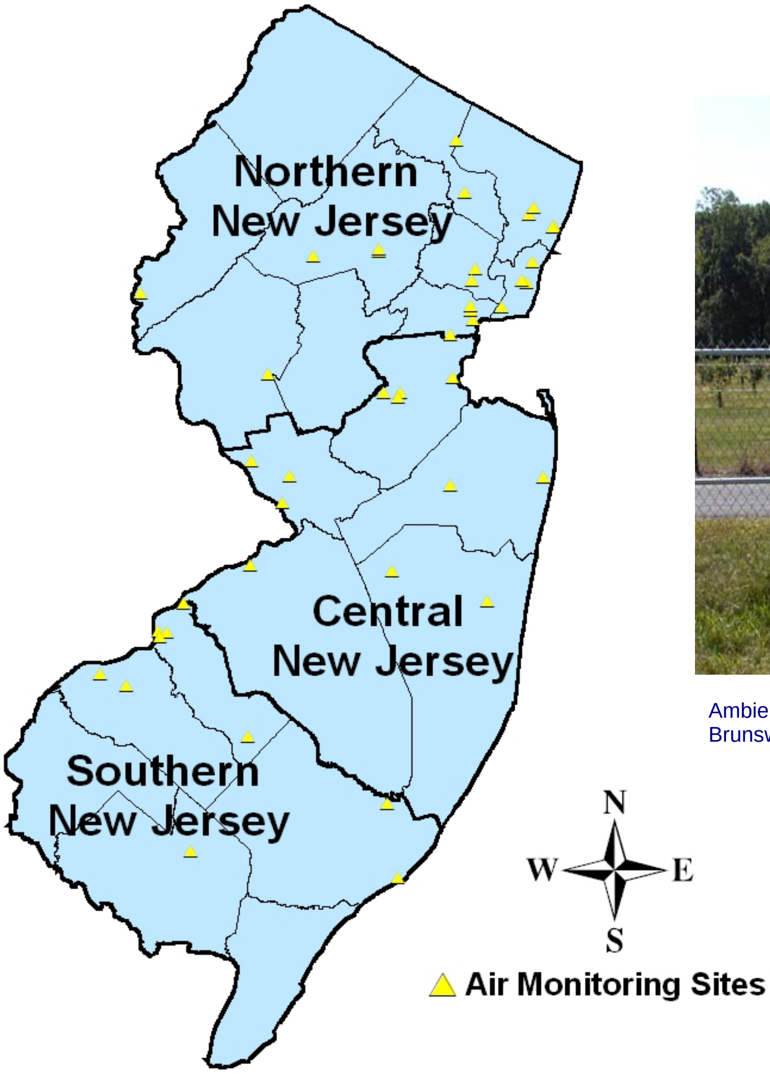
2006 Air Quality Report

New Jersey Department of Environmental Protection

SUMMARY

A summary of the New Jersey air quality monitoring data for 2006. Contains information on the Air Quality Index (AQI), concentrations of individual pollutants – carbon monoxide, lead, nitrogen oxides, ozone, particulate matter, and sulfur dioxide. Data on acid precipitation, sulfates, nitrates and other constituents of particulate matter, ozone precursors and toxic air contaminants are also provided.



Ambient air monitoring fine particle sampler located at the New Brunswick Site in Middlesex County.

2006 Air Quality Report

New Jersey Department of Environmental Protection

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INTRODUCTION

The State of New Jersey has been monitoring air quality for over 40 years. During that time, pollution levels have improved significantly. This is a result of state regulations, which are among the most stringent in the country, as well as regional and national air pollution reduction efforts.

But air quality problems do continue across in the state. Ozone continues be to a significant problem in the summer months, and has been found to have serious health effects at lower levels than previously thought. The United States Environmental Protection Agency (USEPA) revised the NAAQS for ozone in 1997 to account for this new health information. Although the standard changes were challenged, the courts eventually upheld them. If the new standards for ozone are to be met, additional emission reduction strategies will have to be implemented.

At the same time the USEPA revised the standards for ozone, they promulgated a new standard for fine particles. Fine particles are defined as particles less than 2.5 micrometers in diameter and are referred to as PM2.5. These small particles have been found to have a greater impact on public health than larger particles, which were the focus of the previous standards. Monitoring data indicate PM2.5 levels in New Jersey will be a problem in some areas of the state.

In addition to ozone and PM2.5, there is increasing concern about a class of air pollutants termed “air toxics”. These pollutants include substances known to cause cancer or other serious health problems. The list of potential air toxics is very large and includes many different types of compounds from heavy metals to toxic volatile organic compounds such as benzene. New Jersey is using the results of an EPA air toxics study and other information to address this complex problem. More comprehensive monitoring of air toxics in New Jersey is being implemented and data from that program is presented in this report.

Questions or comments concerning this report can be made by e-mailing us at bamweb@dep.state.nj.us, by phone at (609) 292-0138 or by writing to us at:

New Jersey Department of Environmental Protection
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2006 Network Summary

New Jersey Department of Environmental Protection

NETWORK DESIGN

In 2006, the Bureau of Air Monitoring maintained 43 Ambient Air Monitoring Sites in New Jersey. These monitoring sites are designed to fulfill the following monitoring objectives for federal and state regulated pollutants: to measure maximum pollutant concentrations, to assess population exposure, to determine the impact of major pollution sources, to measure background levels, to determine the extent of regional pollutant transport, and to measure secondary impacts in rural areas. In addition, monitoring data are provided to various public and media outlets and are used to provide hourly updates on air quality to the Bureau's web page at www.state.nj.us/dep/airmon. The Air Monitoring Sites can be divided into two primary networks: the Continuous Monitoring Network and the Manual Sampling Network.

SPATIAL SCALES

There are many factors and constraints, which affect the design of a monitoring network. Among these factors, a network design should consider pollutant characteristics, topographical features, and resource limitations when evaluating whether data collected at a particular site can meet monitoring objectives. To assist in designing an effective air monitoring network, the United States Environmental Protection Agency (USEPA) developed the concept of spatial scales of representativeness. The spatial scales define prospective sites in terms of the area surrounding a monitor where the pollutant concentrations are relatively similar. For each monitoring objective, appropriate spatial scales can be used to identify the general physical location of a suitable monitoring site. The various spatial scales are defined below:

Figure 1: Ambient air monitoring fine particle sampler located at the New Brunswick Site in Middlesex County.

Micro-scale (10 – 100m): Monitors that show significant concentration differences from as little as 10 meters or up to 50 meters away from the monitor are classified being Micro-scale monitors. This often occurs when monitors are located right next to low-level emission sources, such as busy roadways, construction sites, and facilities with short stacks. These locations should be in areas where the general public is exposed to the concentrations measured.

Middle Scale (100 – 1000m): These monitors show pollutant measurement variations between locations that are approximately 1 kilometer apart. These differences may occur near large industrial areas with many different operations or near large construction sites. Middle scale monitoring sites are often source oriented. Monitoring measurements of this type might be appropriate for the evaluation of short-term exposure to an emission source.

Neighborhood scale (1 – 10km): Neighborhood scale monitors do not show significant differences in pollutant concentrations over areas of a few kilometers. A particular scale location can represent not only the immediate neighborhood but also neighborhoods of the same type in other parts of the city. Neighborhood scale monitors provide good data for trend analysis studies and compliance with National Ambient Air Quality Standards (NAAQS) because their zone of representation are often found in areas were people commonly reside.

Urban Scale (10 – 100km): Urban scale monitors show consistency among pollutant measurements with monitor separations of at least 10 kilometers. Urban scale sites are usually located at higher elevations and away from highly traveled roads, and industries. These locations are ideal for evaluating concentrations over an entire metropolitan and/or rural area.

Regional scale (100 – 1000km): Regional scale (background monitors) show consistency among measurements for monitor separations of a few hundred kilometers. These monitors are best located in rural areas away from local sources, and at higher elevations. National parks, national wilderness areas, and many state and county parks and reserves are appropriate areas for regional scale sites. Data gathered at this scale location is most useful in assessing pollutant concentrations over a large area and evaluating transported emissions.

THE CONTINUOUS MONITORING NETWORK

The Continuous Monitoring Network consists of sites which measure carbon monoxide (CO), oxides of nitrogen (NO_x), ozone (O_3), sulfur dioxide (SO_2), particulate matter, and meteorological data by automated instruments (not all pollutants are measured at all sites). On April 28, 2006 the Bureau of Air Monitoring installed a new data acquisition system primarily for it's continuous monitoring network. The system uses wireless communication technology to transmit data to a centralized computer station located in Trenton, NJ. The information is transmitted once every minute, thus providing real-time data retrieval capability. A map showing the location of the continuous monitoring sites is shown in Figure 2 and the parameters recorded at each site are displayed in Table 2 (page 3). Changes to the Continuous Network are summarized in Table 1. Many of the continuous site locations are also part of the Manual Monitoring Network, which is described in the next section.

Figure 2
2006 – Continuous Monitoring Network

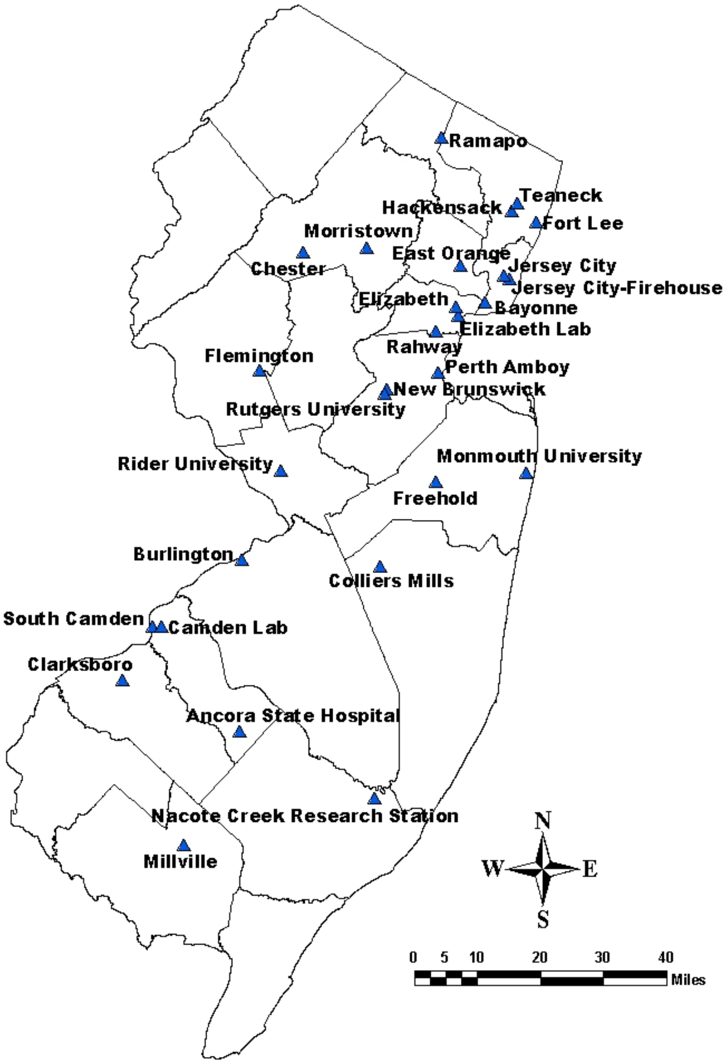

Table 1

2005-2006 Continuous Network Changes			
Monitoring Site	**Parameter(s)**	**Action**	**Date**
Fort Lee	CO,TEOM	Re-Start	03/31/05
Millville	TEOM	Start-up	05/05/05
Flemington	Smoke	Shutdown	04/05/06

Table 2
2006 – Continuous Air Monitoring Network

Continuous Parameter Codes

CO - Carbon Monoxide
NO$_x$ - Nitrogen Dioxide and Nitric Oxide
O$_3$ - Ozone
SO$_2$ - Sulfur Dioxide
SS - Smoke Shade
TEOM - Continuous PM$_{2.5}$ Analyzer
MET - Meteorological Parameters

SITE	**CO**	**NO$_x$**	**O$_3$**	**SO$_2$**	**SS**	**TEOM**	**MET**
Ancora State Hospital	U		U	U			
Bayonne		U	N	N			
Burlington	Mi			N	N		
Camden Lab	N	N	U	N	N	N	U
Chester		U	U	U			U
Clarksboro			U	U			
Colliers Mills			U				
East Orange	N	N					U
Elizabeth	Mi			M	N		
Elizabeth Lab	N	N		N	N	N	U
Flemington			U		N	N	U
Fort Lee	M					M	
Freehold	Mi				N		
Hackensack	N			N	N		
Jersey City-Firehouse						N	
Jersey City	Mi			N	N		
Millville		N	N	N		N	
Monmouth University			N				
Morristown	Mi				N		
Nacote Creek Research Station			U	U			
New Brunswick						N	
Perth Amboy	N			N	N		
Rahway						N	
Ramapo			U				
Rider University		N	N				U
Rutgers University		N	N				U
South Camden						N	
Teaneck		N	N				
TOTAL	**12**	**9**	**14**	**13**	**10**	**9**	**7**

Spatial Scale codes: Mi - **Micro**, M - **Middle**, N - **Neighborhood**, U - **Urban**, R – **Regional**

MANUAL MONITORING NETWORK

The Manual Monitoring Network does not transmit data in near real-time as does the Continuous Monitoring Network. The manual network consists primarily of various instruments that collect samples for subsequent analysis in a laboratory. The network provides data on fine particulates (particles smaller than 2.5 micrometers in diameter or $PM_{2.5}$), inhalable particulates (particles smaller than 10 micrometers in diameter or PM_{10}), lead (Pb), Total Suspended Particulates (TSP), several parameters associated with atmospheric deposition, pollutants important in the formation of ground level ozone (ozone precursors), and a group of organic and inorganic compounds that are considered toxic pollutants. Sites that measure ozone precursors are part of the national Photochemical Assessment Monitoring Station (PAMS) program. While these ozone precursors are automatically measured every hour, the data are retrieved once a day and require extensive review before they are validated. Changes to the Manual Network are summarized in Table 3. A map of the manual sampling sites is shown in Figure 3 and a list of the pollutants measured at each location in shown in Table 4 (page 5).

Figure 3
2006 – Manual Monitoring Network

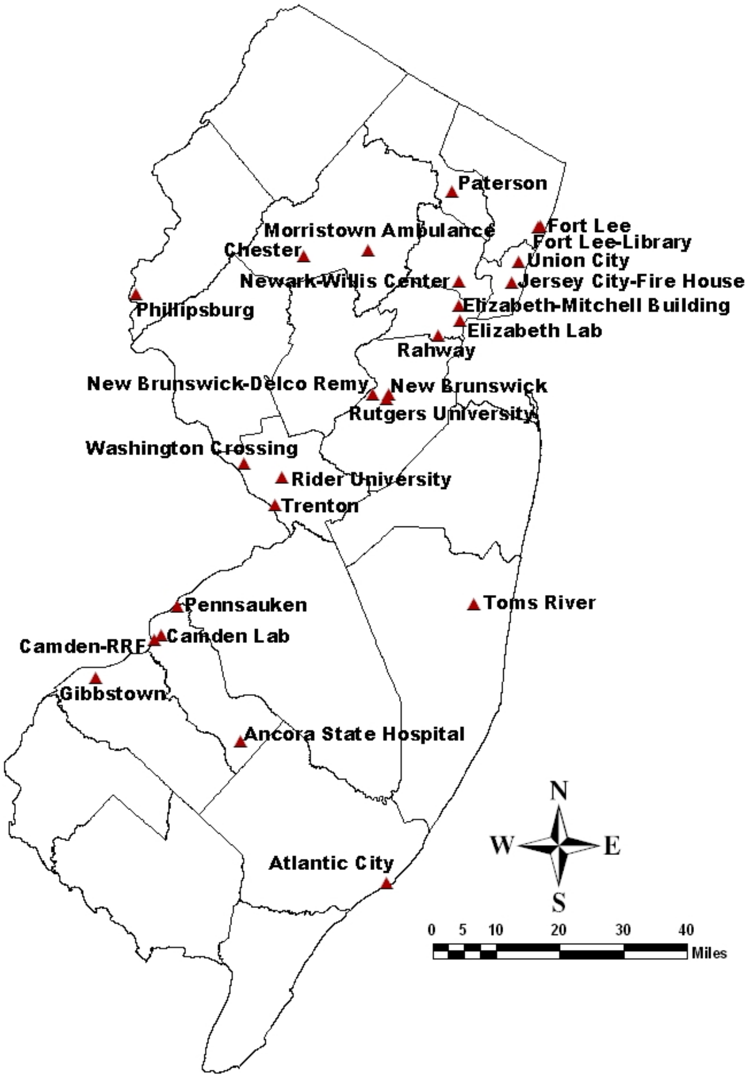

Table 3

2005-2006 Manual Network Changes			
Monitoring Site	**Parameter(s)**	**Action**	**Date**
Fort Lee	PM_{10}	Re-Start	03/31/05
[1]Jersey City-Firehouse	PM_{10}	Start-up	05/12/05
Union City	$PM_{2.5}$	Re-Start	07/25/05
Gibbstown	$PM_{2.5}$	Shutdown	04/05/06

[1] Collocated a PM_{10} sampler for precision measurements.

Table 4
2006 - Manual Air Monitoring Network

Manual Parameter Codes

$PM_{2.5}$	-	FRM (Federal Reference Method) Manual $PM_{2.5}$ Sampler	**PAMS**	-	Photochemical Assessment Monitoring Station (Ozone Precursors)
PM_{10}	-	FRM Manual PM_{10} Sampler	**CARB**	-	Carbonyls
Pb	-	Particulates Analyzed for Lead	**VOCs**	-	Volatile Organic Compounds
TSP	-	Total Suspended Particulates	**SVOCs**	-	Semi-Volatile Organic Compounds
$PM_{2.5}$ Spec	-	$PM_{2.5}$ Speciation Trends Network Sampler	**Acid Deposition**	-	Acidity (pH scale) in precipitation

SITE	$PM_{2.5}$	PM_{10}	Pb	TSP	$PM_{2.5}$ Spec	PAMS	CARB	VOCs	Acid Deposition
Ancora State Hospital									U
Atlantic City	N	N							
Camden Lab	N	N			N	N	N	N	
Camden-RRF		M							
Chester	U				U		U	U	
Elizabeth Lab	N				N		N	N	
Elizabeth-Mitchell Building	N								
Fort Lee		M							
Fort Lee-Library	N								
Gibbstown	N								
Jersey City-Firehouse	N	N							
Morristown-Ambulance Squad	N								
New Brunswick	N				N		N	N	
New Brunswick-Delco Remy			Mi	Mi					
Newark-Willis Center	N								
Paterson	N								
Pennsauken	N								
Phillipsburg	N								
Rahway	N								
Rider University						N			
Rutgers University						N			
Toms River	N								
Trenton	N	N							
Union City	N								
Washington Crossing	N								U
TOTAL	**19**	**6**	**1**	**1**	**4**	**3**	**4**	**4**	**2**

Spatial Scale codes: Mi - **Micro**, M - **Middle**, N - **Neighborhood**, U - **Urban**, R - **Regional**

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2006 Air Quality Index Summary

New Jersey Department of Environmental Protection

WHAT IS THE AIR QUALITY INDEX (AQI)?

The Air Quality Index (AQI) is a national air quality rating system based on the National Ambient Air Quality Standards (NAAQS). Generally, an index value of 100 is equal to the primary, or health based, NAAQS for each pollutant. This allows for a direct comparison of each of the pollutants used in the AQI (carbon monoxide, nitrogen dioxide, particulate matter, ozone, and sulfur dioxide). The AQI rating for a reporting region is equal to the highest rating recorded for any pollutant within that region. In an effort to make the AQI easier to understand, a descriptive rating and a color code, based on the numerical rating are used (see Table 1).

For more information on the AQI, visit EPA's web site at http://airnow.gov/.

Table 1
Air Quality Index

Numerical AQI Rating	Descriptive Rating	AQI Color Code
0-50	Good	Green
51-100	Moderate	Yellow
101-150	Unhealthy for Sensitive Groups	Orange
151-200	Unhealthy	Red
200-300	Very Unhealthy	Purple

Each weekday morning a forecast is prepared using the AQI format. The forecast is provided to participating radio and television stations. Each afternoon, an air quality update, which includes the current air quality information and a forecast for the following day, is issued to various newspapers.

For purposes of reporting the AQI, the state is divided into 9 regions (see Figure 1). Table 2 shows the monitoring sites and parameters used in each reporting region to calculate the AQI values.

Figure 1

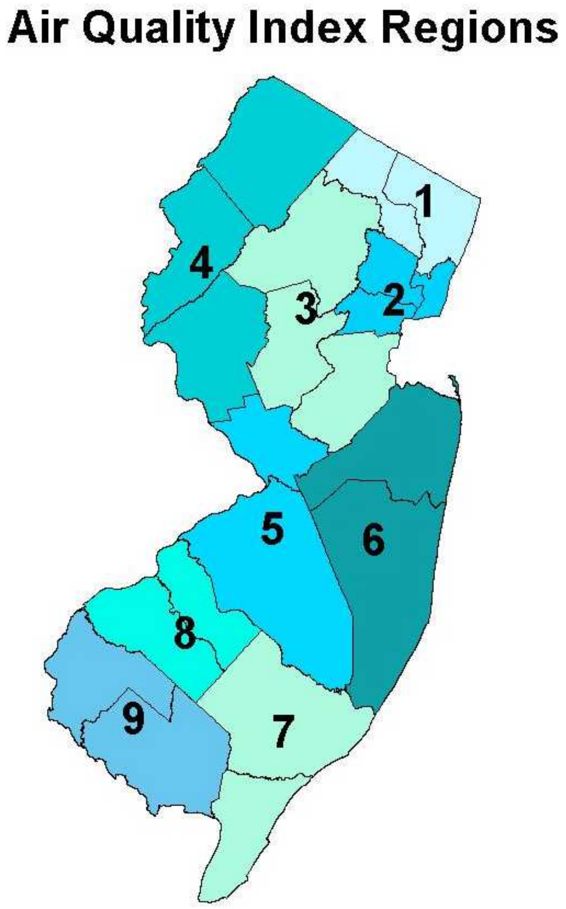


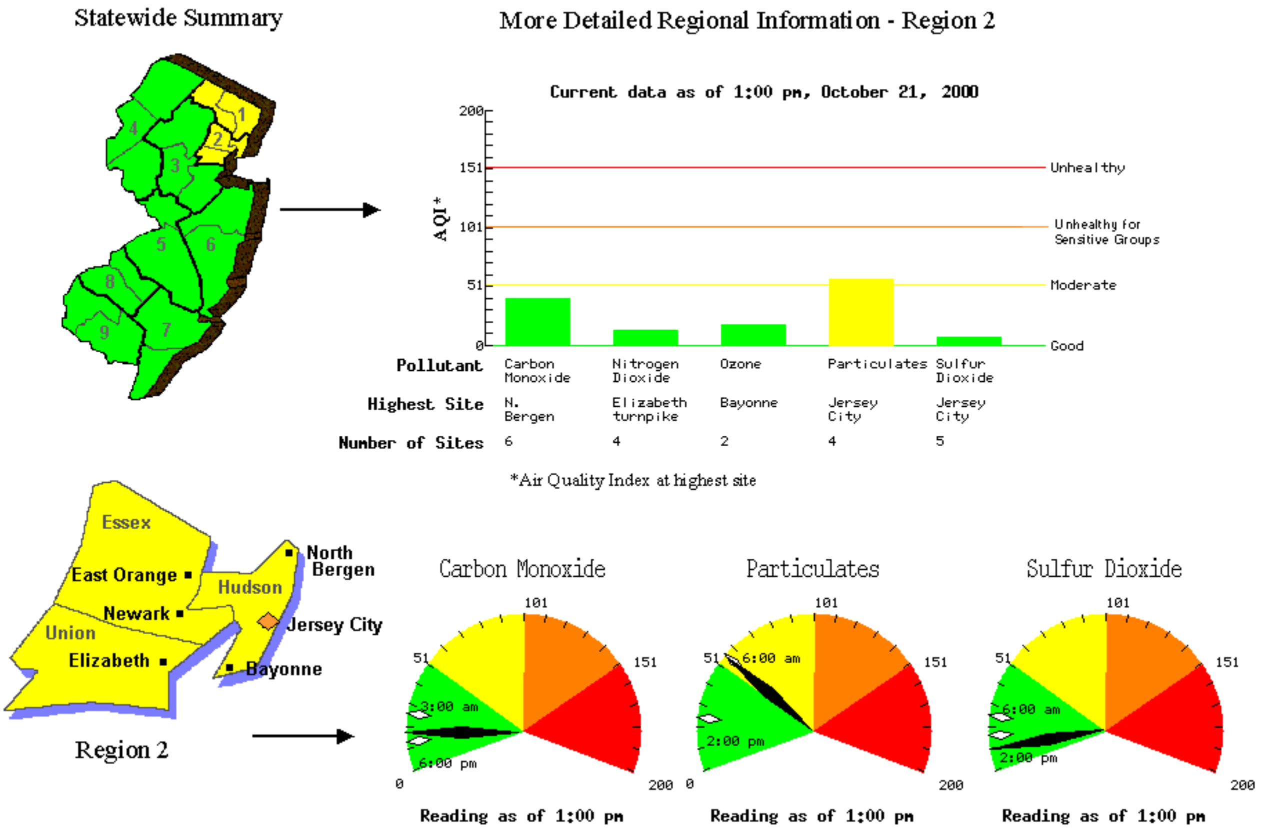
Table 2
Pollutants Monitored According to Air Quality Index Reporting Region - 2006

CO - Carbon Monoxide
SO_2 - Sulfur Dioxide
PM - Particulate Matter
O_3 - Ozone
NO_2 - Nitrogen Dioxide

Reporting Region	Monitoring Site	CO	SO_2	PM	O_3	NO_2
1. Northern Metropolitan	Fort Lee	X	---	X	---	---
	Hackensack	X	X	X	---	---
	Ramapo	---	---	---	X	---
	Teaneck	---	---	---	X	X
2. Southern Metropolitan	Bayonne	---	X	---	X	X
	East Orange	X	---	---	---	X
	Elizabeth	X	X	X	---	---
	Elizabeth Lab	X	X	X	---	X
	Jersey City	X	X	X	---	---
	Jersey City Firehouse	---	---	X	---	---
	Rahway	---	---	X	---	---
3. Suburban	Chester	---	X	---	X	X
	Morristown	X	---	X	---	---
	New Brunswick	---	---	X	---	---
	Perth Amboy	X	X	X	---	---
	Rutgers University	---	---	---	X	X
4. Northern Delaware Valley	Flemington	---	---	X	X	---
5. Central Delaware Valley	Burlington	X	X	X	---	---
	Rider University	---	---	---	X	X
6. Northern Coastal	Colliers Mills	---	---	---	X	---
	Freehold	X	---	X	---	---
	Monmouth University	---	---	---	X	---
7. Southern Coastal	Nacote Creek R. S.	---	X	---	X	---
8. Southern Delaware Valley	Ancora State Hospital	X	X	---	X	---
	Camden Lab	X	X	X	X	X
	Clarksboro	---	X	---	X	---
	South Camden	---	---	X	---	---
9. Delaware Bay	Millville	---	X	X	X	X

Along with the forecast, cautionary statements are provided for days when the air quality is expected to be unhealthy. A weekday air quality forecast map, introduced during the 1996 ozone season, is televised on New Jersey Network's (NJN) TV News Broadcast. A web page was also created in 1996 to show current air quality levels. This page can be accessed at the following internet address: http://www.state.nj.us/dep/airmon. Some examples of the air quality information available on our web site are shown in Figure 2 below:

Figure 2
Examples of NJDEP's Air Monitoring Website



Readings from Individual Instruments at Jersey City

2006 AQI SUMMARY

A summary of the AQI ratings for New Jersey in 2006 is presented in the pie chart to the right. In 2006 there were 161 "Good" days, 170 were "Moderate", 31 were rated "Unhealthy for Sensitive Groups", 3 were considered "Unhealthy", and zero were rated "Very Unhealthy". This indicates that air quality in New Jersey is considered good or moderate most of the time, but that pollution is still bad enough to adversely affect some people on about one day in eleven. Table 3 lists the dates when the AQI reached the "Unhealthy for Sensitive Groups" threshold at any monitoring location and shows which pollutant(s) were in that range or higher. Figure 4 shows the AQI ratings for the year broken down by AQI region (AQI data was not available for every day therefore some of the regions total day count does not add up to 365).

Figure 3
Air Quality Summary by Days

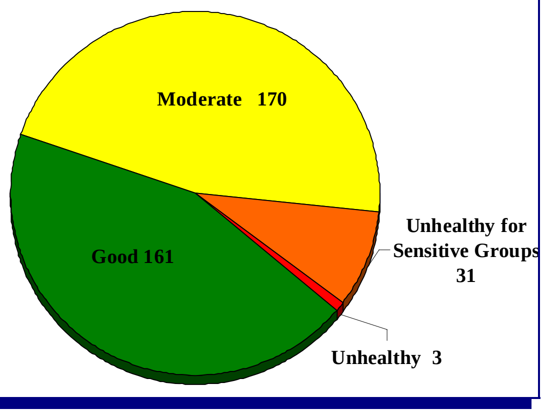


Table 3
Air Quality Index (AQI) Exceedances of 100 During 2006

Ratings

USG - Unhealthy for Sensitive Groups
UH - Unhealthy
VUH - Very Unhealthy

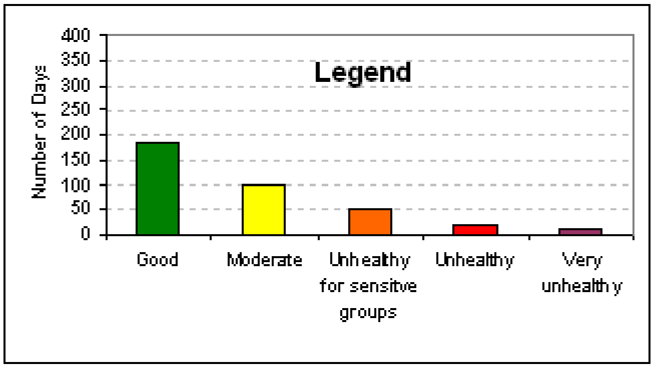
Pollutants

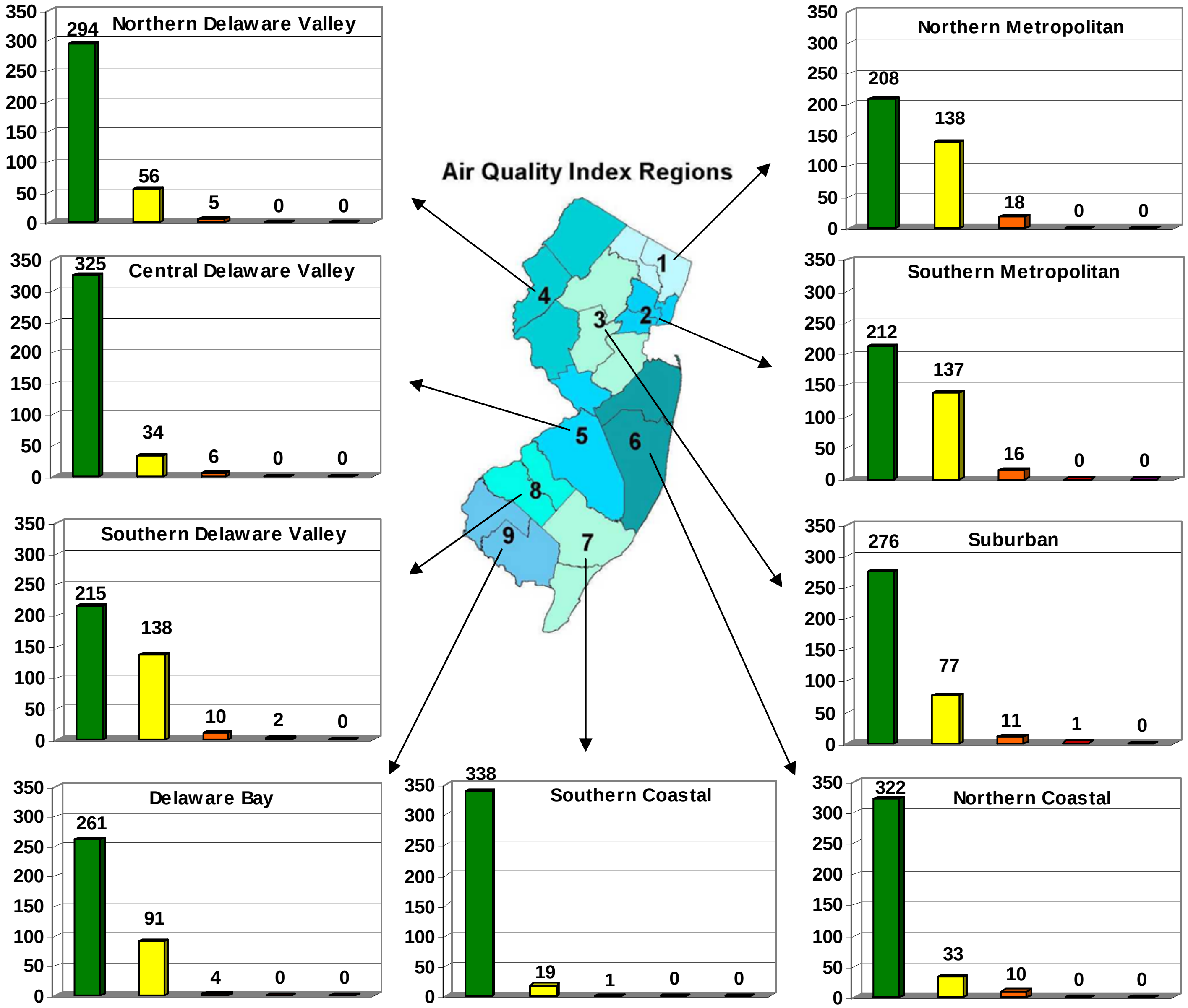
PM - Fine Particle Matter (9 sites monitored)
O_3 - Ozone (14 sites monitored)

* Number in parentheses () indicates the total number of ozone and $PM_{2.5}$ sites exceeding 100 on a given day

Date	Highest Location	Highest AQI Value	Highest Pollutant	Highest Rating	Pollutant(s) with AQI above 100 *	
January 11	Jersey City Firehouse	110	PM	USG		PM (3)
January 13	Fort Lee	102	PM	USG		PM (1)
February 16	Elizabeth Lab	132	PM	USG		PM (2)
March 13	Fort Lee	103	PM	USG		PM (2)
May 26	Fort Lee	128	PM	USG		PM (2)
May 29	Colliers Mills	135	O3	USG	O3 (1)	
May 30	Chester	140	O3	USG	O3 (3)	PM (1)
June 01	Rutgers University	147	O3	USG	O3 (3)	
June 17	Rutgers University	119	O3	USG	O3 (3)	
June 18	Rutgers University	154	O3	UH	O3 (6)	
June 19	Jersey City Firehouse	120	PM	USG	O3 (3)	PM (4)
June 22	Camden Lab	119	O3	USG	O3 (5)	
June 29	Chester	104	O3	USG	O3 (1)	
July 02	Monmouth University	111	O3	USG	O3 (2)	
July 03	Colliers Mills	109	O3	USG	O3 (1)	
July 04	Jersey City Firehouse	105	PM	USG		PM (1)
July 11	Rutgers University	137	O3	USG	O3 (4)	PM (2)
July 12	Fort Lee	149	PM	USG		PM (5)
July 17	Ancora State Hospital	177	O3	UH	O3 (9)	
July 18	Ancora State Hospital	169	O3	UH	O3 (1)	PM (3)
July 19	Chester	111	O3	USG	O3 (1)	
July 21	South Camden	106	PM	USG		PM (1)
July 26	Chester	104	O3	USG	O3 (2)	
July 27	Rider University	109	O3	USG	O3 (1)	
July 30	South Camden	103	PM	USG		PM (1)
August 01	Ancora State Hospital	122	O3	USG	O3 (3)	PM (4)
August 02	Camden Lab	124	PM	USG	O3 (4)	PM (5)
August 03	Colliers Mills	106	O3	USG	O3 (2)	PM (2)
August 05	Monmouth University	109	O3	USG	O3 (1)	
September 19	Fort Lee	110	PM	USG		PM (1)
October 4	Fort Lee	106	PM	USG		PM (1)
November 27	Jersey City Firehouse	106	PM	USG		PM (1)
November 28	Elizabeth Lab	120	PM	USG		PM (4)
November 29	Fort Lee	110	PM	USG		PM (2)

Figure 4
2006 Air Quality Index Summary
Number of Days by Reporting Region





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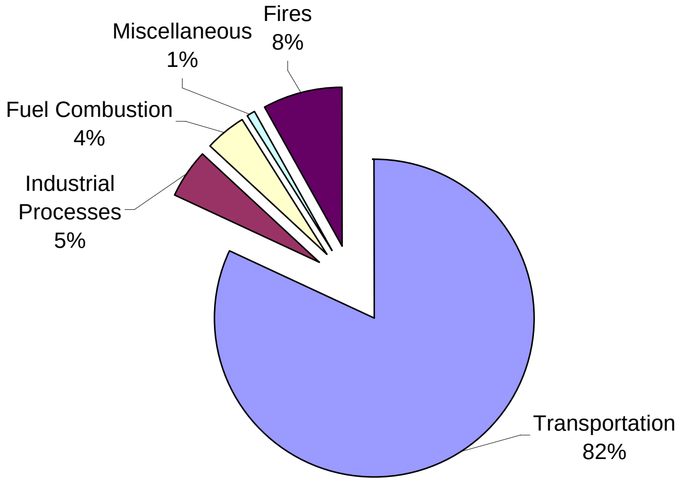
2006 Carbon Monoxide Summary

New Jersey Department of Environmental Protection

NATURE AND SOURCES

Carbon monoxide (CO) is a colorless, odorless, poisonous gas formed when carbon in fuels is not burned completely. It is a by-product of motor vehicle exhaust, which contributes over 56 percent of all CO emissions nationwide. In cities, automobile exhaust can cause as much as 95 percent of all CO emissions, and high CO levels often coincide with morning and afternoon rush hours. Non-road engines and vehicles, such as construction equipment and boats, are also significant sources of CO and overall the transportation sector is responsible for about 82% of all CO emissions nationally. Other sources of CO include industrial processes, fuel combustion in sources such as boilers and incinerators, and natural sources such as forest fires. Figure 1 shows the national average contributions of these sources.

