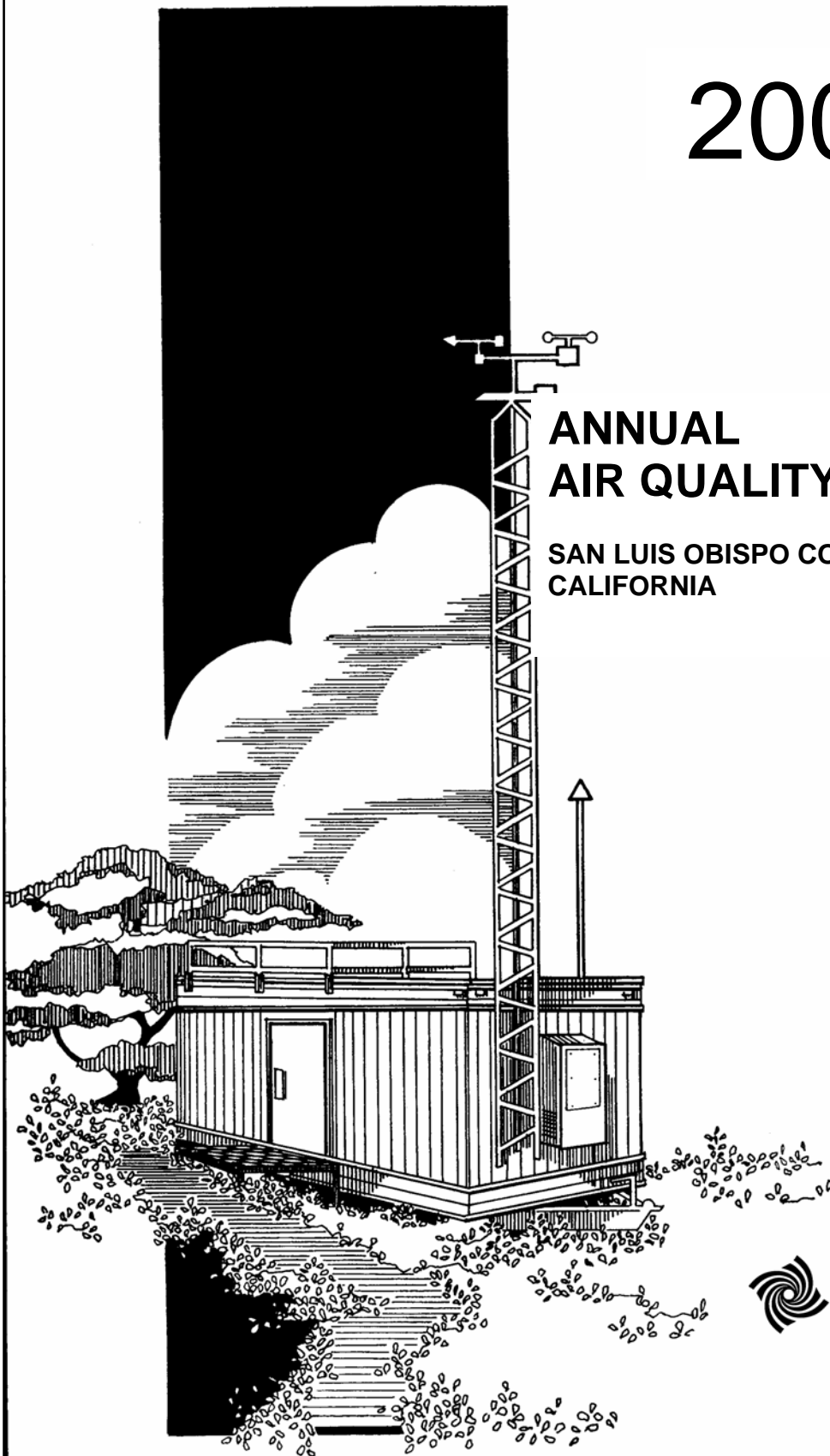


# 2005

## ANNUAL AIR QUALITY REPORT

SAN LUIS OBISPO COUNTY  
CALIFORNIA



AIR POLLUTION  
CONTROL DISTRICT  
COUNTY OF SAN LUIS OBISPO

# **AIR POLLUTION CONTROL DISTRICT COUNTY OF SAN LUIS OBISPO**

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2005 Annual Air Quality Report  
Published September 2006  
By Technical Services Division

*The air quality database for San Luis Obispo County is a public record and is available from the APCD office in various forms, including comprehensive records of all hourly or other sample values acquired anywhere in the county. Data summaries are published weekly on the APCD's website and in this Annual Air Quality Report. Ozone summary data appear weekly in the Saturday edition of the San Luis Obispo County Tribune, a local newspaper. Each month's data from ambient monitoring is added to separate archives maintained by the federal Environmental Protection Agency (EPA) and by the Air Resources Board (ARB). Summary data from San Luis Obispo County can be found in EPA and ARB publications and on the world wide web at the following websites:*

[www.slocleanair.org](http://www.slocleanair.org)  
SLO APCD website  
[www.arb.ca.gov](http://www.arb.ca.gov)  
ARB website  
[www.epa.gov](http://www.epa.gov)  
US EPA website

## 2005 Air Quality Summary

Most populated areas of San Luis Obispo County enjoyed very good air quality this year. There was only one exceedance day of the state standard for ozone and no exceedance of the federal ozone standard in 2005. Countywide, exceedances of the state 24 hour PM<sub>10</sub> standard of 50 ug/m<sup>3</sup> occurred only once out of 61 different sample days.

Statistically, this is equivalent to 6 exceedance days for 2005 since sampling is only conducted once every six days. The exceedance of the state PM<sub>10</sub> standard was recorded at the contractor-operated MESA2 station which ended operation on April 30, 2005. There was no exceedance of the federal air quality standard for PM<sub>10</sub> in 2005.

