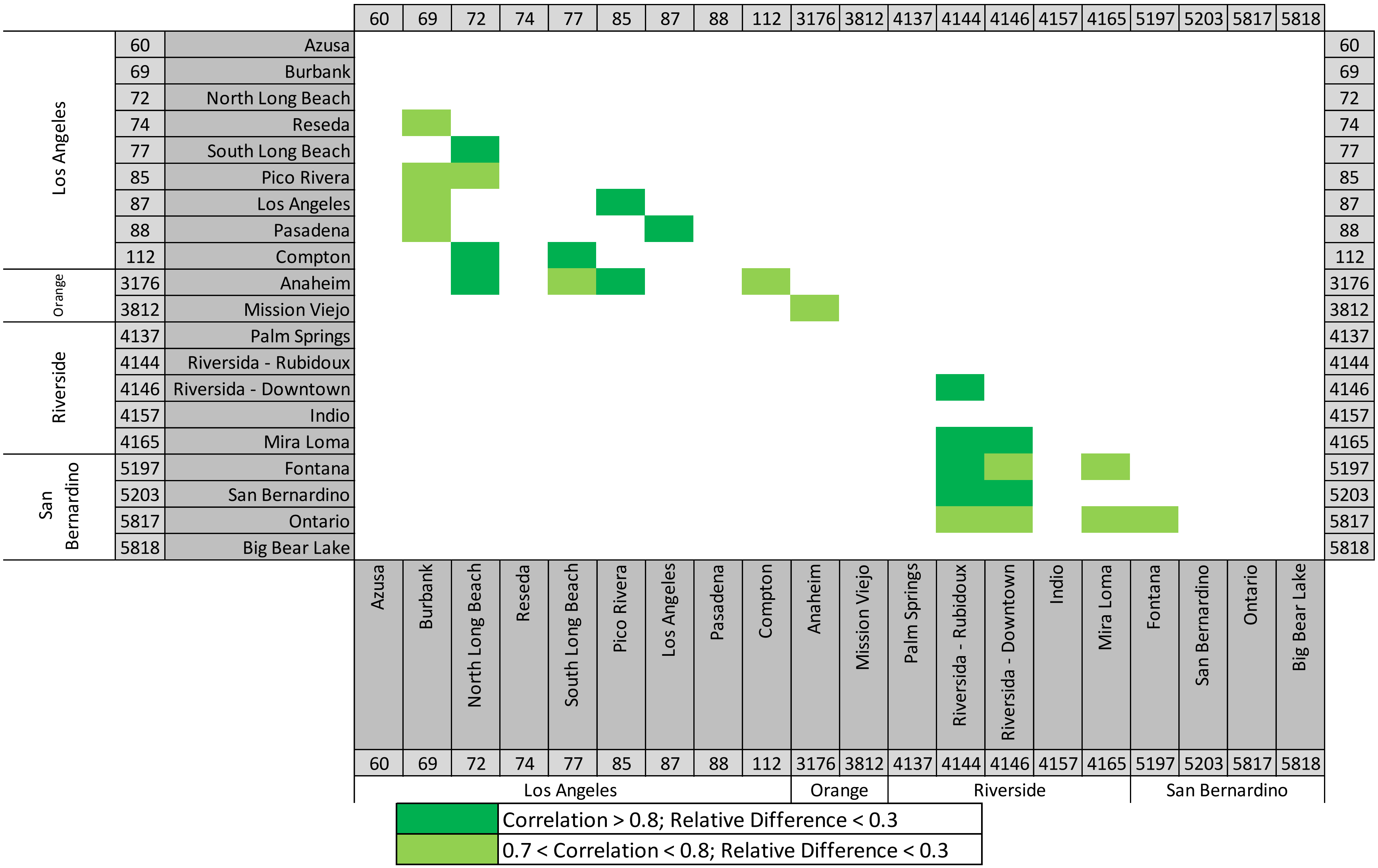
FIGURE 33. PM2.5 Correlation Matrix Chart

