

# 2010 Ambient Air Monitoring Network Assessment

July 2010



VENTURA COUNTY AIR  
POLLUTION CONTROL DISTRICT



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## ACRONYMS

AQS:	.....	Air Quality System
BAM	.....	Beta Attenuation Mass Monitor
CARB	.....	California Air Resources Board
CFR	.....	Code of Federal Regulations
CMSA	.....	Consolidated Metropolitan Statistical Area
CO	.....	Carbon Monoxide
District:	.....	Ventura County Air Pollution Control District
EPA	.....	U. S. Environmental Protection Agency
FEM	.....	Federal Equivalent Method
FRM	.....	Federal Reference Method
NAAQS	.....	National Ambient Air Quality Standards
NMHC	.....	Non-Methane Hydrocarbons
NO <sub>2</sub>	.....	Nitrogen Dioxide
O <sub>3</sub>	.....	Ozone
PAMS	.....	Photochemical Assessment Monitoring Systems
PM	.....	Particulate Matter
PM <sub>2.5</sub>	.....	Particulates less than or equal to 2.5 microns in size
PM <sub>10</sub>	.....	Particulates less than or equal to 10 microns in size
SIP	.....	State Implementation Plan
SLAMS:	.....	State and Local Air Monitoring Stations
SO <sub>2</sub>	.....	Sulfur Dioxide
VCAPCD:	.....	Ventura County Air Pollution Control District

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## EXECUTIVE SUMMARY

### Purpose

The purpose of this Ambient Air Monitoring Network Assessment is to assess the status of the Ventura County Air Pollution Control District's (District) ambient air monitoring network with respect to the following: (1) Whether the network is sufficient to meet the goals and objectives of the District; (2) Whether the network provides adequate air quality information for the residents of the County; (3) Whether the District's resources could be better utilized by removing monitors from service or repositioning monitors, and; (4) Whether any gaps in the network exist that could be corrected by the addition of new monitors.

### Background

This document is prepared in part to fulfill the new requirements specified in the revised Monitoring Regulations Part 58. The Ventura County Air Pollution Control District's air monitoring network was evaluated to determine if it meets the District's monitoring objectives. Considerations were given to: population and geographical coverage; air quality trends; parameters monitored, attainment classification and emissions inventory.

### Findings

Ventura County is well served by the District's ozone, PM<sub>2.5</sub> and PM<sub>10</sub> air monitoring efforts. The District's air monitoring network provides air quality coverage to the vast majority of the population and inhabited areas of the County. The monitors in the network exceed the minimum number of monitors required by federal regulations.

There are potentially some monitoring parameters which should be further reviewed and prioritized for consolidation. Those parameters are:

Ozone: The Ventura - Emma Wood monitoring site includes an ozone monitor, is a Type 1 PAMS site, and collects meteorological data; as such, this site could be considered the District's lowest value site; it monitors only ozone, is a Type 1 PAMS site, and meteorological data is collected. Monitored ozone values are less than the federal ozone standard; the site's current ozone design value is approximately 89 percent of the federal standard. Therefore, the District could consider removal of this monitoring site; however, federal regulations allow removal of a monitor if it has a probability of less than 10 percent of exceeding 80 percent of the applicable NAAQS. Several exceptions apply to this threshold, which the District should explore. The region of the County served by the Ventura - Emma Wood ozone monitor may be adequately served by the El Rio monitoring site.

PM<sub>2.5</sub>: Of the four FRM PM<sub>2.5</sub> monitors operating in the County, either the Thousand Oaks or Piru monitors might be a candidate for removal. In addition to giving consideration to removal of individual FRM PM<sub>2.5</sub> monitors, the District should give strong consideration to replacing all of the FRM and continuous PM<sub>2.5</sub> monitors with federal equivalent method (FEM) PM<sub>2.5</sub> monitors. This would allow the District to eliminate up to four FRM PM<sub>2.5</sub> monitors (however, there may be requirements to site a colocated FRM with an FEM).

PM<sub>10</sub>: Consideration could be given to removing either the El Rio or Simi Valley PM<sub>10</sub> monitor.

Future monitoring requirements such as the addition of a near-roadway NO<sub>2</sub> monitor and possibly an SO<sub>2</sub> monitor make it important that the District look for opportunities to streamline its monitoring operations, while continuing to provide adequate and sufficient air quality data to the public.

## 1.0 Introduction

The Ventura County Air Pollution Control District's Network Assessment Plan is an examination and evaluation of the District's network of air pollution monitoring stations. This assessment is required by Title 40, Code of Federal Regulations, Part 58.10(d) (40 CFR 58.10(d)). The requirement to submit an assessment of the air pollution monitoring system is provided for in §58.10, (d) which states:

*“The State, or where applicable local, agency shall perform and submit to the EPA Regional Administrator an assessment of the air quality surveillance system every 5 years to determine, at a minimum, if the network meets the monitoring objectives defined in appendix D to this part, whether new sites are needed, whether existing sites are no longer needed and can be terminated, and where new technologies are appropriate for incorporation in the ambient air monitoring network. The network assessment must consider the ability of existing and proposed sites to support air quality characterization for areas with relatively high populations of susceptible individuals (e.g., children with asthma), and, for any sites that are being proposed for discontinuance, the effect on data users other than the agency itself, such as nearby States and Tribes or health effects studies. For PM<sub>2.5</sub>, 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.”*

A network assessment includes (1) re-evaluation of the objectives and budget for air monitoring, (2) evaluation of a network's effectiveness and efficiency relative to its objectives and costs, and (3) development of recommendations for network reconfigurations and improvements.

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## 2.0 Regional Description

### 2.1. Physical Setting

Ventura County is located along the southern portion of the central California coast between Santa Barbara and Los Angeles Counties. Its diverse topography is characterized by mountain ranges to the north, two major river valleys (the Santa Clara, which trends east-west, and the Ventura, which trends roughly north-south), and the Oxnard Plain to the south and west.

The “north half” of the county is mountainous and sparsely populated. The “south half” includes the populated areas where the Ventura County Air Pollution Control District has established its air monitoring network. The south half of the County includes the Oxnard Plain, the Ventura Coastal area and four inland valleys: the Simi Valley, the Conejo Valley, the Santa Clara River Valley, and the Ojai Valley. These areas are described in more detail in Section 3. The approximate land area of Ventura County is 1,832 square miles; with the Los Padres National Forest comprising approximately 964 square miles.

Generally, steep hills border the inland valleys. Bluffs dominate the coastline north of the mouth of the Ventura River, while the coastline south of the Ventura River to Point Mugu is near sea level. The Santa Monica Mountains rise above the Oxnard Plain and continue east into Los Angeles County.

The south half of the County has ten incorporated cities and includes both urban and agricultural areas. Outside of the urban and agricultural areas, the countryside is dominated by sage brush, chaparral scrub, and oak forest plant communities typical of a Mediterranean climate. These generally cover the lower hillsides and southern exposures of higher slopes, while conifer forests typically occur in deep valleys and on the northern slopes of higher elevations.

Agriculture is the dominant non-urban activity in the Oxnard Plain and Santa Clara River Valley, along much of the river valleys, and on the neighboring hillsides.<sup>1</sup>



<sup>1</sup> Ventura County Air Pollution Control District, PM<sub>2.5</sub> Monitoring Network Plane, June 1998.

## 2.2. Population

The 2000 Census lists the population for Ventura County as 753,197 persons. According to Census Bureau estimates the County population in 2009 totaled 836,080 persons<sup>2</sup>. The overwhelming majority of the population resides in the southern portion of the County. In 2009 approximately 88 percent of the County's population resided in one of the County's ten cities. In 2000 there were approximately 752 residents in the north-half of the County. Overall population growth in the County between 2000 and 2009 was 11 percent. Population growth, by city, between 2000 and 2009 ranged from one percent in Port Hueneme to 18 percent in Moorpark.

**Table 1: Ventura County Population, 2000 and 2009**

City	Population				
	2000	% of 2000 Total	2009	% of 2009 Total	% Growth
Camarillo	57,084	7.6	66,149	7.9	16%
Fillmore	13,643	1.8	15,639	1.9	15%
Moorpark	31,415	4.2	37,086	4.4	18%
Ojai	7,862	1.0	8,157	1.0	4%
Oxnard	170,358	22.6	197,067	23.6	16%
Port Hueneme	21,845	2.9	22,171	2.7	1%
San Buenaventura	100,916	13.4	108,787	13.0	8%
Santa Paula	28,598	3.8	29,725	3.6	4%
Simi Valley	111,351	14.8	125,814	15.0	13%
Thousand Oaks	117,005	15.5	128,564	15.4	10%
Balance of County	93,120	12.4	96,921	11.6	4%
<b>County Total</b>	<b>753,197</b>		<b>836,080</b>		<b>11%</b>

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<sup>2</sup> U.S. Census Bureau, <http://factfinder.census.gov/>

## **2.3. Topography and Climate**

The majority of the population resides in the southern half of the County – the District has focused its air monitoring efforts there. The south half of the county is divided into six air basins: Ventura Coastal, Oxnard Plain, Ojai Valley, Santa Clara River Valley, Simi Valley, and the Conejo Valley).

The climate of the coastal shore region is dominated by the cool moist Pacific Ocean. The inland coastal plain is also affected by the proximity of the ocean, but as the distance from the ocean increases so does the heating affects of the land mass.

The Ojai Valley is a bowl shape, surrounded by mountains, and has a warm dry climate. There is only one pathway for the flow of air to enter or exit the valley. The shape of the valley prevents the escape of pollutants that are produced in the valley as well as transported in.

The Santa Clara River Valley allows the transport of air pollutants to and from the Santa Clarita Valley in Los Angeles County.