In San Luis Obispo County, ozone and PM<sub>10</sub> are the pollutants of main concern, since exceedances of state health-based standards for those are experienced here in most years. In January 2004 our county was designated by the state Air Resources Board as being in attainment of the state ozone standard but our county is still designated as a non-attainment area for the state PM<sub>10</sub> standard

## Air Quality Monitoring

San Luis Obispo County air quality was measured in 2005 by a network of seven ambient air monitoring stations and two special stations run only during the summer ozone season. Station locations are depicted on the map on page 2. The APCD operated four permanent stations at Nipomo Regional Park, Grover Beach, Morro Bay, and Atascadero and seasonal research stations at Red Hills and on the summit of Black Mountain. The State Air Resources Board (ARB) operated stations at San Luis Obispo and Paso Robles. One station on the Nipomo Mesa at 1300 Guadalupe Road, was operated by a private contractor for the ConocoPhillips refinery until it closed on 30 April, 2005.

In March 2005 District staff completed a comprehensive review of the ambient air monitoring network to evaluate how well it is achieving the objectives of providing adequate, representative and useful air quality data. While most of the existing network was found to support these objectives several recommendations were made for improvements. The network review report may be viewed at the District office and is available upon request.

Air quality monitoring is rigorously controlled by federal and state quality assurance and control procedures to ensure data validity. Gaseous pollutant levels are measured continuously and averaged each hour, 24 hours a day. Particulate pollutants are generally sampled by filter techniques for averaging periods of 24 hours. PM<sub>10</sub> (respirable particulate matter 10 microns or less in size) and PM<sub>2.5</sub> (fine particulate matter 2.5 microns or less in size) are sampled for 24 hours every sixth day on the same schedule nationwide. In addition, PM<sub>10</sub> is sampled continuously at the Atascadero monitoring station using a TEOM (*tapered element oscillating microbalance*) sampler.



Figure 1: Ambient Air Pollution Monitoring Stations in San Luis Obispo County in 2005

**Table 1: Ambient Air Quality Parameters Monitored in San Luis Obispo County in 2005**

O <sub>3</sub>	NO	NO <sub>2</sub>	NOx	SO <sub>2</sub>	CO	PM <sub>10</sub>	PM <sub>2.5</sub>	TEOM	WS	WD	ATM
----------------	----	-----------------	-----	-----------------	----	------------------	-------------------	------	----	----	-----

**APCD Permanent Stations**

Atascadero	X	X	X	X			X	X	X	X	X	X
Morro Bay	X	X	X	X			X			X	X	
Nipomo Reg. Park	X	X	X	X	X		X			X	X	X
Grover Beach	X	X	X	X						X	X	

**APCD Research Stations**

Black Mountain	X									X	X	X
Red Hills	X									X	X	X

**Nipomo Mesa Special Study Sites**

CDF							X			X	X	
Calle Bendita							X	mv				
Hillview							X					
Mesa 2								mv				
Oso Flaco								mv				
Santa Maria (ARB station in Santa Barbara County)								mv				

**ARB Stations**

San Luis Obispo	X	X	X	X		X	X	X		X	X	X
Paso Robles	X						X			X	X	X

**Operated by Contractor**

Nipomo, Mesa2					X		X			X	X	X
---------------	--	--	--	--	---	--	---	--	--	---	---	---

Acronyms:

O <sub>3</sub>	Ozone	SO <sub>2</sub>	Sulfur Dioxide	PM <sub>10</sub>	Particulates < 10 microns (samples every sixth day)	WS	Wind Speed
NO	Nitric Oxide	CO	Carbon Monoxide			WD	Wind Direction
NO <sub>2</sub>	Nitrogen Dioxide	TEOM	Particulates <10 microns (monitored continuously)	PM <sub>2.5</sub>	Particulates < 2.5 microns (samples every sixth day)	ATM	Ambient Temp
NOx	Oxides of Nitrogen					mv	Minivol sampler

**Table 2: Ambient Air Quality Standards in 2005**

<p><i>The factors that lead to ozone formation are very complex and include: climate, topography, emissions of precursor pollutants, and pollutant transport. Air quality monitoring has shown that ozone levels can be very different from year to year. The reasons for this are not fully understood and are the subject of ongoing research.</i></p> <p><b>A standard exceedance</b> occurs when a measured value meets exceedance criteria prescribed by state or federal agencies and does not necessarily constitute a violation.</p> <p><b>A standard violation</b> may occur following a single or cumulative series of standard exceedances. Criteria constituting a violation are unique for each pollutant and may result in changes to an area's attainment status.</p>	Pollutant	Averaging Time	California Standard	National Standard
	<b>Ozone (O<sub>3</sub>)</b>	1 Hour	0.09 ppm	-----
		8 Hour	0.07 ppm	0.08 ppm
	<b>Carbon Monoxide (CO)</b>	8 Hour	9.0 ppm	9 ppm
		1 Hour	20 ppm	35 ppm
	<b>Nitrogen Dioxide (NO<sub>2</sub>)</b>	Annual Arithmetic Mean	-----	0.053 ppm
		1 hour	0.25 ppm	-----
	<b>Sulfur Dioxide (SO<sub>2</sub>)</b>	Annual Arithmetic Mean	-----	30 ug/m <sup>3</sup> (primary)
		24 Hour	0.04 ppm	0.14 ppm (primary)
		3 Hour	-----	0.5 ppm (secondary)
		1 Hour	0.25 ppm	-----
	<b>Respirable Particulate Matter (PM<sub>10</sub>)</b>	24 Hour	50 ug/m <sup>3</sup>	150 ug/m <sup>3</sup>
		Annual Arithmetic Mean	20 ug/m <sup>3</sup>	50 ug/m <sup>3</sup>
	<b>Fine Particulate Matter (PM<sub>2.5</sub>)</b>	24 Hour	-----	65 ug/m <sup>3</sup>
		Annual Arithmetic Mean	12 ug/m <sup>3</sup>	15 ug/m <sup>3</sup>
	<b>Hydrogen Sulfide (H<sub>2</sub>S)</b>	1 Hour	0.03 ppm	-----
	<b>Visibility</b>	8 hour	Insufficient amount to reduce the prevailing visibility to less than ten miles when the relative humidity is less than 70 %.	