			60	69	72	74	77	85	87	88	112	3176	3812	4137	4144	4146	4157	4165	5197	5203	5817	5818	
Los Angeles	60	Azusa																					60
	69	Burbank	0.4																				69
	72	North Long Beach	0.29	0.52																			72
	74	Reseda	0.25	0.73	0.39																		74
	77	South Long Beach	0.2	0.43	0.89	0.26																	77
	85	Pico Rivera	0.43	0.78	0.78	0.52	0.7																85
	87	Los Angeles	0.62	0.8	0.6	0.57	0.52	0.83															87
	88	Pasadena	0.66	0.78	0.44	0.54	0.37	0.65	0.85														88
	112	Compton	0.1	0.6	0.86	0.35	0.8	0.68	0.56	0.35													112
Orange	3176	Anaheim	0.33	0.52	0.82	0.46	0.79	0.83	0.64	0.5	0.7												3176
	3812	Mission Viejo	0.39	0.53	0.57	0.32	0.55	0.53	0.6	0.45	0.33	0.7											3812
Riverside	4137	Palm Springs	0.15	0.03	0	0.08	0	0.01	0.05	0.08	0.01	0.02	0.12										4137
	4144	Riversida - Rubidoux	0.5	0.49	0.26	0.44	0.22	0.5	0.51	0.58	0.2	0.38	0.47	0.2									4144
	4146	Riversida - Downtown	0.41	0.53	0.31	0.48	0.2	0.49	0.52	0.61	0.22	0.43	0.47	0.15	0.9								4146
	4157	Indio	0.08	0.16	0.13	0.15	0.08	0.09	0.15	0.11	0.06	0.22	0.12	0.53	0.24	0.15							4157
	4165	Mira Loma	0.35	0.52	0.36	0.49	0.31	0.52	0.51	0.5	0.24	0.44	0.47	0.16	0.88	0.85	0.23						4165
San Bernardino	5197	Fontana	0.42	0.48	0.22	0.36	0.15	0.36	0.51	0.5	0.11	0.34	0.33	0.16	0.84	0.71	0.16	0.8					5197
	5203	San Bernardino	0.4	0.39	0.16	0.42	0.09	0.3	0.4	0.52	0.1	0.24	0.29	0.16	0.82	0.8	0.12	0.67	0.68				5203
	5817	Ontario	0.43	0.6	0.45	0.5	0.39	0.63	0.61	0.69	0.34	0.61	0.48	0.07	0.72	0.79	0.12	0.71	0.77	0.64			5817
	5818	Big Bear Lake	0.01	0.08	0.27	0.08	0.29	0.11	0.05	0.02	0.32	0.19	0.05	0.07	0	0.02	0	0.02	0	0	0.04		5818
			Azusa	Burbank	North Long Beach	Reseda	South Long Beach	Pico Rivera	Los Angeles	Pasadena	Compton	Anaheim	Mission Viejo	Palm Springs	Riversida - Rubidoux	Riversida - Downtown	Indio	Mira Loma	Fontana	San Bernardino	Ontario	Big Bear Lake	
			60	69	72	74	77	85	87	88	112	3176	3812	4137	4144	4146	4157	4165	5197	5203	5817	5818	
			Los Angeles									Orange		Riverside					San Bernardino				

FIGURE 34. PM2.5 Relative Difference Chart

County	ID	Site	60	69	72	74	77	85	87	88	112	3176	3812	4137	4144	4146	4157	4165	5197	5203	5817	5818	ID
Los Angeles	60	Azusa																					60
Los Angeles	69	Burbank	0.1																				69
Los Angeles	72	North Long Beach	0	0.09																			72
Los Angeles	74	Reseda	0.1	0.22	0.13																		74
Los Angeles	77	South Long Beach	0	0.12	0.02	0.1																	77
Los Angeles	85	Pico Rivera	0.1	0.02	0.07	0.2	0.1																85
Los Angeles	87	Los Angeles	0.1	0.03	0.12	0.25	0.14	0.05															87
Los Angeles	88	Pasadena	0.1	0.16	0.07	0.06	0.04	0.14	0.19														88
Los Angeles	112	Compton	0.1	0.01	0.09	0.21	0.11	0.01	0.03	0.15													112
Orange	3176	Anaheim	0.1	0.16	0.07	0.06	0.04	0.14	0.19	0	0.15												3176
Orange	3812	Mission Viejo	0.3	0.43	0.34	0.21	0.31	0.41	0.45	0.27	0.42	0.27											3812
Riverside	4137	Palm Springs	0.6	0.67	0.59	0.47	0.57	0.65	0.7	0.53	0.67	0.53	0.26										4137
Riverside	4144	Riversida - Rubidoux	0.2	0.09	0.19	0.31	0.21	0.11	0.07	0.25	0.1	0.25	0.51	0.75									4144
Riverside	4146	Riversida - Downtown	0	0.1	0.01	0.12	0.02	0.08	0.12	0.06	0.09	0.06	0.33	0.58	0.19								4146
Riverside	4157	Indio	0.4	0.5	0.41	0.29	0.39	0.48	0.53	0.35	0.5	0.35	0.08	0.19	0.59	0.41							4157
Riverside	4165	Mira Loma	0.3	0.18	0.27	0.39	0.29	0.2	0.15	0.33	0.18	0.33	0.59	0.82	0.08	0.27	0.66						4165
San Bernardino	5197	Fontana	0.1	0	0.09	0.22	0.12	0.02	0.03	0.16	0.01	0.16	0.43	0.67	0.09	0.1	0.5	0.18					5197
San Bernardino	5203	San Bernardino	0	0.08	0.01	0.14	0.04	0.06	0.11	0.08	0.08	0.08	0.35	0.6	0.18	0.02	0.42	0.26	0.08				5203
San Bernardino	5817	Ontario	0.1	0.02	0.11	0.24	0.13	0.04	0.01	0.18	0.02	0.18	0.44	0.69	0.08	0.11	0.52	0.16	0.02	0.1			5817
San Bernardino	5818	Big Bear Lake	0.3	0.4	0.31	0.19	0.29	0.38	0.43	0.25	0.4	0.25	0.02	0.29	0.49	0.31	0.1	0.57	0.4	0.32	0.42		5818
			Azusa	Burbank	North Long Beach	Reseda	South Long Beach	Pico Rivera	Los Angeles	Pasadena	Compton	Anaheim	Mission Viejo	Palm Springs	Riversida - Rubidoux	Riversida - Downtown	Indio	Mira Loma	Fontana	San Bernardino	Ontario	Big Bear Lake	
			60	69	72	74	77	85	87	88	112	3176	3812	4137	4144	4146	4157	4165	5197	5203	5817	5818	
			Los Angeles									Orange		Riverside					San Bernardino				