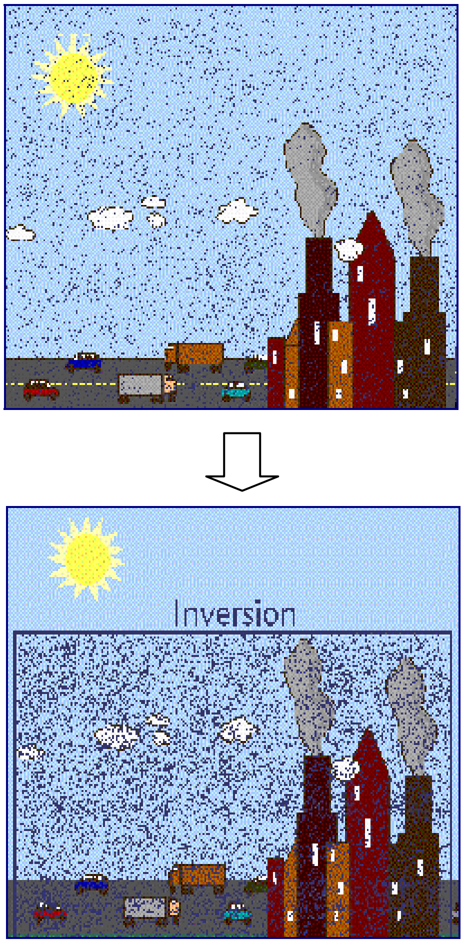
Figure 1
National Summary of
CO Emissions by Source Category



Source: United States Environmental Protection Agency
www.epa.gov/air/urbanair/co/what1.html
Updated: July, 2007

Figure 3 also shows that CO levels are typically higher in the winter. This is because motor vehicles do not burn fuel as efficiently when they are cold. Atmospheric inversions are also more frequent during the winter months. Inversions usually occur overnight when cooler air is trapped beneath a layer of warmer air aloft. When this occurs, the inversion acts like a lid, preventing pollution from mixing in the atmosphere and effectively trapping it close to ground level (see Figure 2).

Figure 2: Effect of Atmospheric Inversion on Air Pollution



HEALTH AND ENVIRONMENTAL EFFECTS

Carbon monoxide enters the bloodstream and reduces the body's ability to distribute oxygen to organs and tissues. The most common symptoms associated with exposure to carbon monoxide are headaches and nausea. The health threat from exposure to CO is most serious for those who suffer from cardiovascular disease. For a person with heart disease, a single exposure to CO at low levels may cause chest pain and reduce that individual's ability to exercise. Healthy people are also affected, but only at higher levels of exposure. Elevated CO levels are also associated with visual impairment, reduced work capacity, reduced manual dexterity, decreased learning ability, and difficulty in performing complex tasks.

STANDARDS

There are currently two national primary, or health based, standards for carbon monoxide. They are set at a one-hour concentration of 35 parts per million (ppm), and an 8-hour average concentration of 9 ppm. These levels are not to be exceeded more than once in any calendar year. There are no national secondary (welfare based) standards for CO at this time.

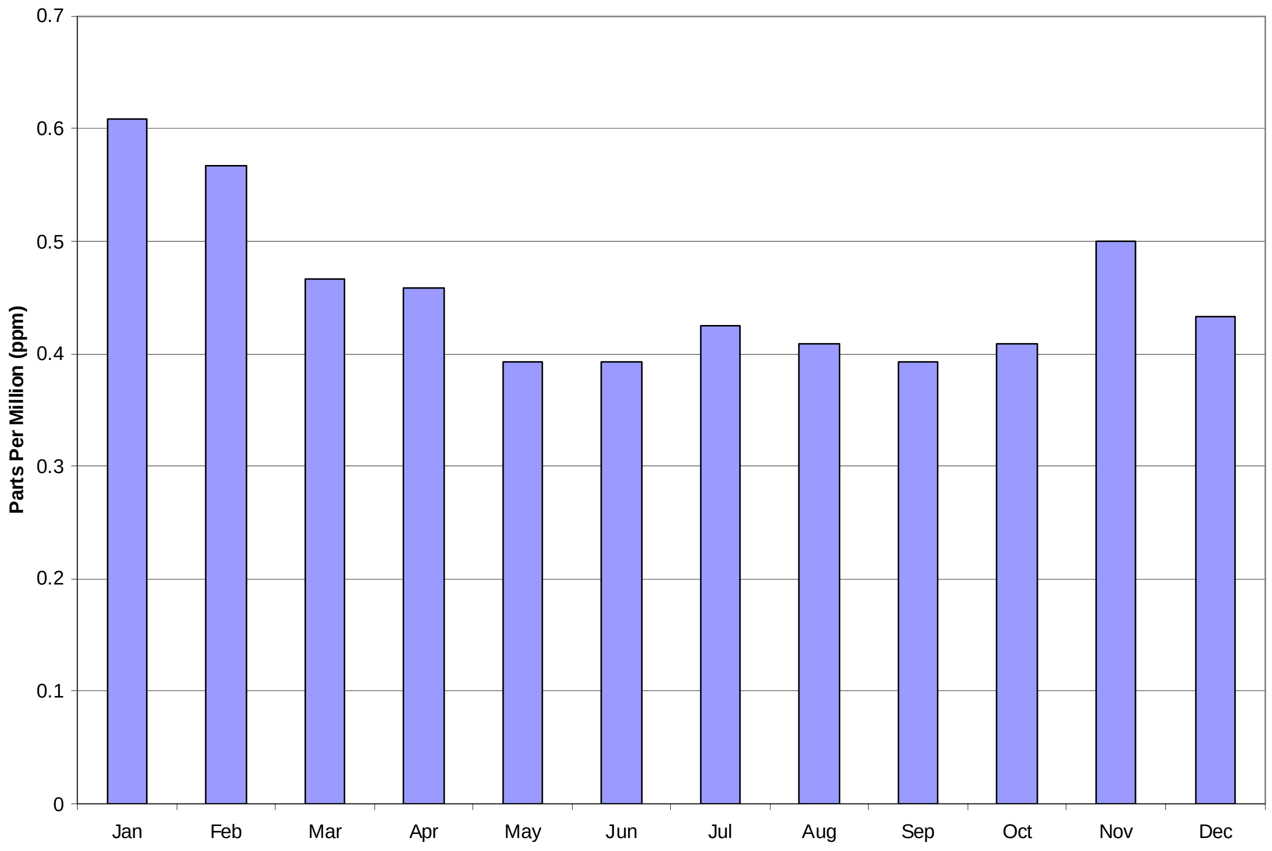
New Jersey state standards for CO are based on different units (milligrams per cubic meter as opposed to parts per million), and our standards are not to be exceeded more than once in any 12-month period. The state has set secondary (welfare based) standards for CO at the same level as the primary standards. The standards are summarized in Table 1.

Table 1
National and New Jersey Ambient Air Quality Standards for Carbon Monoxide

mg/m^3 = Milligrams Per Cubic Meter
ppm = Parts per Million

Averaging Period	Type	New Jersey	National
1-Hour	Primary	40 mg/m^3 (35 ppm)	35 ppm
1-Hour	Secondary	40 mg/m^3 (35 ppm)	----
8-Hour	Primary	10 mg/m^3 (9 ppm)	9 ppm
8-Hour	Secondary	10 mg/m^3 (9 ppm)	----

Figure 3
Carbon Monoxide Concentrations – New Jersey
2006 Monthly Variations



MONITORING LOCATIONS

The state monitored CO levels at 12 locations in 2006. These sites are shown in the map in Figure 4.

CO LEVELS IN 2006

None of the monitoring sites recorded exceedances of any CO standard during 2006. The maximum one-hour average concentration recorded was 4.6 ppm at the site in downtown Elizabeth. The highest 8-hour average level recorded was 3.0 ppm, also recorded at the downtown Elizabeth site. Summaries of the 2006 data are provided in Figure 5 and Table 2 (page 4).

Figure 4
2006 Carbon Monoxide
Monitoring Network

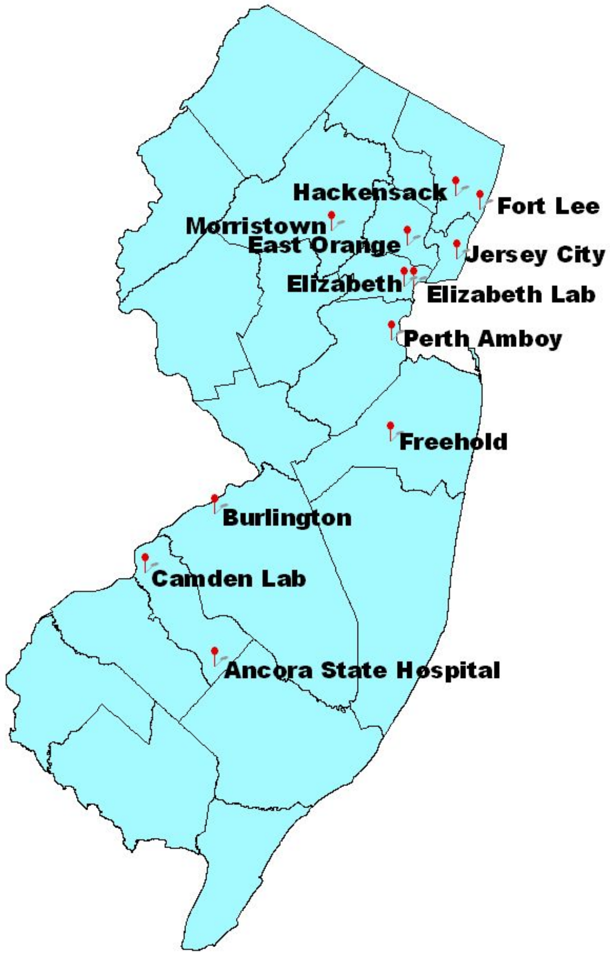


Figure 5
Highest and 2nd Highest 8-Hour Averages
of Carbon Monoxide in New Jersey - 2006

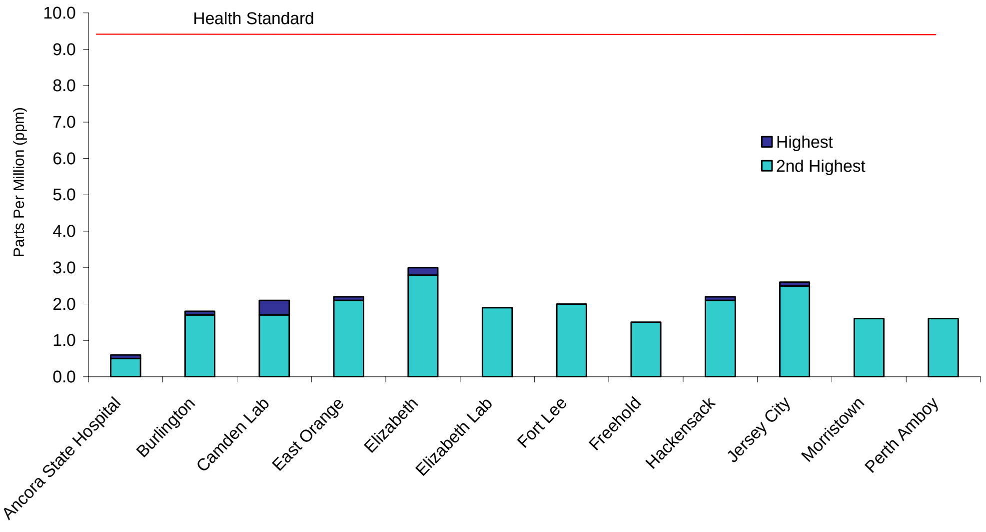


Table 2
Carbon Monoxide Data – 2006
1-Hour and 8-Hour Averages

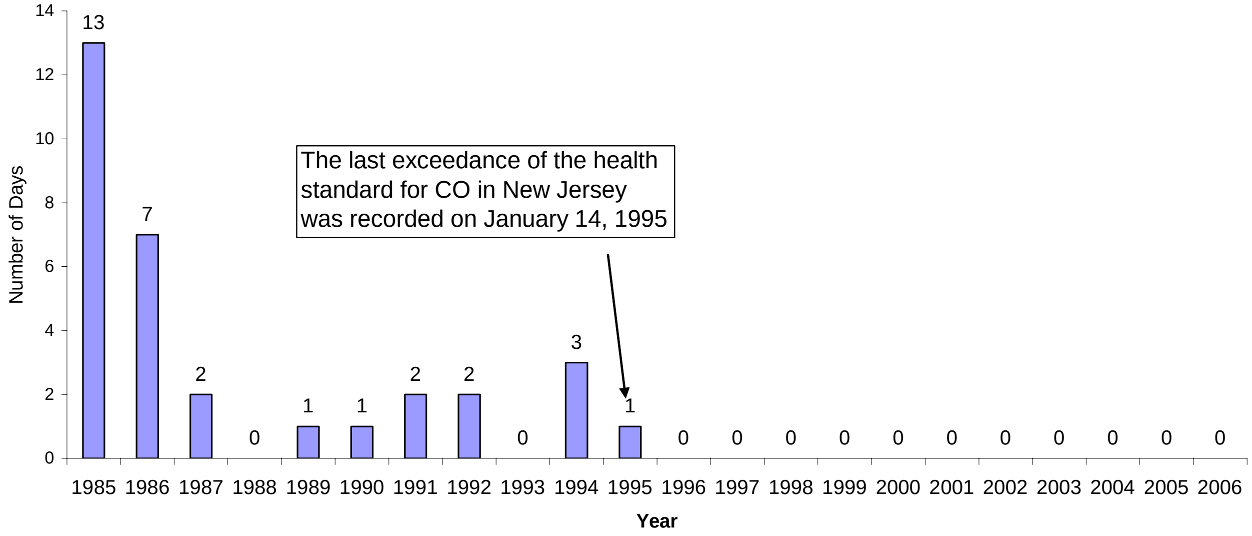
Parts Per Million (ppm)
1-hour standard = 35 ppm
8-hour standard = 9 ppm

Monitoring Sites	Maximum 1-Hour Average	2nd Highest 1-Hour Average	Maximum 8-Hour Average	2nd Highest 8-Hour Average
Ancora State Hospital	1.0	1.0	0.6	0.5
Burlington	3.5	3.0	1.8	1.7
Camden Lab	2.9	2.7	2.1	1.7
East Orange	3.8	3.3	2.2	2.1
Elizabeth	4.6	4.5	3.0	2.8
Elizabeth Lab	2.8	2.8	1.9	1.9
Fort Lee	2.9	2.7	2.0	2.0
Freehold	3.3	3.1	1.5	1.5
Hackensack	4.5	2.9	2.2	2.1
Jersey City	4.4	3.8	2.6	2.5
Morristown	2.7	2.6	1.6	1.6
Perth Amboy	3.3	2.9	1.6	1.6

Trends

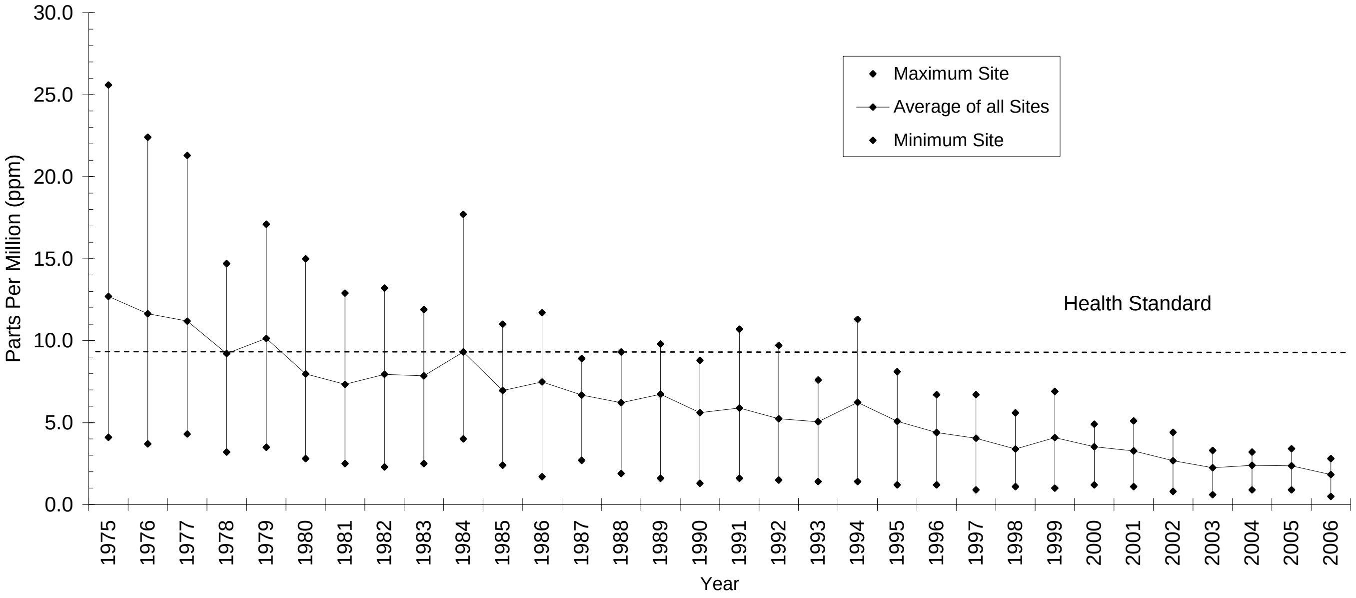
Carbon monoxide levels have improved dramatically over the past 20 years. The last time the CO standard was exceeded in New Jersey was in January of 1995 (see Figure 6, page 5), and the entire state was officially declared as having attained the CO standard on August 23, 2002. At one time unhealthy levels of CO were recorded on a regular basis – as much as a hundred days a year at some sites. The reduction in CO levels is due primarily to cleaner running cars which are by far the largest source of this pollutant. A trend graph of CO levels showing the maximum, minimum and average concentrations recorded since 1975 is provided in Figure 7 (page 5). The graph depicts the second highest 8-hour value recorded; as this is the value that determines if the health standard is being met (one exceedance per site is allowed each year).

Figure 6
Carbon Monoxide
Unhealthy Days 1985-2006



The last exceedance of the health standard for CO in New Jersey was recorded on January 14, 1995

Figure 7
Carbon Monoxide Concentrations in New Jersey 1975-2006
2^{nd} Highest 8-Hour Average



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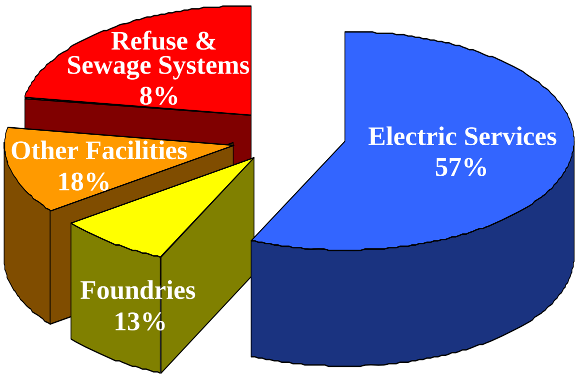
2006 Lead Summary

New Jersey Department of Environmental Protection

NATURE AND SOURCES

Lead (Pb) is a metal that occurs naturally in the environment as well as being produced by a variety of human activities. Historically, the major sources of lead in the air have been motor vehicles and industrial facilities. With the phase out of lead in gasoline, however, the industrial sources now predominate. Because of the reductions in lead emissions from cars and trucks, levels in the air have decreased dramatically. When high levels do occur, they are usually near industrial sources. The pie chart below shows the major industrial sources of lead in New Jersey. The industrial sources include Electric Services (Energy generating facilities), Foundries (Metal casting facilities), and Refuse and Sewage systems.

Figure 1
New Jersey's Summary of Lead Emissions by Industrial Category



Source: NJDEP, Air Quality Planning Data 2004

HEALTH AND ENVIRONMENTAL EFFECTS

Lead accumulates in the blood, bones, muscles, and fat. People are mainly exposed to lead by breathing it from the air or by ingesting food, water, soil, or dust that has been contaminated with lead. Infants and small children are especially sensitive to lead, even at low levels. Lead can damage the kidneys, liver, brain, and nerves and very high exposures can result in mental retardation, behavioral disorders, memory problems, and seizures. Lower levels of lead can damage the brain and nerves in fetuses and young children, resulting in learning disabilities. Lead can also cause high blood pressure and increase the risk of heart disease.

Animals can ingest lead while grazing and may experience health effects similar to those seen in humans. Lead can enter water systems through runoff and from sewage and industrial waste streams. Elevated levels of lead in water can cause reproductive damage in aquatic life and may cause changes in the blood and nerves of fish.

STANDARDS

The primary (health based) and secondary (welfare based) standards for lead are the same. The national standards are set at a maximum quarterly average concentration of 1.5 micrograms per cubic meter ($\mu g/m^3$). The table below shows the National and New Jersey Ambient Air Quality Standards (NAAQS and NJAAQS) for lead. The difference between the national and state standards is that the national standards are based on calendar quarters (Jan-Mar, Apr-Jun, Jul-Sep, Oct-Dec) while the state standards are based on concentrations recorded over any three consecutive months.

Table 1
National and New Jersey Ambient Air Quality Standards for Lead

$\mu g/m^3$ = Micrograms Per Cubic Meter

Averaging Period	Type	New Jersey	National
3-Month Arithmetic Mean	Primary and Secondary	1.5 $\mu g/m^3$	
Calendar Quarter Arithmetic Mean	Primary and Secondary		1.5 $\mu g/m^3$

MONITORING LOCATIONS

Lead concentrations in recent years have been so low that many of the monitoring sites have been discontinued. As a result, New Jersey monitored lead at only one location in 2006. This location, near a battery manufacturing plant in New Brunswick, is shown on the map in Figure 2.

LEAD LEVELS IN 2006

A summary of the lead levels monitored in 2006 is shown in Table 2 and Figure 3. No exceedances of the primary or secondary standards were recorded. The maximum 3-month average was 0.154 micrograms per cubic meter (µg/m^3), barely one tenth of the health standard.

Figure 2
2006 Lead
Monitoring Network

Figure 3
2006 New Jersey Quarterly Average Lead Concentration

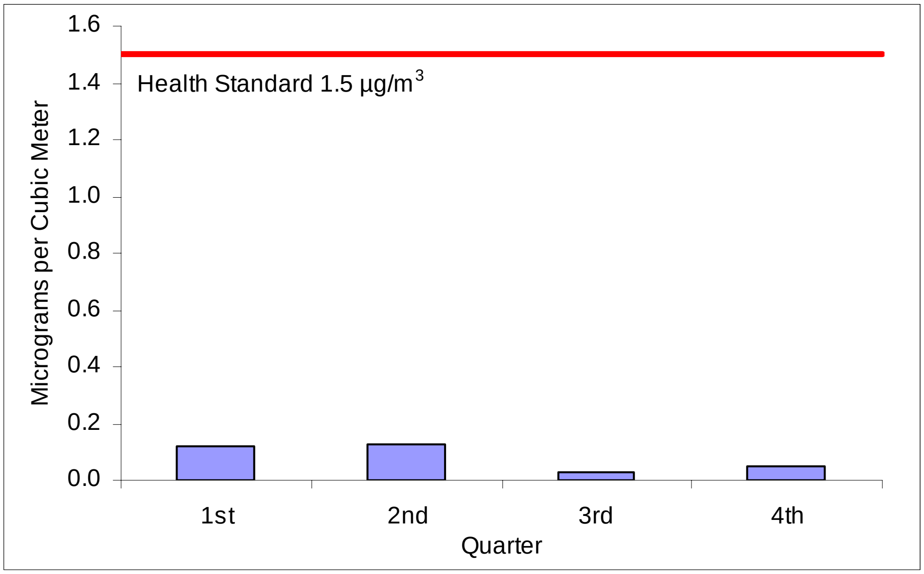


Table 2
Lead Data – 2006
3-Month and Calendar Quarter Averages

$\mu g/m^3$ = Micrograms Per Cubic Meter

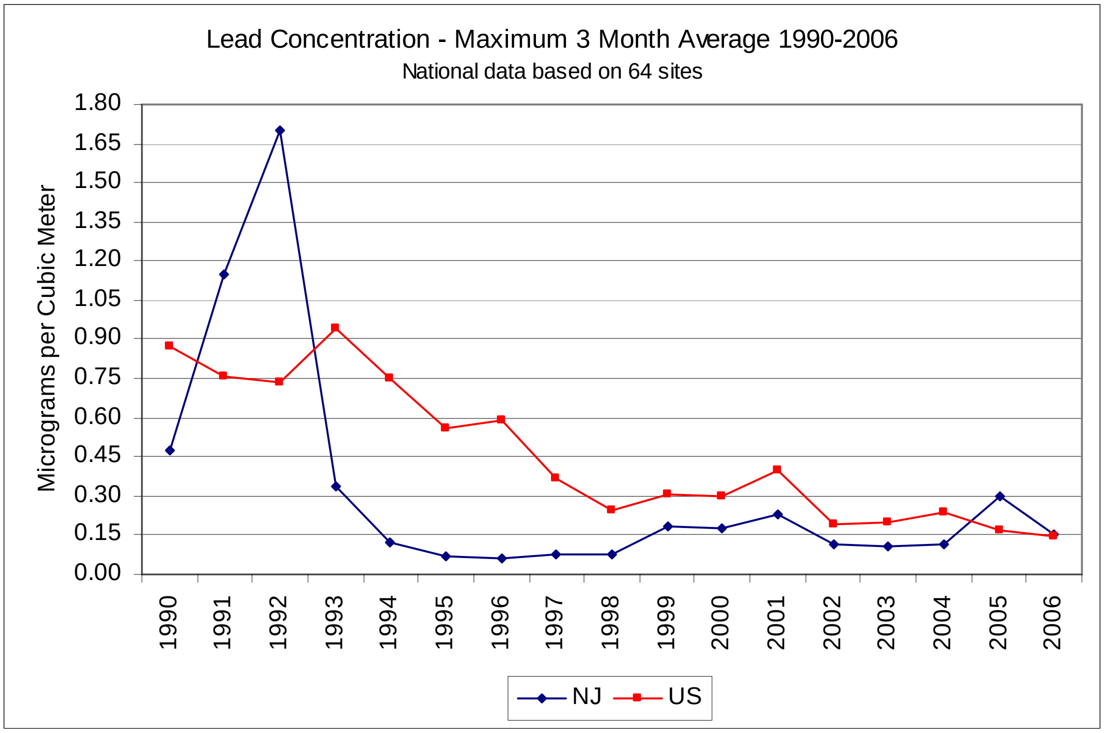
Monitoring Site	3-Month Average $\mu g/m^3$		Calendar Quarter Averages $\mu g/m^3$			
	Maximum	Month[1]	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
New Brunswick	.154	Jan.	.122	.129	.026	.051

[1] The month indicates the last month in the 3-month period

TRENDS

The phase out of lead in gasoline has resulted in substantial improvements in air quality, and lead levels in New Jersey are now well within the air quality standards. The trend graph below (Figure 4) shows New Jersey's Annual Maximum 3-Month Average concentrations from 1990 to 2006, compared to EPA's national Annual Maximum 3-Month Average (based on 64 sites). New Jersey's lead levels have decreased steadily since 1990 to about 14% of the levels seen in previous years. National concentrations have declined consistently over the same time span. New Jersey values are based on data from one site, New Brunswick, which has been the only Lead monitoring site in operation since 2002. While meeting the NAAQS for lead is no longer a major environmental issue in New Jersey, concern still exists over lead exposure via routes other than direct inhalation. Lead may have accumulated in the soil over time and children playing in such areas may ingest the lead directly.

Figure 4



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2006 Nitrogen Dioxide Summary

New Jersey Department of Environmental Protection

NATURE AND SOURCES

Nitrogen Dioxide (NO_2) is a reddish-brown, highly reactive gas that is formed in the air through the oxidation of Nitric Oxide (NO). When NO_2 reacts with other chemicals, it can form ozone, particulate matter, and other compounds which can contribute to regional haze and acid rain. Nitrogen Oxides (NO_x) is a mixture of gases which is mostly comprised of NO and NO_2. These gases are emitted from the exhaust of motor vehicles, the burning of coal, oil or natural gas, and during industrial processes such as welding, electroplating, and dynamite blasting. Although most NO_x is emitted as NO, it is readily converted to NO_2 in the atmosphere. In the home, gas stoves and heaters produce substantial amounts of nitrogen dioxide. A pie chart summarizing the major sources of NO_x is shown below (Figure 1). As much of the NO_x in the air is emitted by motor vehicles, concentrations tend to peak during the morning rush hours as shown in Figure 2 (page 2). Figure 3 (page 2) indicates that concentrations tend to be higher in the winter than the summer. This is due in part to space heating and poorer local dispersion conditions caused by light winds and other weather conditions that are more prevalent in the colder months of the year.

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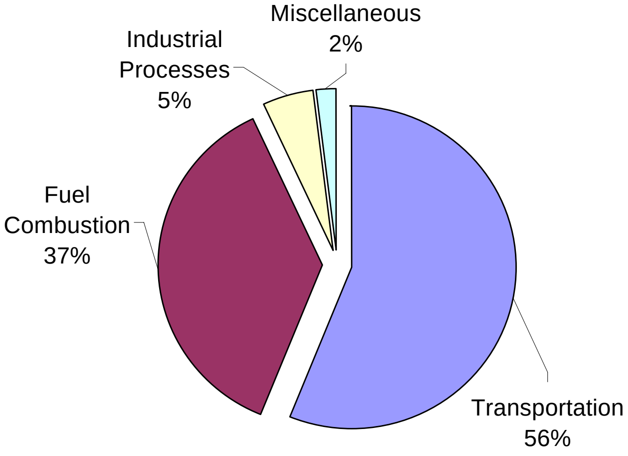
Figure 1
National Summary of 2002
NO_x Emissions by Source Category



Source: USEPA National Air Quality Emissions Trends Report, 2003 Special Studies, September 2003

HEALTH AND ENVIRONMENTAL EFFECTS

Short-term exposures (less than 3 hours) to low levels of nitrogen dioxide may aggravate pre-existing respiratory illnesses, and can cause respiratory illnesses, particularly in children ages 5-12. Symptoms of low level exposure to NO and NO_2 include irritation to eyes, nose, throat and lungs, coughing, shortness of breath, tiredness and nausea. Long-term exposures to NO_2 may increase susceptibility to respiratory infection and may cause permanent damage to the lung. NO and NO_2 are found in tobacco smoke, so people who smoke or breathe in second-hand smoke may be exposed to NO_x. The U.S. Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC), and the U.S. Environmental Protection Agency (EPA) have determined that, with the available information, no conclusion can be made as to the carcinogenicity of NO or NO_2 to human beings.

Nitrogen Oxides contribute to a wide range of environmental problems. These include potential changes in the composition of some plants in wetland and terrestrial ecosystems, acidification of freshwater bodies, eutrophication of estuarine and coastal waters, increases in levels of toxins harmful to fish and other aquatic life, and visibility impairment.

STANDARDS

The primary (health based) and secondary (welfare based) National Ambient Air Quality Standards (NAAQS) for NO_2 are the same. They are set at a calendar year average concentration of 0.053 parts per million (ppm). The New Jersey Ambient Air Quality Standards (NJAAQS) are identical to the NAAQS except micrograms per cubic meter ($\mu g/m^3$) are the standard units and the state standard applies to any 12-month period, not just the calendar year. The state of California has a one-hour average standard of 470 $\mu g/m^3$ that New Jersey uses as a guideline in assessing short-term impacts from specific sources. Table 1 provides a summary of the NO_2 standards.

Table 1
National and New Jersey Ambient Air Quality Standards for Nitrogen Dioxide

Parts Per Million (ppm) and Micrograms Per Cubic Meter (µg/m^3)

Averaging Period	Type	New Jersey	National	California
12-month average	Primary	100 µg/m^3 (0.05 ppm)		
Annual average	Primary		0.053 ppm (100 µg/m^3)	
12-month average	Secondary	100 µg/m^3 (0.05 ppm)		
Annual average	Secondary		0.053 ppm (100 µg/m^3)	
1-hour average	Primary			470 µg/m^3 (0.25 ppm)

Figure 2
Total Oxides of Nitrogen (NO$_x$) – New Jersey
2006 Hourly Variation

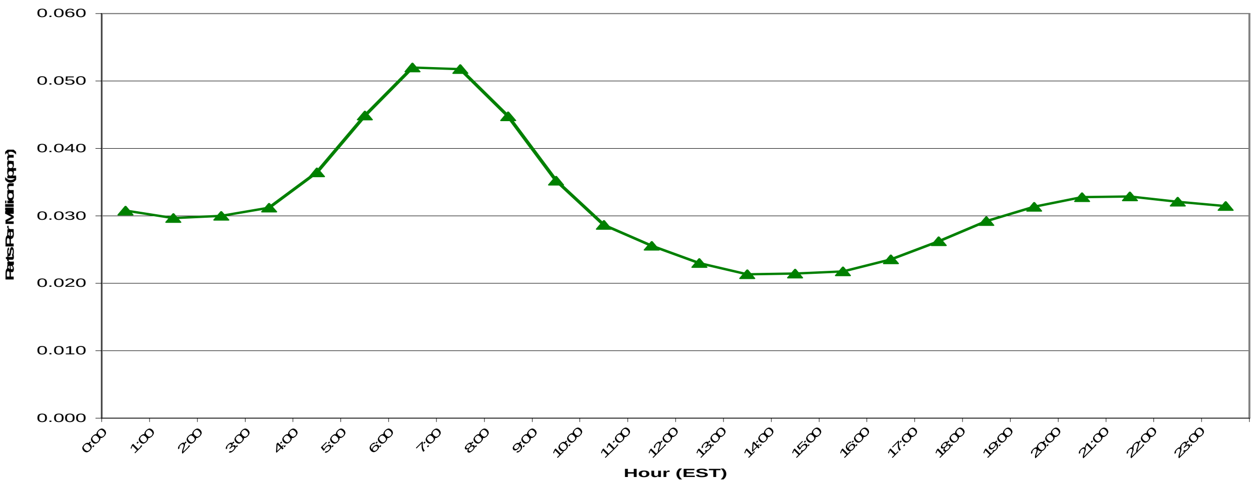
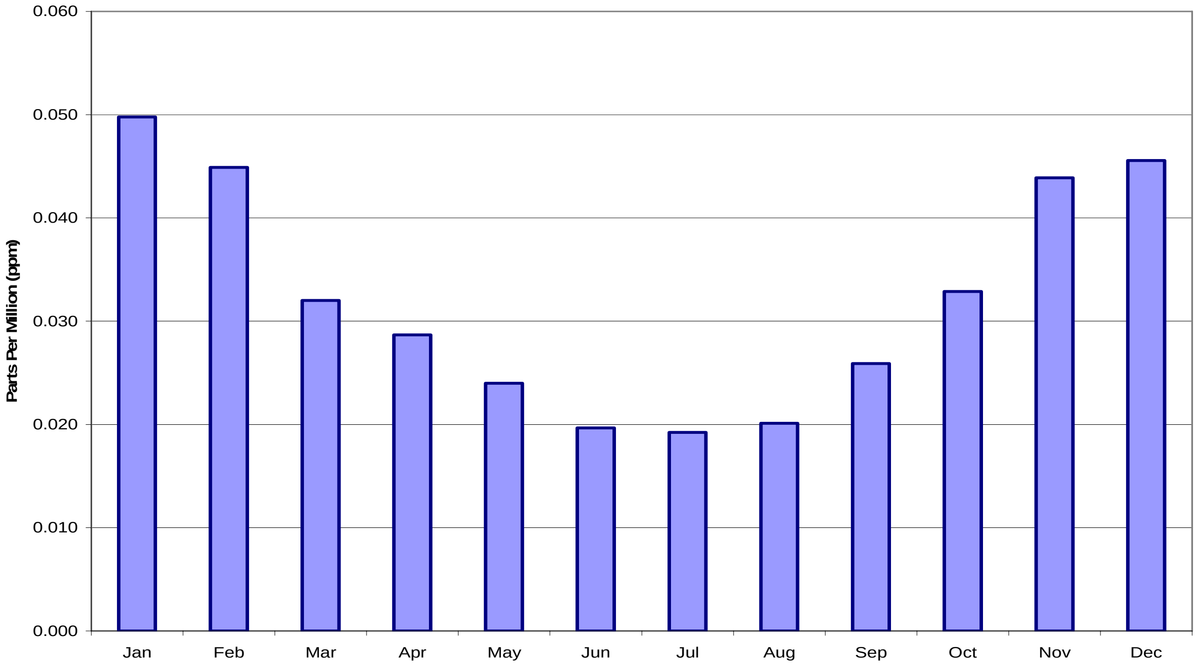


Figure 3
Total Oxides of Nitrogen (NO$_x$) – New Jersey
2006 Monthly Variation



MONITORING LOCATIONS

The state monitored NO_2 levels at 9 locations in 2006. These sites are shown in the map to the right.

NO_2 LEVELS IN 2006

None of the monitoring sites recorded exceedances of either the National or New Jersey Air Quality Standards for NO_2 during 2006. The highest 12-month (calendar year) average concentration of NO_2 recorded was 0.029 ppm at the Elizabeth Lab site located at Exit 13 of the New Jersey Turnpike (Table 2, below and Figure 5, page 4). While national health and welfare standards have not been established for Nitric Oxide (NO), it is considered to be an important pollutant that contributes to the formation of ozone, fine particles and acid rain. The maximum annual average concentration of NO recorded in 2006 was 0.038 ppm, also at the Elizabeth Lab site (Table 2, below and Figure 6, page 4).

TRENDS

Routine monitoring for NO_2 began in 1966 and 1974 was the last year that concentrations exceeded the NAAQS in New Jersey. A graph of NO_2 levels provided in Figure 7 (page 5) shows the statewide average annual mean concentrations recorded from 1975 to 2006 in the form of a trendline. The graph also includes the levels of the sites that measured the highest annual mean and lowest annual mean in each year as points above and below this trendline. Although NO_2 concentrations are well within the NAAQS, there is still a great deal of interest in oxides of nitrogen because of their role in the formation of other pollutants – most notably ozone and fine particles. Both these pollutants are of concern over much of the northeastern United States and efforts to reduce levels of ozone and fine particles are likely to require reductions in NO emissions.