The Simi Valley is horse shoe shaped with the open end to the west. The sea breeze flows in from the west during the afternoon bringing in air pollutants which are combined with those produced locally. The Simi Valley is also adjacent to the Los Angeles basin and does see transport of air pollutants in the mornings and afternoons when winds are light and easterly. The mountains around Simi trap the air pollutants and the inversion limits mixing aiding the production of ozone.

The Conejo Valley is a west to east valley with the western edge raised above the coastal plain and the eastern end narrows toward the Los Angeles air basin. The topographical shape of the valley and the wind patterns limit the amount of trapping of air pollutants.

### **2.3.1. Weather Patterns**

The weather of the south half of the County is primarily controlled by the differences in the thermal mass of the land and of the Pacific Ocean. The ocean remains relatively constant and slow to change temperature (55F-65F), while the land mass varies daily and seasonally in temperature (30F-110F).

Diurnal wind patterns consist of light night to morning winds and the afternoon sea breeze. The late evening to morning winds are a light drainage flow wind from the northeast or east. As the evening air cools, it flows toward the ocean. From mid to late

morning the sea breeze begins its push from the ocean to the land. Afternoon sea breeze winds from the west to southwest are a steady 5-15 mph. The sea breeze continues through the afternoon into the early evening.

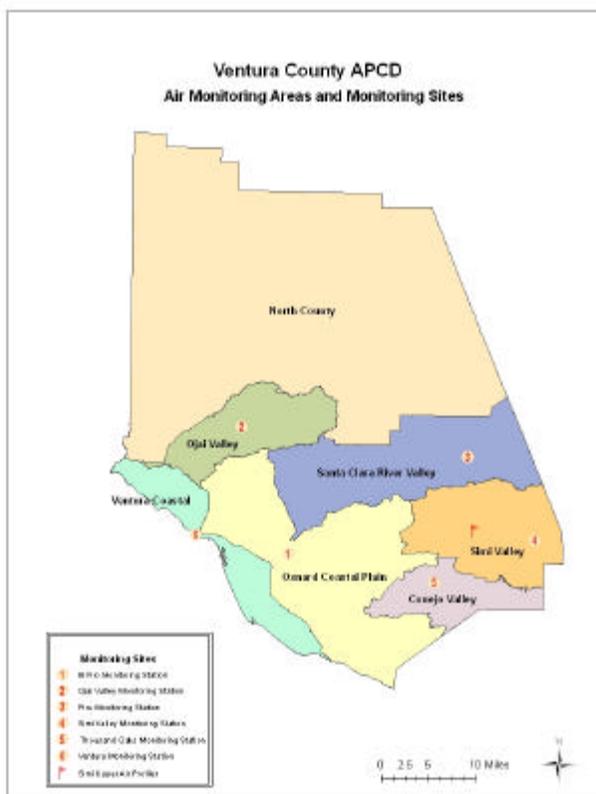
The early summer months have a typical weather pattern of low clouds and fog along the coast and inland during the night and morning hours, with afternoons becoming sunny. The mid to late summer season typically sees the establishment of the semi-permanent subtropical high pressure area that positions itself in the eastern Pacific and/or over southern California. When the high pressure area sets up it is the basis for the occurrence of high temperatures and high ozone concentrations. The winter storm season runs from late October to late March. Santa Ana wind season occurs from late September to mid May. Santa Ana winds are dry strong northeasterly winds. The Santa Ana winds typically follow on the heels of winter type weather systems. During these times the air is very mixed or unstable, not allowing the formation or trapping of air pollutants.

### 3.0 Overview of Air Monitoring Network

The Ventura County Air Quality Control District operates six air monitoring sites and one upper air profiler within Ventura County. The District's monitoring network has been designed to provide ozone, PM<sub>2.5</sub> and PM<sub>10</sub> monitoring coverage to the majority of the inhabited regions of the County. The District has conducted air monitoring for ozone or oxidants in Ventura County since 1963. The District's present-day air monitoring network is designed to provide air monitoring coverage to those areas with a majority of the residents of Ventura County. Locations of the District's monitoring sites are shown Figure 1 (page 8).

The air monitoring network serves the following areas of Ventura County:

Conejo Valley – an inland area, which includes the city of Thousand Oaks and the communities of Westlake Village and Newbury Park, covering 75 square miles and home to 138,000 people. The area is surrounded by foothills and low-lying mountains. The eastern edge of the Conejo Valley is the border between Ventura and Los Angeles Counties. There are no major stationary sources in its boundaries. The area is impacted primarily by mobile sources. This area is served by the District's monitoring station at Thousand Oaks High School, Moorpark Road, in Thousand Oaks.



Ojai Valley – an inland area including the City of Ojai and the communities of Oak View, and Meiners Oaks, which covers 102 square miles and is home to 30,000 people. The Ojai Valley is surrounded by mountain ranges. There is one major stationary source<sup>3</sup> on the southeastern edge of the region; however, it may be influenced by oil production

<sup>3</sup> For the purpose of this report a major stationary source is considered to be a facility that has been issued a federal Part 70 operating permit (also referred to as a Title V permit).

activities occurring to the south, in the Ventura Coastal area. The area is impacted primarily by mobile sources. The Ojai Valley is served by the District's monitoring station at the County fire station, Ojai Avenue, in Ojai.

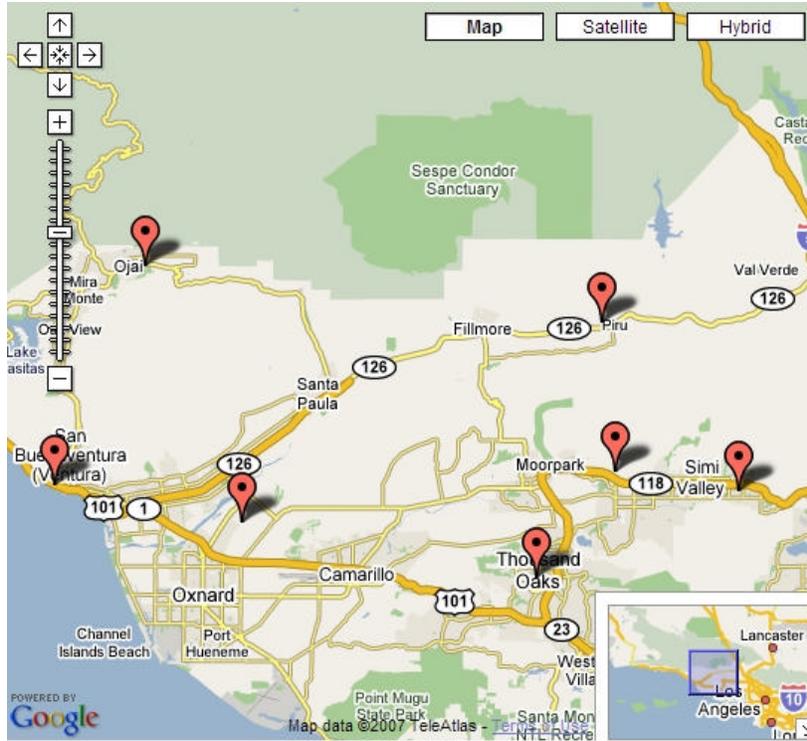
Oxnard Coastal Plain – a broad coastal area from the Pacific Ocean to several inland valleys, covering 286 square miles and has a population of 190,000 people. The Oxnard Coastal Plain area is a relatively flat plain area with foothills and mountains at its northern border. The Oxnard Coastal Plain is home to considerable agricultural activities. Emission sources within the area include several of the County's major stationary sources, including natural gas-fired cogeneration facilities, several oil and gas production and processing facilities, and a paper products manufacturer. Its air quality is influenced by emission sources in the Ventura Coastal area that include a deepwater port, two natural gas-fired electric generating units, two naval bases, and several natural gas-fired cogeneration facilities. The area is impacted by marine shipping operations occurring off of the County's coast and mobile sources. This area is served by the District's monitoring station at Rio Mesa High School, Central Avenue, in Oxnard.

Santa Clara River Valley – an inland area, covering 204 square miles and home to 49,000 people. The Valley is surrounded by foothills and low-lying mountains. The eastern edge of the Santa Clara River Valley is the border between Ventura and Los Angeles Counties. The area is also home to considerable agricultural activities. There are oil production and processing activities occurring throughout the Valley. There are two major stationary sources in its boundaries. The area is impacted primarily by mobile sources. This area is served by the District's monitoring station on Pacific Avenue, in Piru.

Simi Valley – an inland area, which covers the cities of Simi Valley and Moorpark, is 142 square miles and is home to 148,000 people. The Valley is surrounded by foothills and low-lying mountains. The eastern edge of the Simi Valley is the border between Ventura and Los Angeles Counties. There are two major stationary sources in its boundaries. The area is impacted primarily by mobile sources. This area is served by the District's monitoring station at Simi Valley High School, on Cochran Street, in Simi Valley.

Ventura Coastal - a coastal area, which covers 119 square miles and has a population of 197,000 people. The Ventura Coastal monitoring area represents an area that borders the Pacific Ocean, with Santa Barbara County to the west. This area encompasses the city of Port Hueneme and portions of the cities of Ventura and Oxnard. Some agricultural activities occur in the Ventura Coastal area. Emission sources within the area include a deepwater port and a number of the County's major stationary sources, including two natural gas-fired electric generating units, two naval bases and several natural gas-fired cogeneration facilities. In addition to stationary sources, the area is impacted by mobile sources and marine shipping operations

occurring off of the County's coast. This area is served by the District's monitoring station at the Emma Wood State Park group campground, west of Ventura.