FIGURE 35. PM2.5 Sites with High Correlation and Low Relative Difference



Minimum Number of Sites Required

EPA criteria specify minimum numbers of sites required in an air monitoring network based on MSA population and measured concentrations. Population data was taken from the 2013 census to determine the required number of samplers for the SCAB and are shown in Table 28a-c.

TABLE 28a Minimum Monitoring Requirements for PM2.5 SLAMS (FRM/FEM/ARM)

(Note: Refer to sections 4.71, 4.72, and Table D-5 of Appendix D of 40 CFR Part 58.)

MSA	Counties	Population and Census Year	Annual Design Value [ug/m3], DV & Years[1]	Annual Design Value Site (Name, AQS ID)	Daily Design Value [ug/m3], DV & years	Daily Design Value site (name AQS ID)	# Required SLAMS Monitors	# Active SLAMS Monitors	# Additional SLAMS needed
30180	Los Angeles Orange	13,131,431 2013	12.4 2012-2014	Los Angeles 060371103	32 2012-2014	Los Angeles 060371103	3	10	0
40140	San Bernardino Riverside	4,380,878 2013	14.7 2012-2014	Mira Loma 060658005	38 2012-2014	Mira Loma 060658005	3	9	0

[1]DV Years – The three years over which the design value was calculated.

Monitors required for SIP or Maintenance Plan: 19

TABLE 28b Minimum Monitoring Requirements for Continuous PM2.5 Monitors (FEM and Non-FEM)*

(FEM/ARM and non-FEM see 40 CFR 58 Appendix D Section 4.72.)

MSA	Counties	Population and Census Year	Annual Design Value [ug/m3], DV & Years[1]	Annual Design Value Site (Name, AQS ID)	Daily Design Value [ug/m3], DV & years	Daily Design Value site (name AQS ID)	# Required Continuous Monitors	# Active Continuous Monitors	# Additional Continuous needed
30180	Los Angeles Orange	13,131,431 2013	19.58 2012-2014	Los Angeles 060371103	41.7, 2012-2014	Los Angeles 060371103	2	4-FEM 3-Non FEM	0
40140	San Bernardino Riverside	4,380,878 2013	19.37, 2012-2014	Mira Loma 060658005	52.6, 2012-2014	Rubidoux 060658001	2	3-FEM 6-Non FEM[2]	0

[1]DV Years – The three years over which the design value was calculated.

Monitors required for SIP or Maintenance Plan: 15

[2]One Non FEM is collocated at the Rubidoux site with a FEM.

* Currently all active continuous monitors do not meet acceptance criteria under 78 FR 3086 and is requested to not be compared to the NAAQS.

TABLE 28c Minimum Monitoring Requirements for Speciated PM2.5 Monitors

(Note: Refer to sections 4.74 of Appendix D of 40 CFR Part 58.)

MSA	Counties	Population and Census Year	Monitors Required[1]	Monitors Active	Monitors Needed
30180	Los Angeles Orange	13,131,431 2013	1	2	0
40140	San Bernardino Riverside	4,380,878 2013	1	2	0

[1]Sites designated as part of the $PM_{2.5}$ Speciation Trends Network (STN).

Monitors required for SIP or Maintenance Plan: 4

PAMS Network Assessment
Although SCAQMD has used the PAMS data for trends analysis, trajectory modeling, and source emissions inventory reconciliation, SCAQMD has conducted an assessment of its PAMS program. The survey assessment indicated that although the existing program provides a robust data set, the measurement program could be modernized to compliment current and future U.S. EPA program requirements, strengthening the connection between the PAMS measurements objectives for better comprehension of ozone in the South Coast Basin. Specific objectives identified were:

- Better time resolution of VOC measurements
- An annual measurement intensive every few years (especially if it coordinates with an AQMP data year) would be more beneficial than a summer intensive every year
- Mobile platform studies to obtain higher spatial resolution in specific areas the Basin
- Improved data set for the western boundary background O3 concentration
- Vertical profile O3 measurements
- Identify a site to capture port and goods movement VOC emissions

Population Assessment
Since the end of World War II, the Basin has experienced faster population growth than the rest of the nation. Although growth has slowed somewhat, the region's population is expected to increase significantly through 2023 and beyond. Table 29 shows the projected growth based on SCAG's regional growth forecast.