Figure 4
2006 Nitrogen Dioxide Monitoring Network

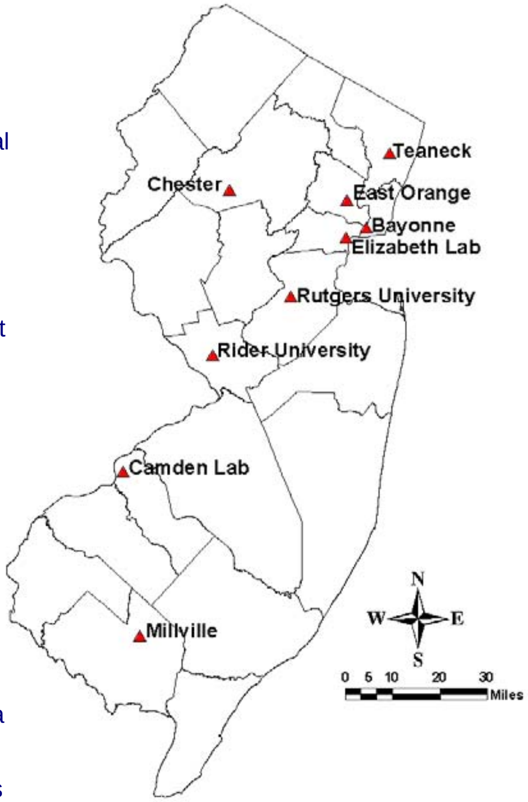


Table 2
Nitrogen Dioxide and Nitric Oxide Data-2006
1-Hour and 12-Month Averages

Parts Per Million (ppm)
California 1-Hour Standard = 0.25 ppm
National 12-Month Standard = 0.053 ppm

	Nitrogen Dioxide 1-Hour Average (ppm)		Nitrogen Dioxide 12-Month Average (ppm)		Nitric Oxide Annual
Monitoring Sites	**Maximum**	**2nd Highest**	**Maximum**	**Calendar year**	**Average(ppm)**
Bayonne	0.132	0.106	0.022	0.022	0.015
Camden Lab	0.068	0.067	0.019	0.017	0.010
Chester	0.069	0.064	0.011	0.008	0.002
East Orange	0.091	0.089	0.026	0.023	0.022
Elizabeth Lab	0.128	0.116	0.031	0.029	0.038
Millville	0.052	0.050	0.012	0.011	0.009
Rider University	0.061	0.057	0.015	0.012	0.009
Rutgers University	0.064	0.063	0.017	0.013	0.008
Teaneck	0.091	0.089	0.022	0.018	0.017

Figure 5
Annual Average Nitrogen Dioxide Concentrations in New Jersey - 2006

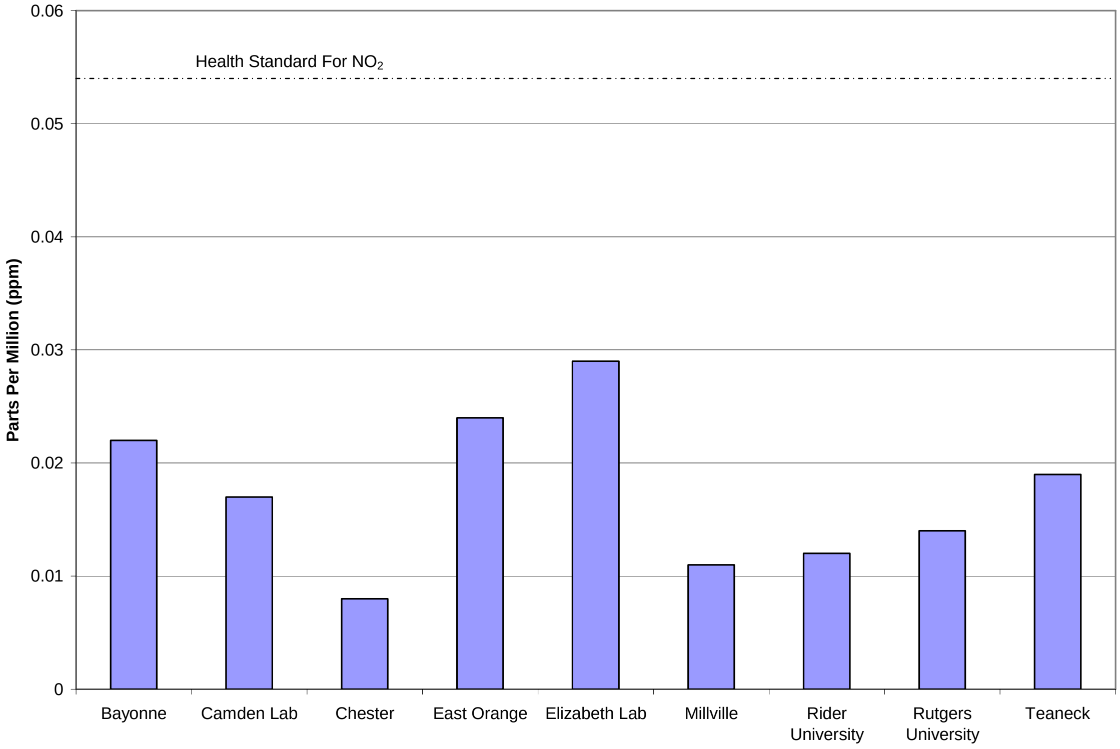


Figure 6
Annual Average Nitric Oxide Concentrations in New Jersey - 2006

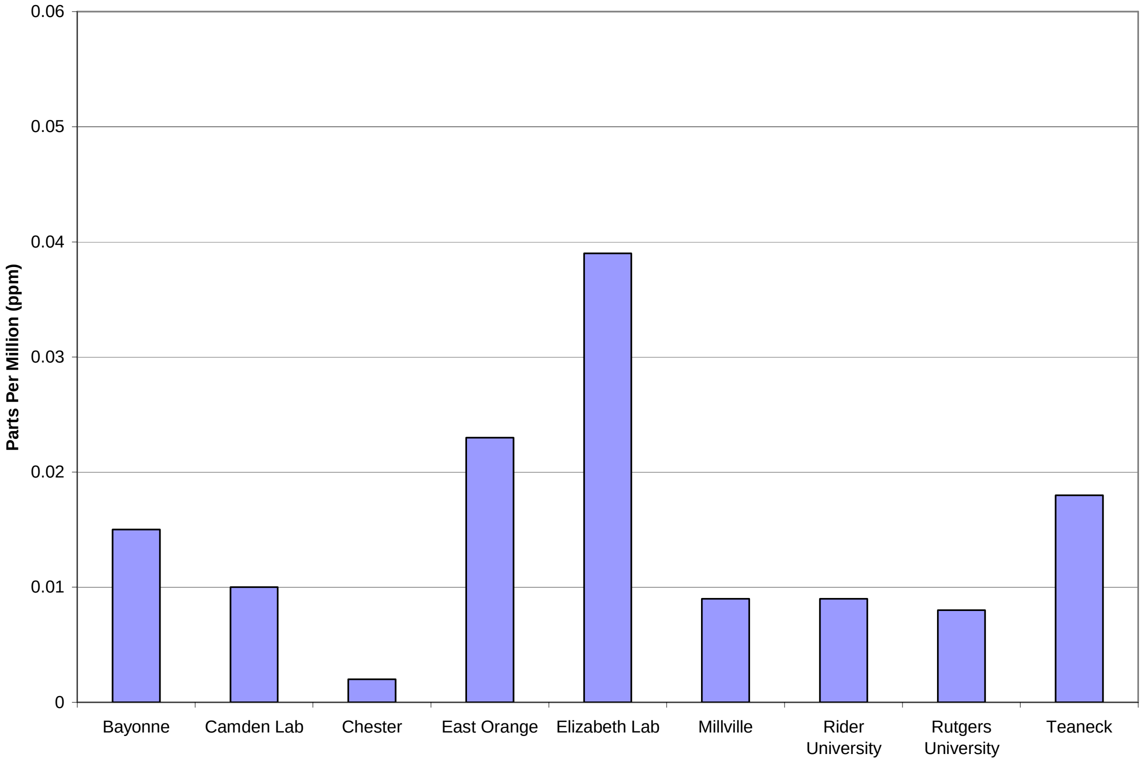
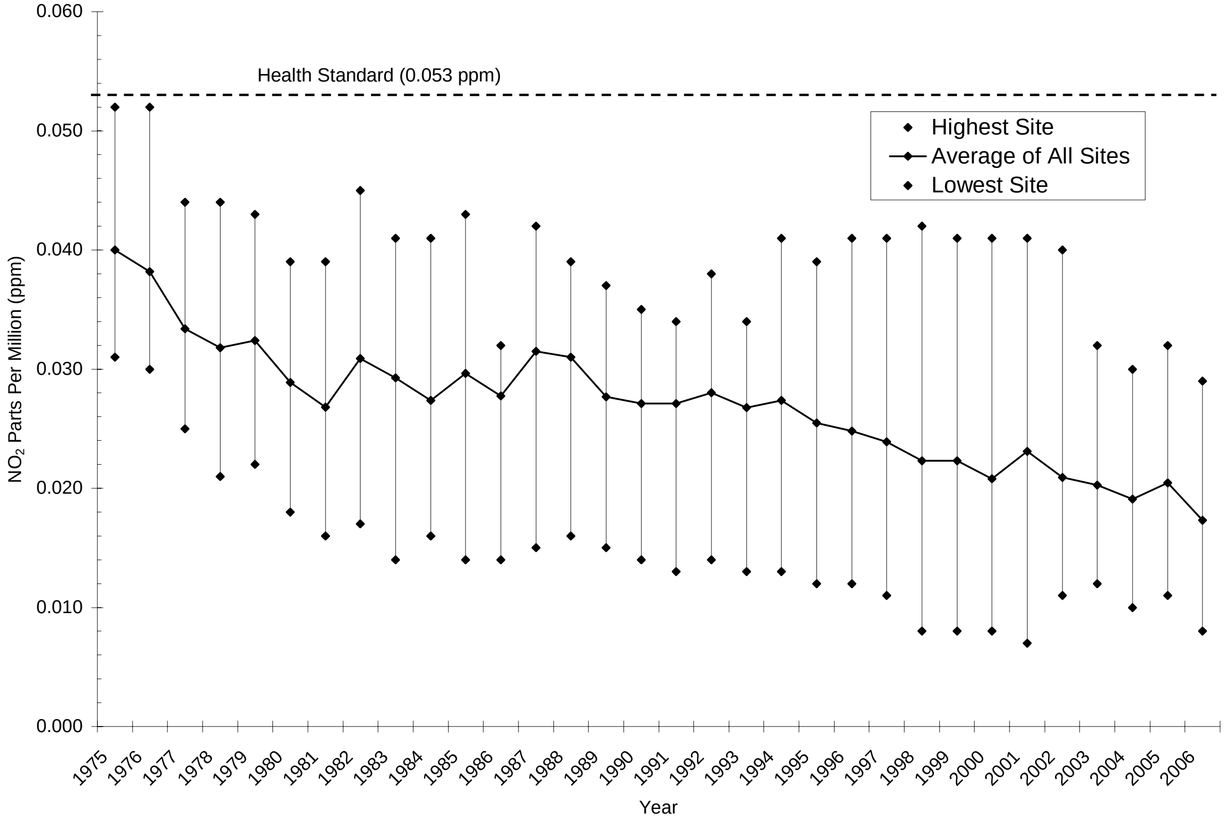


Figure 7
Nitrogen Dioxide Concentrations in New Jersey 1975-2006
12-Month (Calendar Year) Averages



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2006 Ozone Summary

New Jersey Department of Environmental Protection

NATURE AND SOURCES

Ozone (O_3) is a gas consisting of three oxygen atoms. It occurs naturally in the upper atmosphere (stratospheric ozone) where it protects us from harmful ultraviolet rays (see Figure 1). However, at ground-level (tropospheric ozone) it is considered an air pollutant and can have serious adverse health effects. Ground-level ozone is created when nitrogen oxides (NOx) and volatile organic compounds (VOC's) react in the presence of sunlight and heat. NOx is primarily emitted by motor vehicles, power plants, and other sources of combustion. VOC's are emitted from sources such as motor vehicles, chemical plants, factories, consumer and commercial products, and even natural sources such as trees. Ozone and the pollutants that form ozone (precursor pollutants) can also be transported into an area from sources hundreds of miles upwind.

Figure 1: Good and Bad Ozone

Ozone is good up here…Many popular consumer products like air conditioners and refrigerators involve CFCs or halons during either manufacturing or use. Over time, these chemicals damage the earth's protective ozone layer.

Ozone is bad down here… Cars, trucks, power plants and factories all emit air pollution that forms ground-level ozone, a primary component of smog.

Source: EPA

Since ground-level ozone needs sunlight and warm temperatures to form, it is mainly a daytime problem during the summer months. Weather patterns have a significant effect on ozone formation and hot, dry summers will result in more ozone than cool, wet ones. In New Jersey, the ozone monitoring season runs from April 1st to October 31st, although unhealthy conditions are rare before mid-May or after the first few weeks of September. For a more complete explanation of the difference between ozone in the upper and lower atmosphere, see the U.S. Environmental Protection Agency (EPA) publication "Ozone: Good Up High, Bad Nearby".

ENVIRONMENTAL EFFECTS

Ground-level ozone damages plant life and is responsible for 500 million dollars in reduced crop production in the United States each year. It interferes with the ability of plants to produce and store food, making them more susceptible to disease, insects, other pollutants, and harsh weather. "Bad" ozone damages the foliage of trees and other plants, sometimes marring the landscape of cities, national parks and forests, and recreation areas. The black areas on the leaves of the blackberry bush and sassafras tree shown in Figure 2 and Figure 3 are damage caused by exposure to ground-level ozone. (Figure 2 and 3 Photos by: Teague Prichard, Wisconsin Department of Natural Resources)

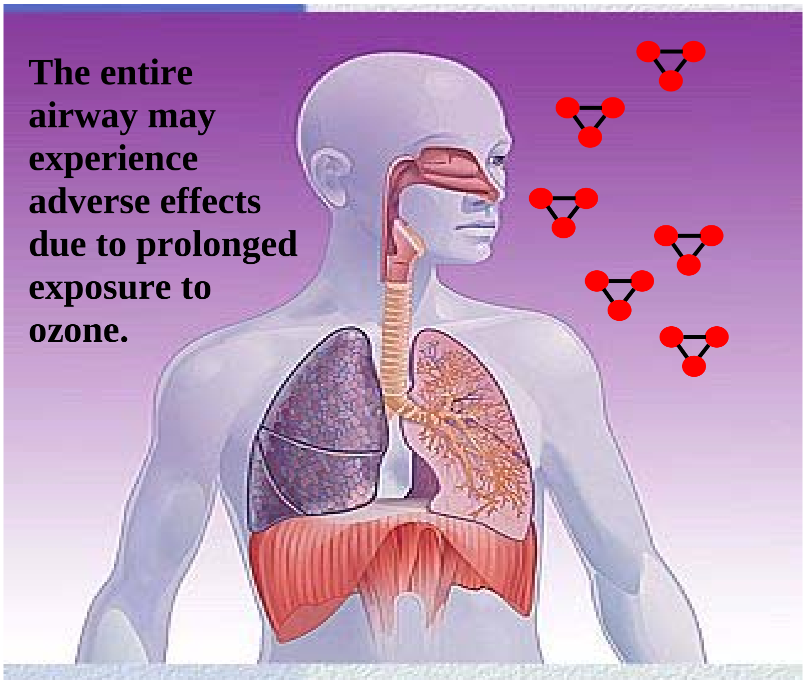

Figure 2: Ozone Damage to Blackberry Bush


Figure 3: Ozone Damage to Sassafras Tree

HEALTH EFFECTS

Repeated exposure to ozone pollution may cause permanent damage to the lungs. Even when ozone is present in low levels, inhaling it can trigger a variety of health problems including chest pains, coughing, nausea, throat irritation, and congestion. Ozone also can aggravate other health problems such as bronchitis, heart disease, emphysema, and asthma, and can reduce lung capacity. People with pre-existing respiratory ailments are especially prone to the effects of ozone. For example, asthmatics affected by ozone may have more frequent or severe attacks during periods when ozone levels are high. As shown in Figure 4 ozone can irritate the entire respiratory tract. Children are also at risk for ozone related problems. Their respiratory systems are still developing and they breathe more air per pound of body weight than adults. They are also generally active outdoors during the summer when ozone levels are at their highest. Anyone who spends time outdoors in the summer can be affected and studies have shown that even healthy adults can experience difficulty in breathing when exposed to ozone. Anyone engaged in strenuous outdoor activities, such as jogging, should limit activity to the early morning or late evening hours on days when ozone levels are expected to be high.

Figure 4



Areas of the Respiratory Tract that may be Affected by Ozone

AMBIENT AIR QUALITY STANDARDS FOR OZONE

National and state air quality standards have been established for ground-level ozone. There are both primary standards, which are based on health effects, and secondary standards, which are based on welfare effects (e.g. damage to trees, crops and materials). For ground-level ozone, the primary and secondary National Ambient Air Quality Standards (NAAQS) are the same (see Table 1). The ozone NAAQS were revised in 1997 because EPA had determined that the old standard of 0.12 parts per million (ppm) maximum daily one-hour average was not sufficiently protective of public health. They set a revised standard of 0.08 ppm maximum daily 8-hour average. The standard changes were challenged in court but eventually upheld. As many people are accustomed to the old standards, summary information relative to that standard will be provided in this report along with summaries based on the new standard.

Table 1

National and New Jersey Ambient Air Quality Standards for Ozone

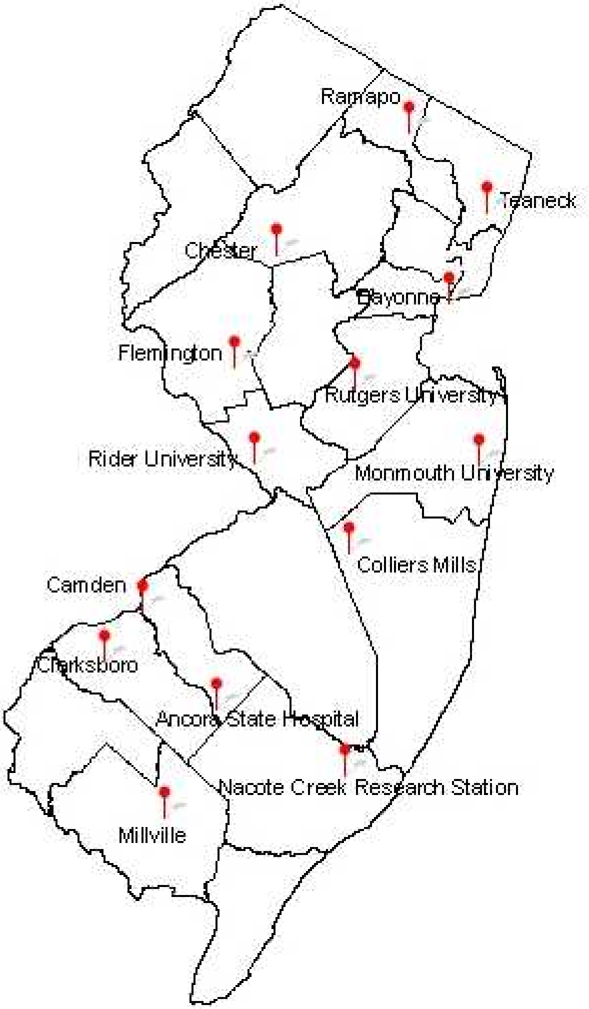
ppm = Parts per Million

Averaging Period	Type	New Jersey	National
1-Hour	Primary	0.12 ppm	0.12 ppm
1-Hour	Secondary	0.08 ppm	0.12 ppm
8-Hour	Primary	-----	0.08 ppm
8-Hour	Secondary	-----	0.08 ppm

OZONE NETWORK

Ozone was monitored at 14 locations in New Jersey during 2006. Of those 14 sites, 11 operated year round and 3 operated only during the ozone season (April 1st through October 31st). Colliers Mills, Monmouth University, and Ramapo were only operated during the ozone season. Site locations are shown in Figure 5.

Figure 5
2006 Ozone
Monitoring Network



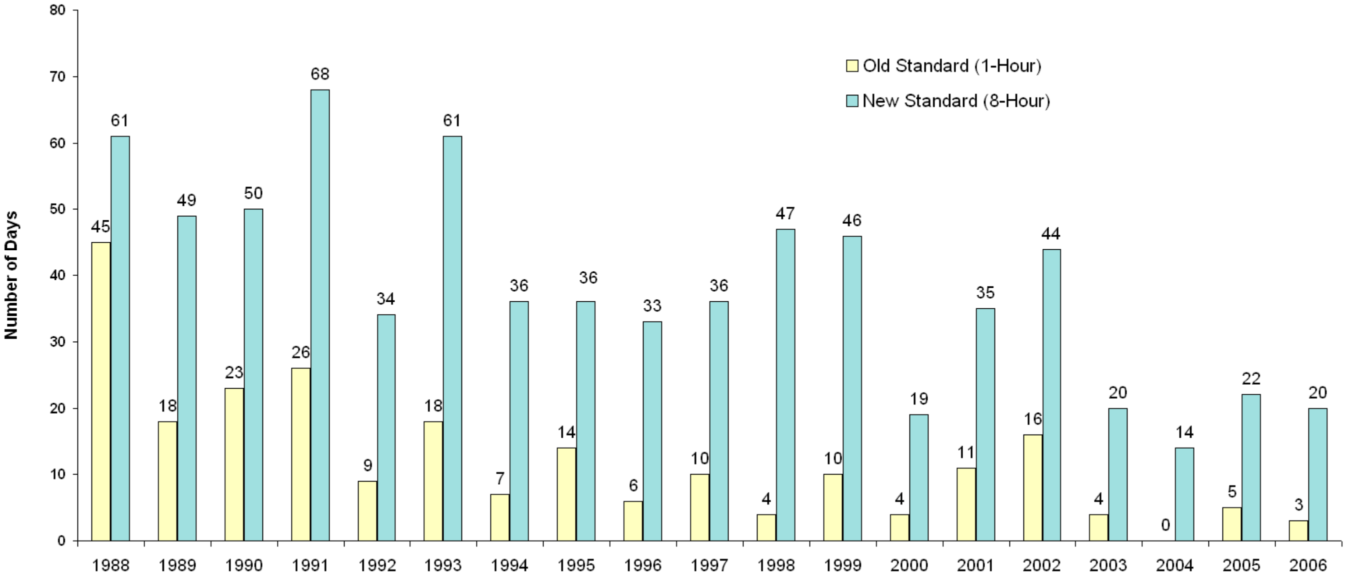
HOW THE CHANGES TO THE OZONE STANDARDS AFFECT AIR QUALITY RATINGS

In 2006 there were three days on which the old standard was exceeded in New Jersey and 20 days on which the new standard was exceeded. Significant progress is being made towards meeting the old standard (see Figure 6 below). There are fewer days on which that standard is exceeded, and when it is, fewer sites tend to be involved. Also, the maximum levels reached are not as high as they were in the past. The maximum 1-hour average concentration recorded in 1988 was 0.218 ppm, compared to a maximum of 0.135 ppm in 2006.

It is apparent, however, that the current standard is significantly more stringent than the old one (see Figure 6 below). As a result, additional control measures to reduce ozone levels will be needed. These measures will have to be implemented over a wide area and will require the cooperative effort of many states and the federal government if they are to be successful.

Figure 6

Days on Which the Old and New Ozone Standards Have Been Exceeded in New Jersey 1988 - 2006



DESIGN VALUES

The NAAQS for ozone are set in such a way that determining whether they are being attained is not based on a single year. For example, an area was considered to be attaining the old 1-hour average standard if the average number of times the standard was exceeded over a three-year period was 1 or less (after correcting for missing data). Thus it was the fourth highest daily maximum 1-hour concentration that occurred over a three-year period that determined if an area would be in attainment. If the fourth highest value was above 0.12 ppm then the average number of exceedances would be greater than 1. The fourth highest value is also known as the design value.

Under the new standard, attainment is determined by taking the average of the fourth highest daily maximum 8-hour average concentration that is recorded each year for three years. This becomes the design value for an area under the new standard. When plans are developed for reducing ozone concentrations, an area must demonstrate that the ozone reduction achieved will be sufficient to ensure the design value will be below the NAAQS, as opposed to ensuring that the standards are never exceeded. This avoids having to develop plans based on extremely rare events.

Figures 7 and 8 show the design value for the 1 and 8-hour standards starting with the 1986-1988 period. Design values are calculated for all ozone sites in the network and the median, maximum and minimum for each year were used in the graphics.

Figure 7

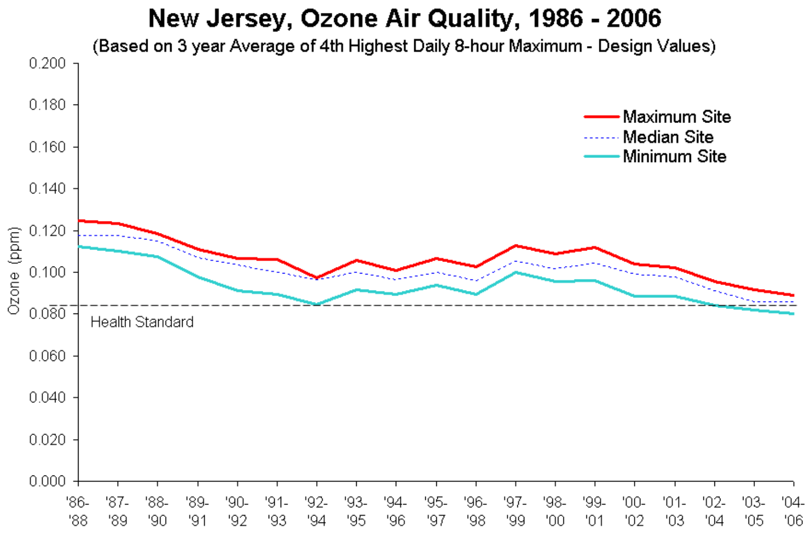
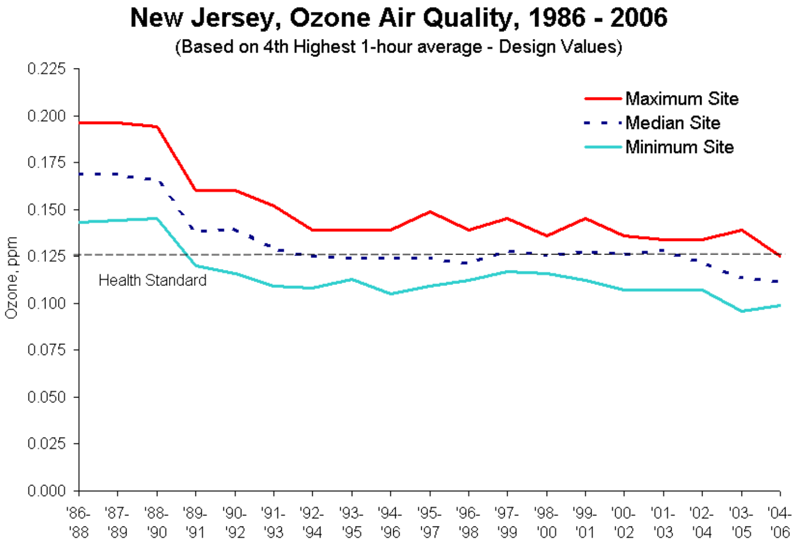


Figure 8



SUMMARY OF 2006 Ozone Data Relative to the 1-HOUR STANDARD

Of the 14 monitoring sites that were operated during the 2006 ozone season, three recorded levels above the old 1-hour standard of 0.12 ppm during the year. The highest 1-hour concentration was 0.135 ppm at the Ancora S.H. monitor on July 17th. In the 2005 ozone season five sites recorded levels above the 1-hour standard.

Figure 9

Highest and Second Highest Daily Ozone 1-Hour Averages

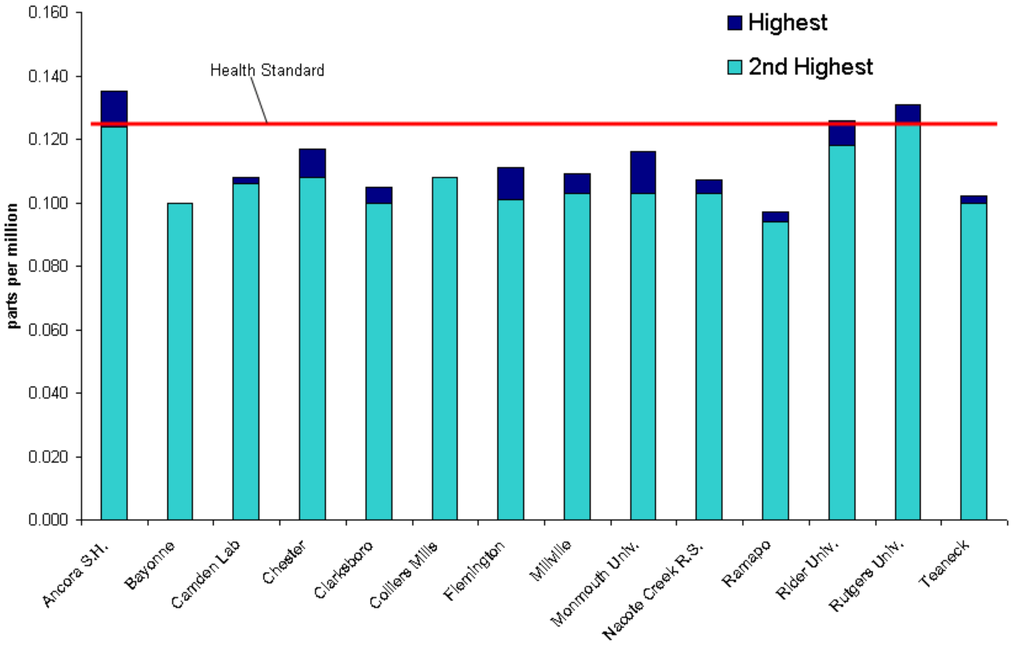


Table 3
Ozone Data – 2006
1-Hour Averages

Parts Per Million (ppm) **1-hour standard is 0.12 ppm**

Monitoring Site	1-hr Max	2nd Highest 1-hr Max	4th Highest 1-hour Average 2004-2006	# of days with 1-hour Averages above 0.12ppm
Ancora S.H.	.135	.124	.114	1
Bayonne	.100	.100	.114	0
Camden Lab	.108	.106	.108	0
Chester	.117	.108	.103	0
Clarksboro	.105	.100	.113	0
Colliers Mills	.108	.108	.117	0
Flemington	.111	.101	.109	0
Millville	.109	.103	.111	0
Monmouth Univ.	.116	.103	.112	0
Nacote Creek R.S.	.107	.103	.099	0
Ramapo	.097	.094	.102	0
Rider University	.126	.118	.110	1
Rutgers University	.131	.125	.125	2
Teaneck	.102	.100	.110	0
Statewide	.135	.131		3

SUMMARY OF 2006 OZONE DATA RELATIVE TO THE 8-HOUR STANDARD

All 14 monitoring sites that were operated during the 2006 ozone season recorded levels above the 8-hour standard of 0.08 ppm. Colliers Mills recorded the most exceedances with nine. The highest 8-hour concentration recorded was 0.115 ppm at the Ancora S.H. site on July 17th. Comparatively, all 14 sites recorded levels above the 8-hour standard in 2005, with a maximum concentration of 0.110 ppm, recorded at the Millville site on July 22nd. Design values for the 8-hour standard were also above the standard at 9 of 14 sites, indicating that the ozone standard is being violated throughout most of New Jersey.

Figure 10

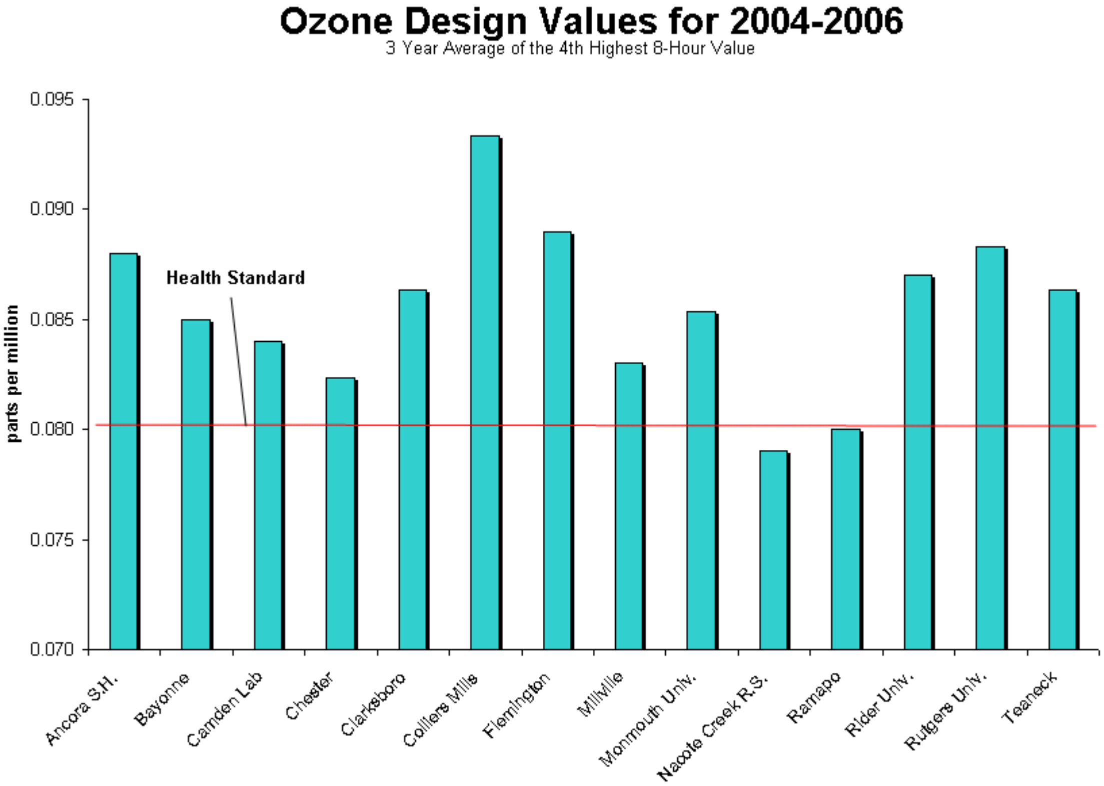


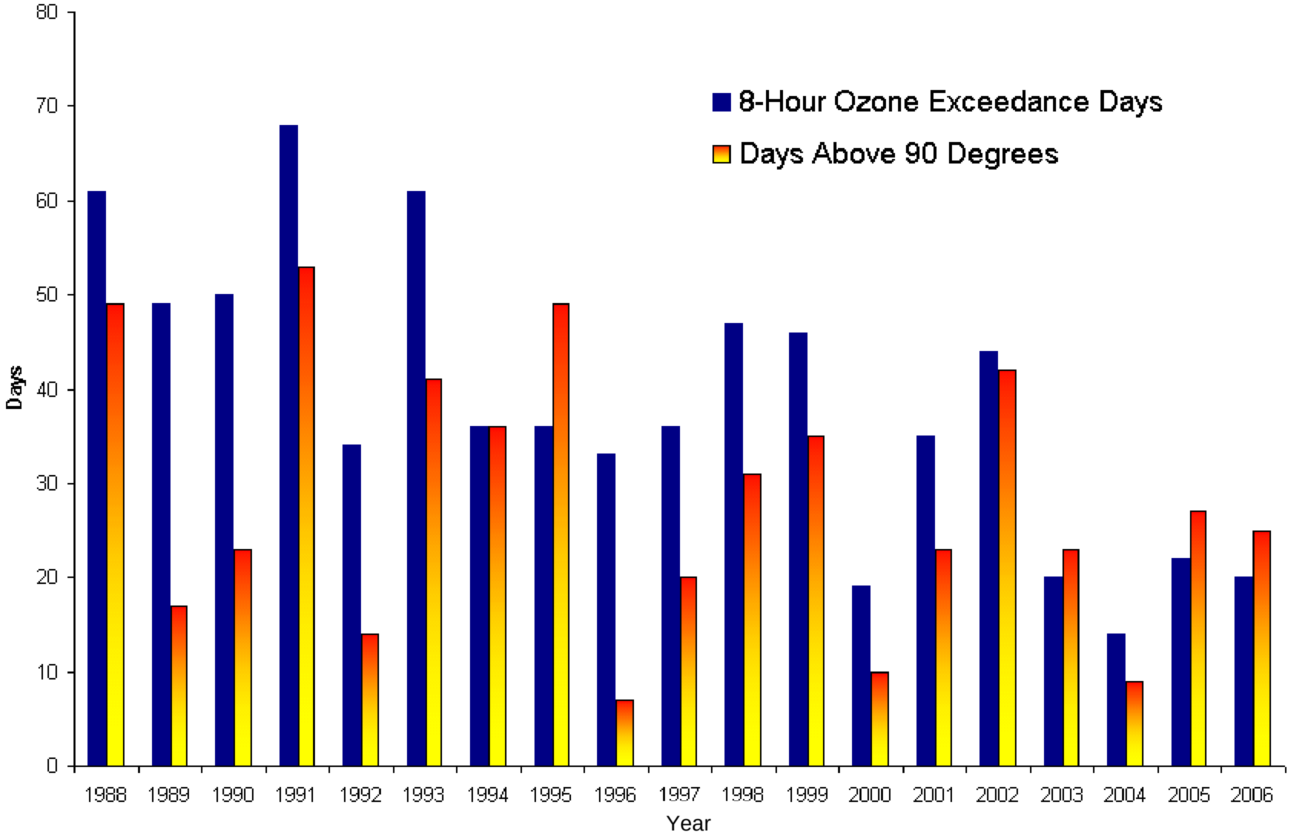
Table 4
Ozone Data – 2006
8-Hour Averages

Parts Per Million (ppm) **8-hour standard is 0.08 ppm**

Monitoring Site	1st Highest	2nd Highest	3rd Highest	4th Highest	Avg. of 4th Highest 8-hour Averages 2004-2006	# of days with 8-hour above 0.08ppm
Ancora S.H.	.115	.112	.093	.086	.088	6
Bayonne	.093	.092	.091	.086	.085	6
Camden Lab	.092	.089	.088	.087	.084	4
Chester	.100	.099	.093	.090	.082	8
Clarksboro	.091	.089	.088	.083	.086	3
Colliers Mills	.099	.098	.094	.091	.093	9
Flemington	.093	.088	.087	.087	.089	5
Millville	.096	.087	.084	.083	.083	2
Monmouth Univ.	.102	.092	.089	.088	.085	5
Nacote Creek R.S.	.094	.079	.078	.076	.079	1
Ramapo	.085	.084	.077	.077	.080	1
Rider University	.103	.097	.090	.090	.087	6
Rutgers University	.106	.103	.099	.092	.088	6
Teaneck	.094	.089	.089	.086	.086	4
Statewide	.115	.112	.106	.103	.100	20

Figure 11

Number of Days 8-Hour Ozone Standard was Exceeded and Number of Days Above 90 Degrees in New Jersey 1988 - 2006



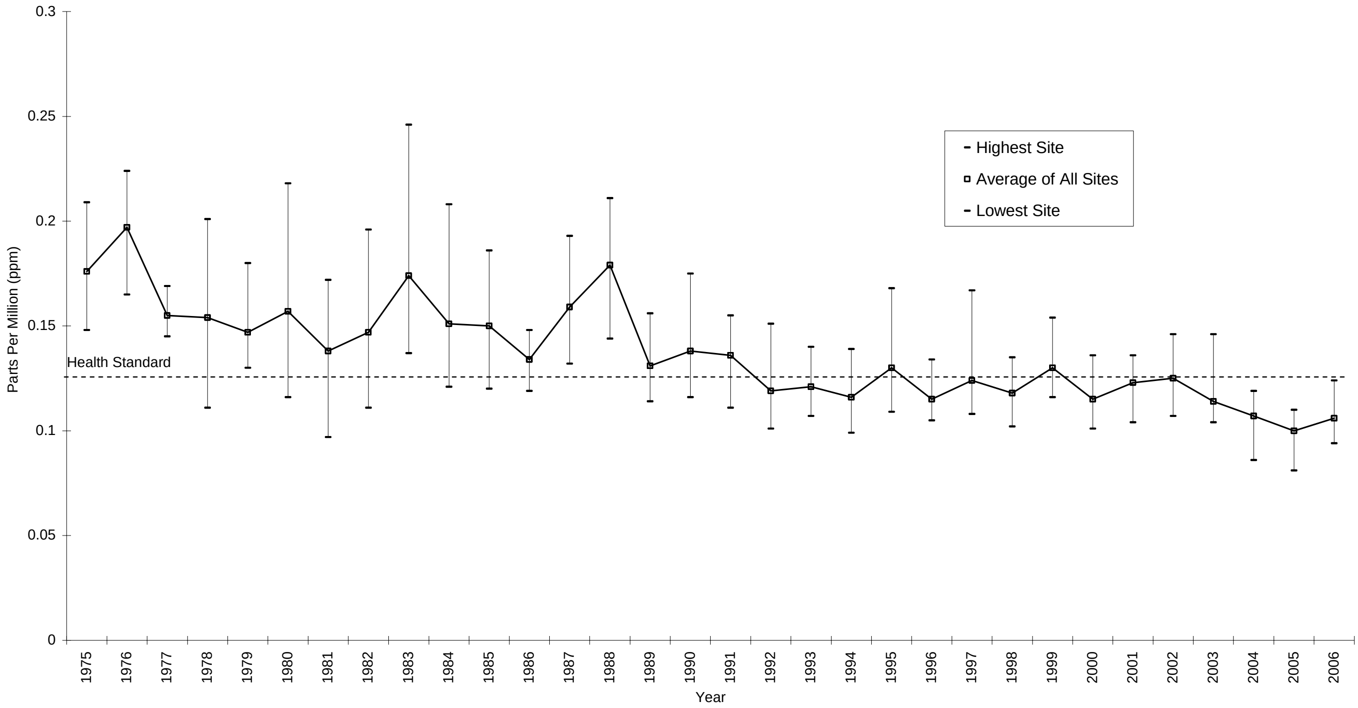
ACCOUNTING FOR THE INFLUENCE OF WEATHER

Trends in ground level ozone are influenced by many factors including weather conditions, transport, growth, and the state of the economy, in addition to changes brought about by regulatory control measures. Of these factors, weather probably has the most profound effect on year to year variations in ozone levels. Several methods have been developed to try to account for the effect of weather on ozone levels so that the change due to emissions could be isolated. While none of these methods are completely successful they do show that over the long term, real reductions in ozone levels have been achieved. A simple way of showing the changing effect of weather on ozone is shown above in Figure 11. The number of days each year on which the ambient temperature was 90 degrees or greater is shown next to the number of days the ozone standard was exceeded. In the earliest years shown (1988-1993) there are significantly more days with high ozone than days above 90 degrees. But this pattern gradually changes and for the most recent years there are more “hot” days than “ozone” days. This is an indication that on the days when conditions are suitable for ozone formation, unhealthy levels are being reached less frequently.