**Figure 1: Ventura County APCD Air Monitoring Stations**

Table 2 lists the pollutants or parameters currently measured at each site and the assigned Air Quality System (AQS) identification number for each monitoring site. The table also identifies the respective air monitoring region served by the monitoring station.

**Table 2: Air Monitoring Stations,  
Region Served and Pollutants Monitored**

Site Name and Region Served	AQS ID	Parameters Monitored
El Rio – Rio Mesa School #2 Region: Oxnard Coastal Plain	061113001	NO <sub>2</sub> , Ozone, Total NMHC, PM <sub>10</sub> , BAM PM <sub>2.5</sub> , FRM PM <sub>2.5</sub> , VOCs, carbonyls, Meteorology
Ojai – Ojai Avenue Region: Ojai Valley	061111004	Ozone, BAM PM <sub>2.5</sub> , PM <sub>10</sub> , Meteorology
Piru – Pacific Avenue Region: Santa Clara River Valley	061110009	Ozone, BAM PM <sub>2.5</sub> , FRM PM <sub>2.5</sub> , Meteorology
Simi Valley – Cochran Street Region: Simi Valley	061112002	Ozone, NO <sub>2</sub> , Total NMHC, PM <sub>10</sub> , BAM PM <sub>2.5</sub> , FRM PM <sub>2.5</sub> Toxics (Cr <sup>6+</sup> , aldehydes, total metals), VOCs, speciated PM <sub>2.5</sub> , Meteorology
Simi Valley Upper Air Profiler	061110008	Meteorology only
Thousand Oaks – Moorpark Road Region: Conejo Valley	061110007	Ozone, BAM PM <sub>2.5</sub> , FRM PM <sub>2.5</sub> , Meteorology
Ventura – Emma Wood State Beach Region: Ventura Coastal	061112003	Ozone, VOCs, Meteorology

Notes:

- 1) BAM PM<sub>2.5</sub> – continuous/hourly PM<sub>2.5</sub>
- 2) FRM PM<sub>2.5</sub> – Federal Reference Method, 24 hour filter samples every 3 or 6 days
- 3) Total NMHC - non-methane hydrocarbons

**Table 3: Pollutants Monitored and Monitoring Objectives**

Pollutant	Monitoring Site	Monitoring Objectives and Spatial Scale			
		Highest Concentration	Population	Background	Spatial Scale
Ozone	El Rio		✓		Urban
	Ojai		✓		Urban
	Piru	✓			Urban
	Simi Valley	✓			Urban
	Thousand Oaks		✓		Urban
	Ventura - Emma Wood			✓	Urban
NO2	El Rio		✓		Urban
	Simi Valley	✓			Urban
PM <sub>2.5</sub>	El Rio		✓		Neighborhood
	Piru		✓		Neighborhood
	Simi Valley		✓		Neighborhood
	Thousand Oaks		✓		Neighborhood
PM10	El Rio		✓		Neighborhood
	Ojai		✓		Urban
	Simi Valley	✓			Neighborhood

**3.1. Program Budget and Staffing**

The FY 2010 budget for the District's Air Monitoring Division is approximately \$1,672,810. Of this amount approximately \$1,144,600 is for salaries and benefits and \$268,210 is for services and supplies. The District has also allocated \$260,000 for fixed asset items. Funding for the Division comes from the District's general fund, federal

grants, state subvention and contract revenue. In future years the Division will need additional fixed assets funds to replace the District's upper air profiler, for installation of a near-roadway NO<sub>2</sub> monitor, for the possible installation of an SO<sub>2</sub> monitor, and for minor to major upgrades and repairs to some air monitoring shelters.

The Air Monitoring Division includes the following staffing:

1. One supervising instrument technician and two instrument technicians whose primary functions are to operate the air monitoring network;
2. One supervising meteorologist and one meteorologist who are responsible for providing daily air quality forecasts, agricultural burn forecasts and providing assistance in maintaining and operating the District's five Beta Attenuation Mass Monitors (BAM) PM<sub>2.5</sub> monitors and the District's upper air profiler. The meteorologists also assist the instrument technicians with PM monitor set up and recovery and air quality instrumentation tasks;
3. One supervising chemist and one chemist who are primarily responsible for operating, maintaining and conducting data analysis for the District's PAMS program;
4. One supervising air quality specialist and one air quality specialist who are responsible for operating the District's PM<sub>2.5</sub> filter weighing program and data input into EPA's Air Quality System (AQS).

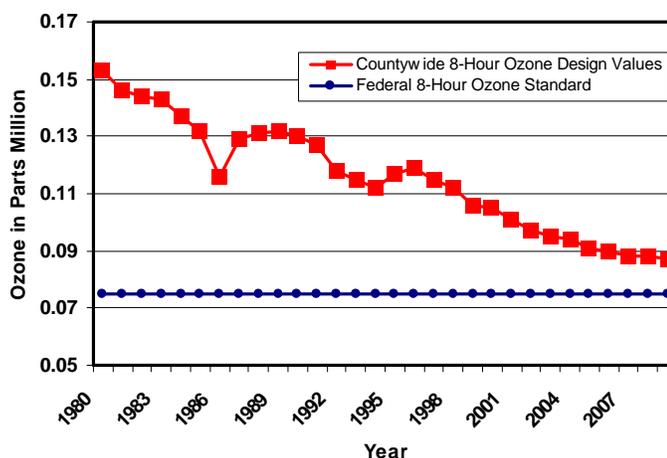
## 4.0 Current and Historical Air Quality Conditions

For over 30 years the Ventura County APCD has developed numerous air quality attainment and management plans, rules and regulations to reduce emissions of ozone precursors - reactive organic compounds (ROC) and oxides of nitrogen (NOx) – as well as particulate matter (PM). Historical trends for ozone and PM show a continued improvement in the County's air quality. Previous air monitoring in the County has shown that ambient levels of carbon monoxide (CO) and sulfur dioxide (SO<sub>2</sub>) are significantly below federal air quality standards. This section presents County-wide air quality data and trends; air quality data and trends for each individual air monitoring station are shown in the Appendices.

### 4.1. Ozone

Ventura County is a severe nonattainment area for ozone. The District monitors for ozone at all six of its air monitoring stations. The current federal ozone standard is an 8-hour average of 0.075 parts per million (ppm), which has been exceeded at various monitoring sites in Ventura County. The federal ozone standard is exceeded most frequently at Simi Valley, followed by Ojai and Piru. El Rio and Ventura-Emma Wood exceed the federal ozone standard infrequently and record similar levels of ozone. The District's continuous ozone data is provided to EPA's AIRNow website. The number of monitors in the District's ozone monitoring network exceeds the federal requirements.

Ventura County Ozone Design Values



County-wide ozone design values and days exceeding the standard have continued to decline in spite of increasing population and vehicle miles in the County. Ozone trends for each air monitoring site are shown in the Appendices.

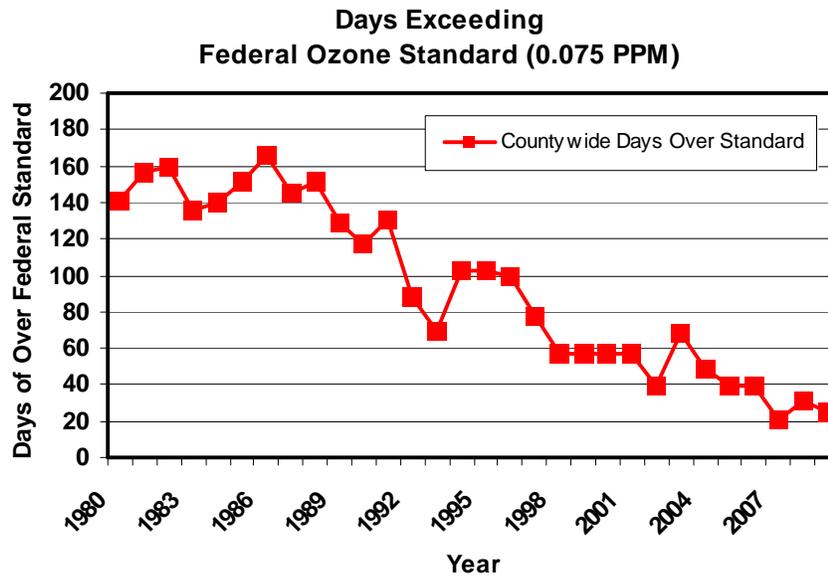
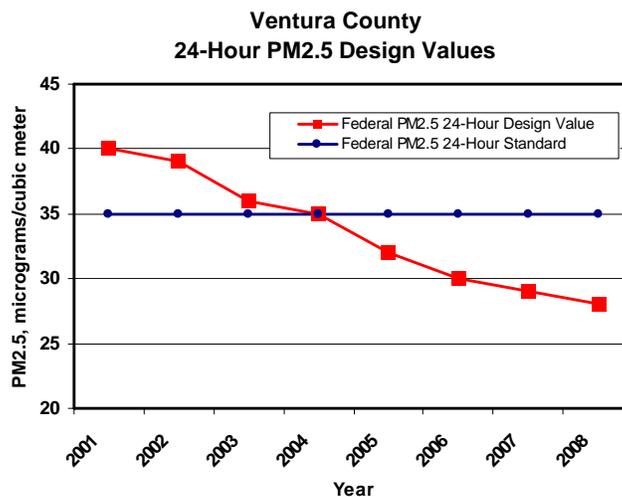


Figure 2: Days Exceeding Federal Ozone Standard

**4.2. Particulate Matter – 2.5 microns (PM<sub>2.5</sub>)**

The District operates Federal Reference Method (FRM) monitors for PM<sub>2.5</sub> at four of its air monitoring sites – El Rio, Piru, Simi Valley and Thousand Oaks. The District began its PM<sub>2.5</sub> monitoring program in 1999 with the installation of monitors at the El Rio and Thousand Oaks sites; PM<sub>2.5</sub> monitors were added at Simi Valley and Piru in 2000. The County is in attainment of both federal PM<sub>2.5</sub> standards - the annual arithmetic mean of 15 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) and the 24-hour standard of 35  $\mu\text{g}/\text{m}^3$ . Historical PM<sub>2.5</sub> values for each air monitoring site are shown in the Appendices. The number of monitors in the District’s PM<sub>2.5</sub> monitoring network exceeds the federal requirements.