Table 29. Population Projection from 1990 to 2030

YEAR	POPULATION	AVERAGE PERCENT INCREASE PER YEAR OVER THE PERIOD
1990	13.0 million	--
2000	14.8 million	1.4
2008	15.6 million	0.7
2023	17.3 million	0.7
2030	18.1 million	0.7

There are sources that grow proportionately to population such as passenger cars, residential burning, consumer products, etc. so the population distribution and projected population distribution could be considered as additional criteria for the air monitoring network design and measurement types. Figure 36 shows the current population density distribution, and the population density is higher in Los Angeles and Orange Counties and in general nearby the major freeways. Population growth in the past few years (Figure 37) are consistent with projections (Figure 38). Growth is predicted most at the borders of the Basin and mostly in Riverside County.

FIGURE 36 Population Density (per Square Mile)

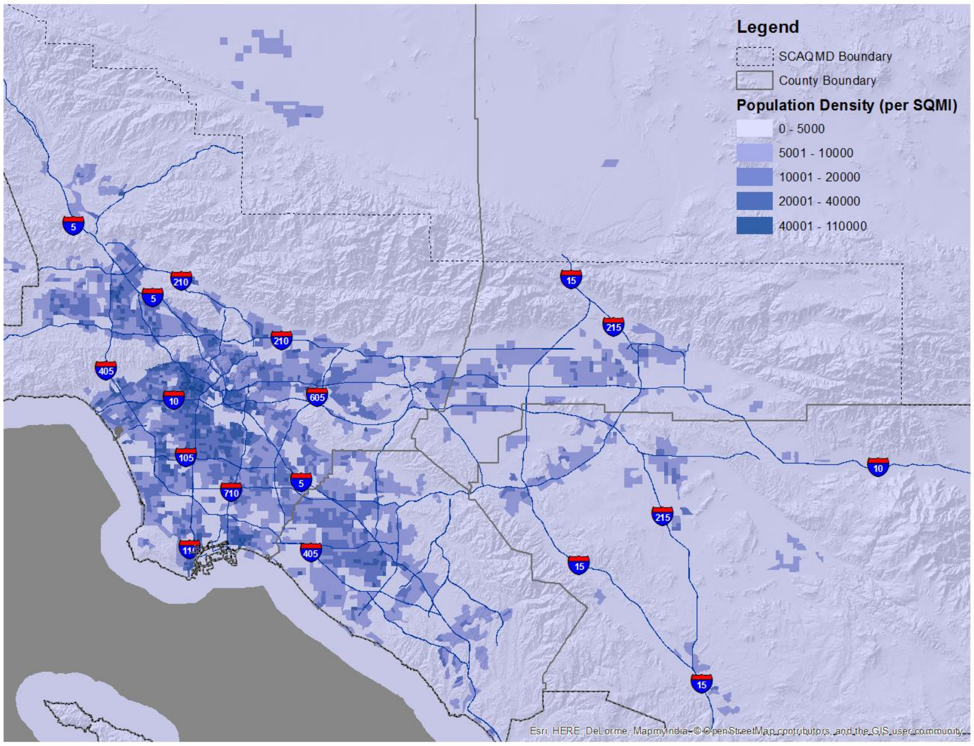


FIGURE 37. Population Annual Growth Rate between 2010 and 2012

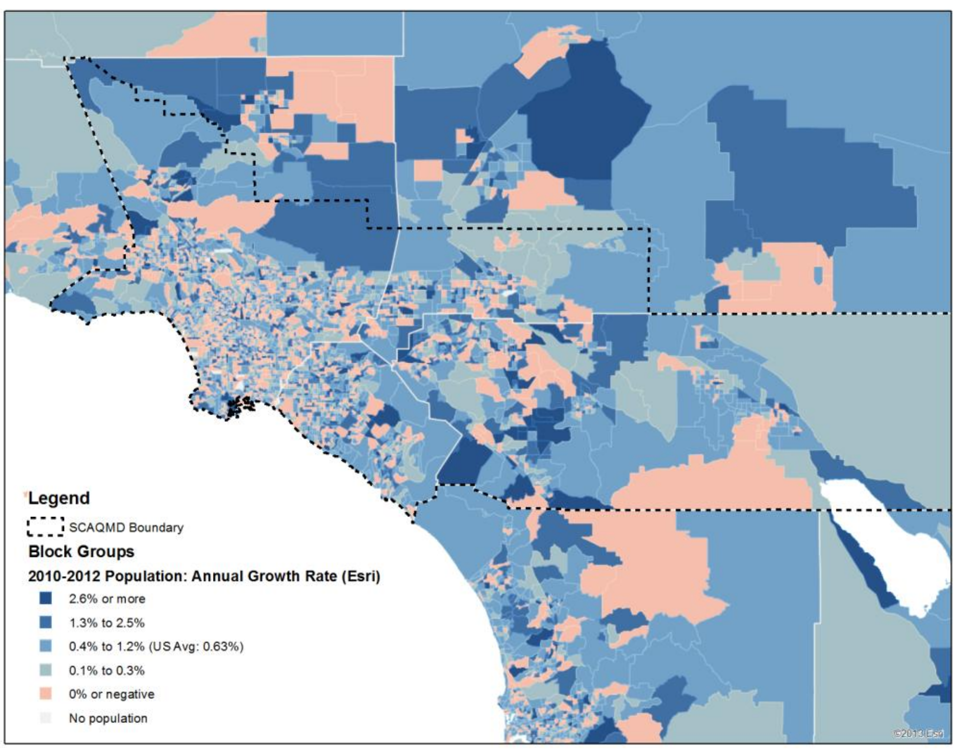
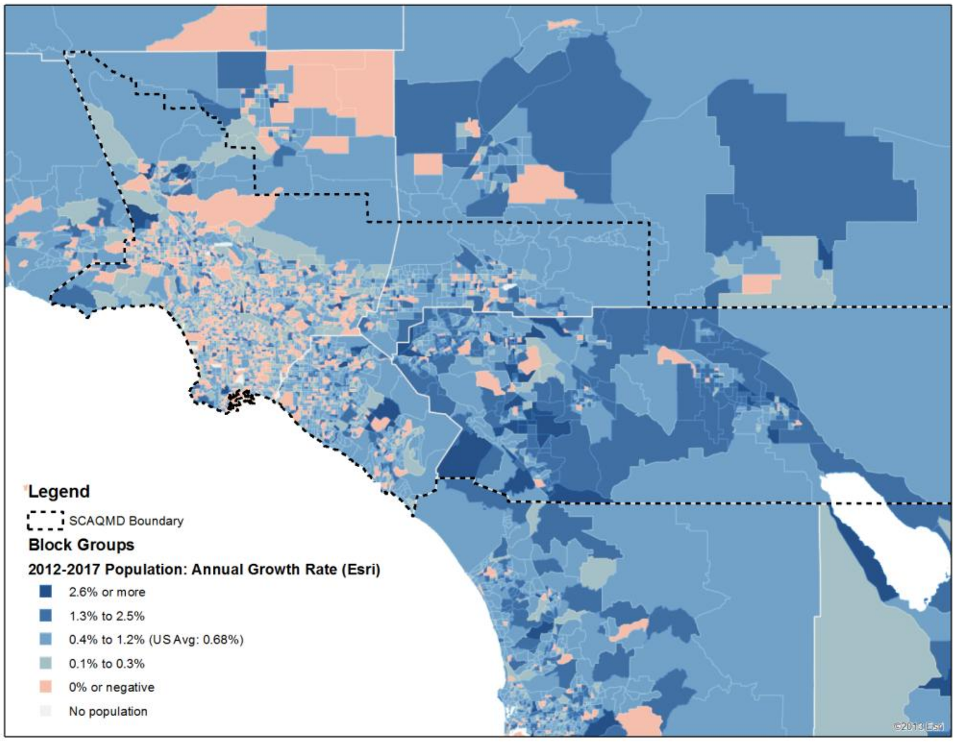


FIGURE 38. Forecasted Population Annual Growth Rate between 2012 and 2017



IV. ASSESSMENT CONCLUSIONS AND CONSIDERATIONS

This section summarizes the findings of the site-by-site assessments (Section II) and the pollutant network assessments (Section III) and provides guidance based upon the assessment criteria for further consideration intended to optimize the network design and operation and improve SCAQMD's ability to achieve multiple monitoring objectives while ensuring the efficient use of limited resources.