*While ground level **ozone** is harmful to plants and animals and is considered a pollutant, upper level (stratospheric) ozone occurs naturally and protects the earth from harmful ultra-violet energy from the sun.*

***Fine particulate matter**, in addition to being a health hazard, can greatly reduce visibility. Recent research suggests that fine particulate may be much more detrimental to human health than previously thought.*

***NO<sub>2</sub>** and **SO<sub>2</sub>** create aerosols, which may fall as acid rain causing damage to crops, forests, and lakes.*

***CO** is a colorless, odorless gas that can lower the blood's ability to carry oxygen.*

## Ambient Air Pollutants Of Local Concern

### Ozone

Although ozone occurs naturally at low concentrations near the earth's surface, much higher and unhealthful levels are created when airborne mixtures of hydrocarbons and oxides of nitrogen are driven by sunlight to react, forming ozone pollution. The emissions of these ozone precursor pollutants come from many human activities, but primarily from industry and the wide use of motor vehicles. As a pollutant, ozone is a strong oxidant gas which attacks plant and animal tissues. It causes impaired breathing and reduced lung capacity, especially among children, athletes and persons with compromised respiratory systems. It also causes significant crop and forest damage. Ozone is a pollutant of particular concern in California where geography, climate and high population densities contribute to frequent violations of health-based air quality standards.

### Particulate Matter

Two classes of particulate matter with air quality standards are PM<sub>10</sub> (respirable particulate matter less than 10 microns in aerodynamic diameter), and PM<sub>2.5</sub> (fine particulate matter 2.5 microns or less in aerodynamic diameter). Both consist of many different types of particles that vary in their chemical activity and toxicity. PM<sub>2.5</sub> tends to be a greater health risk since it cannot be removed from the lungs once it is deeply inhaled. Sources of particulate pollution include: diesel exhaust, mineral extraction and production; combustion products from industry and motor vehicles; demolition and construction; agricultural operations; smoke from open burning; paved and unpaved roads; condensation of gaseous pollutants into liquid or solid particles; and natural sources such as wind-blown dust.

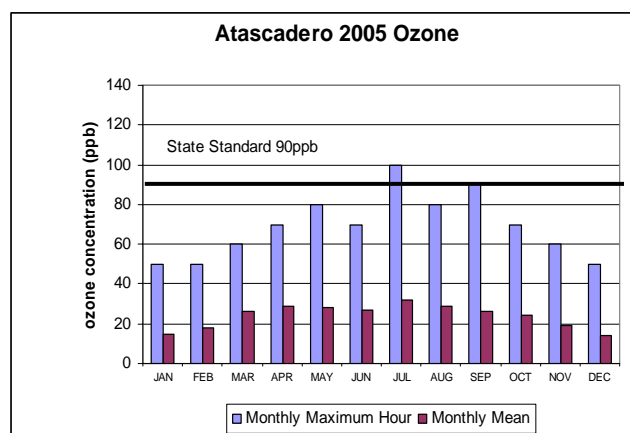
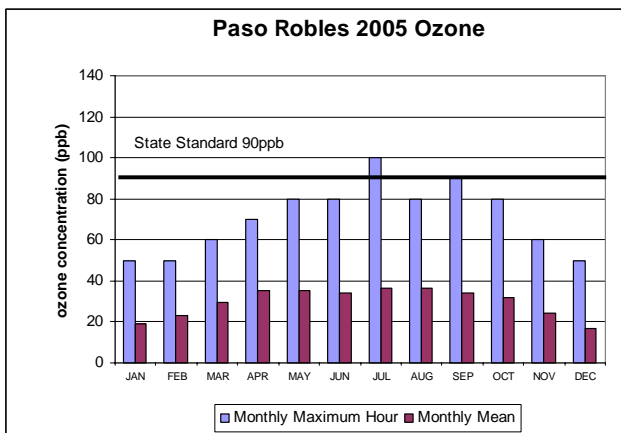
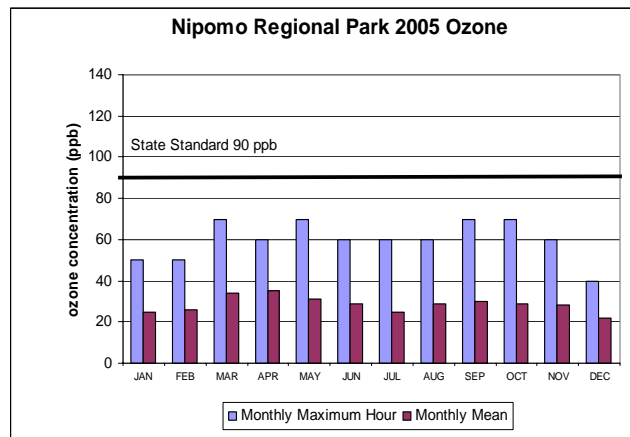
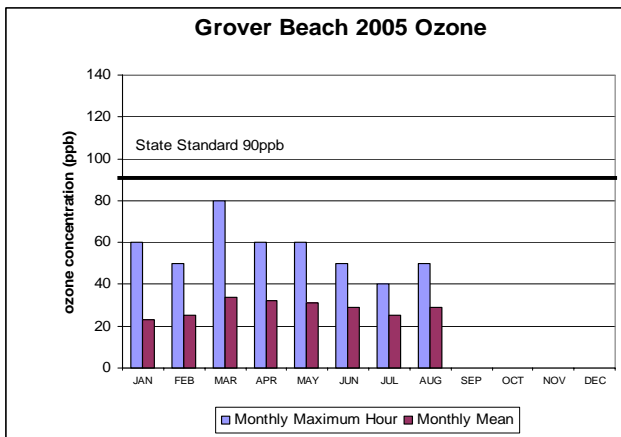
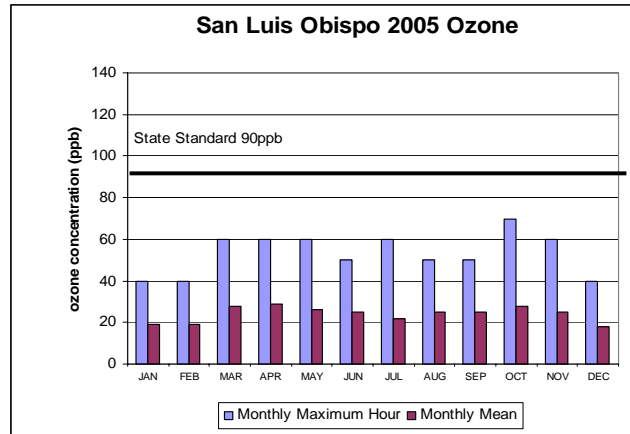
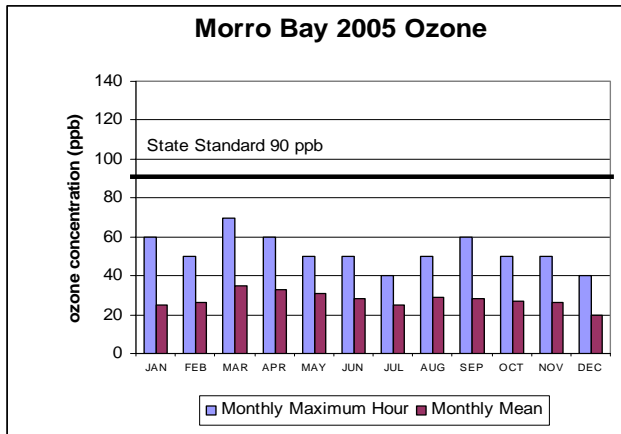
### NO<sub>2</sub>, SO<sub>2</sub>, CO