In addition to monitoring PM<sub>2.5</sub> using the Federal Reference Method, the District also operates continuous PM<sub>2.5</sub> monitors (beta attenuation mass monitors, or BAMs) at all of its sites except Ventura-Emma Wood. The continuous



PM<sub>2.5</sub> data is provided to EPA's AIRNow website.

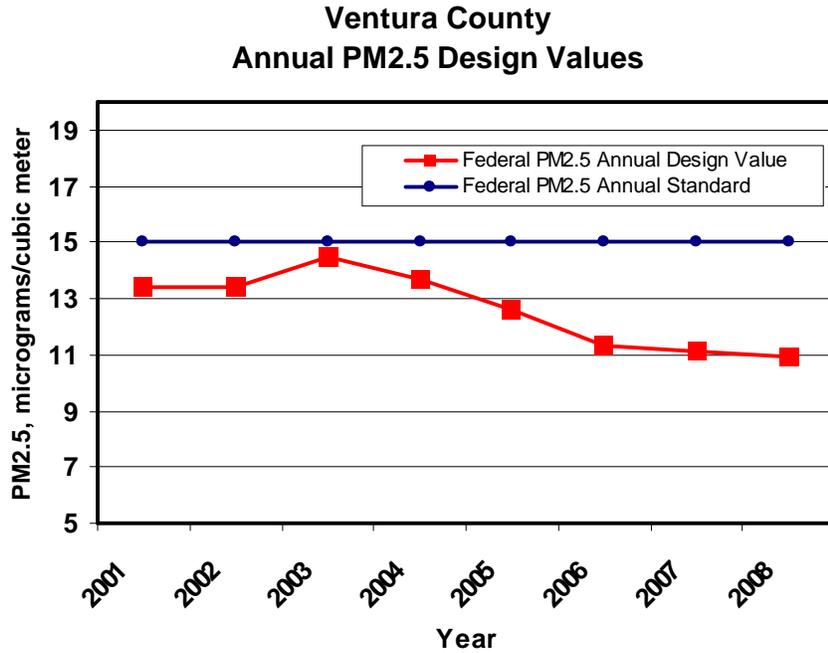
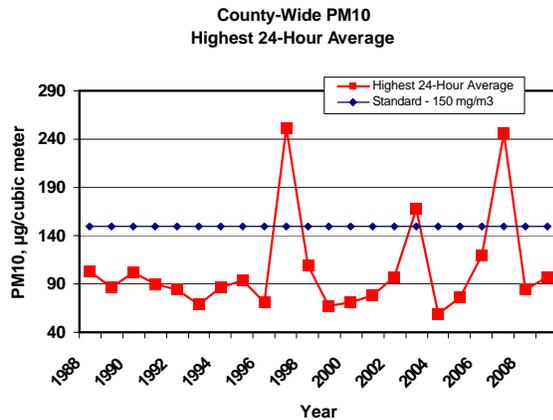


Figure 3: Annual PM<sub>2.5</sub> Design Values

#### 4.3. Particulate Matter – 10 microns (PM<sub>10</sub>)

The District operates Federal Reference Method (monitors) for PM<sub>10</sub> at three of its air monitoring sites – El Rio, Ojai and Simi Valley. The federal 24-Hour standard for PM<sub>10</sub> is 150 µg/m<sup>3</sup>, not to be exceeded more than once per year on average over 3 years. The District began its PM<sub>10</sub> monitoring program in 1988 with monitors in El Rio and Simi Valley; the Ojai Valley PM<sub>10</sub> monitor was added in 1996. The County is in attainment with the federal PM<sub>10</sub> standard. Historical PM<sub>10</sub> values for each air monitoring site are shown in the Appendices.



#### **4.4. Other Pollutants**

In addition to monitoring for ozone, PM<sub>2.5</sub> and PM<sub>10</sub>, the District also monitors for non-methane hydrocarbons, VOCs, carbonyls, Toxics (Cr<sup>6+</sup>, total metals and aldehydes), NO<sub>2</sub> and speciated PM<sub>2.5</sub>

## 5.0 Network Analysis

The District's network of ozone, PM<sub>2.5</sub> and PM<sub>10</sub> air monitors was evaluated using several different methods: a ranking based upon air quality data and monitor-to-monitor correlation. In some cases consideration was given to the value of the air monitor or air monitoring site in the District's overall monitoring goals.

**Monitor Ranking:** Monitors are ranked against one another based on comparisons of the pollutant they measure. Monitors that have higher concentrations, design values, frequency of exceedances, etc. are ranked higher than monitors that have low concentrations, design values or frequency of exceedances.

**Monitor-to-Monitor Correlation:** Using diagnostic tools provided by EPA, monitors were compared to each other to determine if concentrations correlate temporally. According to EPA, monitors with concentrations that correlate well (e.g.,  $r^2$  greater than 0.75) with concentrations at another monitor may be redundant. Conversely, a monitor with concentrations that do not correlate with other nearby monitors may be unique and have more value for spatial monitoring objectives<sup>4</sup>.

The Ojai Valley has a unique topography in that it is a bowl shape, surrounded by mountains, and has a warm dry climate. There is only one pathway for the flow of air to enter or exit the valley. The shape of the valley prevents the escape of pollutants that are produced in the valley as well as transported in. For these reasons, it is the District's opinion that ozone, PM<sub>10</sub> and continuous PM<sub>2.5</sub> monitoring should continue in the Ojai Valley.

### 5.1. Area and Population Served

Each of the District's air monitoring sites has at a minimum an ozone monitor. Instrumentation at monitoring other sites includes FRM PM<sub>2.5</sub> monitors, continuous PM<sub>2.5</sub> monitors (BAMs), PM<sub>10</sub> monitors and monitors for hydrocarbons, carbon monoxide (CO) and oxides of nitrogen (NOx). The District has located each of its air monitoring sites in relation to specific geographic areas of the County, depending upon each area's population, topography and meteorology. Because the north-half of the County is mountainous and sparsely populated, no air monitoring sites have been located in that area. As shown previously in Table 1 (page 3), the County's growth rate between 2000 and 2009 has been approximately 11 percent. Growth between individual cities has ranged from one percent to 18 percent, while the approximate growth between the District's air monitoring regions has ranged from four percent (Ojai Valley) to 14 percent (Simi Valley). Because the District has designed its network with consideration given to the distinct geographic, topographic and meteorological areas of

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<sup>4</sup> U.S. Environmental Protection Agency, Ambient Air Monitoring Network Assessment Guidance, EPA-454/D-07-001, February 2007.

the County, the areas and population served by the District's air monitoring vary greatly. Table 4, below, displays the area and population served by each of its air monitoring sites; area and population for each air monitoring site are based upon data from the 2000 Census. District staff evaluated EPA's "area served" assessment tool for use in this assessment, however due to the large area that the county's north-half encompasses and the unique topography of the monitoring regions, it was not feasible to use for this assessment. Table 5 displays the distance (in miles) between each pair of air monitoring sites.

**Table 4: Air Monitoring Regions - Area and Population Served**

Site Name and Region Served	AQS ID	Area Served (Sq. Miles)	Population Served	Population Density (Pop./Sq. Mi)
El Rio – Rio Mesa School #2 Region: Oxnard Coastal Plain	061113001	286	190,000	664
Ojai – Ojai Avenue Region: Ojai Valley	061111004	102	30,000	294
Piru – Pacific Avenue Region: Santa Clara River Valley	061110009	204	49,000	240
Simi Valley – Cochran Street Region: Simi Valley	061112002	142	148,000	1,042
Thousand Oaks – Moorpark Road Region: Conejo Valley	061110007	75	138,000	1,840
Ventura – Emma Wood State Beach Region: Ventura Coastal	061112003	119	197,000	1,655

**Table 5: Distance Between Air Monitoring Sites, in Miles**

Monitor Site	Thousand Oaks	Piru	Ojai	Simi Valley	Ventura - Emma Wood	El Rio
Thousand Oaks	1					
Piru	22	1				
Ojai	42	39	1			
Simi Valley	19	18	54	1		
Ventura - Emma Wood	42	48	20	58	1	
El Rio	26	35	23	42	16	1

## 5.2. Ozone

The first evaluation was to rank the District's ozone monitors using data from 2000 through 2009. Rankings were evaluated for four factors; the number of days the federal ozone standard was exceeded at each site, each site's peak eight-hour ozone reading, each site's ozone design value and the percent each site is to the federal ozone standard. Each station was ranked one (1) through six (6), with one being the highest value. From this analysis, the ozone monitor at Simi Valley serves the area with the most severe ozone problem in the County, followed by the monitor at the Ojai monitoring site. Although the rankings of the District's ozone monitors show that the El Rio monitor scores the lowest values in the County, it is one of the District's highest value monitoring sites. The El Rio site is the District's PAMS (Photochemical Assessment Monitoring Stations) Type 2 site. The El Rio site also monitors for NO<sub>2</sub>, non-methane hydrocarbons, carbonyls and VOCs and is a part of the District's PM<sub>2.5</sub> and PM<sub>10</sub> monitoring network. The Ventura - Emma Wood site on the other hand is the District's lowest value site: it monitors for ozone, collects meteorological data and is a PAMS Type 1 site, which is not required by EPA's air monitoring regulations (although the District has committed to operate it as a part of an alternative program). Federal regulations require that Ventura County have at a minimum two ozone monitors<sup>5</sup>; the District's air monitoring network exceeds this criteria.

