MONITORING AND TECHNICAL SERVICES DIVISION

# 5-YEAR AIR QUALITY MONITORING NETWORK ASSESSMENT 2020

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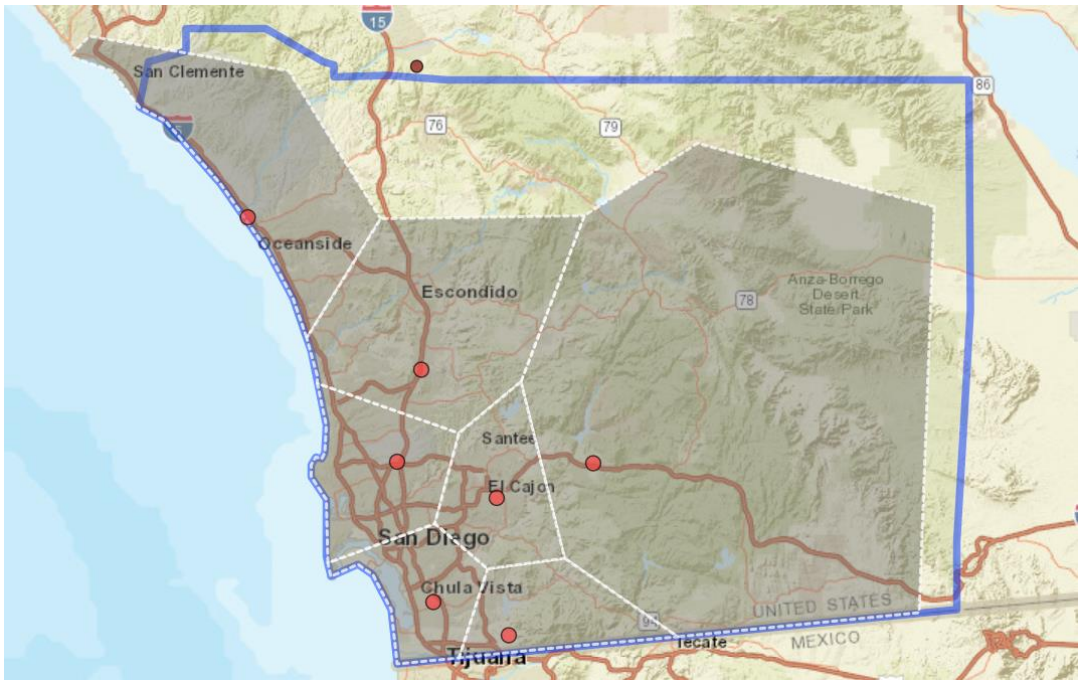


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# Table of Contents

# List of Figures

# List of Tables

# 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 $SO_2$ 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
$NO_y$- 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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# 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 $PM_{2.5}$, 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."*

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. These reasons are:

- 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 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.
- The establishment of new air quality objectives. New programs and rules are constantly being instituted, including rules that will reduce air pollution.

- 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 the 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 will greatly benefit the District's network, as well as the stakeholders (scientists, and the 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 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 also evaluates the non-criteria pollutants/programs in the District air monitoring network (some are federally mandated). These pollutant/programs are:

- Photochemical Assessment Monitoring Stations (PAMS) for Volatile Organic Compounds (VOC) and Carbonyls-This program is mandated.
- National Core (NCore)-This program is mandated.
- Toxics-VOC and Toxics-Metals.

This assessment considers the aforementioned parameters, with particular attention paid to $O_3$ and $PM_{2.5}$ due to concerns with attainment status and health effects, in terms of associated monitoring requirements and budget constraints. 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,
- 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, Exceedance Probabilities 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 much like Table 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.

Monitor Needs

This includes the designation and purpose of the monitor and the station as well as quality assurance needs. 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 a very lengthy process; such monitors received a high ranking. Also, some sites are needed for quality assurance purposes. For example, collocated particulate instrumentation should be in areas that approach the NAAQS or have a higher probability of approaching the NAAQS. These sites were awarded higher rankings than others.

Type of Community

The type of community and community need is important in the rating. For instance, 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 major pollution source). However, if the station is in place to record possible influences from a power plant or a freeway, it received a higher score. Another factor includes whether a community action group requested the monitoring in the area and if they rely on the monitors for air pollution information. Stations that have such instrumentation received a higher score than stations that were not requested.

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 an area, where population will grow? These areas received a higher ranking.

Health

This includes the 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.

Other/ Internal

This includes factors including trends data, recent expenditures to the station, etc. 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. Also, if significant capital has been spent upgrading a station for safety or other reasons, then the station received a higher rating due to a recent (within the last five years) expenditure. For example, a new wooden sampling deck can cost $100,000 (about 1/3 the cost of an entire station start-up); therefore, if a station recently upgraded to a new deck, it received a higher number than one that was not upgraded. Other factors unique to the site are also accounted for if necessary.

## Table A Station Score Sheet (Example)

| | TOTAL | Correlation | Removal | Exceedance | Monitor Needs | Area Served | Type of Community | Population | Health | Other / Internal |
|---|---|---|---|---|---|---|---|---|---|---|
| Alpine (ALP) | | | | | | | | | | |
| Camp Pendleton (CMP) | | | | | | | | | | |
| Chula Vista (CVA) | | | | | | | | | | |
| Otay Mesa-Donovan (DVN) | | | | | | | | | | |
| Lexington Elementary School (LES) | | | | | | | | | | |
| McClellan-Palomar Airport (CRQ) | | | | | | | | | | |
| Sherman Elementary School (SES) | | | | | | | | | | |
| San Diego-Kearny Villa Rd. (KVR) | | | | | | | | | | |
| San Diego-Rancho Carmel Dr. (RCD) | | | | | | | | | | |

# Executive Summary

The San Diego County Air Pollution Control District (District) is required by the U.S. Environmental Protection Agency (EPA) to complete a Network Assessment of its air monitoring network every five years. This latest assessment (2020) fulfills this requirement, and the this Network Assessment is also available to the public for review.

The Network Assessment documents the current status of the District's air monitoring network, and whether or not the network is properly designed to adequately measure the air pollution that the residents of San Diego County are exposed to on a daily basis. This Executive Summary is provided to give the reader an introduction to the document and its findings. For detailed information, the reader is encouraged to explore the entire document.

## Results of the Scoring of the San Diego County Air Monitoring Network Assessment

The District recently relocated several stations and started-up other stations (and will be relocating and starting up additional stations in Fiscal Year 2020/2021). These recent and projected 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-year Network Assessment report, including:

- Do we have unnecessarily 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)?
  - -Can the gaps be covered by modeling or the extrapolation of data from existing stations?
- Are our stations and monitors/samplers still valid for the air quality purpose they were designed?
  - -If not, why?
  - -Is newer technology available?
  - -Are there obstructions to the airflow, such as the growth of trees around the station, and other such reasons?

The results from the EPA Network Assessment tool are consistent with the District's assessment of the air monitoring network. Our internal network review and the review using the EPA Network Assessment tools revealed the following:

- There is no need for any major changes (adding/relocating/closing stations) beyond those already planned or anticipated.
- A minor change to the network includes the addition of certain non-criteria pollutant monitors to sites, if funding allows.

Due to station relocations since the last Assessment five years ago, some extrapolations are necessary with accompanying information. For the purposes of this report:

1. Del Mar is permanently decommissioned and there are no plans to site another station. Camp Pendleton extends coverage to this area.

2. The information for Escondido and El Cajon is valid for the new site locations, as they are well within EPA's requirements for using the same AQS number.
3. The information for San Diego-Beardsley (DTN) will be considered valid for the new site at Sherman Elementary School (SES). The new site is 800 m east of the old site. It is downwind of the same Bay sources and serves the same EJ community.

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, station expansions, station closures, or relocations. Table B provides a summary of the 2020 Network Assessment scores. Sites in gray are currently not in operation. These sites are expected to be operational in the upcoming years. No total score is reported in this assessment because they are not part of the 2020 EPA Network Assessment tool.

**Table B Summary of the San Diego County Air Monitoring 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sherman Elementary School (SES) | **146*** | 6 | 30 | n/a | n/a | n/a | 10 | n/a | n/a | n/a | 40 | 40 | 10 | 10 |
| Lexington Elementary School (LES) | **262** | 37 | 41 | 31 | A | n/a | 34 | 44 | 30 | 30 | n/a | n/a | 7 | 8 |
| Otay Mesa-Donovan (DVN) | **187** | 31 | 38 | n/a | n/a | n/a | 8 | 33 | n/a | n/a | 32 | 32 | 7 | 6 |
| Chula Vista (CVA) | **154** | 32 | 38 | n/a | n/a | n/a | 33 | 34 | n/a | n/a | n/a | n/a | 8 | 9 |
| San Diego-Kearny Villa Rd. (KVR) | **121** | 36 | 39 | n/a | n/a | n/a | 34 | n/a | n/a | n/a | n/a | n/a | 8 | 4 |
| Rancho Carmel Dr. (RCD) | **101** | n/a | 42 | 33 | n/a | n/a | 10 | n/a | n/a | n/a | n/a | n/a | 10 | 6 |
| Camp Pendleton (CMP) | **96** | 39 | 36 | n/a | n/a | n/a | 8 | n/a | n/a | n/a | n/a | n/a | 10 | 3 |
| Alpine (ALP) | **92** | 40 | 36 | n/a | n/a | n/a | 8 | n/a | n/a | n/a | n/a | n/a | 2 | 6 |
| 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 |
| Escondido Site (ESC) | | B | B | n/a | n/a | n/a | B | B | n/a | n/a | B | B | 8 | n/a |
| 2nd Near-road Site (San Ysidro) | | n/a | B | n/a | n/a | n/a | B | n/a | n/a | n/a | n/a | n/a | 9 | n/a |
| Otay Border Crossing Site (Border 2020) | | n/a | n/a | n/a | n/a | n/a | B | n/a | n/a | n/a | n/a | n/a | 7 | n/a |

*Sherman Elementary School started operation in 2019. The site was not part of the EPA assessment tool and the total score does not include Network Assessment scoring. Note: Sites in gray are not currently operational.
A: This federally required monitor has no pollutant scoring
B: Monitor is expected once the site is operational.

Scoring

1. For all columns, high scores indicate that the District is justified in keeping that parameter, program, and/or station.
2. A high score for any parameter means that that air pollution monitor/sampler/program is needed at that location.
3. High scores for the Population or Health Risk metric indicates that a station is needed in that locale. The maximum score for these is 10.
4. High scores for the pollutant indicate that monitor is needed. The maximum score for these is 40.

## Table C Site Legend

| Abbreviation | Name | | Abbreviation | Name |
|---|---|---|---|---|
| ALP | Alpine | | GAP 1 | Inland North County |
| CMP | Camp Pendleton | | GAP 2 | Coastal North County |
| CVA | Chula Vista | | GAP 3 | East County |
| CRQ | McClellan-Palomar Airport | | GAP 4 | Mid-County |
| DVN | Otay Mesa-Donovan | | GAP 5 | Southeast County |
| KVR | Kearny Villa Road | | SCAQMD1 | Temecula |
| LES | Lexington Elementary School | | | |
| RCD | Rancho Carmel Drive | | | |
| SES | Sherman Elementary School | | | |
| | **Future Sites** | | | |
| | Escondido Site | | | |
| | San Ysidro Near Road Site | | | |
| | Otay Border Site | | | |

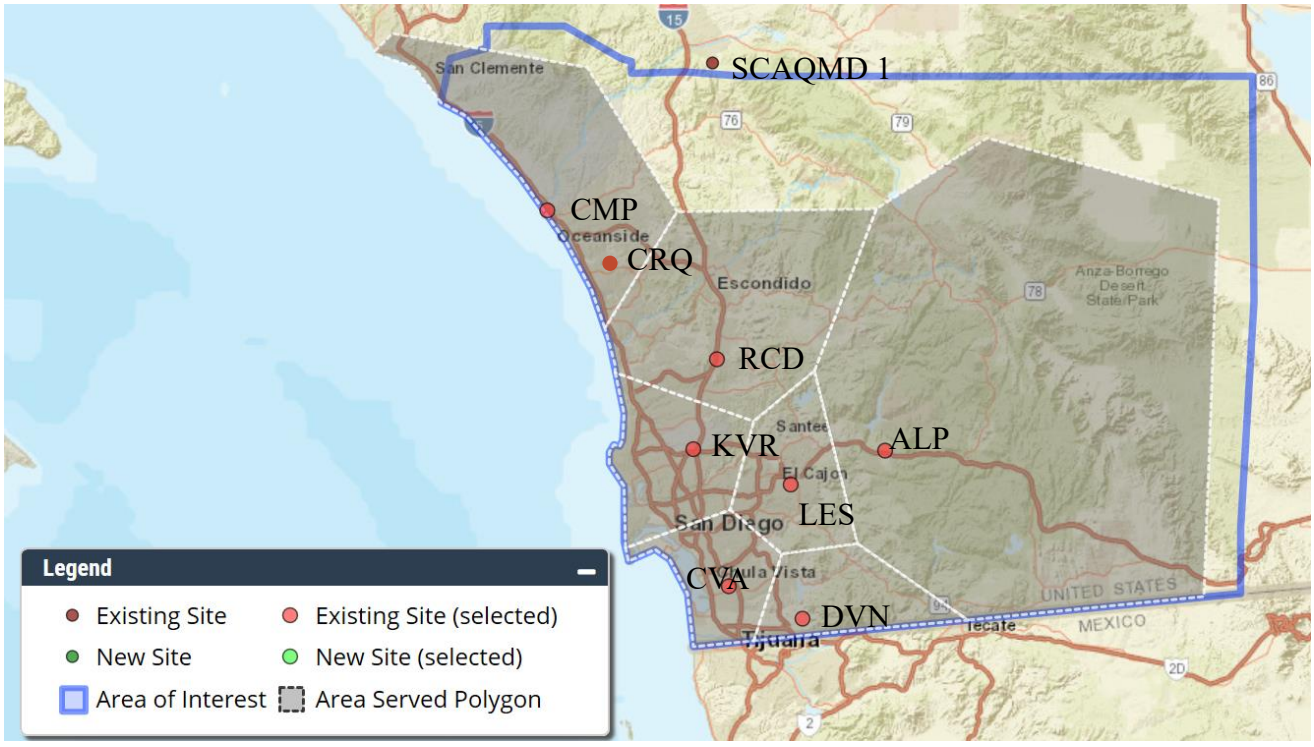



**Figure A Map of the San Diego County Air Quality Monitoring Network**

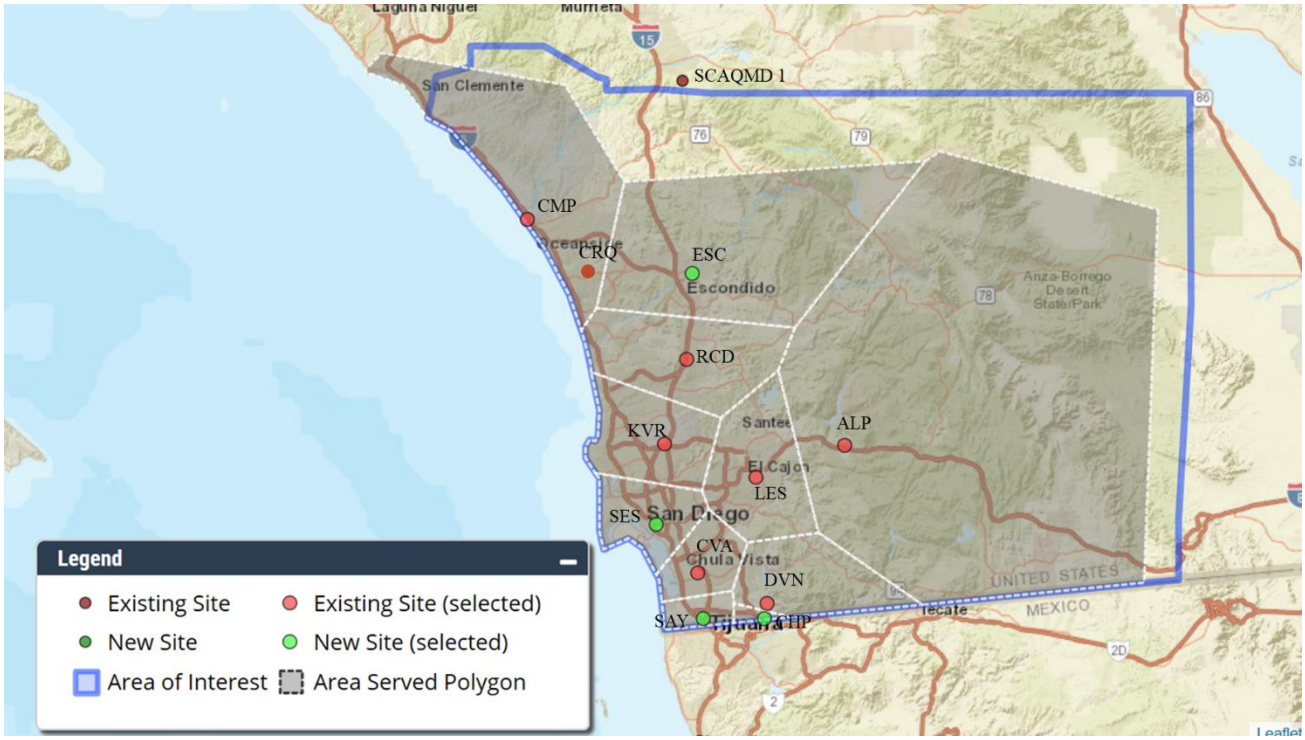



**Figure B Map of the San Diego County Air Quality Monitoring Network including Future Sites**

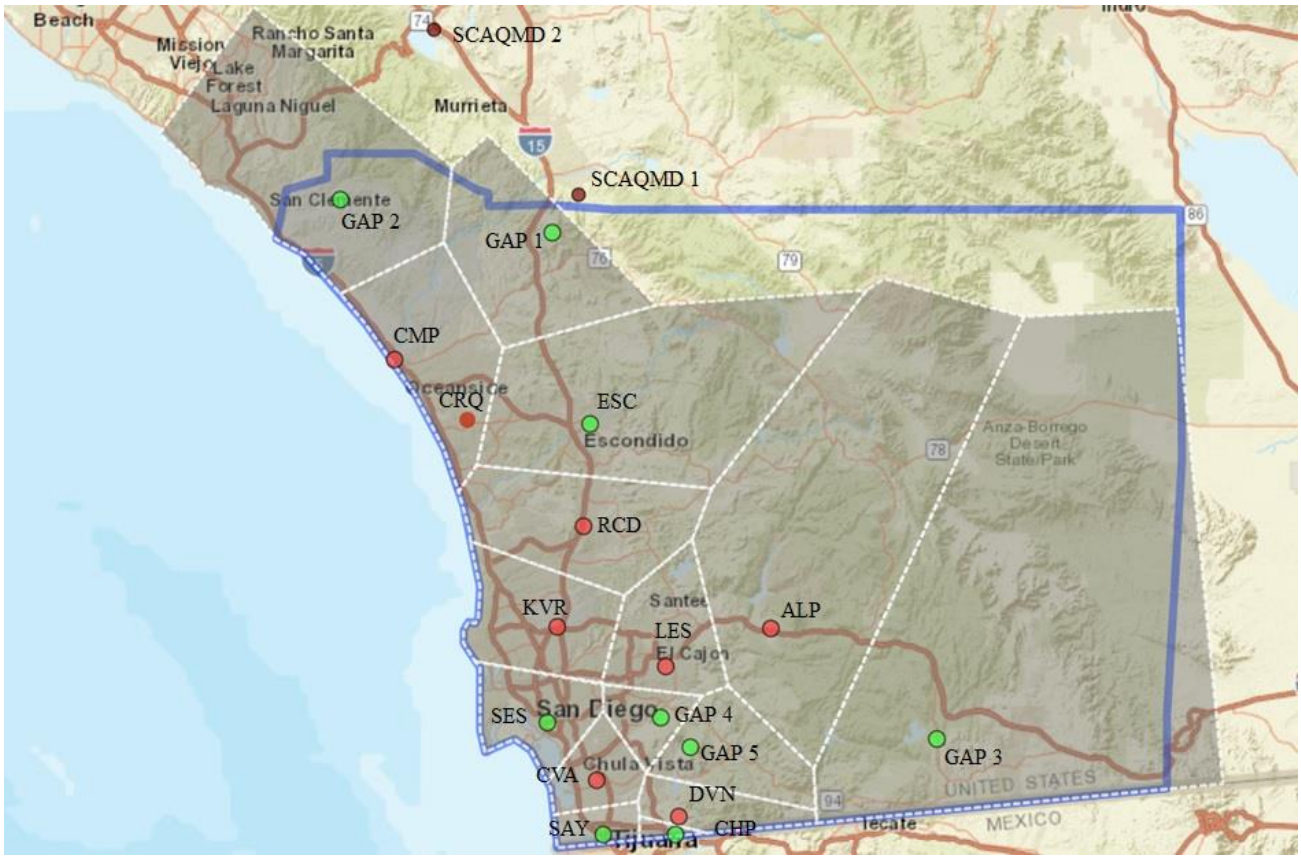



**Figure C Map of San Diego County Air Quality Monitoring Network including Future Sites and Gap Areas**

The Figures above depict the current, future, and prospective sites throughout the San Diego air monitoring network. Figure A shows the sites that have been reviewed using the Network Assessment tool. The Network Assessment tool did not account for sites that have been suspended. Figure B depicts the planned future air monitoring sites in the District including the recent re-located Downtown site to Sherman Elementary School (SES). Figure B shows the planned site at Escondido, the second near road site at San Ysidro, and the Border site in Otay. Figure C depicts all sites in the air monitoring network, future sites, and gap areas. These gaps have been identified by the District as areas where additional air monitoring sites could potentially be established. These gaps have been discussed in prior Network Assessments. The District analyzes trends in population and pollution to determine where additional sites and/or monitors, if any, are to be established.

The District can determine air pollution in areas where there is no monitor established based on several factors including pollution trends and meteorology. Typically, all ambient/neighborhood scale air monitoring stations that have an $O_3$ monitor also have a collocated $NO_x$ monitor. These two pollutants have an inverse relationship. Therefore, they serve as an automated data validation tool for each other. For example, if the $NO_x$ monitor at a site has seemingly anomalous high values, but the $O_3$ monitor has corresponding dips in concentrations, the $O_3$ and $NO_x$ data is deemed to be real occurrence and the data is kept.

The $NO_x$ analyzers also serve a vital role by documenting the effectiveness of the cumulative effects of air pollution control programs and technologies. In addition to using $NO_x$ analyzers, the District will incorporate direct-$NO_2$ analyzers for the Photochemical Assessment Monitoring Stations (PAMS), NCore, and Near-road programs. As the District implements direct-$NO_2$ analyzers throughout the Network, it will continue to maintain $NO_x$ monitors that are considered essential for data validation purposes.

## Site Discussion and Recommendations

1. Sherman Elementary School (SES)
   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 relatively high for the air basin. The surrounding community is concerned with heavy industry surrounding the neighborhood. To supplement criteria pollutant monitoring, the District added the following non-mandated equipment:
   - Toxics-Metals
   - Toxics-VOC
   - Toxics-Carbonyls

   **RECOMMENDATIONS**
   - ✓ The station was recently relocated from the Beardsley site. It will neither be closed nor relocated in the foreseeable future.
   - ✓ If the District gets additional funding and staffing a BTEX-continuous analyzer should be put at the SES station for the quantification of emissions from the large volume of diesel trucks, cranes and generators in this community.

2. Lexington Elementary School (LES)
This station is federally mandated for PAMS and NCore. The PAMS re-engineering is set by the EPA to be operational by June 2021. This includes the implementation of near real time monitoring by AutoGC and True $NO_2$ monitoring. The NCore program requires total reactive nitrogen ($NO_y$) sampling and regularly achieves low concentrations. Similarly, the $SO_2$ concentrations at the site are negligible and well below the NAAQS. The non-mandated equipment includes the following:
    - $NO_x$

    **RECOMMENDATIONS**
    - ✓ The station will neither be closed nor relocated.

3. Escondido (ESC)
    - The site is temporarily suspended, and it is expected to resume operation in 2021. The station is located east of the most trafficked Interstate highway and State Route in the air basin, this station is situated in a borderline EJ location. Its $NO_x$ and $PM_{2.5}$ concentrations are relatively high for the air basin. To supplement criteria pollutant monitoring, the District will add the following non-mandated equipment: Toxics-VOC
    - Toxics-Metals

    The Toxics-VOC sampler will be the northernmost and easternmost sampler in the District's Toxics program.

    **RECOMMENDATIONS**
    - ✓ The station is to resume monitoring
    - ✓ If approved by EPA, the PAMS ceilometer will be set-up at the site.
    - ✓ Petition EPA to relocate the PAMS & NCore parameters to this site.

4. Otay Mesa-Donovan (DVN)
This station is the District's southeastern-most site and is approximately 3.5 kilometers from the Otay Mesa border crossing. Otay Mesa is the busiest Heavy-Duty truck crossing in California and one of the busiest in the nation (This crossing is under construction to double the truck, passenger cars, and pedestrian entry lanes; so, it has the potential to become the busiest truck crossing along the United States-Mexico border and possibly the United States). Upwind and north of this station are the second fastest growing areas in the County. The $NO_x$ monitor is used to measure the cross-border influence of the heavy-truck traffic. This station was 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. To supplement criteria pollutant monitoring, the District added the following non-mandated equipment:
    - Toxics-Metals
    - Toxics-VOC
    - Toxics-Carbonyls
    - Non-FEM $PM_{2.5}$ sampler (EPA requested & funded for the Border 2020 Program)
    - Black Carbon-continuous (EPA requested & funded for the Border 2020 program, late-2020)

    **RECOMMENDATIONS**

- ✓ The station will neither be closed nor relocated.
- ✓ All samplers and monitors will be retained.
- ✓ If funding and staffing becomes available, BTEX-continuous analyzer should be put here to quantify the VOC emissions from diesel truck traffic from one of the busiest border truck crossings in the United States.

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 one of the highest rates of respiratory ailments in the County. Because the station is located inland, the measured concentrations can be used to interpolate the concentrations for surrounding cities and communities. The non-mandated equipment includes the following:

- $O_3$
- $PM_{10}$

**RECOMMENDATIONS**

- ✓ The station will neither be closed nor relocated. However, an upgrade to the shelter is planned.
- ✓ Historical $PM_{10}$ data should be reviewed for possible decommissioning.
- ✓ A $PM_{2.5}$ FRM sampler should be added for quality assurance/collocation purposes (relocated from KVR station).

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.

**RECOMMENDATIONS**

- ✓ The station will neither be closed nor relocated.
- ✓ The $PM_{2.5}$ FRM sampler used for quality assurance/collocation purposes should be relocated to CVA (an area of higher $PM_{2.5}$ concentrations).

7. Camp Pendleton (CMP)

This location is the District's northernmost station, and it records transport from the South Coast Air Basin. Furthermore, the data from this area are used to interpolate the concentrations for the communities (north and south) along State Route 76 & 78. 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 not be closed, but it may be relocated to nearby Oceanside in the future.
- ✓ All samplers and monitors will be retained.

8. Alpine (ALP)

This location is the easternmost station of the District's air monitoring network. It monitors the air downwind of the County's major metropolitan areas. It is the District's ozone Design Value site. The non-mandated equipment includes the following:

- $PM_{2.5}$ non-FEM continuous

**RECOMMENDATIONS**

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

9. 2nd Near-Road Site – San Ysidro

The District is working on establishing the 2nd Near-road station in San Ysidro. The site will have a True $NO_2$ analyzer.

**RECOMMENDATIONS**

- ✓ Add a black carbon analyzer if funding is available.
- ✓ If funding and staffing becomes available, a BTEX-continuous analyzer should be put here to quantify the VOC emissions from traffic from the busiest border crossing in the world.

10. Rancho Carmel Drive (RCD) - Near Road Site

This area is one of the most heavily trafficked areas in the County. A $PM_{2.5}$ sequential sampler has been deployed at the site. There is no non-mandated equipment at this site.

**RECOMMENDATIONS**

- ✓ None

11. Palomar Airport (CRQ)

This station is federally mandated, due to measured concentrations for airborne lead particulate matter triggering a requirement for permanent sampling. The measured concentrations have been less than 80% of the NAAQS for three consecutive years. In 2017, the District submitted a petition to the EPA to close the regulatory lead monitor.

**RECOMMENDATIONS**

- ✓ The District has satisfied monitoring requirements for regulatory lead sampling at the airport. District recommends decommissioning regulatory lead sampler. Once the sampler is decommissioned, the District will continue to sample for non-regulatory metals, including lead at the airport (Pending OAQPS ruling on decommissioning regulatory sampling).

## Gaps in the San Diego County Air Monitoring Network

The District has identified five air monitoring gaps within the air monitoring network. These gaps have been discussed in prior Network Assessments. These sites are, again, reviewed and discussed to determine if additional sites at these locations need to be established. The District reviews these sites as air pollution monitoring needs and population trends change throughout the air monitoring network.

A. Inland North County

The 2015 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 (GAP 1 in Figure C). The current Network Assessment found similar results

**RECOMMENDATIONS**

- ✓ No new/additional stations are suggested for the north and northwest areas. The South Coast Air Quality Management District (SCAQMD) has monitors for ozone, nitrogen dioxide, $PM_{10}$, and $PM_{2.5}$ in the area north of Escondido, Temecula (SCAQMD1 in Figure A. 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 data.
- ✓ No new/additional stations are suggested for the northern areas of San Diego County. Studies have shown that the measured concentrations are equivalent to those observed at the Escondido station and that no new information will be gained once the Escondido station is operational.

B. Coastal North County

The 2015 Network Assessment revealed a possible gap in the air pollution monitoring network in the area north of the Camp Pendleton monitoring station (GAP 2 in Figure C). The current Network Assessment found similar results.

**RECOMMENDATIONS**

- ✓ No new/additional stations are suggested, since 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. However, in the past the South Coast AQMD had a site located in Mission Viejo. With the closure of this site, the District may consider sampling to determine air pollution needs.

C. East County

The 2015 Network Assessment suggested a possible gap in the areas east of the Alpine station (GAP 3 in Figure C). The current Network Assessment found similar results.

**RECOMMENDATIONS**

- ✓ No new/additional stations are suggested, since the areas east of the Alpine station have low population centers, low traffic counts, and similar topography. An additional ozone monitor in this area would add little 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 2015 Network Assessment suggested a possible gap in coverage northeast of the Chula Vista monitoring station and southwest of El Cajon monitoring station (GAP 4 in Figure C). The current Network Assessment found similar results.

**RECOMMENDATIONS**

- ✓ When resources become available, temporary sampling may be conducted to ascertain if air monitoring coverage needs to be expanded to include this area.

E. Southeast County

The Network Assessment showed the Otay Mesa-Donovan station has a wide coverage area (GAP 5 in Figure C). The Eastlake area is the second fastest growing area in the County.

**RECOMMENDATIONS**

- ✓ When resources become available, temporary sampling may be conducted to ascertain if air monitoring coverage needs to be expanded to include this area. 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 may now be necessary.

# Chapter 1 Overview of the Network

## 1.1 San Diego Air Basin General Information

The first step in performing a network assessment is to gain 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 $O_3$, $NO_x$, and volatile organic compounds (VOC), 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

EPA regulations specify the minimum number of sites at which state and local air agencies must deploy monitors. The State and local agencies find they need to deploy more monitors than are minimally required by EPA regulations to fulfill state and local purposes for monitoring. The California air quality standards are often more stringent than the National standards. As an example, $PM_{2.5}$ monitors are deployed at additional sites than the minimum required by the EPA. Additionally, the topography in the SDAB is quite varied, so a $PM_{2.5}$ monitor inland will vary significantly with a coastal $PM_{2.5}$ monitor. To obtain a true representation of $PM_{2.5}$ throughout the network, $PM_{2.5}$ monitors are deployed at several air monitoring stations.

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"[1]. Each pollutant has different requirements for determining the minimum number of monitors needed for a Metropolitan

[1] (2019) 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring"

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 Salton 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 criteria pollutant section 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"[2]. 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 Lead Total Suspended Particles (TSP-Pb) monitor that was established at the McClellan-Palomar Airport.

For the San Diego APCD, the most common reasons for stations/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 Downtown site. This new site was set up in 2019 at Sherman Elementary School due to the eviction from the previous location in Downtown. 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. The most current example is the decommissioning of non-required CO monitors. The levels of CO in the SDAB are well below the NAAQS, so the District petitioned the EPA to decommission these non-required CO monitors with a 58.14 application and it was formally approved by the EPA Region 9 (R9) authorities.

## 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

[2] (2019) 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring"

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 Air Quality Monitoring 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. Station coordinates and monitor spacing were verified, as were distances to roadways and obstacles. Has the population, land use or vegetation around the monitor changed significantly since the station/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 was next. Table 1.1 lists the locations and monitoring parameters of each site currently in operation in the SDAB. Table 1.2 lists the pertinent EPA Air Quality System (AQS) database information for each site.

Currently, 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's or neighbor's consent, influence any 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 stations for any combination of the aforementioned reasons and some examples are as follows: the NCore site, the

District temporarily relocated to the Floyd Smith Drive site (in El Cajon) and then back to its original location at Lexington Elementary School; the District had to relocate the entire Escondido station only 20 m, because the landlord wanted the property; and, the District recently (mid-2019) relocated the Downtown site to Sherman Elementary School, The average cost of an air monitoring station start-up is $250,000, not including monitoring equipment; furthermore, the dismantling and destruction of an old air monitoring station costs approximately half the start-up costs, depending on a myriad of County and landlord requirements. These station relocations (temporary and permanent) and demolitions, as well as new EPA 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. Most air monitoring equipment did not trigger any internal District threshold for decommissioning. The Downtown station (Sherman Elementary) is in an Environmental Justice (EJ) area, and all its monitors are required by the EPA, requested by local concerned residents, or added by the District for internal reasons. The Camp Pendleton station is the northernmost air monitoring location in the network, and records pollution transport from the South Coast Air Basin. Both stations and the instrumentation therein are required, and neither will be decommissioned. However, there is the likelihood that the Camp Pendleton station will be relocated to nearby Oceanside in the near future (it was a finding/recommendation in the most recent TSA). The District is waiting on the status for decommissioning the lead monitors at our site at Palomar Airport (CRQ) but the samplers are still operational until further notice by EPA. 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 and before this Network Assessment.

A summary of station changes since the last Network Assessment (2015) is listed below in addition to anticipated station moves:

<u>Start-up/Relocation</u>

- Downtown (Beardsley St) to Sherman Elementary School (in the Portside community)
- Floyd Smith Drive (in El Cajon) relocated to Lexington Elementary School (in El Cajon)

<u>Relocation</u>

- Escondido (Same location/different part of property). Official start date to-be-determined (estimated 2021).

<u>Shut Down</u>

- San Ysidro (original location)
- Del Mar

<u>Future Projects</u>

The District anticipates the following financially significant one-time expenditures to incur over the next 18-24 months:

- one new station start-up in San Ysidro for the 2$^{nd}$ Near-road and Border 2020 programs (in the South San Diego EJ area).

- one new station in Otay Mesa for Border 2020 Program (in the South San Diego EJ area),
- the complete remodeling of the Chula Vista station and wood deck/sampling platform,
- one possible station demolition/relocation for Camp Pendleton (possible relocation to Oceanside).

Table 1.1 describes the air monitors and samplers at each air monitoring site. For reference:

- Yellowed areas indicate a collocation of samplers to satisfy Federal QA requirements for $PM_{2.5}$ FRM monitors, $PM_{10}$, and TSP samplers with a sampling frequency of 1:6.
- The collocated $PM_{2.5}$ PAMS-VOCs sampler have the same sampling frequency as the main sampler.
- All sample times are set to Pacific Standard Time.
- The District operates, calibrates, and audits all instruments listed in Table 1.1, except for the CARB samplers (Xonteck 924) at the Chula Vista and El Cajon stations (operation only).
- Not all collected samples are analyzed by District personnel. Some samples are sent to the EPA or CARB laboratories for subsequent analysis. They are noted in Table 1.1 as CARB.
- CA TAC stands for the California Toxics Air Contaminant Monitoring network.

Sampling frequencies are designated as follows:

7/24= a sampler that operates continually with no media changes needed (Please note that a filter tape roll is used on the BAM and changed as needed).

1:1= a sampler that requires a sample deposition media (filter, DNPH cartridge, or Summa canister); it runs daily for a duration of 24 hours. The media are manually loaded, collected, and programmed to run on a weekly basis.

1:3= a sampler that requires a sample deposition media (filter, DNPH cartridge, or Summa canister); it runs every three (3) days for a duration of 24 hours. The media are manually loaded, collected, and programmed in between sample days.

1:6= a sampler that requires a sample deposition media (filter, DNPH cartridge, or Summa canister); it runs every six (6) days for a duration of 24 hours. The media are manually loaded, collected, and programmed on a weekly basis

1:12= a sampler that requires a sample deposition media (filter, DNPH cartridge, or Summa canister); it runs every twelve (12) days for a duration of 24 hours. The media are manually loaded, collected, and programmed on a biweekly basis.

## Table 1.1 Air Monitoring Sites with Associated Monitors/Samplers & Sample Frequency

| | | **ALP** Alpine | **CMP** Camp Pendleton | **CVA** Chula Vista | **DVN** Donovan | **LES** Lexington Elementary School | **KVR** Kearny Villa Rd. | **CRQ** Palomar Airport | **RCD** Rancho Carmel Drive | **SES** Sherman Elementary School |
|---|---|---|---|---|---|---|---|---|---|---|
| AMBIENT | $O_3$ | 7/24 | 7/24 | 7/24 | 7/24 | 7/24 | 7/24 | | | 7/24 |
| | $NO_2$ | 7/24 | 7/24 | 7/24 | 7/24 | 7/24 | 7/24 | | 7/24 | 7/24 |
| | CO | | | | | | | | 7/24 | |
| NCORE | $NO_y$-TLE | | | | | 7/24 | | | | |
| | CO-TLE | | | | | 7/24 | | | | |
| | $SO_2$-TLE | | | | | 7/24 | | | | |
| LEAD | (Airports) (Hi-Vol) | | | | | | | 1:6 | | |
| $PM_{10}$ | (Manual) | | | 1:6 | 1:6 | 1:6 | | | | |
| $PM_{2.5}$ FRM n- FEM | (non-FEM Continuous) | 7/24 | 7/24 | | 7/24 | 7/24 | | | | 7/24 |
| | (Manual) | | | 1:3 | | 1:1 | 1:3 | | 1:3 | 1:3 |
| $PM_{2.5}$ CSN | (Speciation) | | | | | 1:3 | | | | |
| $PM_{2.5}$ STN | Channel 1 (Metals) | | | | | 1:3 | | | | |
| | Channel 2 (Inorganic Ions) | | | | | 1:3 | | | | |
| | Channel 3 (Wood Smoke) | | | | | | | | | |
| PAMS | (VOCs) | | | | | Not Active | | | | |
| | (Carbonyls) | | | | | Not Active | | | | |
| TOXICS CA-TAC (CARB) | (VOCs) | | | 1:6 | | 1:6 | | | | |
| | (Total Metals & $Cr^{+6}$) | | | 1:12 | | 1:12 | | | | |
| | (Aldehydes/ Carbonyls) | | | 1:6 | | 1:6 | | | | |
| TOXICS (APCD) | (VOCs) | | | | 1:6 | | | | | 1:6 |
| | (Total Metals) | | | | 1:6 | 1:6 | | | | 1:6 |
| | (Aldehydes/ Carbonyls) | | | | 1:6 | | | | | 1:6 |
| METEROLOGICAL PARAMETERS & Others | Wind Speed./ Wind Direction | 7/24 | 7/24 | 7/24 | 7/24 | 7/24 | 7/24 | | | 7/24 |
| | External Temperature | 7/24 | 7/24 | 7/24 | 7/24 | 7/24 | 7/24 | | | 7/24 |
| | % Relative Humidity | 7/24 | | | | 7/24 | 7/24 | | | |
| | Internal Temperature | 7/24 | 7/24 | 7/24 | 7/24 | 7/24 | 7/24 | | 7/24 | 7/24 |
| | Barometric Pressure | | | | | | 7/24 | | | |
| | Solar Radiation | | | | | | 7/24 | | | |
| | Ultraviolet Radiation | | | | | | Not Active | | | |
| | Precipitation | | | | | | Not Active | | | |
| | | | | | | | | | | |

Table 1.2 lists the District's stations and the pertinent information regarding location. For a summary of the site description see Tables 1.2 to 1.4; 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 1.2 Network Sites**

| Station Name | Station Abbreviation | Address | Latitude/ Longitude | AQS ID |
|---|---|---|---|---|
| Alpine | ALP | 2300 W. Victoria Dr. | 32.842318°N 116.768293°W | 06-073-1006 |
| Camp Pendleton | CMP | 21441 W. B St. | 33.217055°N 117.396177°W | 06-073-1008 |
| Chula Vista | CVA | 84 E. J St. | 32.631242°N 117.059088°W | 06-073-0001 |
| Donovan | DVN | 480 Alta Rd. | 32.57816°N 116.92135°W | 06-073-1014 |
| *Escondido | ESC | 600 E. Valley Pkwy. | 33.127769°N 117.075086°W | 06-073-1002 |
| Kearny Villa Rd. | KVR | 6125A Kearny Villa Rd. | 32.845709°N 117.123964°W | 06-073-1016 |
| Lexington Elementary School | LES | 533 S. First St. | 32.789565°N 116.944308°W | 06-073-1022 |
| McClellan-Palomar Airport | CRQ | 2192 Palomar Airport Rd. | 33.130897°N 117.272389°W | 06-073-1023 |
| Rancho Carmel Dr. (1st Near-road Site) | RCD | 11403 Rancho Carmel Dr. | 32.985442°N 117.08218°W | 06-073-1017 |
| **San Ysidro (2nd Near-road Site) | SAY | 198 W. San Ysidro Blvd. | 32.552811°N 117.047345°W | 06-073-1025 |
| Sherman Elementary School | SES | 450B 24th St. | 32.710177°N 117.142665°W | 06-073-1026 |

*Under construction. Projected operational timeline: 2021
**Undergoing negotiations for a sampling platform at this location; projected operational timeline: 2021

**Table 1.3 Probe Inlet Summary**

| (Measurements are in meters) | | Spacing from Minor Sources | Source | Spacing from Obstructions | Obstruction | Height from Ground | Spacing from Trees | | Probe inlet distance from road | AADT | Data Compared to NAAQS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Actual | Required | | | |
| ALP | $O_3$ | n/a | none | n/a | none | 7.2 | 38.8 | >10 | 11.7 | 500 est | Yes |
| | $NO_2$ | | | | | | | | | | |
| | *$PM_{2.5}$ | n/a | | n/a | | 5.0 | 38.8 | | 11.7 | | No |
| CMP | $O_3$ | 121.4 | Military transport vehicles motor pool, repair, and fuel facility | n/a | none | 5.9 | 35.0 | >10 | 47.7 | 500 | Yes |
| | $NO_2$ | | | | | | | | | est | |
| | *$PM_{2.5}$ | 124.8 | | n/a | | 5.0 | 35.0 | | 47.0 | | No |
| CVA | $O_3$ | n/a | none | n/a | none | 6.5 | n/a | >10 | 51.0 | 9,200 | Yes |
| | $NO_2$ | | | | | | | | | | |
| | $PM_{10}$ | n/a | none | n/a | none | 5.1 | n/a | | 51.0 | | Yes |
| | $PM_{2.5}$ | n/a | none | n/a | none | 5.6 | n/a | | 51.0 | | Yes |
| DVN | $O_3$ | 800 | Peaker power plant | n/a | none | 6.4 | n/a | >10 | 12.0 | 300 est | Yes |
| | $NO_2$ | | | | | | n/a | | | | |
| | $PM_{10}$ | 800 | | n/a | none | 5.8 | n/a | | 18.0 | | Yes |
| | *$PM_{2.5}$ | 800 | | n/a | none | 6.4 | n/a | | 19.0 | | No |

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

| (Measurements are in meters) | | Spacing from minor sources | Source | Spacing from obstructions | Obstruction | Height from Ground | Spacing from trees | | Probe inlet distance from road | AADT | Data compared to NAAQS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Actual | Required | | | |
| RCD | $NO_2$ | 32 | Interstate 15 (major source) | n | none | 3.0 | 11 U 5.6 P | >10 | 24.4 | 16,100 | Yes |
| | CO | | | | | | | | | | Yes |
| | $PM_{2.5}$ | 32 | | | | 5.0 | | | | | |
| LES | $O_3$ | n/a | none | n/a | none | 7.1 | 11.7 | >10 | 16.8 | 4,900 | Yes |
| | $NO_2$ | | | | | | | | | | Yes |
| | CO | | | | | | | | | | Yes |
| | $SO_2$ | | | | | | | | | | Yes |
| | $NO_y$ | n/a | | n/a | none | 7.1 | 13.4 | | 16.8 | | No |
| | $PM_{10}$ | n/a | | n/a | none | 6.5 | 11.0 | | 16.8 | | Yes |
| | $PM_{2.5}$ | n/a | | n/a | none | 6.5 | 11.5 | | 16.8 | | Yes |
| KVR | $O_3$ | n/a | none | n/a | none | 7.6 | none | >10 | 180 | 15,400 | Yes |
| | $NO_2$ | | | | | | | | | | |
| | $PM_{10}$ | n/a | none | n/a | none | 7.0 | none | | 180 | | Yes |
| | $PM_{2.5}$ | n/a | none | n/a | none | 7.0 | none | | 180 | | Yes |
| SES | $O_3$ | n/a | San Diego Bay | n/a | none | 6.21 | none | >10 | 12.7 | 9,400 | Yes |
| | $NO_2$ | | | | | | | | | | |
| | $PM_{2.5}$ | n/a | | n/a | none | 6.12 | none | | 14.46 | | Yes |
| CRQ | Pb-TSP | 126 | Airport runway (major source) | n/a | none | 2.1 | 32.0 | >10 | 356 | n/a | Yes |

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

## Table 1.4 Individual Site Assessment Summary

| Site Name | Abbreviation | Year | Comments/Issues | Cost to Move? (High/Avg/Low) | Moved Recently? (Yes/No) |
|---|---|---|---|---|---|
| Alpine | ALP | 2015 | $O_3$ Design Value site; relocated back to original location across the street. | High | Yes |
| Camp Pendleton | CMP | 1997 | Extremely difficult to obtain military consent to relocate elsewhere on CMP property; motor pool affects instruments | Avg | No |
| Chula Vista | CVA | 1974 | Highest rate of asthma in the County; must renovate shelter and deck | High | No |
| Donovan | DVN | 2014 | Near Otay Mesa border crossing, tends to have higher Toxic-VOCs, Carbonyls, and Metals in the Network | High | Yes |
| Rancho Carmel Dr. | RCD | 2015 | Federally required Near Road site | Avg | Yes |
| Lexington Elementary School | LES | 2017 | Station relocated back to original site at Lexington Elementary from Floyd Smith Dr.; NCore site | High | Yes |
| Escondido | ESC | 2021 | High $NO_2$ and $PM_{2.5}$ site. Monitoring suspended until future date (TBD). Is the only Toxics site in Northern San Diego and often captures agricultural related emissions. | High | No |
| Kearny Villa Rd | KVR | 2010 | Secondary business district area. | High | Yes |
| Sherman Elementary School | SES | 2019 | New Downtown site. Relocated from Beardsley site mid-2019. In an EJ area | High | Yes |
| Palomar Airport | CRQ | 2014 | Federally required lead monitor; Airport | Low | Yes |

# Chapter 2 Population Trends

## 2.1 Population of San Diego

Over the years, the District's air monitoring network has evolved to its current state based on several factors, which include meteorology, topography, pollutant(s) being measured, monitor area(s) represented, and population (centers, changes, and shifts).

The monitoring stations are typically situated in communities of high population. The average distance between stations is approximately 20 kilometers for stations south of Interstate 8 and approximately 30 kilometers for stations north of Interstate 8. Table 2.1 lists the population from different communities in the county according to the census performed in 2010 and the most recent population estimates according to the San Diego Association of Governments (SANDAG). At the time of the writing of this Network Assessment, the results of the 2020 census were not available. The District uses population counts to assess where stations should be located to best serve the communities' air monitoring needs and provide representative air quality data.

**Table 2.1 San Diego County Population Trends: 2010 vs. Current Estimates**

| City/Community | 2010 Census | Estimate | Trend | Comments |
|---|---|---|---|---|
| Carlsbad | 105,328 | 114,622 | 9% | Lead monitoring at Palomar Airport |
| Chula Vista | 243,916 | 267,503 | 10% | Has an ambient station |
| Coronado | 18,912 | 21,683 | 15% | |
| Del Mar | 4,161 | 4,322 | 4% | |
| El Cajon | 99,478 | 105,557 | 6% | Lexington Elementary is NCore and PAMS |
| Encinitas | 59,518 | 63,158 | 6% | |
| Escondido | 143,911 | 151,478 | 5% | Station monitoring suspended until 2021 |
| Imperial Beach | 26,324 | 28,163 | 7% | |
| La Mesa | 57,065 | 61,261 | 7% | |
| Lemon Grove | 25,320 | 26,834 | 6% | |
| National City | 58,582 | 62,257 | 6% | |
| Oceanside | 167,086 | 177,362 | 6% | Has an ambient station in Camp Pendleton |
| Poway | 47,811 | 50,207 | 5% | Has the Near-road station |
| **San Diego** | **1,307,402** | **1,419,845** | 9% | **Ambient stations at Sherman Elementary and Kearny Villa Road** |
| Barrio Logan | 3,885 | 4,267 | 10% | |
| Kearny Mesa | 5,665 | 10,968 | 94% | |
| Tierrasanta | 30,252 | 31,210 | 3% | |
| San Ysidro | 28,008 | 26,520 | -5% | |
| San Marcos | 83,781 | 95,768 | 14% | |
| Santee | 53,413 | 56,944 | 7% | |
| Solana Beach | 12,867 | 13,938 | 8% | |
| Vista | 93,834 | 103,381 | 10% | |
| **Unincorporated** | **486,550** | **513,123** | 5% | **Has ambient stations at Alpine and Otay Mesa-Donovan** |
| Alpine | 14,263 | 18,095 | 27% | Ambient station in Alpine |
| Otay Mesa | 75,801 | 74,882 | -1% | Nearby Otay Mesa Donovan ambient site |
| Otay | 7,621 | 7,902 | 3.7% | |
| **Region (overall)** | 3,095,313 | 3,343,364 | 8% | |

## 2.2 73Air 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 south of the Camp Pendleton station. The Camp Pendleton station is 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 station.

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 in place. This population and the adjacent cities/communities are covered by our ambient air monitoring network.

Coronado

This population will be covered by our Downtown station, which was relocated to Sherman Elementary School (2019) and is located across the bay from Coronado.

Del Mar

This population and the adjacent cities/communities are covered by the Camp Pendleton station north of the city and our ambient air monitoring network.

El Cajon

The station at Lexington Elementary School 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 station.

Escondido

This city is one of the largest in the County. The ambient air monitoring station is suspended and is expected to be in operation in 2021. It is located in a borderline Environmental Justice zone. This population and the adjacent cities/communities will be 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-Donavan stations.