Many of the findings described in the previous sections are site-related issues that are addressed by SCAQMD on an ongoing basis. These include site infrastructure improvements and alterations such as vegetation trimming, soil stabilization or paving, replacement of shelters, moving probes and inlets to meet appropriate setback criteria, and increasing or improving power supplies. Through the Annual Network Plan and regular audit and maintenance schedules, issues such as these are continually being identified and addressed as resources allow. However, when such issues cannot be addressed due to logistical constraints or prohibitive costs, then the value of a particular site could be reconsidered or a waiver can be submitted for review. Furthermore, the monitoring objectives and spatial scales of all sites are also assessed as part of the Annual Network Plan, ensuring U.S. EPA minimum monitoring requirements are satisfied. Therefore, relatively minor changes to site infrastructure and monitoring objective/spatial scale designations are not explicitly addressed in this section, although these factors are important in determining the value of a site within a larger pollutant monitoring network.

What follows are some conclusions based upon the assessment for further evaluation that address larger issues such as redundancies, gaps, efficiencies, and synergies within and between the SCAQMD pollutant monitoring networks. Note that there are many purposes for air quality monitoring, some beyond those described in this assessment. Closing, moving or creating monitoring sites requires significant resources and often a long period of concurrent monitoring to show comparability. Therefore, the conclusions listed below are not to be viewed as commitments but rather as suggestions for further evaluation with the ultimate goal of optimizing the network design for the intended purposes.