OZONE TRENDS

The primary focus of efforts to reduce concentrations of ground-level ozone in New Jersey has been on reducing emissions of volatile organic compounds (VOCs). Studies have shown that such an approach should lower peak ozone concentrations, and it does appear to have been effective in achieving that goal. Maximum 1-hour concentrations have not exceeded 0.200 ppm since 1988 and the last time levels above 0.180 ppm were recorded was in 1990 (Figure 12). Improvements have leveled off in recent years, especially with respect to maximum 8-hour average concentrations. Significant further improvements will require reductions in both VOCs and NOx. The NOx reductions will have to be achieved over a very large region of the country because levels in New Jersey are dependent on emissions from upwind sources.

Figure 12
Ozone Concentrations in New Jersey
1975 – 2006
Second Highest 1-Hour Averages

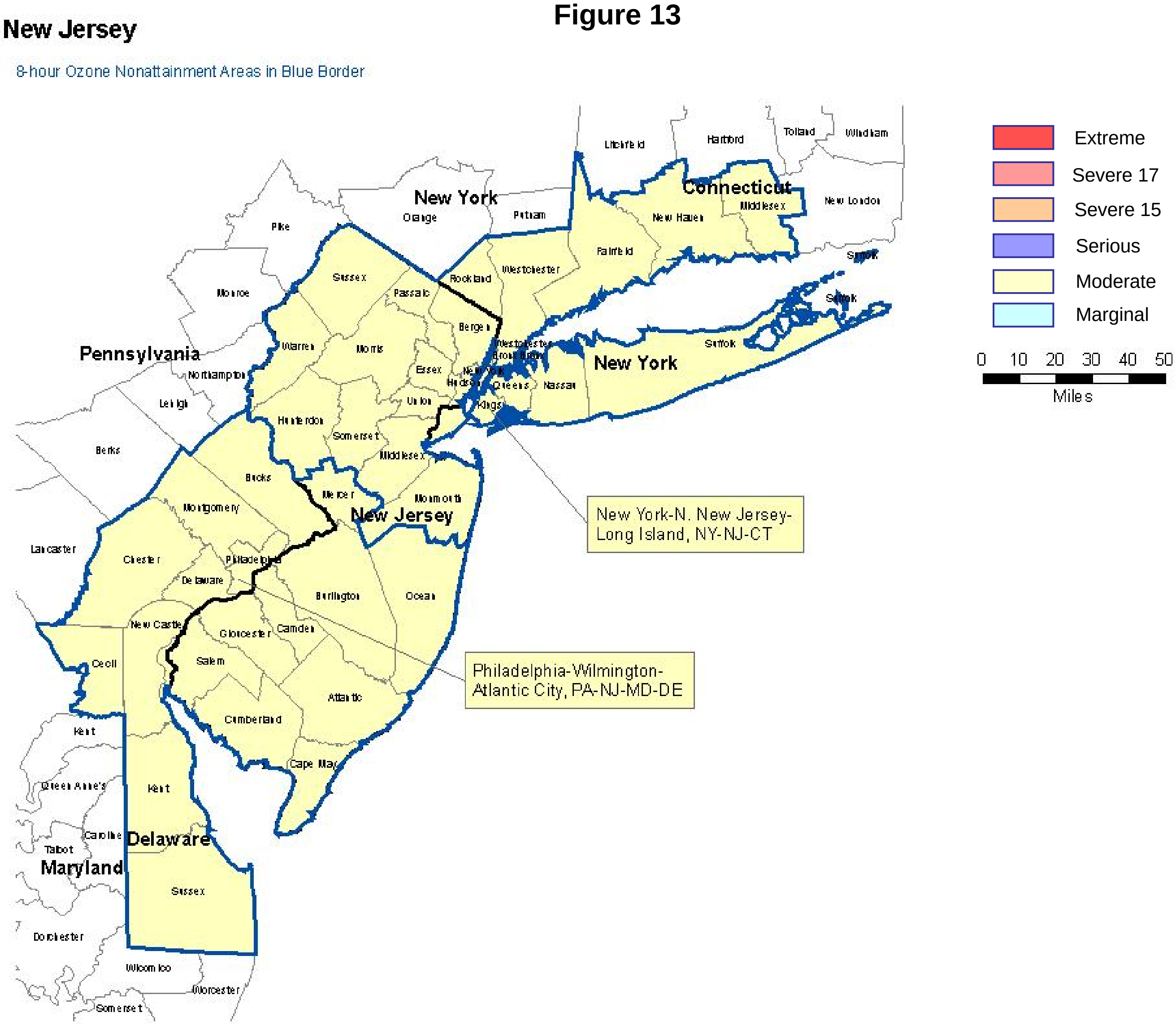


OZONE NON-ATTAINMENT AREAS IN NEW JERSEY

The Clean Air Act requires that all areas of the country be evaluated and then classified as attainment or non-attainment areas for each of the National Ambient Air Quality Standards. Areas can also be found to be “unclassifiable” under certain circumstances. The 1990 amendments to the act required that areas be further classified based on the severity of non-attainment. The classifications range from “Marginal” to “Extreme” and are based on “design values”. The design value is the value that actually determines whether an area meets the standard. For the 8-hour ozone standard for example, the design value is the average of the fourth highest daily maximum 8-hour average concentration recorded each year for three years. Note that these classifications did not take into account the transport of ozone and its precursors and missed the concept of multi-state controls.

Their classification with respect to the 8-hour standard is shown in figure 13 below. The entire state of New Jersey is in non-attainment and is classified as being “Moderate.” A “Moderate” classification is applied when an area has a design value from 0.092 ppm to 0.106 ppm.

Figure 13



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2006 PHOTOCHEMICAL ASSESSMENT MONITORING STATIONS (PAMS)

New Jersey Department of Environmental Protection

PHOTOCHEMICAL ASSESSMENT MONITORING STATIONS (PAMS)

Most ground-level ozone is the result of oxides of nitrogen (NOx) and volatile organic compounds (VOCs) reacting in the presence of sunlight. As a result, it is necessary to measure these ozone forming pollutants, also known as precursor pollutants, to effectively evaluate strategies for reducing ozone levels. The Photochemical Assessment Monitoring Stations (PAMS) network was established for this purpose. Data from the PAMS network is used to better characterize the nature and extent of the O_3 problem, track VOC and NOx emission inventory reductions, assess air quality trends, and make attainment/nonattainment decisions. PAMS monitor both criteria and non-criteria pollutants including ozone (O_3), oxides of nitrogen (NOx), nitric oxide (NO), nitrogen dioxide (NO2), and specific VOCs that are important in ozone formation. In addition, the measurement of specific weather parameters (e.g. wind speed/direction, temperature) is required at all PAMS, and upper air weather measurements are required in certain areas. The VOC and carbonyl measurements are only taken during the peak part of the ozone season, from June 1st to August 31st each year.

The PAMS network is designed around metropolitan areas where ozone is a significant problem, and each site in the network has a specific purpose as shown in Figure 1 below. New Jersey is part of both the Philadelphia and New York Metropolitan areas and has a total of three PAMS sites. A Type 3 maximum ozone site for the Philadelphia area is located at Rider University in Mercer County, a secondary Type 2 maximum emissions site (located downwind of the secondary prevailing morning wind) is located downwind of the Philadelphia Metropolitan urban area in Camden, and a site at Rutgers University in New Brunswick has been designated both a PAMS Type 1 upwind site for the New York urban area, as well as a Type 4 downwind site for the Philadelphia Metropolitan urban area. An upper air weather monitoring station is also located at the Rutgers University site. All of the PAMS sites for the Philadelphia and New York City areas are shown in Figure 2.

Figure 1

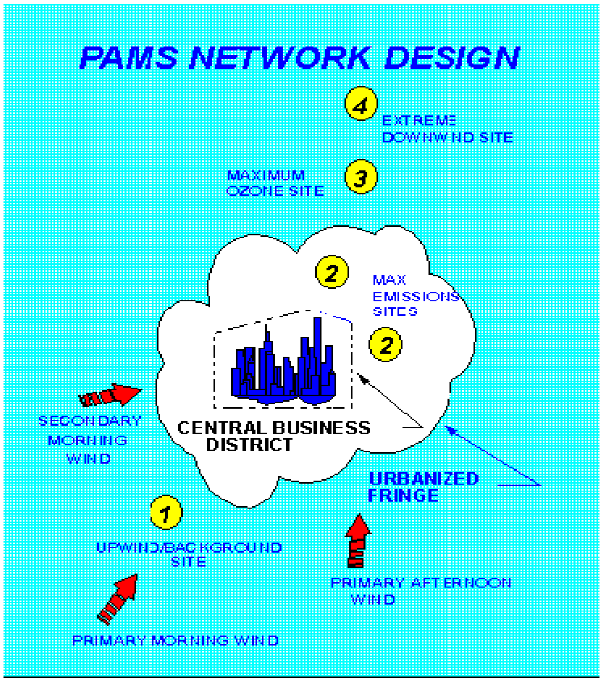
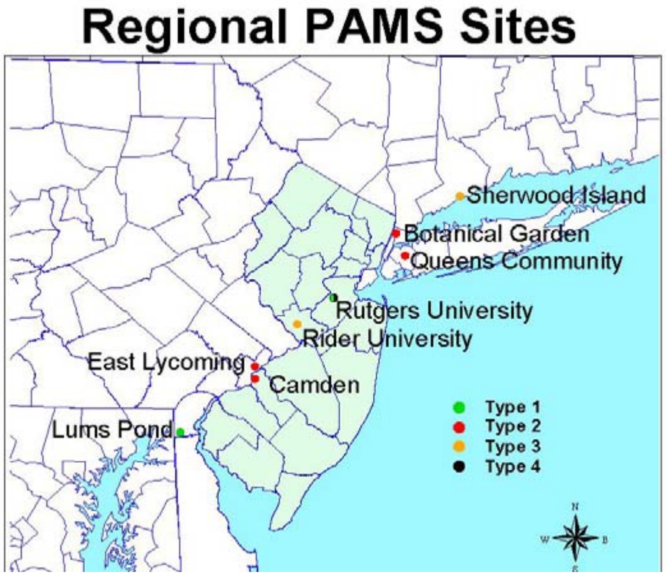


Figure 2



Note: Rutgers University PAMS site is both Type 4 for Philadelphia and Type 1 for New York City.

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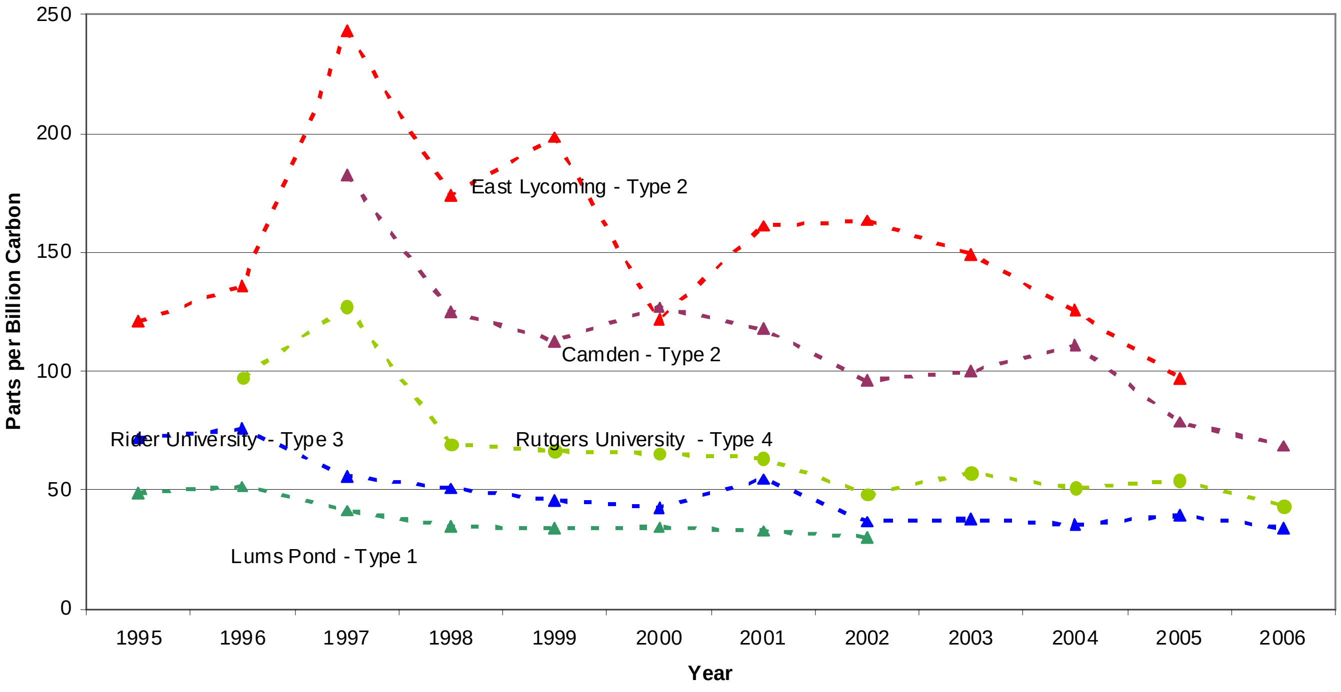
[5] USEPA , PAMS General Information

PAMS (CONT.)

Figure 3 shows VOC trends for the PAMS sites in the Philadelphia area. In general, at the Lums Pond (upwind - Type 1), Rider University (maximum ozone concentration - Type 3) and Rutgers University (downwind - Type 4), VOCs have declined over the measurement period. The improvements were initially more dramatic, with more level, though still discernibly declining concentrations, over the last several years. The maximum emissions -Type 2 sites (Camden and East Lycoming) for this area show more variation from year to year, though the trend at both sites is downward since 1997. This greater variability may be due to the fact that Type 2 sites are typically impacted by varied sources, whereas the other sites are mostly impacted by transportation sources. Philadelphia's Air Management Services Laboratory still operates the PAMS site at their East Lycoming lab, but as of 2006 they no longer report Total Non-Methane Organic Carbon (TNMOC). Delaware's Department of Natural Resources and Environmental Control (DNREC) discontinued operation of the Lums Pond site after the 2002 season.

Figure 3
Philadelphia Region
Total Non-methane Organic Carbon (TNMOC)
Seasonal Average 1995-2006



PAMS (cont.)

Figure 4 shows VOC trends for the PAMS sites in the New York City metropolitan area. In general, observations here are similar to those for the Philadelphia area. The Type 2 site in the New York area at the Bronx Botanical Gardens shows even more year to year variability than does the Philadelphia Type 2 site at East Lycoming. Operation of the Queens Community College site was discontinued after the 2001 season.

In conclusion, trends for VOC values measured at all PAMS sites in the Philadelphia and New York City areas show a decline over the time period these measurements were made. Changes in gasoline formulation over the period as well as the effect of newer, cleaner vehicles replacing older vehicles in the automotive fleet could account for the reductions. Type 2 sites, though impacted by vehicle emissions, are also affected by urban stationary sources whose emission trends over the measurement period are less clear and these sites seem to show more year to year variability. All sites are also impacted by naturally occurring isoprene, which is emitted by trees. All VOCs are not equal in their contribution to ozone formation and while isoprene levels are generally lower than many other VOCs, isoprene can account for a significant amount of the ozone forming potential, especially in non-urban areas. Isoprene levels are also highest during the middle of the day, when photochemical conditions are most conducive to ozone formation. Isoprene emissions are thought to be influenced by factors that affect tree health and growth, such as rainfall and severe temperatures.

Summaries of results for all of the VOCs measured at the New Jersey PAMS sites are provided in Table 1.

Figure 4
New York City Region
Total Non-methane Organic Carbon (TNMOC)
Seasonal Average 1995-2006

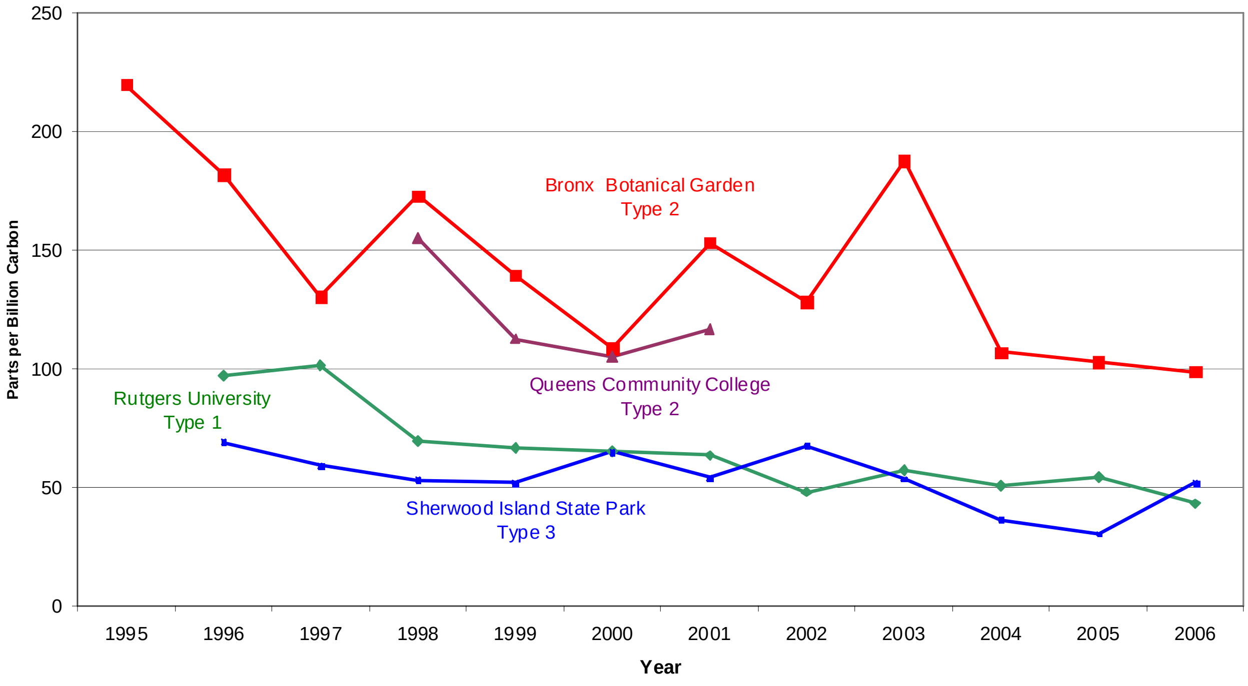


Table 1
Summary of Photochemical Assessment Monitoring (PAMS) Data
June, July, and August, 2006

Parts Per Billion (Volume) – ppbv
Parts Per Billion (Carbon) – ppbC
Max – Maximum Avg - Average

	Camden Lab				Rider University				Rutgers University			
	ppbv		ppbC		ppbv		ppbC		ppbv		ppbC	
	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg
Acetylene	7.11	0.34	14.21	0.69	0.81	0.13	1.62	0.27	0.88	0.14	1.76	0.29
Benzene	4.76	0.24	28.58	1.43	0.93	0.11	5.55	0.64	1.62	0.10	9.73	0.60
n-Butane	49.94	1.03	199.76	4.11	2.84	0.38	11.37	1.53	6.91	0.58	27.62	2.31
1-Butene	2.19	0.09	8.74	0.37	0.21	0.04	0.85	0.15	0.27	0.05	1.09	0.18
cis-2-Butene	2.38	0.05	9.53	0.20	0.11	0.02	0.44	0.09	0.16	0.03	0.64	0.10
trans-2-Butene	2.80	0.06	11.20	0.22	0.12	0.03	0.49	0.12	0.21	0.04	0.84	0.15
Cyclohexane	6.79	0.07	40.71	0.40	0.16	0.03	0.97	0.20	0.95	0.04	5.69	0.23
Cyclopentane	1.65	0.07	8.25	0.36	1.00	0.05	5.01	0.24	0.33	0.05	1.67	0.23
n-Decane	2.85	0.03	28.47	0.31	0.25	0.02	2.5	0.18	0.20	0.02	2.01	0.22
m-Diethylbenzene	3.59	0.01	35.91	0.14	0.34	0.01	3.38	0.13	0.11	0.02	1.06	0.18
p-Diethylbenzene	2.24	0.01	22.43	0.14	0.04	0.01	0.43	0.09	0.38	0.01	3.83	0.12
2,2-Dimethylbutane	1.66	0.08	8.31	0.40	1.29	0.03	6.43	0.17	0.41	0.03	2.07	0.16
2,3-Dimethylbutane	2.06	0.11	10.31	0.57	0.35	0.08	1.75	0.38	0.78	0.05	3.88	0.24
2,3-Dimethylpentane	7.49	0.05	52.44	0.37	0.16	0.04	1.09	0.25	1.50	0.03	10.49	0.24
2,4-Dimethylpentane	5.76	0.05	40.31	0.32	0.11	0.02	0.76	0.17	0.92	0.03	6.44	0.19
Ethane	19.72	2.88	39.44	5.76	8.20	2.15	16.39	4.31	12.02	2.64	24.04	5.28
Ethylbenzene	2.87	0.05	22.93	0.41	0.30	0.03	2.39	0.28	3.10	0.05	24.77	0.40
Ethylene (Ethene)	7.03	0.88	14.05	1.77	4.11	0.45	8.21	0.90	5.85	0.80	11.69	1.60
m/p-Ethyltoluene	6.69	0.06	60.25	0.55	0.46	0.04	4.13	0.37	2.52	0.06	22.69	0.55
o-Ethyltoluene	3.92	0.02	35.26	0.20	0.08	0.01	0.71	0.12	0.66	0.02	5.92	0.14
n-Heptane	3.50	0.11	24.53	0.77	0.33	0.05	2.33	0.32	2.28	0.05	15.98	0.37
Hexane	4.92	0.24	29.49	1.42	0.67	0.10	4.02	0.58	2.65	0.11	15.9	0.68
1-Hexene	0.26	0.02	1.55	0.14	0.30	0.02	1.82	0.11	0.27	0.01	1.61	0.09
Isobutane	31.01	0.84	124.04	3.34	2.15	0.28	8.6	1.10	2.92	0.33	11.67	1.31
Isopentane	20.52	1.05	102.58	5.24	3.10	0.41	15.49	2.07	4.95	0.49	24.73	2.43
Isoprene	1.82	0.22	9.08	1.09	3.81	0.24	19.05	1.22	3.76	0.59	18.8	2.93
Isopropylbenzene	4.21	0.03	37.90	0.26	0.19	0.01	1.73	0.12	0.29	0.01	2.59	0.11
Methylcyclohexane	4.32	0.08	30.24	0.57	0.19	0.04	1.3	0.25	1.58	0.04	11.08	0.27
Methylcyclopentane	4.07	0.13	24.44	0.79	0.31	0.06	1.83	0.36	1.81	0.07	10.88	0.43
2-Methylheptane	3.00	0.03	24.03	0.23	0.08	0.01	0.66	0.11	0.78	0.02	6.21	0.15
3-Methylheptane	3.06	0.03	24.44	0.24	0.11	0.02	0.85	0.13	0.80	0.02	6.36	0.17
2-Methylhexane	3.28	0.09	22.99	0.65	0.24	0.04	1.69	0.29	1.57	0.05	11.02	0.32

Table 1 (Continued)
Summary of Photochemical Assessment Monitoring (PAMS) Data
June, July, and August, 2006

	Camden Lab				Rider University				Rutgers University			
	ppbv		ppbC		ppbv		ppbC		ppbv		ppbC	
	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg
3-Methylhexane	3.52	0.11	24.64	0.79	0.36	0.05	2.54	0.35	1.81	0.05	12.66	0.37
2-Methylpentane	5.07	0.28	30.40	1.68	0.60	0.12	3.59	0.71	2.14	0.13	12.85	0.77
3-Methylpentane	3.03	0.19	18.19	1.12	0.41	0.08	2.46	0.47	1.52	0.08	9.13	0.49
n-Nonane	2.65	0.03	23.88	0.27	0.13	0.02	1.14	0.17	0.54	0.03	4.82	0.23
n-Octane	3.63	0.04	29.00	0.35	0.13	0.02	1.03	0.19	1.14	0.03	9.15	0.24
n-Pentane	8.66	0.53	43.30	2.67	1.44	0.21	7.2	1.05	4.46	0.26	22.29	1.31
1-Pentene	0.85	0.04	4.27	0.21	0.14	0.02	0.68	0.12	0.19	0.03	0.94	0.15
cis-2-Pentene	0.99	0.03	4.94	0.15	0.10	0.02	0.48	0.08	0.27	0.02	1.37	0.10
trans-2-Pentene	1.85	0.05	9.25	0.26	0.13	0.02	0.65	0.11	0.54	0.03	2.72	0.17
Propane	128.01	2.66	384.03	7.98	7.75	1.32	23.26	3.96	6.81	1.45	20.42	4.34
n-Propylbenzene	3.02	0.02	27.20	0.14	0.07	0.01	0.62	0.11	0.66	0.02	5.9	0.14
Propylene (Propene)	7.28	0.52	21.85	1.55	6.26	0.23	18.77	0.68	2.21	0.32	6.62	0.97
Styrene	3.60	0.03	28.78	0.22	0.11	0.02	0.9	0.14	0.30	0.02	2.38	0.18
Toluene	5.32	0.54	37.21	3.79	1.58	0.27	11.07	1.92	13.43	0.38	94.04	2.69
1,2,3-Trimethylbenzene	3.96	0.04	35.61	0.34	0.57	0.05	5.13	0.42	0.76	0.04	6.86	0.39
1,2,4-Trimethylbenzene	2.54	0.04	22.89	0.38	0.29	0.04	2.63	0.35	2.43	0.06	21.9	0.56
1,3,5-Trimethylbenzene	2.60	0.02	23.41	0.18	0.11	0.02	0.99	0.14	0.84	0.02	7.57	0.18
2,2,4-Trimethylpentane	3.66	0.17	29.28	1.35	0.43	0.08	3.47	0.64	4.18	0.11	33.42	0.87
2,3,4-Trimethylpentane	2.99	0.05	23.90	0.42	0.14	0.03	1.11	0.22	1.56	0.03	12.49	0.26
n-Undecane	2.45	0.02	26.98	0.17	0.10	0.01	1.07	0.13	0.11	0.01	1.16	0.16
m/p-Xylene	4.40	0.14	35.17	1.14	0.69	0.08	5.53	0.68	7.42	0.12	59.36	0.98
o-Xylene	2.90	0.06	23.22	0.49	0.27	0.04	2.19	0.30	2.92	0.05	23.35	0.39

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2006 Particulate Summary

New Jersey Department of Environmental Protection

NATURE AND SOURCES

Particulate air pollution is a complex mixture of organic and inorganic substances, present in the atmosphere as either liquids or solids. Particulates may be as large as 70 microns in diameter or smaller than 1 micron in diameter. Most Particulates are small enough that individual particles are undetectable by the human eye. Particles may travel hundreds of miles suspended in the atmosphere from their sources before reaching ground level.

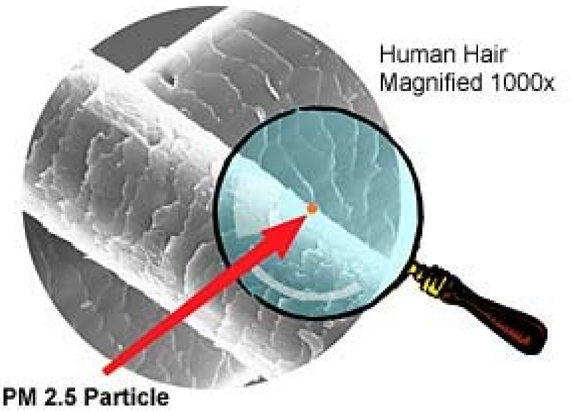
Generally particulate pollution is categorized by size. Particles with diameters less than 2.5 microns are considered fine Particulates, often referred to as $PM_{2.5}$ (Figure 1). Particles with diameters greater than 2.5 microns are considered to be coarse Particulates. Coarse particles are further divided into Total Suspended Particulates (TSP) and PM_{10}. TSP consists of all suspended particles including the largest ones. PM_{10} consists of particles that are 10 microns in diameter or less. Particles smaller than 10 microns are considered to be inhalable and are a greater health risk. Particles of all sizes have an impact on the environment.

Particulates can occur naturally or be man made. Examples of naturally occurring particulates are windblown dust and sea salt. Man made particulates come from sources such as fossil fuel combustion and industrial processes. Man made sources can be divided into two categories Primary Particulates and Secondary Particulates. Primary Particulates are directly emitted from their sources while Secondary Particulates are created in the atmosphere through reactions of gaseous emissions.

ENVIRONMENTAL EFFECTS

Particulate matter is the major cause of reduced visibility in many parts of the United States. Figure 2a provides an example of reduced visibility due to particulate pollution recorded by our WebCam site in Newark. Figure 2b is an example of a day with low particulate pollution and good visibility. The backdrop is the New York City sky-line. Airborne particles can also impact vegetation and aquatic ecosystems, and can cause damage to paints and building materials. More information is provided in the Regional Haze section of this report.

Figure 1
Size of $PM_{2.5}$ Particle Compared to a Human Hair



Graphics Courtesy of the US Department of Energy

Figure 2a

Figure 2b

HEALTH EFFECTS

Inhalable particles (smaller than 10 microns) and especially fine particles (PM$_{2.5}$) are a health concern because they are easily breathed into the lungs. Various health problems are associated with both long and short-term exposures. When inhaled, these particles can accumulate in the respiratory system and are responsible for heart and lung conditions, such as asthma, bronchitis, cardiac arrhythmias, heart attacks, and can even be attributed to premature death. Groups that appear to be at the greatest risk from particulates include children, the elderly, and individuals with heart and lung diseases, such as asthma (*US EPA, 2001).*

STANDARDS

In 1971, Environmental Protection Agency (EPA) set primary (health based) and secondary (welfare based) standards for total suspended particulate matter (TSP). These standards, known as the National Ambient Air Quality Standards (NAAQS), were based on maximum 24-hour and annual concentrations (*US EPA, 1997)*. The annual standards were based on the geometric mean concentrations over a calendar year, and the 24-hour standards were based on the arithmetic average concentration from midnight to midnight. The primary 24-hour average standard for TSP was set at 260 micrograms per cubic meter ($\mu g/m^3$) and the annual geometric mean health standard was set at 75 $\mu g/m^3$. The 24-hour secondary standard was set at 150 $\mu g/m^3$. While EPA did not establish a secondary annual standard for TSP they did set a guideline of 60 $\mu g/m^3$ to be used to ensure that the secondary 24-hour standard was being met throughout the year. Although New Jersey still maintains state standards for TSP, the national standards have been replaced with standards for smaller particles as described below. As a result, monitoring for TSP has largely been discontinued, with the exception of one station, where TSP samples are taken to analyze for lead (Pb). See the Lead Summary section for more details.

In 1987, EPA replaced the TSP standards with standards that focused only on inhalable particles. Inhalable particles are defined as particles less than 10 microns in diameter (PM$_{10}$). The 24-hour PM$_{10}$ primary and secondary standards were set at 150 $\mu g/m^3$, and the annual primary and secondary standards were set at 50 $\mu g/m^3$. The annual standard for PM$_{10}$ is based on the arithmethic mean, as opposed to the geometric mean that was used for TSP.

In 1997, EPA promulgated new standards for fine particulates, which it defined as particles less than 2.5 microns in diameter (PM$_{2.5}$). They kept the existing standards for PM$_{10}$ as well. The PM$_{2.5}$ annual primary and secondary standards were set at 15 $\mu g/m^3$ and the 24-hour standard was set at 65 $\mu g/m^3$. Table 1 provides a summary of the Particulate Matter standards.