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

Lemon Grove
This city is east of the Downtown station at Sherman Elementary School and west of the Lexington Elementary School (El Cajon) station. Lemon Grove and the adjacent cities/communities are covered by the Sherman Elementary School (Downtown) and Lexington Elementary School (El Cajon) stations.

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

Oceanside
This city has the third largest population 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
The closest air monitoring station is the Near-road monitoring station at Rancho Carmel Drive. Additionally, the Kearny Villa Road station is located south. Poway and the adjacent cities/communities are covered by the 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. South-east of Downtown San Diego is Sherman Heights 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. San Marcos and the adjacent cities/communities are covered by the Camp Pendleton station.

Santee
This city is east of the Kearny Villa Road station and northwest of the Lexington Elementary School (El Cajon) station. Santee and the adjacent cities/communities are covered by the Kearny Villa Road and Lexington Elementary School (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 station.

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

Unincorporated Areas-South County
This area has the Otay Mesa-Donovan ambient air monitoring station. This area is southeast of the Chula Vista and Sherman Elementary School (Downtown) stations. Otay Mesa and the adjacent cities/communities are covered by the Otay Mesa-Donovan 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 (monitoring suspended) and south of three stations from the South Coast Air Quality Management District (SCAQMD). The Unincorporated Areas in North County will be covered by the District's Escondido station and the SCAQMD stations.

## 2.3 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. Since the last Network Assessment, monitoring at our Escondido location has been suspended until the new station is operational (2021). The new Escondido station will be located a few meters away from the original site on the same property. In addition, due to eviction, our Downtown site was relocated 800 meters east northeast (downwind) to the Sherman Heights community at Sherman Elementary School in 2019 (both in the Portside EJ community). The monitoring site in Del Mar was decommissioned in 2016.

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 the average 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.

## 2.4 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 | | |
| **Otay Mesa-Donovan (DVN)** | **7** | **Based on total population and population growth.** |
| Otay Mesa-West | | |
| Otay Mesa-East | | |
| San Ysidro | | |
| **El Cajon-Lexington Elementary (LES)** | **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. Monitoring Suspended. Expected start-up 2021.** |
| Vista | | |
| Bonsall | | |
| Fallbrook | | |
| Poway | | |
| Valley Center | | |
| Pala | | |
| **Sherman Elementary School (SES)** | **10** | **Based on total population and surrounding population. Relocated site. Operational mid-2019.** |
| Logan Heights | | |
| Grant Hill | | |
| East Village | | |
| Sherman Heights | | |
| Mountain View | | |
| National City | | |
| Downtown San Diego | | |
| **San Diego-Kearny Villa Rd. (KVR)** | **8** | **Based on total population and surrounding population.** |
| Fairbanks Ranch | | |
| Rancho Santa Fe | | |
| Solana Beach | | |
| La Jolla | | |
| Sorrento Valley | | |
| Tierrasanta | | |
| Clairemont Mesa | | |
| Mira Mesa | | |
| Serra Mesa | | |
| Scripps Ranch | | |
| **Near Road - Rancho Carmel Dr (RCD)** | **10** | **Highest trafficked area** |
| **2nd Near-road & Border 2020 – San Ysidro** | **9** | **Required; Environmental Justice area** |
| **Border 2020-Otay Border Crossing Site** | **7** | **High counts of cross border traffic.** |

# 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 will be detailed and discussed in this chapter. 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 the effect air pollution has on these maladies.

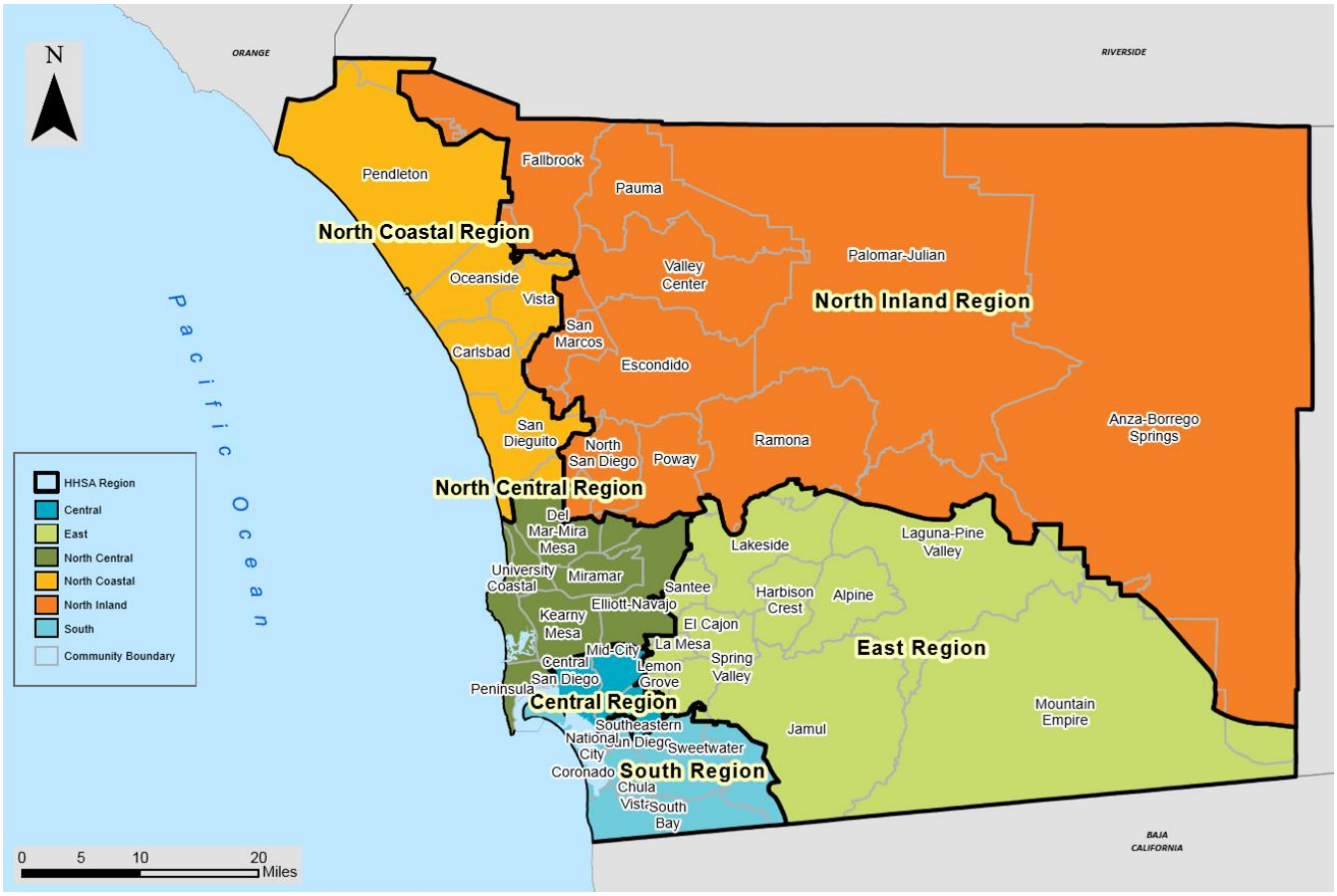



**Figure 3.1 HHSA Regional Health Map**

EPA-Region 9 Health Risk mapping tool, CalEnviroScreen 3.0, breaks down various health, pollution, and demographic statistics by census tract, including the asthma rate and corresponding percentile. Asthma rate is calculated as the number of emergency department visits per 10,000 people.

EPA-National mapping database tool, EJ View, can break down the health and pollution statistics by a user selected region or, like CalEnviroScreen 3.0, by census tract and even by sub-tract. EJ View has compiled a broad array of environmental data, including the National Air Toxics Assessment (NATA) respiratory hazard index and the corresponding percentile. The respiratory hazard index represents the cumulative risk of all respiratory toxics.

Table 3.1 presents the asthma rate, respiratory hazard index, and percentiles for each statistic of the regions and subregions of San Diego County, as well as which APCD station records air pollution data for each location.

**Table 3.1 Health Risk Summary by Region**

| Region | Subregion | Station | Asthma Rate | Asthma Rate Percentile | NATA Respiratory Hazard Index | Respiratory Hazard Percentile | Comments |
|---|---|---|---|---|---|---|---|
| Central | Downtown San Diego | SES | 78 | 84 | 0.6378 | 77 | Includes Gaslamp, Little Italy |
| Central | Logan Heights | SES | 127 | 97 | 0.5398 | 49 | Includes Barrio Logan, Logan Heights, Grant Hill, Golden Hill |
| Central | Balboa Park | SES | 77 | 83 | 0.6356 | 76 | Includes South Park, North Park, Hillcrest, Bankers Hill |
| Central | University Heights and Mission Hills | SES | 40 | 43 | 0.5578 | 54 | |
| Central | Mid-City | SES? | 81 | 86 | 0.5712 | 57 | Includes SDSU, Normal Heights, City Heights, Mid-City, Oak Park |
| Central | Southeastern San Diego | SES/CVA | 111 | 95 | 0.5275 | 45 | East of National City, South of Lemon Grove |
| East | El Cajon | LES | 62 | 71 | 0.5579 | 54 | |
| East | La Mesa | LES | 75 | 82 | 0.5626 | 55 | |
| East | Santee | LES | 39 | 40 | 0.5319 | 47 | |
| East | Lemon Grove | LES | 68 | 77 | 0.5600 | 54 | |
| East | Spring Valley | LES | 71 | 79 | 0.5173 | 43 | |
| East | Alpine | ALP | 32 | 29 | 0.3751 | 7 | |
| East | Lakeside | ALP | 44 | 48 | 0.5319 | 47 | |
| East | Jamul | ALP/DVN | 15 | 3 | 0.4417 | 22 | |
| North Central | Peninsula | SES | 36 | 36 | 0.4226 | 17 | Includes Ocean Beach, Point Loma |
| North Central | Kearny Mesa | KVR | 60 | 69 | 0.5201 | 43 | Includes Clairemont Mesa |
| North Central | Mira Mesa | KVR | 35 | 34 | 0.4687 | 30 | Includes Sorrento Valley, Miramar, Carmel Valley |
| North Central | La Jolla | KVR | 22 | 11 | 0.3898 | 9 | Includes La Jolla Village, University City |
| North Central | Del Mar | KVR | 23 | 13 | 0.4139 | 15 | Includes Solana Beach, San Dieguito |
| North Central | North San Diego | KVR | 25 | 16 | 0.4674 | 30 | Includes Fairbanks Ranch, Rancho Santa Fe, Torrey Highlands, |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | | Black Mtn Ranch, 4SRanch, Rancho Bernardo |
| North Central | Scripps Ranch | KVR | 29 | 23 | 0.5294 | 46 | |
| North Coastal | Carlsbad | CMP | 31 | 27 | 0.4780 | 33 | |
| North Coastal | Oceanside | CMP | 54 | 62 | 0.5354 | 48 | |
| North Coastal | Encinitas | CMP/KVR | 19 | 7 | 0.4644 | 29 | |
| North Coastal | Camp Pendleton | CMP | 23 | 12 | 0.4455 | 23 | |
| North Coastal | Vista | CMP | 55 | 63 | 0.5262 | 45 | |
| North Inland | San Marcos | CMP/ Escondido | 33 | 30 | 0.5097 | 41 | |
| North Inland | Escondido | Escondido site | 41 | 43 | 0.5522 | 52 | |
| North Inland | Poway | Escondido site | 24 | 15 | 0.4750 | 32 | |
| North Inland | Fallbrook | Escondido site | 32 | 29 | 0.5343 | 47 | Growing community, development |
| North Inland | Valley Center | Escondido site | 23 | 12 | 0.4330 | 19 | |
| North Inland | Pauma | Escondido site | 21 | 9 | 0.4345 | 20 | |
| North Inland | Ramona | Escondido site | 25 | 17 | 0.4506 | 25 | Growing community, development in region |
| North Inland | Anza-Borrego Springs | Escondido site | 16 | 4 | 0.2541 | 0 | |
| South | Otay Mesa East | DVN | 49 | 54 | 0.5591 | 54 | Growing community, development in region |
| South | Otay Mesa West | DVN | 54 | 61 | 0.5473 | 51 | |
| South | San Ysidro | DVN | 60 | 69 | 0.5297 | 46 | Future Near road site |
| South | Chula Vista | CVA | 69 | 77 | 0.5886 | 68 | |
| South | Bonita | CVA | 48 | 53 | 0.5089 | 40 | |
| South | Imperial Beach | CVA | 75 | 82 | 0.5279 | 46 | |
| South | Otay Ranch | DVN | 24 | 15 | 0.4775 | 33 | Growing community |
| South | National City | SES/CVA | 80 | 85 | 0.5414 | 49 | EJ community |
| South | Coronado | SES | 23 | 13 | 0.4653 | 29 | |

### 3.1.1 Coronary Health Issues by Region

Figure 3.2 includes graphical representation of data available from HHSA that illustrate the regional trends with respect to coronary health.

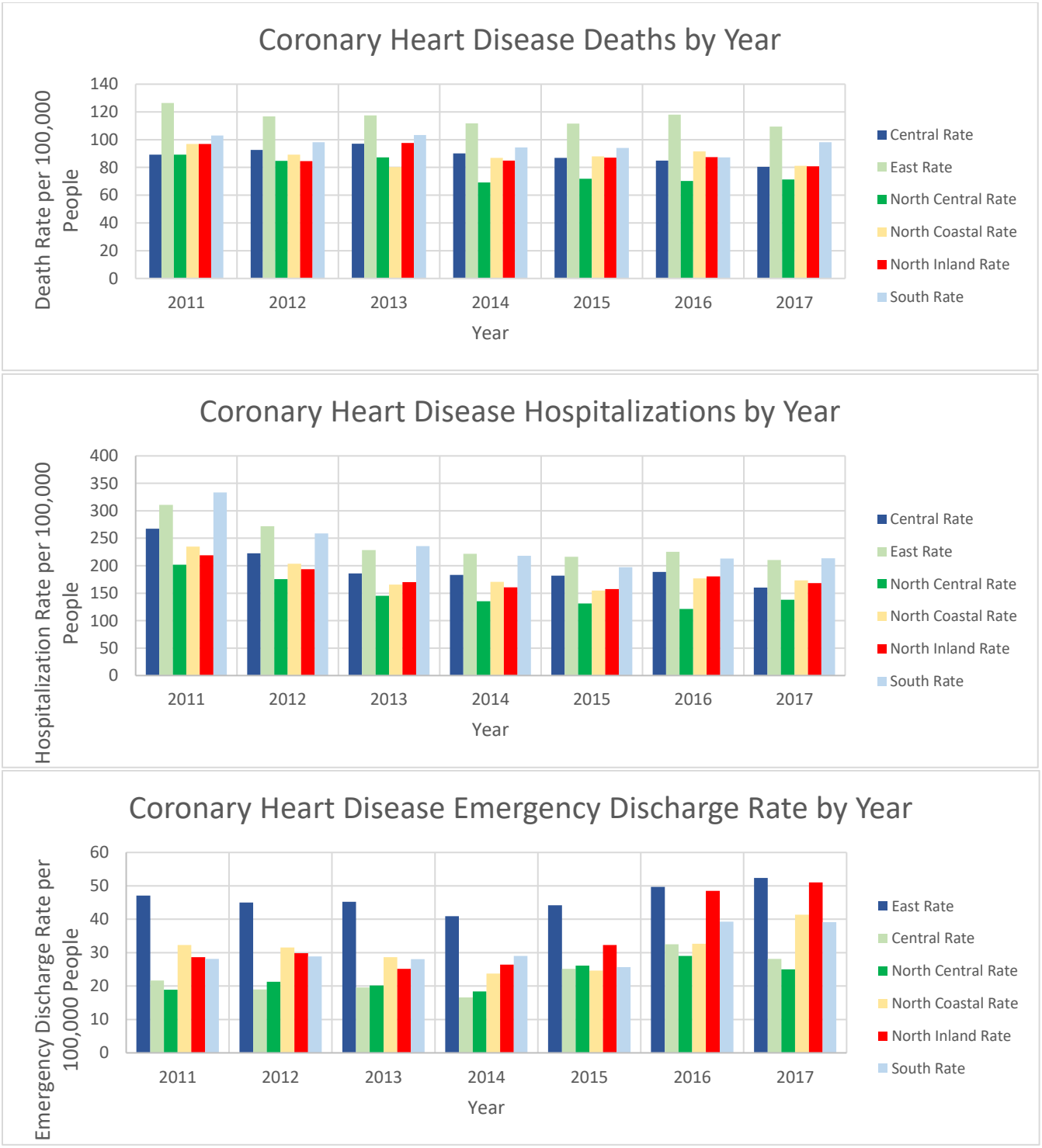



**Figure 3.2 Coronary Health Issues by Region According to HHSA**

### 3.1.2 Asthma Health Issues by Region

Figure 3.3 includes graphical representation of data available from HHSA that illustrate the regional trends with respect to asthma. Absence of a column (as seen in the Asthma Deaths by Year) indicates that fewer than 5 deaths occurred.

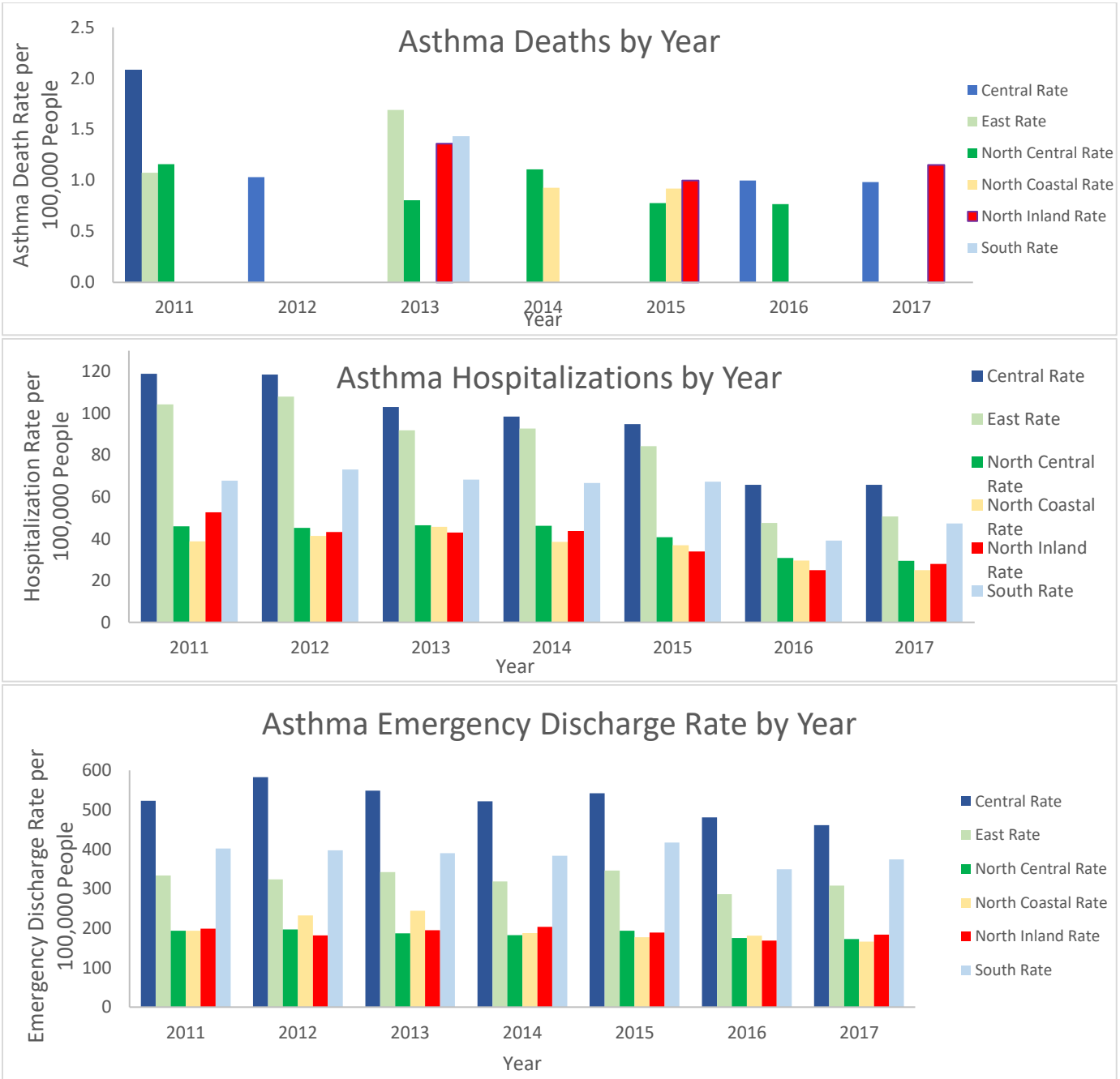
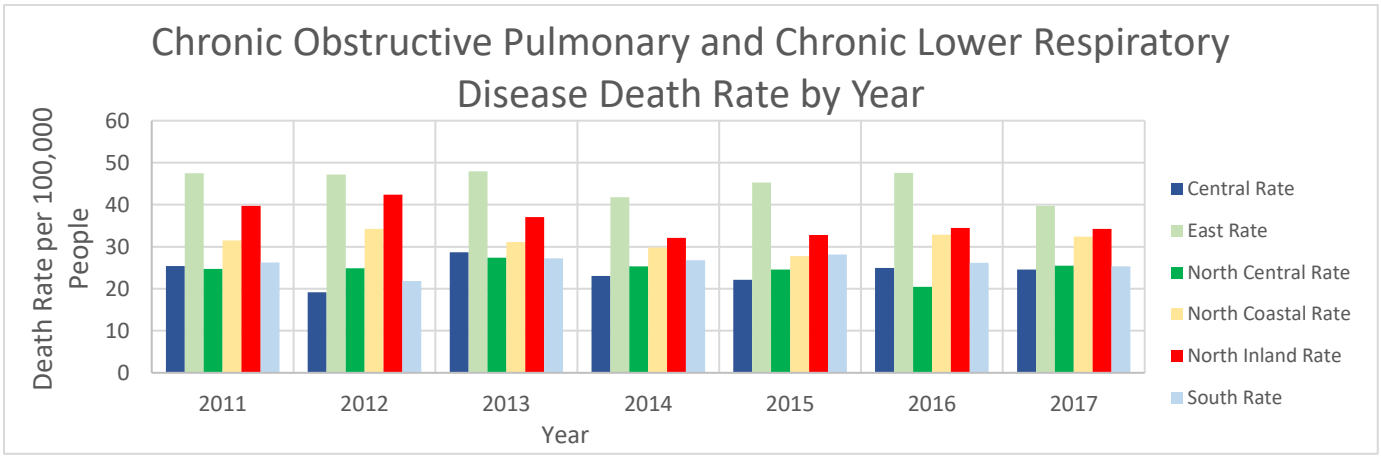
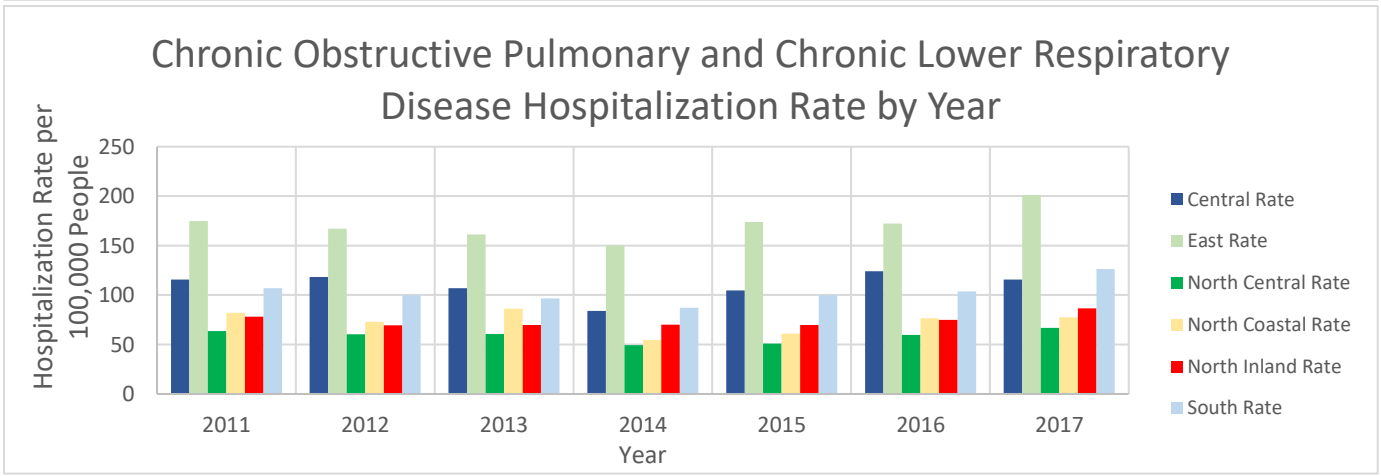



**Figure 3.3 Asthma Health Issues by Region According to HHSA**

## 3.1.3 Chronic Obstructive Pulmonary Disease and Chronic Lower Respiratory Disease Health Issues by Region

Figure 3.4 includes graphical representation of data available from HHSA that illustrate the regional trends with respect to Chronic Obstructive Pulmonary Disease (COPD) and Chronic Lower Respiratory Disease.



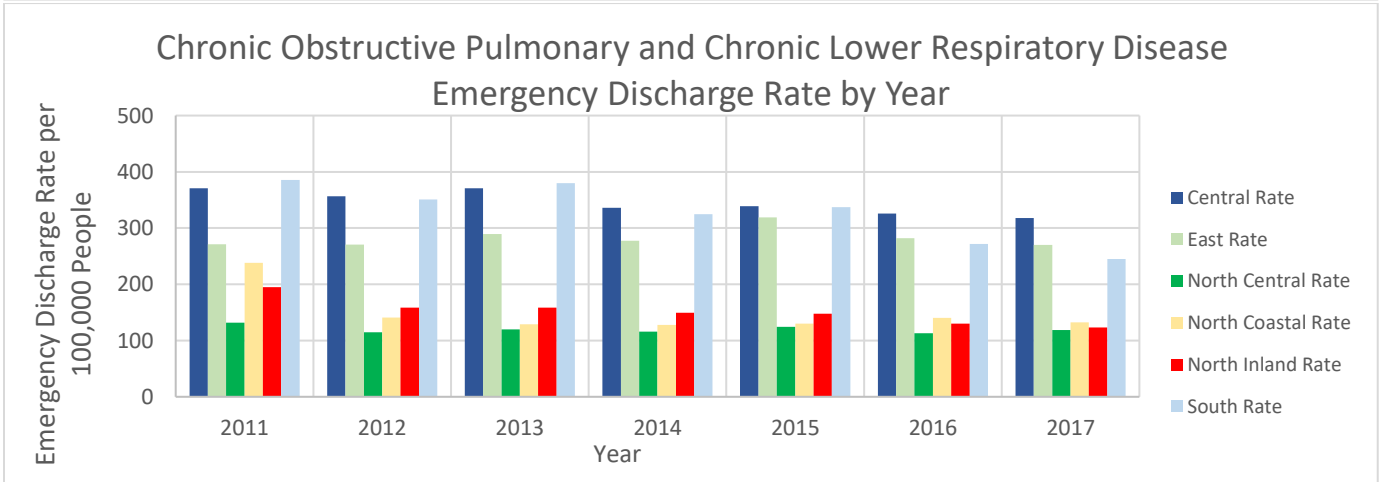




**Figure 3.4 COPD and Chronic Lower Respiratory Disease Health Issues by Region**

## 3.2 Health Scoring for Air Monitoring Stations

The air monitoring stations are listed in Table 3.2 with an associated health score. The scoring is based on the site location, the community served, and the rates of chronic diseases discussed in the chapter. Areas with higher rates of chronic diseases are scored higher.

**Table 3.2 Health Scoring for Ambient Monitoring Stations**

| | Health Scoring | Comments |
|---|---|---|
| **Alpine (ALP)** | **6** | The station is located in the east region and has high rates of respiratory issues. |
| **Camp Pendleton (CMP)** | **3** | Located in the north coastal region. Surrounding communities have lower rates of asthma and respiratory issues. |
| **Chula Vista (CVA)** | **9** | The station is located in the south region where there are high rates of asthma and respiratory issues. |
| **Otay Mesa-Donovan (DVN)** | **6** | Located in the south region. There are high rates of asthma. |
| **Lexington Elementary School (LES)** | **8** | There are high rates of respiratory issues in the east region. |
| **Kearny Villa Road (KVR)** | **4** | The station is located in the north central region. There are lower rates of HHSA asthma rates. |
| **Rancho Carmel Drive (RCD)** | **6** | Near road station. Only site in north inland region until the Escondido station is operating. |
| **Sherman Elementary School (SES)** | **10** | Located in the central region. The region has the highest rates of asthma. High respiratory issues. |

## 3.3 Conclusion

The District has ambient air monitoring stations located throughout the county. These stations are located within the different designated regions. For this health assessment, the District used various health assessment tools and the County Health and Human Services data to review and assess the locations of our current air monitoring sites. The District plans to re-start sites that are currently suspended to increase coverage in areas known to have higher rates of chronic diseases that may be attributed to air pollution. These stations help provide valuable air pollution information that is used to help protect public health.

# Chapter 4 Ozone ($O_3$)

## 4.1 Ozone - Introduction

Ambient level ozone was sampled on a continuous (7/24) basis at locations throughout the SDAB (See Figure 4.1 for the current ozone network configuration). The network has had several recent station moves and closures since the last Network Assessment (2015):

- The Escondido (ESC) site was temporarily shut down for construction at the site in 2016. It is expected to resume monitoring in 2021.
- The El Cajon site was temporarily relocated to the Gillespie Field area of Floyd Smith Drive (FSD) until 2015. A new station was set up in the original location in 2017. The site was renamed Lexington Elementary School (LES).
- The Downtown site (DTN) was shut down (evicted from site) in 2016 and relocated to a nearby location at Sherman Elementary School (SES). Monitoring at SES resumed in mid-2019.
- The monitoring site in Del Mar (DMR) was decommissioned in 2016.

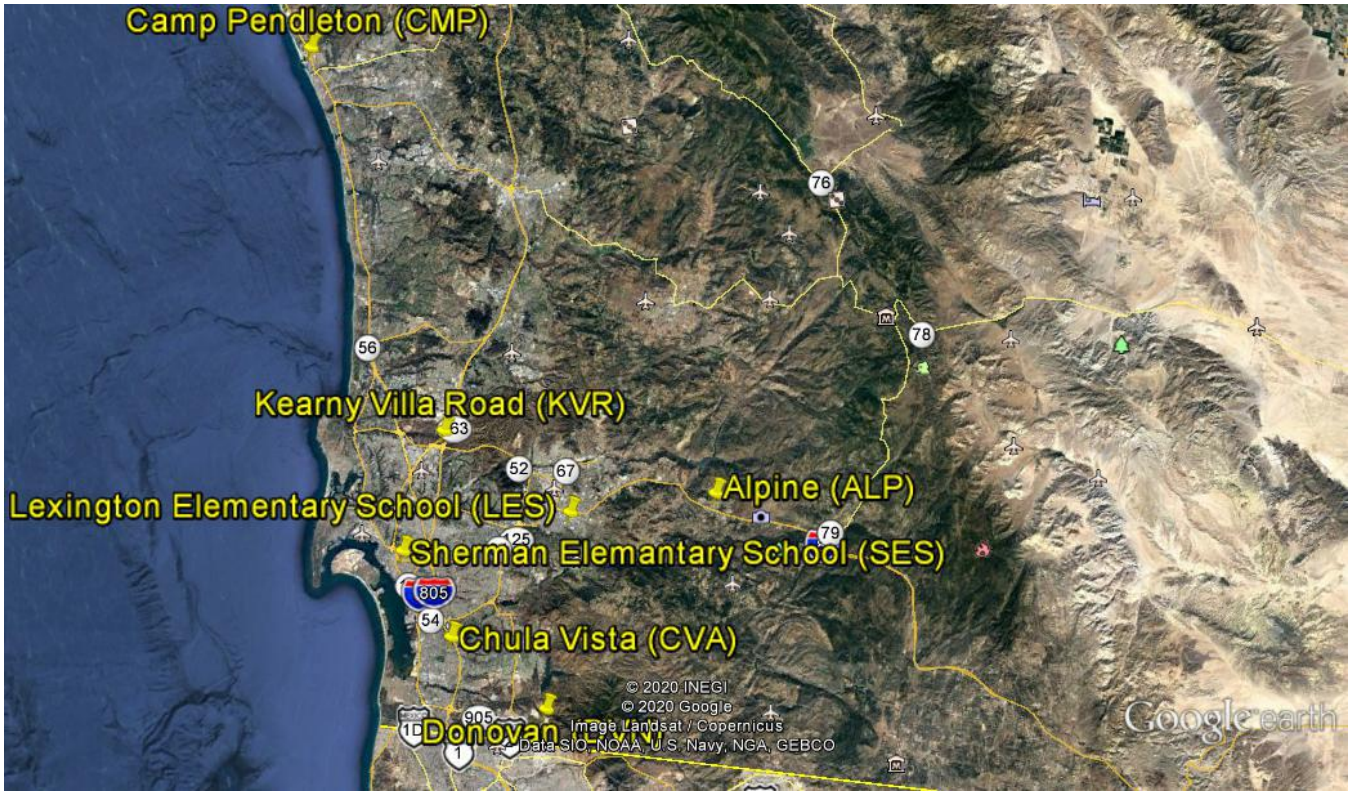



**Figure 4.1 Ozone Network Map**

**Table 4.1 Annual Ozone State and Federal Standards**

| Ambient Air Quality Standards | | | | |
|---|---|---|---|---|
| Pollutant | Averaging Time | California Standards | National Standards | |
| | | Concentration | Primary | Secondary |
| Ozone ($O_3$) | 1 hour | 0.09 ppm (180 µg/m$^3$) | Not Applicable | Not Applicable |
| | 8 hour | 0.07 ppm (137 µg/m$^3$) | 0.07 ppm (137 µg/m$^3$) | 0.07 ppm (137 µg/m$^3$) |

## 4.2 Ozone - Trends in the SDAB

Over the years, the SDAB has seen a decrease in ozone levels (Table 4.2 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 1999. Note that the "Days above the National 8-Hr Standard" row in Table 4.2 reflects the ozone standard for that year.

**Table 4.2 Summary of Ozone Concentrations, 1999-2019**

| | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2011 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average of the 4th Highest 8-Hr Design Value (ppm) | 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 | 0.079 | 0.081 | 0.084 | 0.084 | 0.076 |
| Maximum 8-Hr Concentration (ppm) | 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 | 0.084 | 0.091 | 0.095 | 0.082 | 0.084 |
| Days above the National 8-Hr Standard | 44 | 46 | 43 | 31 | 38 | 23 | 24 | 38 | 27 | 35 | 24 | 14 | 10 | 10 | 7 | 12 | 13 | 13 | 54 | 23 | 19 |

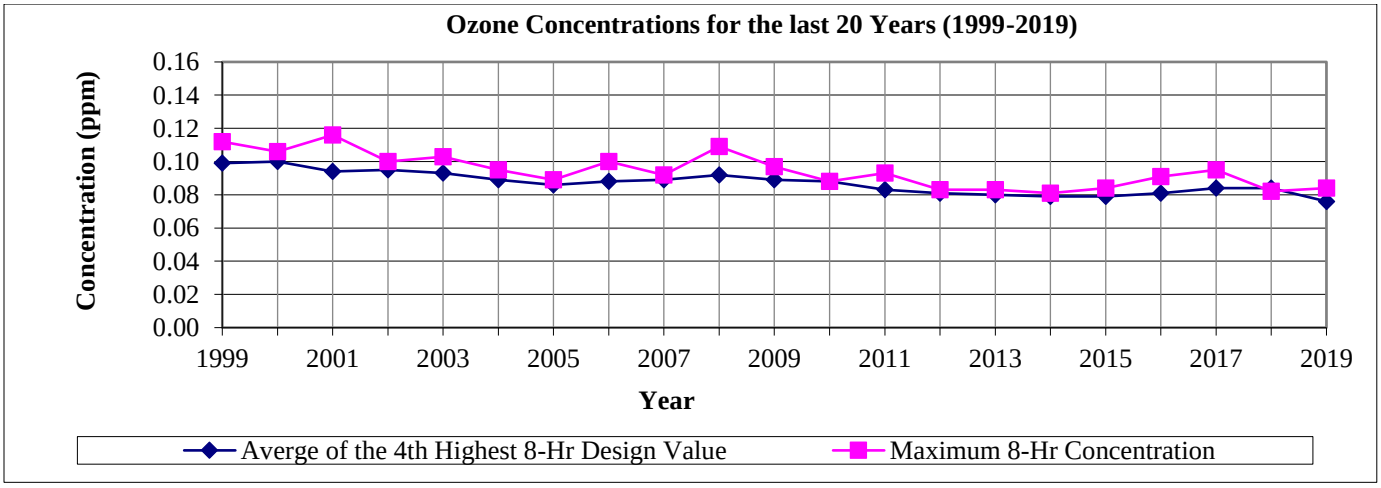



**Figure 4.2 Ozone Concentrations, 1999-2019**

## 4.2.1 Ozone Measurements by Site, 2015-2019

Table 4.3 lists the maximum ozone measurement for each ozone monitoring location by year. Figure 4.3 shows the maximum concentration data graphically. Decommissioned sites listed in *italics.*

**Table 4.3 Ozone Measurements by Site, 2015-2019**

| Site (name) | | Maximum Concentration for 8-Hrs (ppm) | | | | | Annual Average (ppm) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2015 | 2016 | 2017 | 2018 | 2019 | 2015 | 2016 | 2017 | 2018 | 2019 |
| Camp Pendleton | CMP | 0.076 | 0.073 | 0.081 | 0.068 | 0.064 | 0.043 | 0.045 | 0.044 | 0.042 | 0.039 |
| *Del Mar* | *DMR* | *0.078* | *0.071* | *0.061* | *n/a* | *n/a* | *0.042* | *0.041* | *0.041* | *n/a* | *n/a* |
| Escondido | ESC | 0.071 | n/a | n/a | n/a | n/a | 0.047 | n/a | n/a | n/a | n/a |
| Alpine | ALP | 0.084 | 0.091 | 0.095 | 0.082 | 0.084 | 0.053 | 0.054 | 0.055 | 0.053 | 0.052 |
| El Cajon - LES | LES | n/a | 0.074 | 0.081 | 0.079 | 0.074 | n/a | 0.045 | 0.047 | 0.047 | 0.045 |
| *El Cajon - FSD* | *FSD* | *0.065* | *0.077* | *n/a* | *n/a* | *n/a* | *0.042* | *0.046* | *n/a* | *n/a* | *n/a* |
| Kearny Villa Road | KVR | 0.070 | 0.075 | 0.083 | 0.077 | 0.075 | 0.043 | 0.044 | 0.045 | 0.044 | 0.042 |
| San Diego- Beardsley/SES | DTN/SES | 0.067 | 0.061 | n/a | n/a | 0.072 | 0.039 | 0.039 | n/a | n/a | *n/a* |
| Chula Vista | CVA | 0.066 | 0.068 | 0.074 | 0.064 | 0.076 | 0.040 | 0.040 | 0.040 | 0.040 | 0.041 |
| Otay Mesa | DVN | 0.071 | 0.075 | 0.082 | 0.078 | 0.062 | 0.045 | 0.045 | 0.046 | 0.044 | 0.041 |

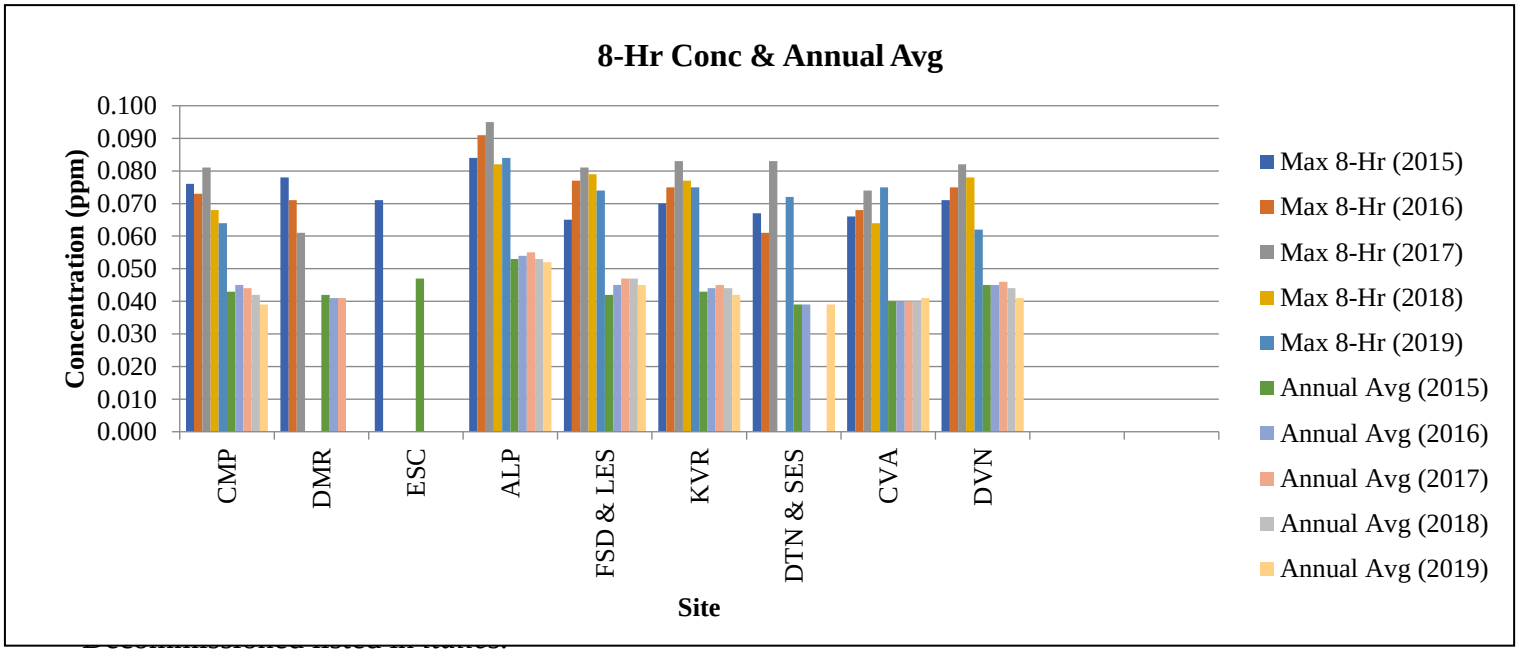



**Figure 4.3 Graph of 8-Hr Concentration and Annual Average**

## 4.2.2 Ozone Measurements by Site, Design Value, 2015-2019

Table 4.4 lists the maximum ozone measurements for each ozone monitoring location by design value. Figure 4.4 shows the Design Values graphically with respect to the 8-hour ozone standard.

**Table 4.4 Ozone Measurements by Site, Design Value**

| Site (name) | | Design Value Maximum Concentration for 8-Hrs (ppm) | | | | |
|---|---|---|---|---|---|---|
| | | 2013-2015 | 2014-2016 | 2015-2017 | 2016-2018 | 2017-2019 |
| Camp Pendleton | CMP | 0.067 | 0.070 | 0.070 | 0.067 | 0.063 |
| *Del Mar* | *DMR* | *0.066* | *0.067* | *0.061* | *n/a* | *n/a* |
| Escondido | ESC | 0.072 | 0.072* | 0.069* | 0.069* | 0.069* |
| Alpine | ALP | 0.079 | 0.081 | 0.084 | 0.084 | 0.082 |
| El Cajon (new site) | LES | n/a | 0.067 | 0.070 | 0.071 | 0.070 |
| El Cajon (old site) | FSD | 0.066 | 0.067 | n/a | n/a | n/a |
| Kearny Villa Road | KVR | 0.068 | 0.068 | 0.077 | 0.072 | 0.071 |
| San Diego-Beardsley | DTN | 0.060 | 0.062 | n/a | n/a | n/a |
| Chula Vista | CVA | 0.061 | 0.070 | 0.070 | 0.067 | 0.062 |
| Otay Mesa | DVN | 0.066 | 0.067 | 0.070 | 0.068 | 0.064 |

*Design value carries over. Site is still active, however there has been no monitoring since 2015.

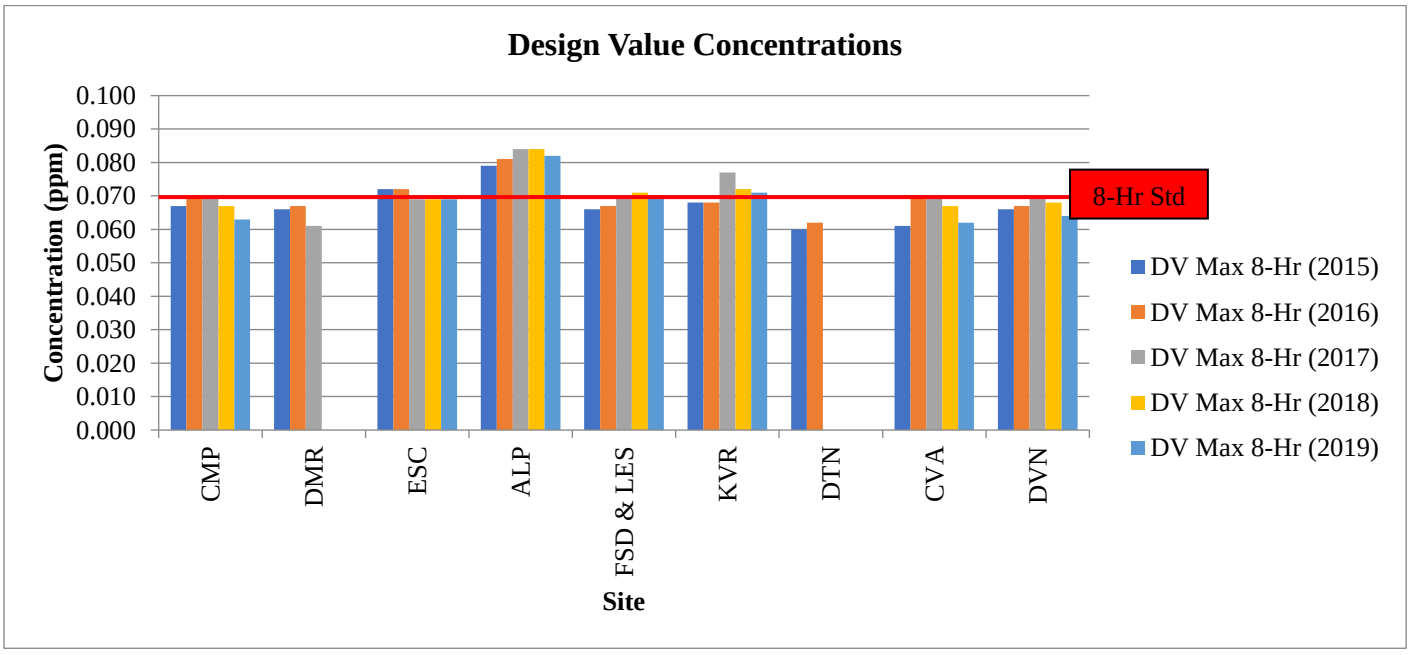



**Figure 4.4 Graph of Design Value Concentrations**

## 4.3 Ozone – Federal Design Criteria Requirements

The District is federally mandated to monitor $O_3$ levels in accordance with the CFR. This section will state the different monitoring requirements for each program, e.g. ambient, PAMS, NCore, etc. that the District operates and references therein (Note: only the passages applicable/informative to the District are referenced). These monitors can serve as fulfilling other $O_3$ network requirements, e.g. ambient $O_3$ monitor can fulfill a PAMS $O_3$ monitor requirement. The District meets or exceeds all minimum requirements for $O_3$ monitoring for all programs.

### 4.3.1 Ozone - Design Value Criteria

The District is required to operate a minimum number of $O_3$ monitors irrespective of $O_3$ network affiliations. To ascertain the minimum number of monitors required, the Design Value (DV) must be calculated. The DV is derived by averaging the 4th highest 8-hour average for the last three years. Table 4.5 lists these DV requirements.

> *4.1(a) Ozone ($O_3$) Design Criteria*[3]
> *…local agencies must operate $O_3$ sites for various locations depending upon area size (in terms of population and geographic characteristics) and typical peak concentrations (expressed in percentages below, or near the $O_3$ NAAQS). Specific SLAMS $O_3$ site minimum requirements are included in Table D-2 of this appendix. The NCore sites are expected to complement the $O_3$ data collection that takes place at single-pollutant SLAMS sites, and both types of sites can be used to meet the network minimum requirements. The total number of $O_3$ sites needed to support the basic monitoring objectives of public data reporting, air quality mapping, compliance, and understanding $O_3$-related atmospheric processes will include more sites than these minimum numbers required in Table D-2 of this appendix….*

*Table D–2 of Appendix D to Part 58— SLAMS Minimum $O_3$ Monitoring Requirements*

| *MSA population* | *Most recent 3-year design value concentrations ≥85% of any $O_3$ NAAQS* | *Most recent 3-year design value concentrations <85% of any $O_3$ NAAQS* |
|---|---|---|
| *350,000 - < 4 million* | *2* | *1* |

**Table 4.5 Ozone Minimum Monitoring Requirements-Design Value Criteria (8-Hr)**

| What is the Maximum 8-Hr Design Value? **2017-2019** (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) | MSA (name) | County (name) | Population Estimated from 2010 Census (#) | Number of Monitors (Sites) Required (#) | Number of Monitors (Sites) Active (#) | Number of Monitors (Sites) Needed (#) |
|---|---|---|---|---|---|---|---|---|---|
| 0.082 | YES | no | no | San Diego | San Diego | 3.3 Million | 2 | 7 | 0 |

Note: At time this report was written, the 2020 Census had not been performed.

[1](2019) 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), list the requirements necessary to fulfill the Ozone ($O_3$) Design Value Criteria.

## 4.3.2 Ozone Minimum Monitoring Requirements-Maximum Concentration Site Design Value

All Districts are required to categorize at least one monitor/sampling site in the air basin as an area of maximum concentration. The DV is derived by averaging the 4th highest 8-hour average for the last three years. Table 4.6 lists these maximum concentrations site requirements.

> *4.1(b) Ozone ($O_3$) Design Criteria*[4]
> *Within an $O_3$ network, at least one $O_3$ site for each MSA…must be designed to record the maximum concentration for that particular metropolitan area. Table D-2 of this appendix does not account for the full breadth of additional factors that would be considered in designing a complete $O_3$ monitoring program for an area. Some of these additional factors include geographic size, population density, complexity of terrain and meteorology, adjacent $O_3$ monitoring programs, air pollution transport from neighboring areas, and measured air quality in comparison to all forms of the $O_3$ NAAQS (i.e., 8-hour and 1-hour forms).*

**Table 4.6 Ozone Minimum Monitoring Requirements-Maximum Concentration Site Design Value**

| Maximum 8-Hr Design Value Site **2017-2019** (name) | Maximum 8-Hr Design Value Site AQS ID (#) | Maximum 8-Hr Design Value Concentration (ppm) |
|---|---|---|
| Alpine (ALP) | 06-073-1006 | 0.082 |

## 4.3.3 Ozone Minimum Monitoring Requirements-Ozone Season

All Districts are required to sample for ozone during ozone season as defined by Table D-3. Table 4.7 lists the ozone sampling season for the SDAB.