Nitrogen dioxide (NO<sub>2</sub>) is the brownish-colored component of smog. NO<sub>2</sub> irritates the eyes, nose and throat, and can damage lung tissues. Sulfur dioxide (SO<sub>2</sub>) is a colorless gas with health effects similar to NO<sub>2</sub>. SO<sub>2</sub> and NO<sub>2</sub> are generated by fossil fuel combustion by mobile sources (such as vehicles, ships and aircraft), and at stationary sources (such as industry, homes and businesses). SO<sub>2</sub> may also be emitted by petroleum production and refining operations. The state and national standards for NO<sub>2</sub> have never been exceeded in this county. The state standard for SO<sub>2</sub> was exceeded periodically on the Nipomo Mesa up until 1993. Equipment and processes at the facilities responsible for the emissions were upgraded as a result, and the state SO<sub>2</sub> standard has not been exceeded since that time. Exceedances of the federal SO<sub>2</sub> standard have never been measured here.

Carbon monoxide (CO) can cause headaches and fatigue and results from fuel combustion of all types. Motor vehicles are by far the chief contributor of CO in outdoor air. State CO standards have not been exceeded in San Luis Obispo County since 1975. CO is currently monitored only at the San Luis Obispo Station where the measured concentrations have been low in recent years.

## 2005 Ozone

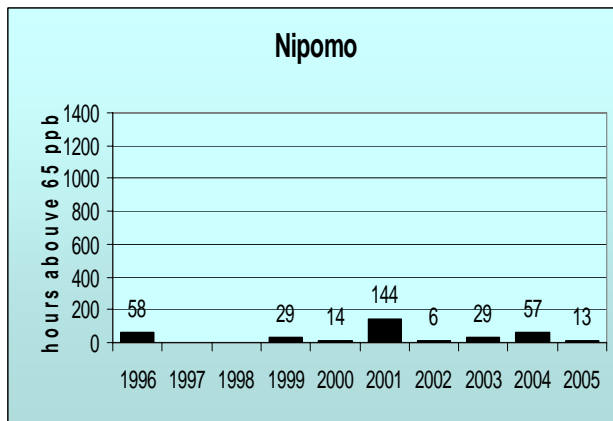
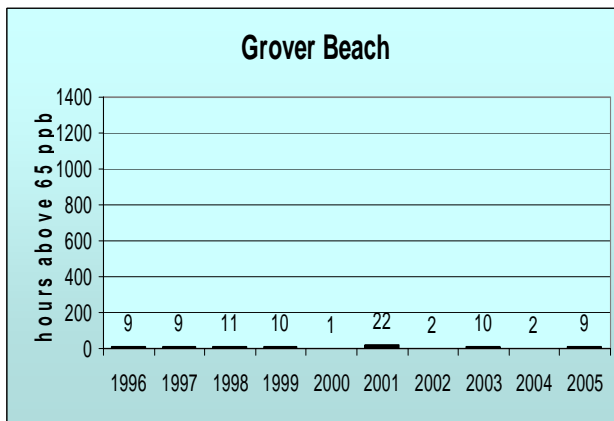
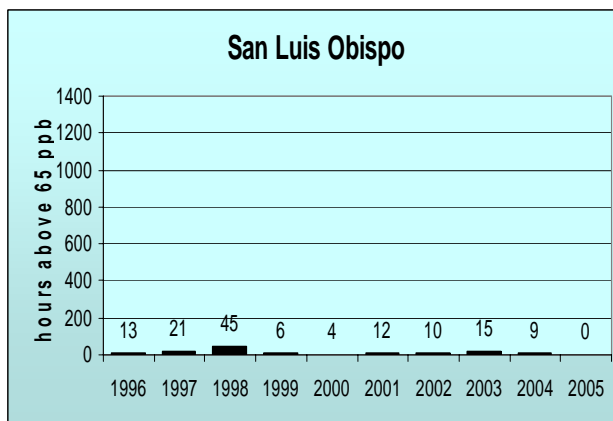
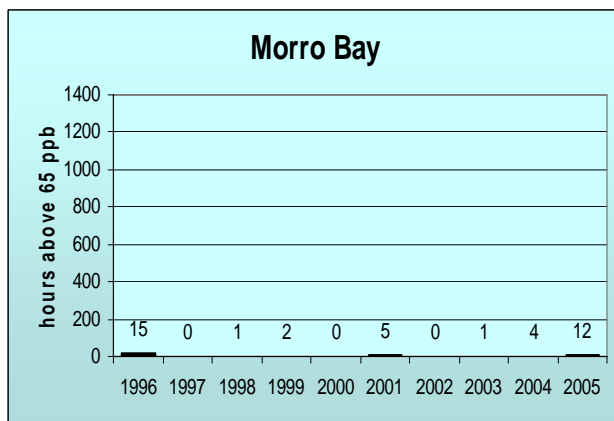
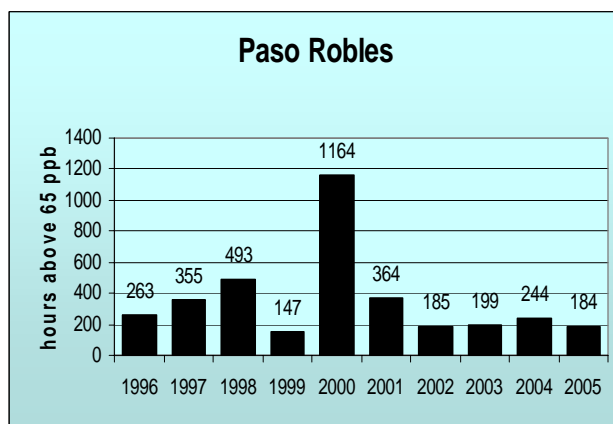
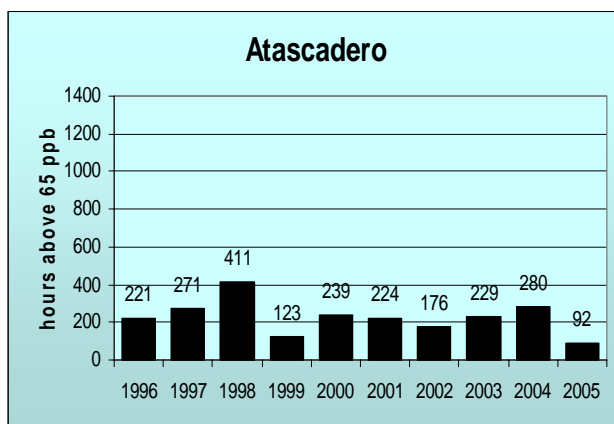
The following graphs depict 2005 monthly ozone concentrations at six permanent monitoring stations in the county. There are two data bars presented for each month. The monthly maximum hour bar shows the highest hourly average concentration during the month in parts per billion (ppb). The monthly mean bar is a monthly average concentration and depicts average ozone intensity (in ppb) for the month. There was one day of exceedance of the state hourly standard for ozone in 2005 measured at both Atascadero and Paso Robles. There was no exceedance of the federal 8-hour ozone standard measured in 2005. Monitoring was terminated at the Grover Beach station in September 2005.