SO2, NO2, AND CO MONITORING NETWORKS

The SCAQMD monitoring network far exceeds the minimum monitoring requirements for SO2, NO2, and CO, and SCAQMD areas are currently in attainment of the NAAQS for these pollutants. As of 2009, there were no minimum monitoring requirements for these criteria pollutants. In 2010, minimum monitoring requirements were added for NO2, CO and SO2, and have already been implemented.

In all cases, SCAQMD measurements of SO2, NO2 and CO are made at monitoring sites that are also part of the more essential O3 and PM monitoring networks for which the basin is not in attainment with the NAAQS. Thus, the cost of continuing to monitor for these pollutants is relatively low given that the site infrastructure and staff resources dedicated to the sites will continue as part of the PM and O3 networks. However, there are costs associated with the maintenance, calibration, replacement, and auditing of the SO2, NO2, and CO instruments as well as the resources required to validate and submit the data to U.S. EPA. The shifting of resources and funding sources to accommodate these new requirements may affect the current network configuration.

Near Road NO2, CO, and PM2.5 are relatively new measurements and will be assessed in the coming years.

It is likely that the future SCAQMD monitoring networks for these pollutants will continue to exceed minimum requirements in order to meet other objectives such as attainment demonstrations, model validation, maintenance plan requirements, and trend analysis. A careful consideration of these factors along with the costs of continued operation may lead to more efficient and effective monitoring networks for SO2, NO2, and CO.

OZONE MONITORING NETWORK

SCAQMD exceeds the minimum monitoring requirements for the O3 monitoring network. Due to the large population in Southern California and the complexity of the geography and meteorology, a relatively large number of air monitoring stations are needed to adequately describe air quality in SCAQMD's jurisdiction and provide important health information to the public. Both SCAQMD air basins (South Coast and Coachella Valley) are designated non-attainment for O3, and a wide, robust O3 network is critical for accurate assessment and modeling efforts. However in areas of frequent exceedances and need for public health advisories, it is important to continue to have higher representaiton in this area and have a good spatial distribution.

However, as a regional pollutant, O3 concentrations generally do not vary significantly on short spatial scales, the exception being near busy roadways where NO titration occurs. Based on the correlation analysis in Section III, some sites in close proximity to one another provide very similar O3 readings. Clusters of high similarity identified in Section III were observed in San Bernardino, Riverside and East Los Angeles. Clusters of high similarity means relatively ubiquitous distribution of the pollutant and thus those areas may be considered for areas of high representation and may not be affected if an change was implemented.

In terms of siting criteria, findings related to these sites included:

- La Habra - is within 3 m of cypress trees surrounding inlet probe and does not meet distance from traffic lane requirement.
- Pomona - is less than the required distance from roadway. A waiver has been submitted as part of the 2015 annual network plan.
-

Other assessment findings regarding these sites include:

- Glendora has been in operation for 30 years and was originally a CARB monitoring location. There have been difficulties securing a long-term rental contract and the City of

Glendora requirements have made it difficult to upgrade the monitoring shelter. The site lacks adequate space and infrastructure to expand at the current location.

- La Habra has been in operation for 50 years; however, it lacks adequate space and infrastructure to expand to include particulate monitoring. The site has not typically been used for research or air toxics studies and there are few synergies at the site between air monitoring programs.
- Pomona has been in operation for 45 years. However, it lacks adequate space and infrastructure to expand. The data has not typically been used for research or air toxics studies and the site was originally intended as a micro-scale CO location. There are few synergies between air monitoring programs at this location. A waiver has been submitted as part of the 2015 annual network plan.

PM2.5 MONITORING NETWORK

The SCAQMD monitoring network exceeds the minimum monitoring requirements for PM2.5. Due to the large population in Southern California, the complexity of the geography, and the non-attainment status of the basin, a relatively large number of air monitoring stations are needed to adequately describe air quality and provide important health information to the public.

As a generally regional pollutant, PM2.5 concentrations generally do not vary significantly on short spatial scales unless very near strong sources of particulate matter. Based on the correlation analysis in Section III, some sites in close proximity to one another provide very similar PM2.5 readings. Two clusters of high similarity identified in Section III were the Riverside County area and also North Orange County with Long Beach sites.

The Riverside County cluster is relatively well spaced in an area of generally the highest PM2.5 levels in the basin with Mira Loma and Rubidoux sites. It is important to continue to monitor in this area and have a good spatial distribution of PM2.5 levels given the frequent exceedances and need for public health advisories.

In terms of siting criteria, findings related to these sites included:

- Fontana is within 9 m of unpaved parking and within 9 m of regularly idling diesel exhaust.

- South Long Beach does not currently meet all 40 CFR § 58 Appendix E probe siting criteria, specifically the spacing from obstructions surrounding the instrumentation. A waiver has been submitted as part of the 2015 annual network plan.

Other assessment findings regarding these and other sites include:

- Big Bear Lake has been in operation for 11 years and was originally established to determine the extent of winter wood smoke particulate matter. Since that time, there have not been exceedances of the standard. It is the only measurement made at the site and thus there are no synergies between monitoring programs. Consideration must be given to the remoteness of the location and the cost to maintain the site.