> *4.1(i) Ozone ($O_3$) Design Criteria*[5]
> *Ozone monitoring is required at SLAMS monitoring sites only during the seasons of the year that are conducive to $O_3$ formation (i.e., "ozone season") as described below in Table D-3… Ozone monitors at NCore stations are required to be operated year-round (January to December).*

*Table D-3 to Appendix D of part 58. Ozone Monitoring Season by State*

| *State* | *Begin Month* | *End Month* |
|---|---|---|
| *California* | *January* | *December* |

**Table 4.7 Ozone Minimum Monitoring Requirements-Ozone Sampling Season**

| Required Ozone Sampling Season (range) | Active Ozone Sampling Season (range) | Does Active Ozone Sampling Season Meet Requirements? (yes/no) |
|---|---|---|
| January-December (annually) | January-December (annually) | yes |

[4](2019) 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), list the requirements needed to fulfill the criteria for maximum concentration sites.
[5](2019) 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(i), list the requirements for ozone sampling season.

## 4.4 Ozone - Correlation Matrix

The correlation matrix analysis (Figure 4.5) shows the correlation, mean absolute difference, distance between sites, and design values. This graphic gives you information about how concentrations at ozone monitors within San Diego County compare to one another. The red squares in the top-right corner show the mean absolute difference in concentrations between each pair of monitors, with text indicating the distance in kilometers between each pair of monitors. The intensity of the red boxes (from light red to dark red) represents the mean absolute difference in concentration where a dark red represents 0.01 ppm difference and light red represents 0 ppm difference. Each monitor comparison is represented by a square in the chart. The blue squares in the bottom-left corner show the correlation between each pair of monitors, with text indicating the number of days used in the calculation. The intensity of the blue boxes (from light blue to dark blue) represents the correlation between sites where the lightest shade of blue is a correlation equal to 1 and the dark blue has a correlation equal to -1. The numbers along the diagonal indicate the most recent design value for each monitor. AQS site data with less than 75% completion are not used in this analysis.

The correlation matrix helps to determine sites that are redundant. Sites with high correlation, low absolute difference, and close proximities are considered redundant. In the District's 2015 Network Assessment, it was concluded that two sites were considered redundant under these criteria. These included the sites located in Escondido and El Cajon. The other redundant sites were Camp Pendleton and Del Mar. Since the 2015 Network Assessment was written, the District temporarily shut down the Escondido site (expected start-up in 2021) and permanently shut down the Del Mar site. Additionally, the Downtown site was shut down and relocated to Sherman Elementary School in mid-2019 (not included in the correlation matrix).

The correlation matrix analysis for ozone 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. Sites may measure comparable ozone levels. However, the need for public reporting of health alerts and Air Quality Index (AQI) levels requires ozone reporting in highly populated communities. A configuration of sites with high correlation may cause some redundancy but may provide valuable data for public welfare. In the 2015 Network Assessment it was determined that despite the redundancy of the Escondido and El Cajon stations it is essential to maintain both sites. The sites are in completely different communities, topography, and register different air masses. Although the site at Escondido is temporarily shut down, it will provide essential data to the community once it is operational (2021). It should be noted that the monitors listed as Tribal 1 and Tribal 2 in Figure 4.5 are not part of the San Diego APCD.

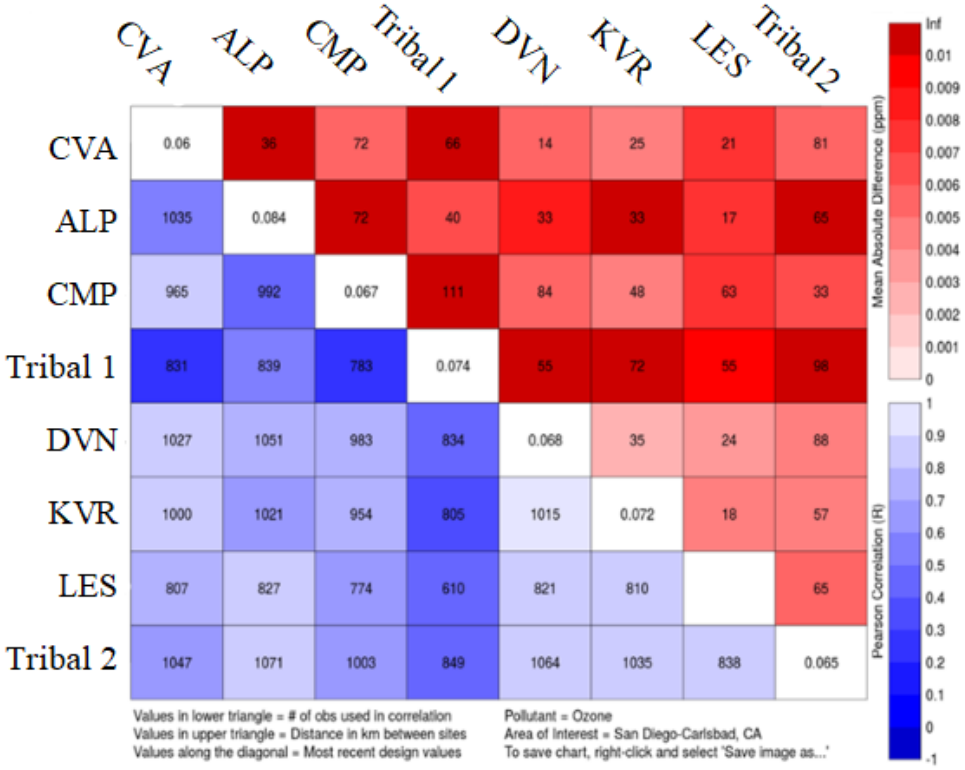



**Figure 4.5 Correlation Matrix of Ozone Sites in San Diego**

### 4.4.1 Ozone - Removal Bias

The ozone removal bias determines which sites are considered redundant throughout the network. The bias estimation uses the nearest neighbor site to estimate the concentration at that location if the site was not there. The Removal Bias tool finds the nearest neighbors to each selected site and then uses the data from the neighboring sites to estimate concentrations at the site. A positive bias indicates that if the site being examined was removed, the neighboring site(s) would register higher values for the region served by that site. The opposite indicates negative bias, i.e. neighboring sites registering lower values. Figure 4.6 is a pictorial representation for removal bias for 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. If the bias is small, that may indicate that the monitor is redundant and could be removed. In the 2015 Network Assessment, the removal bias between sites in San Diego County for ozone indicated three sites that were considered redundant. These included Escondido, El Cajon, and Del Mar. Since the last Network Assessment in 2015, the Del Mar site has been permanently shut down, the Escondido site has been temporarily shut down (expected start-up 2021), and the El Cajon site returned to the original location at Lexington Elementary School. With Del Mar permanently decommissioned the next coastal monitor is at the Sherman Elementary School site (Operational in mid-2019 and not included in the Removal Bias calculations).

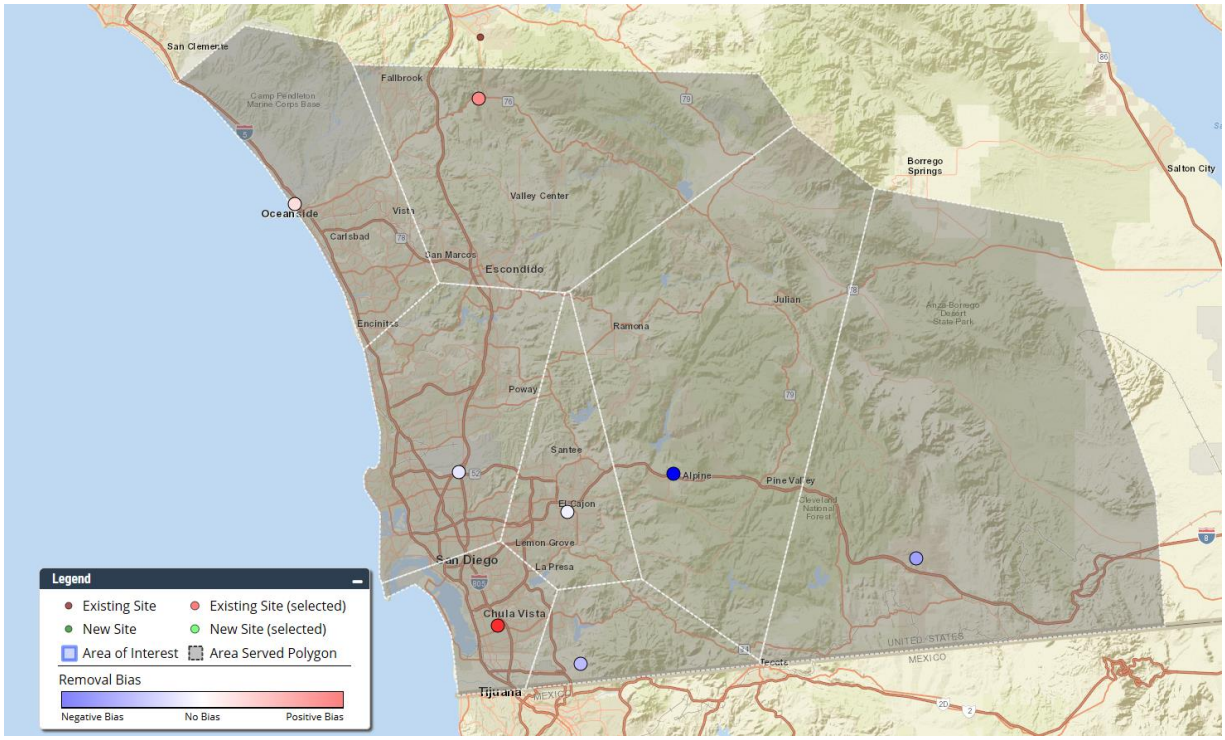



**Figure 4.6 2020 Network Assessment Removal Bias Map – Ozone**

Although results of the Removal Bias in the 2015 Network Assessment indicate redundancy for Escondido, this area is in the top 10 traffic counts for the County and has significantly different topography than the next closest station. The Escondido ozone monitor is used to model the ozone concentrations along State Route (SR) 78, which is a connecting roadway between two major highways; SR-78 is undergoing a multi-million dollar expansion to increase throughput. It is important to have monitors located in population centers. Significant value would be lost if the Escondido ozone monitor was permanently decommissioned. When the Escondido site is operational in 2021, the data will provide valuable information to the region.

Similarly, in the 2015 Network Assessment, the El Cajon site showed redundancy. In this assessment, the El Cajon site continues to show redundancy, but the El Cajon site is required because it is a PAMS and NCore station. Ozone monitors are requirements at PAMS and NCore Stations. In addition, El Cajon provides valuable data to the local population. Significant value would be lost if the El Cajon ozone monitor was permanently decommissioned.

## 4.4.2 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. Each polygon represents the area that is closer to the monitor within it than any other monitor in the 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. Is should be noted that the Area Served Map in Figure 4.7 does not include the relocated site in the Downtown area (Sherman Elementary

School) or our site in Escondido, which has been temporarily shut down and is anticipated to start-up soon (2021).

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 (temporarily shut down) 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 demographics for each area served by monitoring sites is detailed in Tables 4.8, 4.9, and 4.10 (below). Sites are typically located in areas with a high population. The Escondido site is temporarily shut down but is expected to be operational in 2021. This is an important site in the San Diego APCD based on the area served and population.

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

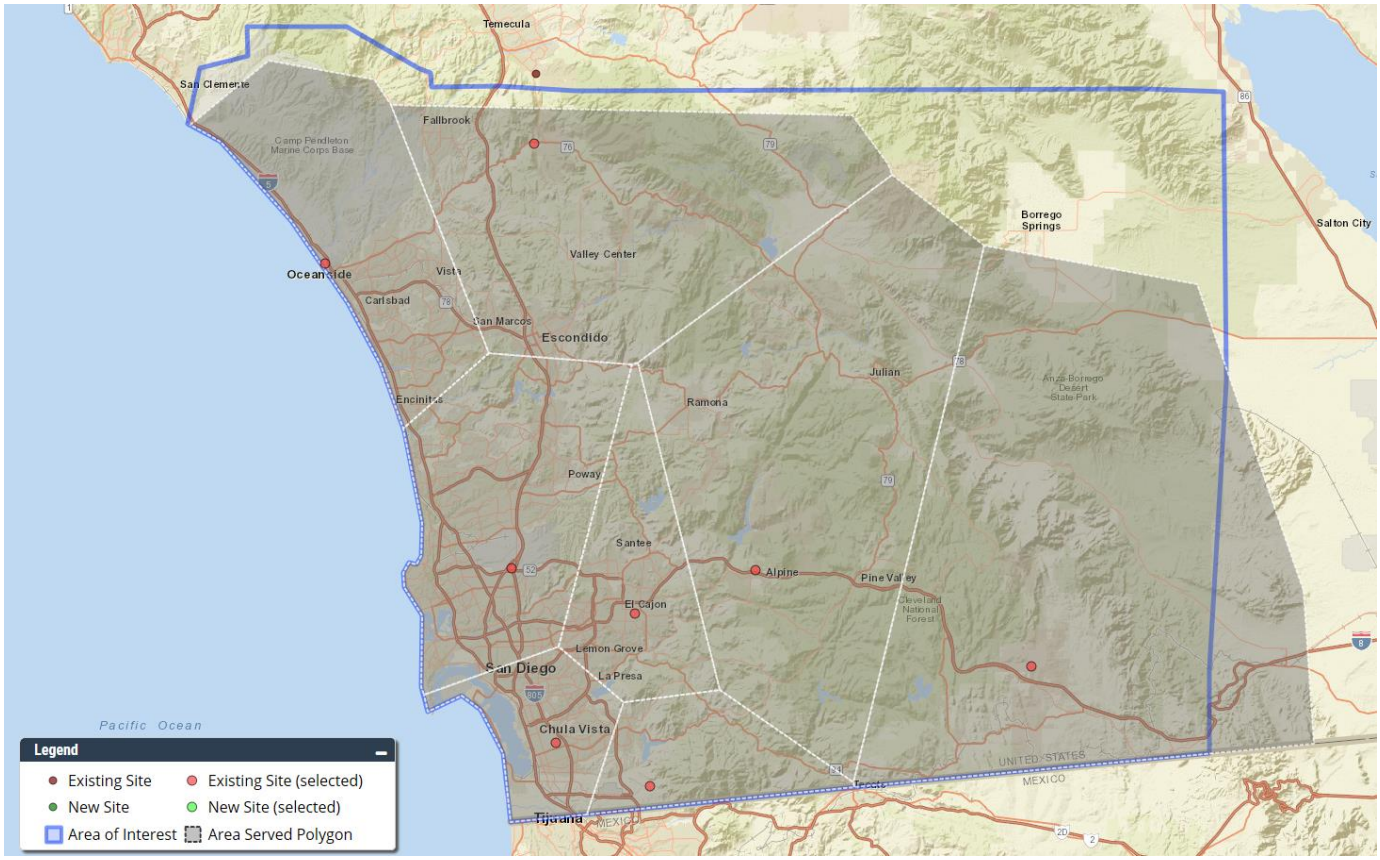



**Figure 4.7 Image of Area Served Map – Ozone**

**Table 4.8 Area Served for ozone and Population (sites in red are not part of the San Diego APCD)**

| Site Name | Area ($km^2$) | Total Population |
|---|---|---|
| Chula Vista | 281 | 704362 |
| Alpine | 1243 | 65059 |
| Camp Pendleton | 882 | 499774 |
| La Posta Reservation | 3925 | 12029 |
| Pala Airpad | 2345 | 265913 |
| Donovan | 571 | 72145 |
| Kearny Villa Rd. | 973 | 1056168 |
| El Cajon - LES | 505 | 413917 |

### Table 4.9 Ozone Area Served Demographics (Race)

| Site Name | Male | Female | Caucasian/ White | African/ Black | Native American | Asian | Pacific Islander | Other Race | Multiple Races | Hispanic/ Latino |
|---|---|---|---|---|---|---|---|---|---|---|
| Chula Vista | 353917 | 350445 | 341240 | 61745 | 5762 | 88592 | 4825 | 165000 | 37198 | 392455 |
| Alpine | 32625 | 32434 | 54447 | 600 | 1738 | 1012 | 191 | 4749 | 2322 | 12544 |
| Camp Pendleton | 254575 | 245199 | 356360 | 16546 | 4100 | 28864 | 3525 | 65261 | 25118 | 152418 |
| La Posta Reservation | 6330 | 5699 | 8950 | 217 | 524 | 104 | 34 | 1741 | 459 | 4206 |
| Pala Airpad | 132159 | 133754 | 171163 | 5669 | 5118 | 14080 | 781 | 57163 | 11939 | 111249 |
| Donovan | 39330 | 32815 | 36183 | 5449 | 441 | 14284 | 264 | 11377 | 4147 | 32927 |
| Kearny Villa Rd. | 530120 | 526048 | 705399 | 43584 | 5416 | 171268 | 3524 | 74390 | 52587 | 186719 |
| El Cajon - LES | 201602 | 212315 | 302717 | 24369 | 3222 | 17730 | 2187 | 39204 | 24488 | 97611 |

### Table 4.10 Ozone Area Served Demographics (Age)

| Site Name | Age 0-4 | Age 5-9 | Age 10-14 | Age 15-19 | Age 20-24 | Age 25-29 | Age 30-34 | Age 35-39 | Age 40-44 |
|---|---|---|---|---|---|---|---|---|---|
| Chula Vista | 48561 | 47992 | 51646 | 58332 | 65743 | 56430 | 48316 | 47467 | 46737 |
| Alpine | 3595 | 3865 | 4745 | 5033 | 3858 | 3188 | 3145 | 3470 | 4228 |
| Camp Pendleton | 36705 | 33389 | 31803 | 35305 | 48643 | 38484 | 33170 | 32787 | 33055 |
| La Posta Reservation | 669 | 676 | 789 | 845 | 534 | 582 | 555 | 593 | 660 |
| Pala Airpad | 19512 | 18654 | 19086 | 21321 | 19999 | 18591 | 16747 | 16839 | 17493 |
| Donovan | 5226 | 5559 | 5692 | 5835 | 4849 | 5487 | 6313 | 6840 | 6522 |
| KearnyVilla Rd. | 61421 | 57775 | 57404 | 58141 | 95834 | 97722 | 85421 | 67885 | 73152 |
| El Cajon - LES | 27513 | 25850 | 27218 | 29922 | 31002 | 30038 | 26307 | 25902 | 27379 |
| **Site Name** | **Age 45-49** | **Age 50-54** | **Age 55-59** | **Age 60-64** | **Age 65-69** | **Age 70-74** | **Age 75-79** | **Age 80-84** | **Age 85 and over** |
| Chula Vista | 47422 | 44893 | 37837 | 29894 | 20985 | 17217 | 14234 | 10823 | 9833 |
| Alpine | 5560 | 5985 | 5273 | 4432 | 3023 | 2035 | 1532 | 1109 | 983 |
| Camp Pendleton | 34592 | 32915 | 27976 | 22984 | 15817 | 11808 | 10660 | 9402 | 10279 |
| La Posta Reservation | 805 | 940 | 980 | 1000 | 764 | 625 | 462 | 317 | 233 |
| Pala Airpad | 18586 | 18188 | 15761 | 13182 | 9596 | 7104 | 5547 | 4604 | 5103 |
| Donovan | 5767 | 4505 | 3224 | 2394 | 1496 | 1057 | 645 | 425 | 309 |
| KearnyVilla Rd. | 74966 | 71154 | 61844 | 52883 | 36231 | 26156 | 21649 | 18086 | 19444 |
| El Cajon - LES | 31691 | 31825 | 26857 | 21992 | 14888 | 10968 | 9346 | 7616 | 7603 |

### 4.4.3 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.

Figure 4.8 is a pictorial representation 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. These values represent the probability of a National Ambient Air Quality Standard (NAAQS) exceedance based on Downscaler fused air quality surfaces for 2014-2016. The current federal NAAQS is 70 ppb for ozone. The current State CAAQS is 70 ppb. In the 2015 Network Assessment, it was concluded that the District had adequate coverage using three thresholds (65 ppb, 70 ppb, and 75 ppb). For this 2020 Network Assessment Plan, the threshold on the Network Assessment tool only accounts for exceedance probabilities according to the NAAQS. The Figures below indicate that the inland regions of San Diego have a greater chance of exceedances. This includes the Alpine and Escondido regions. Currently, our Design Value site for ozone is Alpine (our most inland and highest elevation site). Table 4.11 indicates that the Alpine and El Cajon sites have the highest ozone exceedance probability in the ambient monitoring network.

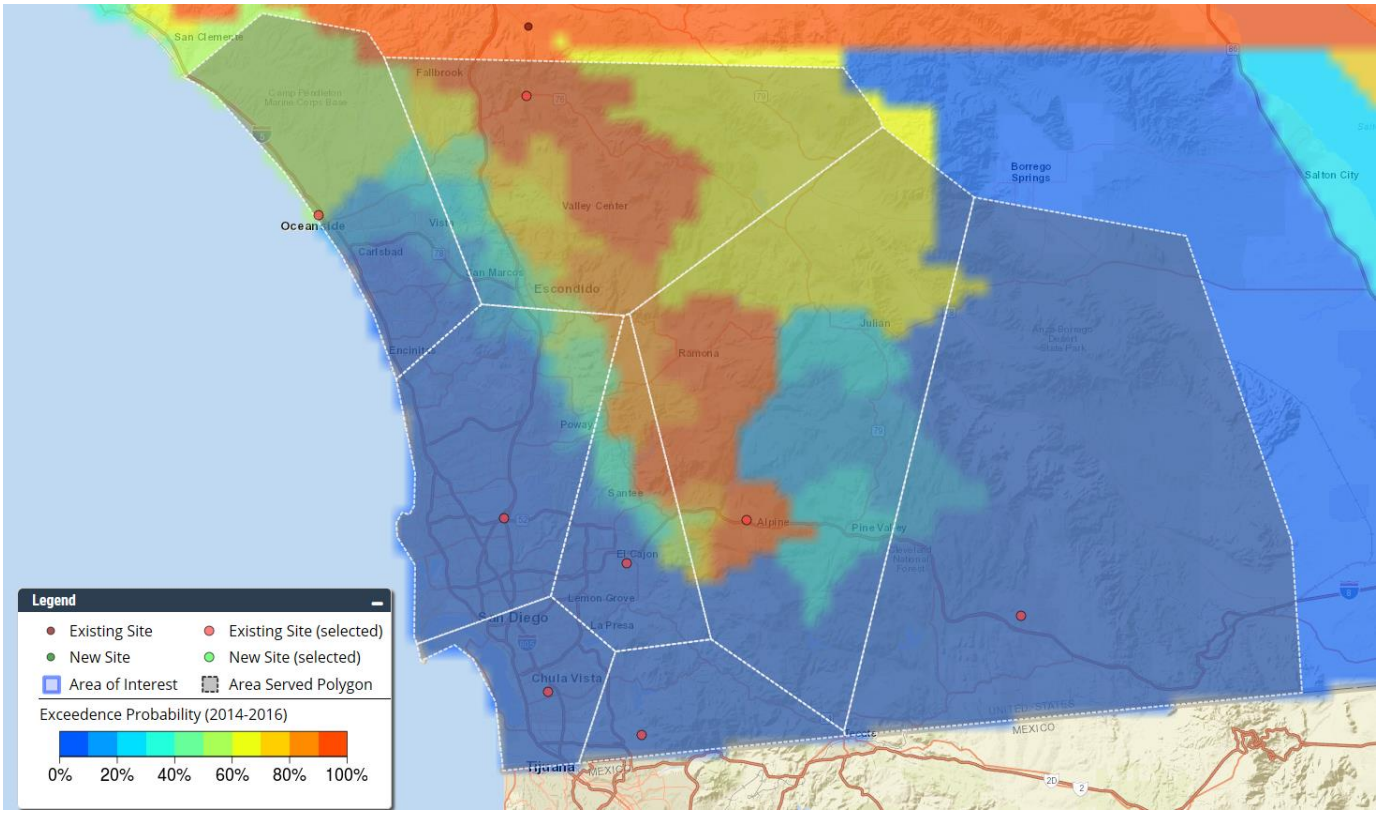



**Figure 4.8 Surface Probability Map 2020 Network Assessment**

**Table 4.11 Ozone Exceedance Probability by Site (sites in red are not San Diego APCD air monitoring sites)**

| Site Name | Ozone Exceedance Probability |
|---|---|
| Chula Vista | <10% |
| Alpine | >90% |
| Camp Pendleton | 50%-75% |
| La Posta Reservation | <10% |
| Pala Airpad | >90% |
| Donovan | <10% |
| Kearny Villa Rd. | 50%-75% |
| El Cajon – Lexington Elementary School | 75%-90% |

## 4.5 Ozone - Rating Summary

Table 4.12 is a summary of the District's ozone monitor rating for the network instruments. The scores are based on the analysis from the Network Assessment tool for ozone. The analysis includes scores for correlation between sites, site removal, area served, potential exceedances, and an internal factor. The site in Downtown was relocated to Sherman Elementary School in 2019 and was not included in the Network Assessment tool.

**Table 4.12 Ozone Monitoring Station Summary**

| | **Overall Scoring** | **COMMENTS** | **1.** Correlation | **2.** Removal | **3.** Area Served | **4.** Exceedance Threshold | **5.** Internal |
|---|---|---|---|---|---|---|---|
| Alpine (ALP) | **40** | **1&2**: Ozone required for Design Value<br>**3:** Based on total population and population growth<br>**4:** High probability of exceedances | 7 | 10 | 4 | >90% = 9 | 10 |
| Camp Pendleton (CMP) | **39** | **1&2:** Ozone required for PAMS and Transport site<br>**3:** Based on total population and surrounding population<br>**4:** High probability of exceedances | 6 | 8 | 9 | 50-75% = 7 | 9 |
| Chula Vista (CVA) | **32** | **1&2:** Some of the highest asthma rates in the County<br>**3:** Based on total population and population growth<br>**4:** Low probability of exceedances | 8 | 10 | 7 | <10%= 3 | 4 |
| Otay Mesa-Donovan (DVN) | **31** | **1& 2:** Farthest south, registers transport from Mexico<br>**3:** Based on total population and population growth<br>**4:** Low probability of exceedances | 9 | 8 | 7 | <10%= 3 | 4 |
| Lexington Elementary School (LES) | **37** | **1&2:** Ozone required for PAMS and NCore<br>**3:** Based on total population and surrounding population<br>**4:** High probability of exceedance | 9 | 5 | 7 | 75-90%= 8 | 8 |
| Kearny Villa Rd. (KVR) | **36** | **1&2:** Registers Downtown emissions<br>**3:** Based on total population and surrounding population<br>**4:** High probability of exceedances | 9 | 7 | 6 | 50-75% = 7 | 7 |
| Sherman Elementary School (SES) | **6** | **1&2:** EJ location, some of the highest asthma rates<br>**3:** n/a<br>**4:** n/a | n/a | n/a | n/a | n/a | 6 |

## 4.6 Conclusion – Ozone Monitoring

Over the last five years since the last Network Assessment was published in 2015, San Diego has had a decrease in ozone concentrations. The correlation matrix, area served study statistics, removal bias, and surface probability analysis for exceedances will help assess the future needs for ozone monitoring throughout San Diego County. Since the 2015 Five Year Network Assessment, the District has undergone several site changes. The site in Del Mar was decommissioned and our site in Downtown was relocated in

late 2019 (not included in this assessment). In addition, our site in Escondido was temporarily shut down and is expected to be in operation in 2021. The site in Escondido will continue to provide essential data to San Diego County. El Cajon station is also essential to the San Diego Air Monitoring Network. El Cajon and Escondido sites are in completely different communities, have different topography, and register different air masses. Although the site at Escondido is temporarily shut down, it will provide essential data to the community once it is operational.

# Chapter 5 Nitrogen Dioxide ($NO_2$) and $NO_y$

## 5.1 Nitrogen Dioxide - Introduction

Ambient level nitrogen dioxide ($NO_2$) was sampled on a continuous basis at locations throughout the SDAB (Figure 5.1). Reactive oxides of nitrogen ($NO_y$) are sampled at the Lexington Elementary School site in El Cajon for the National Core (NCore) and Photochemical Assessment Monitoring Stations (PAMS) programs. The standards for $NO_2$ are summarized in Table 5.1. There is no state or national standard for $NO_y$. The changes to the $NO_2$ network during the last five years were the following:

- The El Cajon station was relocated to its original location at Lexington Elementary School area from the temporary site at Floyd Smith Dr.
- Monitoring at the Escondido station was temporarily suspended in 2015 and is expected to be operational in 2021. The new station will be 20 meters southeast of the original location.
- The Downtown site was temporarily shut down due to eviction in late 2016 and relocated to Sherman Elementary School in mid-2019.


**Figure 5.1 Nitrogen Dioxide and Reactive Oxides of Nitrogen ($NO_y$)Network Map**

**Table 5.1 Nitrogen Dioxide State and National Standards for the Year***

| Ambient Air Quality Standards | | | | |
|---|---|---|---|---|
| Pollutant | Averaging Time | California Standards | National Standards | |
| | | Concentration | Primary | Secondary |
| Nitrogen Dioxide ($NO_2$) | 1 hour | 0.18 ppm (339 µg/m$^3$) | 0.100 ppm (188 µg/m$^3$) | Not Applicable |
| | Annual Arithmetic Mean | 0.030 ppm (57 µg/m$^3$) | 0.053 ppm (137 µg/m$^3$) | 0.053 ppm (137 µg/m$^3$) |

*The $NO_y$ analyzer is non-regulatory; therefore there are no NAAQS to compare. The $NO_x$ and $NO_y$ measurements are comparable in the SDAB

Figure 5.1 reflects the current configuration. The site at Sherman Elementary School was not operational until mid-2019 and is not shown on the map. The monitoring sites serve several monitoring requirements. The District operates $NO_2$ instruments for ambient monitoring, the Near Road Program, NCore, and Photochemical Assessment Monitoring Stations (PAMS). The site at Lexington Elementary School serves as an NCore and PAMS site. This site monitors $NO_y$ in addition to $NO_2$. The District's Near Road monitoring site is located at Rancho Carmel Drive. The District is in the process of establishing its second Near Road monitoring site in the San Ysidro area. This site is expected to be operational in 2021. In addition, the District is in the process of introducing Direct $NO_2$ monitors at select sites throughout the monitoring network. The Direct $NO_2$ monitor will be first installed at the PAMS site.

## 5.2 Nitrogen Dioxide - Trends in the SDAB

As seen in Figure 5.2, emissions of $NO_2$ decreased over the years and they have been consistently below 0.10 ppm over the last ten years in the SDAB (Table 5.2). As with the state and the nation, the general downward trend is a result of improved emission control technology on mobile sources. 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 5.2 Nitrogen Dioxide Concentrations for San Diego-for the Last 20 Years (1999-2019)**

| Maximum 1-Hr Concentration (ppm) | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.172 | 0.117 | 0.148 | 0.126 | 0.148 | 0.125 | 0.109 | 0.097 | 0.101 | 0.091 | 0.078 | 0.081 | 0.067 | 0.065 | 0.081 | 0.075 | 0.062 | 0.073 | 0.074 | 0.055 | 0.086 |
| Maximum Annual Average (ppm) | 0.026 | 0.024 | 0.022 | 0.022 | 0.021 | 0.023 | 0.024 | 0.024 | 0.022 | 0.019 | 0.017 | 0.015 | 0.014 | 0.013 | 0.014 | 0.013 | 0.016 | 0.017 | 0.016 | 0.014 | 0.014 |
| 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 |

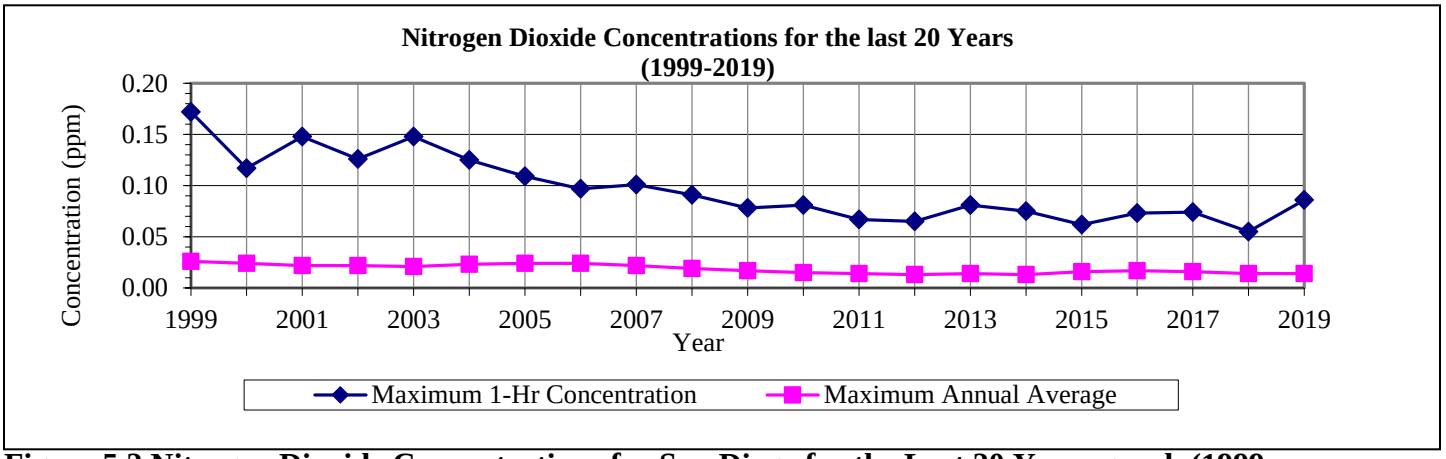



**Figure 5.2 Nitrogen Dioxide Concentrations for San Diego for the Last 20 Years graph (1999-2019)**

### 5.2.1 Nitrogen Dioxide Measurements by Site

Table 5.3 lists the maximum nitrogen dioxide measurements and $NO_y$-NO for each nitrogen dioxide monitoring location and NCore site, respectively; Figure 5.3 shows the values graphically with respect to the Annual Avg Std of 0.053 ppm.

**Table 5.3 Nitrogen Dioxide by Site, 2015-2019**

| Site (name) | | Maximum Concentration for 1-Hr (ppm) | | | | | Annual Average (ppm) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2015 | 2016 | 2017 | 2018 | 2019 | 2015 | 2016 | 2017 | 2018 | 2019 |
| Camp Pendleton | CMP | 0.060 | 0.072 | 0.063 | 0.048 | 0.053 | 0.006 | 0.006 | 0.006 | 0.005 | 0.004 |
| Escondido | ESC | 0.048 | --- | --- | --- | --- | 0.010 | --- | --- | --- | --- |
| Rancho Carmel Drive | RCD | 0.055 | 0.062 | 0.062 | 0.055 | 0.054 | 0.016 | 0.017 | 0.016 | 0.014 | 0.014 |
| Alpine | ALP | 0.048 | 0.033 | 0.028 | 0.031 | 0.029 | 0.004 | 0.003 | 0.003 | 0.003 | 0.003 |
| El Cajon | FSD & LES | 0.059 | 0.057 | 0.045 | 0.045 | 0.039 | 0.010 | 0.009 | 0.010 | 0.007 | 0.008 |
| *El Cajon- LES | LES ($NO_y$-NO) | --- | --- | --- | 0.049 | 0.041 | --- | --- | --- | 0.008 | 0.009 |
| Kearny Villa Road | KVR | 0.051 | 0.053 | 0.054 | 0.045 | 0.046 | 0.009 | 0.009 | 0.009 | 0.007 | 0.007 |
| *San Diego- Beardsley/SES* | DTN & SES | 0.062 | 0.073 | --- | --- | 0.062 | 0.013 | 0.011 | --- | --- | 0.012 |
| Chula Vista | CVA | 0.049 | 0.054 | 0.057 | 0.052 | 0.050 | 0.010 | 0.009 | 0.009 | 0.008 | 0.008 |
| Donovan | DVN | 0.061 | 0.067 | 0.074 | 0.054 | 0.086 | 0.008 | 0.007 | 0.007 | 0.006 | 0.007 |

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

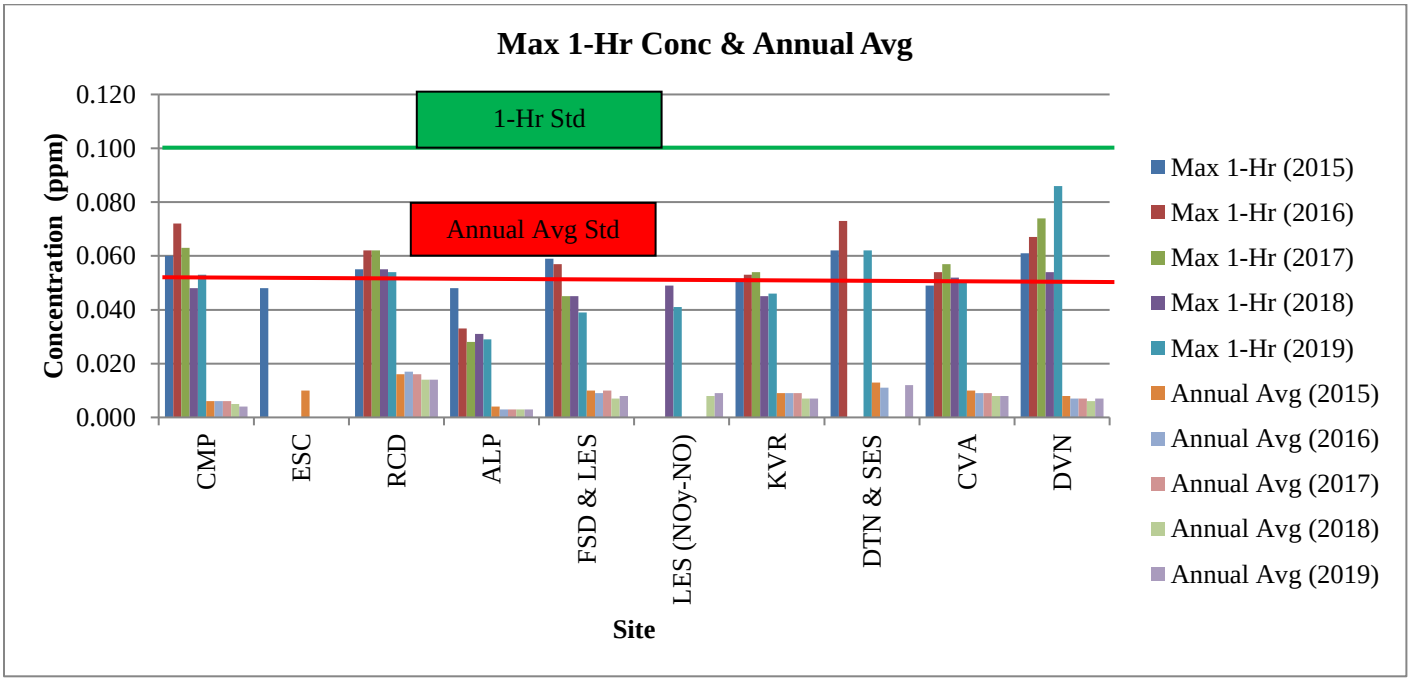



**Figure 5.3 Graph of Max 1-Hr Concentration and Annual Average**

## 5.2.2 Nitrogen Dioxide Measurements by Site, Design Value 2015-2019

Table 5.4 lists the design value maximum nitrogen dioxide measurements and $NO_y$-NO for each nitrogen dioxide monitoring location and NCore site, respectively; Figure 5.4 shows the Design Values (98 percentile Daily maximum) graphically with respect to the 1-Hr Std of 0.100 ppm.

**Table 5.4 Nitrogen Dioxide Design Value Measurements by Site**

| Site (name) | | Design Value Maximum Concentration for 1-Hr (ppm) | | | | |
|---|---|---|---|---|---|---|
| | | 2013-2015 | 2014-2016 | 2015-2017 | 2016-2018 | 2017-2019 |
| Camp Pendleton | CMP | 0.048 | 0.047 | 0.047 | 0.047 | 0.044 |
| Escondido | ESC | 0.051 | 0.051 | 0.04 | --- | --- |
| Rancho Carmel Drive | RCD | 0.052 | 0.052 | 0.052 | 0.050 | 0.049 |
| Alpine | ALP | 0.026 | 0.024 | 0.022 | 0.020 | 0.020 |
| El Cajon | FSD &LES | 0.048 | 0.045 | 0.043 | 0.040 | 0.038 |
| El Cajon - $NO_y$ | FSD &LES | 0.048 | 0.045 | 0.043 | 0.040 | |
| Kearny Villa Road | KVR | 0.045 | 0.044 | 0.042 | 0.040 | 0.039 |
| Chula Vista | CVA | 0.047 | 0.047 | 0.046 | 0.045 | 0.043 |
| San Diego-Beardsley | DTN | 0.057 | 0.057 | 0.056 | 0.058 | 0.043 |
| Donovan | DVN | 0.065 | 0.058 | 0.051 | 0.050 | 0.043 |

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

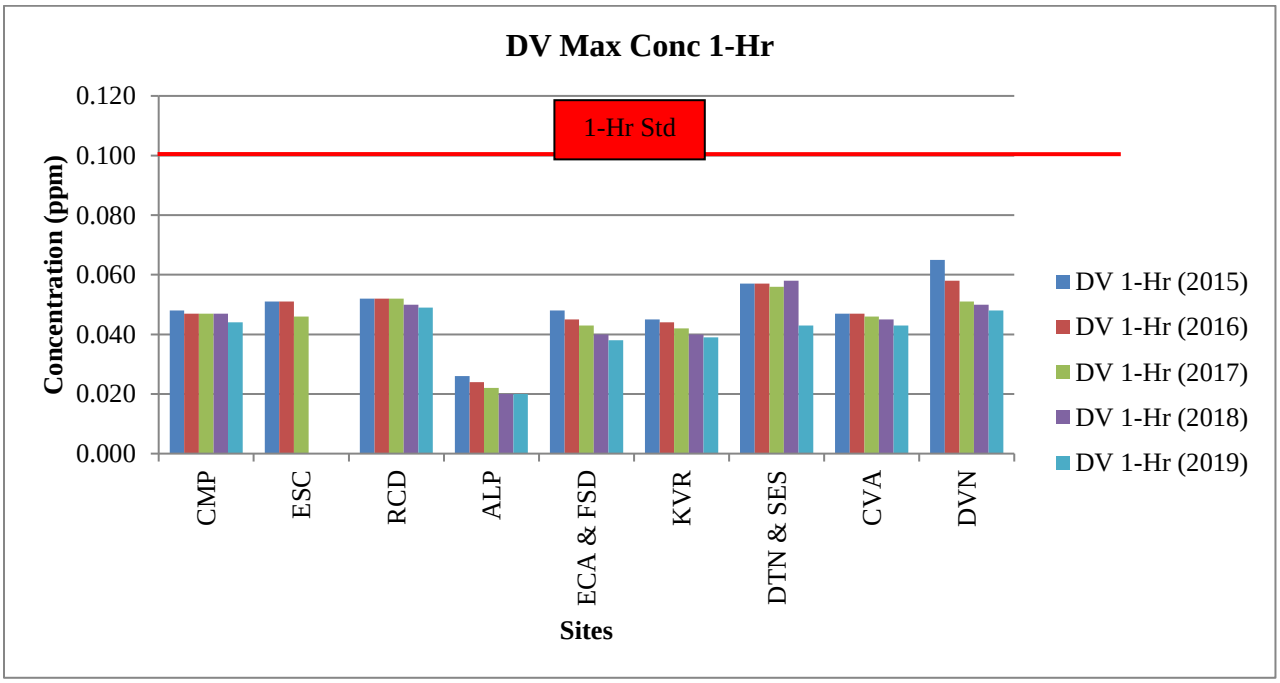



**Figure 5.4 Graph of Design Value (DV) Max 1-Hr Concentration and Annual Average**

## 5.3 Nitrogen Dioxide Minimum Monitoring Requirements

The District is federally mandated to monitor $NO_2$ levels in accordance with the CFR. This section will state the different minimum monitoring requirements for each program. This includes requirements for ambient, Near-road, PAMS, etc., that the District operates and the references therein (Note: only the passages applicable to the District are referenced). These monitors can serve as fulfilling other $NO_2$ network requirements, e.g. ambient $NO_2$ monitor can fulfill a PAMS $NO_2$ monitor requirement. For additional details on the required $NO_2$ monitors in the District, refer to the most recent Annual Network Plan.

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 4.3.2(a)[6]. Table 5.5 lists the minimum number of Near-road monitors required for the San Diego Air Basin. The goal of the Near-road program is to monitor locations of expected maximum hourly concentrations sited near a major road with high Annual Average Daily Traffic (AADT) counts. The District is required to have two Near-road $NO_2$ monitors. The two sites are to be differentiated by one or more factors which includes fleet mix, terrain, geographic area, or different roadway. The first $NO_2$ Near-road site is located on Rancho Carmel Dr. (RCD), approximately 6 kilometers north of Poway Rd. The District has successfully located an area near the San Ysidro Point-of-Entry (POE) for the second Near-road site and is expected to begin monitoring in 2021. This location is at Interstate-5 and Cottonwood Road at Fire Station #29. This site has been verbally approved by EPA-National authorities and visited and verbally approved by EPA-Region 9 Authorities. Consequently, the District has pursued and obtained a signed Memorandum of Understanding (MOU) with the City for this location and have a projected construction completion and station start-up of 2021.

**Table 5.5 Nitrogen Dioxide Minimum Monitoring Requirements - Near-road**

| MSA (name) | County (name) | Population Estimated from 2010 Census (#) | Number of $NO_2$ Near-road Monitors Required (#) | Are Additional $NO_2$ Near-road Monitors Required? (yes/no) | Number of Additional $NO_2$ Near-road Monitors Required (#) | Number of $NO_2$ Near-road Monitors Required (total) (#) | Number of $NO_2$ Near-road Monitors Active (#) | Number of $NO_2$ Near-road Monitors Needed (#) |
|---|---|---|---|---|---|---|---|---|
| San Diego | San Diego | 3.3 Million | 1 | YES | 1 | 2 | 1 | 1 |

The requirements necessary to fulfill the area-wide $NO_2$ monitoring are described in 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4.3.3(a)[7]. The District is required to label a monitor that routinely measures high concentrations of nitrogen dioxide. The Donovan monitor consistently registers the highest Maximum Concentration for 1-hr. and for the Annual Average therefore it is designed the Area-wide monitor. Table 5.6 lists the Area-wide $NO_2$ Monitoring requirements for the SDAB.

[6](2019) 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 4.3.2(a), list the requirements needed to fulfill the Nitrogen Dioxide ($NO_2$) near-road design criteria.

[7](2019) 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(a), list the requirements needed to fulfill the Nitrogen Dioxide ($NO_2$) area-wide design criteria.

**Table 5.6 Nitrogen Dioxide Minimum Monitoring Requirements-Area-wide**

| MSA (name) | County (name) | Population Estimated from 2010 Census (#) | Number of Area-wide $NO_2$ Monitors Required (#) | Number of Area-wide $NO_2$ Monitors Active (#) | Number of Area-wide $NO_2$ Monitors Needed (#) | Location of Area-wide Site (name) | AQS ID of Area-wide Site (#) | Does Area-wide Site Meet NAAQS? (yes/no) |
|---|---|---|---|---|---|---|---|---|
| San Diego | San Diego | 3.3 Million | 1 | 1 | 0 | Donovan | 06-073-1014 | yes |

The requirements necessary to fulfill the Regional Administrator $NO_2$ monitoring site are described in 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4.3.4(a)[8]. To obtain a pollutant profile in certain areas, additional monitoring beyond the minimum monitoring requirements of $NO_2$ may be required by the EPA Regional Administrator. This includes regions considered to be Environmental Justice areas. The Downtown station in Barrio Logan satisfied this requirement. However, due to eviction in 2016, the District was forced to relocate this station to Sherman Heights (Sherman Elementary School), about 1.2-km downwind of Barrio Logan. This new location has been designated a Regional Administrator monitor. The monitoring site at Sherman Elementary School began monitoring in mid-2019. Table 5.7 lists the Regional Administrator Designated $NO_2$ Monitoring requirements for the SDAB.

**Table 5.7 Nitrogen Dioxide Minimum Monitoring Requirements-Regional Administrator**

| MSA (name) | County (name) | Population Estimated from 2010 Census (#) | Number of Regional Administrator $NO_2$ Monitors Required (#) | Number of Regional Administrator $NO_2$ Monitors Active (#) | Number of Regional Administrator $NO_2$ Monitors Needed (#) | Location of Regional Administrator Site (name) | AQS ID of Regional Administrator Site (#) | Does Regional Administrator Site Meet NAAQS? (yes/no) |
|---|---|---|---|---|---|---|---|---|
| San Diego | San Diego | 3.3 Million | 1 | 1 | 0 | Sherman Elementary | 06-073-1010 | Yes |

The District is required to operate $NO_x$ monitors as part of the PAMS program (see the PAMS chapter for additional information). The requirements necessary to fulfill PAMS measurements, including hourly averaged nitrogen oxide (NO), true nitrogen dioxide ($NO_2$), and total reactive nitrogen ($NO_y$), are defined in 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 5(b)(4)[9]. The Environmental Protection Agency has delayed the implementation of the PAMS requirements until June 1, 2021. The PAMS site is to be set-up at the NCore site, which is at Lexington Elementary School. As part of the PAMS re-engineering, a direct $NO_2$ monitor must be implemented. This technique is based on Cavity Attenuated Phase Shift while traditional analyzers based on chemiluminescence measure $NO_2$ indirectly using the difference of $NO_x$ and NO. Table 5.8 lists the PAMS $NO_x$ ($NO_2$) Monitoring requirements for the SDAB.

[8](2019) 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 4.3.4(a), list the requirements needed to fulfill the Nitrogen Dioxide ($NO_2$) Regional Administrator design criteria.

[9](2019) 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 5, "Network Design for Photochemical Assessment Monitoring Stations (PAMS) and Enhanced Ozone Monitoring", subsection 5(b)(4), list the requirements needed to fulfill the Nitrogen Oxide (NO), true Nitrogen Dioxide ($NO_2$), and total reactive Nitrogen ($NO_y$) PAMS measurement criteria.

**Table 5.8 Nitrogen Dioxide Minimum Monitoring Requirements- PAMS for true-$NO_2$**

| PAMS Sites/Locations (name) | PAMS Sites/Locations AQS ID (#) | Number of true-$NO_2$ Monitors Required at PAMS Sites (#) | Number of true-$NO_2$ Monitors Active at PAMS Sites (#) | Number of true-$NO_2$ Monitors Needed at PAMS Sites (#) |
|---|---|---|---|---|
| Lexington (LES) | 06-073-1022 | 1 | 0 | *1 |

*As stated in the Executive Summary, the implementation of the re-engineered PAMS required hardware have been nationally delayed. The District is still using the traditional $NO/NO_2/NO_x$ analyzer until a true-$NO_2$ is received from EPA.