## Countywide Ozone Trends - 1996-2005

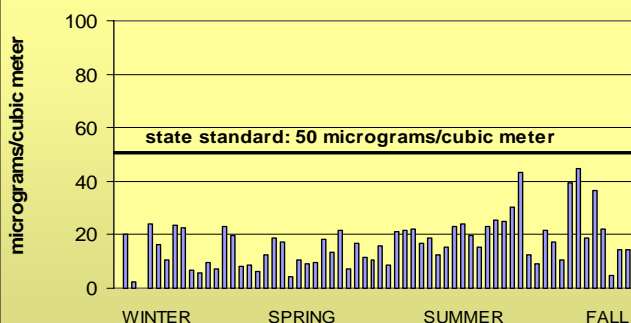
The following graphs depict ozone trends at six locations within the county for the past ten years (eight at Nipomo). Each data bar represents the total number of hours in a given year in which the ozone concentrations exceeded 65 parts per billion. This concentration level is a useful indicator for trend purposes even though there are no health standards for single-hour exposures to 65 parts per billion of ozone. No data was collected for Nipomo in 1997 and 1998 during which time the station was relocated. Monitoring resumed at Nipomo in November 1998. Monitoring was terminated at Grover Beach in September 2005.



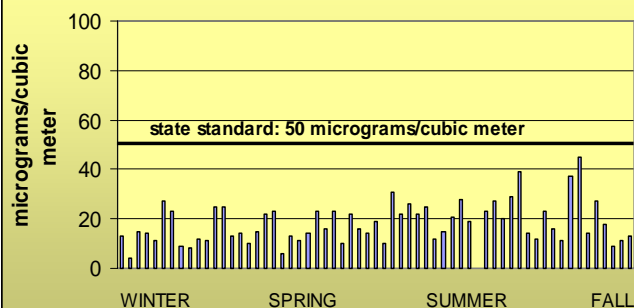
## Particulate Matter, 10 microns or less (PM<sub>10</sub>)

The graphs on this page present PM<sub>10</sub> particulate data from six locations. In 2005, there was only one exceedance of the state standard of 50 micrograms per cubic meter in our county during the sixty-one days sampling occurred. The single exceedance occurred at the Mesa 2 monitoring station on the Nipomo Mesa which ceased operation on April 30, 2005.