- Fontana has been in operation for 29 years. However, the site lacks adequate space and infrastructure to expand at the current location.

- South Long Beach was established June 2003 to monitor particulate influence from port activities. The infrastructure of the facility meets the needs of particulate sampling, but there are no facilities for continuous analyzers and no room for expansion. There are no synergies between air monitoring programs or use of office space by inspectors. The cost to relocate the site is low due to the low number of samplers and there is potential to consolidate this site with the North Long Beach replacement.

Another suggested change in the configuration of the PM2.5 network is to continue the transition to continuous PM2.5 FEM monitors. Currently, these monitors are being run collocated with FRM filter-based measurements to establish comparability and determine any biases. Once complete, the FEM continuous monitors can replace many existing FRM monitors in the network. This will reduce the considerable resources required to maintain the aging FRM samplers and to process and weigh the collected filter samples. It will also provide for daily data at sites that may only be one-in-three day sites currently, and it will provide useful hourly data for public reporting and air quality assessments. Currently FEM/FRM comparisons are not meeting U.S. EPA acceptance criteria, but SCAQMD has been conducting efforts to evaluate methods and instrumentation to move towards deploying more continuous PM2.5.

PM10 MONITORING NETWORK

The AQMD monitoring network exceeds the minimum monitoring requirements for PM10. Due to the large population in Southern California, the complexity of the geography, and the current non-attainment status of the basin, a relatively large number of air monitoring stations are needed to adequately describe air quality and provide important health information to the public.

PM10 includes PM2.5, but concentrations can vary significantly on short spatial scales. However, based on the correlation analysis in Section III, some sites in close proximity to one another provide similar PM10 readings. These sites tend to be in the highest concentration areas (Indio, Rubidoux and Mira Loma Van Buren), but the correlated site clusters are not as clear as for O3 and PM2.5.

In terms of siting criteria, findings related to PM10 sites include:

- South Long Beach does not currently meet all 40 CFR § 58 Appendix E probe siting criteria, specifically the spacing from obstructions surrounding the instrumentation. A waiver is being submitted as part of the 2015 Annual Network Plan.

Other assessment findings regarding these and other sites include:

- Norco has been in operation for 30 years. The infrastructure is inadequate as there are no indoor facilities which allow for monitoring of criteria pollutants. Data is not used for purposes other than NAAQS and there are no other measurements being made at the site.

The only measurement at the Norco site is PM10 and thus does not provide any synergies with other programs. It consistently records lower PM10 concentrations than nearby Rubidoux and Mira Loma. Therefore, it can be considered for potential elimination from the PM10 monitoring network. A similar analysis can be made for the Ontario station, with few synergies with other programs and very similar PM10 statistics levels to Norco and other nearby sites. If both sites were eliminated, this may create a geographical gap in western Riverside and San Bernardino Counties. To provide spatial coverage in that area, the sites could be consolidated into a new location with better infrastructure between the current Norco and Ontario sites.

The potential move of the South Long Beach site in a consolidation with the replacement North Long Beach site is suggested for the PM2.5 network also holds for the PM10 network.

Another suggested change in the configuration of the PM10 network is to transition towards continuous PM10 FEM monitors. New continuous PM10 monitors have recently been deployed for a regional health study and can eventually serve to replace many existing FRM monitors in the network. This will reduce the considerable resources required to maintain the aging FRM samplers and to process and weigh the collected filter samples. It will also provide for daily data at sites that may only be one-in-six day sites currently, and it will provide useful hourly data for public reporting and air quality assessments.

PAMS

Given the results of the assessment, in the next two years, SCAQMD will focus its resources on optimizing the program, evaluating technologies, and shifting resources to prepare for a revised program to address some of the new objectives. The general concept will be to conduct intensive one-year large-scale Specialized PAMS (SPAMS) measurements every several years and in between SPAMS, conduct reduced core PAMS program during non-intensive years.

During non-intensive years the goal is to track Annual statistics, trends (yearly, seasonally, monthly, weekly, daily, hourly), spatial distribution, comparison to other federal programs, and comparison data for special projects. Non-intensive monitoring is proposed at four sites:

- Los Angeles (Main street): Proposed required by U.S. EPA, Station Leveraging, Current Type 2 site
- Azusa: Current Type 2 site, Trend site
- Rubidoux: Proposed required by U.S. EPA, Station leveraging, Current Type 3 site.
- Long Beach: Port/ Refineries activity and emissions

During the periodic intensive one year SPAMS period, the goal is to conduct measurements of criteria pollutants and their precursors to obtain better spatial resolution (both vertical and horizontal) and establish trend data (yearly, seasonally, monthly, weekly, daily, hourly). The more refined measurements obtained during the intensive SPAMS periods will be used for developing elements critical for air quality planning purposes such as developing control strategies, emissions inventory evaluations, local scale studies, full scale photochemical transport modeling, VOC/NOx profiling, and background characterization. Intensive years would take place on Air Quality Management Plan (AQMP) years. More detail on the SPAMS program will be provided in the 2016 annual network plan along with some of the assessments guiding the network and measurement design.