The District is required to monitor reactive oxides of nitrogen ($NO_y$) as part of the NCore program. The NCore requirements for the number of reactive oxides of nitrogen ($NO_y$) monitors are defined in 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 3, "Design Criteria for NCore Sites", subsection (b)[10]. In addition, since the NCore site also serves as the re-engineered PAMS site, the requirements for $NO_y$ for the PAMS program are defined in 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 5(b)(4)[11].

**Table 5.9 Reactive Oxides of Nitrogen Minimum Monitoring Requirements-PAMS & NCore**

| Number of $NO_y$ Monitors Required (#) | Number of $NO_y$ Monitors Active (#) | Number of $NO_y$ Monitors Needed (#) | Location of $NO_y$ Monitor Site (name) | AQS ID of $NO_y$ Monitor Site (#) |
|---|---|---|---|---|
| 1 | 1 | 0 | Lexington (LES) | 06-073-1022 |

The District meets or exceeds all minimum requirements for $NO_2$ monitoring for all programs except for the following:

- Establishment of the 2nd Near-road location (in process now)
- Establishment of true-$NO_2$ monitor at the PAMS site (EPA approved).

## 5.4 $NO_2$ – Correlation Matrix

The correlation matrix analysis (Figure 5.5) shows the correlation, mean absolute difference, distance between sites, and design values. This graphic gives you information about how concentrations at $NO_2$ monitors within San Diego County compare to one another. The red squares in the top-right corner show the mean absolute difference in concentrations between each pair of monitors, with text indicating the distance in kilometers between each pair of monitors. The intensity of the red boxes (from light red to dark red) represents the mean absolute difference in concentration where a dark red represents 0.01 ppm difference and light red represents 0 ppm difference. Each monitor comparison is represented by a square in the chart. The blue squares in the bottom-left corner show the correlation between each pair of monitors, with text indicating the number of days used in the calculation. The intensity of the blue boxes (from light blue to dark blue) represents the correlation between sites where the lightest shade of blue is a correlation equal to 1 and the dark blue has a correlation equal to -1. The numbers along the

[10](2019) 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 3, "Design Criteria for NCore Sites", subsection 3(b), list the requirements for NCore measurements..

[11](2017) 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 5, "Network Design for Photochemical Assessment Monitoring Stations (PAMS) and Enhanced Ozone Monitoring", subsection 5(b)(4), list the requirements needed to fulfill the Nitrogen Oxide (NO), true Nitrogen Dioxide ($NO_2$), and total reactive Nitrogen ($NO_y$) PAMS measurement criteria.

diagonal indicate the most recent design value for each monitor. AQS site data with less than 75% completion are not used in this analysis.

Sites with high correlation, low absolute difference, and close proximities are considered redundant. Under these criteria, there are no redundant sites for $NO_2$ monitors in the SDAB. All sites measure comparable $NO_2$ data. Future plans for $NO_2$ monitors include the addition of the Downtown site, which was temporarily shut down and relocated to Sherman Elementary School in mid-2019 (not included in this correlation matrix) and the Escondido $NO_2$ monitor. Escondido $NO_2$ monitoring was suspended and is expected to begin monitoring in 2021 once the re-located station is operational. $NO_2$ monitoring provides a general overview of air pollution trends throughout the SDAB. There will also be a $NO_2$ monitor installed along the border in San Ysidro. The additional sites at Sherman Elementary School, Escondido, and San Ysidro will provide valuable $NO_2$ data to the local communities.

The Network Assessment tool does not provide correlation data for $NO_y$ monitors. The only site that has a $NO_y$ monitor is Lexington Elementary School in El Cajon. The $NO_y$ monitor at Lexington Elementary is a requirement for the NCore and PAMS programs. There are no plans to expand $NO_y$ monitoring in the San Diego air monitoring network. Data from previous years show that the $NO_y$ monitor at Lexington Elementary School are equivalent to the $NO_x$ monitor and no value is added with the NOyparameter. The $NO_y$ values follow the same seasonal, diurnal, and special event patterns as the collocated $NO_x$ instrument. The yearly, monthly, weekly, daily, and hourly averages are identical for the $NO_y$ and $NO_x$ instrumentation.

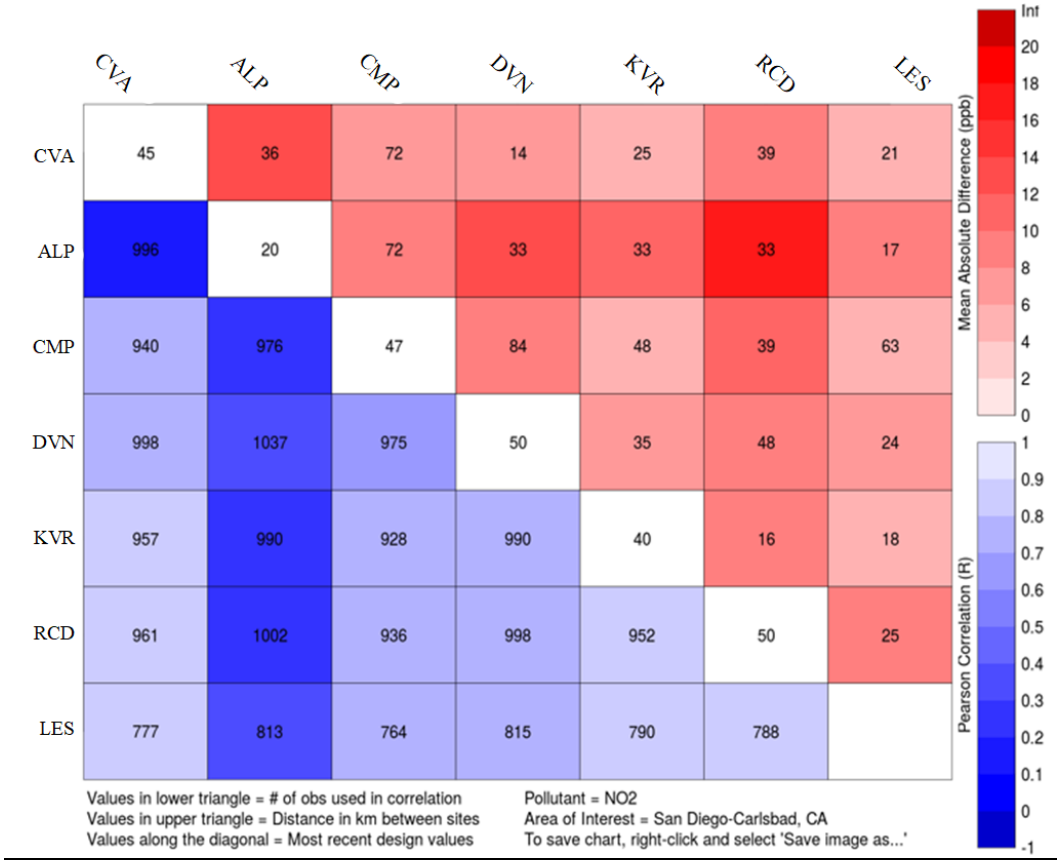



**Figure 5.5 Correlation Matrix of $NO_2$ Sites in San Diego**

## 5.4.1 $NO_2$ – Removal Bias

The $NO_2$ removal bias map shows sites that are considered redundant throughout the network. The bias estimation uses the nearest neighbor site to estimate the concentration at that location if the site was not there. The Removal Bias tool finds the nearest neighbors to each selected site and then uses the data from the neighboring sites to estimate concentrations at the site. A positive bias indicates that if the site being examined was removed, the neighboring site(s) would register higher values for the region served by that site. The opposite indicates negative bias, i.e. neighboring sites registering lower values. Figure 5.6 is a map of the $NO_2$ monitors in the network highlighted in blue or red to indicate bias. 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. If the bias is small, that may indicate that the monitor is redundant and could be removed. The results of this analysis are similar to the removal bias analysis for ozone. The results of the removal bias analysis for $NO_2$ show that El Cajon (Lexington Elementary School) has neutral bias. The $NO_2$ monitor at Lexington Elementary School in El Cajon serves several purposes including being a PAMS and NCore site where $NO_2$ monitoring is required. In addition, the monitor provides valuable data to the local community and helps assess air pollution trends.

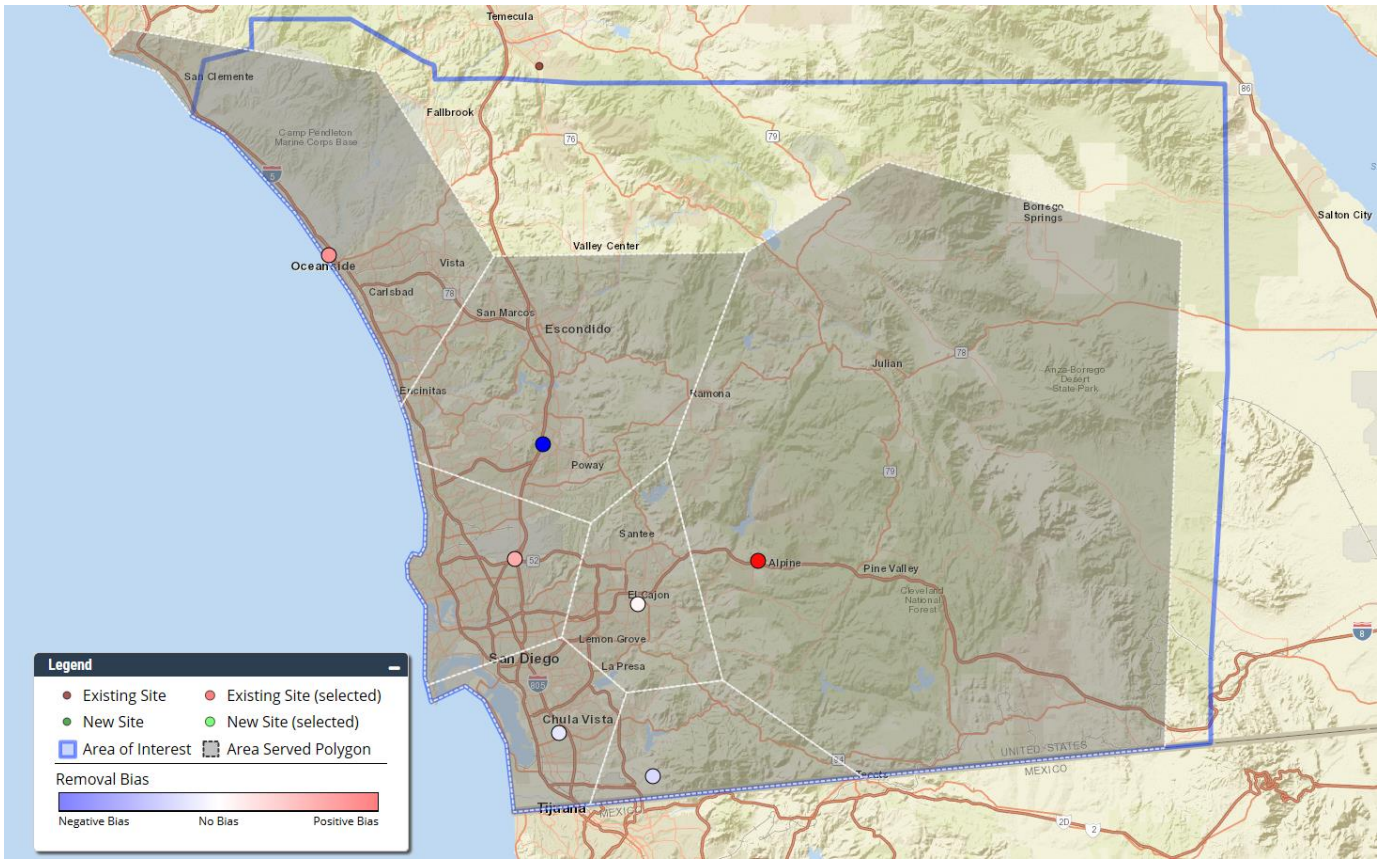



**Figure 5.6 Removal Bias Map for $NO_2$ monitors**

## 5.4.2 Nitrogen Dioxide – Area Served

The regions and area served by the $NO_2$ monitors represent significant population centers. Figure 5.7 is a map of the area served by the $NO_2$ monitors in the air quality network. Each polygon represents the area that is closer to the monitor within it than any other monitor in the 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. It should be noted that Area Served Map for $NO_2$ does not

include the relocated site in the Downtown area (Sherman Elementary School) or our site in Escondido, which has been temporarily shut down and is anticipated to start-up in 2021. This site provides valuable data to the area served and population.

The area east of Camp Pendleton and west of Escondido, which includes San Marcos and Vista, is one of the faster growing areas in the county. Concentrations of ozone, nitrogen dioxide, and $PM_{2.5}$ have been shown to be derived from the measured concentrations from the Camp Pendleton and Escondido station (temporarily shut down) ozone, nitrogen dioxide, 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 $NO_2$ 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, so an additional $NO_2$ monitor in this area would add little informational value.

However, as part of the Near-road program, the second Near-road monitor will be placed near the border crossing in San Ysidro, considered to be one of the busiest points of entry (POE) in the world. Vehicles crossing this POE emit air pollution when moving and as they idle. Residents are concerned with air quality impacts of this traffic in their community. The second Near-road site will provide valuable information to determine the steps needed to improve air quality in the community.

The demographics for each area served by monitoring sites is detailed in Tables 5.10, 5.11, and 5.12 (below). Including the Escondido site will expand the area covered to northern San Diego county. The area served is shown in Figure 5.7. In addition, the site at Sherman Elementary School is expected to add additional coverage for the community.

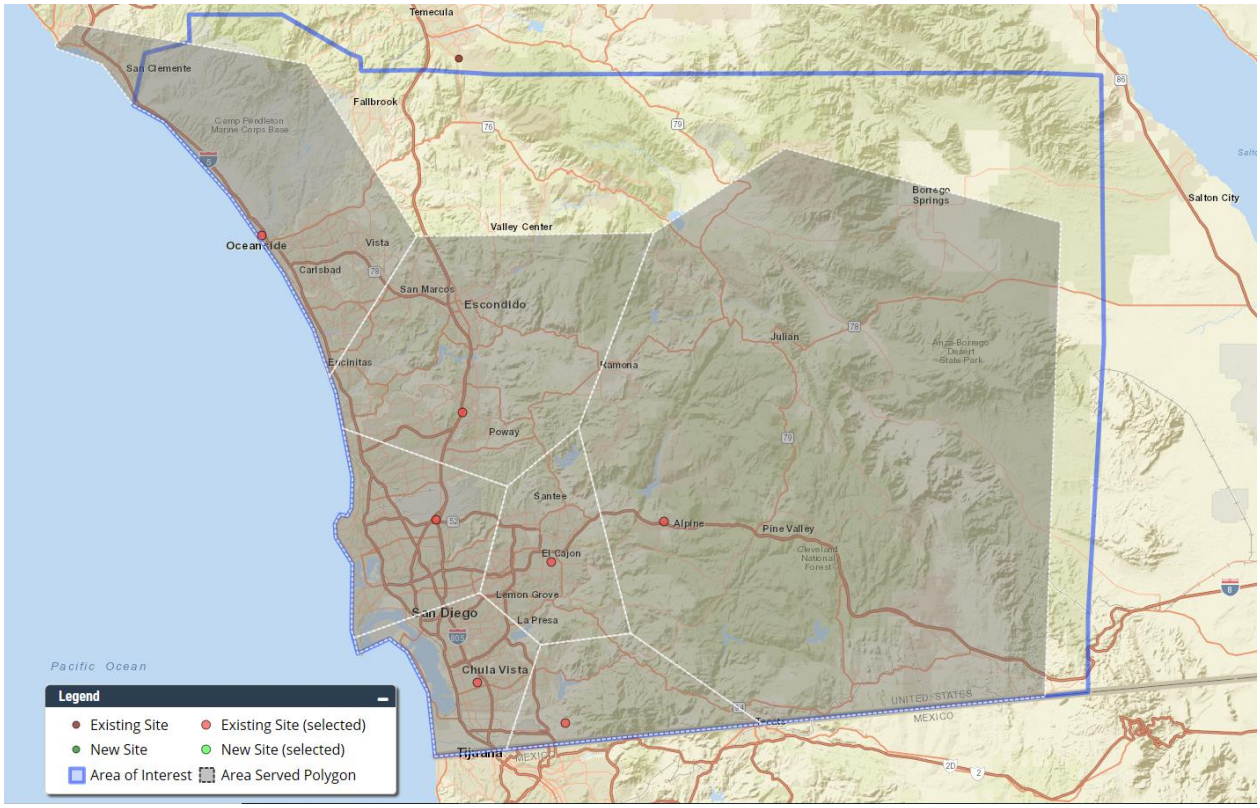



**Figure 5.7 Area Served $NO_2$**

## Table 5.10 Area Served for $NO_2$ and Total Population

| Site Name | Area ($km^2$) | Total Population |
|---|---|---|
| Chula Vista | 281 | 704362 |
| Alpine | 6430 | 70933 |
| Camp Pendleton | 948 | 527598 |
| Donovan | 571 | 72145 |
| Kearny Villa Rd. | 433 | 728198 |
| Rancho Carmel Drive | 1117 | 592738 |
| El Cajon - LES | 371 | 408687 |

## Table 5.11 $NO_2$ Area Served Demographics (Race)

| Site Name | Male | Female | Caucasian/ White | African/ Black | Native American | Asian | Pacific Islander | Other Race | Multiple Races | Hispanic/ Latino |
|---|---|---|---|---|---|---|---|---|---|---|
| Chula Vista | 353917 | 350445 | 341240 | 61745 | 5762 | 88592 | 4825 | 165000 | 37198 | 392455 |
| Alpine | 35922 | 35011 | 58873 | 770 | 2671 | 1002 | 200 | 4961 | 2456 | 13752 |
| Camp Pendleton | 269346 | 258252 | 383338 | 16635 | 4415 | 27126 | 3573 | 66876 | 25635 | 159864 |
| Donovan | 39330 | 32815 | 36183 | 5449 | 441 | 14284 | 264 | 11377 | 4147 | 32927 |
| Kearny Villa Rd. | 369506 | 358692 | 478672 | 37271 | 4212 | 106674 | 2771 | 61674 | 36924 | 148052 |
| Rancho Carmel Dr. | 291389 | 301349 | 403628 | 11699 | 3740 | 81262 | 1468 | 63523 | 27418 | 139417 |
| El Cajon - LES | 198960 | 209727 | 298052 | 24285 | 3194 | 17630 | 2181 | 38968 | 24377 | 96914 |

## Table 5.12 $NO_2$ Area Served Demographics (Age)

| Site Name | Age 0-4 | Age 5-9 | Age 10-14 | Age 15-19 | Age 20-24 | Age 25-29 | Age 30-34 | Age 35-39 | Age 40-44 |
|---|---|---|---|---|---|---|---|---|---|
| Chula Vista | 48561 | 47992 | 51646 | 58332 | 65743 | 56430 | 48316 | 47467 | 46737 |
| Alpine | 3657 | 3992 | 4907 | 5188 | 3810 | 3258 | 3311 | 3661 | 4405 |
| Camp Pendleton | 37295 | 33627 | 32625 | 37222 | 51275 | 40848 | 34068 | 33297 | 34096 |
| Donovan | 5226 | 5559 | 5692 | 5835 | 4849 | 5487 | 6313 | 6840 | 6522 |
| Kearny Villa Rd. | 40789 | 34694 | 32906 | 45989 | 80368 | 80724 | 66208 | 53609 | 47495 |
| Rancho Carmel Driv | 40504 | 42777 | 44250 | 42929 | 33759 | 35450 | 36787 | 41756 | 44633 |
| El Cajon - LES | 27321 | 25576 | 26882 | 29431 | 30730 | 29822 | 26126 | 25686 | 27070 |
| **Site Name** | **Age 45-49** | **Age 50-54** | **Age 55-59** | **Age 60-64** | **Age 65-69** | **Age 70-74** | **Age 75-79** | **Age 80-84** | **Age 85 & Over** |
| Chula Vista | 47422 | 44893 | 37837 | 29894 | 20985 | 17217 | 14234 | 10823 | 9833 |
| Alpine | 5848 | 6530 | 6040 | 5411 | 3762 | 2676 | 1937 | 1376 | 1164 |
| Camp Pendleton | 36696 | 35656 | 30633 | 25640 | 17837 | 13480 | 11909 | 10313 | 11081 |
| Donovan | 5767 | 4505 | 3224 | 2394 | 1496 | 1057 | 645 | 425 | 309 |
| Kearny Villa Rd. | 46312 | 43841 | 38864 | 33960 | 23691 | 17586 | 15089 | 12686 | 13387 |
| Rancho Carmel Driv | 47921 | 45485 | 38153 | 30927 | 20712 | 14419 | 11442 | 9753 | 11081 |
| El Cajon - LES | 31210 | 31198 | 26312 | 21574 | 14634 | 10820 | 9228 | 7527 | 7540 |

## 5.5 $NO/NO_2/NO_x$ & $NO_y$ Monitor and Station Evaluation

Table 5.13 is a summary of the District's $NO_x$ monitor rating for the network instruments. The scores are based on the analysis from the Network Assessment tool for $NO_2$. The analysis includes scores for correlation between sites, site removal, community type, area served, monitoring needs, and an internal factor. No $NO_x$ monitor is recommended for decommissioning.

**Table 5.13 $NO/NO_2/NO_x$ Monitor Summary Rating**

| | **Overall Scoring** | **COMMENTS** | **1.**Correlation | **2.** Removal | **3.** Community Type and Area Served | **4.**Monitors and QA/QC Needs | **5.**Internal/ Other |
|---|---|---|---|---|---|---|---|
| Alpine (ALP) | **39** | **3:** Based on total population and population growth | 5 | 10 | 4 | 10 | 10 |
| Camp Pendleton (CMP) | **36** | **1 &2:** Transport site<br>**3:** Bedroom community. Based on total population and surrounding population | 7 | 9 | 6 | 6 | 8 |
| Chula Vista (CVA) | **38** | **1:** n/a<br>**2:** Mixed use<br>**3:** Based on total population and population growth | 7 | 7 | 7 | 7 | 10 |
| Otay Mesa-Donovan (DVN) | **38** | **1& 2:** Farthest south. Registers transport from Mexico. Industrial becoming mixed use<br>**3:** Based on total population and population growth | 7 | 7 | 7 | 7 | 10 |
| Lexington Elementary School (LES) | **41** | **1 &2:** PAMS and NCore,<br>**3:** Light Industrial/ mixed use. Based on total population and population growth. | 8 | 6 | 7 | 10 | 10 |
| Rancho Carmel Dr. (RCD) | **42** | **1,2,& 3:** Near-road requirement<br>**4.** Recently added $PM_{2.5}$ sequential sampler | 7 | 10 | 9 | 6 | 10 |
| Sherman Elementary School (SES) | **30** | **1&2:** Regional monitor, EJ site<br>**3.** Heavy Industrial/mixed use, Compare to Near-road | n/a | n/a | 10 | 10 | 10 |
| Kearny Villa Rd. (KVR) | **39** | **1 & 2:** Registers Downtown emissions<br>**3:** Mixed use | 8 | 8 | 5 | 8 | 10 |

## 5.6 Conclusion - $NO_x$

Since 2015 Network Assessment, the San Diego region has measured $NO_2$ concentrations trending downward. The correlation matrix, area served study statistics, and removal bias help assess the future needs for $NO_2$ monitoring throughout the region. Since the 2015 Five Year Network Assessment, the District has undergone several site changes. Our site in Downtown was temporarily suspended in 2016 until it was relocated to the new site at Sherman Elementary School in 2019 (not included in this assessment). In addition, our site in Escondido was temporarily shut down and is expected to be in operation in 2021. The site in Escondido will continue to provide essential data to San Diego County. The District's goal is to get this site operational and continue to provide the robust $NO_x$ data for the region.

The District's monitoring site at Lexington Elementary School in El Cajon provides valuable information to the community. As part of the PAMS and NCore program, Lexington Elementary School monitors for $NO_x$ and $NO_y$. Measurements for $NO_x$ and $NO_y$ have historically been the same at Lexington Elementary School. The non-regulatory $NO_y$ instrument requires more of a financial investment due to the labor and support infrastructure needed to ensure valid $NO_y$ data collection and for the exact same concentrations as obtained by the traditional regulatory $NO_2$ measuring instruments. Consequently, the District has requested the permanent decommissioning of $NO_y$ sampling but were denied. For the 2020 Network Assessment, there is no additional analysis provided for $NO_y$ since there is no state or federal standard and we will not expand $NO_y$ coverage for the reasons detailed above. However, the District will soon deploy a Direct $NO_2$ monitor for PAMS and NCore to obtain true $NO_2$ measurements.

# Chapter 6 Carbon Monoxide (CO)

## 6.1 Carbon Monoxide – Introduction

Carbon monoxide (CO) is sampled on a continuous basis at two locations in the SDAB (Figure 6.1). Trace level CO was sampled at the El Cajon-NCore site. Updates to CO monitoring throughout the Ambient Network include:

- The decommissioning of CO analyzers at the Escondido and Downtown stations.
- The relocation of the El Cajon station to Lexington Elementary School from the Gillespie Field area off Floyd Smith Drive.

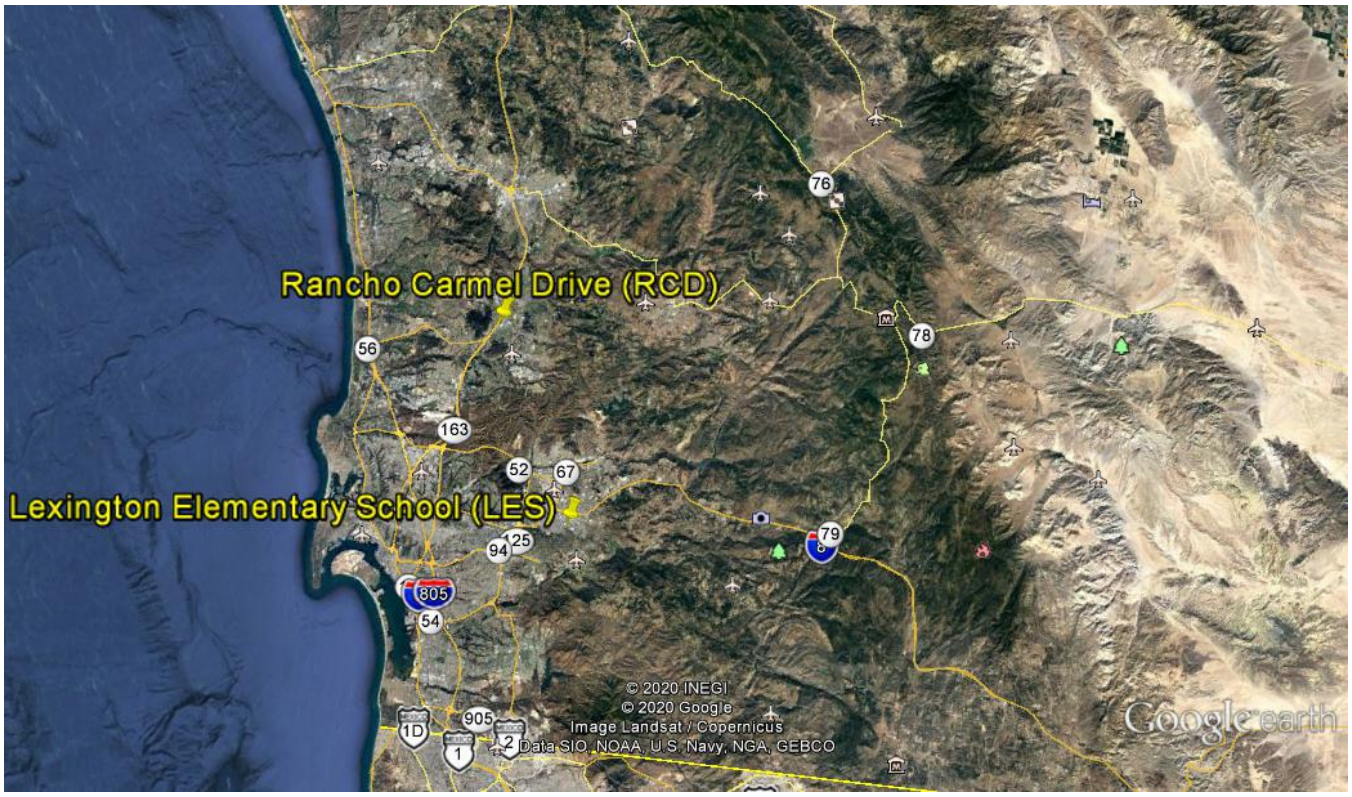



**Figure 6.1 Carbon Monoxide Network Map**

**Table 6.1 Carbon Monoxide State and National Standards for the Year**

| Ambient Air Quality Standards | | | | |
|---|---|---|---|---|
| Pollutant | Averaging Time | California Standards | National Standards | |
| | | Concentration | Primary | Secondary |
| Carbon Monoxide (CO) | 1 hour | 20 ppm (23 mg/m$^3$) | 35 ppm (40 mg/m$^3$) | Not Applicable |
| | 8 hour | 9 ppm (10 mg/m$^3$) | 9 ppm (10 mg/m$^3$) | Not Applicable |

## 6.2 Carbon Monoxide – Trends in the SDAB

The peak 8-Hr indicator for carbon monoxide has steadily decreased over the years (Table 6.2) 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 6.2 reflects the carbon monoxide standards for that year.

**Table 6.2 Carbon Monoxide Concentrations for San Diego-for the Last 20 Years, 1999-2019**

| | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Maximum 1-Hr Concentration (ppm) | 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 | 3.1 | 2.2 | 2.0 | 1.9 | 4.1 |
| Maximum 8-Hr Concentration (ppm) | 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 | 2.0 | 1.7 | 1.5 | 1.4 | 2.5 |
| 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 |

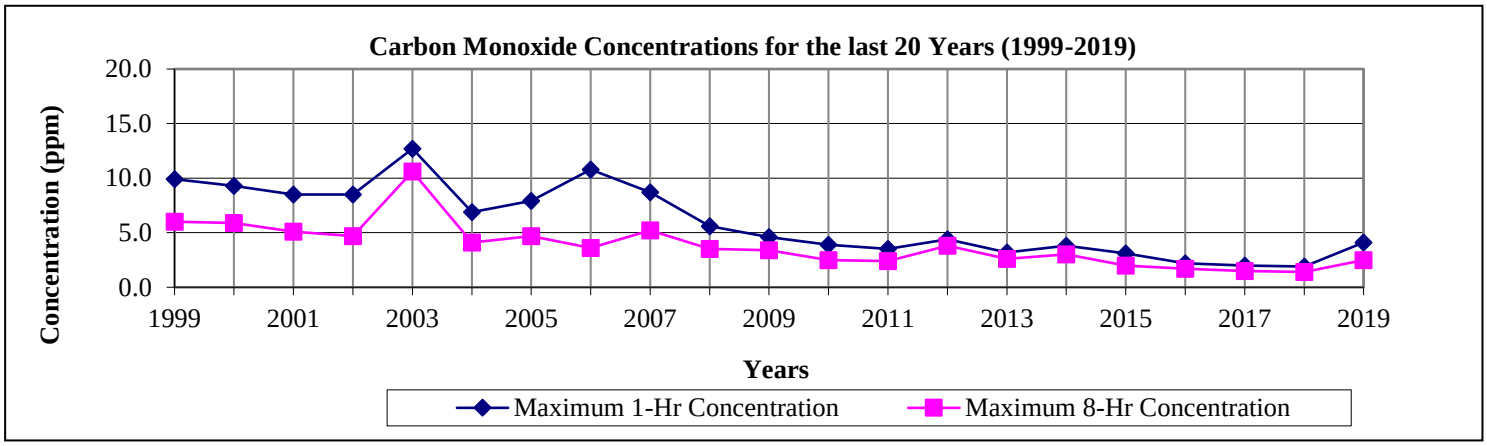



**Figure 6.2 Carbon Monoxide Concentrations for the Last 20 Years**

## 6.2.1 Carbon Monoxide - Measurements by Site

Table 6.3 lists the maximum carbon monoxide measurements for each carbon monoxide monitoring location and NCore. Figure 6.3 shows this information graphically with respect to the 1-Hr and 8-Hr Stds (35 and 9 ppm, respectively).

**Table 6.3 Carbon Monoxide by Site, 2015-2019**

| Site | | Maximum Concentration for 1-Hr (ppm) | | | | | Maximum Concentration for 8-Hr (ppm) | | | | | Annual Average (ppm) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (name) | (abbrev) | 2015 | 2016 | 2017 | 2018 | 2019 | 2015 | 2016 | 2017 | 2018 | 2019 | 2015 | 2016 | 2017 | 2018 | 2019 |
| Escondido | ESC | 3.1 | N/A | N/A | N/A | N/A | 2.0 | N/A | N/A | N/A | N/A | 0.400 | N/A | N/A | N/A | N/A |
| Rancho Carmel Dr | RCD | 2.4 | 2.0 | 2.0 | 1.9 | 4.1 | 1.4 | 1.2 | 1.5 | 1.4 | 2.5 | 0.562 | 0.577 | 0.630 | 0.528 | 0.497 |
| El Cajon | FSD & LES | 1.432 | 1.670 | 1.533 | 1.499 | 1.3 | 1.1 | 1.1 | 1.4 | 1.1 | 1.0 | 0.310 | 0.311 | 0.324 | 0.316 | 0.303 |
| SD-Beardsley | DTN | 2.6 | 2.2 | N/A | N/A | N/A | 1.9 | 1.7 | N/A | N/A | N/A | 0.331 | 0.280 | N/A | N/A | N/A |

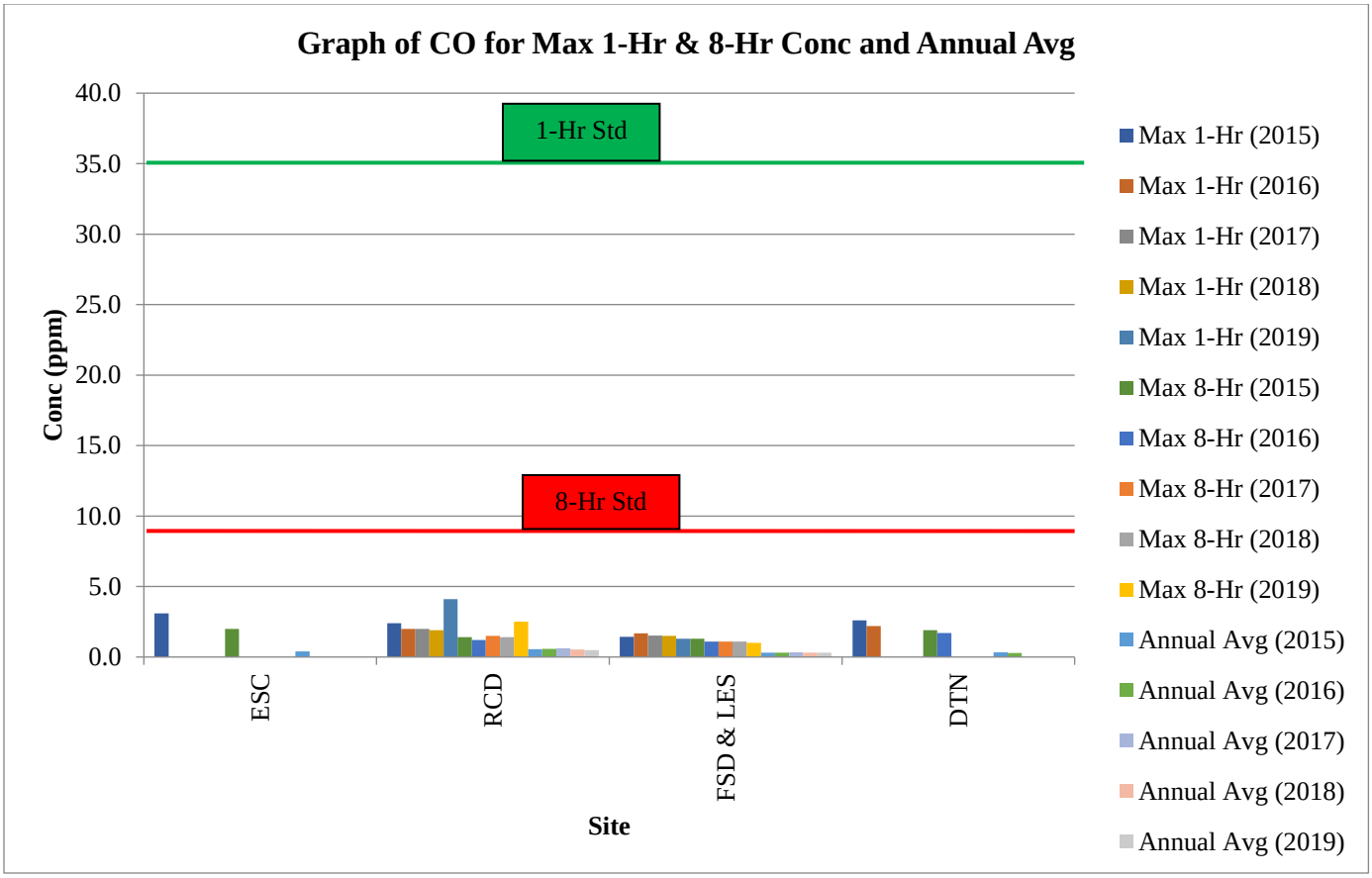



**Figure 6.3 Graph of CO for Max 1-Hr & 8-Hr and Annual Average**

## 6.3 Carbon Monoxide – Minimum Monitoring Requirements

The District is federally mandated to monitor CO levels in accordance with the CFR. This section will state the different monitoring requirements for each program, including ambient, PAMS, NCore, Near-road, etc. that the District operates and references therein (Note: only the passages applicable/informative to the District are referenced). These monitors can serve as fulfilling other CO network requirements, e.g. ambient CO monitor can fulfill a PAMS CO monitor requirement. The District meets or exceeds all minimum requirements for CO monitoring for all programs.

### 6.3.1 Carbon Monoxide Design Criteria for Near-road Requirements

In an effort to measure concentrations for some pollutants in communities located by highly trafficked roadways, the EPA instituted the Near-road monitoring program. Requirements 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(b)[12]. One CO monitor is to be collocated with the required near-road $NO_2$ monitor for CBSA having populations greater than 1,000,000. Table 6.4 lists the Near-road requirements.

[12](2019) 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", subpart 4.2.1(a) lists requirements to fulfill carbon monoxide (CO) near-road design criteria.

**Table 6.4 Carbon Monoxide Minimum Monitoring Requirements-Near-road**

| MSA (name) | County (name) | Population Estimated from 2010 Census (#) | Are Near-road $NO_2$ Monitors Required (yes/no) | Are Collocated CO Monitors Required (yes/no) | Number of Collocated CO Monitors Required (#) | Number of Collocated CO Monitors Active (#) | Number of Collocated CO Monitors Needed (#) |
|---|---|---|---|---|---|---|---|
| San Diego | San Diego | 3.3 Million | Yes | Yes | 1 | 1 | 0 |

## 6.3.2 Carbon Monoxide Minimum Monitoring Requirements-Regional Administrator

Requirements for the Regional Administrator Required Monitoring are detailed 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 4.2.2(a)[13]. This reference states the requirement for additional CO monitors above the minimum number of required monitors, where the minimum requirements are not sufficient to meet objectives. Table 6.5 lists the Regional Administrator Designated CO Monitoring requirements for the SDAB. The county does not have a Regional Administrator site active.

**Table 6.5 Carbon Monoxide Minimum Monitoring Requirements-Regional Administrator**

| MSA (name) | County (name) | Population Estimated from 2010 Census (#) | Number of Regional Administrator sites Required (#) | Number of Regional Administrator sites Active (#) | Number of Regional Administrator sites Needed (#) |
|---|---|---|---|---|---|
| San Diego | San Diego | 3.3 Million | 0 | *0 | 0 |

*The Downtown/Barrio Logan station was in an Environmental Justice area and the District sampled for CO as a legacy monitor. CO emissions in Barrio Logan were so far below the NAAQS that the EPA Regional Authorities approved the decommissioning of monitoring in this area.

## 6.3.3 Carbon Monoxide Minimum Monitoring Requirements - NCore

The District is required to operate a CO monitor as part of the NCore multipollutant monitoring program. This program was designed to measure pollutants at lower levels, low ppb-ppt range. The requirements are described in 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 3, "Design Criteria for NCore Sites", subpart 3(b)[14]. The District operates one CO monitor for NCore. Table 6.6 lists the NCore CO requirements.

**Table 6.6 Carbon Monoxide Minimum Monitoring Requirements-NCore**

| Number of CO Monitors Required at NCore Sites (#) | Number of CO Monitors Active at NCore Sites (#) | Number of CO Monitors Needed at NCore Sites (#) | NCore Sites/Locations (name) | NCore Sites/Locations AQS ID (#) |
|---|---|---|---|---|
| 1 | 1 | 0 | Lexington (LES) | 06-073-1022 |

[13](2019) 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", subpart 4.2.2(a), lists requirements to fulfill Regional Administrator design criteria.
[14](2019) 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 3, "Design Criteria for NCore sites", subpart 3(b) lists the requirements for NCore measurements.

### 6.3.4 Carbon Monoxide Minimum Monitoring Requirements-State (SIP)

The District must operate one non-source monitor as part of the 2004 Revision to the California State Implementation Plan (SIP) for Carbon Monoxide[15]. Table 6.7 summarizes these requirements.

**Table 6.7 Carbon Monoxide Minimum Monitoring Requirements-State (SIP)**

| Number of CO Monitors Required for the SIP (#) | Number of CO Monitors Active for the SIP (#) | Number of CO Monitors Needed for the SIP (#) | SIP Sites/Locations (name) | SIP Sites/Locations AQS ID (#) |
|---|---|---|---|---|
| 1 | 1 | 0 | Lexington (LES) | 06-073-1022 |

## 6.4 Carbon Monoxide - Correlation Matrix

The correlation matrix analysis (Figure 6.4) shows the correlation, mean absolute difference, distance between sites, and design values. This graphic gives you information about how concentrations at CO monitors within San Diego County compare to one another. The red squares in the top-right corner show the mean absolute difference in concentrations between each pair of monitors, with text indicating the distance in kilometers between each pair of monitors. The intensity of the red boxes (from light red to dark red) represents the mean absolute difference in concentration where a dark red represents 1 ppm difference and light red represents 0 ppm difference. Each monitor comparison is represented by a square in the chart. The blue squares in the bottom-left corner show the correlation between each of the monitors, with text indicating the number of days used in the calculation. The intensity of the blue boxes (from light blue to dark blue) represents the correlation between sites where the lightest shade of blue is a correlation equal to 1 and the dark blue has a correlation equal to -1. The numbers along the diagonal indicate the most recent design value for each monitor. AQS site data with less than 75% completion are not used in this analysis.

The correlation matrix shown in Figure 6.4 includes two sites (Rancho Carmel Drive and Lexington Elementary School). The distance between the two sites is 25 kilometers. The most recent design values are 1.3 ppm and 1.1 ppm for Rancho Carmel Drive and Lexington Elementary School, respectively.

[15](2004) Revision to the California State Implementation Plan for Carbon Monoxide, http://www.arb.ca.gov/planning/sip/co/final_2004_co_plan_update.pdf

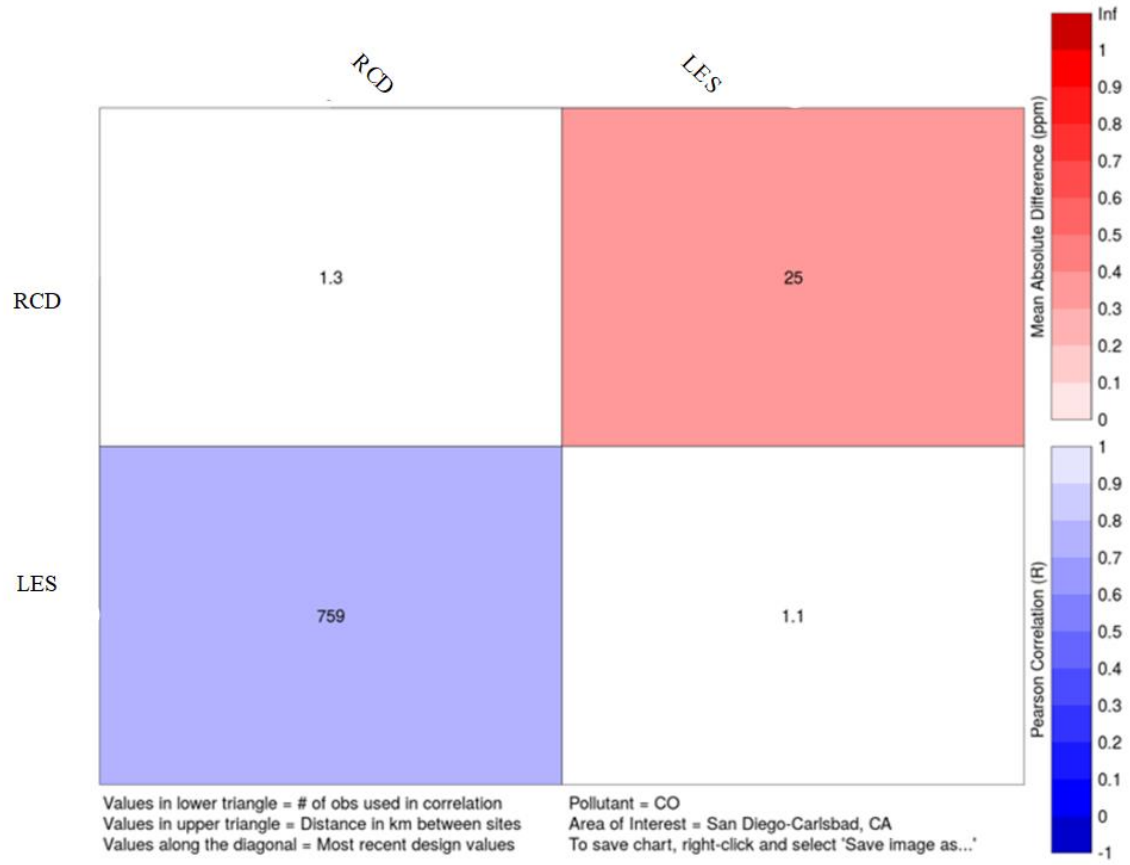



**Figure 6.4 Correlation Matrix – Carbon Monoxide**

## 6.4.1 Carbon Monoxide - Removal Bias

The CO removal bias determines sites that are considered redundant throughout the network. The bias estimation uses the nearest neighbor site to estimate the concentration at that location if the site was not there. The Removal Bias tool finds the nearest neighbors to each selected site and then uses the data from the neighboring sites to estimate concentrations at the site. A positive bias indicates that if the site being examined was removed, the neighboring site(s) would register higher values for the region served by that site. The opposite indicates negative bias, i.e. neighboring sites registering lower values. Figure 6.5 is a map of the CO analyzers 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. If the bias is small, that may indicate that the monitor is redundant and could be removed. The map shows that the removal of any CO analyzer from the sites will create a bias. Both analyzers are requirements at each site and there is no plan to remove either analyzer.