Table 1
National and New Jersey
Ambient Air Quality Standards for Particulate Matter

Micrograms Per Cubic Meter ($\mu g/m^3$)

Standard	Averaging Period	Type	New Jersey	National
Total Suspended Particulates (TSP)	12-Month[‡]	Primary	75 $\mu g/m^3$	---
	24-Hour	Primary	260 $\mu g/m^3$	---
	12-Month[‡]	Secondary	60 $\mu g/m^3$	---
	24-Hour	Secondary	150 $\mu g/m^3$	---
Inhalable Particulates (PM$_{10}$)	Annual[†]	Primary & Secondary	---	50 $\mu g/m^3$
	24-Hour Average	Primary & Secondary	---	150 $\mu g/m^3$
Fine Particulates (PM$_{2.5}$)	Annual[†]	Primary & Secondary	----	15 $\mu g/m^3$
	24-Hour Average	Primary & Secondary	----	65 $\mu g/m^3$

[‡] Annual Geometric Mean

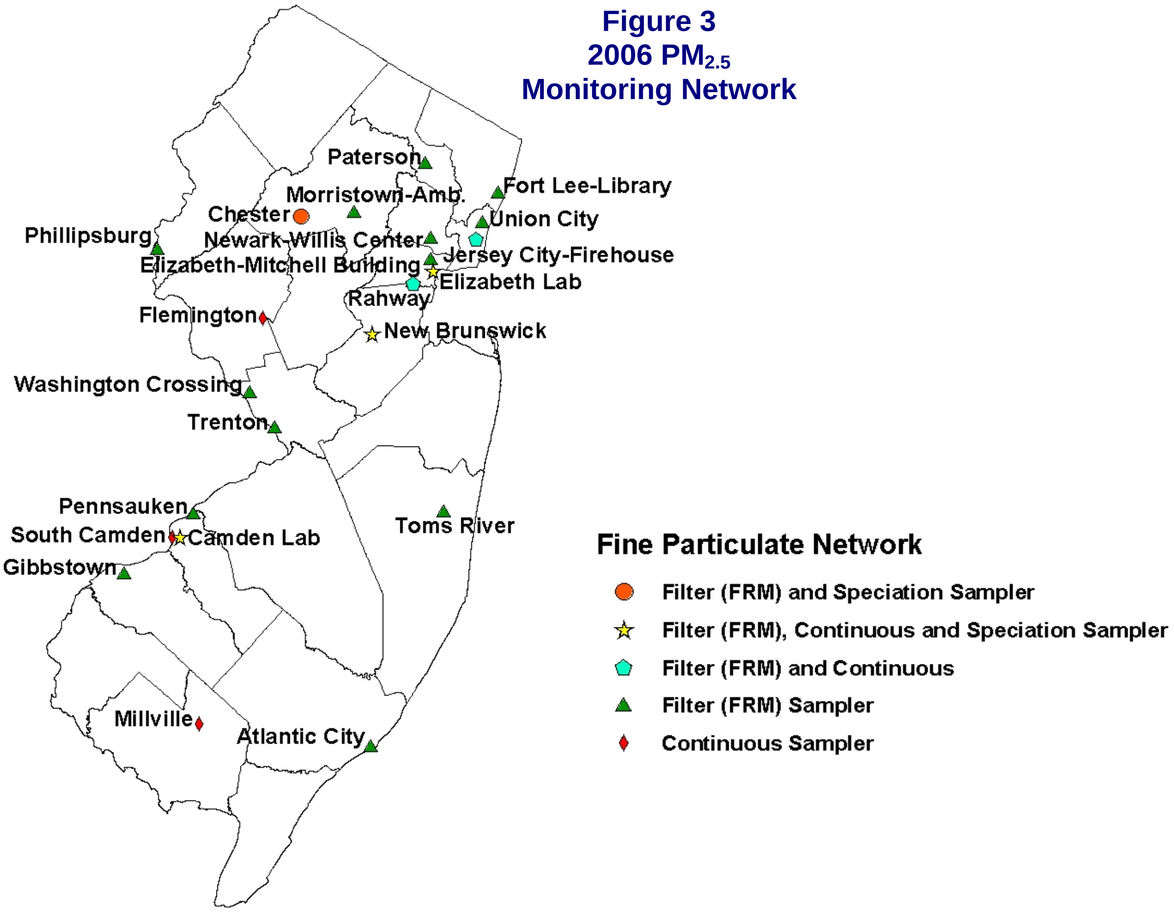
[†] Annual Arithmetic Mean

PARTICULATE MONITORING NETWORK

New Jersey's Particulate Monitoring Network consists of 23 fine particulate monitoring sites, 6 PM_{10} monitoring sites, 1 TSP monitoring site, and 10 sites where smoke shade is monitored.

Samplers that comply with strict EPA specifications are used for collecting data that is submitted to a national database maintained by the EPA. These samplers pull a predetermined amount of air through a filter for a 24-hour period capturing particles on the filter. Different sample inlets determine what size particles will be captured. The filters are weighed before and after sampling under controlled environmental conditions to determine the concentration. The data is then used by the New Jersey Department of Environmental Protection (NJDEP) and EPA to determine whether the state, or portions of the state, meets the federal health and welfare standards for particulate matter. Because these samplers are required to run for 24-hour period and can not provide data in real time the NJDEP employs additional samplers that continuously measure particulate concentrations. These samplers are used by the NJDEP to report current air quality to the public through the Air Quality Index (www.state.nj.us/dep/airmon). The NJDEP uses Tapered Element Oscillating Microbalance (TEOM) analyzers and smoke shade instruments for real-time particle reporting. The TEOM analyzers collect a sample of fine particles on an oscillating filter, and determine the concentration based on the change in the frequency at which the filter oscillates. Smoke shade instruments collect a sample of particles on a paper tape for one hour. At the end of each hour the amount of light that will pass through the spot that has formed on the tape is measured, the tape advanced, and the cycle started over. The amount of light transmittance measured is used as an estimate of actual particle concentrations.

Figure 3
2006 $PM_{2.5}$
Monitoring Network



FINE PARTICLE SUMMARY

FINE PARTICLE MONITORING SITES

There are 19 monitoring sites in New Jersey where a filter-based sampler routinely collects 24-hour $PM_{2.5}$ samples (see Figure 3). At 9 sites, continuous particulate monitors (TEOMs) measure the concentration of fine particles every minute and transmit the data to the Bureau of Air Monitoring's central computer, where it is made available on the Bureau's Public Website (www.state.nj.us/dep/airmon). Additionally, at four of these locations a separate 24-hour filter based sampler collects fine particles on three types of filter media which are subsequently analyzed using ion chromatography (IC), X-ray fluorescence (XRF), and Thermal Optical Analysis (TOA) to determine the concentrations of the chemical analytes that constitute the sample.

FINE PARTICLE CONCENTRATION SUMMARY

The annual mean concentration of $PM_{2.5}$ ranged from 9.0 $\mu g/m^3$ in Chester to 14.2 $\mu g/m^3$ at Elizabeth Lab. The highest daily concentration ranged from 35.9 $\mu g/m^3$ at New Brunswick (Gibbstown not included because it only ran for 4 months) to 52.5 $\mu g/m^3$ at Union City. Figure 4 and Table 2 depicts the mean and maximum concentrations at each site. Table 2 also shows the 2006 design value for each site. A design value is calculated by averaging the average concentration from 12 consecutive quarters (3 years), in this case 2004-2006. Design values are used to determine attainment/non-attainment status.

None of the sites exceeded either the 24-hour standard of 65 $\mu g/m^3$ or the annual standard of 15.0 $\mu g/m^3$. While neither of these standards were exceeded in 2006 parts of the state are still designated as non-attainment based on designations made in 2006. For more detail see page 8.

Figure 4
2006 Fine Particulate ($PM_{2.5}$)

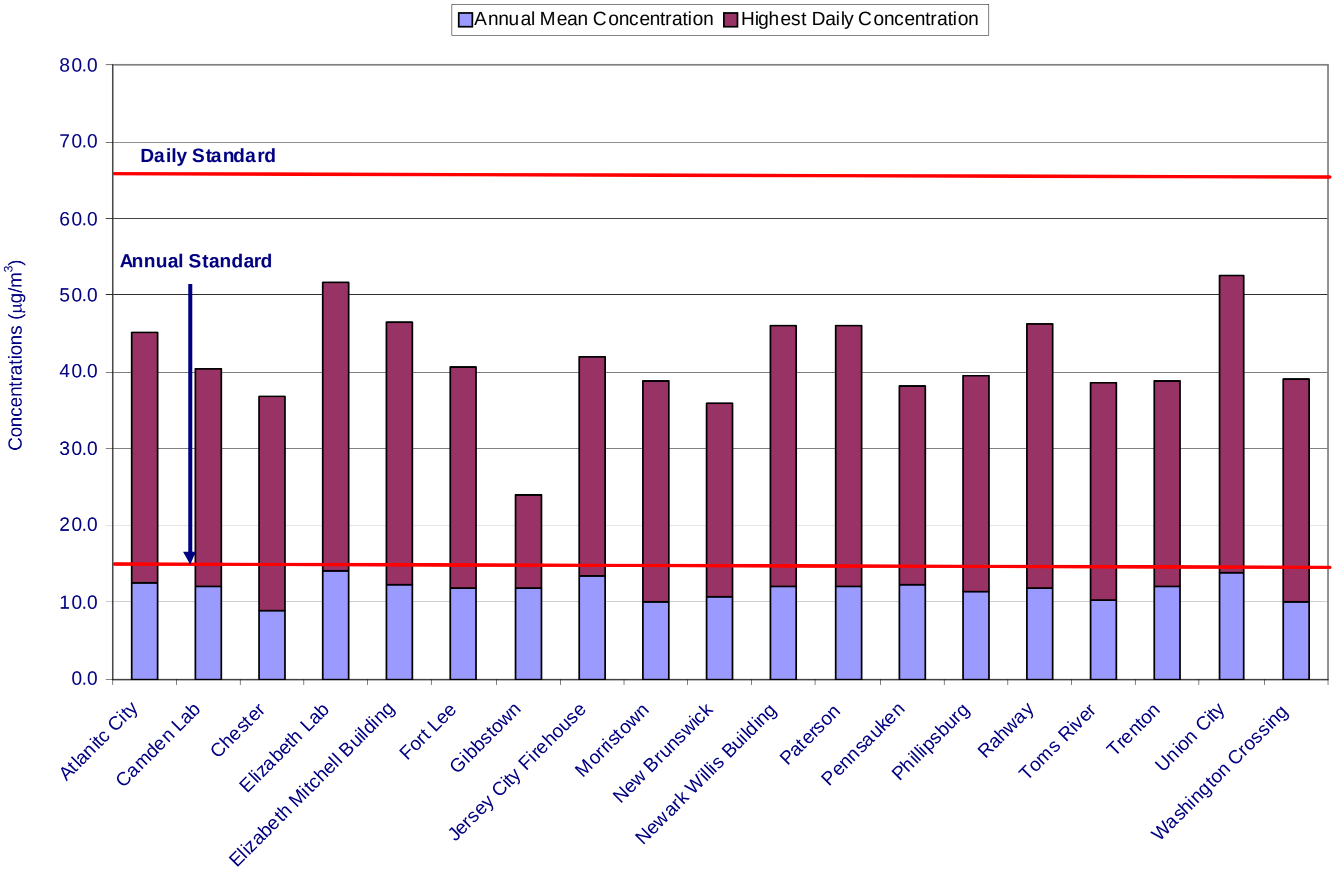


Table 2
2006 Summary of $PM_{2.5}$ Sampler Data

Monitoring Site	Number of Samples	Annual Mean Concentration $\mu g/m^3$	Highest Daily Concentration $\mu g/m^3$	Second Highest Daily Concentration $\mu g/m^3$	2006 Annual Average Design Values
Atlantic City	116	12.5	45.1	35.4	11.7
Camden Lab	114	12.2	40.5	34.8	13.5
Chester	112	9.0	36.9	30.3	10.2
Elizabeth Lab	340	14.2	51.6	49.0	15.0
Elizabeth Mitchell Building	114	12.4	46.5	39.0	13.2
Fort Lee Library	119	11.8	40.7	38.6	12.9
Gibbstown *	28	--	24.1	22.6	--
Jersey City Firehouse	119	13.4	42.1	41.8	14.2
Morristown	111	10.1	38.8	30.9	11.4
New Brunswick	116	10.8	35.9	33.2	12.0
Newark Willis Center	115	12.1	46.0	41.5	13.4
Paterson	116	12.0	46.0	40.7	12.7
Pennsauken	119	12.4	38.2	38.1	13.4
Phillipsburg	117	11.3	39.5	38.0	12.5
Rahway	121	11.9	46.2	38.1	13.0
Toms River	116	10.3	38.6	33.8	11.0
Trenton	96	12.2	38.8	36.2	12.8
Union City	115	13.8	52.5	43.7	15.4
Washington Crossing	118	10.1	39.0	33.7	11.2

* Site shut down on 4/5/2006 and therefore annual mean concentration and annual average design value not calculated.

Table 3
2006 Summary of Continuous $PM_{2.5}$ Data

Concentration in Micrograms Per Cubic Meter ($\mu g/m^3$)

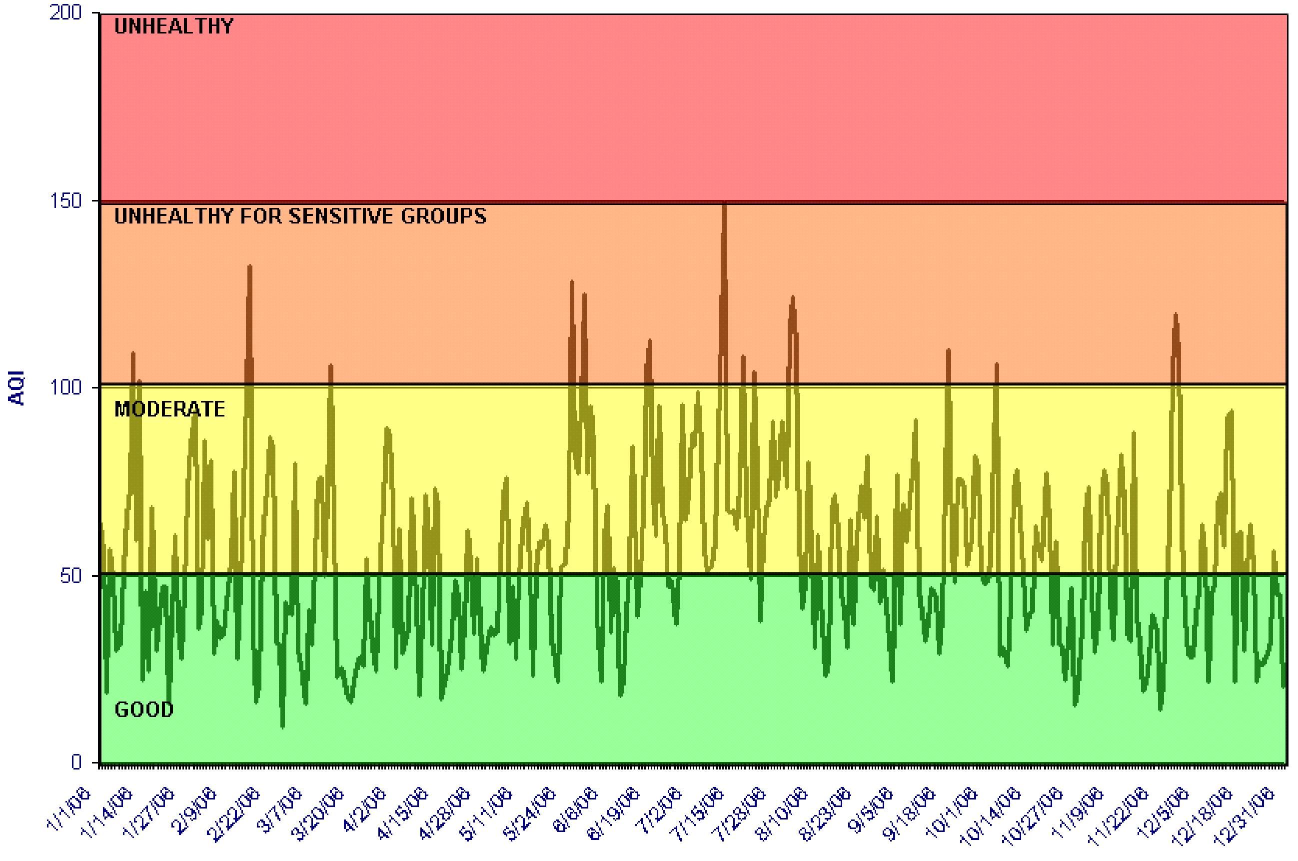
Monitoring Site	Annual Mean	Highest Daily Concentration	Second Highest Daily Concentration
Camden Lab	11.9	52.2	46.7
Elizabeth Lab	13.6	56.4	54.5
Flemington*	--	38.4	33.4
Fort Lee	17.3	65.1	54.3
Jersey City-Firehouse	12.6	46.8	43.9
Millville	11.8	48.3	42.1
New Brunswick	9.8	46.0	39.1
Rahway	13.9	48.8	45.5
South Camden	13.1	44.6	44.3

* TEOM did not run entire year

PM$_{2.5}$ REAL-TIME MONITORING

New Jersey’s continuous PM$_{2.5}$ monitoring network consists of 9 sites: Camden Lab, Elizabeth Lab, Flemington, Fort Lee, Jersey City, Millville, New Brunswick, Rahway and South Camden. The data is transmitted once a minute to a central computer in Trenton, where it is averaged and automatically updated on the bureau’s website every hour. Table 3 provides a summary of the data from these sites, and Figure 5 depicts the health level associated with the maximum daily fine particulate concentration recorded in the state each day for the entire year.

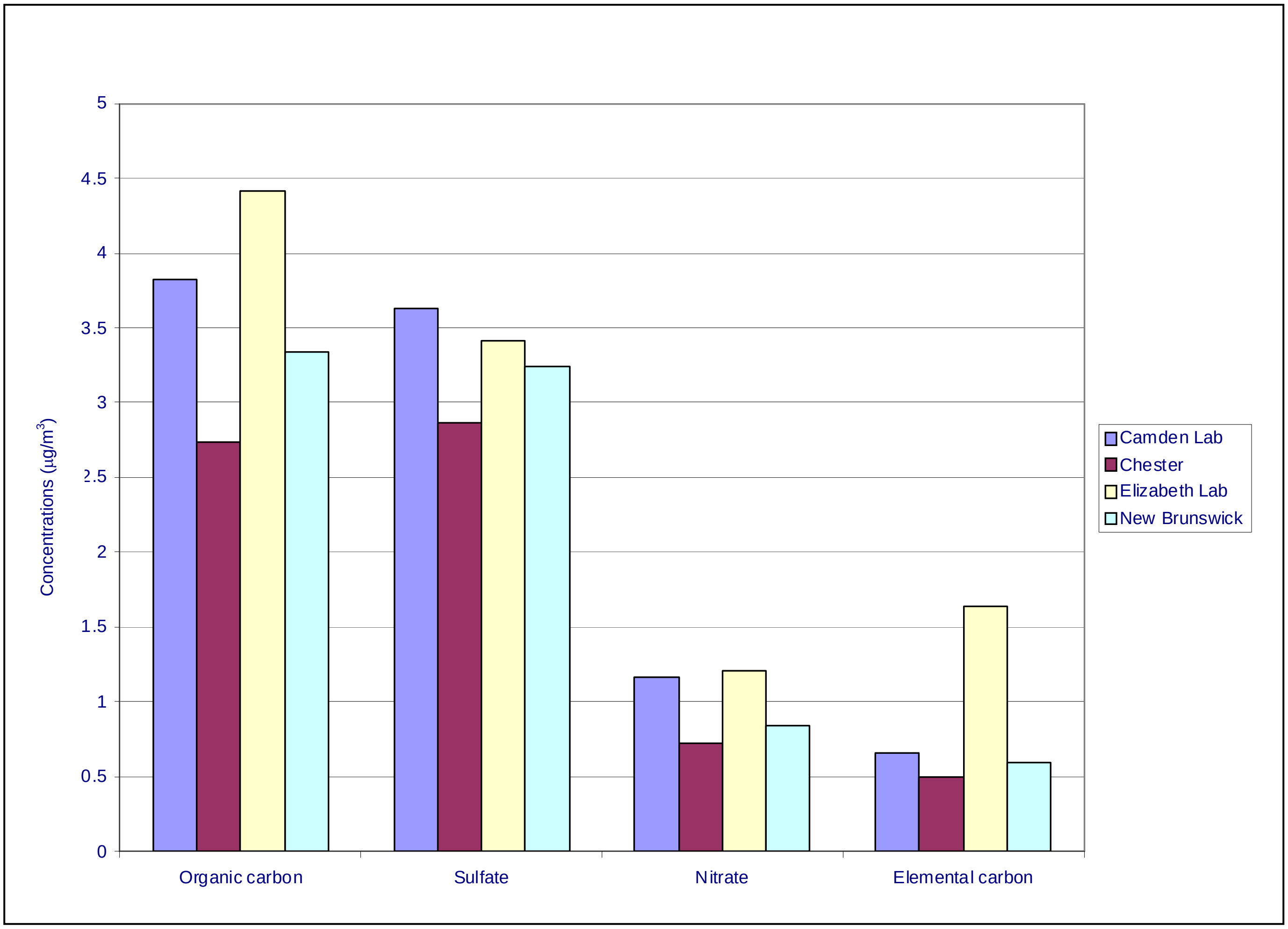
Figure 5
2006 Maximum Daily Fine Particulate Concentration
(Highest site)
Air Quality Index (AQI)



FINE PARTICLE SPECIATION SUMMARY

New Jerseys Fine Particulate Speciation Network consists of 4 monitoring sites: Camden Lab, Elizabeth Lab, New Brunswick, and Chester. Samplers run every third day on a schedule concurrent with the Federal Reference Method (FRM) sampling network. Of the 55 measured analytes, organic carbon, sulfate, nitrate and elemental carbon combined make up 71% of the total mass. Figure 6 depicts the average concentration of the four most prevalent species depicted. Appendix B shows the average, maximum, and 2nd highest daily average concentrations for each species for 2006.

Figure 6
2006 Fine Particulate Analyte Composition
(Highest 4 Analytes Depicted)



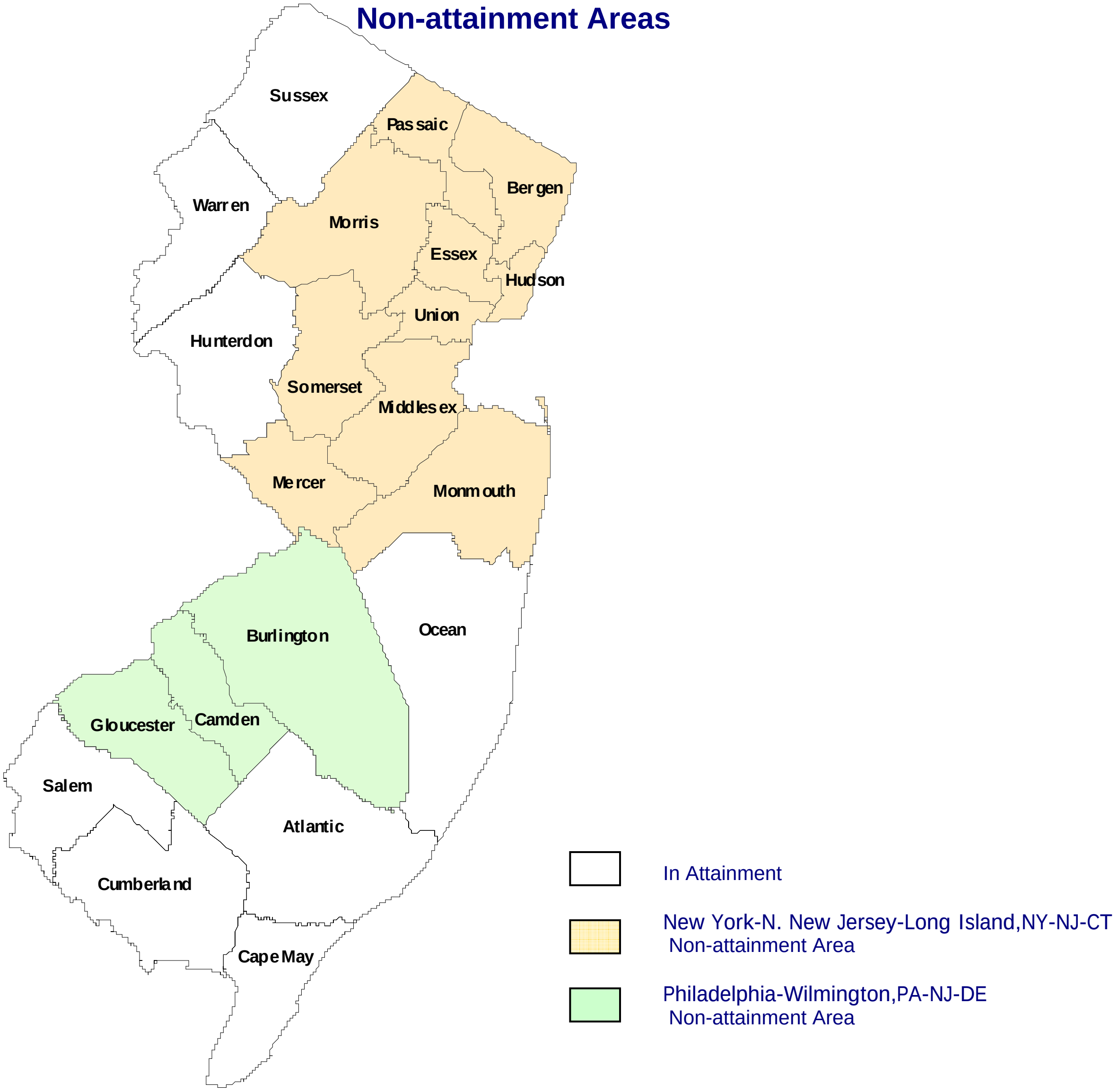
FINE PARTICULATE NON-ATTAINMENT AREAS

In 2006 thirteen New Jersey counties were classified as non-attainment areas. Non-attainment classification is given to an area that exceeds the air quality standard or contributes to the exceedance of that standard. In order to calculate the annual standard, EPA regulations require the averaging of 12 consecutive quarters of valid data within 3 calendar years. Data from sampling years 2001-2003 was used to make these designations.

While the Elizabeth Lab was the only New Jersey site to record a violation of the annual standard for the 2001-2003 period, 10 counties in the northeast and central region of the state were designated as non-attainment due to their potential $PM_{2.5}$ contribution to the Elizabeth Lab monitor and additional sites in New York City that recorded violations of the $PM_{2.5}$ Standards.

Similarly, 3 counties in the southwestern part of the state have been classified as non-attainment due to their contribution to $PM_{2.5}$ violations in the city of Philadelphia. DEP is currently devising a strategy to lower $PM_{2.5}$ levels in these affected areas.

Figure 7
New Jersey Particulate Matter ($PM_{2.5}$)
Non-attainment Areas

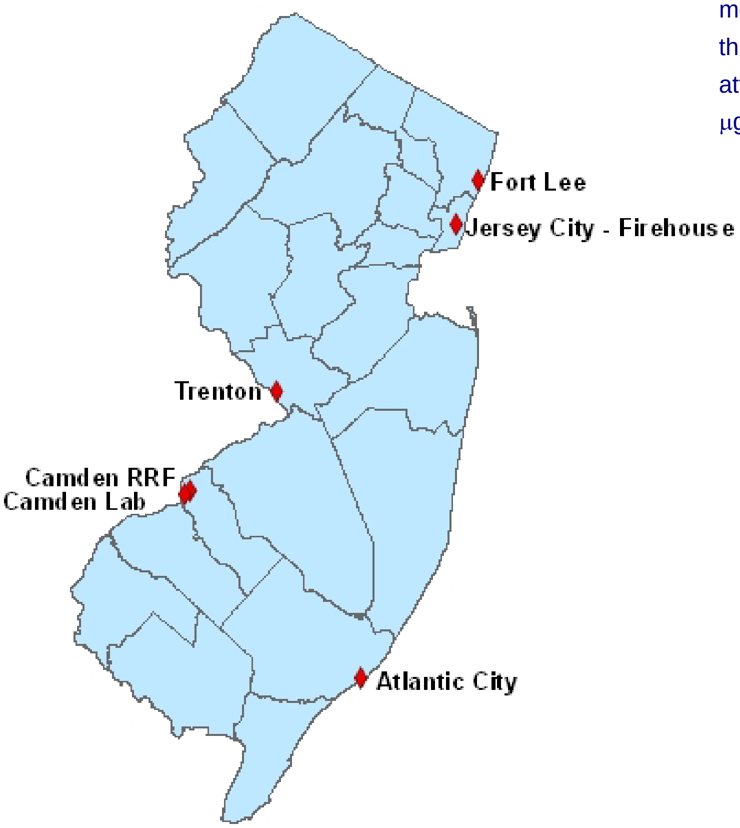


2006 COARSE PARTICLE SUMMARY

COARSE PARTICLE MONITORING SITES

The coarse particulate monitoring network is composed of 6 PM_{10} sampling sites and 1 TSP sampling sites. Samples are collected on a filter, which is weighed before and after sampling to determine the concentration. Figure 8 depicts the PM_{10} particulate monitoring network in New Jersey.

Figure 8
2006 PM_{10}
Monitoring Network



TSP CONCENTRATION SUMMARY

New Jersey currently operates one TSP monitoring site, located in New Brunswick. In 2006, the annual geometric mean concentration of TSP in New Brunswick was 28.6 $\mu g/m^3$, and the maximum 24-hour concentration recorded was 77.0 $\mu g/m^3$. The site was in attainment for the primary and secondary annual TSP standards of 75 $\mu g/m^3$ and 60 $\mu g/m^3$ respectively, and the site did not surpass the 24-hour primary standard of 260 $\mu g/m^3$ or the 150 $\mu g/m^3$ secondary standard.

PM_{10} CONCENTRATION SUMMARY

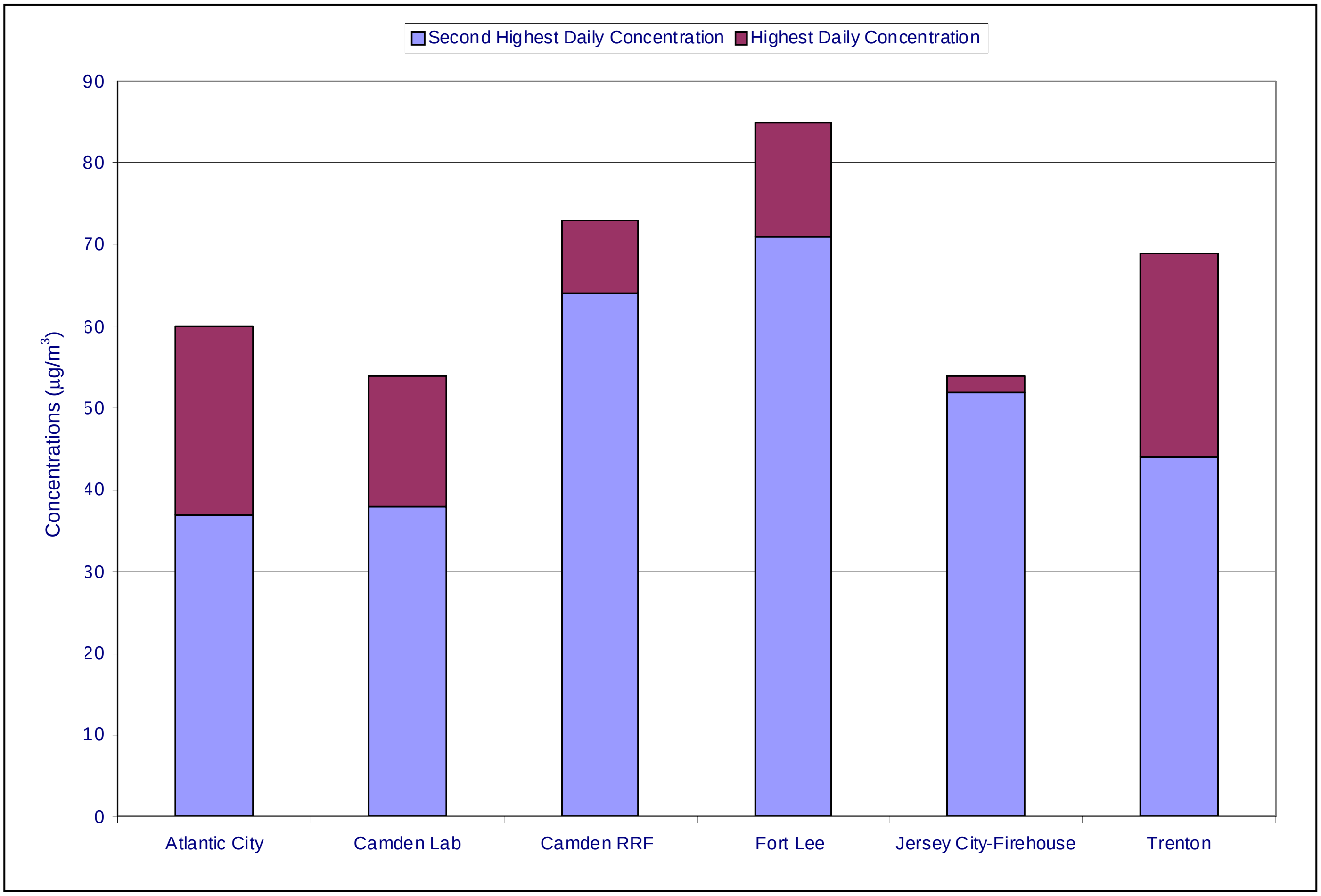
In 2006, the annual mean concentration of PM_{10} ranged from 20 $\mu g/m^3$ at Camden Lab and Atlantic City to 37 $\mu g/m^3$ at Camden RRF. Table 4 and Figure 9 show the annual mean and 24-hour maximum PM_{10} concentrations throughout the state. All areas of the state are in attainment for the both the annual PM_{10} standards of 50 $\mu g/m^3$ and the 24-hour standard of 150$\mu g/m^3$.

Table 4
PM_{10} Data - 2006
Daily and Annual Averages

Micrograms Per Cubic Meter ($\mu g/m^3$)
Daily Standard = 150 ($\mu g/m^3$)
Annual Standard = 50 $\mu g/m^3$

Monitoring Site	Number of Samples	Highest Daily Concentration	Second Highest Daily Concentration	Annual Mean
Atlantic City	51	60	37	20
Camden Lab	50	54	38	20
Camden RRF	42	73	64	37
Fort Lee	48	85	71	34
Jersey City-Firehouse	51	54	52	24
Trenton	47	69	44	22

Figure 9
Summary of PM_{10} Concentrations, New Jersey 2006



SMOKE SHADE SUMMARY

SMOKE SHADE MONITORING SITES

In addition to fine and coarse particulate monitoring, smoke shade is also monitored at 10 stations around the state. Smoke shade, which is an indirect measurement of particles in the atmosphere, has been monitored in New Jersey for over 30 years. Smoke shade is primarily used for the daily reporting of particulate levels in the Air Quality Index. The sites monitoring smoke shade are shown in Figure 10.

SMOKE SHADE CONCENTRATION SUMMARY

In 2006, the annual mean concentration of smoke shade ranged from 0.13 Coefficient of Haze units (COH) at Burlington to 0.61 COH at Elizabeth Lab. COH are units of light transmittance and smoke shade is not a direct measure of particle mass. A 24-hour average level of 2.0 COH is used as a benchmark. Readings above the 2.0 COH benchmark are reported as Unhealthy for Sensitive Groups on the daily Air Quality Index. For more details see the Air Quality Index section of this report. Table 5 lists the maximum and second highest daily average and annual mean smoke shade levels recorded at the monitoring sites in 2006.

Figure 10
2006 Smoke Shade
Monitoring Network

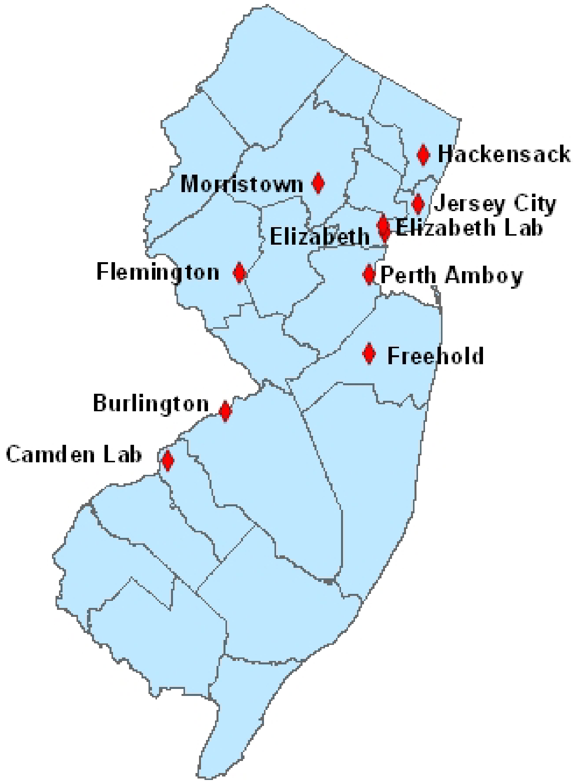


Table 5
Smoke Shade - 2006

Coefficient of Haze (COHs)
No Standard

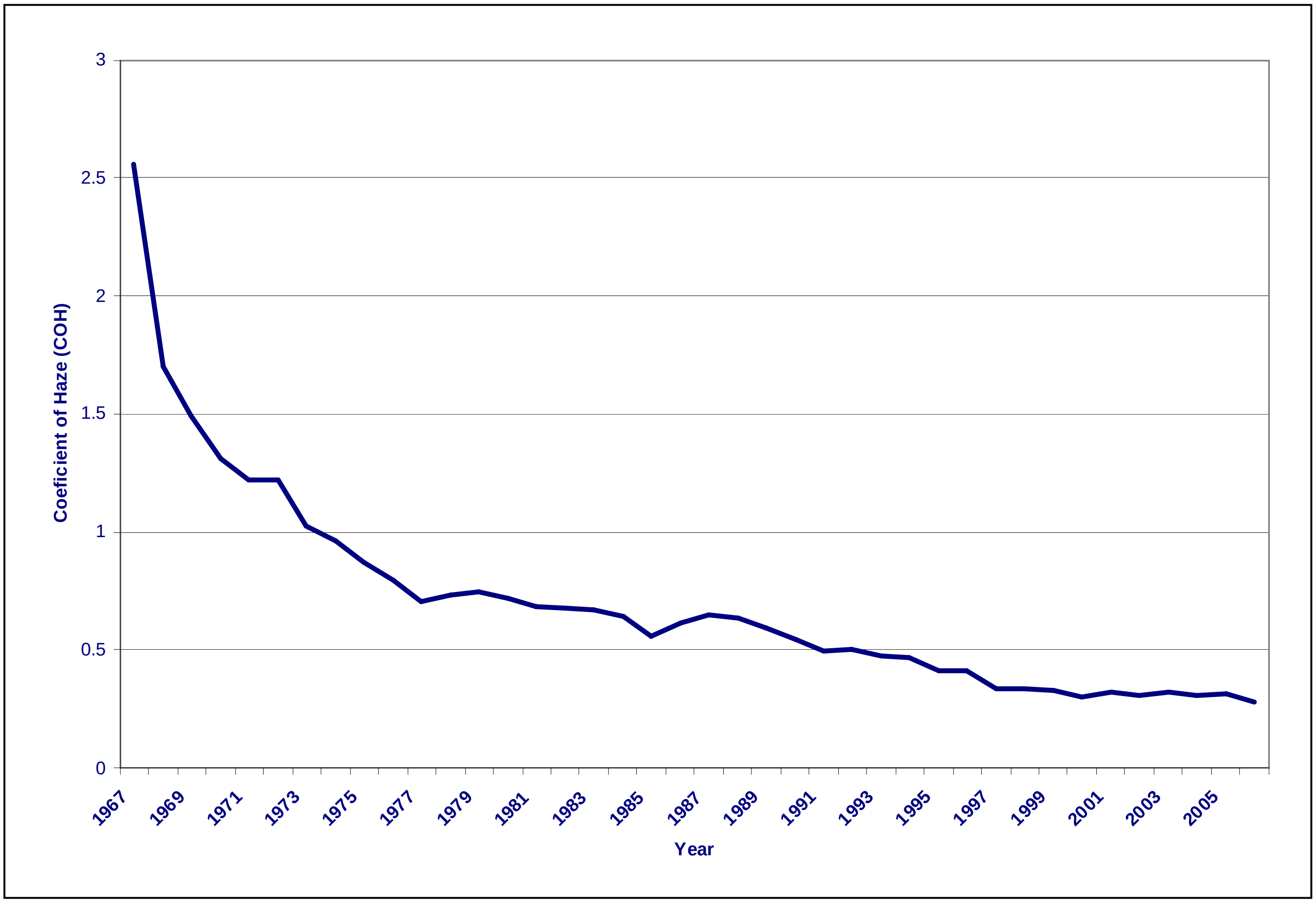
Site	Maximum Daily Average	2nd Highest Daily Average	Annual Mean
Burlington	0.45	0.44	0.13
Camden Lab	0.59	0.48	0.16
Elizabeth	1.32	1.15	0.34
Elizabeth Lab	2.09	2.07	0.61
Flemington*	0.44	0.34	---
Freehold	0.59	0.53	0.16
Hackensack	1.00	0.95	0.21
Jersey City	1.42	1.20	0.48
Morristown	0.79	0.63	0.21
Perth Amboy	1.11	0.87	0.24

* data not available after April

TRENDS IN PARTICULATE CONCENTRATIONS

The longest continuously operating particle monitoring network in the state that is suitable for looking at trends is the smoke shade network. As noted earlier, this monitoring program has been in effect for over thirty years and still has 10 active sites. The trend graph for smoke shade, shown in Figure 11 indicates that particulate levels have steadily declined over the past thirty years. Smoke shade is not a direct measurement of particle mass, but can be related to TSP, PM_{10} and $PM_{2.5}$ health standards.