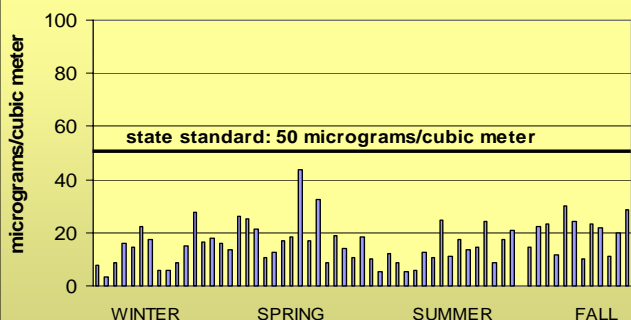
**Atascadero 2005 PM<sub>10</sub>**



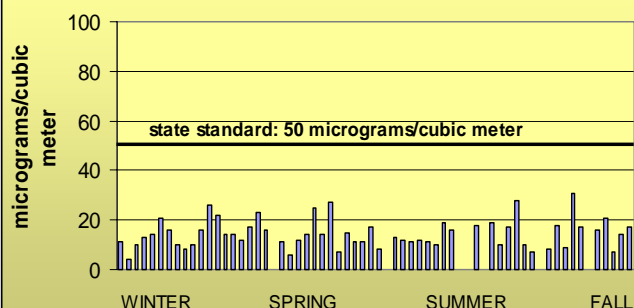
**Paso Robles  
2005 PM<sub>10</sub>**



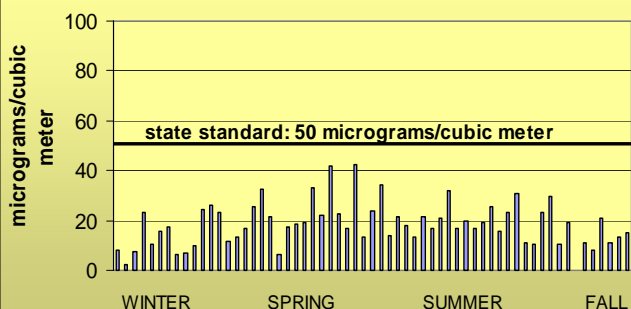
**Morro Bay  
2005 PM<sub>10</sub>**



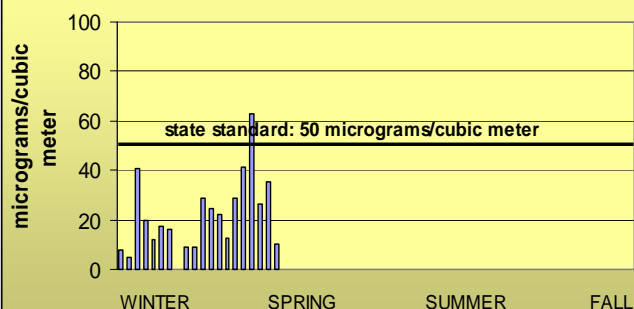
**San Luis Obispo  
2005 PM<sub>10</sub>**



**Nipomo Regional Park  
2005 PM<sub>10</sub>**

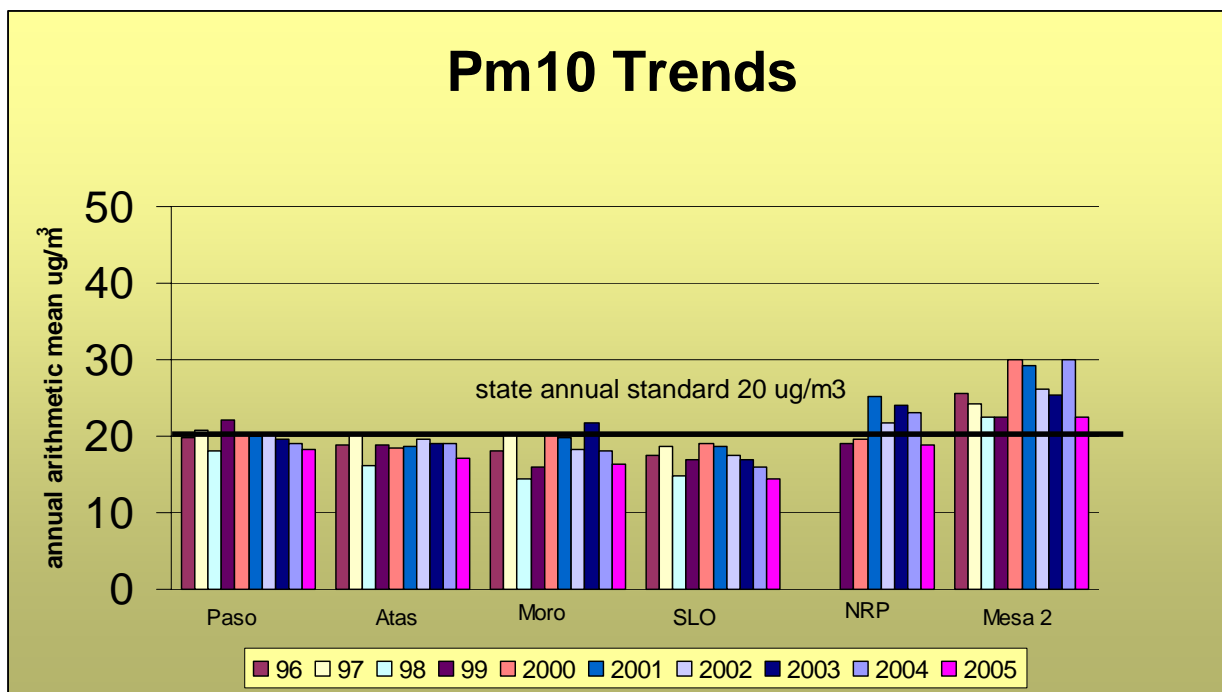


**Mesa2  
2005 PM<sub>10</sub>**



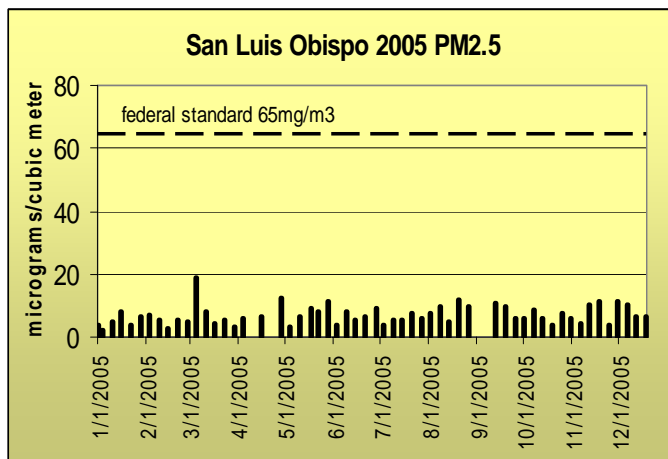
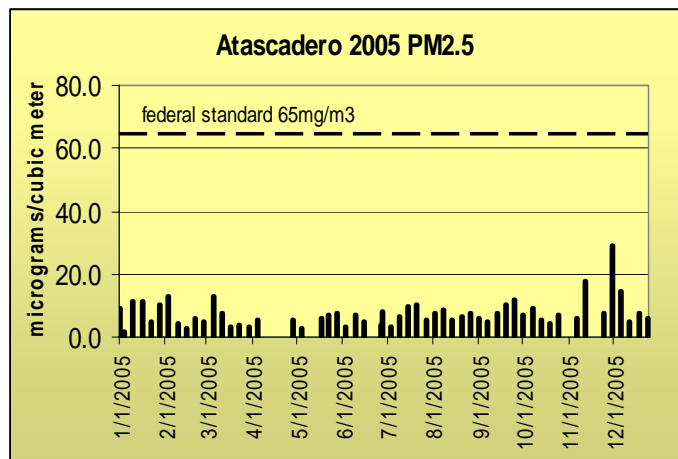
## Particulate Matter, 10 microns or less (PM<sub>10</sub>) continued.