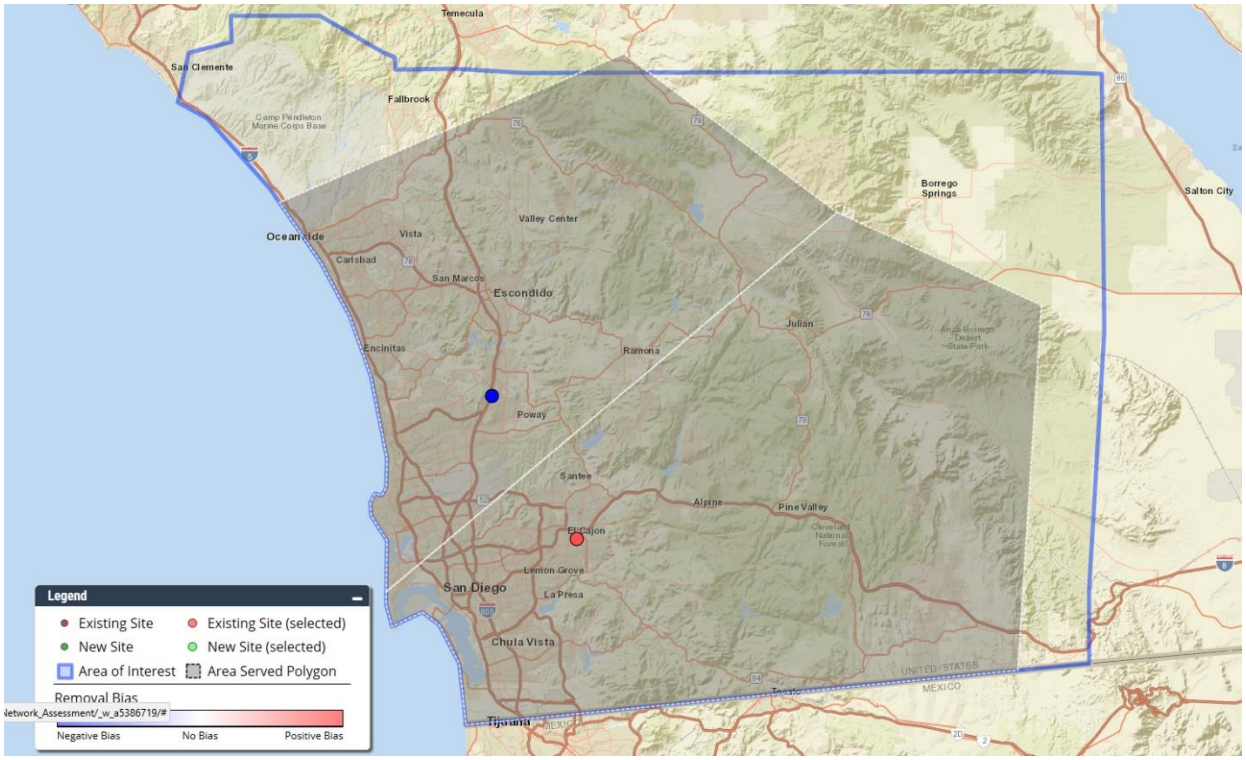



**Figure 6.5 Removal Bias Map – Carbon Monoxide**

## 6.4.2 Carbon Monoxide – Area Served

Figure 6.6 is a pictorial representation of the area served by the CO monitors in the air quality network. Each polygon represents the area that is closer to the monitor within it than any other monitor in the network. The CO monitor at Rancho Carmel Drive serves as the CO monitor for the Near Road program and provides CO data for much of northern San Diego county. The CO monitor at Lexington Elementary School is part of the NCore program and serves the southern portion of San Diego county. The representative area for each CO monitor is listed in Table 6.8 along with total population in the area served. The demographics of the area served are listed in Table 6.9 and 6.10

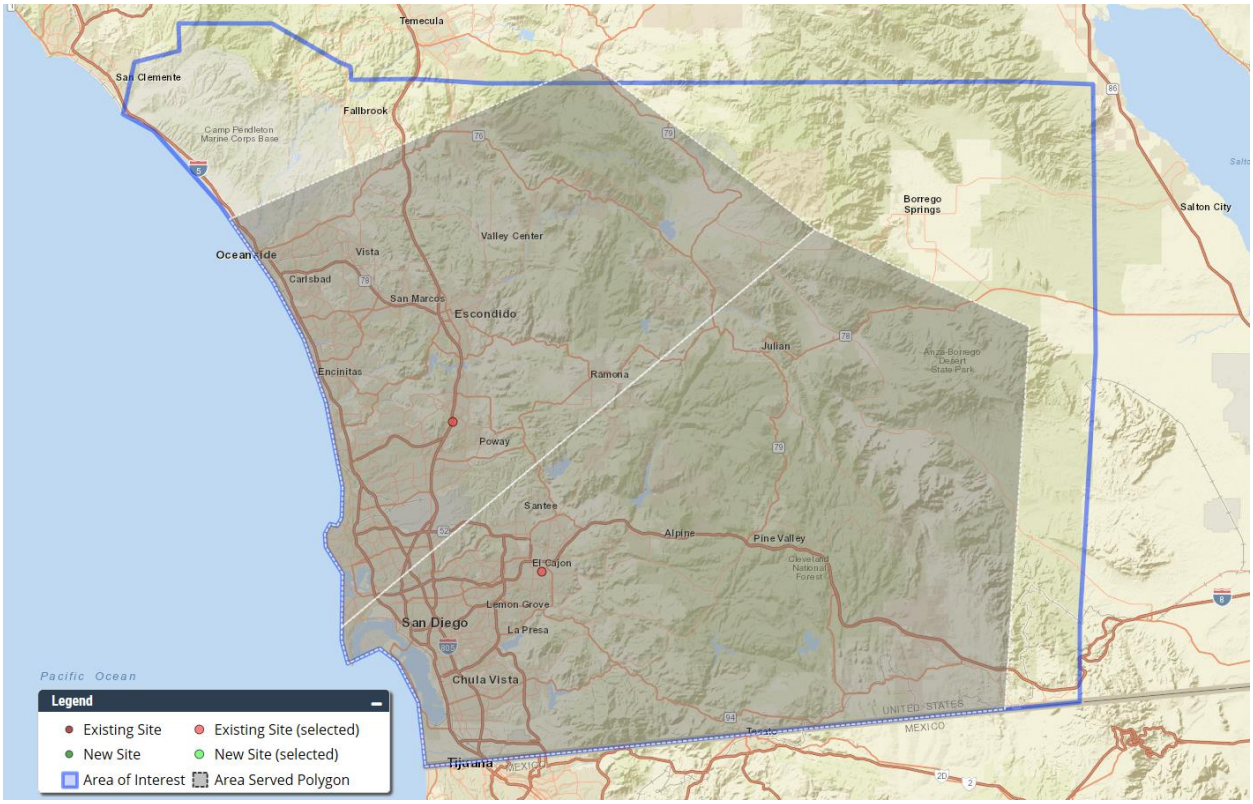



**Figure 6.6 Area Served Map – Carbon Monoxide**

**Table 6.8 Area Served and Total Population – Carbon Monoxide**

| Site Name | Area ($km^2$) | Total Population |
|---|---|---|
| Rancho Carmel Drive | 3674 | 1446559 |
| Lexington Elementary School | 6400 | 1568562 |

**Table 6.9 Area Served Demographics – Carbon Monoxide (Race)**

| Site Name | Male | Female | Caucasian/ White | African/ Black | Native American | Asian | Pacific Islander | Other Race | Multiple Races | Hispanic/ Latino |
|---|---|---|---|---|---|---|---|---|---|---|
| Rancho Carmel Dr. | 718929 | 727630 | 991227 | 36802 | 11758 | 180835 | 6156 | 150398 | 69383 | 344545 |
| El Cajon - LES | 787347 | 781215 | 931053 | 117894 | 13777 | 153262 | 8765 | 258678 | 85133 | 622394 |

**Table 6.10 Area Served Demographics – Carbon Monoxide (Age)**

| Site Name | Age 0-4 | Age 5-9 | Age 10-14 | Age 15-19 | Age 20-24 | Age 25-29 | Age 30-34 | Age 35-39 | Age 40-44 |
|---|---|---|---|---|---|---|---|---|---|
| Rancho Carmel Dr. | 91905 | 90116 | 91013 | 99265 | 114422 | 112829 | 101423 | 99233 | 100649 |
| El Cajon - LES | 103965 | 98747 | 103600 | 118301 | 137213 | 130750 | 114728 | 108493 | 105989 |
| **Site Name** | **Age 45-49** | **Age 50-54** | **Age 55-59** | **Age 60-64** | **Age 65-69** | **Age 70-74** | **Age 75-79** | **Age 80-84** | **Age 85 & Over** |
| Rancho Carmel Dr. | 106771 | 102560 | 87738 | 73768 | 50957 | 37249 | 31105 | 26602 | 28954 |
| El Cajon - LES | 109983 | 105160 | 89516 | 72794 | 50011 | 38372 | 31954 | 25012 | 23974 |

## 6.5 Carbon Monoxide Monitors and Station Evaluation Summary

The 2020 Network Assessment tool is used to evaluate the CO monitors deployed throughout the San Diego Air Monitoring Network. Table 6.11 is a summary of the District's CO monitor rating for the network instruments. The District has two CO monitors, which are located at the Rancho Carmel Drive station and Lexington Elementary School. The purpose of these monitors was discussed in the sections above. The analysis includes the scores of station correlation, removal bias, area served, community type, and monitor needs. The District proposed that no CO monitors are to be decommissioned.

**Table 6.11 CO Monitor Summary Rating**

| | **Overall Scoring** | **COMMENTS** | **1.**Correlation and Removal | **2.** Community Type and Area Served | **3.**Monitors and QA/QC Needs | **4.**Internal / Other |
|---|---|---|---|---|---|---|
| Lexington Elementary School (LES) | **31** | **1:** n/a<br>**2:** Light Industrial/mixed use<br>**4:** Required for NCore; recently moved | 8 | 7 | 6 | 10 |
| Rancho Carmel Drive (RCD) | **33** | **1:** n/a<br>**2:** Bedroom<br>**4:** Required for Near-road | 8 | 9 | 6 | 10 |

## 6.6 Conclusion – Carbon Monoxide

Over the last two decades, CO concentrations in San Diego county have trended downward. The District has two required CO monitors as part of the Ambient Air Monitoring Network; there are no additional CO monitors. The CO monitor at Rancho Carmel Drive is part of the Near Road program and the CO monitor at Lexington Elementary School is part of the NCore program. As the District moves forward with CO monitoring in the Air Quality Network, the District plans to maintain the existing CO monitors, as they are both federally required. There are no plans to decommission any CO monitors in the network.

# Chapter 7 Sulfur Dioxide ($SO_2$)

## 7.1 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. Table 7.1 lists the air quality standards for Sulfur Dioxide. Please note:

- The El Cajon station was relocated to Lexington Elementary School from Floyd Smith Drive.

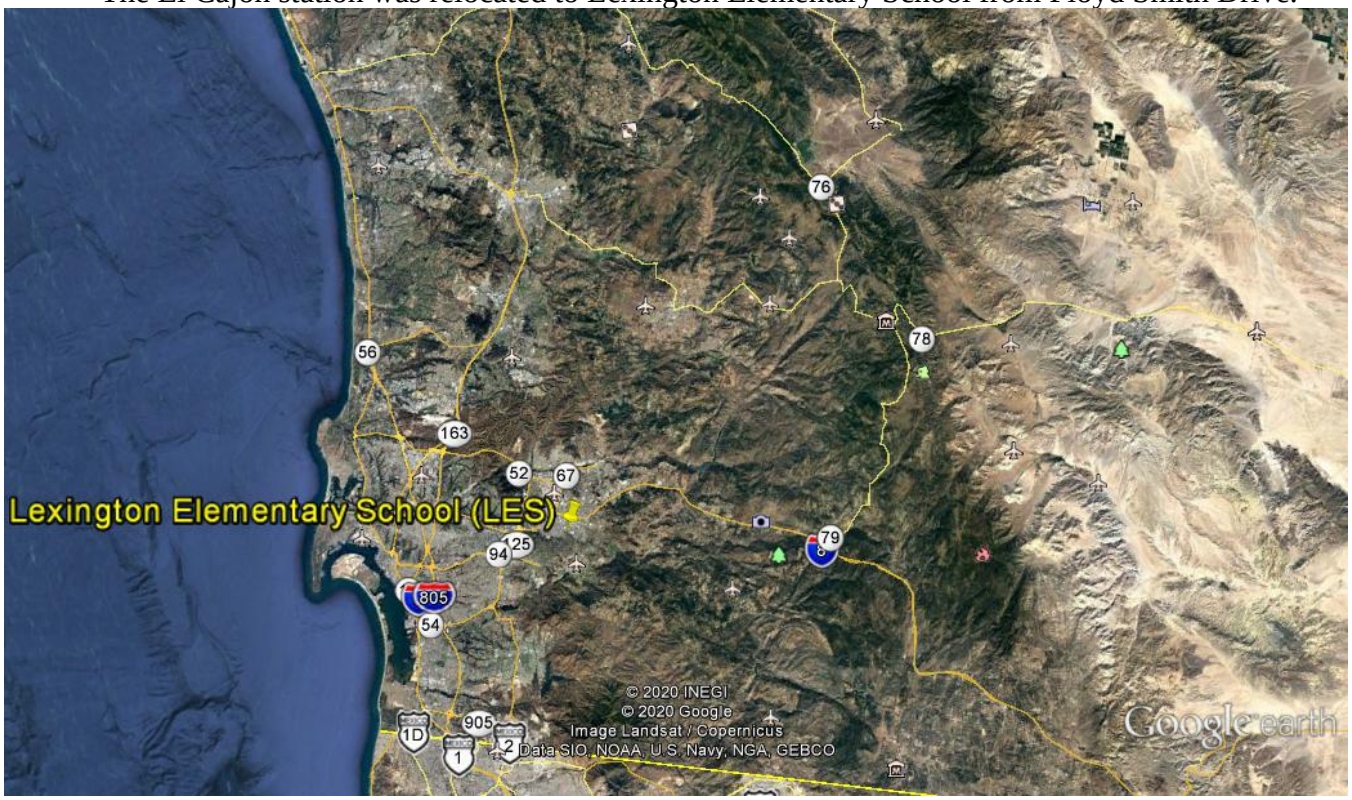



**Figure 7.1 Sulfur Dioxide Network Map**

**Table 7.1 Sulfur Dioxide State and National Standards for the Year**

| Ambient Air Quality Standards | | | | |
|---|---|---|---|---|
| Pollutant | Averaging Time | California Standards | National Standards | |
| | | Concentration | Primary | Secondary |
| Sulfur Dioxide ($SO_2$) | 1 hour | 0.25 ppm (665 µg/m$^3$) | 75 ppb (196 µg/m$^3$) | Not Applicable |
| | 3 hour | Not Applicable | Not Applicable | 0.5 ppm (1300 µg/m$^3$) |
| | 24 hour | 0.04 ppm (105 µg/m$^3$) | Not Applicable in San Diego | Not Applicable |
| | Annual Arithmetic Mean | Not Applicable | Not Applicable in San Diego | Not Applicable |

## 7.2 Sulfur Dioxide Trends in the SDAB

Emissions of $SO_x$ have declined tremendously in California over the last 20 years. A major constituent of $SO_x$ 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. Figure 7.2 shows the concentrations of Sulfur Dioxide over the last twenty years. Note that the "Days above National Standard" row in Table 7.2 reflects the $SO_2$ standards for that year.

**Table 7.2 Sulfur Dioxide Concentrations for San Diego-for the Last 20 Years 1999-2019**

| | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Maximum 1-Hr Concentration (ppm) | 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 | 0.001 | 0.001 | 0.001 | 0.003 | 0.001 |
| Maximum 24-Hrs Concentration (ppm) | 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 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Maximum Annual Average (ppm) | 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 | 0.000 | 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 |

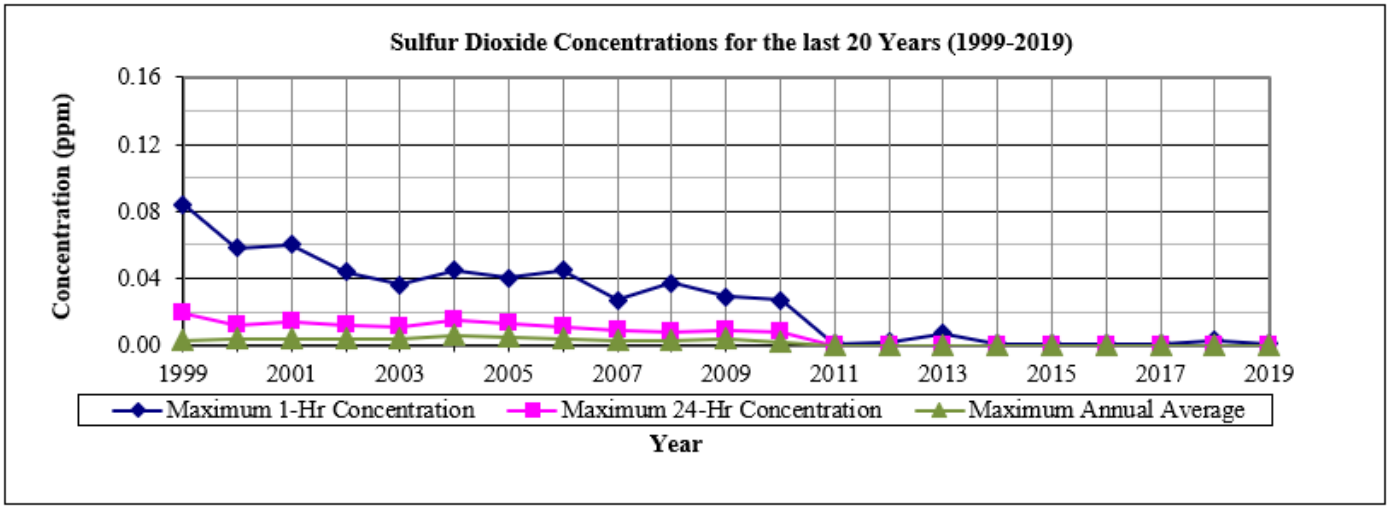



**Figure 7.2 Sulfur Dioxide Concentrations for San Diego-for the Last 20 Years Graph**

## 7.2.1 Sulfur Dioxide Measurements by Site, Yearly 2015 - 2019

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

**Table 7.3 Sulfur Dioxide Measurements by Site, 2015 - 2019**

| Site (name) | | Maximum Concentration for 1-Hr (ppm) | | | | | Maximum Concentration for 24-Hrs (ppm) | | | | | Annual Average (ppm) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2015 | 2016 | 2017 | 2018 | 2019 | 2015 | 2016 | 2017 | 2018 | 2019 | 2015 | 2016 | 2017 | 2018 | 2019 |
| El Cajon | FSD & LES | 0.001 | 0.001 | 0.001 | 0.003 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

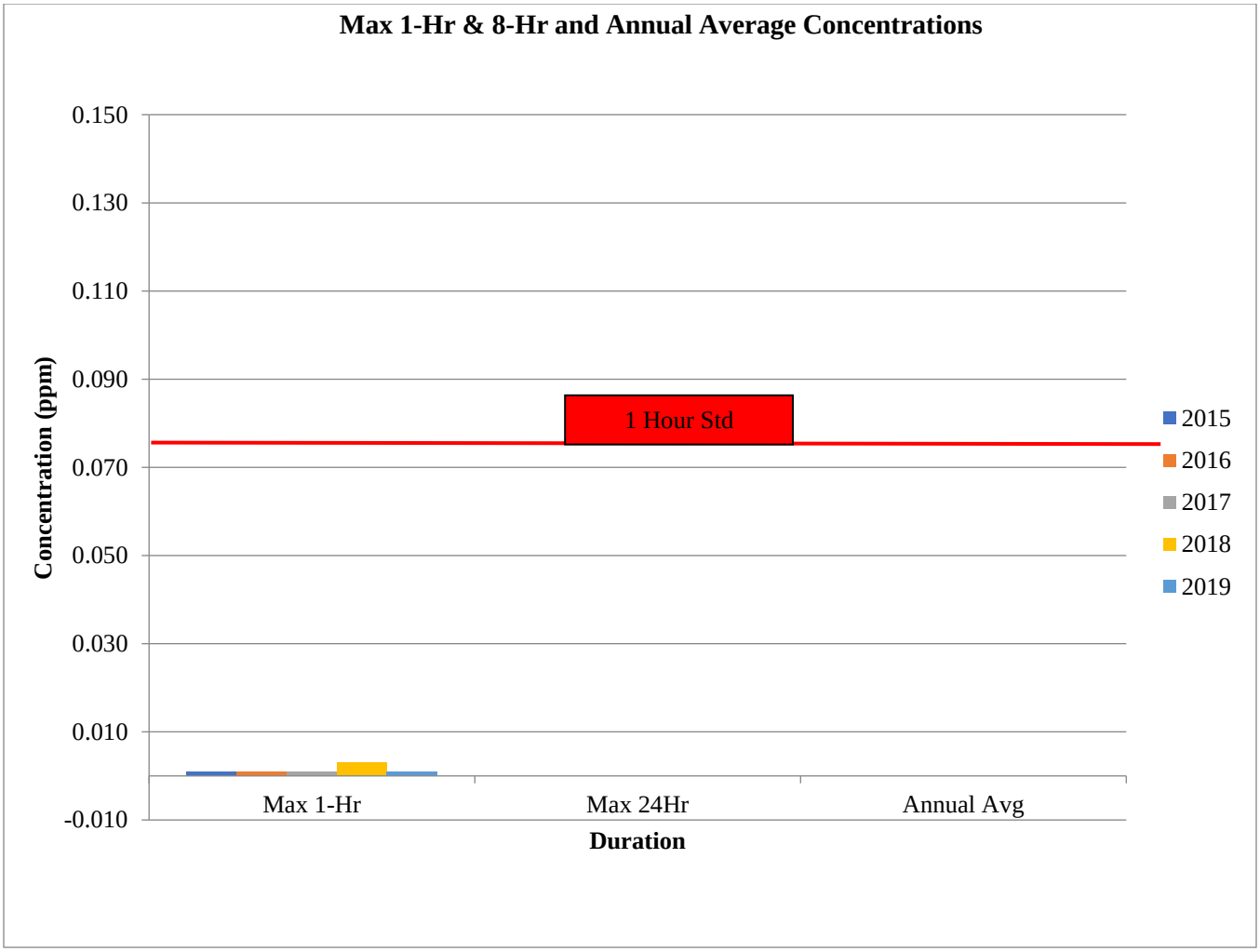



**Figure 7.3 Graph of $SO_2$ Max 1-Hr & 24-Hr concentrations and Annual Average at FSD & LES**

## 7.2.2 Sulfur Dioxide Concentrations for San Diego-by Site for the Design Value

Table 7.4 lists the maximum sulfur dioxide measurements for the NCore monitoring location. The most recent design value is based on the maximum concentration data from 2017 to 2019. Figure 7.4 shows the values graphically with respect to the National Standard.

**Table 7.4 Sulfur Dioxide Concentrations for San Diego-by Site for the Design Value**

| Site (site) | Site Abbreviation | Design Value Maximum Concentration 1-Hr **2017-2019** (ppm) | Number of Days Above the National Standard (#) |
|---|---|---|---|
| Lexington | LES | 0.001 | 0 |

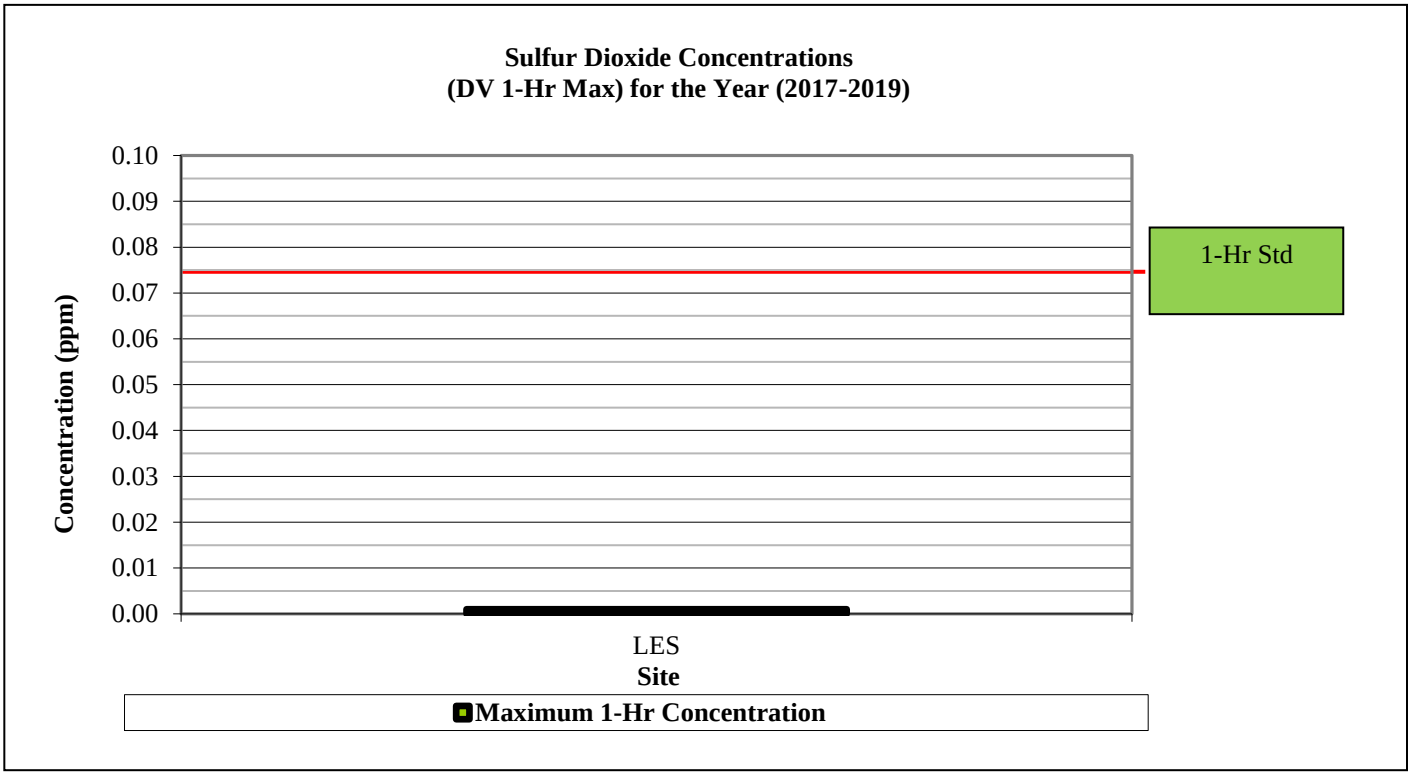



**Figure 7.4 Sulfur Dioxide Concentrations for San Diego-by Site for the Design Value Graph**

## 7.3 Sulfur Dioxide Minimum Monitoring Requirements

The District is federally mandated to monitor $SO_2$ levels in accordance with the CFR. This section will state the different monitoring requirements for each program, ambient, NCore, etc. that the District operates and the references therein (Note: only the passages applicable/informative to the District are referenced). These monitors can serve as fulfilling other $SO_2$ network requirements, e.g. ambient $SO_2$ monitor can fulfill a PAMS $SO_2$ monitor requirement.

The Districts meets or exceeds all minimum requirements for $SO_2$ monitoring for all programs.

### 7.3.1 Sulfur Dioxide Minimum Monitoring Requirements-Ambient

The procedure to determine the minimum number of ambient (or non-source) level monitors required is different than the other gaseous criteria pollutants. It is based on the total $SO_2$ emissions in the air basin with respect to the population of the air basin. The requirements 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(a), "Requirement for Monitoring by Population Weighted Emissions Index."[16] Tables 7.5 and 7.6 lists these requirements.

> *4.4.2(a) Sulfur Dioxide ($SO_2$) Design Criteria Requirement for Monitoring by the Population Weighted Emissions Index*

[16](2019) 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, subpart 4.4.2(a) "Requirement for Monitoring by the Population Weighted Emissions Index" lists the minimum monitoring requirements for sulfur dioxide ($SO_2$).

*The population weighted emissions index (PWEI) shall be calculated by States for each core based statistical area (CBSA) they contain or share with another State or States for use in the implementation of or adjustment to the $SO_2$ 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 $SO_2$ 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 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 $SO_2$ 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 $SO_2$ monitors are required within that CBSA. For any CBSA with a calculated PWEI value equal to or greater than 5,000, but less than 100,000, a minimum of one $SO_2$ monitor is required within that CBSA.*

**Table 7.5 Sulfur Dioxide Minimum Monitoring Requirements - EPA NEI $SO_2$**

| MSA (name) | County | Population Estimated from 2010 Census (yes/no) | Total $SO_2$ Emissions From NEI (tons/yr) | Total $SO_2$ Emissions ÷ 1,000,000 (TPY-1M) | Calculated PWEI= Total $SO_2$ Emissions x Population (MPeople-TPY) |
|---|---|---|---|---|---|
| San Diego | San Diego | 3.3 Million | 1,444 | 0.0001444 | 4,765.2 |

**Table 7.6 Sulfur Dioxide Minimum Monitoring Requirements-Ambient**

| Calculated PWEI (MP-TPY) | Are the Emissions <5,000 MP-TPY? (yes/no) | Number of Required $SO_2$ Monitors Monitors (#) | Number of Active $SO_2$ Monitors Monitors (#) | Number of Ambient $SO_2$ Monitors Needed (#) |
|---|---|---|---|---|
| 4,765.2 | Yes | 1 | 1 | 0 |

## 7.3.2 Sulfur Dioxide Minimum Monitoring Requirements-NCore

If the calculated PWEI is below a certain threshold, the EPA allows the minimum required $SO_2$ monitor to be the District's NCore $SO_2$ required monitor. This is 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", subpart 4.4.2(1)[17] and in 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 3, "Design Criteria for NCore Sites", part 3(b)[18]. Table 7.7 lists these requirements.

[17](2019) 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, subpart 4.4.2(1) "Requirement for Monitoring by the Population Weighted Emissions Index" lists the minimum monitoring requirements for sulfur dioxide ($SO_2$).

[18](2019) 40 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 for NCore measurements.

*4.4(1 )Sulfur Dioxide ($SO_2$) Design Criteria*
*The $SO_2$ monitoring site(s) required as a result of the calculated PWEI in each CBSA shall satisfy minimum monitoring requirements if the monitor is sited within the boundaries of the parent CBSA and is one of the following site types (as defined in section 1.1.1 of this appendix): population exposure, highest concentration, source impacts, general background, or regional transport. $SO_2$ monitors at NCore stations may satisfy minimum monitoring requirements if that monitor is located within a CBSA with minimally required monitors under this part.*

*3(b) Design Criteria for NCore Sites*
*The NCore sites must measure, at a minimum…, $SO_2$...*

**Table 7.7 Sulfur Dioxide Minimum Monitoring Requirements-NCore**

| MSA | County | Number of NCore $SO_2$ Monitors Required (#) | Number of NCore $SO_2$ Monitors Active (#) | Number of NCore $SO_2$ Monitors Needed (#) | Met NAAQS? (yes/no) |
|---|---|---|---|---|---|
| San Diego | San Diego | 1 | 1 | 0 | yes |

## 7.4 $SO_2$ Monitor and Station Evaluation Summary

The EPA has Network Assessment tools available for the assessment of $SO_2$ monitors and station comparisons throughout the Air Monitoring Network. However, the $SO_2$ monitor at Lexington Elementary School is the only site that monitors $SO_2$ in the San Diego Air Monitoring Network. No further analysis is necessary, because the District already operates the minimum number of $SO_2$ monitors allowed/required by EPA. For reference, Figure 7.5 shows the Area Served Map from the Network Assessment tool. A correlation matrix, and a removal bias map are not available for $SO_2$ monitors in the Air Monitoring Network because there is only one site (LES). More than one site is required to have a correlation matrix or to provide a reliable removal bias assessment.

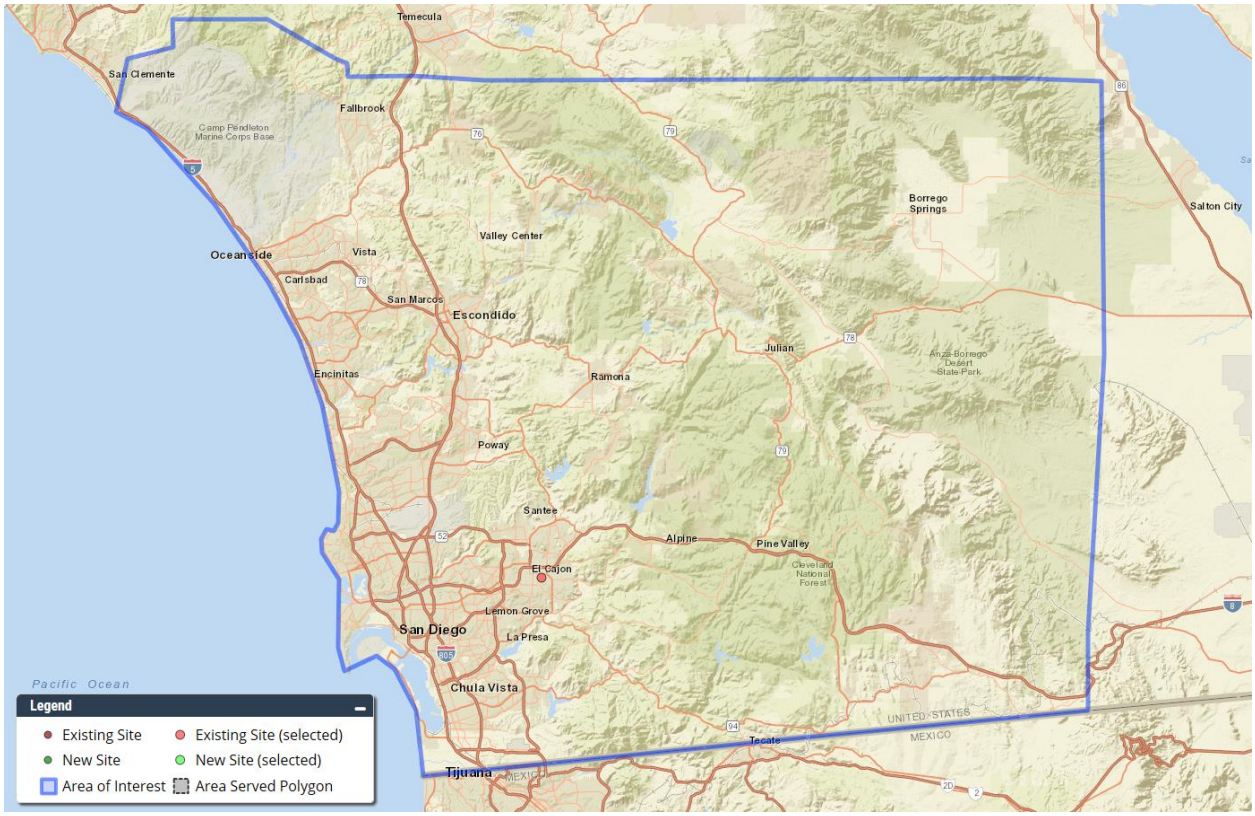



**Figure 7.5 Area Served Map – Sulfur Dioxide ($SO_2$)**

## 7.5 Conclusion – Sulfur Dioxide ($SO_2$)

The NCore $SO_2$ monitor is federally required. The annual average is routinely below 1 ppb, the maximum 24-hr concentration is routinely below 1 ppb, and the maximum 1-hr concentration is routinely below 5 ppb, and well below the standards for these metrics. The monitor consistently measures near zero concentrations and has since the inception of the NCore program. The $SO_2$ data from the NCore site is informative to EPA in showing areas that achieve these low $SO_2$ concentrations compared to other regions (outside of the San Diego Air Basin) with higher $SO_2$ measurements.

# Chapter 8 Lead (Pb)

## 8.1 Lead – Introduction

Regulatory Lead (Pb) was sampled for at one location in the SDAB (Figure 8.1 and Table 8.2) and referenced to the lead standards of the year (Table 8.1). Source level lead was sampled at McClellan-Palomar airport.

- The ambient level lead sampler in El Cajon (Floyd Smith Drive) was part of the NCore program. The final year of lead data for this site was 2016.

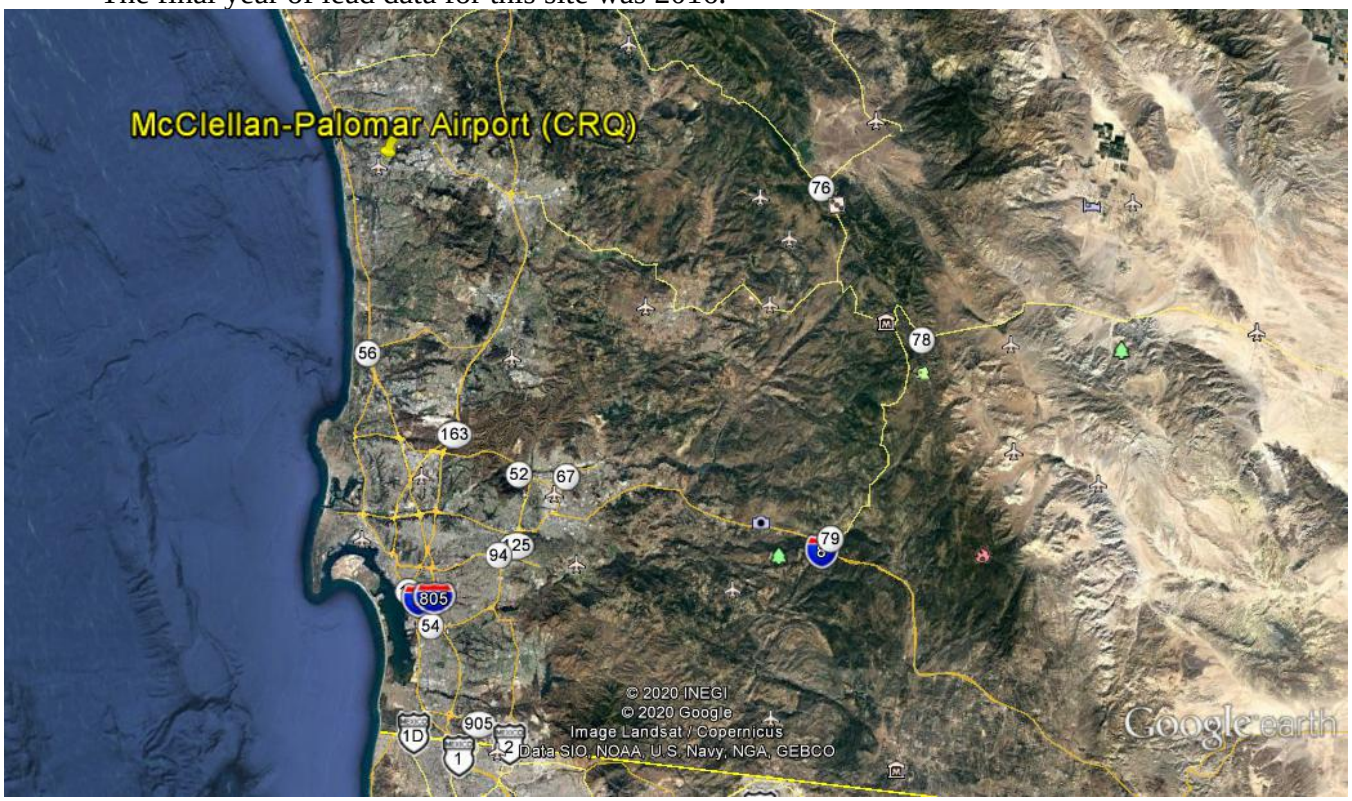



**Figure 8.1 Lead Network Map**

**Table 8.1 Lead State and National Standards for the Year**

| Ambient Air Quality Standards | | | | |
|---|---|---|---|---|
| Pollutant | Averaging Time | California Standards | National Standards | |
| | | Concentration | Primary | Secondary |
| Lead (Pb) | 30 Day Average | 1.5 µg/m$^3$ | Not Applicable | Not Applicable |
| | Calendar Quarter | Not Applicable | 1.5 µg/m$^3$ (for certain areas) | 1.5 µg/m$^3$ (for certain areas) |
| | Rolling 3-Month Average | Not Applicable | 0.15 µg/m$^3$ | 0.15 µg/m$^3$ |

## 8.2 Lead – Trends in the SDAB

The rapid decrease in lead emissions since the 80s 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 8.2 reflect the lead standard for that year. No Testing (NT) was conducted in the SDAB from 1997 until 2012. The measured

concentrations for 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 8.2 Lead Concentrations for San Diego-for the Last 20 Years**

| | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Maximum Calendar Quarter ($\mu g/m^3$) | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | 0.006 | 0.007 | 0.010 | 0.015 | 0.010 | 0.020 | 0.020 | 0.020 |
| Maximum Rolling 3-Month Average ($\mu g/m^3$) | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | 0.006 | 0.007 | 0.011 | 0.015 | 0.010 | 0.020 | 0.020 | 0.020 |
| Days above the National Standard | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

***NT= Not Tested**

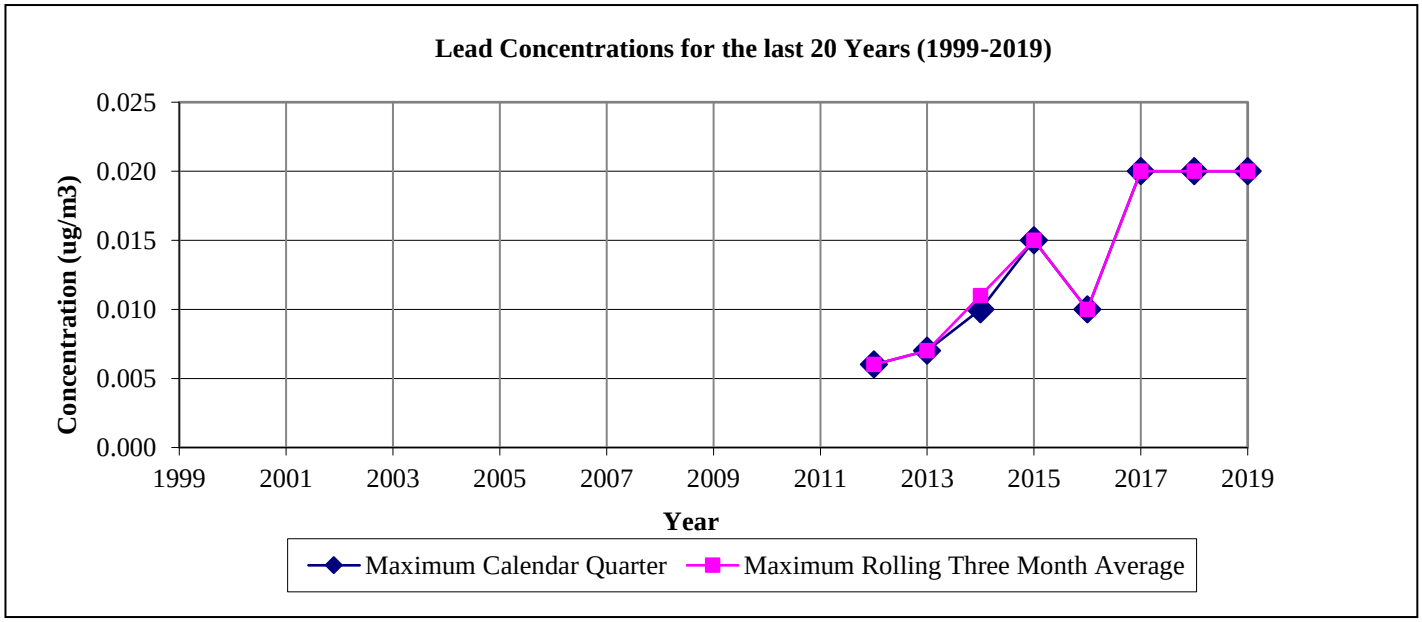



**Figure 8.2 Lead Concentrations for San Diego-for the Last 20 Years**

## 8.2.1 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 8.3 lists the maximum lead measurements for each lead monitoring location. Figure 8.3 shows trends graphically with respect to the Rolling 3-Mo Std for 2015 (0.15 $\mu g/m^3$).

**Table 8.3 Lead Measurements by Site, 2015-2019**

| Site (name) | | Maximum Rolling 3-Month Average ($\mu g/m^3$) | | | | |
|---|---|---|---|---|---|---|
| | | 2015 | 2016 | 2017 | 2018 | 2019 |
| El Cajon (NCore) | FSD (NCore) | 0.01 | 0.01 | n/a | n/a | n/a |
| Palomar Airport | CRQ | 0.02 | 0.01 | 0.02 | 0.02 | 0.02 |

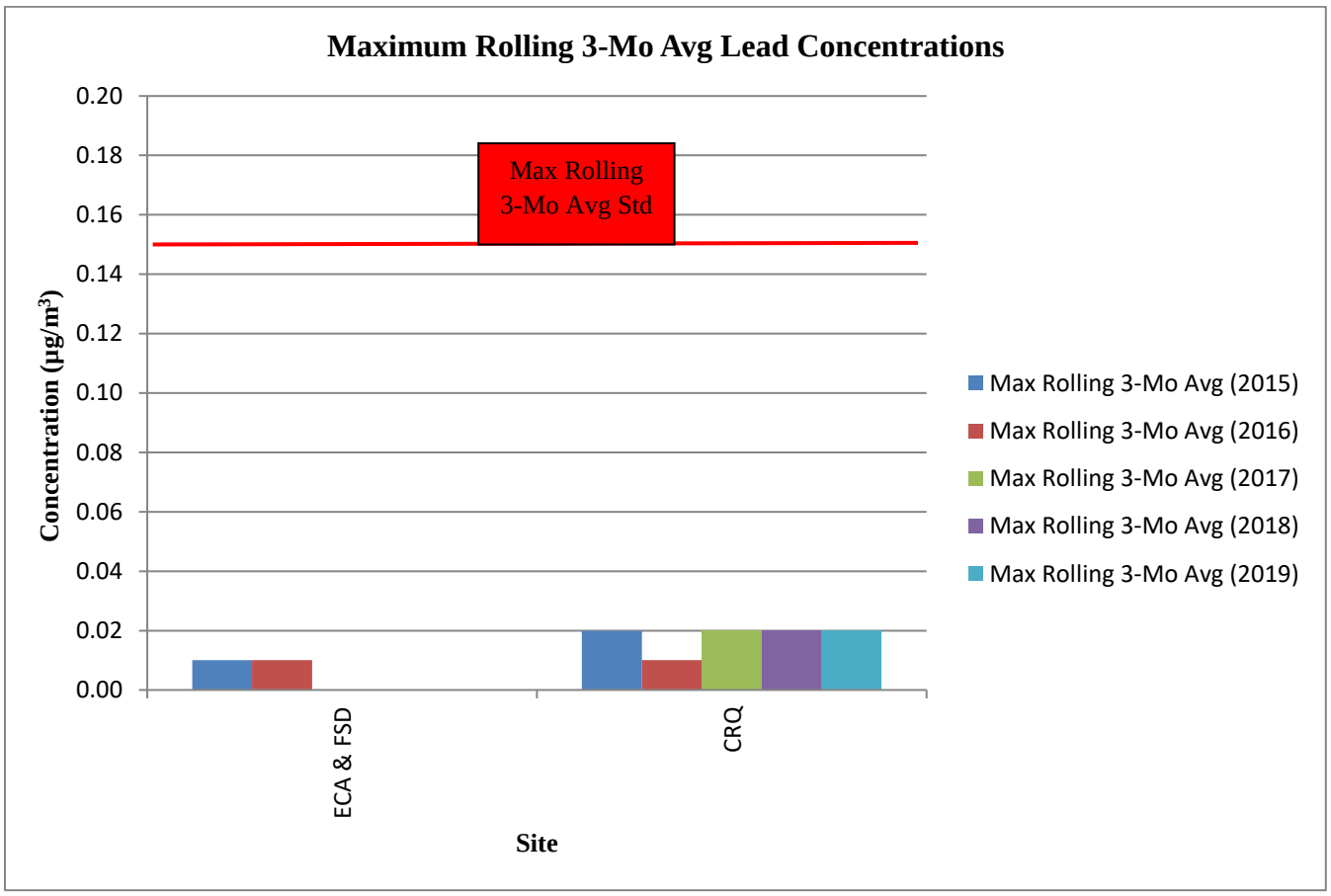



**Figure 8.3 Lead Measurements by Site, 2015-2019**

## 8.3 Lead Design Criteria Requirements from the Code of Federal Regulations

The District is federally mandated to monitor Pb levels in accordance with the CFR. This section will state the different minimum monitoring requirements for each program, e.g. ambient, NCore, Airports, etc. that the District operates and the references therein (Note: only the passages applicable/informative to the District are referenced). For detailed information regarding the Lead program, refer to the current Annual Network Plan.

The District meets or exceeds all minimum requirements for Pb monitoring for all programs.

### 8.3.1 Lead Minimum Monitoring Requirements-Source (non-Airport) & Source (Airport)

The requirements necessary to fulfill the Lead (Pb) source monitoring requirements are described in 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4.5(a)[19]. The procedure to determine the minimum number of non-Airport source level monitors required is based on any non-Airport source emitting more than 0.5 tons/year of Pb emissions. Table 8.4 lists these requirements for non-Airport sources. The procedure to determine the minimum number of Airport source level monitors is the same, except that the threshold is 1.0 tons/year. Table 8.5 lists these requirements for

[19](2019) 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) lists the requirements necessary to fulfill the Lead (Pb) source monitoring requirements.

Airport source level sampling. The sources and their Pb emissions are based on the latest published EPA National Emissions Inventory (NEI) database (http://www.epa.gov/ttn/chief/eiinformation.html).

**Table 8.4 Lead Minimum Monitoring Requirements-Source (non-Airport) based on the NEI**

| MSA (name) | County (name) | From NEI* Any Non-Airport Pb Sources >0.5 TPY? (yes/no) | From NEI What is the Largest Non-Airport Pb Source? | From NEI What is the Largest Non-Airport Pb Emissions Rate? (TPY) | Number of Non-Airport Sources Pb Monitors Required (#) | Number of Non-Airport Sources Pb Monitors Active (#) | Number of Non-Airport Sources Pb Monitors Needed (#) |
|---|---|---|---|---|---|---|---|
| San Diego | San Diego | No | Camp Pendleton | 0.23 | 0 | 0 | 0 |

**Table 8.5 Lead Minimum Monitoring Requirements-Source (Airport) based on the NEI**

| MSA (name) | County (name) | From NEI* Any Airport Pb Sources >=1.0 TPY? (yes/no) | From NEI What is the Largest Airport Pb Source (TPY) | From NEI What is the Largest Airport Pb Emissions Rate? (TPY) | Number of Airport Sources Pb Monitors Required (#) | Number of Airport Sources Pb Monitors Active (#) | Number of Airport Sources Pb Monitors Needed (#) |
|---|---|---|---|---|---|---|---|
| San Diego | San Diego | No | Montgomery Field | 0.59 | 0 | 0 | 0 |

## 8.3.2 Lead Minimum Monitoring Requirements-Special Study (Airport)

One EPA regulation states that if an airport emits less than 1.0 TPY of Pb emissions, no source sampling is required. In 2011, the EPA added a regulation that listed several airports to undergo temporary Pb sampling, regardless if the NEI listed Pb emissions were less than 1.0 TPY. If the analyzed emissions exceeded the NAAQS by 50%, the sampler was to become permanent, or until the emissions were proven to be less than 50% of the NAAQS (over a minimum 3-yr period). These requirements are listed in 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4.5(a)(iii)[20] and shown in Table 8.6.

> *4.5(iii) Lead (Pb) Design Criteria*
> *…local agencies are required to conduct ambient air Pb monitoring near each of the airports listed in Table D-3A for a period of 12 consecutive months commencing no later than December 27, 2011. Monitors shall be sited to measure the maximum Pb concentration in ambient air, taking into account logistics and the potential for population exposure, and shall use an approved Pb-TSP Federal Reference Method or Federal Equivalent Method. Any monitor that exceeds 50 percent of the Pb NAAQS on a rolling 3-month average (as determined according to 40 CFR part 50, Appendix R) shall become a required monitor under paragraph 4.5(c) of this Appendix, and shall continue to monitor for Pb unless a waiver is granted allowing it to stop operating as allowed by the provisions in paragraph 4.5(a)(ii) of this appendix. Data collected shall be submitted to the Air Quality System database according to the requirements of 40 CFR part 58.16.*

[20](2019) 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) lists the specific airports mandated by the EPA to monitor for lead (Pb).

*Table D-3A Airports to be Monitored for Lead*

| ***Airport*** | **County** | **State** |
|---|---|---|
| McClellan-Palomar | San Diego | *CA* |
| Gillespie Field | San Diego | *CA* |

**Table 8.6 Lead Minimum Monitoring Requirements - Airport (Special Study) Results**

| Names of Airport Monitors Required (name) | Was Airport Testing Done? (yes/no) | Is Airport Testing Concluded? (yes/no) | Did the Airport Pass? (yes/no) | Does the Airport Require Continued Sampling? (yes/no) | Is Continued Sampling Active? (yes/no) | Number of Continued Sampling Sites Needed (#) |
|---|---|---|---|---|---|---|
| McClellan-Palomar | Yes | yes | NO | YES | YES | 0 |
| *Gillespie Field | Yes | yes | yes | no | Not Applicable* | Not Applicable |

*Gillespie Field

The Airport study at Gillespie Field officially concluded and it was determined by EPA to discontinue all lead sampling at the airport.

McClellan-Palomar

The Airport study at McClellan-Palomar Airport has officially concluded. McClellan-Palomar Airport did not pass the minimum tolerances established by the EPA. This required the District to sample for lead at Palomar Airport until such time as the measured concentrations are below the Federal standard for a minimum of three years. At the time of the writing of this report, measured concentrations for lead have met the waiver criteria (three continuous years of sampling at this location and less than 50% of the NAAQS) set forth 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 4.5 "Lead (Pb) Design Criteria", subsection (iii), paragraph 4.5(a)(ii) and the District has requested the cessation of regulatory lead sampling.

## 8.3.3 NCore Lead Design Criteria

Currently, there is no requirement in the CFR for NCore Lead monitoring at NCore sites and the District does not have a Pb-TSP sampler at the NCore site. However, a lead sampler was operating at Floyd Smith Drive for the year of 2015. In 2015, the NCore lead requirement was detailed in 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 3, "Design Criteria for NCore Sites", part 3(b)[21] and 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(b)[22]. A Pb-TSP sampler was required at NCore sites in a Core Based Statistical Area (CBSA) with populations greater than 500,000. The Pb-NCore monitor satisfied Federal requirements for the sampling of airborne lead particulate at NCore locations. The sampler was designated as Population Exposure, Neighborhood scale, and Representative concentrations of the area served.

[21](2015) 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 3, "Design Criteria for NCore Sites", subsection 3(b), lists the requirements for NCore requirements.

[22](2015) 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(b), lists the requirements needed to fulfill the lead (Pb) NCore monitoring requirements..

### 8.3.4 Lead Minimum Monitoring Requirements-Regional Administrator

The requirements necessary to fulfill the Regional Administrator Lead (Pb) monitoring site are described in 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4.5(c)[23]. The EPA Regional Administrator may require additional lead sampling beyond what is required in section 4.5 particularly near industrial sources of lead. As yet, industrial sources of lead, etc. in the SDAB have not required additional monitoring as directed by the EPA Regional Administrator. Table 8.7 lists these requirements.