Figure 11
Long Term Trend in Particulate Levels
State Average
1967- 2006



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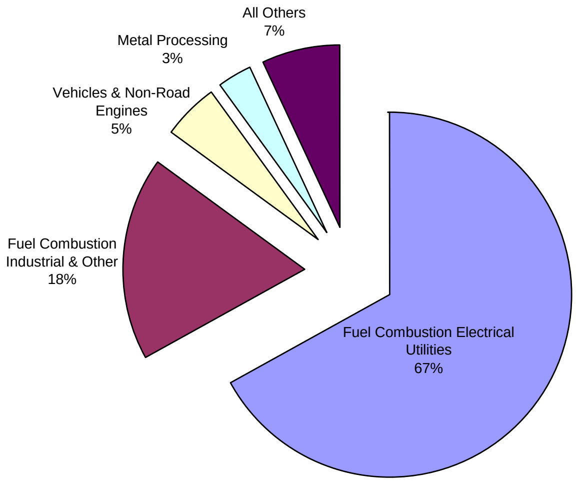
2006 Sulfur Dioxide Summary

New Jersey Department of Environmental Protection

NATURE AND SOURCES

Sulfur dioxide (SO_2) is a heavy, colorless gas with a suffocating odor that easily dissolves in water to form sulfuric acid. SO_2 gases can be formed when fuels containing sulfur are burned, or when gasoline is extracted from oil. Most of the sulfur dioxide released into the air comes from electric utilities, especially those that burn coal with high sulfur content. Sulfur is found in raw materials such as crude oil, coal, and ores that contain metals such as aluminum, copper, zinc, lead and iron. Industrial facilities that derive their products from these materials may also release SO_2. A pie chart summarizing the major sources of SO_2 is shown in Figure 1.

Figure 1
National Summary
SO_2 Emissions by Source Category



Source: USEPA website
http://www.epa.gov/air/urbanair/so2/what1.html
Last updated, Monday, July 23, 2007

Figure 2 (page 2) shows that SO_2 concentrations in New Jersey are generally higher in the winter than in the summer due to higher emissions from space heating and other sources. As shown in Figure 3 (page 2) SO_2 levels tend to peak in mid to late morning as emissions accumulate prior to being more effectively dispersed when wind speeds increase and atmospheric mixing increases later in the day.

HEALTH AND ENVIRONMENTAL EFFECTS

Sulfur dioxide causes irritation of the mucous membranes. This is probably the result of the action of sulfurous acid that is formed when the highly soluble SO_2 dissolves at the surface of the membranes. Groups that are especially susceptible to the harmful health effects of SO_2 include children, the elderly, and people with heart or lung disorders such as asthma. When SO_2 concentrations in the air become elevated, people belonging to these sensitive groups and those who are active outdoors may have trouble breathing. The International Agency for Research on Cancer (IARC) evaluated SO_2 and based on available information, determined that no conclusion can be made as to the carcinogenicity of SO_2 to human beings.

Sulfur dioxide reacts with other gases and particles in the air to form sulfates that can be harmful to people and the environment. Sulfate particles are the major cause of reduced visibility in the eastern United States. SO_2 can also react with other substances in the air to form acids that fall to the earth in rain and snow. Better known as acid rain, this acidic precipitation can damage forests and crops, can make lakes and streams too acidic for fish, and eventually speeds up the decay of building materials and paints.

STANDARDS

There are three National Ambient Air Quality Standards (NAAQS) for SO_2. There is an annual average health standard of 0.03 parts per million (ppm). This is based on a calendar year average of continuously monitored levels. There is also a 24-hour average health based standard of 0.14 ppm which is not to be exceeded more than once a year, and a secondary (welfare based) standard of 0.5 ppm, 3-hour average concentration that is also not to exceeded more than once per year.

New Jersey has also set state air quality standards for SO_2. They are similar to the federal standards but are expressed in micrograms per cubic meter (µg/m^3) instead of ppm. They are also based on rolling averages rather than block averages. So, for example, the state's primary 12-month standard is based on any twelve-month average recorded during the year, while the federal standard is based solely on the calendar year average. The state also has secondary 12-month, 24-hour, and 3-hour average standards. Table 1 summarizes the NAAQS and the New Jersey Ambient Air Quality Standards (NJAAQS) for SO_2.

Figure 2
Sulfur Dioxide – New Jersey
2006 Monthly Variation

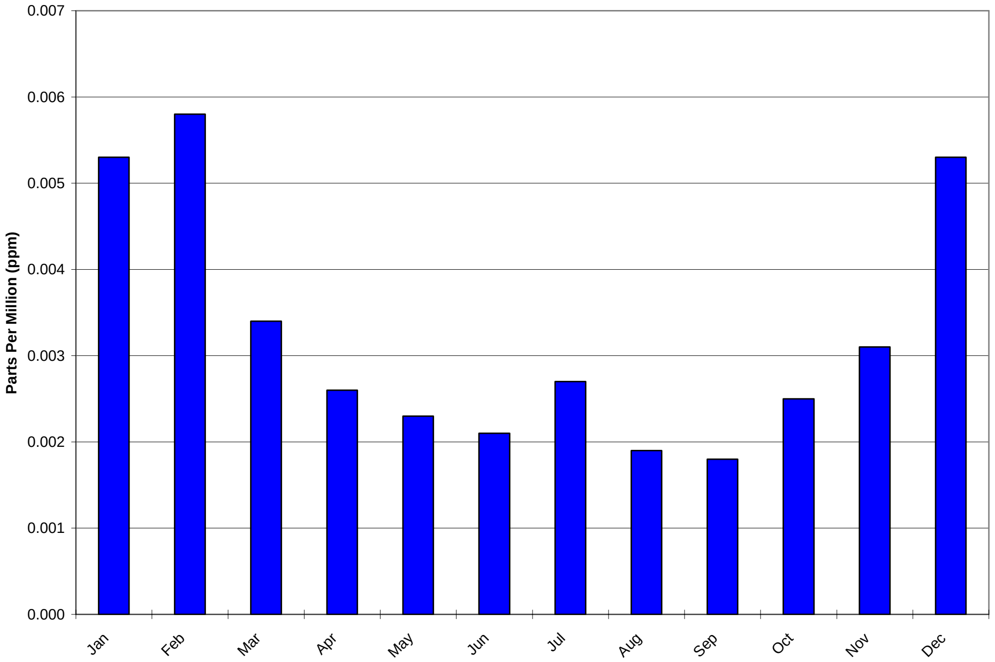


Figure 3
Sulfur Dioxide – New Jersey
2006 Hourly Variation

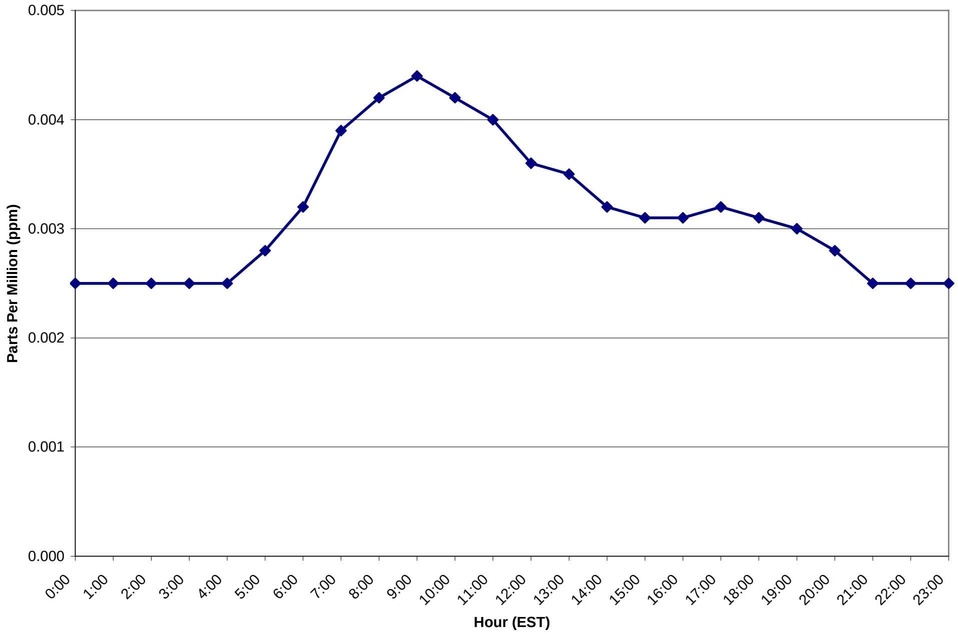


Table 1
National and New Jersey Ambient Air Quality Standards for Sulfur Dioxide

Parts Per Million (ppm)
Micrograms Per Cubic Meter (µg/m^3)

Averaging Period	Type	New Jersey	National[a]
12-month average	Primary	80 µg/m^3 (0.03 ppm)	0.03 ppm
12-month average	Secondary	60 µg/m^3 (0.02 ppm)	---
24-hour average	Primary	365 µg/m^3 (0.14 ppm)	0.14 ppm
24-hour average	Secondary	260 µg/m^3 (0.10 ppm)	---
3-hour average	Secondary	1300 µg/m^3 (0.5 ppm)	0.5 ppm

[a] – National standards are block averages rather than moving averages

MONITORING LOCATIONS

The state monitored SO_2 levels at 13 locations in 2006. These sites are shown in the map in Figure 4.

SO_2 LEVELS IN 2006

None of the monitoring sites recorded exceedances of the primary or secondary SO_2 standards during 2006. The maximum 12-month average concentration recorded was 0.008 ppm in Bayonne. The maximum 24-hour average level recorded was 0.029 ppm which was recorded at Camden Lab. The highest 3-hour average recorded was 0.052 ppm at Camden Lab and Elizabeth Lab. Summaries of the 2006 data are provided in Tables 2 and 3 (page 4), and Figures 5 and 6 (page 5).

Figure 4
2006 Sulfur Dioxide Monitoring Network

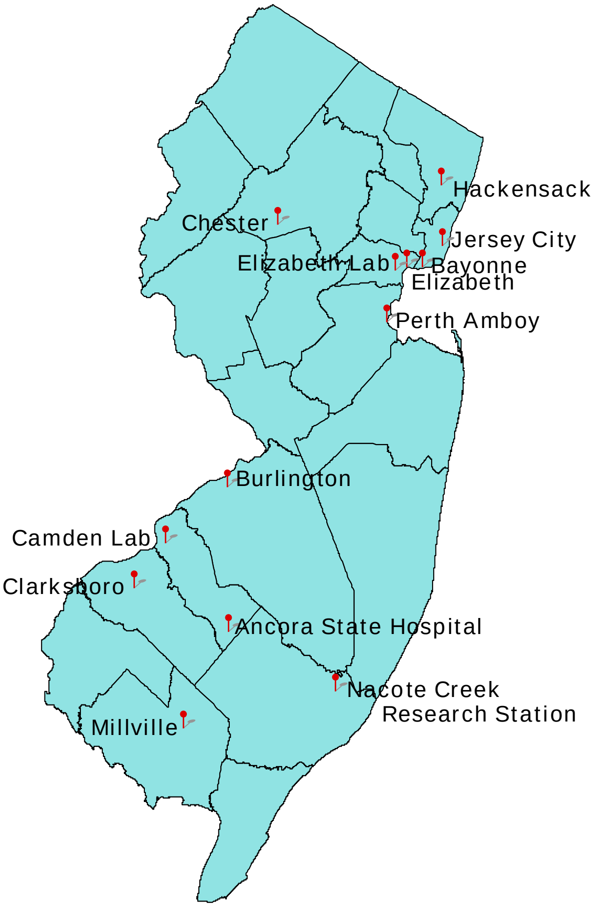


Table 2
Sulfur Dioxide Data – 2006
3-Hour and Annual Averages

Parts Per Million (ppm)

Monitoring Sites	3-Hour Average Maximum	3-Hour Average 2nd Highest	12-Month Average Maximum	Average Calendar Year
Ancora State Hospital	0.032	0.031	0.003	0.002
Bayonne	0.047	0.042	0.008	0.005
Burlington	0.026	0.025	0.003	0.003
Camden Lab	0.052	0.037	0.005	0.003
Chester	0.044	0.036	0.003	0.003
Clarksboro	0.035	0.033	0.004	0.003
Elizabeth	0.040	0.026	0.005	0.004
Elizabeth Lab	0.052	0.047	0.007	0.005
Hackensack	0.031	0.024	0.004	0.003
Jersey City	0.040	0.040	0.007	0.005
Millville	0.039	0.030	0.003	0.002
Nacote Creek Research Center	0.016	0.015	0.002	0.001
Perth Amboy	0.031	0.025	0.004	0.003

Table 3
Sulfur Dioxide Data – 2006
24-Hour and Daily Averages

Parts Per Million (ppm)

Monitoring Sites	24-Hour Average Maximum	24-Hour Average 2nd Highest	Daily Average Maximum	Daily Average 2nd Highest
Ancora State Hospital	0.016	0.011	0.013	0.011
Bayonne	0.020	0.019	0.018	0.017
Burlington	0.020	0.017	0.019	0.015
Camden Lab	0.029	0.025	0.024	0.024
Chester	0.024	0.020	0.020	0.019
Clarksboro	0.017	0.015	0.015	0.014
Elizabeth	0.017	0.015	0.017	0.014
Elizabeth Lab	0.025	0.024	0.022	0.022
Hackensack	0.015	0.014	0.015	0.013
Jersey City	0.028	0.027	0.025	0.023
Millville	0.012	0.010	0.011	0.009
Nacote Creek Research Station	0.008	0.006	0.006	0.006
Perth Amboy	0.015	0.015	0.014	0.013

Figure 5
Highest and 2nd Highest 24-Hour Averages of Sulfur Dioxide in New Jersey - 2006

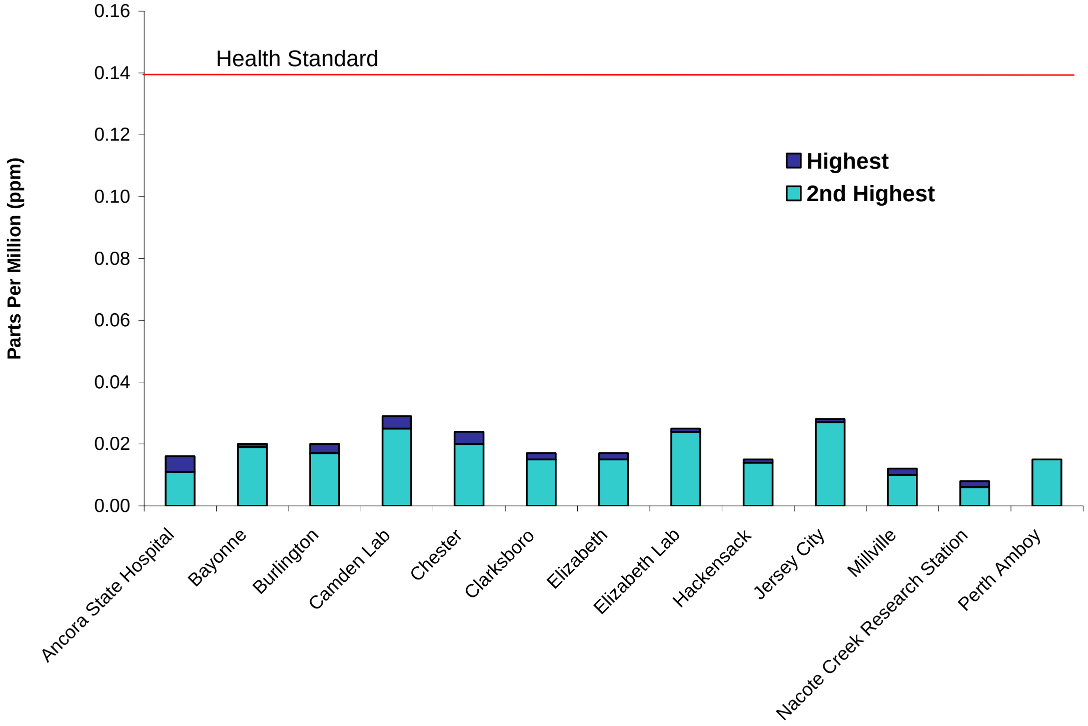
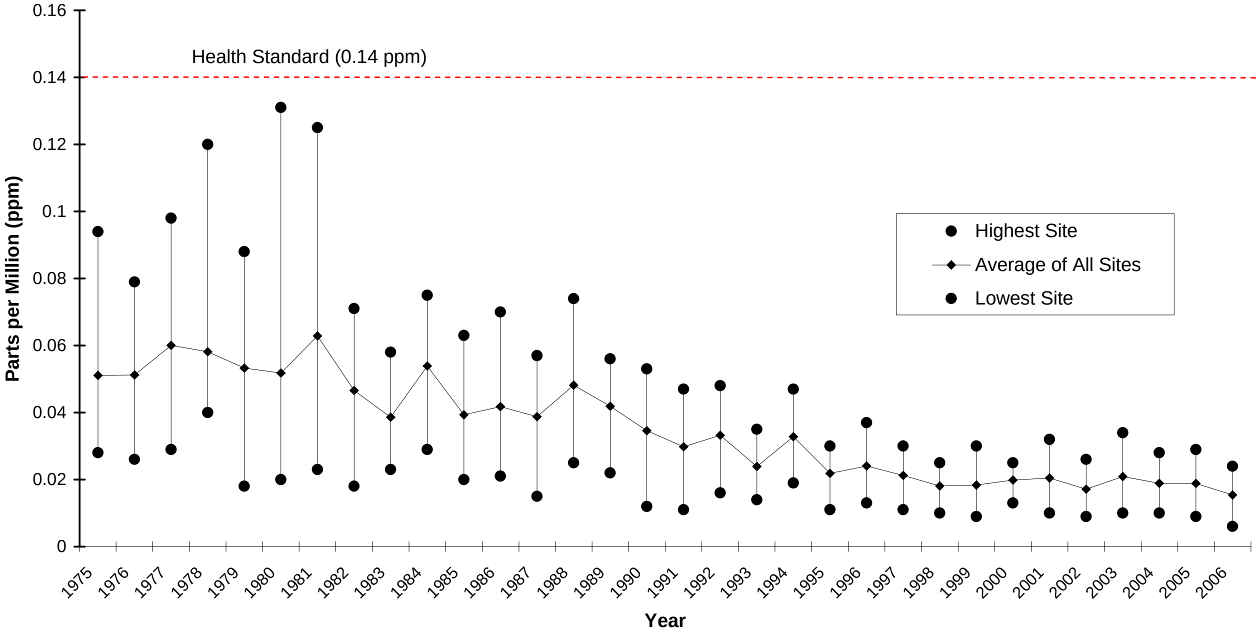


Figure 6
Sulfur Dioxide Concentrations in New Jersey
1975 - 2006
Second Highest Daily Average

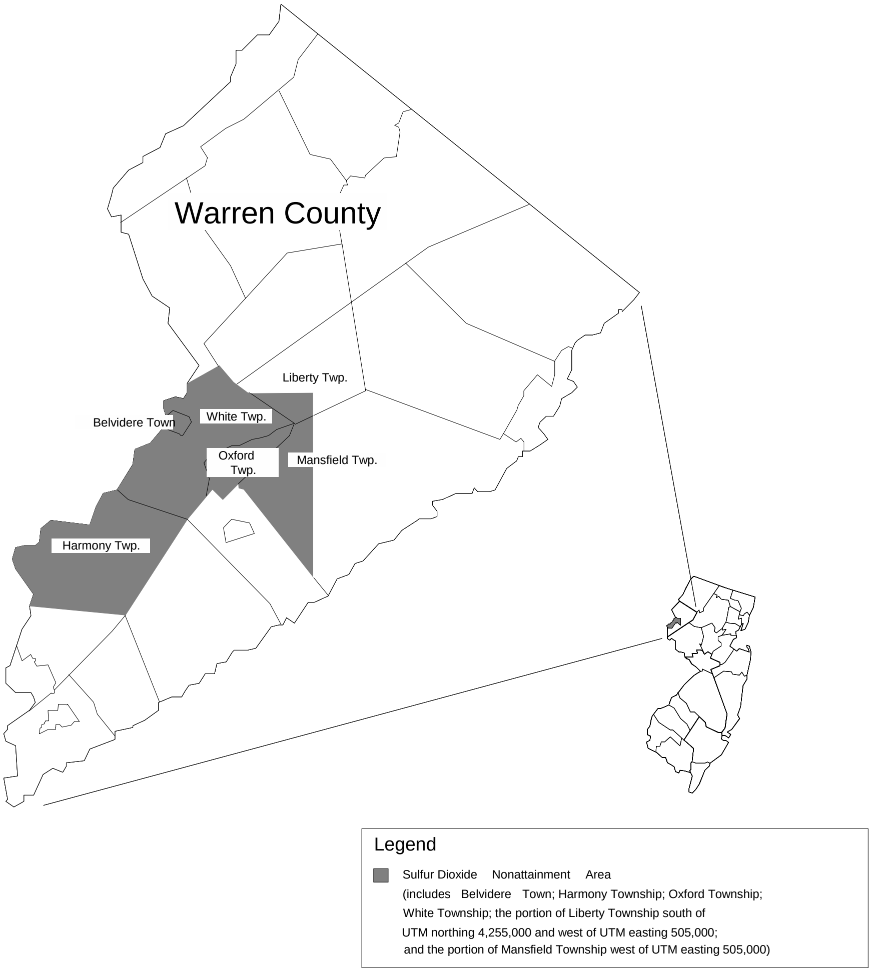


TRENDS

Since the implementation of regulations requiring the use of low sulfur fuels in New Jersey, SO_2 concentrations have improved significantly. The last time an exceedance of any of the National SO_2 standards was recorded in the state was in 1980. A trend graph of SO_2 levels showing the daily average concentrations recorded since 1975 from the highest, average, and lowest of all sites is shown in Figure 6 (page 5). The graph uses the second highest daily average, as this is the value that determines if the national health standard is being met (one exceedance per site is allowed each year).

Although there has not been a measured exceedance of the NAAQS in over two decades, there is still a small area of New Jersey that is classified as a non-attainment area for SO_2. This is the result of air quality modeling studies that predicted non-attainment of the standard within a small area of Warren County. The area is shown below in Figure 7.

Figure 7
Sulfur Dioxide Non-Attainment Areas* in New Jersey



*Nonattainment of the National Primary (Health) and Secondary (Welfare) Standards

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2006 Air Toxics Summary

New Jersey Department of Environmental Protection

INTRODUCTION

Air pollutants can be divided into two categories: the criteria pollutants (ozone, sulfur dioxide, carbon monoxide, nitrogen dioxide, particulate matter, and lead); and air toxics. The criteria pollutants have been addressed at the national level since the 1970's. The United States Environmental Protection Agency (USEPA) has set National Ambient Air Quality Standards (NAAQS) for them, and they are subject to a standard planning process that includes monitoring, reporting, and control requirements. Each of these pollutants is discussed in its own section of this New Jersey Department of Environmental Protection (NJDEP) 2006 Air Quality Report.

Air toxics are basically all the other chemicals released into the air that have the potential to cause adverse health effects in humans. These effects cover a wide range of conditions, from lung irritation to birth defects to cancer. There are no NAAQS for these pollutants, but in 1990 the U.S. Congress directed the USEPA to begin to address a list of almost 200 air toxics by developing control technology standards for specific categories of sources that emit them. These air toxics are known as the Clean Air Act Hazardous Air Pollutants (HAPs). You can get more information about HAPs at the USEPA Air Toxics web site at www.epa.gov/ttn/atw. NJDEP also has several web pages dedicated to air toxics. They can be accessed at www.state.nj.us/dep/airtoxics.

HEALTH EFFECTS

People exposed to significant amounts of air toxics may have an increased chance of getting cancer or experiencing other serious health effects. The non-cancer health effects can range from respiratory, neurological, reproductive, developmental, or immune system damage, to irritation and effects on specific organs. In addition to inhalation exposure, there can be risks from the deposition of toxic pollutants onto soils or surface waters. There, they can be taken up by plants and animals, which are later consumed by humans.

The effects on human health resulting from exposure to specific air toxics can be estimated by using chemical-specific "health benchmarks." These toxicity values are developed by the USEPA and other agencies, using health studies for a chemical. For carcinogens, the health benchmark is the concentration of the pollutant that corresponds to a one in a million increase in the risk of getting cancer if a person was to breathe that concentration over his or her entire lifetime. The health benchmark for non-carcinogens is a concentration at which no adverse health effects are expected to occur (this is also known as a reference concentration). Not all air toxics have health benchmarks because of a lack of toxicity studies. Available health benchmarks, for the air toxics monitored in New Jersey are listed in Tables 5 through 8. If ambient air concentrations exceed the health benchmarks then some action, such as a reduction in emissions, should be considered.

SOURCES OF AIR TOXICS

A number of years ago, USEPA began the National-Scale Air Toxics Assessment (NATA). Starting with the year 1996, they set out on a three-year cycle to determine people's exposure to air toxics around the country. To do this, USEPA first prepared a comprehensive inventory of air toxics emissions from all man-made sources. The emissions inventory is then reviewed and revised by each state. Although there are likely to be some errors in the details of such a massive undertaking, the emissions inventory still can give us a reasonable indication of the most important sources of air toxic emissions in our state. The pie chart in Figure 1, based on the 1999 NATA emissions estimates, shows that mobile sources are the largest contributors of air toxics emissions in New Jersey.

On-road mobile sources (cars and trucks) account for 36% of the air toxics emissions, and non-road mobile sources (airplanes, trains, construction equipment, lawnmowers, boats, dirt bikes, etc.) contribute 25%. Area sources (residential, commercial, and small industrial sources) represent 27% of the inventory, and major point sources (such as factories and power plants) account for the remaining 12%.

Air toxics come from many different sources, not only manufacturing, but also other kinds of human activity. When New Jersey's emissions estimates are broken down by county (see Figure 2) it is evident that the areas with the largest air toxic emissions are generally those with the largest populations. This is directly related to high levels of vehicle use, solvent use, heating, and other population-related activities in those counties.

ESTIMATING AIR TOXICS EXPOSURE

The second step in USEPA's NATA project is to use the emissions information in an air dispersion model to estimate air toxic concentrations in the different parts of the country. The map in Figure 3 shows the predicted concentrations of benzene throughout New Jersey. The high concentration areas tend to overlap the more densely populated areas of the state, following the pattern of emissions. Not all air toxics follow this pattern, as some are more closely associated with individual point sources,

Figure 1
1999 Air Toxics Emissions Estimates for New Jersey

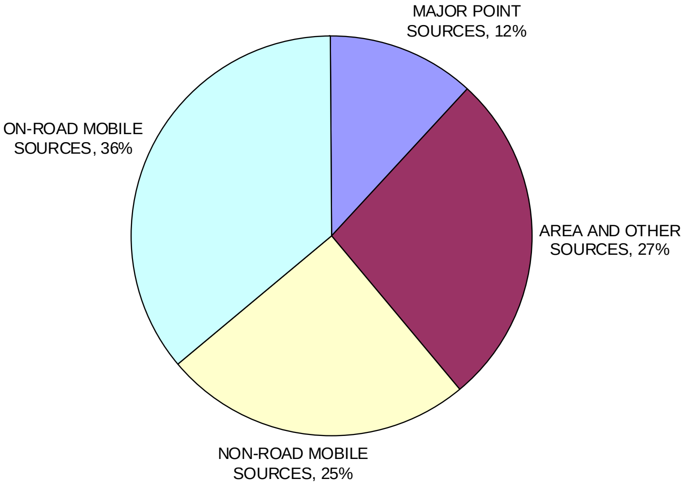
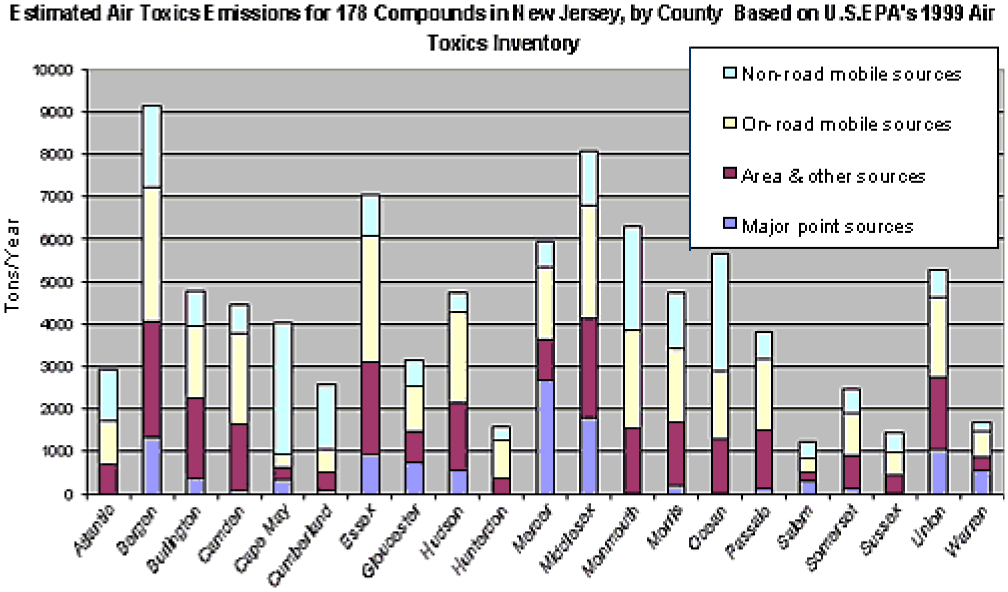


Figure 2



but in general, larger populations result in greater emissions of, and exposure to, air toxics.

Analysis of the NATA state and county average air toxics concentrations indicates that twenty-two chemicals were predicted to exceed their health benchmarks, or level of concern, in one or more counties in 1999. Twenty-one of these are considered to be cancer causing (carcinogenic) chemicals, and one (acrolein) is not. Estimated air concentrations of these 22 pollutants vary around the state, depending on the types of sources that emit them. This is summarized in Table 1.

Figure 3. NATA Predicted concentrations in New Jersey for 1999

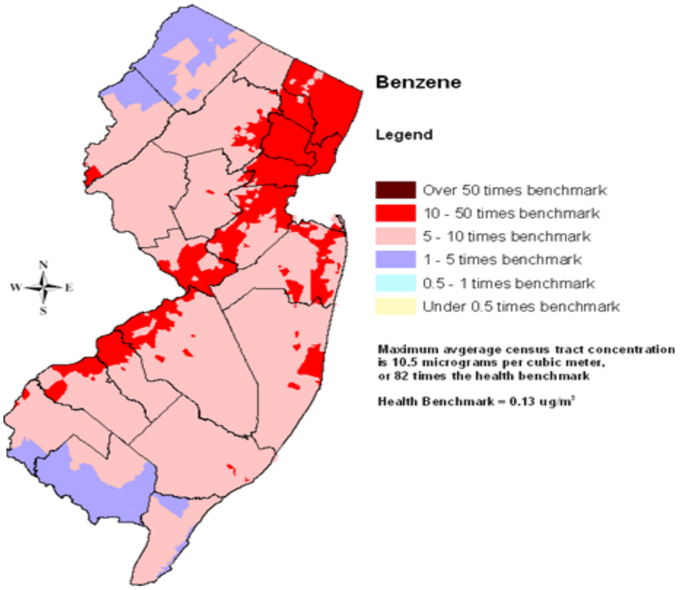


Table 1
Air Toxics of Greatest Concern in New Jersey
Based on 1999 National Air Toxics Assessment

Pollutant of Concern	Number of Counties Above Health Benchmarks	Primary Source of Emissions
Acetaldehyde	Statewide	On-road, background
Acrolein	Statewide	Mobile, area
Arsenic Compounds	4	Major, area
Benzene	Statewide	Mobile
Bis(2-ethylhexyl) phthalate	Statewide	Background
1,3-Butadiene	Statewide	On-road, background
Cadmium Compounds	1	Area
Carbon Tetrachloride	Statewide	Background
Chloroform	20	Area, background
Chromium VI	14	Area
1,4-Dichlorobenzene	4	Area
1,3-Dichloropropene	1	Area
Diesel Particulate Matter	Statewide	Mobile
Ethylene Dibromide	Statewide	Background
Ethylene Dichloride	11	Background
Ethylene Oxide	2	Area
Formaldehyde	Statewide	Mobile, background
Methyl Chloride	Statewide	Background
Naphthalene	14	Area
Nickel Compounds	1	Area, major
Perchloroethyllene	10	Area, background
1,1,2,2-Tetrachloroethane	Statewide	Background

NJ AIR TOXICS MONITORING PROGRAM RESULTS FOR 2006

NJDEP has established four air toxics monitoring sites around the state. They are located in Camden, Elizabeth, New Brunswick and Chester (see Figure 4). The Camden site has been measuring several toxic volatile organic compounds (VOCs) since 1989. The Elizabeth site began measuring VOCs in 2000, and the New Brunswick and Chester sites became operational in July 2001. Analysis of toxic metals at all four sites also began in 2001. Metals data can be found in Appendix B (Fine Particulate Speciation Summary 2006) of this Air Quality Report.

2006 air toxic monitoring results for VOCs are shown in Table 2. This table contains the average concentration for each air toxic measured at the four New Jersey monitoring sites. All values are in micrograms per cubic meter ($\mu g/m^3$). More detail can be found in Tables 5 through 8, including additional statistics, detection limit information, health benchmarks used by NJDEP, risk ratios, and concentrations in parts per billion by volume (ppbv). The ppbv units are more common for monitoring results, while $\mu g/m^3$ units are generally used in modeling and health studies. Many of the compounds that were tested for were below the detection limit of the method used. These are listed separately in Table 9.

Reported averages for which significant portions of the data (more than 50%) were below the detection limit should be viewed with extreme caution. Median values (the value of the middle sample value when the results are ranked) are reported along with the mean (average) concentrations because for some compounds only a single or very few high values were recorded. These high values will tend to increase the average concentration significantly but would have less effect on the median value. In such cases, the median value may be a better indicator of long term exposures, on which most of the health benchmarks for air toxics are based.

The Chester site has the lowest concentrations for the majority of the prevalent air toxics, while Elizabeth had the highest concentration for most compounds. This is comparable to previous years. Along with the highest concentrations, Elizabeth was also the only site to detect a number of compounds.