<sup>5</sup> 40 CFR Part 58, Appendix D, Section 4.1

**Table 6: Historical Ozone Data, 2000- 2009**

Ozone Monitor	Ave. Days/Yr. Exceeding Standard	Peak 8-Hour Value, PPM	Ozone Design Value, PPM	Percent of Federal Standard
Simi Valley	33.6	0.101	0.093	125%
Ojai	25.3	0.099	0.089	119%
Piru	20.1	0.094	0.084	113%
Thousand Oaks	8.6	0.088	0.081	108%
Ventura - Emma Wood	1.0	0.075	0.067	89%
El Rio	0.2	0.073	0.065	86%

**Table 7: Relative Rankings of Ozone Monitors**

Ozone Monitor	Days Exceeding Standard	Peak 8-Hour Value	Ozone Design Value	Percent of Federal Standard
Simi Valley	1	1	1	1
Ojai	2	2	2	2
Piru	3	3	3	3
Thousand Oaks	4	4	4	4
Ventura - Emma Wood	5	5	5	5
El Rio	6	6	6	6

The ozone monitor-to-monitor correlation matrix was used to develop a correlation between each pair of the District's ozone monitors, based upon data from 2005 through 2008. From this analysis, the ozone monitor pairs of Ventura-Emma Wood/El Rio, Ojai/Piru and Piru/Simi Valley have the highest correlations, indicating each pair's possible redundancy. A number of monitor pairs have low correlations, indicating each pair's uniqueness to one another.

**Table 8: Correlation Matrix of Ozone Monitors, 2005 - 2008**

Ozone Monitor	Thousand Oaks	Piru	Ojai	Simi Valley	Ventura - Emma Wood	El Rio
Thousand Oaks	1					
Piru	0.56	1				
Ojai	0.40	0.77	1			
Simi Valley	0.56	0.76	0.64	1		
Ventura - Emma Wood	0.16	0.04	0.03	0.04	1	
El Rio	0.43	0.18	0.11	0.16	0.69	1

### 5.2.1. Analysis of Ozone Network

Because the Ojai monitoring site is located in an area that is geographically and meteorologically distinct from the rest of the County, District staff believes the Ojai site should not be considered for removal. Furthermore, the Ojai monitoring station serves a small geographical area with a small population, thus the addition of another ozone monitor in the Ojai Valley is not warranted. The Simi Valley, Thousand Oaks and Piru monitoring sites all exceed the federal ozone standard. The Ventura - Emma Wood and El Rio ozone monitors are District's only monitors that are in attainment with the federal ozone standard. The Ventura - Emma Wood monitor records slightly higher values, and has a higher design value than the El Rio monitor. The two sites are approximately 16 miles apart (see Table 5). The El Rio monitor is located at a high-value site that is the District's PAMS Type 2 site, and monitors for PM<sub>2.5</sub> (FRM and continuous), PM<sub>10</sub>, non-methane hydrocarbons and carbonyls. The Ventura - Emma Wood is the District's lowest value site in that it monitors only for ozone and is the District's PAMS Type 1 site. In light of this, it appears that the Ventura - Emma Wood ozone monitor is the only monitor that may be considered for removal.

### 5.3. PM<sub>2.5</sub>

The District's PM<sub>2.5</sub> monitoring network consists of four sites using FRM PM<sub>2.5</sub> monitors and five sites using continuous (BAM) PM<sub>2.5</sub> monitors. The sites using FRM PM<sub>2.5</sub> monitors were ranked according to five different PM<sub>2.5</sub> values – annual average, annual design value, 98<sup>th</sup> percentile ranking and 24-hour design value. Data from 2000 through 2009 was used; however, some monitors did not have sufficient history to perform averaging periods until after 2000 (El Rio, Piru and Simi Valley in particular). Each

station was ranked one (1) through four (4), with one being the highest value. Tables 8 and 9 present the data and rankings of each PM<sub>2.5</sub> monitor. This analysis shows the PM<sub>2.5</sub> monitor at Simi Valley serves the area with the most severe PM<sub>2.5</sub> problem in the County, followed by the monitors at Thousand Oaks, El Rio and Piru. It should be noted that all monitors meet the federal 24-hour and annual arithmetic mean PM<sub>2.5</sub> standards. Federal regulations require that Ventura County have at a minimum one PM<sub>2.5</sub> monitor<sup>6</sup>; the District's air monitoring network exceeds this criteria.

It should be noted that at all four of the District's FRM PM<sub>2.5</sub> monitoring sites, plus the Ojai monitoring site, the District operates continuous (BAM) PM<sub>2.5</sub> monitors. The continuous monitors are used to provide the public with real-time PM<sub>2.5</sub> air quality data.

**Table 9: Historical PM<sub>2.5</sub> Data**

PM <sub>2.5</sub> Monitor	Annual Average, µg/m3	Annual Design Value, µg/m3	% of Annual Design Value	98th Percentile, µg/m3	24-Hour Design Value, µg/m3
Simi Valley	12.5	12.4	82%	33.2	34
Thousand Oaks	11.6	11.7	78%	29.7	29
El Rio	11.3	11.2	74%	26.3	27
Piru	10.2	10.0	67%	22.2	22

**Table 10: Relative Rankings of PM<sub>2.5</sub> Monitors**

PM <sub>2.5</sub> Monitor	Annual Average	Annual Design Value	98th Percentile	24-Hour Design Value
Simi Valley	1	1	1	1
Thousand Oaks	2	2	2	2
El Rio	3	3	3	3
Piru	4	4	4	4

The monitor-to-monitor correlation matrix was used to develop correlations between each pair of the District's PM<sub>2.5</sub> monitors, based upon data from 2005 through 2008. From this analysis, the PM<sub>2.5</sub> monitor pair of Simi Valley/Piru has a correlation of 0.72, which is approaching EPA's criteria (a correlation of 0.75) for the pair's possible

<sup>6</sup> 40 CFR Part 58, Appendix D, Section 4.7

redundancy; the Simi Valley/Thousand Oaks monitor pair has a correlation of 0.764, indicating a possible redundancy, according to EPA’s criteria.

**Table 11: Correlation Matrix of PM<sub>2.5</sub> Monitors, 2005 - 2008**

PM <sub>2.5</sub> Monitor	Thousand Oaks	Piru	Simi Valley	El Rio
Thousand Oaks	1			
Piru	.653	1		
Simi Valley	.764	.724	1	
El Rio	.593	.550	.511	1

**5.3.1. Analysis of PM<sub>2.5</sub> Network**

The Thousand Oaks, Piru and El Rio sites all have annual design values less than 80 percent of the federal standard. The Simi Valley/Thousand Oaks and Simi Valley/Piru monitor pairs have correlations of .764 and .724, respectively. The Piru monitor ranks lowest among the four monitors, with El Rio ranking third lowest. This analysis would indicate that either the Thousand Oaks or Piru PM<sub>2.5</sub> monitor might be candidates for removal.

In addition to giving consideration to removal of individual FRM PM<sub>2.5</sub> monitors the District will be giving strong consideration to replacing all of the FRM and continuous PM<sub>2.5</sub> monitors with federal equivalent method (FEM) PM<sub>2.5</sub> monitors.

**5.4. PM<sub>10</sub>**

The District’s PM<sub>10</sub> monitors were ranked using three different values – annual average, three-year average and the highest 24-hour average. Data from 2000 through 2009 was used. Each station was ranked one (1) through three (3), with one being the highest value. Tables 11 and 12 present the data and rankings of each PM<sub>10</sub> monitor. The rankings show the monitor at El Rio serves the area with the most severe PM<sub>10</sub> problem in the County, followed by Simi Valley and Ojai. Federal regulations require that Ventura County have at a minimum one to two PM<sub>10</sub> monitors<sup>7</sup>; the District’s air monitoring network exceeds this criteria.

<sup>7</sup> 40 CFR Part 58, Appendix D, Section 4.6

**Table 12: Historical PM<sub>10</sub> Data**

PM <sub>10</sub> Monitor	Annual Average, µg/m <sup>3</sup>	3-Year Average, µg/m <sup>3</sup>	High 24-Hour Average, µg/m <sup>3</sup>
El Rio	27.60	27.67	98.0
Simi Valley	27.56	22.56	84.3
Ojai	21.79	27.56	54.4

**Table 13: Relative Rankings of PM<sub>10</sub> Monitors**

PM <sub>10</sub> Monitor	Annual Average	3-Year Average	High 24-Hour Average
El Rio	1	1	1
Simi Valley	2	2	2
Ojai	3	3	3

The monitor-to-monitor correlation matrix for the three PM<sub>10</sub> monitors was based upon data from 2005 through 2008. Because of the uniqueness of the Ojai Valley, the District believes the Ojai monitor should be left in place; therefore, the only monitor pair to evaluate is the El Rio/Simi Valley pair, which does not show a strong correlation, indicating that the pair's uniqueness and that they may not be suitable for removal.