**Table 8.7 Lead Minimum Monitoring Requirements-Regional Administrator**

| MSA (name) | County (name) | Number of Regional Administrator Pb Monitors Required (#) | Number of Regional Administrator Pb Monitors Active (#) | Number of Regional Administrator Pb Monitors Needed (#) |
|---|---|---|---|---|
| San Diego | San Diego | 0 | 0 | 0 |

### 8.3.5 Lead Minimum Monitoring Requirements-Collocation

The requirements necessary to fulfill Lead (Pb) monitor collocation are described in 40 CFR Part 58, Appendix A, "Quality Assurance Requirements for Monitors Used in Evaluations of National Ambient Air Quality Standards", Section 3.4.4.1[24]. The District is to have one collocated monitor. One sampler is designated the primary monitor to report air quality. The second sampler is used as the quality control monitor. Table 8.8 summarizes the collocation requirements for quality assurance purposes.

**Table 8.8 Lead Minimum Monitoring Requirements-Collocation**

| Number of Pb-TSP Samplers Required (#) | Number of Pb-TSP Samplers Active (#) | Number of Pb-TSP Samplers Calculated for Collocation (#) | Number of Pb-TSP Samplers Active for Collocation (#) | Number of Pb-TSP Samplers Needed for Collocation (#) | Location of Collocated Site (name) | AQS ID of Collocated Site (#) |
|---|---|---|---|---|---|---|
| 1 | 1 | 1 x (15%) = 1 | 1 | 0 | Palomar (CRQ) | 06-073-1023 |

## 8.4 Lead (Pb) Monitor and Station Evaluation

The EPA Network Assessment tool is 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. The only site with a Pb sampler is at Palomar Airport. A primary and collocated Pb-TSP sampler is at this site. As a reference, the Area Served Map with the county limits is shown below in Figure 8.4. There is no removal bias analysis or station correlation matrix included in this evaluation because there is only one site operating in the District.

[23](2019) 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), lists the requirements needed to fulfill the lead (Pb) Regional Administrator design criteria.

[24](2019) 40 CFR Part 58, Appendix A, "Quality Assurance Requirements for Monitors Used in Evaluations of National Ambient Air Quality Standards", Section 3, "Measurement Quality Check Requirements", subsection 3.4.4.1 lists the requirements needed to fulfill the lead (Pb) monitor collocation criteria.

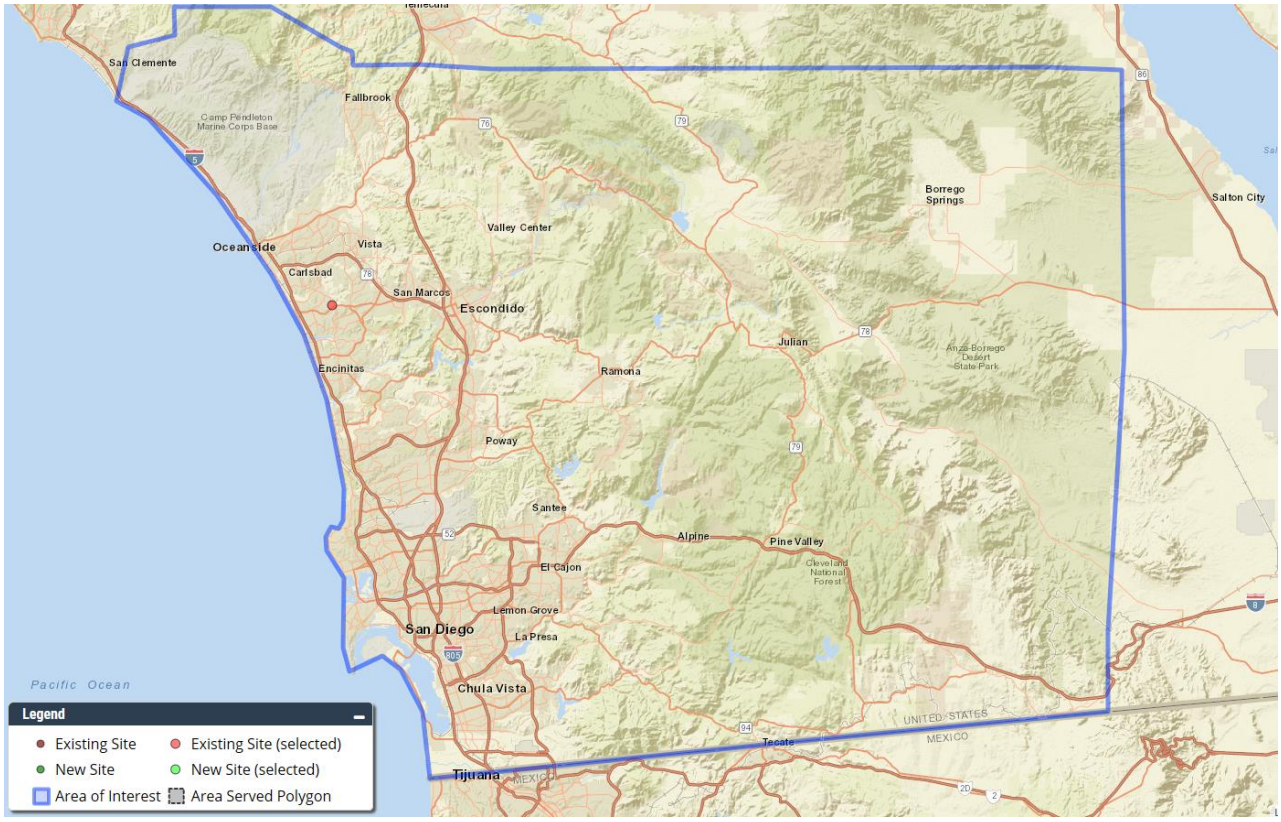



**Figure 8.4 Area Served Map – Lead (Pb)**

## 8.5 Conclusion - Lead (Pb)

The District operates Lead samplers at Palomar Airport. The measured concentrations at the Palomar Airport location have been consistently well below the NAAQS and has repeated for five (5) contiguous years of operations. Because of this, the District is petitioning the EPA to decommission Pb-TSP sampling at this location.

# Chapter 9 Particulate Matter 2.5 µm ($PM_{2.5}$)

## 9.1 $PM_{2.5}$ Introduction

Particulate Matter with a size of 2.5 micrometers or less ($PM_{2.5}$) is sampled on continuous basis and sequentially (based on a schedule set by the EPA). $PM_{2.5}$ is sampled by a sequential sampling method, where particulate is collected onto a filter and measured gravimetrically. The sequential sampling dates are set by the Environmental Protection Agency and this method is the Federal Reference Method (FRM). (Figure 9.1 & Table 9.1), It is also measured by continuous near-real time methods (non-Federal Equivalence Method, or non-FEM). The FRM sequential samplers are located at KVR, LES, CVA, and most recently at SES. The continuous samplers are located at CMP, LES, ALP, DVN and most recently at SES. The resulting data are referenced to the $PM_{2.5}$ standards of the year, when applicable. Additionally, the District samples for $PM_{2.5}$ chemical speciation. This includes the $PM_{2.5}$-CSN sampler and the $PM_{2.5}$ STN sampler that is located at LES. Recent network changes include:

- The Floyd Smith Drive station was relocated to the original site at Lexington Elementary School.
- Sampling at the Escondido site was temporarily suspended in 2015 and is expected to be operational in 2021.
- Sampling at the Downtown site was suspended in late 2016 due to eviction and the site was relocated in mid-2019 to the new location just south of the original location. The station is located at Sherman Elementary School. FRM $PM_{2.5}$ sampling started in 2020.

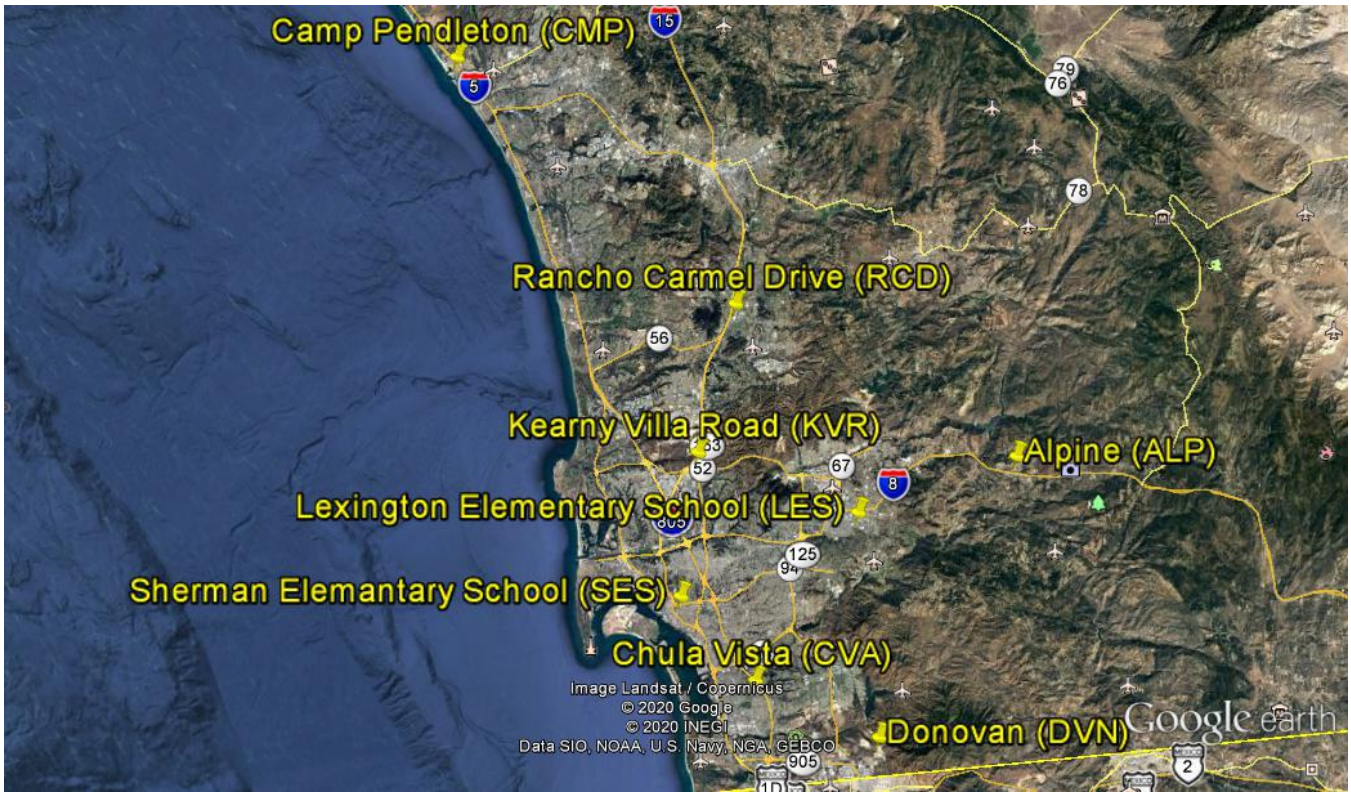



**Figure 9.1 $PM_{2.5}$ Network Map**

**Table 9.1 $PM_{2.5}$ State and National Standards for the Year**

| Ambient Air Quality Standards | | | | |
|---|---|---|---|---|
| Pollutant | Averaging Time | California Standards | National Standards | |
| | | Concentration | Primary | Secondary |
| Fine Particulate Matter ($PM_{2.5}$) | 24 hour | Not Applicable | 35 µg/m$^3$ | 35 µg/m$^3$ |
| | Annual Arithmetic Mean | 12 µg/m$^3$ | 12 µg/m$^3$ | 15 µg/m$^3$ |

## 9.2 $PM_{2.5}$ 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 9.2. 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. Note that the "Days above the Standard" row in Table 9.2 reflects the $PM_{2.5}$ standard for that year. Figure 9.2 graphs the SDAB $PM_{2.5}$ trends over the years.

**Table 9.2 $PM_{2.5}$ Manual Concentrations for San Diego-for the Last 20 Years (24-Hr), 1999-2019**

| Maximum 24-Hr Concentration (µg/m$^3$) | 1999 | 2000 | 2001 | 2002 | 2003 * | 2004 | 2005 | 2006 | 2007 * | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 64.3 | 66.3 | 60.0 | 53.6 | 239.2 | 67.3 | 44.1 | 63.3 | 126.2 | 42.0 | 65.0 | 33.3 | 34.7 | 70.7 | 56.3 | 36.7 | 33.5 | 34.4 | 42.7 | 41.9 | 23.8 |
| Days above the National Std | 0 | 2 | 0 | 0 | 2 | 1 | 0 | 1 | 17 | 3 | 3 | 0 | 0 | 2 | 2 | 1 | 0 | 0 | 1 | 1 | 0 |

n/a= not applicable *Wildfires in San Diego County

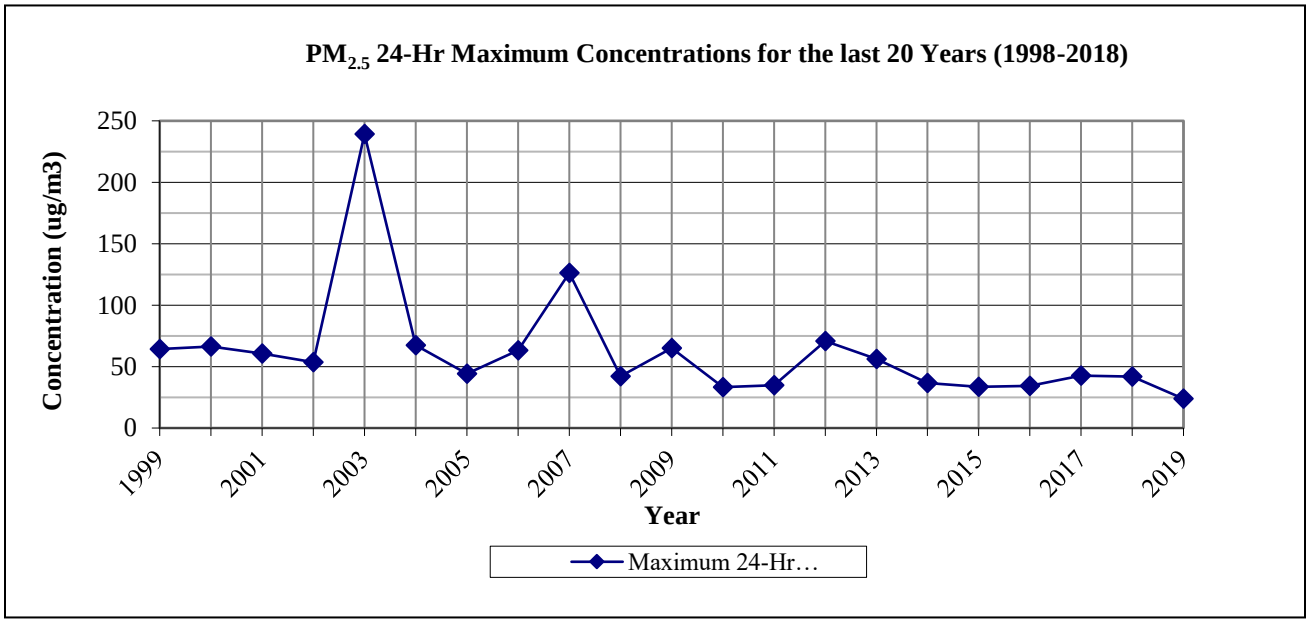



**Figure 9.2 $PM_{2.5}$ Manual Concentrations for San Diego-for the Last 20 Years (24-Hr)**

## 9.2.1 $PM_{2.5}$ FRM/Manual Annual Measurements by Site

Table 9.3 lists the maximum $PM_{2.5}$ FRM measurements for each $PM_{2.5}$ FRM monitoring location. Figure 9.3 shows this graphically.

**Table 9.3 $PM_{2.5}$ FRM/Manual Measurements by Site, 2015-2019**

| Site (name) | | Maximum Concentration for 24-Hr ($\mu g/m^3$) | | | | | Annual Average ($\mu g/m^3$) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2015 | 2016 | 2017 | 2018 | 2019 | 2015 | 2016 | 2017 | 2018 | 2019 |
| Escondido | ESC | 29.4 | N/A | N/A | N/A | N/A | 8.6 | N/A | N/A | N/A | N/A |
| Lexington Elementary | LES | 24.7 | 23.9 | 31.8 | 36.2 | 23.8 | 8.2 | 9.1 | 9.6 | 9.6 | 8.6 |
| Kearny Villa Road | KVR | 25.7 | 19.4 | 27.5 | 32.2 | 16.2 | 7.2 | 7.6 | 8.0 | 8.3 | 7.0 |
| Downtown | DTN | 33.4 | 34.4 | N/A | N/A | N/A | 9.3 | 9.7 | N/A | N/A | N/A |
| Chula Vista | CVA | 33.5 | 23.9 | 42.7 | 41.9 | 18.6 | 8.4 | 8.7 | 9.3 | 10.0 | 8.1 |
| Rancho Carmel Dr. | RCD | N/A | N/A | N/A | N/A | 18.9 | N/A | N/A | N/A | N/A | 8.2 |

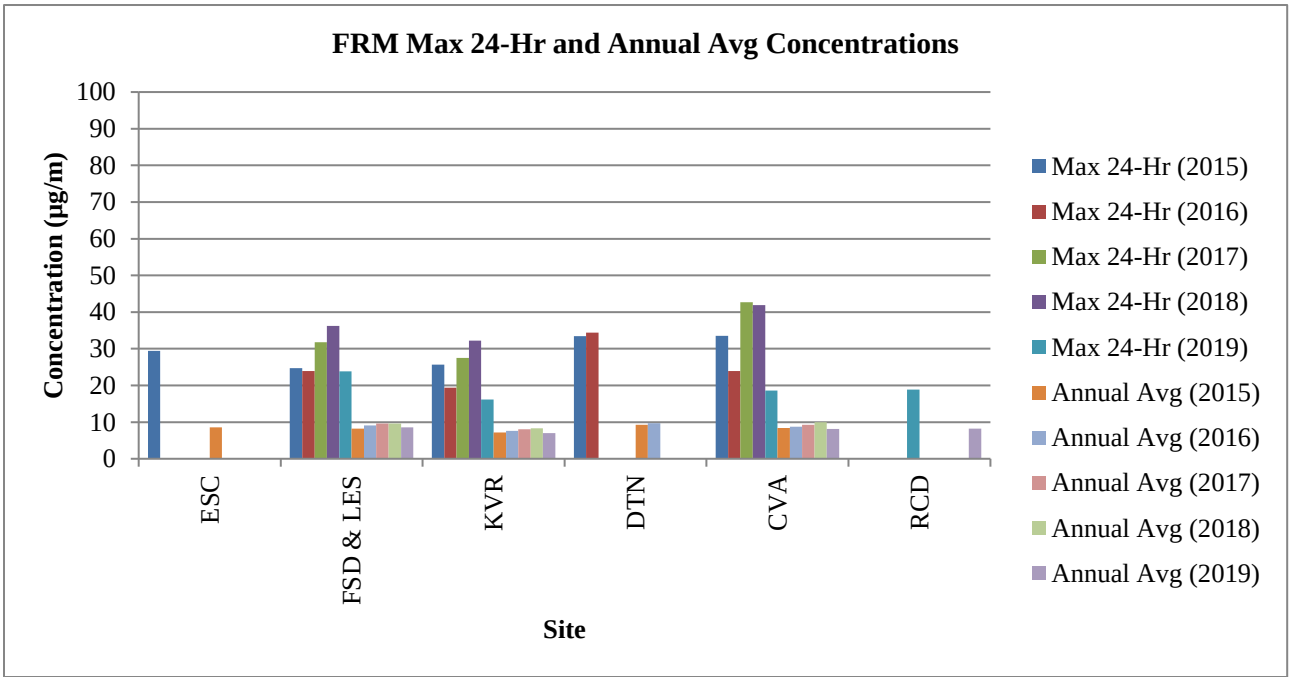



**Figure 9.3 Graph of FRM Concentrations for Max 24-Hr and Annual Average**

## 9.2.2 $PM_{2.5}$ FRM/Manual Design Value Measurements by Site

Tables 9.4 and 9.5 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 maximum 24-Hr concentrations and annual average, respectively. Figures 9.4 & 9.5 show this graphically with respect to the Design Value 24-Hr Concentration Standard for 2020 (35 µg/m³) and Annual Average Standard.

**Table 9.4 $PM_{2.5}$ FRM/Manual Design Value Measurements by Site (24-Hr), 2015-2019**

| Site (name) | | Design Value Maximum Concentration for 24-Hr (µg/m³) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2013-2015 | ≥ 85% of the NAAQS | 2014-2016 | ≥ 85% of the NAAQS | 2015-2017 | ≥ 85% of the NAAQS | 2016-2018 | ≥ 85% of the NAAQS | 2017-2019 | ≥ 85% of the NAAQS |
| Escondido | ESC | 24 | No | 23 | No | 26 | No | N/A | No | N/A | No |
| Kearny Villa Road | KVR | 16 | No | 15 | No | 15 | No | 17 | No | 18 | No |
| Lexington Elementary School | LES | N/A | No | 17 | No | 18 | No | 19 | No | 19 | No |
| San Diego-Beardsley | DTN | 16 | No | 22 | No | N/A | No | N/A | No | N/A | No |
| Chula Vista | CVA | 19 | No | 19 | No | 22 | No | 26 | No | 25 | No |
| Ranch Carmel Dr. | RCD | N/a | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 16 | No |

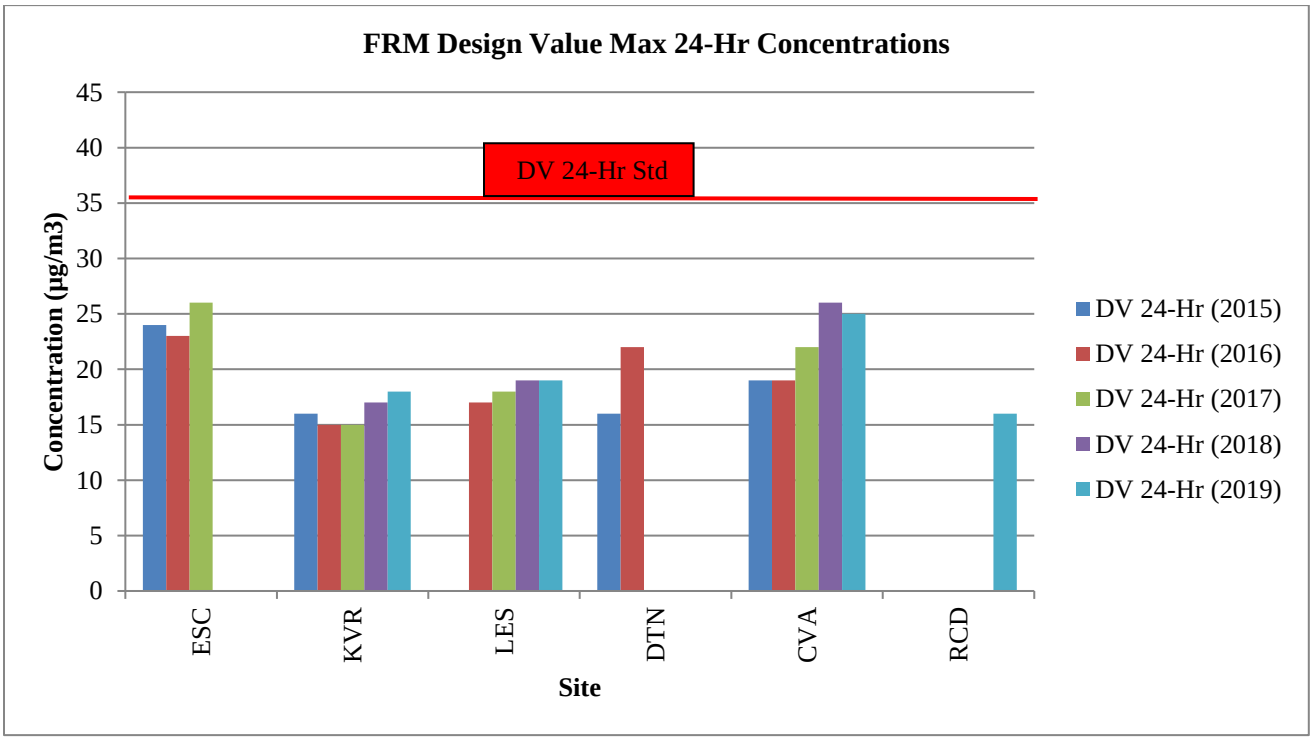



**Figure 9.4 Graph of FRM Concentrations for Design Value Max 24-Hr Concentrations**

**Table 9.5 $PM_{2.5}$ FRM/Manual Design Value Measurements by Site (Annual Average), 2015-2019**

| Site (name) | | Design Value Annual Concentration ($\mu g/m^3$) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2013-2015 | ≥ 85% of the NAAQS | 2014-2016 | ≥ 85% of the NAAQS | 2015-2017 | ≥ 85% of the NAAQS | 2016-2018 | ≥ 85% of the NAAQS | 2017-2019 | ≥ 85% of the NAAQS |
| Escondido | ESC | 9.6 | No | 9.1 | No | 8.6 | No | N/A | No | N/A | No |
| Kearny Villa Road | KVR | 7.9 | No | 7.6 | No | 7.6 | No | 8.0 | No | 7.8 | No |
| Lexington Elementary School | LES | N/A | No | 9.1 | No | 9.3 | No | 9.4 | No | 9.3 | No |
| San Diego-Beardsley | DTN | 10.0 | No | 9.7 | No | N/A | No | N/A | No | N/A | No |
| Chula Vista | CVA | 9.0 | No | 8.8 | No | 8.8 | No | 9.3 | No | 9.2 | No |
| Rancho Carmel Dr. | RCD | N/A | No | N/A | No | N/A | No | N/A | No | 8.2 | No |

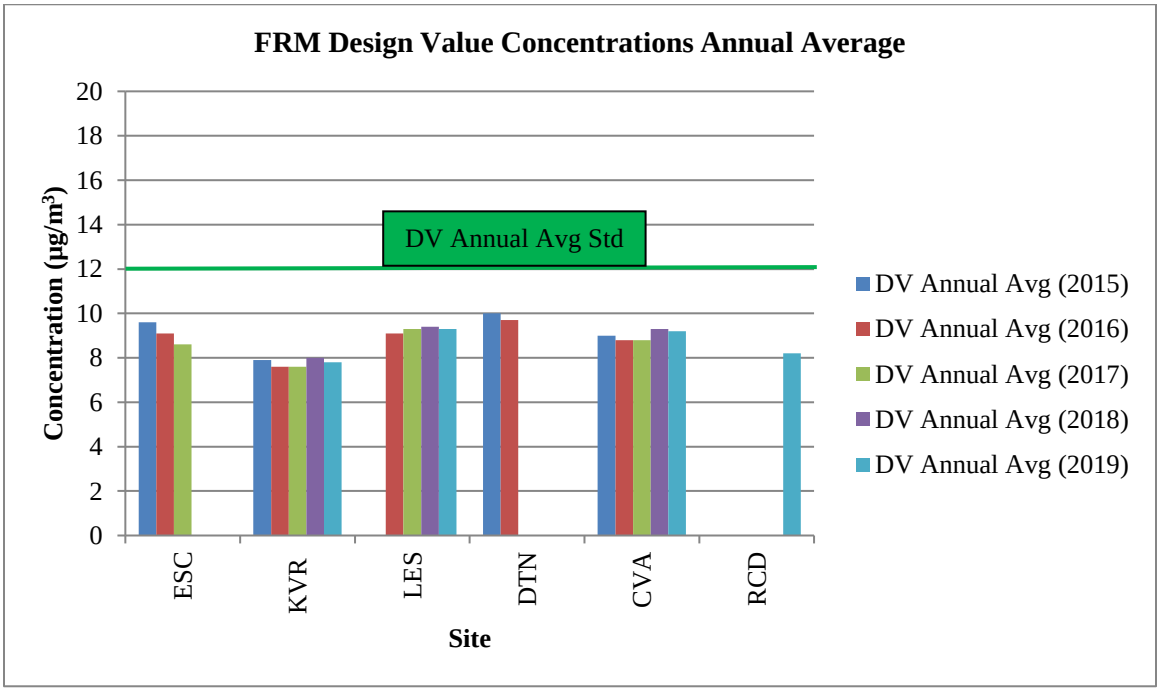



**Figure 9.5 Graph of FRM Concentrations for Design Value Annual Concentrations**

## 9.2.3 $PM_{2.5}$ Non-FEM/Continuous Annual Measurements by Site

Table 9.6 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 (All $PM_{2.5}$ continuous samplers are non-FEM, therefore they cannot be compared to the federal standards).

**Table 9.6 $PM_{2.5}$ Non-FEM/Continuous Measurements by Site, 2015-2019**

| Site (name) | | Maximum Concentration for 24-Hr ($\mu g/m^3$) | | | | | Annual Average ($\mu g/m^3$) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2015 | 2016 | 2017 | 2018 | 2019 | 2015 | 2016 | 2017 | 2018 | 2019 |
| Camp Pendleton | CMP | 41.2 | 28.8 | 26.0 | 30.5 | 13.8 | 10.4 | 11.1 | 10.3 | 9.9 | 6.4 |
| Escondido | ESC | 62.4 | N/A | N/A | N/A | N/A | 9.8 | N/A | N/A | N/A | N/A |
| Alpine | ALP | 18.8 | 19.3 | 16.4 | 29.7 | 13.5 | 6.2 | 7.3 | 7.1 | 7.6 | 5.3 |
| El Cajon - Lexington | LES | N/A | 31.0 | 35.6 | 42.0 | 25.7 | N/A | 14.4 | 11.3 | 10.6 | 10.3 |
| San Diego-Beardsley/ SES | DTN & SES | 44.9 | 34.3 | N/A | N/A | 21.0 | 10.2 | 10.5 | N/A | N/A | 10.5 |
| Donovan | DVN | 35.6 | 42.1 | 42.7 | 50.8 | 34.3 | 12.0 | 12.8 | 12.8 | 12.3 | 12.8 |

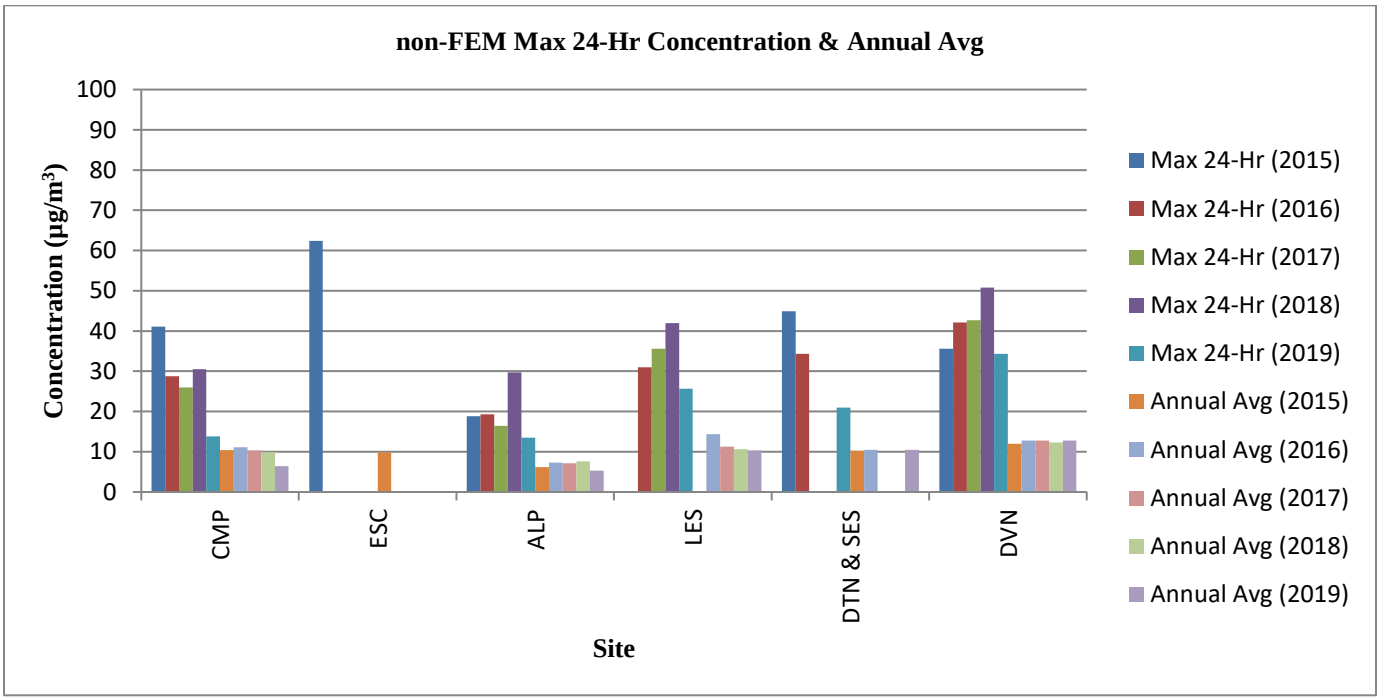



**Figure 9.6 Graph of non-FEM Max Concentration for 24-Hr and Annual Average**

## 9.2.4 $PM_{2.5}$ Non-FEM/Continuous Design Value Measurements by Site

Table 9.7 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 (All $PM_{2.5}$ continuous samplers are non-FEM, therefore they cannot be compared to the federal standards).

**Table 9.7 $PM_{2.5}$ Non-FEM/Continuous Design Value Measurements by Site (24-Hr & Annual Avg), 2015-2019**

| Site (name) | | Design Value Concentration 24-Hr (µg/m³) | | | | | Design Value Concentration Annual (µg/m³) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2013-2015 | 2014-2016 | 2015-2017 | 2016-2018 | 2017-2019 | 2013-2015 | 2014-2016 | 2015-2017 | 2016-2018 | 2017-2019 |
| Camp Pendleton | CMP | 20.3 | 21.4 | 21.3 | 22.0 | 20.0 | 9.4 | 10.3 | 10.5 | 10.4 | 8.8 |
| Escondido | ESC | 26.8 | N/A | N/A | N/A | N/A | 12.1 | N/A | N/A | N/A | N/A |
| Alpine | ALP | 15.6 | 15.6 | 15.1 | 16.0 | 15.0 | 7.4 | 7.2 | 6.8 | 7.3 | 6.6 |
| El Cajon - Lexington | LES | N/A | N/A | 23.1 | 23.0 | 22.0 | N/A | N/A | 12.8 | 12.0 | 10.7 |
| San Diego-Beardsley/ SES | DTN & SES | 23.2 | 23.3 | N/A | N/A | 21.0 | 11.1 | 10.6 | N/A | N/A | 10.4 |
| Donovan | DVN | 25.6 | 25.9 | 27.1 | 28.0 | 28.0 | 12.0 | 12.4 | 12.5 | 12.6 | 12.6 |

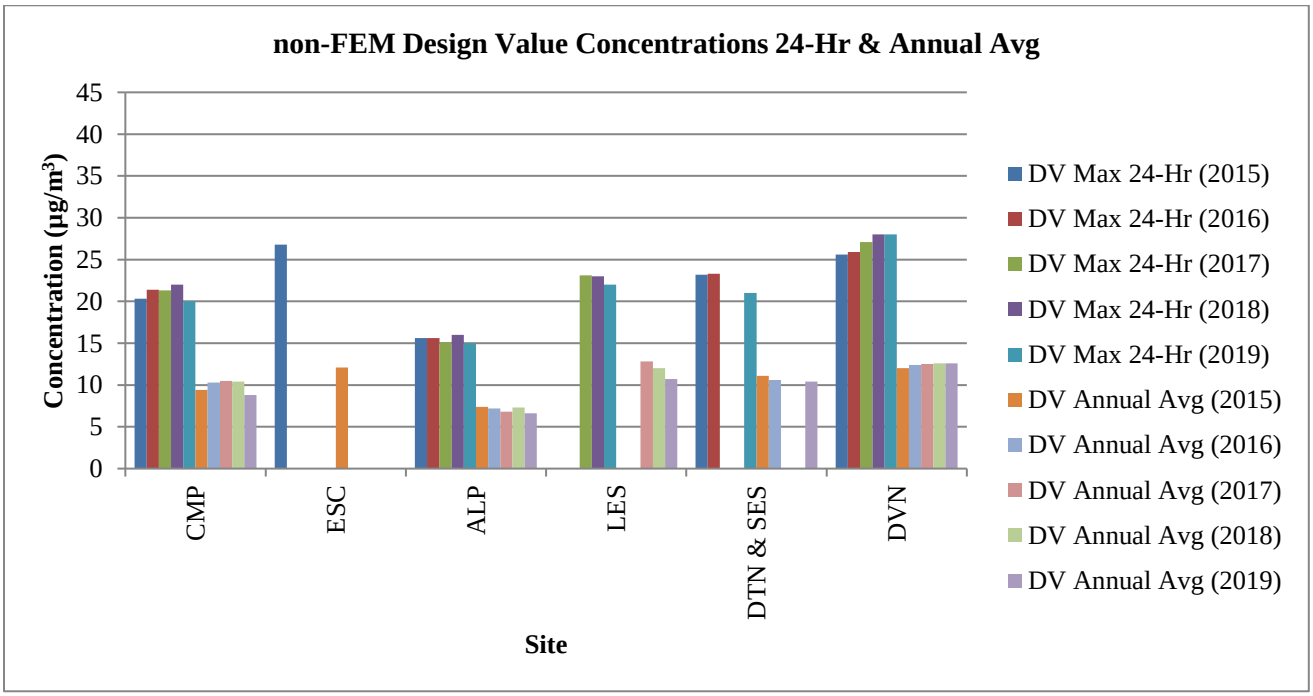



**Figure 9.7 Graph of non-FEM Design Value Max Concentration for 24-Hr and Annual Average**

## 9.3 $PM_{2.5}$ Federal Design Criteria Requirements

The District is federally mandated to monitor $PM_{2.5}$ levels in accordance with the CFR. This section will state the needs for $PM_{2.5}$ manual method samplers only. The District uses the $PM_{2.5}$ manual sampler

to satisfy all minimum monitoring requirements, other than those requirements that specifically state $PM_{2.5}$ continuous sampler. This section will also state the different monitoring requirements for each program, e.g. ambient, manual, NCore, speciated, etc. that the District operates and references therein (Note: only the passages applicable/informative to the District are referenced). These monitors can serve as fulfilling other $PM_{2.5}$ network requirements, e.g. ambient $PM_{2.5}$ sampling can fulfill an NCore requirement. For an in depth overview of the $PM_{2.5}$ Network, including sampling frequency, please see the most current Annual Network Plan for the SDAPCD.

## 9.3.1 $PM_{2.5}$ FRM/Manual Minimum Requirements - Design Criteria for 24 Hour and Annual Averages

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" subsection 4.7.1(a)[25] lists the requirements needed to fulfill the $PM_{2.5}$ Design Criteria for sequential/FRM (manual) samplers, using *Table D-5 (below)*.

*Table D–5 of Appendix D to Part 58—$PM_{2.5}$ Minimum Monitoring Requirements*

| *MSA population* (#) | *Most recent 3-year design value ≥85% of any $PM_{2.5}$ NAAQS* (#) | *Most recent 3-year design value <85% of any $PM_{2.5}$ NAAQS* (#) |
|---|---|---|
| *>1,000,000* | 3 | 2 |

Tables 9.8 -9.10 details these requirements.

**Table 9.8 $PM_{2.5}$ Manual Minimum Monitoring Requirements-Design Criteria (Annual Average)**

| Annual Design Value **2017-2019** (µg/m$^3$) | 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) |
|---|---|---|---|---|---|
| 9.2<br>7.8<br>9.3 | Chula Vista<br>Kearny Villa Rd.<br>Lexington | 06-073-0001<br>06-073-1016<br>06-073-1022 | no | yes | yes |

**Table 9.9 $PM_{2.5}$ Manual Minimum Monitoring Requirements-Design Criteria (24-Hr)**

| 24-Hr Design Value **2017-2019** (µg/m$^3$) | 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) |
|---|---|---|---|---|---|
| 25<br>18<br>19 | Chula Vista<br>Kearny Villa Rd.<br>Lexington | 06-073-0001<br>06-073-1016<br>06-073-1022 | no | yes | yes |

[25](2017) 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 4.7.1(a), list the requirements needed to fulfill the $PM_{2.5}$ Design Criteria.

**Table 9.10 $PM_{2.5}$ Manual Minimum Monitoring Requirements-Ambient**

| MSA (name) | County (name) | Population Estimated from 2010 Census (#) | Number of Required $PM_{2.5}$ Manual Samplers (#) | Number of Active $PM_{2.5}$ Manual Samplers (#) | Number of Needed $PM_{2.5}$ Manual Samplers (#) |
|---|---|---|---|---|---|
| San Diego | San Diego | 3.3 Million | 3 | 5 | 0 |

## 9.3.2 $PM_{2.5}$ Manual Minimum Monitoring Requirements-State (SIP)

In addition to the federal requirements, the District is also required to have $PM_{2.5}$ monitors in accordance with state requirements. In 1998, the San Diego Air Pollution Control District, in partnership with the California Air Resources Board (ARB), developed a PM-fine monitoring network to implement the new $PM_{2.5}$ NAAQS and is outlined in the "California Particulate Matter Monitoring Network Description".[26] Table 9.11 summarizes these requirements.

**Table 9.11 $PM_{2.5}$ Manual Minimum Monitoring Requirements- State (SIP)**

| MSA (name) | County (name) | Population Estimated from 2010 Census (#) | Minimum Number of $PM_{2.5}$ Manual Samplers Required (#) | Number of Active $PM_{2.5}$ Manual Samplers (#) | Number of Monitors $PM_{2.5}$ Manual Needed (#) |
|---|---|---|---|---|---|
| San Diego | San Diego | 3.3 Million | 5 | 5 | 0 |

## 9.3.3 $PM_{2.5}$ (FRM/Manual) Design Criteria for the Site of Expected Maximum Concentration

The District is required to designate $PM_{2.5}$ sampling locations for specific purposes or needs. One of these designations is called the site of expected maximum concentrations with respect to the 24-Hr and annual average NAAQS. For the District these locations can change yearly. For both the 24-Hr and annual average NAAQS, these locations have historically alternated between Escondido, Lexington, and Downtown monitoring locations. Table 9.12 summarize these requirements.

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 4.7.1(b)(1) "Fine Particulate Matter ($PM_{2.5}$) Design Criteria"[27] 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.

[26] $PM_{2.5}$ Monitoring Network Design for California, http://www.arb.ca.gov/aqd/pm25/pmfdsign.htm

[27](2017) 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 4.7.1(b)(1), list the requirements needed to fulfill the $PM_{2.5}$ Design Criteria for area of expected maximum concentration.

**Table 9.12 $PM_{2.5}$ Manual Minimum Monitoring Requirements-Site of Expected Maximum Concentration (Annual Average) & 24-Hr**

| Site of Expected Maximum Concentration for Design Value Annual NAAQS (name) | Site of Expected Maximum Concentration for Design Value Annual NAAQS AQS ID (#) | Site of Expected Maximum Concentration for 24-Hr NAAQS (name) | Site of Expected Maximum Concentration for 24-Hr NAAQS AQS ID (#) |
|---|---|---|---|
| Lexington | 06-073-1022 | Lexington | 06-073-1022 |

In past Network Assessments (2015 Network Assessment), the site of expected maximum annual concentration was located at the San Diego-Beardsley site. Sampling in the region was suspended at the site until early 2020 when the station was relocated to Sherman Elementary School. With the site operational, it is possible that the site of maximum concentration-annual will be at the Sherman Elementary School Site. Similarly, in the last Network Assessment, the site of expected maximum 24-hour concentration was at the Escondido site. This site is also suspended. It is expected to be operational in 2021. After three contiguous years of operations, the District will revisit the designations.

## 9.3.4 $PM_{2.5}$ Manual Minimum Monitoring Requirements-Near-road

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 4.7.1(2) "Fine Particulate Matter ($PM_{2.5}$) Design Criteria"[28] lists the requirements needed to fulfill the $PM_{2.5}$ Design Criteria for the $PM_{2.5}$ sampler collocated at a near-road site (RCD). This sampler fulfills our near-road particulate requirement. This requirement is listed in Table 9.13.

**Table 9.13 $PM_{2.5}$ Manual Minimum Monitoring Requirements-Near-road**

| MSA (name) | County (name) | Population Estimated from 2010 Census (#) | Are $PM_{2.5}$ Near-road Samplers Required? (yes/no) | Number of $PM_{2.5}$ Near-road Samplers Required? (#) | Number of $PM_{2.5}$ Near-road Samplers Active (#) | Number of $PM_{2.5}$ Near-road Samplers Needed (#) |
|---|---|---|---|---|---|---|
| San Diego | San Diego | 3.3 million | YES | 1 | 1 | 0* |

*Sampler was deployed to Rancho Carmel Drive mid-2019

## 9.3.5 $PM_{2.5}$ Manual Minimum Monitoring Requirements-Site of Poor Air Quality

The District is required to designate $PM_{2.5}$ sampling locations for specific purposes or needs. 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 4.7.1(3) "Fine Particulate Matter ($PM_{2.5}$) Design Criteria"[29] states that an air monitoring station is to be sited in an area of poor air quality.

(2017) 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 4.7.1(2), list the requirements needed to fulfill the $PM_{2.5}$ Design Criteria for a near-road site.

[29](2017) 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 4.7.1(3), list the requirements needed to fulfill the $PM_{2.5}$ Design Criteria for an area of poor air quality.

The designated site of Poor Air Quality with respect to the 24-Hr and annual average NAAQS is located at Chula Vista (Note: the site that serves as fulfilling the requirement for the location of maximum concentration cannot be also be the site of poor air quality). Table 9.14 summarizes these requirements.

**Table 9.14 $PM_{2.5}$ Manual Minimum Monitoring Requirements-Site of Poor Air Quality**

| Site of Poor Air Quality (name) | Site of Poor Air Quality AQS ID (#) |
|---|---|
| Chula Vista* | 06-073-0001 |

*In the 2015 Network Assessment, the Escondido site was reported as the site of poor air quality. The Escondido site is suspended and is expected to begin monitoring in 2020.

## 9.3.6 $PM_{2.5}$ Manual Minimum Monitoring Requirements-NCore

The District is required to operate a $PM_{2.5}$ sampler as part of the NCore multipollutant monitoring program. 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 3, "Design Criteria for NCore Sites", part 3(b)[30] states that For the NCore program, the District is required to collect $PM_{2.5}$ and $PM_{coarse}$ ($PM_{10-2.5}$) data. $PM_{coarse}$ data is obtained by operating collocated $PM_{10}$ and $PM_{2.5}$ samplers of the same make and model and on the same sampling frequency. The $PM_{2.5}$ concentrations are then subtracted from the $PM_{10}$ concentrations to get the $PM_{coarse}$ fraction. Table 9.15 lists the NCore $PM_{2.5}$ requirements.

In addition, the only required monitors for $PM_{10-2.5}$ are those required at NCore Stations. These requirements are 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 4.8.1(a)[31]

**Table 9.15 $PM_{2.5}$ Manual Minimum Monitoring Requirements-NCore**

| Number of $PM_{2.5}$ Samplers Required at NCore Sites (#) | Number of $PM_{2.5}$ Samplers Active at NCore Sites (#) | Number of $PM_{2.5}$ Samplers Needed at NCore Sites (#) | Can this $PM_{2.5}$ Sampler be used for PMcoarse? (yes/no) | Number of $PM_{2.5}$ Samplers Needed for PMcoarse? (#) |
|---|---|---|---|---|
| 1 | 1 | 0 | yes | 0 |

## 9.3.7 $PM_{2.5}$ Manual Minimum Monitoring Requirements-Collocation

For quality assurance purposes, there are requirements for analyzers or samplers of the same make and model to be collocated. In 1998, the District and the ARB gave criteria for choosing a site for collocation. Collocation guidance is from the 40 CFR, Appendix A, "Quality Systems Requirements", Section 3.2.3.1, "Collocated Quality Control Sampling Procedures for $PM_{2.5}$"[32]. Table 9.16 summarizes these requirements. For each distinct monitoring method designation (FRM or FEM) that a PQAO is

[30](2017) 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 3, "Design Criteria for NCore Sites", part 3(b)lists the requirements for NCore measurements.
[31](2017) 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 4.8.1(a) lists general monitoring requirements for coarse particulate matter ($PM_{10} - PM_{2.5}$)
(2017) 40 CFR Part 58, Appendix A, "Quality Systems Requirements", Section 3.2.3.1, "Collocated Quality Control Sampling Procedures for $PM_{2.5}$" lists collocation requirements.

using for a primary monitor, the PQAO must have 15 percent of the primary monitors of each method designation collocated.

**Table 9.16 $PM_{2.5}$ Manual Minimum Monitoring Requirements-Collocation**

| Number of $PM_{2.5}$ Samplers Required from Table D-5 (#) | Number of $PM_{2.5}$ Samplers Active (#) | Number of $PM_{2.5}$ Samplers Needed for Collocation (#) | Number of $PM_{2.5}$ Samplers Active for Collocation (#) | Number of $PM_{2.5}$ Samplers Needed for Collocation (#) | Location of Collocation Site (name) |
|---|---|---|---|---|---|
| 3 | 5 | 5 x (15%) = 1 | 1 | 0 | Kearny Villa Rd |

The District and the ARB sited the $PM_{2.5}$ collocation site in partnership. The collocated sampler must be spaced 1-4 meters from the primary sampler and should be located at an area of high concentration.

The District meets or exceeds all minimum requirements for $PM_{2.5}$ collocation.

## 9.4 $PM_{2.5}$ Continuous Minimum Monitoring Requirements

In addition to the required manual $PM_{2.5}$ samplers, the District also operates continuous $PM_{2.5}$ monitors. The District is federally mandated to monitor $PM_{2.5}$ levels in accordance with the CFR. This section will state the needs for $PM_{2.5}$ continuous method samplers only and will state the different monitoring requirements for each program, e.g. ambient, NCore, etc. that the District operates and references therein (Note: only the passages applicable/informative to the District are referenced). Continuous monitors operate on a 7/24 schedule. For additional information refer to the District's Annual Network Plan. The District meets or exceeds all minimum requirements for $PM_{2.5}$ continuous monitoring for all programs.

### 9.4.1 $PM_{2.5}$ Continuous Minimum Monitoring Requirements-Ambient

The District is required to operate a minimum number of $PM_{2.5}$ continuous samplers irrespective of the $PM_{2.5}$ network affiliation. 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 4.7.2 "Requirements for continuous $PM_{2.5}$ Monitoring"[33] states that local agencies must operate continuous $PM_{2.5}$ analyzers equal to one-half (round up) the minimum required sites listed in Table D-5. This translates to two $PM_{2.5}$ Continuous analyzers. Table 9.17 lists the continuous minimum monitoring requirements.