The graph below depicts the annual arithmetic average PM<sub>10</sub> concentration at six locations in San Luis Obispo County over the past ten years (seven years at NRP). While occasional exceedances of the state PM<sub>10</sub> standard occur at all sites, the monitors on the Nipomo Mesa at NRP and Guadalupe Road are consistently higher than elsewhere in the county. The reasons for this are under investigation and are the subject of the Nipomo Mesa particulate study discussed on page 11 of this report.



## Particulate Matter, 2.5 microns or less (PM<sub>2.5</sub>)

Monitoring for fine particulate matter (PM<sub>2.5</sub>) began in 1999 and is performed at two locations in San Luis Obispo County: the San Luis Obispo and Atascadero monitoring stations. The federal standard for PM<sub>2.5</sub> of 65 micrograms per cubic meter was not exceeded during 2005. California has not set a 24 hour PM<sub>2.5</sub> standard.



**Table 3: First, Second and Third Highest Hourly Averages for 2005**

The following table lists the highest hourly (and 8-hour for ozone) concentrations (expressed in parts per million) recorded in 2005 for ozone, sulfur dioxide, nitrogen dioxide and carbon monoxide at the stations where they are monitored. Sampling date and hour appears with each data value in the format of month/day : hour. SO<sub>2</sub> monitoring ceased at the Mesa 2 station on April 30, 2005

Station	O <sub>3</sub> 1-hour			O <sub>3</sub> 8-hour			SO <sub>2</sub>			NO <sub>2</sub>			CO		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Paso Robles	<b>.099</b> 7/23:20	<b>.092</b> 7/20:12	<b>.088</b> 7/16:11												
Atascadero	<b>.096</b> 7/23:19	<b>.089</b> 7/20:17	<b>.087</b> 9/30:16	<b>.084</b> 7/20:11	<b>.080</b> 7/23:16	<b>.075</b> 9/30:11				<b>.052</b> 11/22:16	<b>.051</b> 10/13:18	<b>.050</b> 11/19:18			
Morro Bay	<b>.073</b> 3/11:21	<b>.068</b> 3/12:00	<b>.060</b> 9/20:15							<b>.047</b> 11/17:17	<b>.046</b> 11/21:19	<b>.044</b> 9/29:06			
San Luis Obispo	<b>.062</b> 3/12:02	<b>.056</b> 3/10:03	<b>.056</b> 7/24:18	<b>.056</b> 3/11:22	<b>.056</b> 3/12:00	<b>.052</b> 3/10:00				<b>.032</b> 2/2:07	<b>.032</b> 4/5:06	<b>.032</b> 4/5:07	<b>2.6</b> 1/20:08	<b>1.7</b> 2/04:08	<b>1.6</b> 1/14:21
Grover Beach	<b>.082</b> 3/11:17	<b>.060</b> 4/1:16	<b>.059</b> 1/23:18							<b>.037</b> 1/18:17	<b>.035</b> 1/18:19	<b>.033</b> 1/20:19			
Nipomo Regional Park	<b>.070</b> 3/11:17	<b>.070</b> 9/30:14	<b>.068</b> 9/29:11				<b>.046</b> 10/21:09	<b>.044</b> 8/8:10	<b>.041</b> 10/14:09	<b>.039</b> 11/15:19	<b>.037</b> 11/16:20	<b>.037</b> 11/21:20			
Nipomo, Mesa 2							<b>.050</b> 1/28:16	<b>.047</b> 1/28:15	<b>.036</b> 1/29:15						

**Table 4: Summary of Particulate Matter Concentrations for 2005**

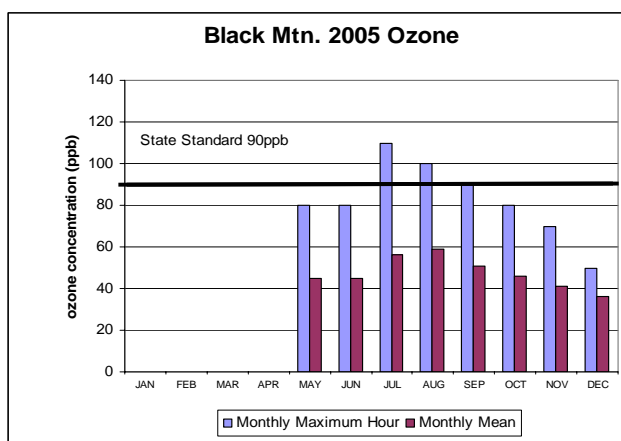
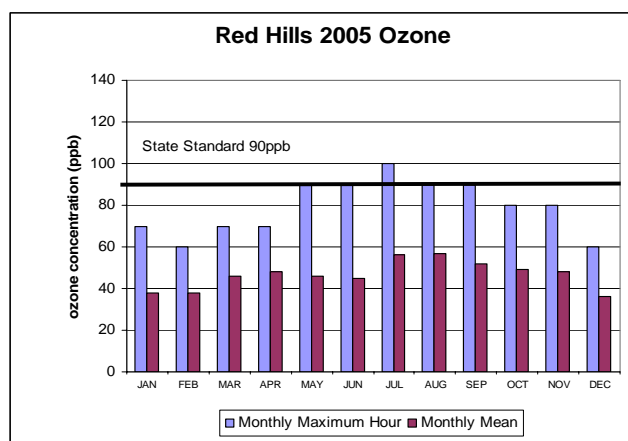
The following table lists the highest concentrations and the annual means recorded in 2005 for PM<sub>10</sub> and PM<sub>2.5</sub> particulate matter at the stations where they are monitored. Values are in micrograms/cubic meter. Values exceeding state or federal standards are in bold.