**Table 14: Correlation Matrix of PM<sub>10</sub> Monitors, 2005 - 2008**

PM <sub>10</sub> Monitor	El Rio	Ojai	Simi Valley
El Rio	1		
Ojai	0.554	1	
Simi Valley	0.352	0.592	1

#### **5.4.1. Analysis of PM<sub>10</sub> Network**

Although the El Rio/Simi Valley pair of monitors does not have a high correlation, both monitors are less than 65 percent of the federal annual PM<sub>10</sub> standard. All three monitors show occasional spikes in excess of the federal PM<sub>10</sub> standard; these spikes are caused by smoke from wildfires within the County; the most recent spike of 246 µg/m<sup>3</sup> (occurring in 2007) was flagged as an exceptional event and submitted to the California Air Resources Board for review and submittal to EPA. Federal regulations require that the District maintain one to two PM<sub>10</sub> monitors; because the District exceeds the minimum monitoring requirements and the El Rio and Simi Valley pair of monitors have recorded less than the federal standard, either one of these monitors could be a candidate for removal. In the future, the District should consider the use of FEM PM<sub>10</sub> monitors as that technology develops.

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**APPENDICES**

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**APPENDIX A: HISTORICAL AIR MONITORING IN VENTURA COUNTY**

**1.0 Ozone and Oxidant Monitoring**

**Table 15: Historical Ozone and Oxidant Monitoring Locations**

Air Monitoring Area	Monitoring Site	Dates of Operation
Coastal Area	Ventura – Loma Vista	Intermittent 10/1963 – 3/1973
	Oxnard – A Street	5/1965 – 4/1966
	Port Hueneme – Civil Engineering Lab	Intermittent 3/1973 – 10/1980
	Ventura – Telegraph Road	4/1973 – 11/1977
	Point Mugu – 13th Street	8/1973 – 8/1977
	Ventura – Figueroa Street	9/1979 – 7/1984
	La Conchita – 7128 Santa Paula Avenue	7/1983 – 10/1983
	Ventura – Emma Wood State Beach	2/1984 – Present
Ventura/Oxnard Plain Area	Camarillo – Magnolia	8/1969 – 9/1971
	Camarillo – Palm	9/1971 – 11/1974
	Camarillo – Elm	12/1974 – 5/1978
	El Rio – Rio Mesa School	9/1978 – 2/1992
	El Rio – Rio Mesa School #2	12/1979 – Present
Ojai Valley Area	Ojai – Signal Street	Intermittent 4/1965 – 10/1980
	Ojai – 1401 Maricopa Highway	3/1981 – 3/1983
	Ojai – 1768 Maricopa Highway	11/1982 – 3/1996
	Casitas Pass (Air Resources Board)	10/1983 – 10/2002
	Ojai – Ojai Avenue	3/1996 – Present
Santa Clara River Valley Area	Santa Paula – Santa Barbara Street	4/1972 – 6/1978
	Piru – Main Street	Intermittent 7/1976 – 9/1981
	Piru - 2 Miles SW	9/1981 – 11/2000
	Piru – Pacific Avenue	11/2000 – Present
Simi Valley Area	Moorpark College	5/1972 – 9/1972
	Simi Valley – Cochran Street I	11/1973 to 8/1985
	Simi Valley – Cochran Street	6/1985 - Present
Conejo Valley Area	Thousand Oaks – Windsor Drive	Intermittent 5/1973 – 2/1992
	Thousand Oaks – Moorpark Road	2/1992 – Present
North Half Offshore	Lockwood Valley	8/1979 – 8/1980
	Anacapa Island – Lighthouse	Intermittent 5/1984 – 10/1992

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## 2.0 2004 Network Reductions

In 2003, District staff conducted an assessment of the Ventura County air monitoring network, in consultation with EPA Region IX staff. The assessment was conducted in anticipation of new requirements under 40 CFR Part 58. The District determined that the existing network should be reduced to prepare for anticipated future monitoring program increases. On June 24, 2004, EPA Region IX approved the following reductions:

**Table 16: Historical Network Reductions**

Parameter	Location	Shutdown Date
PM <sub>10</sub>	Thousand Oaks – Moorpark Road	July 22, 2004
	Piru – Pacific Avenue	July 27, 2004
Sulfur Dioxide	El Rio – Rio Mesa School #2	July 28, 2004
Carbon Monoxide	El Rio – Rio Mesa School #2	March 21, 2004
	Simi Valley – Cochran Street	March 28, 2004
Nitrogen Oxides	Ojai – Ojai Avenue	July 28, 2004
	Ventura – Emma Wood State Beach	July 29, 2004
	Thousand Oaks – Moorpark Road	July 22, 2004

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**APPENDIX B: HISTORICAL AIR QUALITY DATA**

**Table 17: Days Exceeding Federal Ozone Standard (0.075 PPM)**

Year	El Rio	Ojai	Piru	Simi Valley	Thousand Oaks	Ventura (Emma Wood)	Countywide
2009	1	11	11	24	5	0	25
2008	0	12	11	27	6	0	31
2007	0	4	4	19	2	1	21
2006	0	19	21	30	5	0	39
2005	0	20	20	35	6	1	39
2004	1	34	22	35	12	2	49
2003	0	59	43	42	22	2	68
2002	0	28	18	25	4	0	39
2001	0	33	31	46	11	4	57
2000	0	33		53	13	0	57
1999	1	26		51	10	0	57
1998	2	25		52	22	0	57
1997	2	37		70	25	3	78
1996	9	67		89	37	15	100
1995	13			97	37	9	103

**Table 18: PM<sub>2.5</sub> Annual Mean  
(Federal Standard = 15 µg/m<sup>3</sup>)**

Year	El Rio	Piru	Simi Valley	Thousand Oaks
2008	10.1	9.7	10.7	10.3
2007	10.6	10.2	11.6	10.5
2006	9.8	9.3	10.3	9.8
2005	10.5	9.2	11.2	10.5
2004	11.3	10.1	12.5	11.3
2003	11.7	11.0	14.2	11.9
2002	13.0	12.0	14.6	12.6
2001	13.1		14.9	14.1
2000				13.5
1999			13.7	12.5

**Table 19: PM<sub>2.5</sub> Highest 24-Hour Average  
(Federal Standard = 35 µg/m<sup>3</sup>)**

Year	El Rio	Piru	Simi Valley	Thousand Oaks
2009	19.7	20.5	22.2	21.7
2008	23.4	29.4	35.6	27.8
2007	39.9	34.3	48.8	31.5
2006	29.8	28.0	31.7	28.4
2005	35.2	20.4	42.4	27.8
2004	28.5	28.1	41.2	38.3
2003	81.7	26.1	116.0	31.4
2002	29.4	30.6	46.4	31.7
2001	41.0	37.2	50.0	45.5
2000	45.7	37.6	55.3	53.7
1999	36.7		64.6	53.2

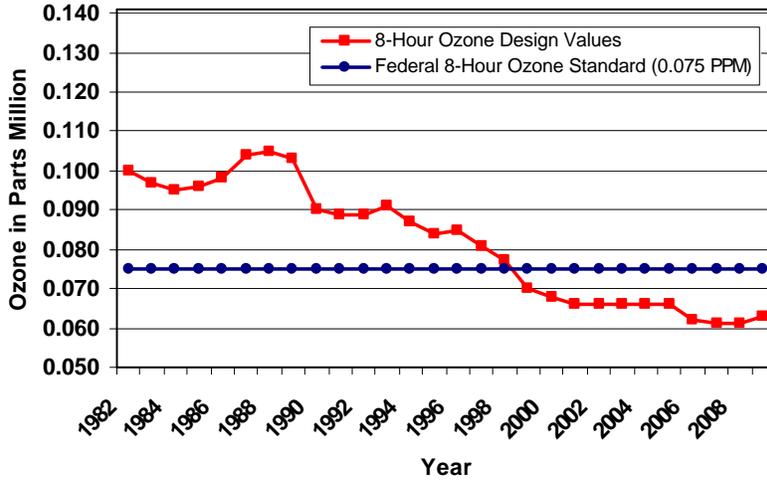
**Table 20: PM<sub>10</sub> Highest 24-Hour Average  
(Standard = 150 µg/m<sup>3</sup>)**

Year	El Rio	Ojai	Simi Valley
2009	97.4	37.5	76.8
2008	79	62.4	83.6
2007	245.5	98.5	118.5
2006	119.4	46.4	56.9
2005	54	60.4	76
2004	59.6	43.8	48.7
2003	81.7	56.5	167.7
2002	29.4	41.9	65.4
2001	41	50.3	78
2000	45.7	46.3	71
1999	36.7	53.6	67.6
1998	70.3	109.5	49.1
1997	252.5	36.2	106.9
1996	63.5	38.8	71.2
1995	62		94
1994	54		86
1993	63.2		68
1992	58		84
1991	59		90
1990	102		90
1989	70		87
1988	64		103

**APPENDIX C: EL RIO MONITORING STATION**

**Figure 4:**

**El Rio Ozone  
8-Hour Design Values**



**Figure 5:**

**El Rio PM2.5  
Annual Design Values**

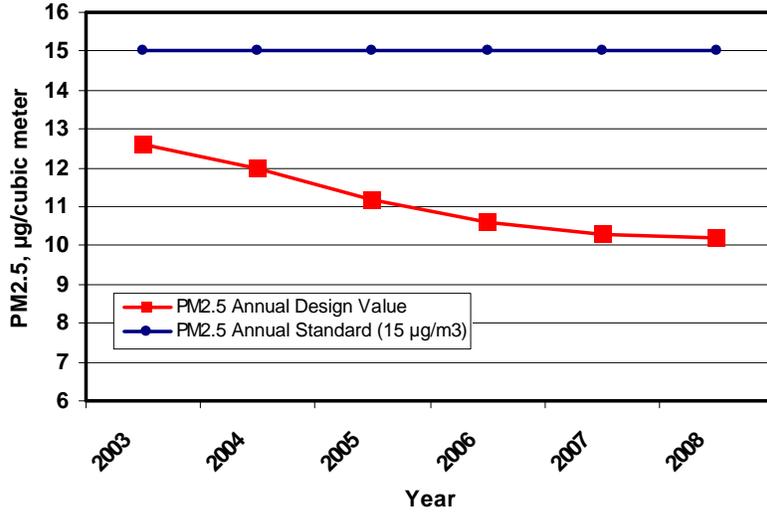


Figure 6:

El Rio PM 2.5  
24-Hour Design Value

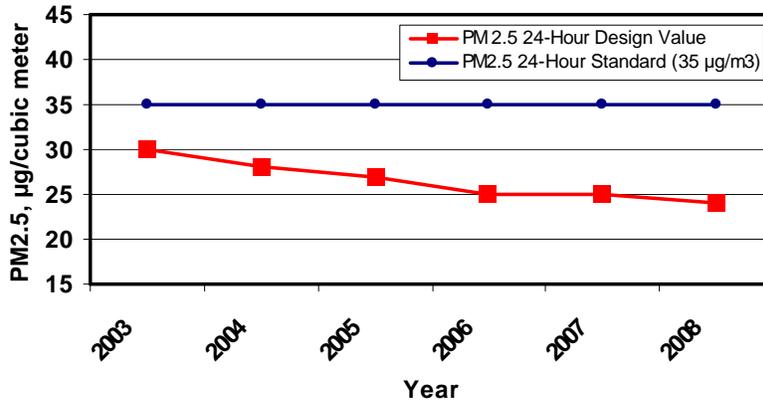
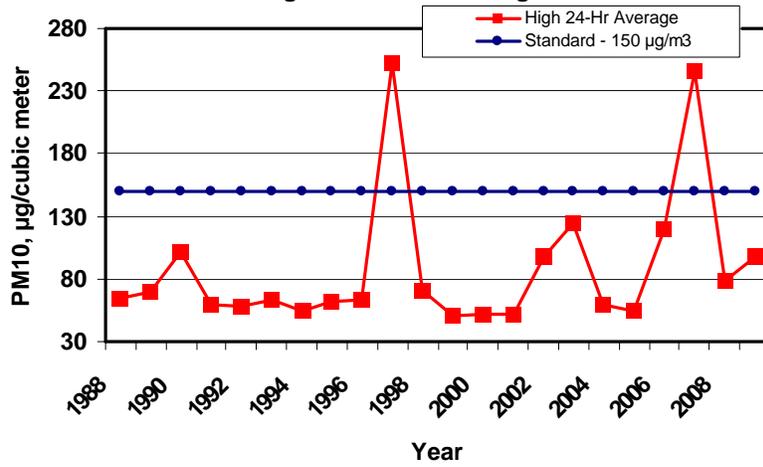


Figure 7:

El Rio PM10  
Highest 24-Hour Average



APPENDIX D: OJAI MONITORING STATION

Figure 8:

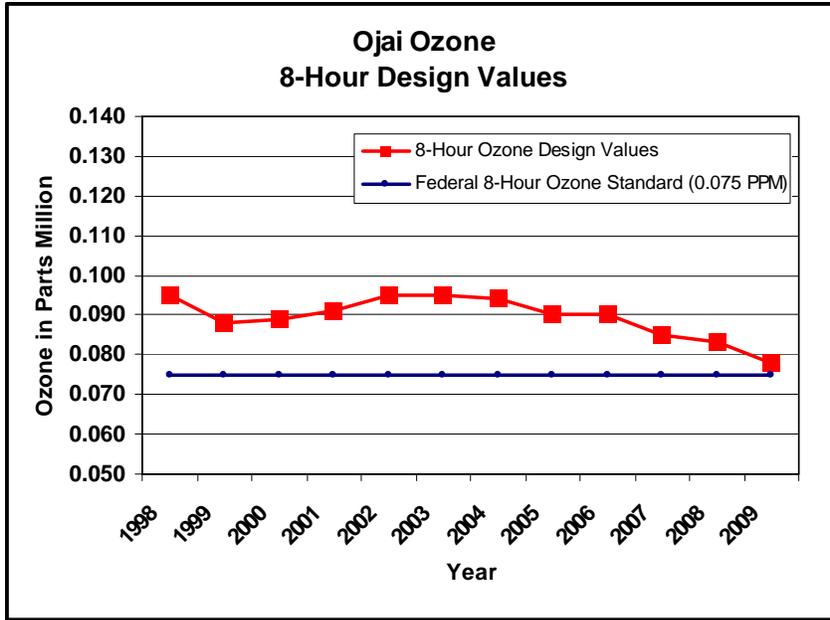
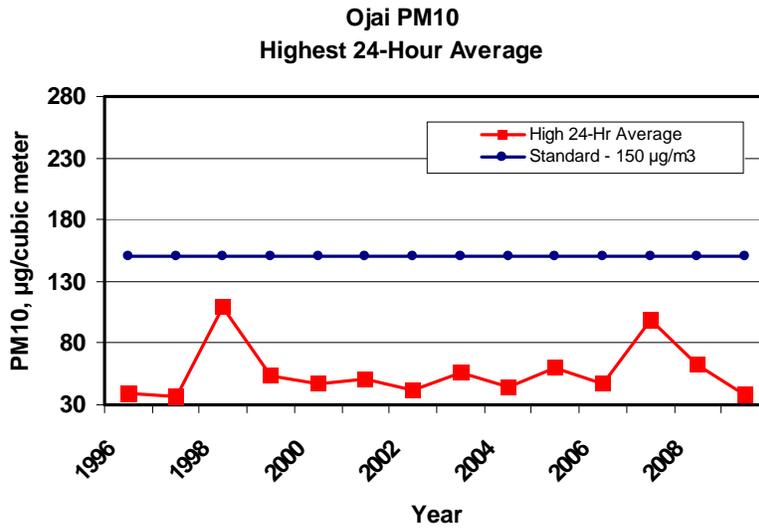


Figure 9:



### APPENDIX E: PIRU MONITORING STATION

Figure 10:

Piru Ozone  
8-Hour Design Values

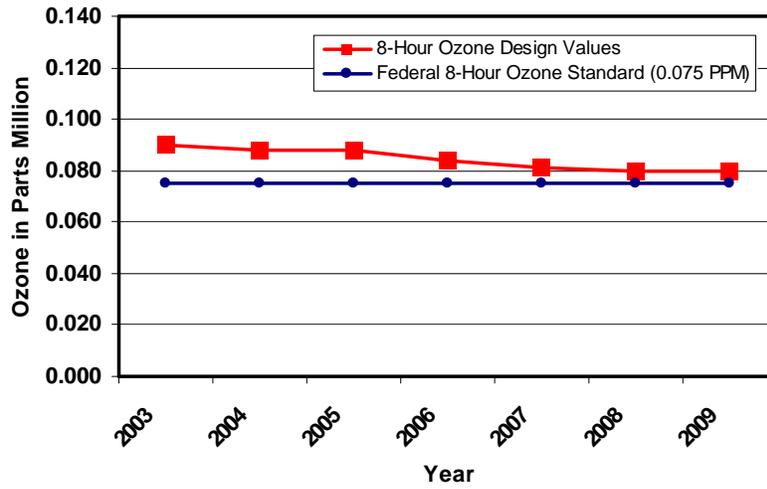
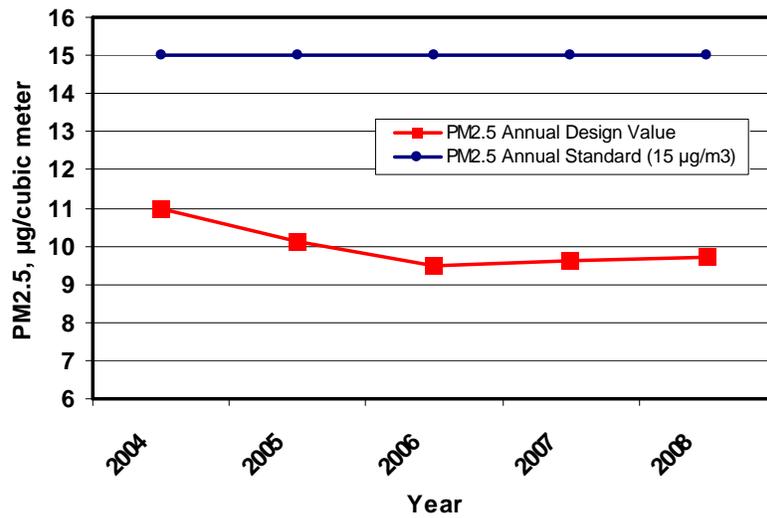
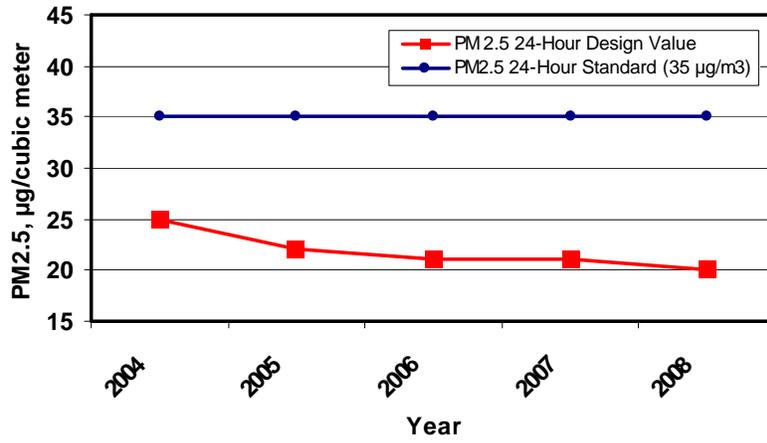


Figure 11:

Piru PM2.5  
Annual Design Values



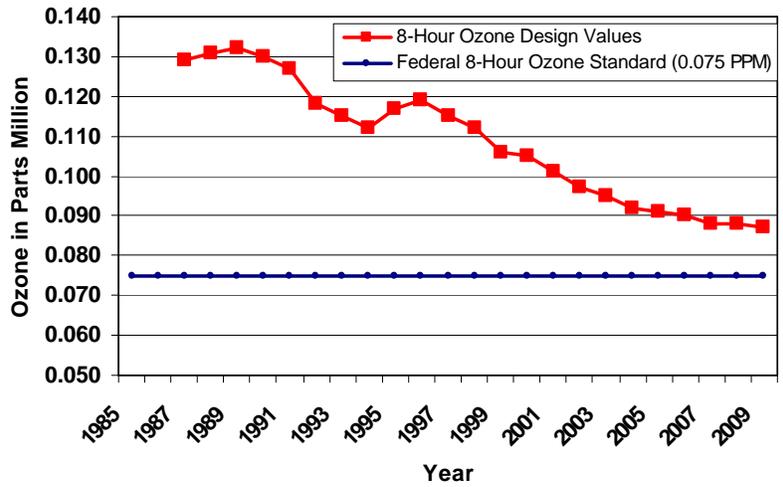
**Figure 12:**  
**Piru PM2.5**  
**24-Hour Design Values**



**APPENDIX F: SIMI VALLEY MONITORING STATION**

**Figure 13:**

**Simi Valley Ozone  
8-Hour Design Values**



**Figure 14:**

**Simi Valley PM2.5  
Annual Design Values**

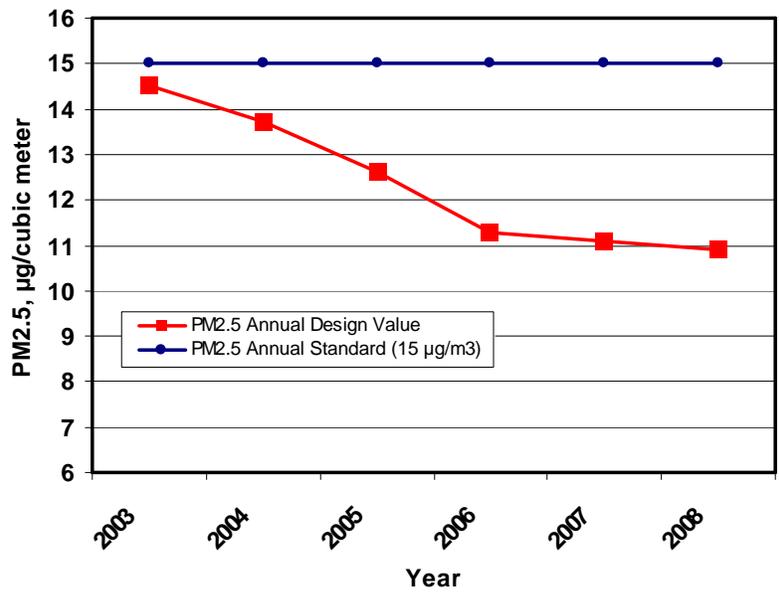


Figure 15:

Simi Valley PM2.5  
24-Hour Design Values

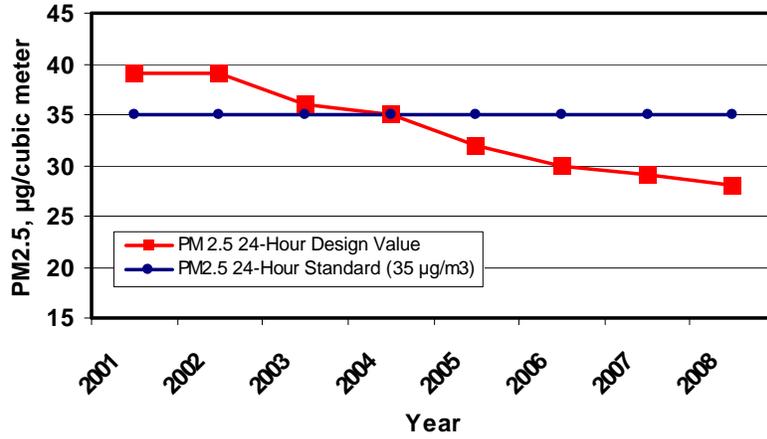
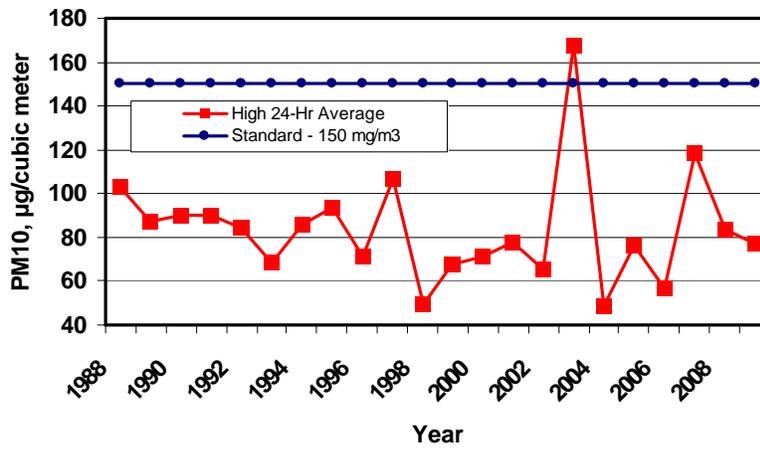


Figure 16:

Simi Valley PM10  
Highest 24-Hour Average



### APPENDIX G: THOUSAND OAKS MONITORING STATION

Figure 17:

Thousand Oaks Ozone  
8-Hour Design Values

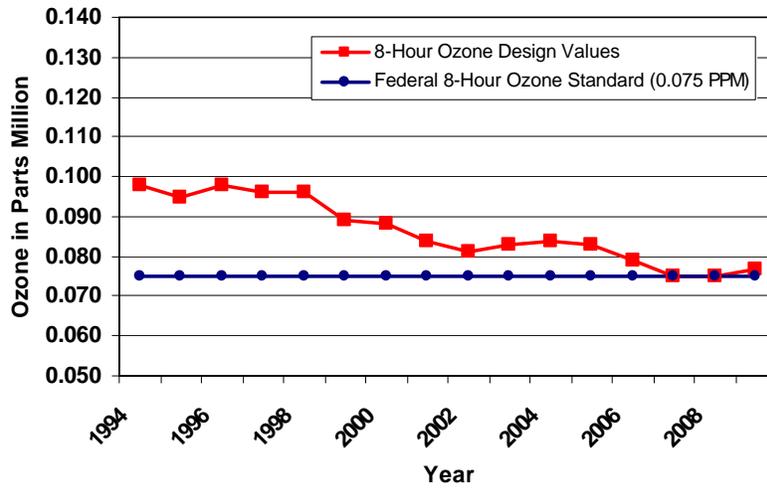
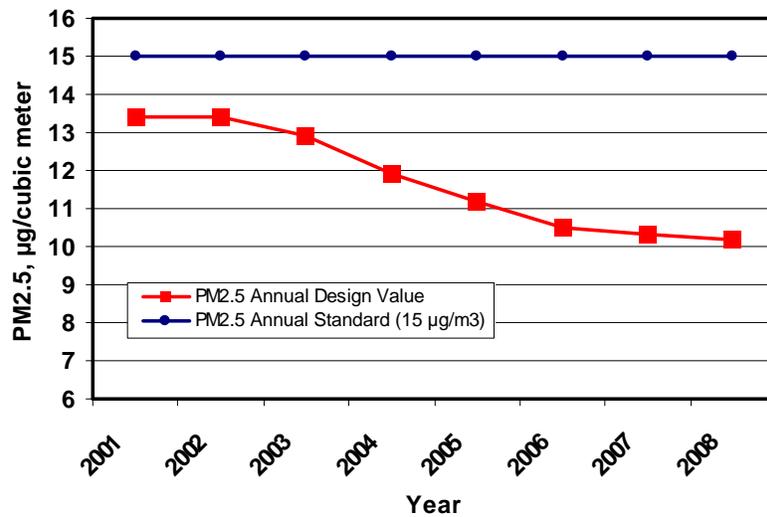


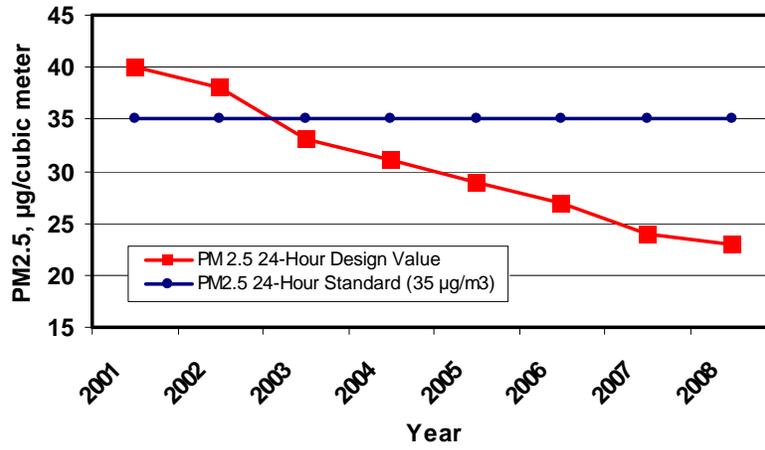
Figure 18:

Thousand Oaks PM2.5  
Annual Design Values



**Figure 19:**

**Thousand Oaks PM2.5  
24-Hour Design Values**



## APPENDIX H: VENTURA - EMMA WOOD MONITORING STATION

Figure 20:

Ventura-Emma Wood Ozone  
8-Hour Ozone Design Values