**Table 9.17 $PM_{2.5}$ Continuous Minimum Monitoring Requirements-Ambient**

| Number of $PM_{2.5}$ Manual Samplers Required from Table D-5 (#) | Number of $PM_{2.5}$ Continuous Analyzers Required= ½ Minimum Number of Required $PM_{2.5}$ Manual Samplers Round Up (#) | Number of $PM_{2.5}$ Continuous Analyzers Active (#) | Number of $PM_{2.5}$ Continuous Analyzers Needed (#) |
|---|---|---|---|
| 3 | 3 x (½) = 2 | 4 | 0 |

### 9.4.2 Continuous Minimum Monitoring Requirements-Collocation/Manual Sampler

40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 4.7.2 "Requirements for continuous $PM_{2.5}$

[33] (2017) 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 4.7.2 "Requirements for continuous $PM_{2.5}$ Monitoring" lists requirements for continuous $PM_{2.5}$ monitoring

Monitoring"[34] states that of these four continuous analyzers deployed, the District is required to operate a minimum number of $PM_{2.5}$ continuous analyzers collocated with $PM_{2.5}$ manual samplers. This translates to having one $PM_{2.5}$ continuous analyzer collocated with our FRM sampler at Lexington Elementary School. Table 9.18 lists the continuous minimum monitoring requirements for collocation with a manual sampler.

**Table 9.18 $PM_{2.5}$ Continuous Minimum Monitoring Requirements-Collocation/Manual Sampler**

| Number of $PM_{2.5}$ Continuous Analyzers Required to be Collocated with $PM_{2.5}$ Manual Samplers (#) | Number of $PM_{2.5}$ Continuous Analyzers Actively Collocated with $PM_{2.5}$ Manual Samplers (#) | Number of $PM_{2.5}$ Continuous Analyzers Needed to be Collocated with $PM_{2.5}$ Manual Samplers (#) | Collocation Locations (name) | Collocation Locations AQS ID (#) |
|---|---|---|---|---|
| 1 | 1 | 0 | Lexington | 06-073-1022 |

As we assess the future of the Network, additional collocated continuous analyzers will be deployed at Escondido. Monitoring at the District's site in Downtown was suspended until mid-2019, when the new monitoring site at Sherman Elementary School became operational. The Escondido site is expected to be operational in 2021.

## 9.4.3 $PM_{2.5}$ Continuous Minimum Monitoring Requirements-NCore

The District is required to operate a $PM_{2.5}$ continuous sampler as part of the NCore multipollutant monitoring program. This requirement is stated in 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 3, "Design Criteria for NCore Sites", part 3(b)[35]. Table 9.19 lists the NCore $PM_{2.5}$ continuous requirements.

**Table 9.19 $PM_{2.5}$ Continuous Minimum Monitoring Requirements-NCore**

| Number of $PM_{2.5}$ Continuous Analyzers Required at NCore Sites (#) | Number of $PM_{2.5}$ Continuous Analyzers Active at NCore Sites (#) | Number of $PM_{2.5}$ Continuous Analyzers Needed at NCore Sites (#) | NCore Location (name) | NCore Location AQS ID (#) |
|---|---|---|---|---|
| 1 | 1 | 0 | Lexington | 06-073-1022 |

## 9.4.4 $PM_{2.5}$ Continuous Minimum Monitoring Requirements-Collocation

The District does not operate any $PM_{2.5}$ continuous analyzer in FEM mode. The District does not have any $PM_{2.5}$ continuous analyzers designated as a primary analyzer. No $PM_{2.5}$ continuous analyzer is used for comparison to the NAAQS. The collocation requirements are stated in 40 CFR Part 58, Appendix A, Section 3.2.3.1, Quality System Requirements, $PM_{2.5}$, Section *3.2.3.2(b)*[36]. Under this requirement, 50 percent of the monitors shall be collocated with a monitor having the same method designation as the FEM primary monitor. Since the District operates the continuous $PM_{2.5}$ analyzers as non-FEM and there are no designated primary analyzers, technically there is no requirement for collocation.

[34](2017) 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 4.7.2 "Requirements for continuous $PM_{2.5}$ Monitoring" lists requirements for continuous $PM_{2.5}$ monitoring

[35] (2017) 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 3, "Design Criteria for NCore Sites", part 3(b) lists NCore measurement requirements.

[36] (2017) 40 CFR Part 58, Appendix A, Section 3.2.3.1, Quality System Requirements, $PM_{2.5}$, Section 3.2.3.2(b) lists collocation requirements.

## 9.4.5 $PM_{2.5}$ Chemical Speciation Monitoring Requirements

One of the requirements is for the STN & CSN network to maintain the current speciation network as designed by the governing authorities. 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 4.7.4 "$PM_{2.5}$ Chemical Speciation Site Requirements"[37] states that each state shall conduct chemical speciation monitoring at $PM_{2.5}$ Special Trends Network (STN) sites.

Additionally, the District is required to operate $PM_{2.5}$ speciation samplers as part of the NCore multipollutant monitoring program. This requirement is stated in 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 3, "Design Criteria for NCore Sites", part 3(b).

Table 9.20 lists the required chemical speciation samplers required in the network. The speciation samplers meet the requirements for the CSN and STN network as well as the requirement for NCore speciation sampling. Monitoring at Escondido is suspended and is expected to be operational in 2021.

**Table 9.20 $PM_{2.5}$ Chemical Speciation Monitoring Requirements- STN and CSN**

| Established $PM_{2.5}$ CSN Samplers (Sites) (#) | Established $PM_{2.5}$ STN Samplers (Sites) (#) | AQS ID of $PM_{2.5}$ CSN & STN Monitors (Sites) (#) | Are the $PM_{2.5}$ CSN & STN Monitor (Sites) Active? (yes/no) | Number of $PM_{2.5}$ CSN & STN Monitor (Sites) Needed? (#) |
|---|---|---|---|---|
| Lexington | Lexington | 06-073-1022 | Yes | 0 |
| Escondido | Escondido | 06-073-1002 | No | 1* |

Note: Lexington Elementary School speciation monitoring is also a requirement for NCore.

## 9.5 $PM_{2.5}$ (Non-speciated) - Correlation Matrix

The correlation matrix analysis (Figure 9.8) shows the correlation, mean absolute difference, distance between sites, and design values. This graphic gives you information about how concentrations at $PM_{2.5}$ monitors within San Diego County compare to one another. The red squares in the top-right corner show the mean absolute difference in concentrations between each pair of monitors, with text indicating the distance in kilometers between each pair of monitors. The intensity of the red boxes (from light red to dark red) represents the mean absolute difference in concentration from 0 to 10 µg/$m^3$ mean absolute difference. Each monitor comparison is represented by a square in the chart. The blue squares in the bottom-left corner show the correlation between each pair of monitors, with text indicating the number of days used in the calculation. The intensity of the blue boxes (from light blue to dark blue) represents the correlation between sites where the lightest shade of blue is a correlation equal to 1 and the dark blue has a correlation equal to -1. The numbers along the diagonal indicate the most recent design value for each monitor. AQS site data with less than 75% completion are not used in this analysis.

The correlation matrix helps to determine sites that are redundant. Sites with high correlation, low absolute difference, and close proximities are considered redundant. In the District's 2015 Network Assessment, it was concluded that two sites were considered redundant under these criteria. This included the Downtown site and Chula Vista. Since the 2015 Network Assessment was written, the District temporarily shut down the Escondido site (expected start-up in 2021) and the Downtown site was temporarily shut down and relocated to Sherman Elementary School in mid-2019 (not included in

[37] (2017) 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 4, "Pollutant-Specific Design Criteria for SLAMS Sites", part 4.7.4 "$PM_{2.5}$ Chemical Speciation Site Requirements" lists chemical speciation site requirements

the correlation matrix). The addition of Sherman Elementary School as a $PM_{2.5}$ sampler site is not reflected in this Network Assessment (started in 2020). The District will continue sampling in the Downtown community. There is a need for continuous $PM_{2.5}$ sampling in the Downtown/EJ community. The community is considered an Environmental Justice area and it also has high rates of respiratory ailments. The Sherman Elementary School will continue to provide valuable $PM_{2.5}$ data to the community. It should be noted that Figure 9.8 lists two Tribal sites that are not part of the San Diego APCD.

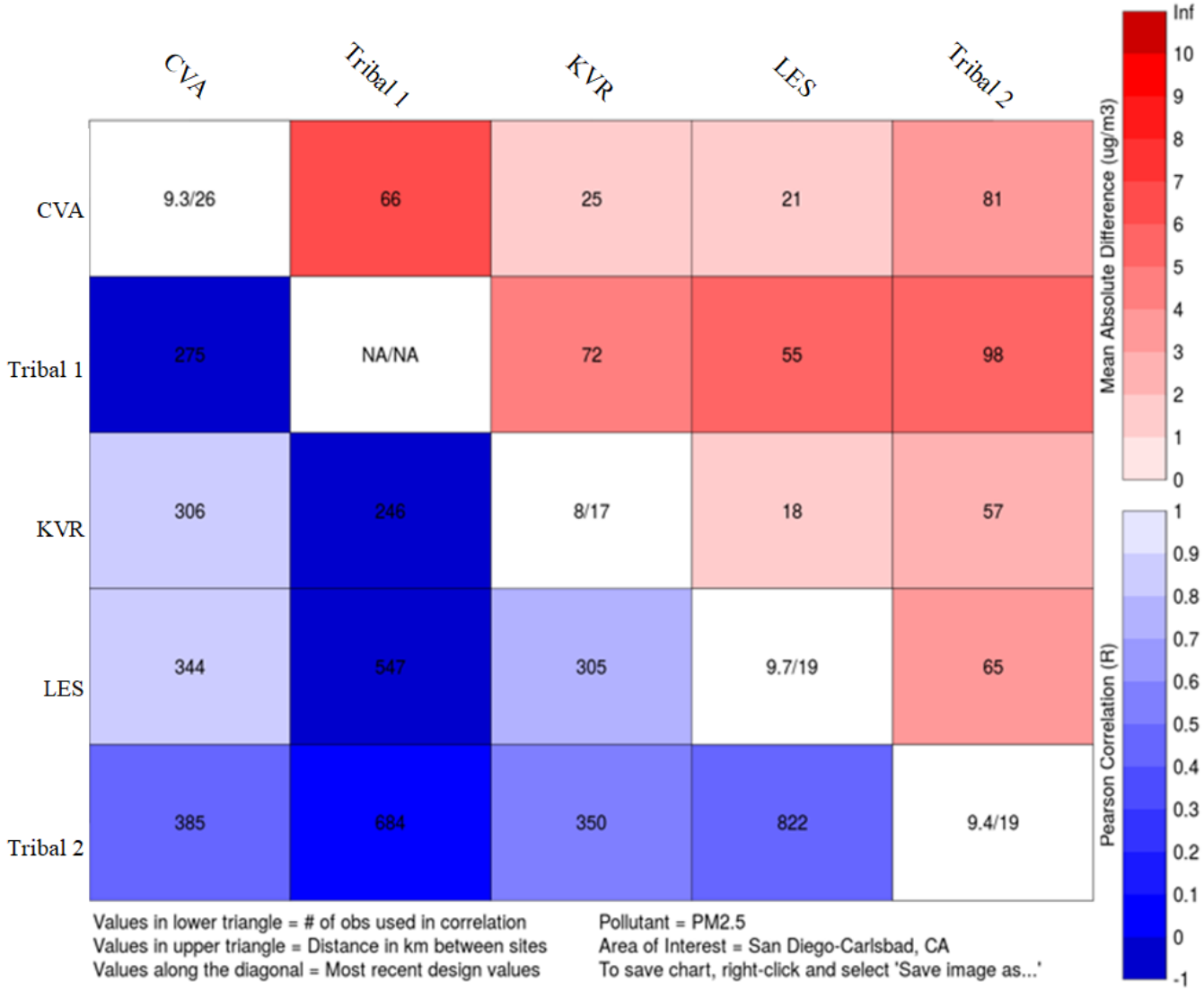



**Figure 9.8 $PM_{2.5}$ Correlation Matrix**

## 9.5.1 $PM_{2.5}$ (Non-Speciated) - Removal Bias

The $PM_{2.5}$ removal bias analysis is used to determine if samplers are redundant throughout the network. The bias estimation uses the nearest neighbor site to estimate the concentration at that location if the site was not there. The Removal Bias tool finds the nearest neighbors to each selected site and then uses the data from the neighboring sites to estimate concentrations at the site. A positive bias indicates that if the

site being examined was removed, the neighboring site(s) would register higher values for the region served by that site. The opposite indicates negative bias, i.e. neighboring sites registering lower values. Figure 9.9 is a map of the $PM_{2.5}$ samplers in the network with bias markers in blue or red. 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. If the bias is small, that may indicate that the monitor is redundant and could be removed. Only FRM $PM_{2.5}$ samplers are used in the removal bias map.

For the Removal Bias assessment, no sites are determined to be redundant throughout the network. The removal of any existing sites will lead to either a positive or a negative bias. For this Network Assessment, only three District sites are represented. These include Chula Vista, Kearny Villa Road, and Lexington Elementary School. In future Network Assessments, the District will see the addition of $PM_{2.5}$ samplers throughout the network. The District has deployed FRM $PM_{2.5}$ samplers at the Near Road site (RCD) in 2019 and the new Downtown site at Sherman Elementary School (SES) in 2020. In addition, the $PM_{2.5}$ sampler at Escondido is suspended and is expected to be operational by 2021.

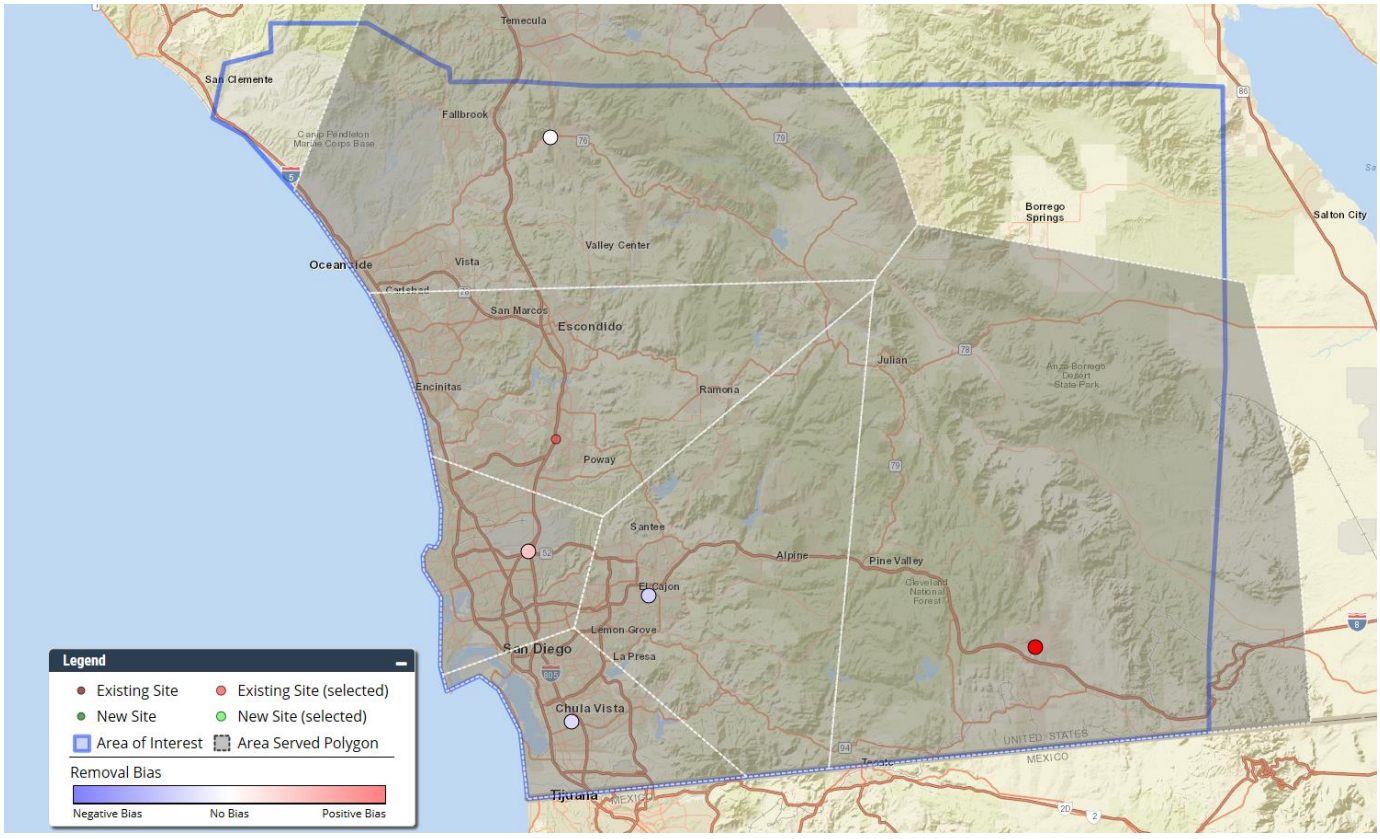



**Figure 9.9 Removal Bias Map – $PM_{2.5}$**

## 9.5.2 $PM_{2.5}$ (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 FRM $PM_{2.5}$ 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 sites depicted on the Area Served Map include Kearny Villa Road, Lexington Elementary School, Chula Vista, and Rancho

Carmel Drive. The District plans to increase coverage with the addition of Sherman Elementary School, which began sampling in early 2020, and Escondido (2021). Table 9.21 lists the size of the area that each $PM_{2.5}$ monitor covers as well as the corresponding population. The addition of $PM_{2.5}$ samplers at Sherman Elementary School and Escondido will improve coverage throughout the ambient network. The demographics of each area served are detailed in Tables 9.22 and 9.23.

Although $PM_{2.5}$ samplers are deployed throughout the Network, only FRM $PM_{2.5}$ samplers are discussed in this Area Served analysis. The addition of a $PM_{2.5}$ sampler at Escondido will provide valuable data for the surrounding communities, which include San Marcos and Vista. This area is one of the faster growing areas in the county. $PM_{2.5}$ concentrations have been shown to be derived from the measured concentrations from $PM_{2.5}$ 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.

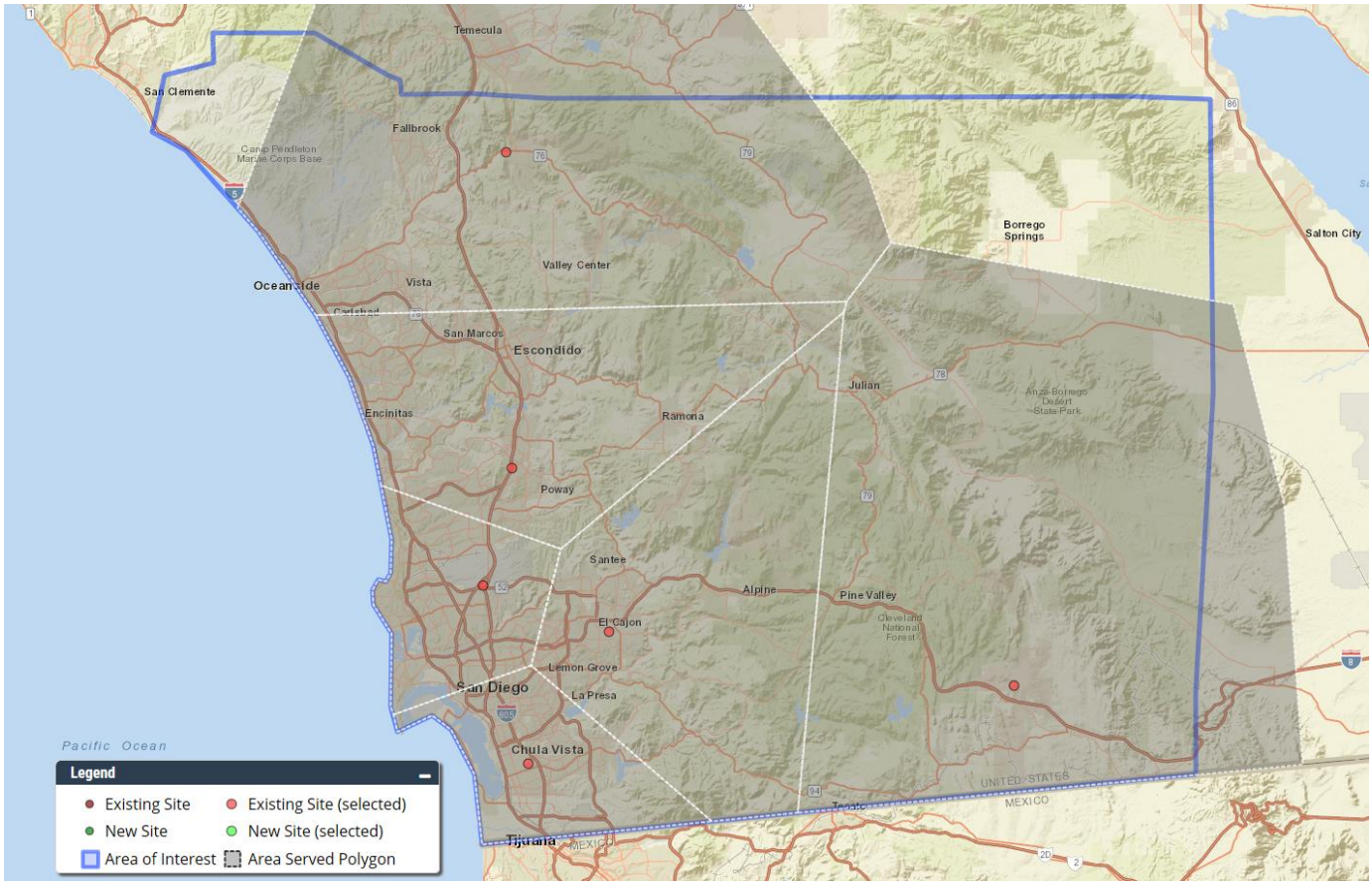



**Figure 9.10 Area Served Map – $PM_{2.5}$**

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 9.21 Area Served for $PM_{2.5}$ and Population. Sites in red are not part of the San Diego APCD**

| Site Name | Area ($km^2$) | Total Population |
|---|---|---|
| Chula Vista | 394 | 766530 |
| La Posta Reservation | 4347 | 14151 |
| Pala Airpad | 4113 | 768390 |
| Kearny Villa Rd. | 433 | 728198 |
| Rancho Carmel Drive | 1168 | 713856 |
| Lexington Elementary School | 1521 | 462877 |

**Table 9.22 $PM_{2.5}$ Area Served Demographics (Race)**

| Site Name | Male | Female | Caucasian/ White | African/ Black | Native American | Asian | Pacific Islander | Other Race | Multiple Races | Hispanic/ Latino |
|---|---|---|---|---|---|---|---|---|---|---|
| Chula Vista | 386803 | 379727 | 369929 | 66461 | 6142 | 102639 | 5066 | 175213 | 41080 | 422193 |
| La Posta Reservation | 7432 | 6719 | 10886 | 251 | 537 | 129 | 35 | 1791 | 522 | 4423 |
| Pala Airpad | 388106 | 380284 | 529511 | 32753 | 9991 | 50355 | 4711 | 98753 | 42316 | 244640 |
| Kearny Villa Rd. | 369506 | 358692 | 478672 | 37271 | 4212 | 106674 | 2771 | 61674 | 36924 | 148052 |
| Rancho Carmel Dr. | 350607 | 363249 | 500303 | 13548 | 4141 | 88130 | 1779 | 73677 | 32278 | 163116 |
| El Cajon - LES | 227530 | 235347 | 343695 | 25451 | 4752 | 18610 | 2323 | 41860 | 26186 | 106187 |

**Table 9.23 $PM_{2.5}$ Area Served Demographics (Age)**

| Site Name | Age 0- 4 | Age 5-9 | Age 10-14 | Age 15-19 | Age 20-24 | Age 25-29 | Age 30-34 | Age 35-39 | Age 40-44 |
|---|---|---|---|---|---|---|---|---|---|
| Chula Vista | 53515 | 53212 | 56846 | 63178 | 69671 | 61172 | 53990 | 53697 | 52487 |
| La Posta Reservation | 751 | 768 | 901 | 966 | 651 | 658 | 655 | 723 | 780 |
| Pala Airpad | 56485 | 55666 | 57976 | 62423 | 67661 | 54058 | 48312 | 50215 | 52551 |
| Kearny Villa Rd. | 40789 | 34694 | 32906 | 45989 | 80368 | 80724 | 66208 | 53609 | 47495 |
| San Diego -Rancho Carmel Drive | 48131 | 50513 | 51658 | 49543 | 40181 | 43329 | 44971 | 50528 | 53539 |
| El Cajon - LES | 29760 | 28438 | 30598 | 33767 | 34020 | 32464 | 28740 | 28547 | 30673 |
| **Site Name** | **Age 45-49** | **Age 50-54** | **Age 55-59** | **Age 60-64** | **Age 65-69** | **Age 70-74** | **Age 75-79** | **Age 80-84** | **Age 85 & Over** |
| Chula Vista | 52279 | 48508 | 40261 | 31683 | 22086 | 18028 | 14709 | 11141 | 10067 |
| La Posta Reservation | 975 | 1179 | 1220 | 1219 | 877 | 704 | 513 | 351 | 260 |
| Pala Airpad | 54997 | 51218 | 40907 | 33391 | 24751 | 19067 | 15624 | 12080 | 11008 |
| Kearny Villa Rd. | 46312 | 43841 | 38864 | 33960 | 23691 | 17586 | 15089 | 12686 | 13387 |
| San Diego -Rancho Carmel Drive | 57314 | 54136 | 45880 | 37810 | 25727 | 18017 | 14749 | 12949 | 14881 |
| El Cajon - LES | 36001 | 36321 | 30920 | 25365 | 17269 | 12611 | 10569 | 8472 | 8342 |

## 9.5.3 $PM_{2.5}$ (Non-speciated) - Exceedance Probability

The Exceedance probability map (Figure 9.11) provides information on the spatial distribution of the highest value for a pollutant. The map illustrates the probability that exceedances may occur in certain geographical locations. The Surface Probability map is based on the current NAAQS for $PM_{2.5}$. The scale ranges from a low probability of exceedance (blue) to a high exceedance probability (red). 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.

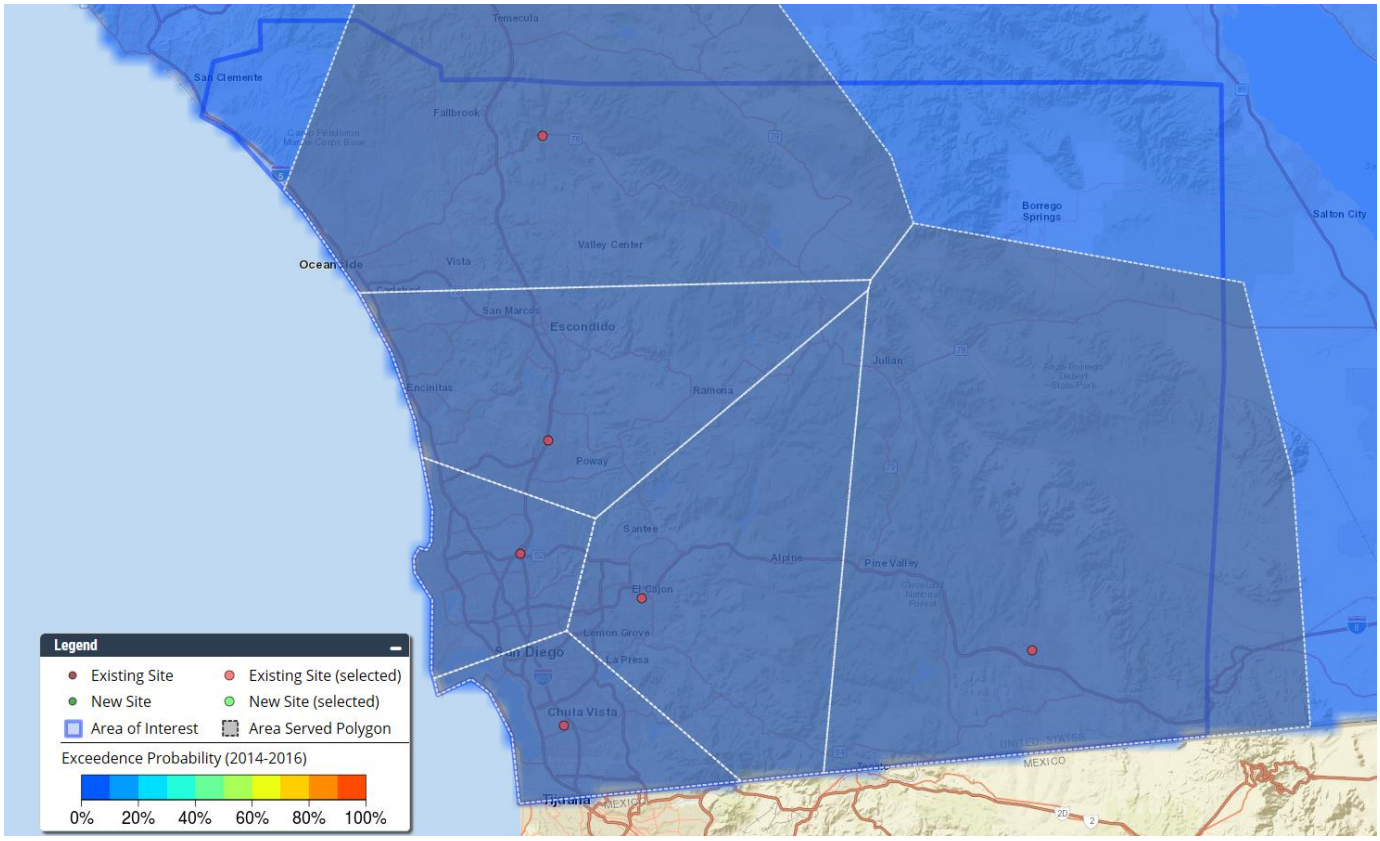



**Figure 9.11 Exceedance Probability Map with Area Served Overlay- $PM_{2.5}$**

## 9.6 $PM_{2.5}$ (Non-speciated) - Rating Summary

Table 9.24 is a summary of the District's $PM_{2.5}$ monitor rating. The scores are based on the analysis from the Network Assessment tool for $PM_{2.5}$. The analysis includes scores for correlation between sites, site removal, area served, thresholds, and internal factors. Internal factors include site features such as continuous $PM_{2.5}$ samplers, QA/QC needs, sampling schedules, etc. For instance, The $PM_{2.5}$ analyzer at Lexington Elementary School samples daily and there is a continuous analyzer at the site. The continuous $PM_{2.5}$ analyzers are operated as non-FEM analyzers. The District does not use the near-real time $PM_{2.5}$ data from these analyzers for regulatory purposes. The data from the $PM_{2.5}$ non-FEM analyzers are for public information and trends analysis uses only. The $PM_{2.5}$ FRM sampler was deployed at Rancho Carmel Drive in 2019 and it was not part of the EPA Assessment analysis.

**Table 9.24 $PM_{2.5}$ Monitor Summary Rating**

| | Overall Scoring | COMMENTS | 1. Correlation | 2. Removal | 3. Area Served | 4. Threshold | 5. Internal |
|---|---|---|---|---|---|---|---|
| Alpine (ALP) | **8** | **5.** Continuous $PM_{2.5}$ monitor at site. | n/a | n/a | n/a | n/a | 8 |
| Camp Pendleton (CMP) | **8** | **5.** Continuous $PM_{2.5}$. Transport site. | n/a | n/a | n/a | n/a | 8 |
| Donovan (DVN) | **8** | **5.** Continuous $PM_{2.5}$. Captures transport from Mexico. | n/a | n/a | n/a | n/a | 8 |
| Chula Vista (CVA) | **33** | **1&2:** Marginal correlation; bias if removed<br>**3:** Based on total population and population growth<br>**4:** Low threshold | 7 | 8 | 8 | 3 | 7 |
| Lexington Elementary School (LES) | **34** | **1&2:** Marginal correlation & high bias if removed<br>**3:** Based on total population and surrounding population<br>**4:** Low Threshold **5**. NCore site. Used in PMcoarse calc. and continuous monitor at site. | 7 | 8 | 7 | 3 | 10 |
| Sherman Elementary School (SES) | **10** | **1:** n/a **2:** n/a<br>**3:** EJ area<br>**4:** n/a **5**. Recently relocated. Manual and continuous monitor | n/a | n/a | n/a | n/a | 10 |
| Kearny Villa Road. (KVR) | **34** | **1&2:** Marginal correlation & high bias if removed<br>**3:** Based on total population and surrounding population<br>**4:** Low threshold. **5**. Collocated site | 7 | 8 | 8 | 3 | 8 |
| Rancho Carmel Dr. - Near-road (RCD) | **10** | **1:** Too new, no data in EPA Assessment tool<br>**2:** Among the top 20 most trafficked areas in SD<br>**3:** EPA near road requirement | n/a | n/a | n/a | n/a | 10 |

## 9.7 Conclusion - $PM_{2.5}$ Monitoring

Over the last five years since the last Network Assessment was published in 2015, $PM_{2.5}$ concentrations in San Diego have decreased. The correlation matrix, area served study statistics, removal bias, and surface probability analysis for exceedances will help assess the future needs for $PM_{2.5}$ monitoring throughout San Diego County. Since the 2015 Five Year Network Assessment, the District has undergone several site changes. One FRM $PM_{2.5}$ sampler was installed in mid-2019 at the Near Road site at Rancho Carmel Drive. The site in Downtown was relocated in mid-2019 (not included in this assessment) to Sherman Elementary School. Our site in Escondido was temporarily shut down and is expected to be in operation in 2021. Although the site at Escondido is temporarily shut down, it will provide essential data to Escondido and the surrounding communities once it is operating. Monitoring at Rancho Carmel Drive, Escondido, and Sherman Elementary School will provide valuable $PM_{2.5}$ data to the County of San Diego.

In addition, the District plans to add continuous $PM_{2.5}$ monitors at future sites. These sites include the second Near Road site, located in San Ysidro, and the Otay Mesa border crossing site. Speciation sampling will also be added. Continuous black carbon analyzers will be deployed to supplement speciation monitoring throughout the network. One black carbon analyzer is already deployed at SES.

# Chapter 10 Particulate Matter 10 µm ($PM_{10}$)

## 10.1 $PM_{10}$ Introduction

$PM_{10}$ was sampled at four 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. Table 10.1 lists the state and national standards for $PM_{10}$. Please note:

- The El Cajon station at Floyd Smith Drive was relocated to back to the original site at Lexington Elementary School (LES) in 2017.
- The Downtown site (DTN) was shut down (evicted from site) in 2016 and relocated to a nearby location at Sherman Elementary School (SES). Monitoring at SES resumed in mid-2019. Per EPA approval, $PM_{10}$ sampling was not resumed.
- In 2015, the District was evicted from our Escondido site (it was on the City of Escondido property) and are in the process of relocating the station 20 meters southeast of the original location to be on San Diego County property. It is expected to be operational in 2021.
- In 2017, the $PM_{10}$ collocation site was relocated to Donovan from Chula Vista
- The Kearny Villa Rd (KVR) $PM_{10}$ sampler was shut down in 2019.

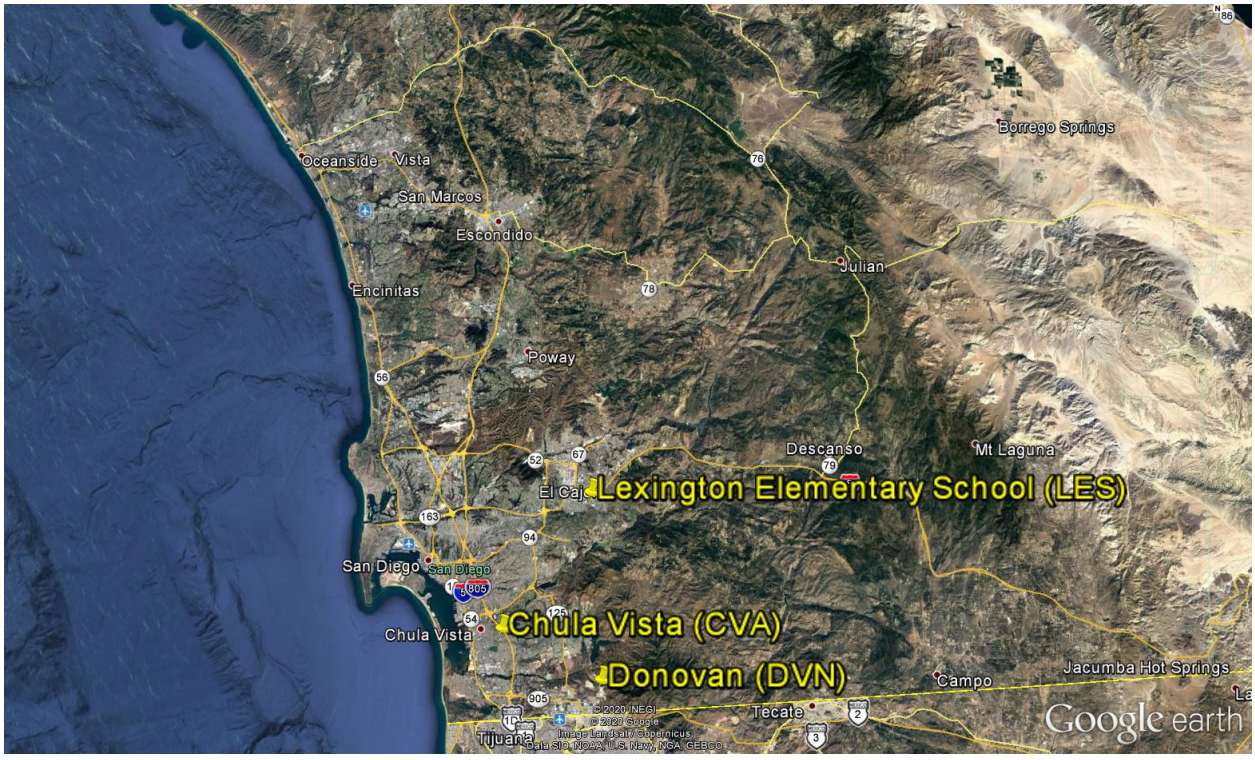



**Figure 10.1 $PM_{10}$ Overall Map**

**Table 10.1 $PM_{10}$ State and National Standards for the Year**

| Ambient Air Quality Standards | | | | |
|---|---|---|---|---|
| Pollutant | Averaging Time | California Standards | National Standards | |
| | | Concentration | Primary | Secondary |
| Fine Particulate Matter ($PM_{10}$) | 24 hour | 50 µg/$m^3$ | 150 µg/$m^3$ | 150 µg/$m^3$ |
| | Annual Arithmetic Mean | 20 µg/$m^3$ | Not Applicable | Not Applicable |

## 10.2 $PM_{10}$ 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 10.2 and Figure 10.2 reflect the $PM_{10}$ standard for that year.

**Table 10.2 $PM_{10}$ Summary of Concentrations for the Last 20 Years**

| | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Maximum 24-Hr Concentration (µg/m³) | 121 | 139 | 107 | 130 | 280 | 137 | 155 | 133 | 394 | 158 | 126 | 108 | 125 | 126 | 90 | 29 | 136 | 79 | 66 | 53 | 199 |
| Days above the National Standard | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |

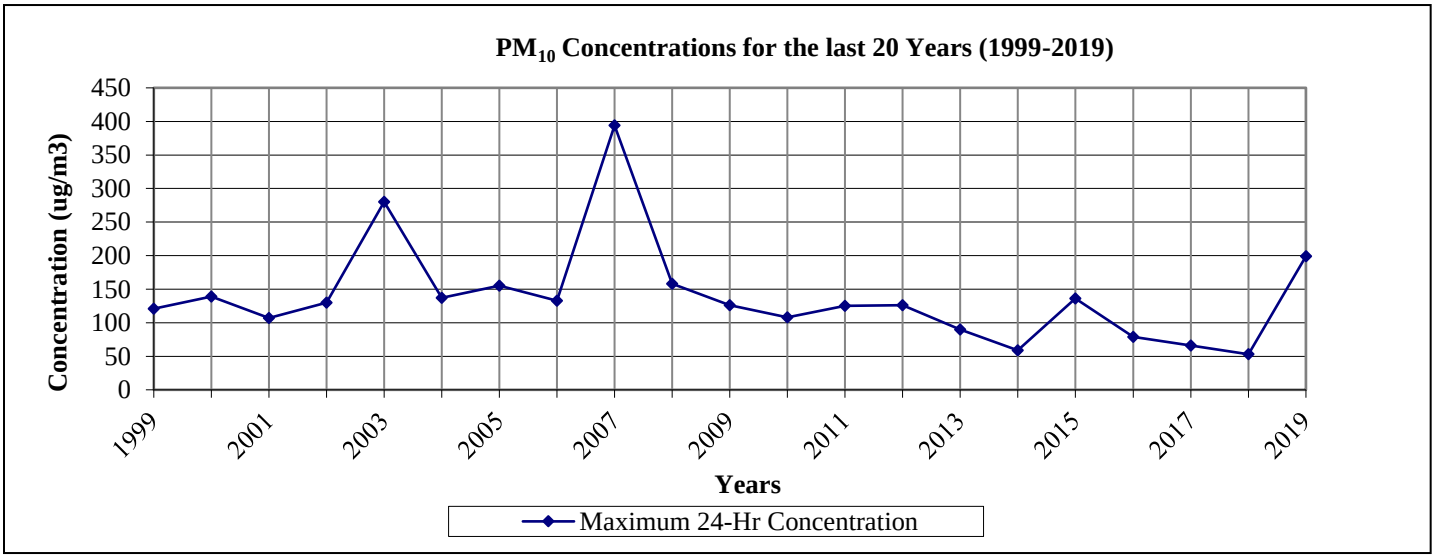



**Figure 10.2 $PM_{10}$ Concentrations for San Diego-for the Last 20 Years Graph**

### 10.2.1 $PM_{10}$ Measurements at STD Conditions by Site, 2015-2019

All data from the $PM_{10}$ samplers are reported in standard (STD) conditions, as shown in Table 10.3. Figure 10.3 shows these graphically. Please note: Data from the now closed Otay Mesa station/sampler is excluded, because it was classified as microscale.

**Table 10.3 $PM_{10}$ Measurements at STD Conditions by Site, 2015-2019**

| Site (name) | | Maximum Concentration for 24-Hr (STD) (µg/m³) | | | | | Annual Average (STD) (µg/m³) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2015 | 2016 | 2017 | 2018 | 2019 | 2015 | 2016 | 2017 | 2018 | 2019 |
| Escondido | ESC | 30 | N/A | N/A | N/A | N/A | 19.4 | N/A | N/A | N/A | N/A |
| El Cajon | FSD & LES | 48 | 43 | 50 | 43 | 38 | 21.9 | 22.6 | 22.5 | 22.7 | 19.4 |
| Kearny Villa Rd | KVR | 39 | 36 | 46 | 38 | N/A | 17.0 | 17.1 | 17.6 | 18.4 | N/A |
| San Diego-Beardsley | DTN | 53 | 49 | N/A | N/A | N/A | 22.9 | 21.9 | N/A | N/A | N/A |
| Chula Vista | CVA | 46 | 48 | 59 | 45 | 68 | 19.7 | 21.5 | 21.4 | 20.7 | 19.0 |
| Donovan | DVN | 136 | 79 | 66 | 53 | 199 | 34.8 | 31.3 | 26.3 | 25.5 | 31.6 |

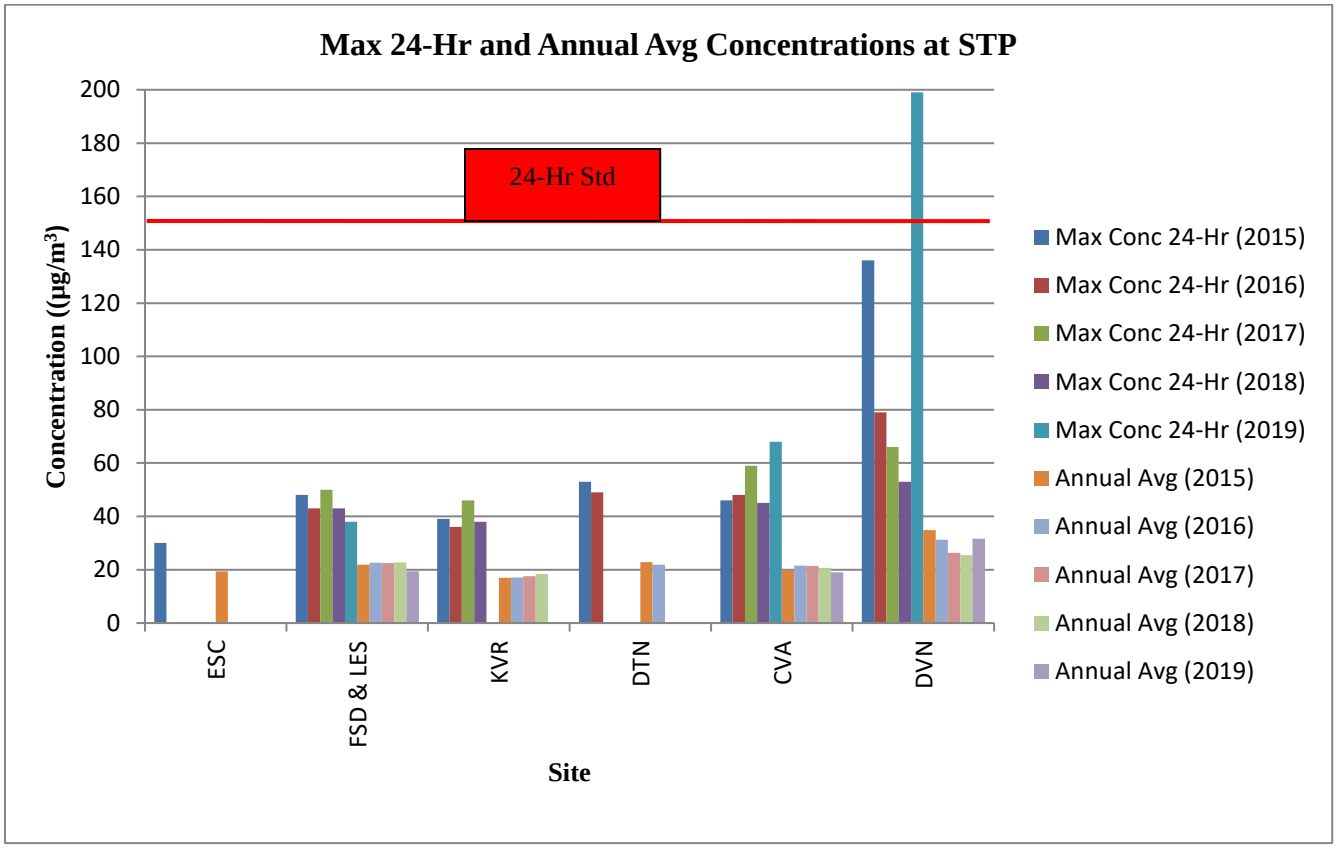



**Figure 10.3 $PM_{10}$ Measurements at STD Conditions by Site, 2015-2019**

## 10.2.2 $PM_{10}$ Measurements at Local Conditions by Site

Table 10.4 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. Please note: Data from the now closed Otay Mesa station/sampler is excluded, because it was classified as microscale.

**Table 10.4 $PM_{10}$ Measurements at Local Conditions by Site, 2015-2019**

| Site (name) | | Maximum Concentration for 24-Hr (LC) (µg/m³) | | | | | Annual Average (LC) (µg/m³) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2015 | 2016 | 2017 | 2018 | 2019 | 2015 | 2016 | 2017 | 2018 | 2019 |
| Escondido | ESC | 31 | N/A | N/A | N/A | N/A | 19.3 | N/A | N/A | N/A | N/A |
| El Cajon | FSD & LES | 50 | 44 | 49 | 44 | 37 | 22.0 | 22.4 | 22.5 | 22.6 | 18.6 |
| Kearny Villa Rd | KVR | 37 | 35 | 47 | 38 | N/A | 16.7 | 17.1 | 17.5 | 18.5 | N/A |
| San Diego-Beardsley | DTN | 54 | 51 | N/A | N/A | N/A | 23.3 | 22.3 | N/A | N/A | N/A |
| Chula Vista | CVA | 45 | 47 | 61 | 45 | 69 | 19.9 | 21.9 | 21.7 | 21.2 | 19.3 |
| Donovan | DVN | 136 | 79 | 67 | 52 | 199 | 34.5 | 31.3 | 26.3 | 25.5 | 31.6 |

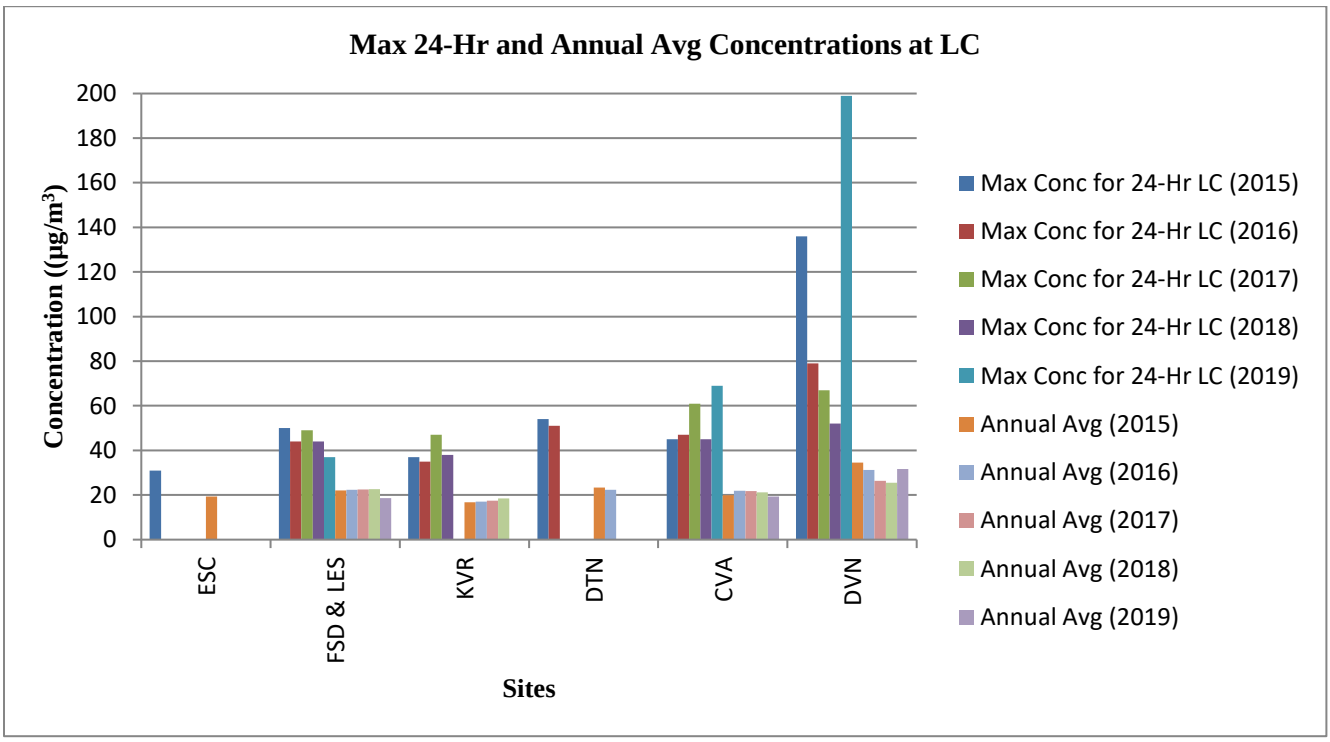



**Figure 10.4 $PM_{10}$ Measurements at LC Conditions by Site, 2015-2019**

## 10.3 $PM_{10}$ Minimum Monitoring Requirements

The District is federally mandated to monitor $PM_{10}$ levels in accordance with the CFR. The District is required to operate 2-4 $PM_{10}$ 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.