Figure 4
2006 Air Toxics Monitoring Network

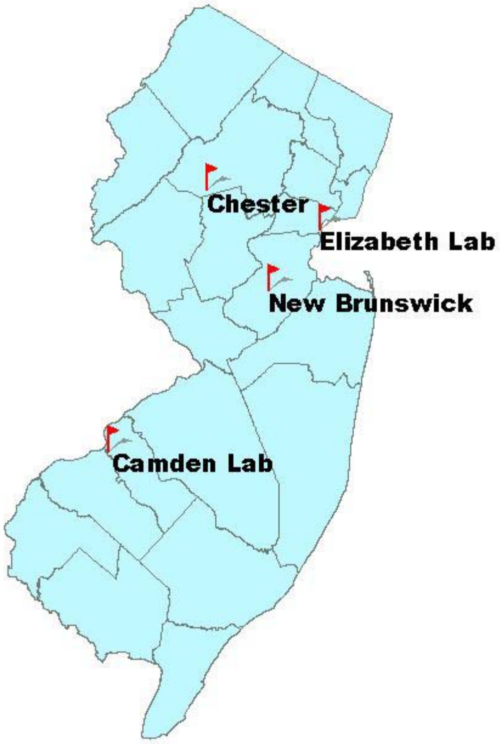


Table 2
New Jersey Air Toxics Summary – 2006

Annual Average Concentration
micrograms per cubic meter ($\mu g/m^3$) [a]

Pollutant	Camden Lab	Chester	Elizabeth Lab	New Brunswick
Acetaldehyde	2.02	1.19	5.70	3.38
Acetone	2.57	2.09	2.79	2.33
Acetonitrile	1.76	0.67	0.98	(0.23)
Acetylene	1.13	0.50	1.53	0.78
Acrolein	0.60	0.50	0.59	0.39
Acrylonitrile	(0.03)	(0)	(0.03)	(0.07)
tert-Amyl Methyl Ether	(0)	-	(0.01)	-
Benzaldehyde	0.27	0.10	0.17	0.09
Benzene	1.17	0.51	1.31	0.68
Bromodichloromethane	-	-	(0)	-
Bromoform	-	-	(0)	-
Bromomethane	0.43	0.05	0.06	0.05
1,3-Butadiene	0.13	0.03	0.16	0.06
Butyraldehyde	0.32	0.20	0.43	0.23
Carbon Disulfide	5.57	2.17	4.49	3.81
Carbon Tetrachloride	0.62	0.59	0.59	0.61
Chlorobenzene	(0)	-	(0)	-
Chloroethane	0.04	(0.02)	0.05	0.07
Chloroform	0.11	0.07	0.13	0.12
Chloromethane	1.18	1.13	1.14	1.18
Chloromethylbenzene	-	(0)	-	-
Chloropene	-	(0)	(0.01)	(0)
Crotonaldehyde	0.25	0.25	0.21	0.20
Dibromochloromethane	(0)	(0)	(0)	-
m-Dichlorobenzene	-	(0)	(0)	-
o-Dichlorobenzene	(0)	(0)	(0)	-
p-Dichlorobenzene	0.21	(0.03)	0.16	0.08
Dichlorodifluoromethane	2.71	2.66	2.78	2.67
1,1-Dichloroethane	-	-	(0)	-
1,2-Dichloroethane	(0)	(0)	(0.01)	(0)
1,1-Dichloroethene	-	-	(0.01)	(0)
cis-1,2-Dichloroethylene	(0.02)	(0)	(0.01)	(0.04)
trans-1,2-Dichloroethylene	-	-	(0)	-
Dichloromethane	0.98	0.34	0.79	0.43
1,2-Dichloropropane	-	-	(0)	-
Dichlorotetrafluoroethane	0.13	0.12	0.13	0.12
Ethyl tert-Butyl Ether	-	-	(0.01)	-
Ethyl Acrylate	(0)	-	-	-
Ethylbenzene	0.38	0.13	0.53	0.26
Formaldehyde	3.50	1.93	4.55	2.59

[a] Numbers in parenthesis indicate averages based on less than 50% detection and dashes represent 100% non-detects

Table 2 (Continued)
New Jersey Air Toxics Summary – 2006

Annual Average Concentration
micrograms per cubic meter (μg/m^3) [a]

Pollutant	Camden Lab	Chester	Elizabeth Lab	New Brunswick
Hexachloro-1,3-butadiene	(0)	(0.01)	(0.02)	(0.01)
Hexaldehyde	0.19	0.10	0.16	0.13
Isovaleraldehyde	0.04	(0.01)	(0.01)	(0)
Methyl Ethyl Ketone	1.21	1.22	1.39	1.29
Methyl Isobutyl Ketone	0.15	0.12	0.19	0.14
Methyl Methacrylate	-	-	(0.04)	-
Methyl tert-Butyl Ether	0.83	(0.09)	1.46	0.33
n-Octane	0.19	0.06	0.32	0.14
Propionaldehyde	0.34	0.20	0.35	0.17
Propylene	1.13	0.41	4.58	0.72
Styrene	0.18	0.06	0.37	0.10
1,1,2,2-Tetrachloroethane	-	-	(0.02)	(0)
Tetrachloroethylene	0.32	0.12	0.36	0.26
Tolualdehydes	0.15	0.12	0.16	0.11
Toluene	2.52	0.69	3.17	1.28
1,2,4-Trichlorobenzene	(0)	(0.01)	(0.01)	(0)
1,1,1-Trichloroethane	0.14	0.11	0.13	0.12
1,1,2-Trichloroethane	(0)	-	(0)	-
Trichloroethylene	0.42	(0.02)	0.08	(0.06)
Trichlorofluoromethane	1.68	1.48	1.54	1.51
Trichlorotrifluoroethane	0.72	0.75	0.75	0.74
1,2,4-Trimethylbenzene	0.40	0.08	0.55	0.21
1,3,5-Trimethylbenzene	0.14	0.04	0.18	0.07
Valeraldehyde	0.16	0.08	0.41	0.13
Vinyl chloride	(0.01)	(0)	(0.01)	(0.01)
m,p-Xylene	1.01	0.29	1.53	0.73
o-Xylene	0.39	0.12	0.57	0.30

[a] Numbers in parenthesis indicate averages based on less than 50% detection and dashes represent 100% non-detects

ESTIMATING HEALTH RISK

A simplified way to determine whether the ambient concentration of an air toxic could pose a potential human health risk is to compare the air concentration to its health benchmark. The number that we get when we divide the air concentration by the benchmark is called a risk ratio. If the risk ratio is less than one, the air concentration should not pose a health risk. If it is greater than one, it may be of concern. The risk ratio also indicates how much higher or lower the estimated air concentration is than the health benchmark.

Camden, Elizabeth, and New Brunswick all had nine or more compounds with annual average concentrations that exceeded their health benchmarks, while Chester only had six. The toxic air pollutants that exceeded their health benchmarks at all sites include acetaldehyde, benzene, carbon tetrachloride, chloroform, chloromethane, and formaldehyde. Camden, New Brunswick and Elizabeth all exceeded the health benchmarks for 1,3-butadiene and tetrachloroethylene.

The top five toxic compounds of concern based on annual risk ratios are listed in Table 3. Formaldehyde contributed the highest risk at every site, but note that the magnitude of the risk was much lower at Chester. Benzene, carbon tetrachloride, and acetaldehyde were common to all four sites as well.

TRENDS AND COMPARISONS

The site in Camden is the only monitoring location that has been measuring air toxics for an extended period. The graph in Figure 5 shows the change in concentrations for three of the most prevalent air toxics (benzene, toluene, and xylene) from 1990 to 2006. The graph shows that while average concentrations can vary significantly from year to year, the overall trend is downward. High individual samples may also result in high annual averages in some years. Concentrations of most air toxics have declined significantly over the last ten years. Because air toxics comprise such a large and diverse group of compounds, however, these general trends may not hold for other compounds.

Table 3
Analytes with the 5 Highest Risk Ratios
(Based on Annual Mean Risk Ratio)
at Each Monitoring Site in 2006

	Camden		Chester		Elizabeth		New Brunswick	
Rank	**Analyte**	**Risk Ratio**	**Analyte**	**Risk Ratio**	**Analyte**	**Risk Ratio**	**Analyte**	**Risk Ratio**
1	Formaldehyde	45 [a,b]	Formaldehyde	25	Formaldehyde	59	Formaldehyde	34
2	Carbon Tetrachloride	9	Carbon Tetrachloride	9	Acetaldehyde	13	Carbon Tetrachloride	9
3	Benzene	9	Benzene	4	Benzene	10	Acetaldehyde	8
4	Acetaldehyde	4	Acetaldehyde	3	Carbon Tetrachloride	9	Benzene	5
5	1,3 Butadiene	4	Chloromethane	2	1,3 Butadiene	5	Acrylonitrile	4

[a] The risk ratio for a chemical is a comparison of the annual mean air concentration to the long-term health benchmark

[b] The long-term health benchmark is defined as the chemical-specific air concentration above which there may be human health concerns. For a carcinogen (cancer-causing chemical), the health benchmark is set at the air concentration that would cause no more than a one in a million increase in the likelihood of getting cancer, even after a lifetime of exposure. For a non-carcinogen, the health benchmark is the maximum air concentration to which exposure is likely to cause no harm, even if that exposure occurs on a daily basis for a lifetime. These toxicity values are not available for all chemicals. For more information, go to www.nj.gov/dep/aqpp/risk.html

Figure 5
Annual Averages for Selected Hazardous Air Pollutants (HAPs) at Camden Lab from 1990-2006

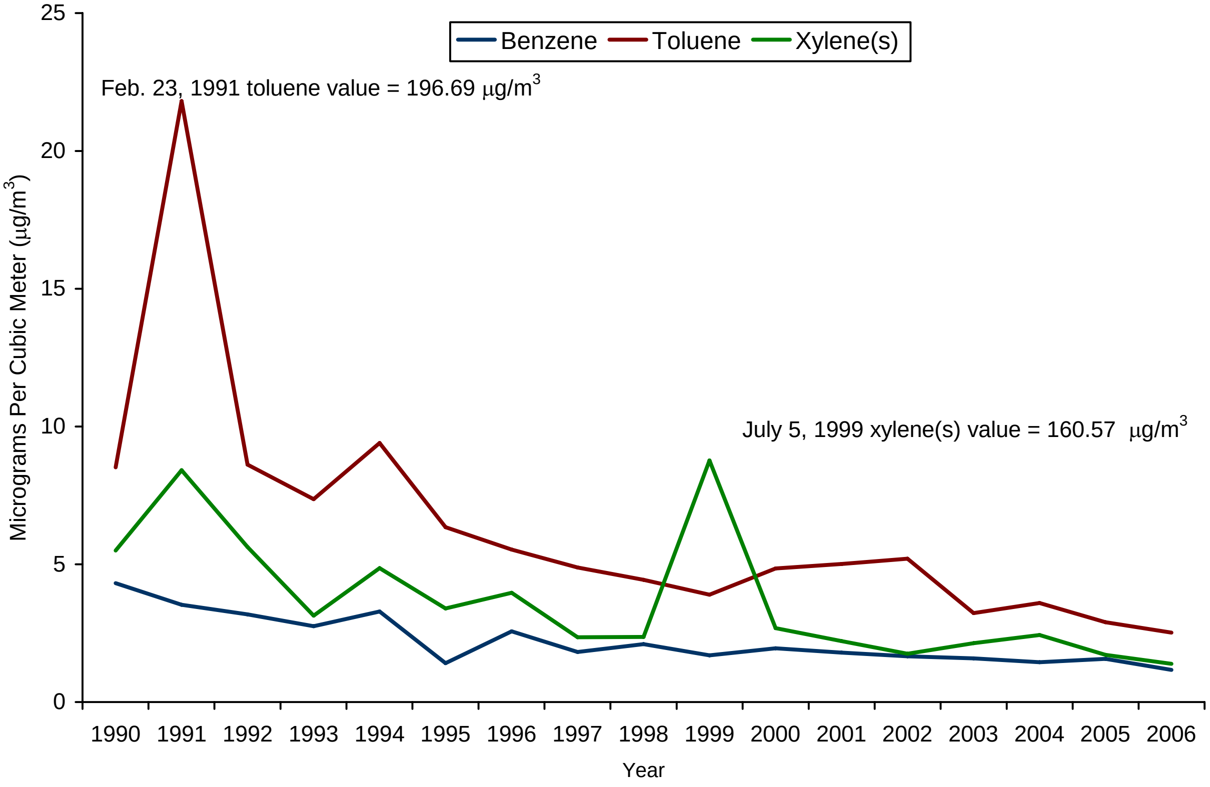


Figure 6 shows a comparison of the concentrations in Camden predicted by NATA for 1999 and the concentrations actually measured in Camden in 1999 for twelve compounds. Table 4 compares the 1999 NATA predictions with the measured concentrations for 1999 and 2006. It appears from this analysis that the agreement between predicted and monitored concentrations is fairly good. Finally, for more than half of the air toxics in Table 4, the 2006 levels measured at Camden were substantially lower than the concentrations measured in 1999.

Figure 6
Air Toxics Levels Measured in 1999 at Camden, New Jersey Compared to NATA Predicted Levels

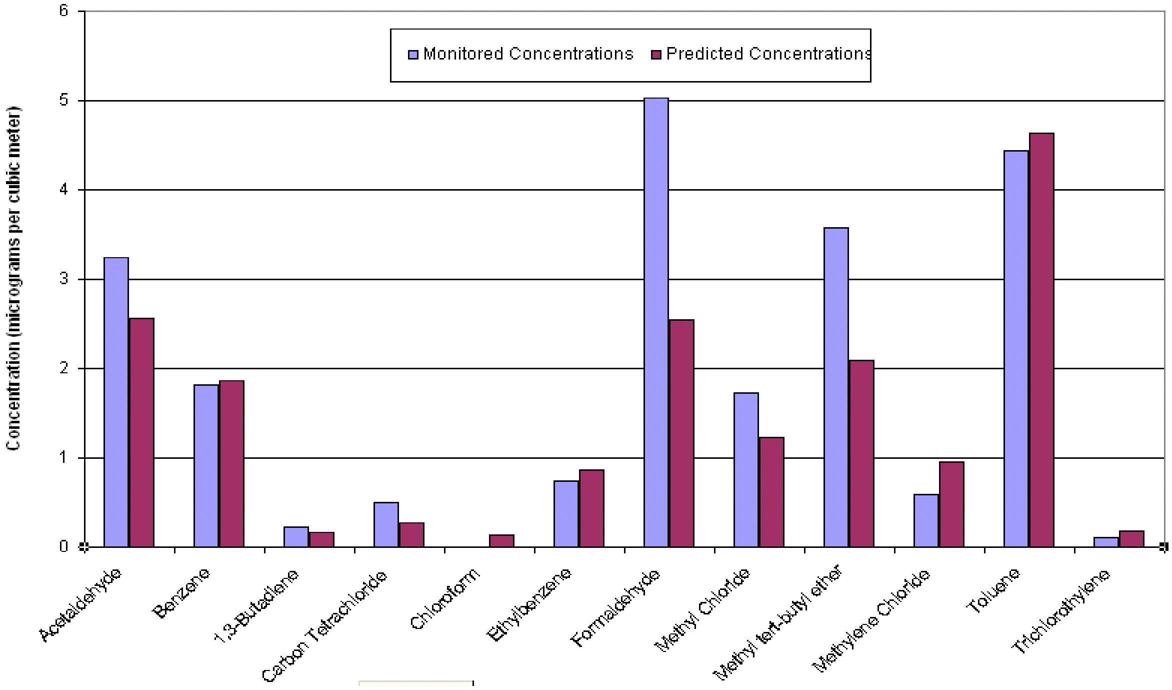


Table 4
Comparison of NATA Predicted to Measured Levels in Camden, NJ

Pollutant (HAP)	NATA Predicted 1999, $\mu g/m^3$	Measured 1999 Level, $\mu g/m^3$	Measured 2006 Level, $\mu g/m^3$
Acetaldehyde	2.56	3.24	2.02
Benzene	1.87	1.82	1.17
1,3-Butadiene	0.17	0.22	0.13
Carbon Tetrachloride	0.28	0.50	0.62
Ethylbenzene	0.74	0.87	0.38
Formaldehyde	2.54	5.03	3.50
Methyl Chloride (Chloromethane)	1.23	1.73	1.18
Methyl tert-butyl ether	2.09	3.57	0.83
Methylene Chloride (Dichloromethane)	0.95	0.59	0.98
Toluene	4.63	4.44	2.52
Trichloroethylene	0.18	0.11	0.42

Table 5

2006 Air Toxics Data for Camden, NJ

Analyte[a]	Cas #	Annual Mean (ppbv)[b,c]	Annual Median (ppbv)[b]	24-Hour Max (ppbv)	Annual Mean (μg/m^3)[b,c]	Annual Median (μg/m^3)[c]	24-hour Max (μg/m^3)	Long-Term Benchmark (μg/m^3)[d]	Annual Mean Risk Ratio[e]	Detection Limit (μg/m^3)	% Above Minimum Detection Limit[f]
Acetaldehyde	75-07-0	**1.12**	0.95	2.38	**2.02**	1.72	4.29	0.45	**4.5**	0.01	100
Acetone	67-64-1	1.08	0.96	2.65	2.57	2.28	6.29	31000	0.0001	0.02	100
Acetonitrile	75-05-8	1.05	0.56	9.61	1.76	0.93	16.13	60	0.03	0.17	75
Acetylene	74-86-2	1.07	0.76	4.53	1.13	0.81	4.82			0.02	100
Acrolein	107-02-8	0.26	0.22	0.99	0.60	0.50	2.27			0.25	79
Acrylonitrile	107-13-1	**(0.01)**	0	0.49	**(0.03)**	0	1.06	0.015	**2.1**	0.12	6
tert-Amyl Methyl Ether	994-05-8	(0)	0	0.02	(0)	0	0.08			0.05	4
Benzaldehyde	100-52-7	0.06	0.06	0.11	0.27	0.26	0.49			0.01	98
Benzene	71-43-2	**0.37**	0.32	0.94	**1.17**	1.02	3.00	0.13	**9.0**	0.02	100
Bromomethane	74-83-9	0.11	0.04	0.74	0.43	0.16	2.87	5	0.09	0.04	100
1,3-Butadiene	106-99-0	**0.06**	0.04	0.27	**0.13**	0.09	0.60	0.033	**3.9**	0.01	98
Butyraldehyde	123-72-8	0.11	0.11	0.19	0.32	0.31	0.57			0.01	98
Carbon Disulfide	75-15-0	1.79	1.68	8.39	5.57	5.23	26.13			0.03	100
Carbon Tetrachloride	56-23-5	**0.10**	0.10	0.16	**0.62**	0.63	1.01	0.067	**9.2**	0.06	100
Chlorobenzene	108-90-7	(0)	0	0.02	(0)	0	0.09	1000	0.0001	0.02	2
Chloroethane	75-00-3	0.01	0.02	0.04	0.04	0.05	0.11			0.02	75
Chloroform	67-66-3	**0.02**	0.02	0.18	**0.11**	0.10	0.88	0.043	**2.6**	0.02	77
Chloromethane	74-87-3	**0.57**	0.57	0.75	**1.18**	1.18	1.55	0.56	**2.1**	0.03	100

[a] Analytes in bold text had annual means above the long-term health benchmark

[b] Numbers in parentheses are arithmetic means (or averages) based on less than 50 percent detection

[c] For a valid 24-hour sampling event when the analyzing laboratory reports the term "Not Detected" for a particular pollutant, the concentration of 0.0 ppbv is assigned to that pollutant. These zero concentrations were included in the calculation of annual averages and medians for each pollutant regardless of percent detection

[d] The long-term health benchmark is defined as the chemical-specific air concentration above which there may be human health concerns. For a carcinogen (cancer-causing chemical), the health benchmark is set at the air concentration that would cause no more than a one in a million increase in the likelihood of getting cancer, even after a lifetime of exposure. For a non-carcinogen, the health benchmark is the maximum air concentration to which exposure is likely to cause no harm, even if that exposure occurs on a daily basis for a lifetime. These toxicity values are not available for all chemicals. For more information, go to www.nj.gov/dep/aqpp/risk.html

[e] The risk ratio for a chemical is a comparison of the annual mean air concentration to the long-term health benchmark. If the annual mean is 0, then the annual mean risk ratio is displayed as N.A. (not applicable)

[f] There were 52 total VOC samples and 57 total carbonyl samples collected in 2006

Table 5 (Continued)

2006 Air Toxics Data for Camden, NJ

Analyte[a]	Cas #	Annual Mean (ppbv)[b,c]	Annual Median (ppbv)[b]	24-Hour Max (ppbv)	Annual Mean ($\mu g/m^3$)[b,c]	Annual Median ($\mu g/m^3$)[c]	24-hour Max ($\mu g/m^3$)	Long-Term Benchmark ($\mu g/m^3$)[d]	Annual Mean Risk Ratio[e]	Detection Limit ($\mu g/m^3$)	% Above Minimum Detection Limit[f]
Crotonaldehyde	123-73-9	0.09	0.03	0.58	0.25	0.10	1.65			0.01	93
Dibromochloromethane	594-18-3	(0)	0	0.01	(0)	0	0.10			0.10	4
o-Dichlorobenzene	95-50-1	(0)	0	0.02	(0)	0	0.12	200	0.0001	0.03	2
p-Dichlorobenzene	106-46-7	**0.04**	0.03	0.10	**0.21**	0.18	0.60	0.091	**2.3**	0.04	98
Dichlorodifluoromethane	75-71-8	0.55	0.55	0.77	2.71	2.70	3.81	200	0.01	0.02	100
1,2-Dichloroethane	107-06-2	(0)	0	0.01	(0)	0	0.04	0.038	0.02	0.06	2
cis-1,2-Dichloroethylene	156-59-2	(0)	0	0.22	(0.02)	0	0.87			0.06	2
Dichloromethane	75-09-2	0.28	0.11	5.42	0.98	0.36	18.83	2.1	0.47	0.06	100
Dichlorotetrafluoroethane	1320-37-2	0.02	0.02	0.02	0.13	0.14	0.14			0.02	100
Ethyl Acrylate	140-88-5	(0)	0	0.01	(0)	0	0.04	2	0.0004	0.05	2
Ethylbenzene	100-41-4	0.09	0.07	0.28	0.38	0.30	1.22			0.02	100
Formaldehyde	50-00-0	**2.85**	2.38	6.65	**3.50**	2.92	8.17	0.077	**45**	0.01	100
Hexachloro-1,3-butadiene	87-68-3	0	0	0.02	(0)	0	0.21	0.045	0.09	0.14	2
Hexaldehyde	66-25-1	0.05	0.04	0.12	0.19	0.18	0.48			0.01	98
Isovaleraldehyde	590-86-3	0.01	0.01	0.03	0.04	0.04	0.10			0.01	81
Methyl Ethyl Ketone	78-93-3	0.41	0.39	1.41	1.21	1.15	4.15			0.13	100
Methyl Isobutyl Ketone	108-10-1	0.04	0.03	0.19	0.15	0.12	0.78			0.03	79
Methyl tert-Butyl Ether	1634-04-4	0.23	0.08	1.84	0.83	0.29	6.63	3.8	0.22	0.01	94

[a] Analytes in bold text had annual means above the long-term health benchmark

[b] Numbers in parentheses are arithmetic means (or averages) based on less than 50 percent detection

[c] For a valid 24-hour sampling event when the analyzing laboratory reports the term “Not Detected” for a particular pollutant, the concentration of 0.0 ppbv is assigned to that pollutant. These zero concentrations were included in the calculation of annual averages and medians for each pollutant regardless of percent detection

[d] The long-term health benchmark is defined as the chemical-specific air concentration above which there may be human health concerns. For a carcinogen (cancer-causing chemical), the health benchmark is set at the air concentration that would cause no more than a one in a million increase in the likelihood of getting cancer, even after a lifetime of exposure. For a non-carcinogen, the health benchmark is the maximum air concentration to which exposure is likely to cause no harm, even if that exposure occurs on a daily basis for a lifetime. These toxicity values are not available for all chemicals. For more information, go to www.nj.gov/dep/aqpp/risk.html

[e] The risk ratio for a chemical is a comparison of the annual mean air concentration to the long-term health benchmark. If the annual mean is 0, then the annual mean risk ratio is displayed as N.A. (not applicable)

[f] There were 52 total VOC samples and 57 total carbonyl samples collected in 2006

Table 5 (Continued)
2006 Air Toxics Data for Camden, NJ

Analyte[a]	Cas #	Annual Mean (ppbv)[b,c]	Annual Median (ppbv)[b]	24-Hour Max (ppbv)	Annual Mean (μg/m^3)[b,c]	Annual Median (μg/m^3)[c]	24-hour Max (μg/m^3)	Long-Term Benchmark (μg/m^3)[d]	Annual Mean Risk Ratio[e]	Detection Limit (μg/m^3)	% Above Minimum Detection Limit[f]
n-Octane	111-65-9	0.04	0.03	0.12	0.19	0.14	0.56			0.03	96
Propionaldehyde	123-38-6	0.14	0.12	0.33	0.34	0.28	0.78			0.01	98
Propylene	115-07-1	0.66	0.53	1.95	1.13	0.90	3.36	3000	0.00	0.02	100
Styrene	100-42-5	0.04	0.03	0.24	0.18	0.13	1.02	1.8	0.10	0.04	94
Tetrachloroethylene	127-18-4	**0.05**	0.04	0.16	**0.32**	0.27	1.09	0.17	**1.9**	0.07	100
Tolualdehydes		0.03	0.03	0.08	0.15	0.13	0.41			0.01	95
Toluene	108-88-3	0.67	0.53	4.06	2.52	1.98	15.30	400	0.01	0.02	100
1,2,4-Trichlorobenzene	102-82-1	(0)	0	0.02	(0)	0	0.15	200	0.0001	0.11	4
1,1,1-Trichloroethane	71-55-6	0.02	0.02	0.12	0.14	0.11	0.65	1000	0.0001	0.02	100
1,1,2-Trichloroethane	79-00-5	(0)	0	0.01	(0)	0	0.05	0.063	0.02	0.03	2
Trichloroethylene	79-01-6	0.08	0.03	0.76	0.42	0.16	4.08	0.5	0.84	0.05	81
Trichlorofluoromethane	75-69-4	0.30	0.30	0.42	1.68	1.69	2.36	700	0.002	0.04	100
Trichlorotrifluoroethane	26523-64-8	0.09	0.09	0.13	0.72	0.69	1.00			0.09	100
1,2,4-Trimethylbenzene	95-63-6	0.08	0.07	0.31	0.40	0.32	1.52			0.01	100
1,3,5-Trimethylbenzene	108-67-8	0.03	0.02	0.09	0.14	0.10	0.44			0.02	98
Valeraldehyde	110-62-3	0.05	0.05	0.09	0.16	0.16	0.32			0.01	98
Vinyl chloride	75-01-4	(0.01)	0	0.03	(0.01)	0	0.08	0.11	0.12	0.02	42
m,p-Xylene	1330-20-7	0.23	0.18	0.82	1.01	0.78	3.56	100	0.01	0.04	100
o-Xylene	95-47-6	0.09	0.08	0.26	0.39	0.33	1.13	100	0.004	0.02	100

[a] Analytes in bold text had annual means above the long-term health benchmark

[b] Numbers in parentheses are arithmetic means (or averages) based on less than 50 percent detection

[c] For a valid 24-hour sampling event when the analyzing laboratory reports the term “Not Detected” for a particular pollutant, the concentration of 0.0 ppbv is assigned to that pollutant. These zero concentrations were included in the calculation of annual averages and medians for each pollutant regardless of percent detection

[d] The long-term health benchmark is defined as the chemical-specific air concentration above which there may be human health concerns. For a carcinogen (cancer-causing chemical), the health benchmark is set at the air concentration that would cause no more than a one in a million increase in the likelihood of getting cancer, even after a lifetime of exposure. For a non-carcinogen, the health benchmark is the maximum air concentration to which exposure is likely to cause no harm, even if that exposure occurs on a daily basis for a lifetime. These toxicity values are not available for all chemicals. For more information, go to www.nj.gov/dep/aqpp/risk.html

[e] The risk ratio for a chemical is a comparison of the annual mean air concentration to the long-term health benchmark. If the annual mean is 0, then the annual mean risk ratio is displayed as N.A. (not applicable)

[f] There were 52 total VOC samples and 57 total carbonyl samples collected in 2006

Table 6
2006 Air Toxics Data for Chester, NJ

Analyte[a]	Cas #	Annual Mean (ppbv)[b,c]	Annual Median (ppbv)[b]	24-Hour Max (ppbv)	Annual Mean (µg/m^3)[b,c]	Annual Median (µg/m^3)[c]	24-hour Max (µg/m^3)	Long-Term Benchmark (µg/m^3)[d]	Annual Mean Risk Ratio[e]	Detection Limit (µg/m^3)	% Above Minimum Detection Limit[f]
Acetaldehyde	75-07-0	**0.66**	0.60	1.71	**1.19**	1.08	3.08	0.45	**2.7**	0.01	100
Acetone	67-64-1	0.88	0.80	2.37	2.09	1.90	5.63	31000	0.0001	0.02	100
Acetonitrile	75-05-8	0.40	0.32	1.82	0.67	0.54	3.06	60	0.01	0.17	63
Acetylene	74-86-2	0.47	0.37	1.65	0.50	0.39	1.76			0.02	98
Acrolein	107-02-8	0.22	0.18	1.22	0.50	0.41	2.80			0.25	70
Acrylonitrile	107-13-1	(0)	0	0.06	(0)	0	0.13	0.015	0.15	0.12	2
Benzaldehyde	100-52-7	0.02	0.02	0.07	0.10	0.09	0.31			0.01	100
Benzene	71-43-2	**0.16**	0.14	0.35	**0.51**	0.45	1.12	0.13	**3.9**	0.02	100
Bromomethane	74-83-9	0.01	0.01	0.06	0.05	0.04	0.23	5	0.01	0.04	86
1,3-Butadiene	106-99-0	0.01	0.01	0.12	0.03	0.02	0.27	0.033	0.86	0.01	63
Butyraldehyde	123-72-8	0.07	0.07	0.15	0.20	0.21	0.44			0.01	100
Carbon Disulfide	75-15-0	0.70	0.59	5.14	2.17	1.84	16.01			0.03	100
Carbon Tetrachloride	56-23-5	**0.09**	0.09	0.17	**0.59**	0.57	1.07	0.067	**8.8**	0.06	100
Chloroethane	75-00-3	(0.01)	0	0.06	(0.02)	0	0.16			0.02	46
Chloroform	67-66-3	**0.01**	0.02	0.11	**0.07**	0.10	0.54	0.043	**1.7**	0.02	67
Chloromethane	74-87-3	**0.55**	0.56	0.86	**1.13**	1.16	1.78	0.56	**2.0**	0.03	100
Chloromethylbenzene	100-44-7	(0)	0	0.04	(0)	0	0.21			0.03	2
Chloroprene	126-99-8	(0)	0	0.01	(0)	0	0.04	1	0.0006	0.08	2

[a] Analytes in bold text had annual means above the long-term health benchmark

[b] Numbers in parentheses are arithmetic means (or averages) based on less than 50 percent detection

[c] For a valid 24-hour sampling event when the analyzing laboratory reports the term "Not Detected" for a particular pollutant, the concentration of 0.0 ppbv is assigned to that pollutant. These zero concentrations were included in the calculation of annual averages and medians for each pollutant regardless of percent detection

[d] The long-term health benchmark is defined as the chemical-specific air concentration above which there may be human health concerns. For a carcinogen (cancer-causing chemical), the health benchmark is set at the air concentration that would cause no more than a one in a million increase in the likelihood of getting cancer, even after a lifetime of exposure. For a non-carcinogen, the health benchmark is the maximum air concentration to which exposure is likely to cause no harm, even if that exposure occurs on a daily basis for a lifetime. These toxicity values are not available for all chemicals. For more information, go to www.nj.gov/dep/aqpp/risk.html

[e] The risk ratio for a chemical is a comparison of the annual mean air concentration to the long-term health benchmark. If the annual mean is 0, then the annual mean risk ratio is displayed as N.A. (not applicable)

[f] There were 57 total VOC samples and 57 total carbonyl samples collected in 2006

Table 6 (Continued)
2006 Air Toxics Data for Chester, NJ

Analyte[a]	Cas #	Annual Mean (ppbv)[b,c]	Annual Median (ppbv)[b]	24-Hour Max (ppbv)	Annual Mean (μg/m^3)[b,c]	Annual Median (μg/m^3)[c]	24-hour Max (μg/m^3)	Long-Term Benchmark (μg/m^3)[d]	Annual Mean Risk Ratio[e]	Detection Limit (μg/m^3)	% Above Minimum Detection Limit[f]
Crotonaldehyde	123-73-9	0.09	0.03	0.65	0.25	0.07	1.87			0.00	98
Dibromochloromethane	594-18-3	(0)	0	0.01	(0)	0	0.10			0.10	2
m-Dichlorobenzene	541-73-1	(0)	0	0.03	(0)	0	0.18			0.02	2
o-Dichlorobenzene	95-50-1	(0)	0	0.03	(0)	0	0.18	200	0.0001	0.03	2
p-Dichlorobenzene	106-46-7	(0)	0	0.04	(0.03)	0	0.24	0.091	0.31	0.04	37
Dichlorodifluoromethane	75-71-8	0.54	0.54	0.97	2.66	2.67	4.80	200	0.01	0.02	100
1,2-Dichloroethane	107-06-2	(0)	0	0.01	(0)	0	0.04	0.038	0.04	0.06	4
cis-1,2-Dichloroethylene	156-59-2	(0)	0	0.05	(0)	0	0.20			0.06	2
Dichloromethane	75-09-2	0.10	0.07	0.46	0.34	0.24	1.60	2.1	0.16	0.06	95
Dichlorotetrafluoroethane	1320-37-2	0.02	0.02	0.02	0.12	0.14	0.14			0.02	100
Ethylbenzene	100-41-4	0.03	0.03	0.10	0.13	0.13	0.43			0.02	100
Formaldehyde	50-00-0	**1.57**	1.24	4.36	**1.93**	1.52	5.35	0.077	**25**	0.01	100
Hexachloro-1,3-butadiene	87-68-3	(0)	0	0.02	(0.01)	0	0.21	0.045	0.25	0.14	7
Hexaldehyde	66-25-1	0.03	0.02	0.06	0.10	0.09	0.24			0.01	100
Isovaleraldehyde	590-86-3	(0)	0	0.02	(0.01)	0	0.07			0.01	39
Methyl Ethyl Ketone	78-93-3	0.41	0.36	2.74	1.22	1.06	8.07			0.13	96
Methyl Isobutyl Ketone	108-10-1	0.03	0.02	0.19	0.12	0.08	0.78			0.03	60
Methyl tert-Butyl Ether	1634-04-4	(0.03)	0	0.31	(0.09)	0	1.12	3.8	0.02	0.01	37

[a] Analytes in bold text had annual means above the long-term health benchmark

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[f] There were 57 total VOC samples and 57 total carbonyl samples collected in 2006

Table 6 (Continued)

2006 Air Toxics Data for Chester, NJ

Analyte[a]	Cas #	Annual Mean (ppbv)[b,c]	Annual Median (ppbv)[b]	24-Hour Max (ppbv)	Annual Mean ($\mu g/m^3$)[b,c]	Annual Median ($\mu g/m^3$)[c]	24-hour Max ($\mu g/m^3$)	Long-Term Benchmark ($\mu g/m^3$)[d]	Annual Mean Risk Ratio[e]	Detection Limit ($\mu g/m^3$)	% Above Minimum Detection Limit[f]
n-Octane	111-65-9	0.01	0.01	0.07	0.06	0.05	0.33			0.03	63
Propionaldehyde	123-38-6	0.09	0.08	0.21	0.20	0.19	0.50			0.01	100
Propylene	115-07-1	0.24	0.20	1.39	0.41	0.34	2.39	3000	0.0001	0.02	100
Styrene	100-42-5	0.01	0.01	0.08	0.06	0.04	0.34	1.8	0.03	0.04	70
Tetrachloroethylene	127-18-4	0.02	0.02	0.11	0.12	0.14	0.75	0.17	0.74	0.07	77
Tolualdehydes		0.02	0.02	0.06	0.12	0.11	0.31			0.01	100
Toluene	108-88-3	0.18	0.14	0.84	0.69	0.53	3.17	400	0.002	0.02	100
1,2,4-Trichlorobenzene	102-82-1	(0)	0	0.05	(0.01)	0	0.37	200	0.0001	0.11	2
1,1,1-Trichloroethane	71-55-6	0.02	0.02	0.03	0.11	0.11	0.16	1000	0.0001	0.02	100
Trichloroethylene	79-01-6	(0)	0	0.04	(0.02)	0	0.21	0.5	0.04	0.05	19
Trichlorofluoromethane	75-69-4	0.26	0.26	0.52	1.48	1.46	2.92	700	0.002	0.04	100
Trichlorotrifluoroethane	26523-64-8	0.10	0.10	0.16	0.75	0.77	1.23			0.09	100
1,2,4-Trimethylbenzene	95-63-6	0.02	0.02	0.09	0.08	0.10	0.44			0.01	75
1,3,5-Trimethylbenzene	108-67-8	0.01	0.01	0.03	0.04	0.05	0.15			0.02	63
Valeraldehyde	110-62-3	0.02	0.02	0.05	0.08	0.07	0.19			0.01	100
Vinyl chloride	75-01-4	(0)	0	0.01	(0)	0	0.03	0.11	0.03	0.02	14
m,p-Xylene	1330-20-7	0.07	0.06	0.26	0.29	0.26	1.13	100	0.003	0.04	100
o-Xylene	95-47-6	0.03	0.03	0.10	0.12	0.13	0.43	100	0.001	0.02	96

[a] Analytes in bold text had annual means above the long-term health benchmark

[b] Numbers in parentheses are arithmetic means (or averages) based on less than 50 percent detection

[c] For a valid 24-hour sampling event when the analyzing laboratory reports the term “Not Detected” for a particular pollutant, the concentration of 0.0 ppbv is assigned to that pollutant. These zero concentrations were included in the calculation of annual averages and medians for each pollutant regardless of percent detection

[d] The long-term health benchmark is defined as the chemical-specific air concentration above which there may be human health concerns. For a carcinogen (cancer-causing chemical), the health benchmark is set at the air concentration that would cause no more than a one in a million increase in the likelihood of getting cancer, even after a lifetime of exposure. For a non-carcinogen, the health benchmark is the maximum air concentration to which exposure is likely to cause no harm, even if that exposure occurs on a daily basis for a lifetime. These toxicity values are not available for all chemicals. For more information, go to www.nj.gov/dep/aqpp/risk.html

[e] The risk ratio for a chemical is a comparison of the annual mean air concentration to the long-term health benchmark. If the annual mean is 0, then the annual mean risk ratio is displayed as N.A. (not applicable)

[f] There were 57 total VOC samples and 57 total carbonyl samples collected in 2006

Table 7
2006 Air Toxics Data for Elizabeth, NJ

Analyte[a]	Cas #	Annual Mean (ppbv)[b,c]	Annual Median (ppbv)[b]	24-Hour Max (ppbv)	Annual Mean ($\mu g/m^3$)[b,c]	Annual Median ($\mu g/m^3$)[c]	24-hour Max ($\mu g/m^3$)	Long-Term Benchmark ($\mu g/m^3$)[d]	Annual Mean Risk Ratio[e]	Detection Limit ($\mu g/m^3$)	% Above Minimum Detection Limit[f]
Acetaldehyde	75-07-0	**3.17**	2.94	7.21	**5.70**	5.29	12.99	0.45	**13**	0.01	100
Acetone	67-64-1	1.18	1.03	3.80	2.79	2.45	9.03	31000	0.0001	0.02	100
Acetonitrile	75-05-8	0.59	0.43	3.78	0.98	0.72	6.35	60	0.02	0.17	70
Acetylene	74-86-2	1.44	0.99	10.00	1.53	1.05	10.64			0.02	98
Acrolein	107-02-8	0.26	0.19	2.02	0.59	0.44	4.63			0.25	86
Acrylonitrile	107-13-1	**(0.01)**	0	0.32	**(0.03)**	0	0.69	0.015	**2.1**	0.12	7
tert-Amyl Methyl Ether	994-05-8	(0)	0	0.06	(0.01)	0	0.25			0.05	5
Benzaldehyde	100-52-7	0.04	0.04	0.09	0.17	0.15	0.38			0.01	100
Benzene	71-43-2	**0.41**	0.35	1.40	**1.31**	1.12	4.47	0.13	**10**	0.02	100
Bromodichloromethane	75-27-4	(0)	0	0.01	(0)	0	0.07			0.05	2
Bromoform	75-25-2	(0)	0	0.01	(0)	0	0.10	0.91	0.002	0.18	2
Bromomethane	74-83-9	0.02	0.01	0.12	0.06	0.04	0.47	5	0.01	0.04	89
1,3-Butadiene	106-99-0	**0.07**	0.05	0.28	**0.16**	0.11	0.62	0.033	**4.8**	0.01	95
Butyraldehyde	123-72-8	0.15	0.10	0.63	0.43	0.28	1.85			0.01	100
Carbon Disulfide	75-15-0	1.44	1.49	3.44	4.49	4.64	10.71			0.03	100
Carbon Tetrachloride	56-23-5	**0.09**	0.09	0.17	**0.59**	0.57	1.07	0.067	**8.8**	0.06	100
Chlorobenzene	108-90-7	(0)	0	0.03	(0)	0	0.14	1000	0.0001	0.02	5
Chloroethane	75-00-3	0.02	0.02	0.07	0.05	0.05	0.18			0.02	70