While shifting efforts and resources towards the new goals, the 2015 PAMS network monitoring objectives and requirements are summarized in Table 30 which shows the distribution of the PAMS network. Starting July 1, 2015 SCAQMD will not conduct the intensive summer season sampling schedule for PAMS sites but will continue the current non intensive schedule for all current PAMS sites. During this non-intensive season twenty-four hour VOC canister samples are run every 6th day and twenty-four hour carbonyl samples are run every 6th day. Rubidoux is a collocated site for VOC canister sampling and Pico Rivera is a collocated site for VOC canister and carbonyl sampling. Instead, SCAQMD will be evaluating implementation options for the revised PAMS/ SPAMS programs by participating in the U.S. EPA PAMS GC assessment, upgrading its air monitoring network infrastructure, preparing mobile platforms, and evaluating instruments and methods.

TABLE 30. SCAQMD PAMS Network (2015)

			January 1 to December 31		
Site Type	**Date Established as PAMS**	**Site / AQS ID#**	**VOC**	**Carbonyl**	**Additional Requirements**
1	04/01/2004	LAX Hastings (replaced Hawthorne)	1 x 24 hr sample every 6th day	No Sampling	
2	06/01/1995	Azusa	1 x 24 hr sample every 6th day	No Sampling	NO/NOx required
2	07/01/1997	Burbank	1 x 24 hr sample every 6th day	1 x 24 hr sample every 6th day	
2	06/01/2009	Los Angeles (Main)	1 x 24 hr sample every 6th day	1 x 24 hr sample every 6th day	Trace level CO required at one type 2 site.
2	08/01/2005	Pico Rivera #2	1 x 24 hr sample every 6th day	1 x 24 hr sample every 6th day	
3	06/09/2009	Rubidoux	1 x 24 hr sample every 6th day	No Sampling	NOy required
3	05/01/2001	Santa Clarita	1 x 24 hr sample every 6th day	1 x 24 hr sample every 6th day	

MONITORING OBJECTIVES: MONITORING REQUIREMENTS:
REDUCED REQUIREMENTS:
1 – Upwind and background characterization site One type 1 or type 3 site required per area
Speciated VOC only required at type 2 and one other (type 1 or 3)
2 – Maximum O3 precursor emissions impact site One type 2 site required per area
Carbonyl only required in areas classified as serious or above 8 hr zone
3 – Maximum O3 concentration site No type 4 required
NO/NOx required only at type 2
4 – Extreme downwind monitoring site NOy required at one site per PAMS area (type 1 or 3)

CONCLUSION

A summary of conclusions from this technical assessment of the air monitoring network changes is provided below. There are many purposes and objectives for air quality monitoring, some beyond those described in this assessment that are taken into consideration when designing an air monitoring network. Meeting minimum monitoring requirements is just one factor in determining the value of sites and measurements. Given the challenges of meeting air quality standards in Southern California and the need for information to help in developing control strategies to achieve attainment, the SCAQMD monitoring network will exceed the minimum requirements. Forecasting, public reporting, permanent or highly potential incident source locations are also critical in the network design. Furthermore, closing, relocating or creating monitoring sites requires significant resources and often a long period of concurrent monitoring to show comparability. Thus, the suggestions summarized below should be viewed not as commitments but rather as potential guidance for further evaluation to beconsidered along with many other factors before being implemented. Also, SCAQMD will continue to evaluate the assessment data and when appropriate to propose to adjust the network in efforts to either optimize measurements or in response to an evaluation or formation of objectives. Most changes to the monitoring network are subject to approval by the U.S. EPA Regional Administrator and are documented for public review in the SCAQMD annual network plan.

- Once new monitoring regulations, attainment status, and network decisions are known for SO2, NO2, and CO, reassess the necessity of maintaining the current number of monitoring sites and if warranted, explore opportunities to optimize the number of monitoring sites while still meeting all monitoring objectives and purposes. Population and model frequency usage can provide some guidelines for decisions.

- In general, the western sites in the O3 monitoring network provide lower value information than those inland sites to the north or east.

- As population growth is predicted to increase towards the outer edges of the South Coast Basin especially in Riverside County, those areas will be further observed to assess adequate monitoring coverage of appropriate pollutants. Populations remain dense near roadways for which the data from the four near roadway sites will be assessed to determine

- Consider the values of the measurements that far exceed the minimum requirements and have high representation in specific areas and also where measurements can be consolidated.

Other considerations not in the scope of this assessment but in the process of developing network based objectives and other evaluations, the below are some other considerations for network design:

- Consider moving Long Beach area measurements to a new permanent site to conduct criteria, PAMS, and PM speciation that is closer to port, refinery and goods movement activities.

- Continue to transition to continuous PM measurements that can eventually replace filter-based measurements.