This section will state the different monitoring requirements for each program, including ambient and NCore, that the District operates and references therein (Note: only the passages applicable/informative to the District are referenced). These monitors can serve as fulfilling other $PM_{10}$ network requirements, e.g. ambient $PM_{10}$ sampler can fulfill an NCore $PM_{10}$ sampler requirement.

The District meets or exceeds all minimum requirements for $PM_{10}$ monitoring for all programs.

## 10.3.1 $PM_{10}$ Minimum Monitoring Requirements - Ambient

The requirements necessary to fulfill $PM_{10}$ monitoring are described in 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" subpart 4.6(a)[38]. Table D-4 lists the minimum monitoring requirements based on population. Tables 10.5 and 10.6 list these requirements.

*Table D-4 of Appendix D to Part 58—$PM_{10}$ Minimum Monitoring Requirements (Approximate Number of Stations per MSA)*

| *Population Category* | *High Concentration (120% of NAAQS[2]* | *Medium Concentration (>80% of NAAQS)* | *Low Concentration (<80% of NAAQS)* |
|---|---|---|---|
| *>1,000,000* | *6-10* | *4-8* | *2-4* |

Table 10.5 below indicates the number of samplers required in the Ambient Network. The District has $PM_{10}$ samplers located at Donovan (collocated), Chula Vista. The samplers at Chula Vista were shut down and the collocated site was established at Donovan. The $PM_{10}$ sampler at Lexington Elementary School is a lo-vol sampler. A $PM_{10}$ sampler will be operating at Escondido when the station re-opens in 2021.

**Table 10.5 $PM_{10}$ Minimum Monitoring Requirements-Ambient**

| MSA (name) | County (name) | Population Estimated from 2010 Census (#) | Number of $PM_{10}$ Samplers Required (#) | Number of $PM_{10}$ Samplers Active (#) | Number of $PM_{10}$ Samplers Needed (#) |
|---|---|---|---|---|---|
| San Diego | San Diego | 3.3 million | 2 - 4 | 4 | 0 |

**Table 10.6 $PM_{10}$ Minimum Monitoring Requirement-Design Criteria for the Year (24-Hr)**

| Site of Expected Maximum Concentration (name) | Site of Expected Maximum Concentration AQS ID (#) | Maximum Concentration for 24-Hr **2019** ($\mu g/m^3$) | Does the Maximum Concentration for 24-Hr meet the NAAQS? (yes/no) | 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) |
|---|---|---|---|---|---|---|
| Donovan (DVN) | 06-073-1014 | 199 | no | Yes | yes | no |

[38](2019) 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", subpart 4.6(a), list the requirements needed to fulfill the particulate matter ($PM_{10}$) design criteria.

## 10.3.2 $PM_{10}$ Minimum Monitoring Requirements-NCore

The District is required to operate a $PM_{10}$ sampler as part of the NCore multipollutant monitoring program for the calculation of $PM_{10-2.5}$ data. The NCore requirements are detailed in 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 3, "Design Criteria for NCore Sites", subsection 3(b)[39]. The PM10 sampler is needed to provide the required $PM_{10-2.5}$ data. Table 10.7 lists the NCore $PM_{10}$ requirements.

**Table 10.7 $PM_{10}$ Minimum Monitoring Requirements-NCore**

| *Number of $PM_{10}$ Samplers Required for NCore Sites (#) | Number of $PM_{10}$ Samplers Active at NCore Sites (#) | Number of $PM_{10}$ Samplers Needed at NCore Sites (#) | Name of NCore Site (name) | AQS ID of NCore Site (#) |
|---|---|---|---|---|
| 1 | 1 | 0 | Lexington (LES) | 06-073-1022 |

*While the $PM_{10}$ sampler is not specifically needed to fulfill NCore requirement, it is needed for $PM_{10-2.5}$ (PMcoarse) measurements.

## 10.3.3 $PM_{10}$ Manual Minimum Monitoring Requirements-Collocation

$PM_{10}$ Collocation requirements are described in the 40 CFR Part 58, Appendix A, Section 3, "Measurement Quality Requirements", subpart 3.3.4[40]. Table 10.8 summarizes these requirements. The collocated site was relocated from Chula Vista to Donovan in 2019. Table 10.8 lists the collocation requirements.

**Table 10.8 $PM_{10}$ Manual Minimum Monitoring Requirements-Collocation**

| Number of $PM_{10}$ Samplers Required (#) | Number of $PM_{10}$ Samplers Active (#) | Number of $PM_{10}$ Samplers Required for Collocation (#) | Number of $PM_{10}$ Samplers Active for Collocation (#) | Number of $PM_{10}$ Samplers Needed for Collocation (#) | Location of Collocated Site(s) (name) | AQS ID of Collocation Site(s) (#) |
|---|---|---|---|---|---|---|
| 2 - 4 | 3* | 3 x (15%) = 1 | 1 | 0 | Donovan (DVN) | 06-073-1014 |

*The NCore $PM_{10}$ sampler is a Lo-Vol sampler, so it is not included in the number of active samplers for collocation.

## 10.4 $PM_{10}$ - Correlation Matrix

The correlation matrix analysis (Figure 10.5) shows the correlation, mean absolute difference, distance between sites, and design values. This graphic gives you information about how concentrations at $PM_{10}$ monitors within San Diego County compare to one another. The red squares in the top-right corner show the mean absolute difference in concentrations between each pair of monitors, with text indicating the distance in kilometers between each pair of monitors. The intensity of the red boxes (from light red to dark red) represents the mean absolute difference in concentration from 0 to 50 µg/$m^3$ mean absolute difference. Each monitor comparison is represented by a square in the chart. The blue squares in the bottom-left corner show the correlation between each pair of monitors, with text indicating the number of days used in the calculation. The intensity of the blue boxes (from light blue to dark blue) represents

[39](2019) 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 3, "Design Criteria for NCore Sites", subsection 3(b) lists the requirements necessary to fulfill NCore design criteria.

[40](2019) 40 CFR Part 58, Appendix A, "Quality Assurance Requirements for Monitors Used in Evaluations of National Ambient Air Quality Standards", Section 3, "Measurement Quality Check Requirements", subsection 3.3.4, lists the requirements necessary to fulfill $PM_{10}$ collocation requirements.

the correlation between sites where the lightest shade of blue is a correlation equal to 1 and the dark blue has a correlation equal to -1. The numbers along the diagonal indicate the most recent design value for each monitor. AQS site data with less than 75% completion are not used in this analysis.

Sites with high correlation, low absolute difference, and close proximities are considered redundant. In the 2015 Network Assessment, the Chula Vista monitor was recommended for decommissioning. Chula Vista is a site that has low annual averages and low maximum concentrations. The Chula Vista sampler is still operational. However, the collocated sampler at Chula Vista was relocated to Donovan (the area of highest concentration). The Kearny Villa Road $PM_{10}$ sampler is also included in this correlation matrix but it was decommissioned in 2019. Since Escondido monitoring is suspended, it is not reflected in the matrix. As the Escondido site will be the only north SDAB $PM_{10}$ sampler, it will be a valuable $PM_{10}$ site in the Ambient Network when it begins monitoring (2021).

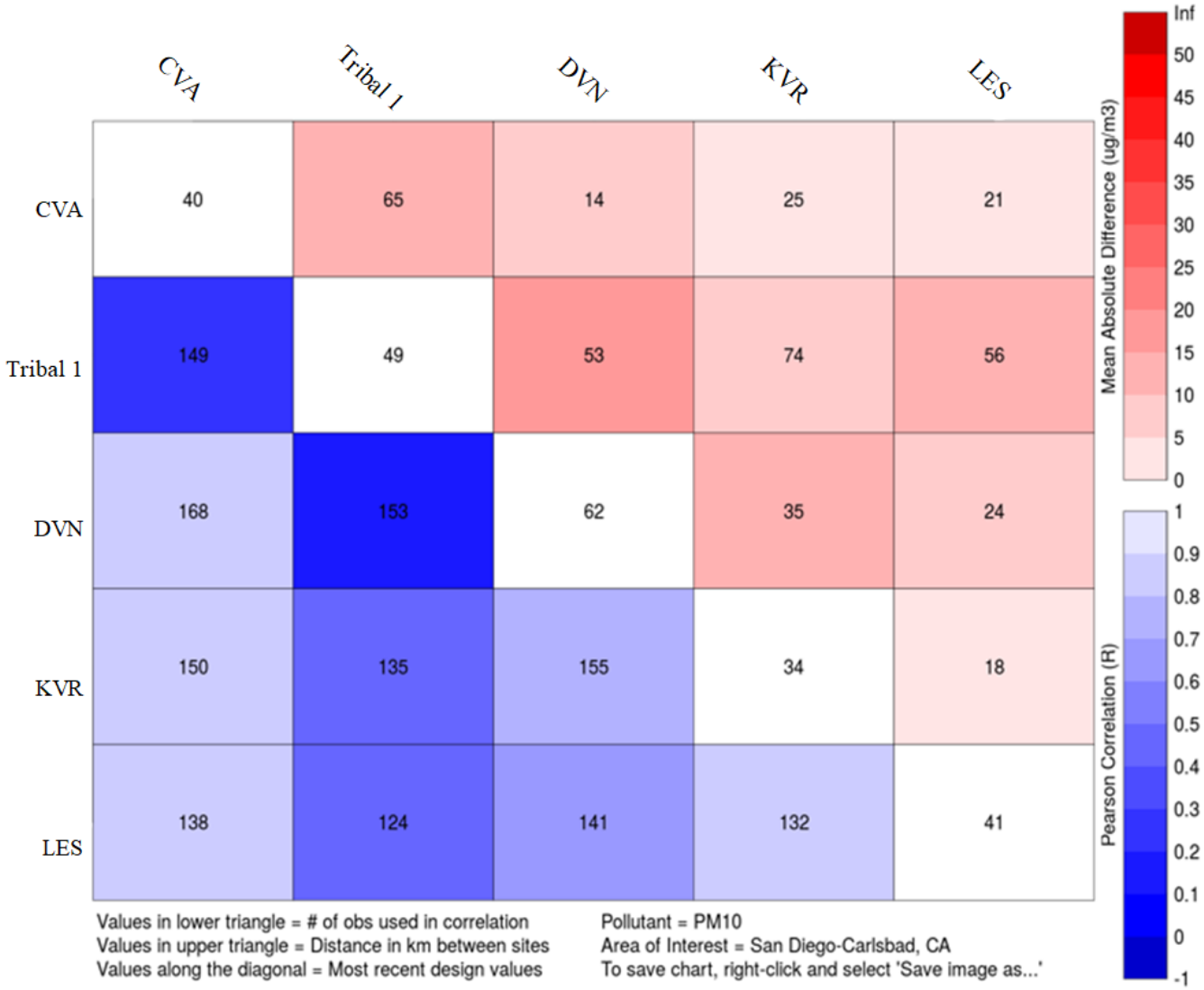



**Figure 10.5 Correlation Matrix - $PM_{10}$**

## 10.4.1 $PM_{10}$ - Removal Bias

The removal bias estimation uses the nearest neighbor site to estimate the concentration at that location if the site was to be removed. The Removal Bias tool finds the nearest neighbors to each selected site and then uses the data from the neighboring sites to estimate concentrations at the site. A positive bias indicates that if the site being examined was removed, the neighboring site(s) would register higher values for the region served by that site. The opposite indicates negative bias, i.e. neighboring sites registering lower values. Figure 10.6 is a pictorial representation of the $PM_{10}$ 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. If the bias is small, that may indicate that the monitor is redundant and could be removed. During the period of 2015-2019, there have been changes to the $PM_{10}$ network. Changes include the shut-down of the Kearny Villa Road sampler and the relocation of the collocated sampler at Chula Vista to Donovan. The future of the network will include the $PM_{10}$ monitor at Escondido, which will be more indicative of the $PM_{10}$ concentrations in Escondido and the surrounding communities.

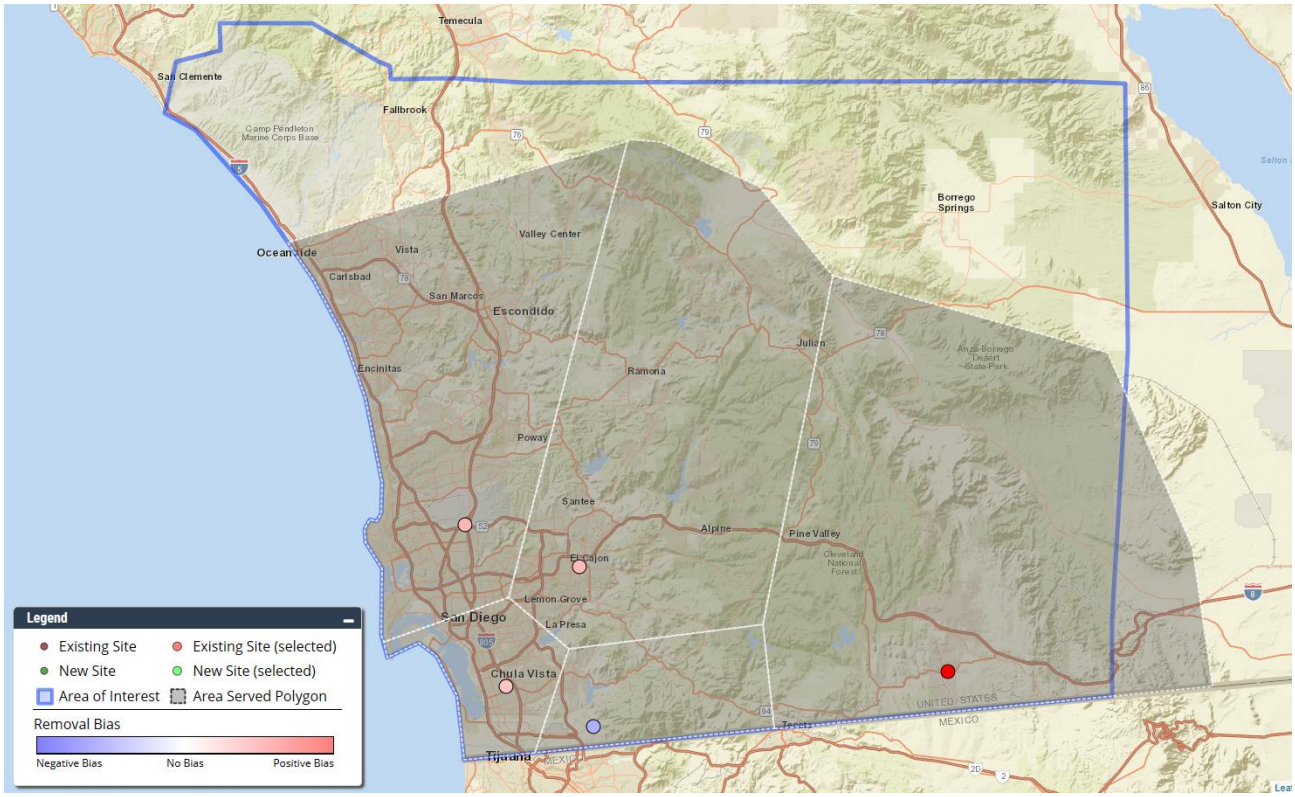



**Figure 10.6 Removal Bias Map - $PM_{10}$**

## 10.4.2 $PM_{10}$ - Area Served

The regions and area served by the monitors represent significant population conglomerations. Figure 10.7 is a pictorial representation of the area served by the $PM_{10}$ monitors in the air quality network. Each polygon represents the area that is closer to the monitor within it than any other monitor in the network. The area and population for each site is listed in Table 10.9. Tables 10.10 and 10.11 provide details on the population for each station in terms of gender, race, and age. Due to the Escondido site being suspended, the site is not represented on the area served map in Figure 10.7. The area north of Escondido includes the communities of Bonsall and Fallbrook. This population in the area has grown significantly over the years. The addition of Escondido will provide coverage for a significant part of northern San Diego county.

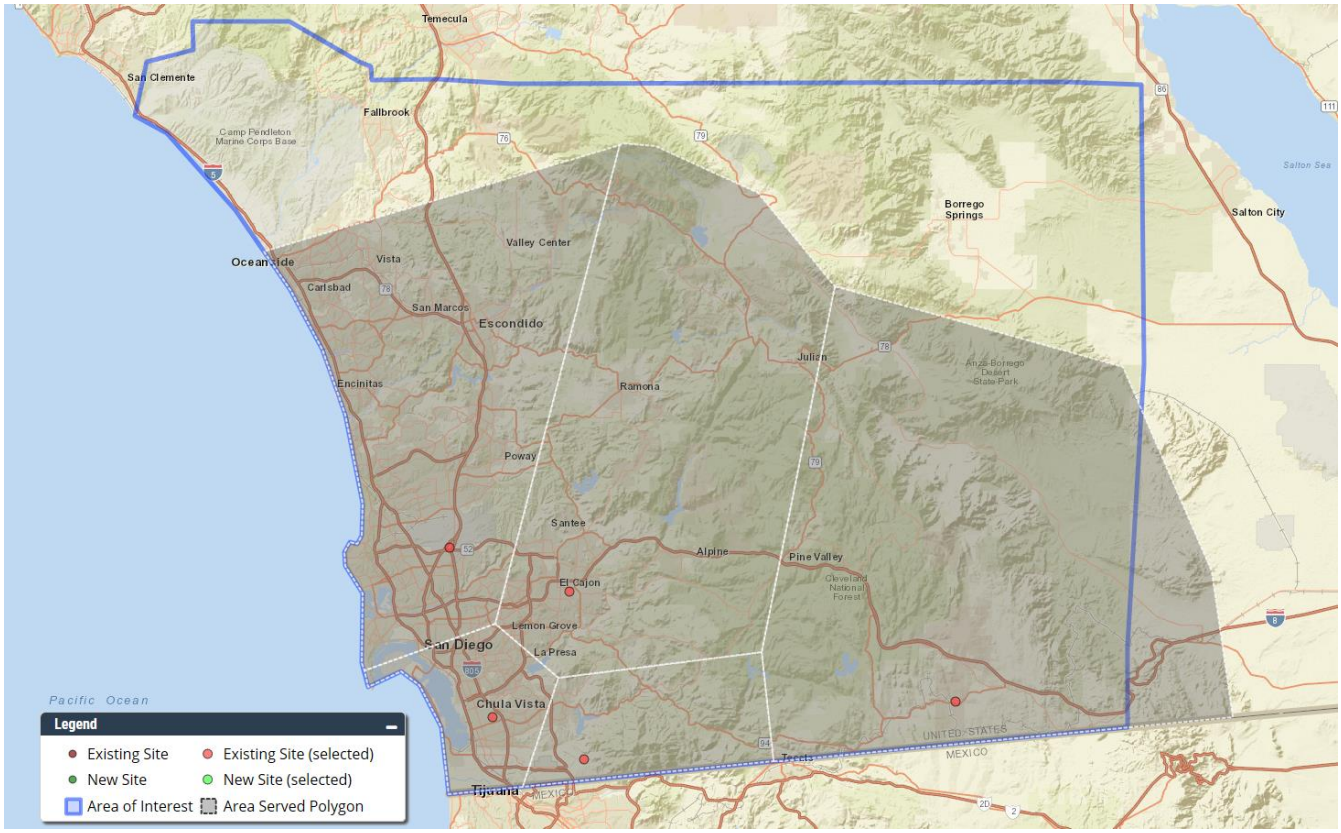



**Figure 10.7 Area Served Map - $PM_{10}$**

**Table 10.9 Area Served and Population for $PM_{10}$ (sites in red are not part of the San Diego APCD)**

| Site Name | Area ($km_2$) | Total Population |
|---|---|---|
| Chula Vista | 281 | 704362 |
| Campo | 1167 | 7589 |
| Donovan | 571 | 72145 |
| Kearny Villa Rd. | 1885 | 1686716 |
| El Cajon - LES | 3024 | 482168 |

**Table 10.10 $PM_{10}$ Area Served Demographics (Race)**

| Site Name | Male | Female | Caucasian/ White | African/ Black | Native American | Asian | Pacific Islander | Other Race | Multiple Races | Hispanic/ Latino |
|---|---|---|---|---|---|---|---|---|---|---|
| Chula Vista | 353917 | 350445 | 341240 | 61745 | 5762 | 88592 | 4825 | 165000 | 37198 | 392455 |
| Campo Indian Reservation | 4084 | 3505 | 5322 | 193 | 449 | 73 | 28 | 1170 | 354 | 2678 |
| Donovan | 39330 | 32815 | 36183 | 5449 | 441 | 14284 | 264 | 11377 | 4147 | 32927 |
| Kearny Villa Rd. | 841980 | 844736 | 1142387 | 59473 | 11718 | 207843 | 6571 | 176567 | 82157 | 403902 |
| El Cajon - LES | 235797 | 246371 | 359496 | 25012 | 5485 | 18792 | 2380 | 44096 | 26907 | 110622 |

**Table 10.11 $PM_{10}$ Area Served Demographics (Age)**

| Site Name | Age 0-4 | Age 5-9 | Age 10-14 | Age 15-19 | Age 20-24 | Age 25-29 | Age 30-34 | Age 35-39 | Age 40-44 |
|---|---|---|---|---|---|---|---|---|---|
| Chula Vista | 48561 | 47992 | 51646 | 58332 | 65743 | 56430 | 48316 | 47467 | 46737 |
| Campo Indian Reservation | 472 | 474 | 580 | 615 | 383 | 426 | 422 | 461 | 469 |
| Donovan | 5226 | 5559 | 5692 | 5835 | 4849 | 5487 | 6313 | 6840 | 6522 |
| Kearny Villa Rd. | 105616 | 100550 | 100248 | 113055 | 141252 | 143543 | 127487 | 119352 | 116847 |
| El Cajon - LES | 31233 | 29842 | 32117 | 35110 | 35009 | 33376 | 29609 | 29525 | 31765 |
| **Site Name** | **Age 45-49** | **Age 50-54** | **Age 55-59** | **Age 60-64** | **Age 65-69** | **Age 70-74** | **Age 75-79** | **Age 80-84** | **Age 85 & Over** |
| Chula Vista | 47422 | 44893 | 37837 | 29894 | 20985 | 17217 | 14234 | 10823 | 9833 |
| Campo Indian Reservation | 540 | 614 | 578 | 543 | 358 | 284 | 167 | 123 | 80 |
| Donovan | 5767 | 4505 | 3224 | 2394 | 1496 | 1057 | 645 | 425 | 309 |
| Kearny Villa Rd. | 121040 | 115280 | 99545 | 83868 | 57790 | 42089 | 35547 | 30428 | 33179 |
| El Cajon - LES | 37443 | 38104 | 32442 | 26797 | 18154 | 13206 | 10985 | 8804 | 8647 |

## 10.5 $PM_{10}$ Sampler Summary Rating

Table 10.12 is a summary of the District's $PM_{10}$ monitor rating for the network. The scores are based on the analysis from the Network Assessment tool for $PM_{10}$. The evaluation has scores for correlation between sites, site removal, community type, area served, monitor needs and an internal factors. The site in Downtown was relocated to Sherman Elementary School in 2019 and was not included in the Network Assessment tool.

**Table 10.12 $PM_{10}$ Samplers Summary Rating**

| | Overall Scoring | COMMENTS | **1.** Correlation and Removal | **2.** Community Type/Area Served | **3.** Monitors and QA/QC Needs | **4.**Internal/ Other |
|---|---|---|---|---|---|---|
| Chula Vista (CVA) | **34** | **1 &2:** Mixed use<br>**3:** Has sequential $PM_{2.5}$<br>**4:** High asthma; deck to be upgraded | 8 | 7 | 7 | 10 |
| Otay Mesa-Donovan (DVN) | **33** | **1 &2:** Industrial becoming mixed use<br>**3:** Expected maximum concentration site; Collocated $PM_{10}$, collocated continuous $PM_{2.5}$<br>**4:** Near border | 8 | 7 | 8 | 10 |
| Lexington Elementary School (LES) | **44** | **1 & 2:** Light Industrial/mixed use<br>**3:** Required for PMcoarse<br>**4:** Moved back to original location | 8 | 7 | 10 | 10 |
| Kearny Villa Rd. (KVR) | **n/a** | **1:** $PM_{10}$ sampling decommissioned in 2019 | n/a | n/a | n/a | n/a |

## 10.6 Conclusion – $PM_{10}$ Monitoring

San Diego has continued to measure low concentrations of $PM_{10}$. The correlation matrix, area served study statistics, and removal bias help assess the future needs for $PM_{10}$ monitoring throughout San Diego County. Since the 2015 Five Year Network Assessment, the $PM_{10}$ program has undergone several changes. The sampler at Kearny Villa Road was decommissioned in 2019. The Chula Vista collocated

$PM_{10}$ sampler was relocated to Donovan. Chula Vista was a site with a lower annual average and low maximum concentrations. The EPA has approved the shutdown of our $PM_{10}$ sampler at Chula Vista and will be relocated to Escondido when it is operational (expected 2021). Escondido was recommended as a site with high maximum concentration. Therefore, the sampler should not be decommissioned. In addition, the sampler in Escondido was temporarily shut down and is expected to be in operation soon. The $PM_{10}$ sampler in Escondido will provide valuable data to the community of Escondido and the surrounding community.

# Chapter 11 Photochemical Assessment Monitoring Stations (PAMS)

## 11.1 PAMS Monitor and Station Introduction

PAMS and PAMS-related sampling was conducted at three sites (Figure 11.1). As yet, there are no NAAQS standards to compare the data. Please note:

- The PAMS site is to be located at Lexington Elementary School (relocated El Cajon site, previously Floyd Smith Drive).
- Per EPA approval, PAMS was suspended and will resume when PAMS re-engineering is operational (EPA timeline indicates June 2021 as implementation start date).

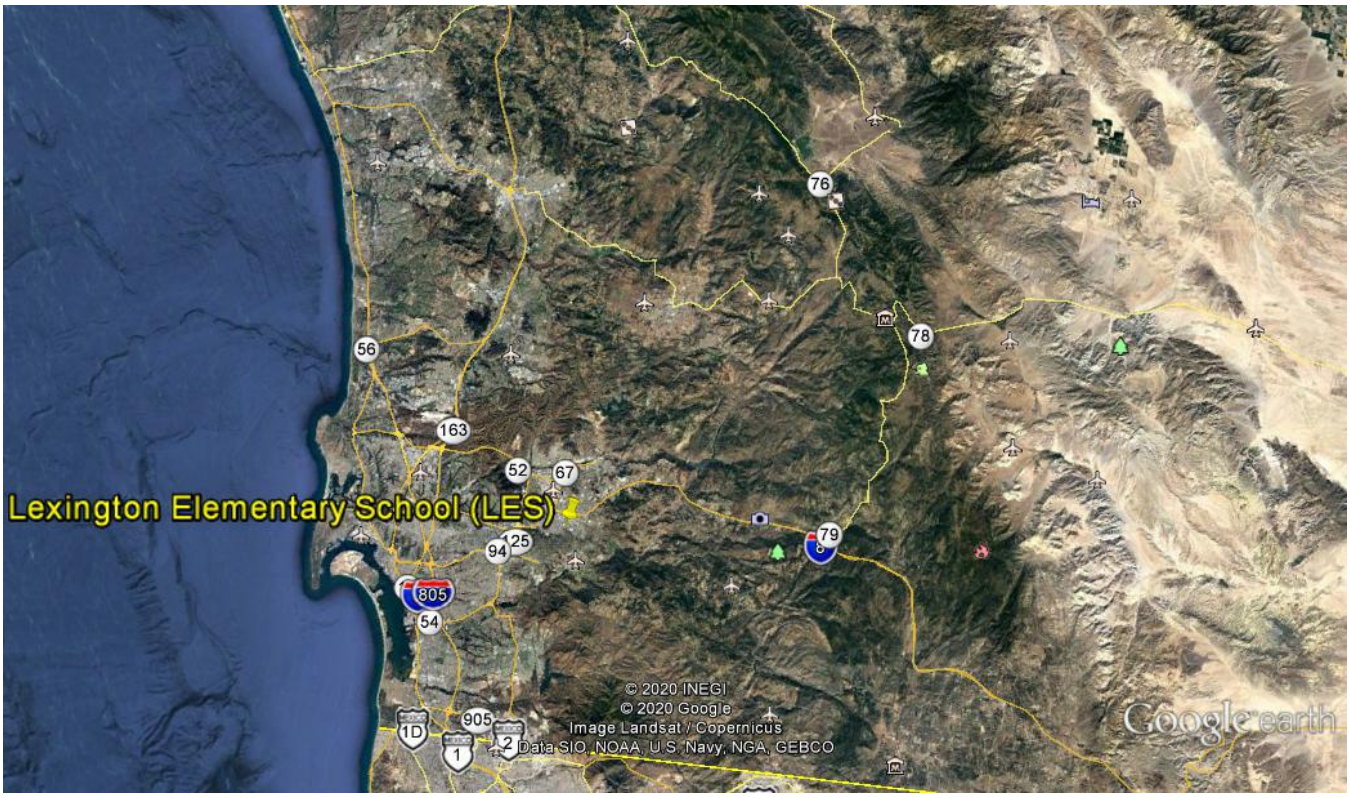



**Figure 11.1 PAMS (Carbonyls and VOCs) Network Map**

The range of compounds for the PAMS program is in excess of 50 different possible ozone precursors and other compounds (See Tables 11.1 and 11.2). The toxicity is gauged by risk factors rather than limits.

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

## 11.2 PAMS Minimum Monitoring Requirements

The PAMS program is a multipronged approach to understand, predict, and control ozone concentrations. Ozone is not emitted directly; it is created by the interactions of several different pollutants/emissions, e.g. oxides of nitrogen ($NO_x$), volatile organic compounds (VOC), and some carbonyls, etc. This enhanced monitoring network to track these different emissions has several different monitoring requirements, e.g. laboratory needs, meteorological needs, etc. that the District operates and references therein (Note: only the passages applicable/informative to the District are referenced). This section will state these requirements. Some of these monitors or samplers can serve as fulfilling other network requirements, e.g. ambient $O_3$ monitor can fulfill a PAMS $O_3$ monitoring requirement.
The District meets or exceeds all minimum requirements for PAMS monitoring except for the following:

- PAMS re-engineering implementation has been delayed per EPA. New implementation date is set for June 2021.

### 11.2.1 PAMS Minimum Monitoring Requirements-Equipment

The District is required to operate equipment for the PAMS parameters for a minimum sampling period. The requirements necessary to fulfill PAMS monitoring requirements are listed in 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 5, "Network Design for Photochemical Assessment Monitoring Stations (PAMS) and Enhanced Ozone Monitoring", subsections 5(a) and 5(b)[41].

> *5. Network Design for Photochemical Assessment Monitoring Stations (PAMS) and Enhanced Ozone Monitoring. (a) …agencies are required to collect and report PAMS measurements at each NCore site required under paragraph 3(a) of this appendix located in a CBSA with a population of 1,000,000 or more, based on the latest available census figures.(b) PAMS measurements include:*
>
> *(1) Hourly averaged speciated volatile organic compounds (VOCs);*
> *(2) Three 8-hour averaged carbonyl samples per day on a 1 in 3 day schedule, or hourly averaged formaldehyde;*
> *(3) Hourly averaged $O_3$;*
> *(4) Hourly averaged nitrogen oxide (NO), true nitrogen dioxide ($NO_2$), and total reactive nitrogen ($NO_y$);*
> *(5) Hourly averaged ambient temperature;*
> *(6) Hourly vector-averaged wind direction;*
> *(7) Hourly vector-averaged wind speed;*
> *(8) Hourly average atmospheric pressure;*
> *(9) Hourly averaged relative humidity;*
> *(10) Hourly precipitation;*
> *(11) Hourly averaged mixing-height;*
> *(12) Hourly averaged solar radiation; and*
> *(13) Hourly averaged ultraviolet radiation.*

[41](2019) 40 CFR Part 58, Appendix D, "Network Design Criteria for Ambient Air Quality Monitoring", Section 5, "Network Design for Photochemical Assessment Monitoring Stations (PAMS) and Enhanced Ozone Monitoring", subsections 5(a) and 5(b) list the requirements necessary to fulfill PAMS monitoring.

In addition, the guidelines for the implementation of the re-designed PAMS program are described in the EPA "Technical Assistance Document for Sampling and Analysis of Ozone Precursors for the Photochemical Assessment Monitoring Stations Program, Revision 2[42]." In the Technical Assistance Document, the implementation of VOC measurements, carbonyl analysis, true $NO_2$ measurements, and meteorological measurements are described in detail. Hourly VOC measurements are to be obtained by Auto-Gas Chromatography (GC) analysis. Carbonyls are collected on DNPH cartridges and analyzed by HPLC. True $NO_2$ is to be measured by Cavity Attenuated Phase Shift Spectroscopy (CAPS).

## 11.3 PAMS Compounds of Interest

Volatile organic compounds (VOC), carbonyls, and direct $NO_2$ measurements are to be measured as part of the PAMS program. The detailed list of compounds of interest are listed in Tables 11.1, 11.2, and 11.3, respectively. As part of the re-engineered PAMS program. True $NO_2$ measurements must be measured by Cavity Attenuated Phase Shift Spectroscopy (CAPS).

**Table 11.1 PAMS VOC Parameter Codes**

| Compound | Parameter |
|---|---|
| Ethylene | 43203 |
| Acetylene | 43206 |
| Ethane | 43202 |
| Propylene | 43205 |
| Propane | 43204 |
| Isobutane | 43214 |
| 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-Dimethylbutane | 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 |
| 3-Methylhexane | 43249 |

| Compound | Parameter |
|---|---|
| 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 |
| α–Pinene | 43256 |
| n-Propylbenzene | 45209 |
| m-Ethyltoluene | 45212 |
| p-Ethyltoluene | 45213 |
| 1.3.5-Trimethylbenzene | 45207 |
| o-Ethyltoluene | 45211 |
| β–Pinene | 43257 |
| 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 |

[42]Technical Assistance Document for Sampling and Analysis of Ozone Precursors for the Photochemical Assessment Monitoring Stations Program, Revision 2, April 2019

**Table 11.2 PAMS Carbonyls Parameter Codes**

| Compound | Parameter |
|---|---|
| Formaldehyde | 43502 |
| Acetaldehyde | 43503 |
| Acetone | 43551 |

**Table 11.3 PAMS True $NO_2$ Parameter Code**

| Compound | Parameter |
|---|---|
| Direct $NO_2$ | 42602 |

## 11.4 PAMS Monitor and Station Summary

The EPA does not provide Network Assessment tools 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 engineered the PAMS program to be mandatory at NCore locations and subjective at non-NCore locations in the SDAB.

### 11.4.1 PAMS-VOC Samplers and Station Evaluation Explanation

The District will keep the PAMS site at the Lexington Elementary School site in El Cajon, which has historically been a PAMS II location at the District. The site is also part of the NCore program. The implementation of near real time VOC data will increase our understanding of ozone formation throughout the air monitoring network. In the next five years, the District recommends implementing canister sampling and analysis via GC-FID for the C2-C6 compounds at Toxic-VOCs stations and at the Camp Pendleton station to supplement the re-engineered PAMS program. This will require laboratory upgrades including a new GC-FID for analysis of PAMS samples. The Camp Pendleton site was historically a PAMS I site and obtaining VOC transport information will be valuable. Table 11.4 is a summary of the multilayered approach for evaluating PAMS-VOC samplers and stations.

**Table 11.4 PAMS-VOC Sampler Summary Rating**

| | **Overall Scoring** | **COMMENTS** | **1.** PAMS Designation | **2.** Community Type | **3.** Ozone | **4.**Other |
|---|---|---|---|---|---|---|
| Lexington Elementary School (LES) | **30** | **1:** PAMS<br>**2:** Light Industrial/mixed use<br>**3:** Required for NCore | 6 | 7 | 7 | 10 |

### 11.4.2 PAMS-Carbonyls Samplers Summary

Formaldehyde is the number one cancer driver in the United States and San Diego is no exception. According to the EPA NATA database, formaldehyde is pervasive throughout the County. The District monitors for formaldehyde via the PAMS-Carbonyl program by collecting samples in a cartridge and analyzing the samples by HPLC. In the upcoming years, the District will seek to upgrade laboratory equipment to support the PAMS carbonyls program, which includes upgrading the HPLC.

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. The implementation of a real time formaldehyde analyzer would provide valuable information alongside the hourly VOC data collected at the PAMS site. If staffing is sufficient, the District will seek additional funding to explore real time formaldehyde analyzers to expand the Carbonyl network. Table 11.5 is a summary of the multilayered approach for evaluating PAMS-Carbonyls samplers and stations.

**Table 11.5 PAMS-Carbonyl Sampler Summary Rating**

| | **Overall Scoring** | **COMMENTS** | **1.** PAMS Designation | **2.** Community Type | **3.** NATA | **4.**Other |
|---|---|---|---|---|---|---|
| Lexington Elementary School (LES) | **30** | **1:** PAMS<br>**2:** Light Industrial/mixed use<br>**3:** Formaldehyde is the highest pollutant contribution at 46%<br>**4:** Collocated with Auto GC (VOC) | 6 | 7 | 7 | 10 |

## 11.5 Conclusion – PAMS Monitoring

The designated PAMS site for the District is at Lexington Elementary School (LES). As part of the PAMS re-engineered program, near real time VOC samples will be analyzed by an Auto-GC continuously (24 hours per day, 7 days per week). The new implementation start date is set for June 1, 2021. In addition to the VOCs analyzed by AutoGC, carbonyl samples will also be collected and analyzed by the District. A True $NO_2$ analyzer will be deployed at LES to provide $NO_2$ data. In addition, a ceilometer will be deployed at the Escondido site to support the PAMS program by providing meteorological data (Pending EPA approval). The District anticipates several changes to the PAMS program in the upcoming years as the program is still being re-engineered. The data from the PAMS program will provide valuable air pollution information regarding ozone formation and precursors in the air monitoring network.

# Chapter 12 Toxics Program

## 12.1 Toxics Introduction

Toxics-related sampling was conducted at five sites during this Assessment: three SDAPCD sites and two CARB sites (Figure 12.1). There are no NAAQS standards which to compare the data. Please note:

San Diego APCD

- The El Cajon station has been relocated to Lexington Elementary School (LES). Because the Floyd Smith Drive relocation was temporary, the maps and table parameters reflect the permanent site metadata (labeled as LES).
- In 2015, the District was evicted from our Escondido (ESC) site (it was on the City of Escondido property) and are in the process of relocating the station 20 meters south east of the original location to be on San Diego County property. Sampling is suspended until the new station is completed. Therefore, ESC is not displayed in the Figure 12.1 nor Table 12.1
- Toxics-VOCs and Toxics-Carbonyls were/are collected in Otay Mesa - Donovan near the Richard J. Donovan Correctional Facility (DVN) and at downtown San Diego (DTN) at Sherman Elementary School (SES, in late-2019) and were collected at the Escondido (ESC) until monitoring at site was suspended, but will resume once relocation is completed (2021).
- Toxics-Metals data were collected at the same locations listed above and at Lexington Elementary School.

California Air Resources Board

- Toxics-VOCs, Carbonyls and Metals were collected at LES and CVA for the CARB CA-TAC program.

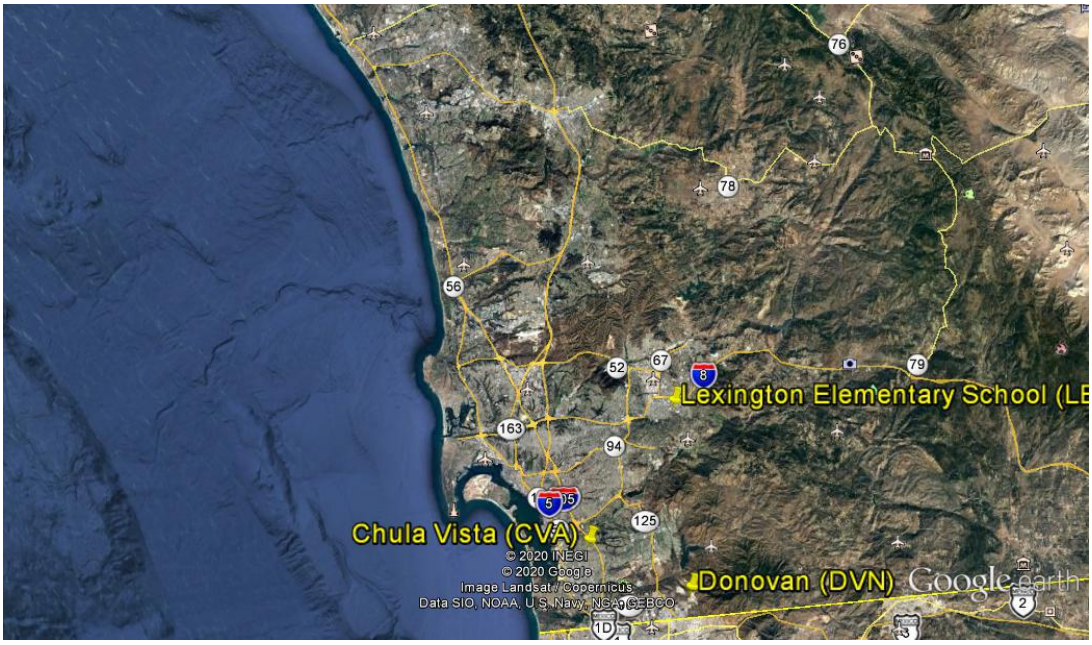



**Figure 12.1 Toxics Network Map**

The range of defined compounds for the Toxics program is in excess of 100 different possible carcinogenic, irritant, and mutagenic chemicals. The District monitors the compounds listed in Tables 12.2, 12.3, and 12.4 and includes sample parameters. Their toxicities are gauged by risk factors rather than limits like there are for the criteria pollutants

## Table 12.1 Toxics Sampling Network

| | Abbreviation | CVA | | | | LES | | | | | DVN | | | SES | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Name | Chula Vista | | | | Lexington | | | | | Donovan | | | Sherman | | |
| | AQS ID | 06-073-0001 | | | | 06-073-1022 | | | | | 06-073-1014 | | | 06-073-1026 | | |
| Toxics | Pollutant | Toxics-VOCs | Toxics-Metals | Toxics-$Cr^{+6}$ | Toxics-Aldehydes/Carbonyls | Toxics-VOCs | Toxics-Metals | Toxics-$Cr^{+6}$ | Toxics-Aldehydes/Carbonyls | Toxics-Metals | Toxics-VOCs | Toxics-Metals | Toxics-Aldehydes/Carbonyls | Toxics-VOCs | Toxics-Metals | Toxics-Aldehydes/Carbonyls |
| | Monitor Type | CA TAC | CA TAC | CA TAC | CA TAC | CA TAC | CA TAC | CA TAC | CA TAC | Not Applicable | Not Applicable | Not Applicable | Not Applicable | Not Applicable | Not Applicable | Not Applicable |
| | Method | Canister | Filter | Filter | Cartridges | Canister | Filter | Filter | Cartridges | Filter | Canister | Filter | Cartridges | Canister | Filter | Cartridges |
| | Affiliation | Not Applicable | Not Applicable | Not Applicable | Not Applicable | Not Applicable | Not Applicable | Not Applicable | Not Applicable | Not Applicable | Not Applicable | Not Applicable | Not Applicable | Not Applicable | Not Applicable | Not Applicable |
| | Spatial Scale | NS | NS | NS | NS | NS | NS | NS | NS | NS | MI | MI | MI | NS | NS | NS |
| | Site Type | PE | PE | PE | PE | PE | PE | PE | PE | PE | SO | SO | SO | PE | PE | PE |
| | Objective (Federal) | Research | Research | Research | Research | Research | Research | Research | Research | Research | Research | Research | Research | Research | Research | Research |
| | Analysis By | ARB | ARB | ARB | ARB | ARB | ARB | ARB | ARB | APCD | APCD | APCD | APCD | APCD | APCD | APCD |
| | Frequency | 1:12 | 1:12 | 1:12 | 1:12 | 1:12 | 1:12 | 1:12 | 1:12 | 1:6 | 1:6 | 1:6 | 1:6 | 1:6 | 1:6 | 1:6 |
| | Equipment | Xontech 910/912 | Xontech 924 | Xontech 924 | Xontech 924 | Xontech 910/912 | Xontech 924 | Xontech 924 | Xontech 924 | Xontech 924 | Xontech 910A FSL | Xontech 924 | Atec 8000 | Xontech 910A FSL | Xontech 924 | Atec 8000 |

**Glossary of Terms**

Monitor Type
E= EPA
O= Other
SLAMS= State & Local monitoring station
SPM= Special purpose monitor
CATAC= California Toxics Monitoring

Site Type
HC= Highest concentration
PE= Population exposure
SO= Source oriented
UPBD= Upwind background
G/B= General/Background
RT= Regional Transport
WRI= Welfare related impacts
QA= Quality assurance

Method (Sampling/Analysis)
CL= Chemiluminescence
CT= Low Volume, size selective inlet, continuous
FL= Fluorescence
HV= High volume
IR= Nondispersive infrared
SI= High volume, size selective inlet
SP= Low volume, size selective inlet, speciated
Q= Low volume, size selective inlet, sequential
UV= Ultraviolet absorption
Canister= Evacuated stainless steel canisters
Cartridges= Di-nitrophenylhydrazine cartridges
FSL= Fused Silica Lined
Filter= Quartz filters
Auto= GCFID continuous

Monitor Designation
PRI= Primary
QAC= Collocated

Network Affiliation
BG= Border Grant
CSN STN= Trends Speciation
CSN SU= Supplemental Speciation
NATTS= National Air Toxics Trends Stations
NCORE= National Core Multi-pollutants
NR= Near-road
PAMS= Photochemical Assessment Monitoring

Spatial Scale
MI= Micro
MS= Middle
NS= Neighborhood

Objective (Federal)
NAAQS= Suitable for NAAQS comparison
Research= Research support
PI= Public Information
N/A= Not Applicable
O= Other

## Table 12.2 Toxics - VOC Compounds Monitored

| Compound | Parameter |
|---|---|
| Dichlorodifluoromethane | 43823 |
| Chloromethane | 43801 |
| 4-Methyl-2-pentanone (MIBK) | 43560 |
| Trichloroethene | 43824 |
| Bromomethane | 43819 |
| Chloroethane | 43812 |
| Trichlorofluoromethane | 43811 |
| cis-1,3-Dichloropropene | 43831 |
| 1,2-Dichloroethane | 43815 |
| 2-Methyl-1,3-butadiene | 43243 |
| 1,1-Dichloroethene | 43826 |
| Carbon Tetrachloride | 43804 |
| Methylene Chloride | 43802 |
| Trichlorotrifluoroethane | 43207 |
| trans-1,2-Dichloroethene | 43838 |
| 1,1,2,2-Tetrachloroethane | 43818 |
| 1,1-Dichloroethane | 43813 |

| Compound | Parameter |
|---|---|
| 4-Ethyltoluene | 45213 |
| 1,3,5-Trimethylbenzene | 45207 |
| 1,2,4-Trimethylbenzene | 45208 |
| 1,3-Dichlorobenzene | 45806 |
| 1,4-Dichlorobenzene | 45807 |
| 1,2-Dichlorobenzene | 45805 |
| 1,2,4-Trichlorobenzene | 45810 |
| Hexachlorobutadiene | 43844 |
| Acetonitrile | 43702 |
| Vinyl acetate | 43447 |
| n-Hexane | 43231 |
| Ethyl acetate | 43209 |
| Methyl methacrylate | 43441 |
| Dichlorotetrafluoroethane | 43208 |
| Benzyl chloride | 45809 |
| Toluene | 45202 |
| 1,2-Dibromoethane | 43843 |

| Compound | Parameter |
|---|---|
| 1,3-Butadiene | 43218 |
| Chloroform | 43803 |
| Naphthalene | 45850 |
| 2-Butanone | 43552 |
| Bromoform | 43806 |
| Styrene | 45220 |
| o-Xylene | 45204 |
| Acrylonitrile | 43704 |
| Acrolein | 43505 |
| Acetone | 43551 |
| Benzene | 45201 |
| Vinyl Chloride | 43860 |

## Table 12.3 Toxics - Carbonyls Monitored

| Compound | Parameter |
|---|---|
| Formaldehyde | 43502 |
| Acetaldehyde | 43503 |
| Acetone | 43551 |

## Table 12.4 Toxics - Metals Monitored

| Compound | Parameter |
|---|---|
| **Tier 1** | |
| Beryllium (TSP) STP | 12105 |
| Manganese (TSP) STP | 12132 |
| Cobalt (TSP) STP | 12113 |
| Nickel (TSP) STP | 12136 |
| Arsenic (TSP) STP | 12103 |
| Selenium (TSP) STP | 12154 |
| Cadmium (TSP STP | 12110 |
| Antimony (TSP) STP | 12102 |
| Lead (TSP) STP | 12128 |
| Chromium (TSP) STP | 12112 |
| **Tier 2*** | |
| Tin (TSP) STP | 12160 |
| Vanadium (TSP) STP | 12164 |
| Strontium (TSP) STP | 12168 |
| Molybdenum (TSP) STP | 12134 |
| Barium (TSP) STP | 12107 |

* Analysis of Tier 2 elements started in 2018

## 12.2 Toxics Monitors and Station Rating Summary

The EPA does not have Network Assessment tools available for Toxic-VOC, Toxic-Metals, or Toxics-Carbonyls sampler and station comparison. The District used other means including community need, community type, and risk factor to ascertain the viability of the Toxics sites. The District will not evaluate CARB Toxics sites. See Table 12.5 for site evaluations.

**Table 12.5 Toxics Monitoring Summary**

| | **Overall Scoring** | **COMMENTS** | **1.** Community Need | **2.** Community Type | **3.** NATA | **4.**Other |
|---|---|---|---|---|---|---|
| Escondido* (ESC) | **33** | **1:** Downwind of agriculture fields<br>**2:** Mixed use with light industry<br>**3:** Average total risk: 68 million<br>**4:** North most site. Temporarily suspended. | 8 | 10 | 7 | 8 |
| Sherman Elementary School (SES) | **40** | **1:** Requested by the community<br>**2:** Heavy Industrial/mixed use<br>**3:** Average total risk: 97 million<br>**4:** EJ area | 10 | 10 | 10 | 10 |
| Otay Mesa-Donovan (DVN) | **32** | **1:** 2nd fastest growing area<br>**2:** Heavy Industrial/becoming mixed use<br>**3:** Average total risk: 64 million<br>**4:** Downwind of San Ysidro and Otay border crossings | 8 | 8 | 6 | 10 |

*Site is currently suspended. Will be relocated within the same property.

## 12.3 Toxics Sampling Conclusion

As evidenced by the preceding sections, the District recommends retaining all Toxics sampling locations and fully advocates the expansion of the program as published data emphasizes the deleterious health effects of long-term exposure to hazardous air pollutants. Once the EPA re-engineers the PAMS-VOC program and there is sufficient staffing, the District will seek funding to expand the network to possibly include the San Ysidro Near-road location and possibly one in West- National City (both in EJ areas) or at Camp Pendleton (or its replacement station).