2003	PM <sub>10</sub>		PM <sub>2.5</sub>	
	Highest Concentration	Annual Arithmetic Mean	Highest Concentration	Annual Arithmetic Mean
Paso Robles	<b>45 ug/M<sup>3</sup></b> 11/24	18.3 ug/M <sup>3</sup>		
Atascadero	<b>45 ug/M<sup>3</sup></b> 11/24	17.1 ug/M <sup>3</sup>	<b>29.2 ug/M<sup>3</sup></b> 12/6	7.37 ug/M <sup>3</sup>
Morro Bay	<b>44 ug/M<sup>3</sup></b> 5/22	16.3 ug/M <sup>3</sup>		
San Luis Obispo	<b>31 ug/M<sup>3</sup></b> 11/18	14.5 ug/M <sup>3</sup>	<b>18.6 ug/M<sup>3</sup></b> 3/11	6.9 ug/M <sup>3</sup>
Nipomo Regional Park	<b>43 ug/M<sup>3</sup></b> 6/22	18.8 ug/M <sup>3</sup>		
Nipomo, Mesa2	<b>63 ug/M<sup>3</sup></b> 4/10	<b>22.5 ug/M<sup>3</sup></b>		

## Ozone at Special Study Sites in 2005

The following graphs depict monthly ozone concentrations at two research monitoring stations operated by the District in 2005. There are two data bars presented for each month. The monthly maximum hour bar shows the highest hourly average concentration during the month in parts-per-billion (ppb). The monthly mean bar is a monthly average concentration and depicts overall average ozone intensity for the month (in ppb). The Black Mountain station was operated only during the summer ozone season.

These research monitoring stations were sited to provide the district with more information about possible transport of polluted air into our county from other areas, as well as providing us with a profile of ozone concentrations in the air column from ground level to about 4000 foot elevation. In general, ozone levels were higher at the study sites located in elevated terrain than in populated areas at lower elevations where we regularly monitor for ozone. Information gathered at these sites is used by APCD staff and ARB researchers in understanding regional pollutant transport within California. Special study site data is not reported to the official state or federal air quality databases and is not used in determination of our attainment status for ozone air quality standards.



## Nipomo Mesa Particulate Study

The Nipomo Mesa Particulate Study was initiated in April 2004 and ran for one year through March 2005. The study was designed to try to answer questions about the extent and severity of previously measured high concentrations of particulates in the area adjacent to U.S. Highway 1 on the Nipomo Mesa. The study was successful in collecting representative samples throughout the year-long period which were then comprehensively analyzed using a variety of laboratory techniques. The resulting data will now be analyzed with the objective of identifying the source and composition of the particulate pollution. Results of this study will be published in a report and are expected to be available for District and public use in 2006. A map showing the location of particulate samplers used in the study appears on the next page.



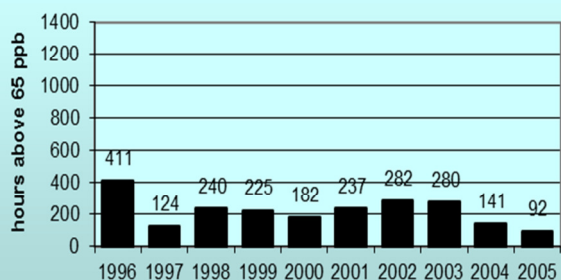
**Figure 2: Monitoring Locations for the Nipomo Mesa Particulate Study**



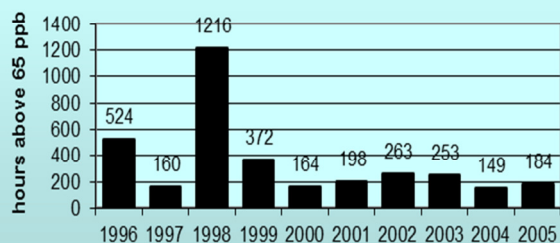
## Errata

Subsequent to the original publication of this report, some minor errors were discovered in the ozone and PM<sub>10</sub> trends charts on pages 7 and 9. Corrected charts appear below; see the [2008-2009 Annual Air Quality Report](#) for detailed discussion of the errors in the original figures.

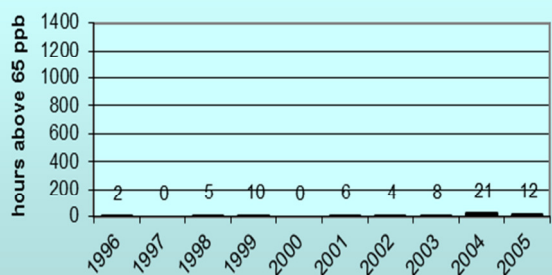
**Atascadero**



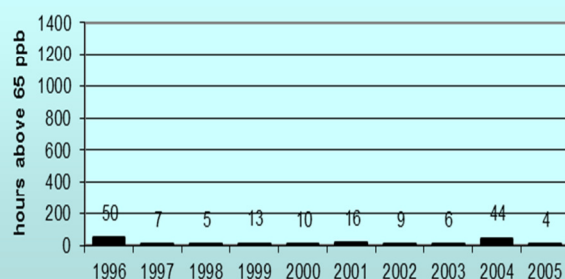
**Paso Robles**



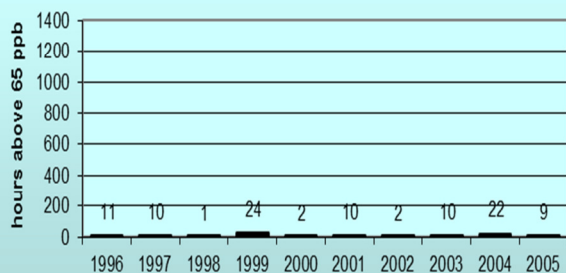
**Morro Bay**



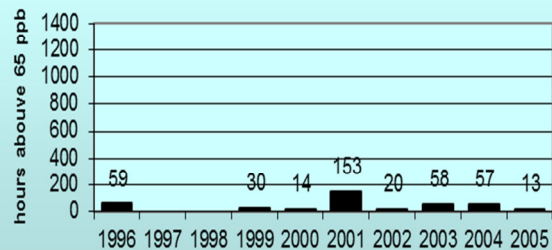
**San Luis Obispo**



**Grover Beach**



**Nipomo**



# PM10 Trends