[a] Analytes in bold text had annual means above the long-term health benchmark

[b] Numbers in parentheses are arithmetic means (or averages) based on less than 50 percent detection

[c] For a valid 24-hour sampling event when the analyzing laboratory reports the term “Not Detected” for a particular pollutant, the concentration of 0.0 ppbv is assigned to that pollutant. These zero concentrations were included in the calculation of annual averages and medians for each pollutant regardless of percent detection

[d] The long-term health benchmark is defined as the chemical-specific air concentration above which there may be human health concerns. For a carcinogen (cancer-causing chemical), the health benchmark is set at the air concentration that would cause no more than a one in a million increase in the likelihood of getting cancer, even after a lifetime of exposure. For a non-carcinogen, the health benchmark is the maximum air concentration to which exposure is likely to cause no harm, even if that exposure occurs on a daily basis for a lifetime. These toxicity values are not available for all chemicals. For more information, go to www.nj.gov/dep/aqpp/risk.html

[e] The risk ratio for a chemical is a comparison of the annual mean air concentration to the long-term health benchmark. If the annual mean is 0, then the annual mean risk ratio is displayed as N.A. (not applicable)

[f] There were 57 total VOC samples and 58 total carbonyl samples collected in 2006

Table 7 (Continued)

2006 Air Toxics Data for Elizabeth, NJ

Analyte[a]	Cas #	Annual Mean (ppbv)[b,c]	Annual Median (ppbv)[b]	24-Hour Max (ppbv)	Annual Mean (µg/m^3)[b,c]	Annual Median (µg/m^3)[c]	24-hour Max (µg/m^3)	Long-Term Benchmark (µg/m^3)[d]	Annual Mean Risk Ratio[e]	Detection Limit (µg/m^3)	% Above Minimum Detection Limit[f]
Chloroform	67-66-3	**0.03**	0.02	0.12	**0.13**	0.10	0.59	0.043	**2.9**	0.02	73
Chloromethane	74-87-3	**0.55**	0.56	0.85	**1.14**	1.16	1.76	0.56	**2.0**	0.03	100
Chloroprene	126-99-8	(0)	0	0.04	(0.01)	0	0.14	1	0.01	0.08	4
Crotonaldehyde	123-73-9	0.07	0.03	0.35	0.21	0.10	1.01			0.01	98
Dibromochloromethane	594-18-3	(0)	0	0.01	(0)	0	0.10			0.10	2
m-Dichlorobenzene	541-73-1	(0)	0	0.01	(0)	0	0.06			0.02	2
o-Dichlorobenzene	95-50-1	(0)	0	0.01	(0)	0	0.06	200	0.0001	0.03	2
p-Dichlorobenzene	106-46-7	**0.03**	0.02	0.12	**0.16**	0.12	0.72	0.091	**1.7**	0.04	95
Dichlorodifluoromethane	75-71-8	0.56	0.55	1.17	2.78	2.72	5.79	200	0.01	0.02	100
1,1-Dichloroethane	75-34-3	(0)	0	0.01	(0)	0	0.04	0.63	0.001	0.02	2
1,2-Dichloroethane	107-06-2	(0)	0	0.06	(0.01)	0	0.24	0.038	0.17	0.06	5
1,1-Dichloroethene	75-35-4	(0)	0	0.11	(0.01)	0	0.44	200	0.0001	0.06	2
cis-1,2-Dichloroethylene	156-59-2	(0)	0	0.09	(0.01)	0	0.36			0.06	4
trans-1,2-Dichloroethylene	156-60-5	(0)	0	0.01	(0)	0	0.04			0.07	2
Dichloromethane	75-09-2	0.23	0.17	1.14	0.79	0.59	3.96	2.1	0.38	0.06	100
1,2-Dichloropropane	78-87-5	(0)	0	0.01	(0)	0	0.05	0.1	0.01	0.15	2
Dichlorotetrafluoroethane	1320-37-2	0.02	0.02	0.02	0.13	0.14	0.14			0.02	100
Ethyl tert-Butyl Ether	637-92-3	(0)	0	0.08	(0.01)	0	0.33			0.03	2

[a] Analytes in bold text had annual means above the long-term health benchmark

[b] Numbers in parentheses are arithmetic means (or averages) based on less than 50 percent detection

[c] For a valid 24-hour sampling event when the analyzing laboratory reports the term “Not Detected” for a particular pollutant, the concentration of 0.0 ppbv is assigned to that pollutant. These zero concentrations were included in the calculation of annual averages and medians for each pollutant regardless of percent detection

[d] The long-term health benchmark is defined as the chemical-specific air concentration above which there may be human health concerns. For a carcinogen (cancer-causing chemical), the health benchmark is set at the air concentration that would cause no more than a one in a million increase in the likelihood of getting cancer, even after a lifetime of exposure. For a non-carcinogen, the health benchmark is the maximum air concentration to which exposure is likely to cause no harm, even if that exposure occurs on a daily basis for a lifetime. These toxicity values are not available for all chemicals. For more information, go to www.nj.gov/dep/aqpp/risk.html

[e] The risk ratio for a chemical is a comparison of the annual mean air concentration to the long-term health benchmark. If the annual mean is 0, then the annual mean risk ratio is displayed as N.A. (not applicable)

[f] There were 57 total VOC samples and 58 total carbonyl samples collected in 2006

Table 7 (Continued)
2006 Air Toxics Data for Elizabeth, NJ

Analyte[a]	Cas #	Annual Mean (ppbv)[b,c]	Annual Median (ppbv)[b]	24-Hour Max (ppbv)	Annual Mean (μg/m^3)[b,c]	Annual Median (μg/m^3)[c]	24-hour Max (μg/m^3)	Long-Term Benchmark (μg/m^3)[d]	Annual Mean Risk Ratio[e]	Detection Limit (μg/m^3)	% Above Minimum Detection Limit[f]
Ethylbenzene	100-41-4	0.12	0.10	0.47	0.53	0.43	2.04			0.02	100
Formaldehyde	50-00-0	**3.70**	3.61	8.60	**4.55**	4.43	10.56	0.077	**59**	0.01	100
Hexachloro-1,3-butadiene	87-68-3	(0)	0	0.05	(0.02)	0	0.53	0.045	0.46	0.14	9
Hexaldehyde	66-25-1	0.04	0.03	0.15	0.16	0.11	0.60			0.01	100
Isovaleraldehyde	590-86-3	(0)	0	0.02	(0.01)	0	0.06			0.01	28
Methyl Ethyl Ketone	78-93-3	0.47	0.40	1.43	1.39	1.18	4.21			0.13	98
Methyl Isobutyl Ketone	108-10-1	0.05	0.04	0.20	0.19	0.16	0.82			0.03	70
Methyl Methacrylate	80-62-6	(0.01)	0	0.48	(0.04)	0	1.69	700	0.0001	0.02	9
Methyl tert-Butyl Ether	1634-04-4	0.41	0.08	4.20	1.46	0.29	15.14	3.8	0.38	0.01	84
n-Octane	111-65-9	0.07	0.05	0.37	0.32	0.23	1.73			0.03	98
Propionaldehyde	123-38-6	0.15	0.10	0.59	0.35	0.23	1.39			0.01	100
Propylene	115-07-1	2.66	1.10	13.50	4.58	1.89	23.23	3000	0.002	0.02	100
Styrene	100-42-5	0.09	0.03	3.18	0.37	0.13	13.54	1.8	0.21	0.04	89
1,1,2,2-Tetrachloroethane	79-34-5	**(0)**	0	0.19	**(0.02)**	0	1.30	0.017	**1.4**	0.09	4
Tetrachloroethylene	127-18-4	**0.05**	0.04	0.39	**0.36**	0.27	2.65	0.17	**2.1**	0.07	96
Tolualdehydes		0.03	0.03	0.10	0.16	0.14	0.50			0.01	100
Toluene	108-88-3	0.84	0.67	3.26	3.17	2.52	12.28	400	0.01	0.02	100
1,2,4-Trichlorobenzene	102-82-1	(0)	0	0.03	(0.01)	0	0.22	200	0.0001	0.11	7

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[a] Analytes in bold text had annual means above the long-term health benchmark

[b] Numbers in parentheses are arithmetic means (or averages) based on less than 50 percent detection

[c] For a valid 24-hour sampling event when the analyzing laboratory reports the term “Not Detected” for a particular pollutant, the concentration of 0.0 ppbv is assigned to that pollutant. These zero concentrations were included in the calculation of annual averages and medians for each pollutant regardless of percent detection

[d] The long-term health benchmark is defined as the chemical-specific air concentration above which there may be human health concerns. For a carcinogen (cancer-causing chemical), the health benchmark is set at the air concentration that would cause no more than a one in a million increase in the likelihood of getting cancer, even after a lifetime of exposure. For a non-carcinogen, the health benchmark is the maximum air concentration to which exposure is likely to cause no harm, even if that exposure occurs on a daily basis for a lifetime. These toxicity values are not available for all chemicals. For more information, go to www.nj.gov/dep/aqpp/risk.html

[e] The risk ratio for a chemical is a comparison of the annual mean air concentration to the long-term health benchmark. If the annual mean is 0, then the annual mean risk ratio is displayed as N.A. (not applicable)

[f] There were 57 total VOC samples and 58 total carbonyl samples collected in 2006

Table 7 (Continued)
2006 Air Toxics Data for Elizabeth, NJ

Analyte[a]	Cas #	Annual Mean (ppbv)[b,c]	Annual Median (ppbv)[b]	24-Hour Max (ppbv)	Annual Mean (µg/m^3)[b,c]	Annual Median (µg/m^3)[c]	24-hour Max (µg/m^3)	Long-Term Benchmark (µg/m^3)[d]	Annual Mean Risk Ratio[e]	Detection Limit (µg/m^3)	% Above Minimum Detection Limit[f]
1,3,5-Trimethylbenzene	108-67-8	0.04	0.03	0.16	0.18	0.15	0.79			0.02	100
Valeraldehyde	110-62-3	0.12	0.05	0.90	0.41	0.18	3.16			0.01	100
Vinyl chloride	75-01-4	(0)	0	0.02	(0.01)	0	0.05	0.11	0.07	0.02	27
m,p-Xylene	1330-20-7	0.35	0.26	1.52	1.53	1.13	6.60	100	0.02	0.04	100
o-Xylene	95-47-6	0.13	0.11	0.58	0.57	0.48	2.52	100	0.01	0.02	100

[a] Analytes in bold text had annual means above the long-term health benchmark

[b] Numbers in parentheses are arithmetic means (or averages) based on less than 50 percent detection

[c] For a valid 24-hour sampling event when the analyzing laboratory reports the term “Not Detected” for a particular pollutant, the concentration of 0.0 ppbv is assigned to that pollutant. These zero concentrations were included in the calculation of annual averages and medians for each pollutant regardless of percent detection

[d] The long-term health benchmark is defined as the chemical-specific air concentration above which there may be human health concerns. For a carcinogen (cancer-causing chemical), the health benchmark is set at the air concentration that would cause no more than a one in a million increase in the likelihood of getting cancer, even after a lifetime of exposure. For a non-carcinogen, the health benchmark is the maximum air concentration to which exposure is likely to cause no harm, even if that exposure occurs on a daily basis for a lifetime. These toxicity values are not available for all chemicals. For more information, go to www.nj.gov/dep/aqpp/risk.html

[e] The risk ratio for a chemical is a comparison of the annual mean air concentration to the long-term health benchmark. If the annual mean is 0, then the annual mean risk ratio is displayed as N.A. (not applicable)

[f] There were 57 total VOC samples and 58 total carbonyl samples collected in 2006

Table 8
2006 Air Toxics Data for New Brunswick, NJ

Analyte[a]	Cas #	Annual Mean (ppbv)[b,c]	Annual Median (ppbv)[b]	24-Hour Max (ppbv)	Annual Mean (μg/m^3)[b,c]	Annual Median (μg/m^3)[c]	24-hour Max (μg/m^3)	Long-Term Benchmark (μg/m^3)[d]	Annual Mean Risk Ratio[e]	Detection Limit (μg/m^3)	% Above Minimum Detection Limit[f]
Acetaldehyde	75-07-0	**1.88**	1.76	4.25	**3.38**	3.16	7.66	0.45	**7.5**	0.01	100
Acetone	67-64-1	0.98	0.89	3.01	2.33	2.11	7.15	31000	0.0001	0.02	100
Acetonitrile	75-05-8	(0.14)	0.0	0.78	(0.23)	0	1.31	60	0.004	0.17	44
Acetylene	74-86-2	0.73	0.50	2.31	0.78	0.53	2.46			0.02	100
Acrolein	107-02-8	0.17	0.13	1.08	0.39	0.30	2.48			0.25	64
Acrylonitrile	107-13-1	**(0.03)**	0	0.61	**(0.07)**	0	1.32	0.015	**4.4**	0.12	14
Benzaldehyde	100-52-7	0.02	0.02	0.12	0.09	0.07	0.51			0.01	100
Benzene	71-43-2	0.21	0.19	0.55	0.68	0.59	1.76	0.13	**5.2**	0.02	100
Bromomethane	74-83-9	0.01	0.01	0.04	0.05	0.04	0.16	5	0.01	0.04	94
1,3-Butadiene	106-99-0	**0.03**	0.02	0.11	**0.06**	0.04	0.24	0.033	**1.7**	0.01	82
Butyraldehyde	123-72-8	0.08	0.06	0.31	0.23	0.18	0.92			0.01	100
Carbon Disulfide	75-15-0	1.22	0.89	5.70	3.81	2.77	17.75			0.03	100
Carbon Tetrachloride	56-23-5	**0.10**	0.09	0.18	**0.61**	0.57	1.13	0.067	**9.1**	0.06	100
Chloroethane	75-00-3	0.03	0.02	0.48	0.07	0.05	1.27			0.02	68
Chloroform	67-66-3	**0.02**	0.02	0.06	**0.12**	0.10	0.29	0.043	**2.7**	0.02	82
Chloromethane	74-87-3	**0.57**	0.56	0.85	**1.18**	1.16	1.76	0.56	**2.1**	0.03	100
Chloroprene	126-99-8	(0)	0	0.01	(0)	0	0.04	1	0.001	0.08	2
Crotonaldehyde	123-73-9	0.07	0.03	0.43	0.20	0.08	1.23			0.00	98

[a] Analytes in bold text had annual means above the long-term health benchmark

[b] Numbers in parentheses are arithmetic means (or averages) based on less than 50 percent detection

[c] For a valid 24-hour sampling event when the analyzing laboratory reports the term "Not Detected" for a particular pollutant, the concentration of 0.0 ppbv is assigned to that pollutant. These zero concentrations were included in the calculation of annual averages and medians for each pollutant regardless of percent detection

[d] The long-term health benchmark is defined as the chemical-specific air concentration above which there may be human health concerns. For a carcinogen (cancer-causing chemical), the health benchmark is set at the air concentration that would cause no more than a one in a million increase in the likelihood of getting cancer, even after a lifetime of exposure. For a non-carcinogen, the health benchmark is the maximum air concentration to which exposure is likely to cause no harm, even if that exposure occurs on a daily basis for a lifetime. These toxicity values are not available for all chemicals. For more information, go to www.nj.gov/dep/aqpp/risk.html

[e] The risk ratio for a chemical is a comparison of the annual mean air concentration to the long-term health benchmark. If the annual mean is 0, then the annual mean risk ratio is displayed as N.A. (not applicable)

[f] There were 50 total VOC samples and 52 total carbonyl samples collected in 2006

Table 8 (Continued)

2006 Air Toxics Data for New Brunswick, NJ

Analyte[a]	**Cas #**	**Annual Mean (ppbv)[b,c]**	**Annual Median (ppbv)[b]**	**24-Hour Max (ppbv)**	**Annual Mean (µg/m^3)[b,c]**	**Annual Median (µg/m^3)[c]**	**24-hour Max (µg/m^3)**	**Long-Term Benchmark (µg/m^3)[d]**	**Annual Mean Risk Ratio[e]**	**Detection Limit (µg/m^3)**	**% Above Minimum Detection Limit[f]**
p-Dichlorobenzene	106-46-7	0.01	0.01	0.04	0.08	0.06	0.24	0.091	0.87	0.04	84
Dichlorodifluoromethane	75-71-8	0.54	0.53	0.75	2.67	2.62	3.71	200	0.01	0.02	100
1,2-Dichloroethane	107-06-2	(0)	0	0.02	(0)	0	0.08	0.038	0.04	0.06	2
1,1-Dichloroethene	75-35-4	(0)	0	0.05	(0)	0	0.20	200	0.00	0.06	2
cis-1,2-Dichloroethylene	156-59-2	(0.01)	0	0.22	(0.04)	0	0.87			0.06	6
Dichloromethane	75-09-2	0.12	0.11	0.48	0.43	0.38	1.67	2.1	0.20	0.06	100
Dichlorotetrafluoroethane	1320-37-2	0.02	0.02	0.02	0.12	0.14	0.14			0.02	100
Ethylbenzene	100-41-4	0.06	0.06	0.15	0.26	0.26	0.65			0.02	100
Formaldehyde	50-00-0	**2.11**	1.79	17.70	**2.59**	2.19	21.74	0.077	**34**	0.01	98
Hexachloro-1,3-butadiene	87-68-3	(0)	0	0.02	(0.01)	0	0.21	0.045	0.28	0.14	10
Hexaldehyde	66-25-1	0.03	0.02	0.56	0.13	0.07	2.30			0.01	98
Isovaleraldehyde	590-86-3	(0)	0	0.01	(0)	0	0.03			0.01	8
Methyl Ethyl Ketone	78-93-3	0.44	0.36	2.08	1.29	1.06	6.13			0.13	94
Methyl Isobutyl Ketone	108-10-1	0.03	0.03	0.21	0.14	0.12	0.86			0.03	78
Methyl tert-Butyl Ether	1634-04-4	0.09	0.03	0.57	0.33	0.11	2.06	3.8	0.09	0.01	74
n-Octane	111-65-9	0.03	0.03	0.07	0.14	0.14	0.33			0.03	94
Propionaldehyde	123-38-6	0.07	0.06	0.27	0.17	0.14	0.65			0.01	100
Propylene	115-07-1	0.42	0.37	1.22	0.72	0.63	2.10	3000	0.0002	0.02	100

[a] Analytes in bold text had annual means above the long-term health benchmark

[b] Numbers in parentheses are arithmetic means (or averages) based on less than 50 percent detection

[c] For a valid 24-hour sampling event when the analyzing laboratory reports the term “Not Detected” for a particular pollutant, the concentration of 0.0 ppbv is assigned to that pollutant. These zero concentrations were included in the calculation of annual averages and medians for each pollutant regardless of percent detection

[d] The long-term health benchmark is defined as the chemical-specific air concentration above which there may be human health concerns. For a carcinogen (cancer-causing chemical), the health benchmark is set at the air concentration that would cause no more than a one in a million increase in the likelihood of getting cancer, even after a lifetime of exposure. For a non-carcinogen, the health benchmark is the maximum air concentration to which exposure is likely to cause no harm, even if that exposure occurs on a daily basis for a lifetime. These toxicity values are not available for all chemicals. For more information, go to www.nj.gov/dep/aqpp/risk.html

[e] The risk ratio for a chemical is a comparison of the annual mean air concentration to the long-term health benchmark. If the annual mean is 0, then the annual mean risk ratio is displayed as N.A. (not applicable)

[f] There were 50 total VOC samples and 52 total carbonyl samples collected in 2006

Table 8 (Continued)
2006 Air Toxics Data for New Brunswick, NJ

Analyte[a]	Cas #	Annual Mean (ppbv)[b,c]	Annual Median (ppbv)[b]	24-Hour Max (ppbv)	Annual Mean (μg/m^3)[b,c]	Annual Median (μg/m^3)[c]	24-hour Max (μg/m^3)	Long-Term Benchmark (μg/m^3)[d]	Annual Mean Risk Ratio[e]	Detection Limit (μg/m^3)	% Above Minimum Detection Limit[f]
Styrene	100-42-5	0.02	0.03	0.08	0.10	0.11	0.34	1.8	0.06	0.04	86
1,1,2,2-Tetrachloroethane	79-34-5	(0)	0	0.01	(0)	0	0.07	0.017	0.08	0.09	2
Tetrachloroethylene	127-18-4	**0.04**	0.03	0.39	**0.26**	0.20	2.65	0.17	**1.5**	0.07	92
Tolualdehydes		0.02	0.02	0.10	0.11	0.09	0.48			0.01	96
Toluene	108-88-3	0.34	0.29	1.01	1.28	1.09	3.81	400	0.003	0.02	100
1,2,4-Trichlorobenzene	102-82-1	(0)	0	0.02	(0)	0	0.15	200	0.0001	0.11	4
1,1,1-Trichloroethane	71-55-6	0.02	0.02	0.05	0.12	0.11	0.27	1000	0.0001	0.02	100
Trichloroethylene	79-01-6	(0.01)	0.00	0.08	(0.06)	0.00	0.43	0.5	0.12	0.05	44
Trichlorofluoromethane	75-69-4	0.27	0.26	0.37	1.51	1.46	2.08	700	0.002	0.04	100
Trichlorotrifluoroethane	26523-64-8	0.10	0.10	0.12	0.74	0.77	0.92			0.09	100
1,2,4-Trimethylbenzene	95-63-6	0.04	0.03	0.14	0.21	0.15	0.69			0.01	98
1,3,5-Trimethylbenzene	108-67-8	0.01	0.01	0.04	0.07	0.05	0.20			0.02	92
Valeraldehyde	110-62-3	0.04	0.02	0.33	0.13	0.08	1.15			0.01	96
Vinyl chloride	75-01-4	(0)	0	0.01	(0.01)	0	0.03	0.11	0.07	0.02	28
m,p-Xylene	1330-20-7	0.17	0.15	0.54	0.73	0.63	2.34	100	0.01	0.04	100
o-Xylene	95-47-6	0.07	0.06	0.18	0.30	0.26	0.78	100	0.003	0.02	100

[a] Analytes in bold text had annual means above the long-term health benchmark

[b] Numbers in parentheses are arithmetic means (or averages) based on less than 50 percent detection

[c] For a valid 24-hour sampling event when the analyzing laboratory reports the term “Not Detected” for a particular pollutant, the concentration of 0.0 ppbv is assigned to that pollutant. These zero concentrations were included in the calculation of annual averages and medians for each pollutant regardless of percent detection

[d] The long-term health benchmark is defined as the chemical-specific air concentration above which there may be human health concerns. For a carcinogen (cancer-causing chemical), the health benchmark is set at the air concentration that would cause no more than a one in a million increase in the likelihood of getting cancer, even after a lifetime of exposure. For a non-carcinogen, the health benchmark is the maximum air concentration to which exposure is likely to cause no harm, even if that exposure occurs on a daily basis for a lifetime. These toxicity values are not available for all chemicals. For more information, go to www.nj.gov/dep/aqpp/risk.html

[e] The risk ratio for a chemical is a comparison of the annual mean air concentration to the long-term health benchmark. If the annual mean is 0, then the annual mean risk ratio is displayed as N.A. (not applicable)

[f] There were 50 total VOC samples and 52 total carbonyl samples collected in 2006

Table 9
Analytes with 100 percent non-detects in 2006

Analyte	CAS #	Detection Limit	Location			
			Camden	Chester	Elizabeth	New Brunswick
tert-Amyl Methyl Ether	994-05-8	0.05015		X		X
Bromochloromethane	74-97-5	0.100544	X	X	X	X
Bromodichloromethane	75-27-4	0.046904	X	X		X
Bromoform	75-25-2	0.17575	X	X		X
Chlorobenzene	108-90-7	0.023018		X		X
Chloromethylbenzene	100-44-7	0.025887	X		X	X
Chloroprene	126-99-8	0.079665	X			
Dibromochloromethane	594-18-3	0.099274				X
1,2-Dibromoethane	106-93-4	0.138317	X	X	X	X
m-Dichlorobenzene	541-73-1	0.024051	X			X
o-Dichlorobenzene	95-50-1	0.030063				X
1,1-Dichloroethane	75-34-3	0.024287	X	X		X
1,1-Dichloroethene	75-35-4	0.055513	X	X		
trans-1,2-Dichloroethylene	156-60-5	0.071374	X	X		X
1,2-Dichloropropane	78-87-5	0.152497	X	X		X
cis-1,3-Dichloropropene	542-75-6	0.063547	X	X	X	X
trans-1,3-Dichloropropene	542-75-6	0.040852	X	X	X	X
2,5-Dimethylbenzaldehyde	5799-94-2	0.004939	X	X	X	X
Ethyl Acrylate	140-88-5	0.045039		X	X	X
Ethyl tert-Butyl Ether	637-92-3	0.029253	X	X		X
Methyl Methacrylate	80-62-6	0.021126	X	X		X
1,1,2,2-Tetrachloroethane	79-34-5	0.089251	X	X		
1,1,2-Trichloroethane	79-00-5	0.032741		X		X

In 2006, these chemicals were never collected above the detection limits, however, they may be present in the air below the detection limit level.

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2006 Atmospheric Deposition Summary

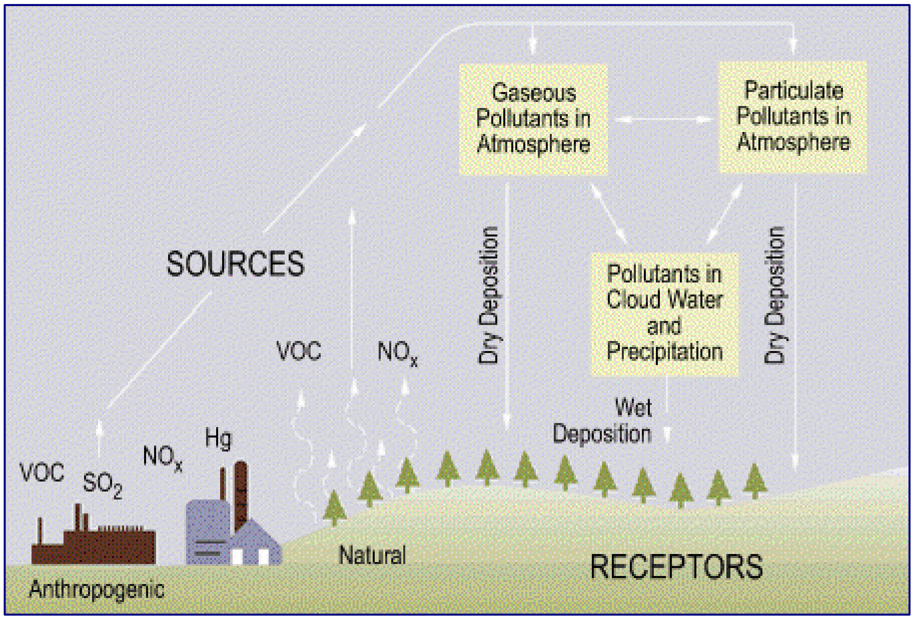
New Jersey Department of Environmental Protection

NATURE AND SOURCES

Atmospheric deposition refers to pollutants that are deposited on land or water from the air. Deposition is usually the result of pollutants being removed from the atmosphere and deposited by precipitation (wet deposition) or by the settling out of particulates (dry deposition). Dry deposition also includes gaseous pollutants that are absorbed by land or water bodies. Figure 1 shows the basic mechanisms of deposition and the major pollutants of concern. These include sulfur dioxide (SO2), nitrogen oxides (NO_X), mercury (Hg), and volatile organic compounds (VOCs). SO2 is a major contributor to acid deposition, which can reduce the ability of water bodies to support certain types of fish and other aquatic organisms. NO_X also contributes to the acid deposition problem and can contribute to eutrophication of water bodies as well. Hg will accumulate in fish by a process known as bio-magnification. Small amounts of Hg in water are concentrated in smaller organisms. These smaller organisms are in turn consumed by larger ones. As the Hg moves up the food chain, it becomes more concentrated. Fish in Hg contaminated water can become contaminated to the point where they are no longer safe for people to eat. For more information on Hg in fish see “A Guide to Health Advisories for Eating Fish and Crabs Caught in New Jersey Waters” which is available at www.state.nj.us/dep/dsr/njmainfish.htm. VOCs are a very diverse group of compounds, some of which are toxic, including known carcinogens.

Atmospheric deposition is the result of pollution from a wide variety of sources and in some cases the pollution can travel great distances before being deposited on the land or water. Some known sources of atmospheric deposition are power plants, motor vehicles, incinerators, and certain industries.

Figure 1



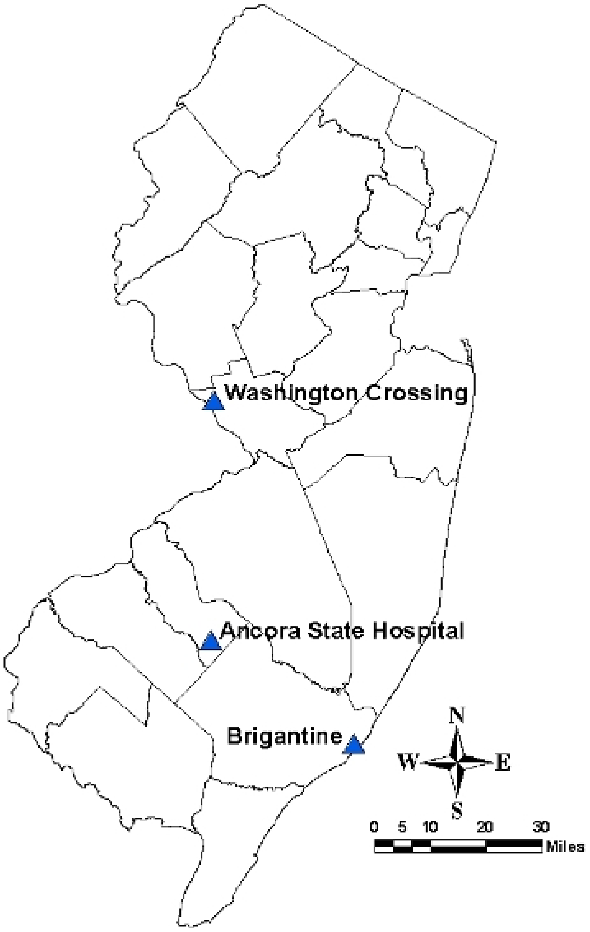
Source: USEPA Clean Air Markets
Web Site: http://www.epa.gov/airmarkets/acidrain/index.html#what

MONITORING LOCATIONS

In 2006 there were three active deposition monitoring sites in New Jersey. Two of them are part of the National Atmospheric Deposition Program's (NADP) National Trends Network (NTN) . These sites are located at Washington Crossing State Park and the Edwin B. Forsythe National Wildlife Refuge (NWR), also known as Brigantine, and are shown in Figure 2. A sample is collected each week from the sites, and is then shipped to the Central Analytical Laboratory (CAL) at the Illinois State Water Survey (ISWS) for analysis. The CAL analyzes each sample with the goal of providing data on amounts, trends, and geographic distributions of acids, nutrients, and base cations in precipitation. The resulting data is then used by the U.S. Environmental Protection Agency to assess national deposition patterns and trends. (NADP, 2007)

In addition to the NADP sites, the state collected samples at a site at the Ancora State Hospital in Camden County. Samples from that site are normally analyzed at the Department's own laboratory, but this year there were problems with the laboratory equipment and these samples have not been analyzed. Each of the sites has a sampler for collecting wet deposition (rain and snow) and a rain gauge for determining precipitation amounts.

Figure 2
Acid Precipitation Monitoring Network - 2006



SUMMARY OF 2006 DATA

A summary of the 2006 wet deposition data is provided in Table 1. The table shows total deposition, pH, conductivity and concentrations of several important ions. When acidity is reported on the pH scale, neutral is considered a 7 with decreasing pH values corresponding to increasing acidity. Normal rainfall has a pH of approximately 5.6 due to the natural presence of carbonic acid in the air. The mean pH value recorded at the Washington Crossing State Park weekly sampler was 4.43 and the Edwin B. Forsythe NWR sampler recorded a mean pH of 4.70.

Conductivity is a measure of the total density of ions in the water collected. It is used as an indicator of the total amount of pollution in the sample. Conductivity is the ability of the water to conduct electricity and generally increases as the concentration of ions in water increases.

Concentrations of specific ions considered important because they can affect the chemistry of lakes, streams and other water bodies, are also reported for each site. Summaries are provided for each season of the year along with annual averages in Table 1.

Table 1
Acid Precipitation Monitoring Network - 2006
Annual and Seasonal Averages

Weighted by Precipitation Amount

Ca^{2+} - Calcium
Mg^{+} - Magnesium
K^{+} - Potassium
Na^{+} - Sodium
NH_4 - Ammonium
NO_3^{-} - Nitrate
Cl^{-} - Chloride
SO_4^{2-} - Sulfate
– - No Data

Cond. - Specific conductance
cm - Centimeter
uS/cm - MicroSiemens per centimeter
mg/L - Milligrams per liter
<MDL - Below minimum detection limit
Winter - December – February
Spring - March – May
Summer - June – August
Fall - September – November

Edwin B. Forsythe National Wildlife Refuge – Weekly

	Precip. cm	pH	Cond. uS/cm	Ca^{2+} mg/L	Mg^{+} mg/L	K^{+} mg/L	Na^{+} mg/L	NH_4^{-} mg/L	NO_3^{-} mg/L	Cl^{-} mg/L	SO_4^{2-} mg/L
Winter	29.41	4.76	14.97	0.077	0.089	0.033	0.784	0.075	0.587	1.394	0.849
Spring	16.82	4.63	22.41	0.150	0.123	0.055	0.967	0.369	1.214	1.748	1.777
Summer	33.30	4.52	20.73	0.080	0.053	0.094	0.362	0.306	0.939	0.700	1.864
Fall	40.73	4.92	20.34	0.114	0.238	0.080	2.007	0.073	0.396	3.610	1.053
Annual	111.05	4.70	19.50	0.101	0.134	0.074	1.103	0.181	0.697	1.996	1.353

Washington Crossing State Park – Weekly

	Precip. cm	pH	Cond. uS/cm	Ca^{2+} mg/L	Mg^{+} mg/L	K^{+} mg/L	Na^{+} mg/L	NH_4^{-} mg/L	NO_3^{-} mg/L	Cl^{-} mg/L	SO_4^{2-} mg/L
Winter	28.04	4.64	15.81	0.070	0.049	0.020	0.413	0.107	0.915	0.751	0.964
Spring	19.28	4.50	21.28	0.136	0.047	0.035	0.284	0.396	1.576	0.526	1.815
Summer	41.05	4.16	37.99	0.137	0.031	0.016	0.094	0.484	1.847	0.238	3.648
Fall	45.09	4.69	12.66	0.049	0.032	0.022	0.253	0.154	0.614	0.469	1.055
Annual	127.61	4.43	22.23	0.095	0.037	0.022	0.237	0.289	1.202	0.455	1.953

WET DEPOSITION

Acid deposition is primarily the result of sulfuric and nitric acids and ammonium derived from atmospheric emissions of sulfur dioxide, nitrogen oxides, and ammonia. Excessive deposition of these materials can have significant environmental impacts on both terrestrial and freshwater ecosystems through acidification of soil and water bodies, reducing the diversity of aquatic organisms and stressing native vegetation. (Driscoll et al, 2003)

Sulfate, for example, can alter soil and water chemistry, and a deposition level of 20 kilograms per hectare per year has been generally accepted as the limit above which damage to sensitive natural resources is likely to occur (i.e. Aquatic Effect Level). Deposition in rain and snow is often expressed as mass per unit land area over time.

Figures 3 and 6 show the change in the amount of sulfate ion deposited over the last several years at the sites in Washington Crossing State Park and the Edwin B. Forsythe NWR, respectively. Figures 4 and 7 show the change in the amount of ammonium ion deposited at these sites, and Figures 5 and 8 shows the change in the amount of nitrate ion deposited. All figures below show “wet deposition” only. They do not include dry particulate deposited when no precipitation was occurring. Therefore, the total deposition is higher than what is shown here.

The year to year variations in the charts below are a function of both the concentrations of sulfate, nitrate, and ammonium in air and cloud droplets, and the total amount of precipitation that occurs each year. For example, in 1991 and 1992, both the sulfate concentrations and the total precipitation were below normal, while they were high in 1993 and 1994. Since the data is in the form of annual totals, it is also sensitive to loss of samples due to contamination or other factors.

According to the New Jersey Comparative Risk Project Ecological Technical Work Group, streams and lakes with significant buffering capacity are somewhat protected from the effects of acid deposition. It is for this reason that actual risk assessments are primarily based on the direct observation of pH in streams and lakes, and on actual observed effects on aquatic species, rather than on deposition measurements alone.

To convert the values shown in Figure 3 through Figure 8 to pounds per acre per year, multiply by 0.89 (since one kilogram equals 2.21 pounds and one hectare equals 2.47 acres).

<table>
<tr><th colspan="2">Figure 3 through 8 Data Legend</th></tr>
<tr><td>●</td><td>Met Criteria</td></tr>
<tr><td>▲</td><td>Did Not Meet Criteria</td></tr>
<tr><td colspan="2">All Raw Data for Figure 3 through 8 were obtained from the NADP website. NADP criteria requirements can also be found at http://nadp.sws.uiuc.edu/.</td></tr>
</table>

Figure 3
Sulfate (SO4) NADP/NTN Site NJ99 (Washington Crossing State Park)
Annual Wet Depositions (1981 - 2006)
Kilograms Per Hectare (kg/ha)

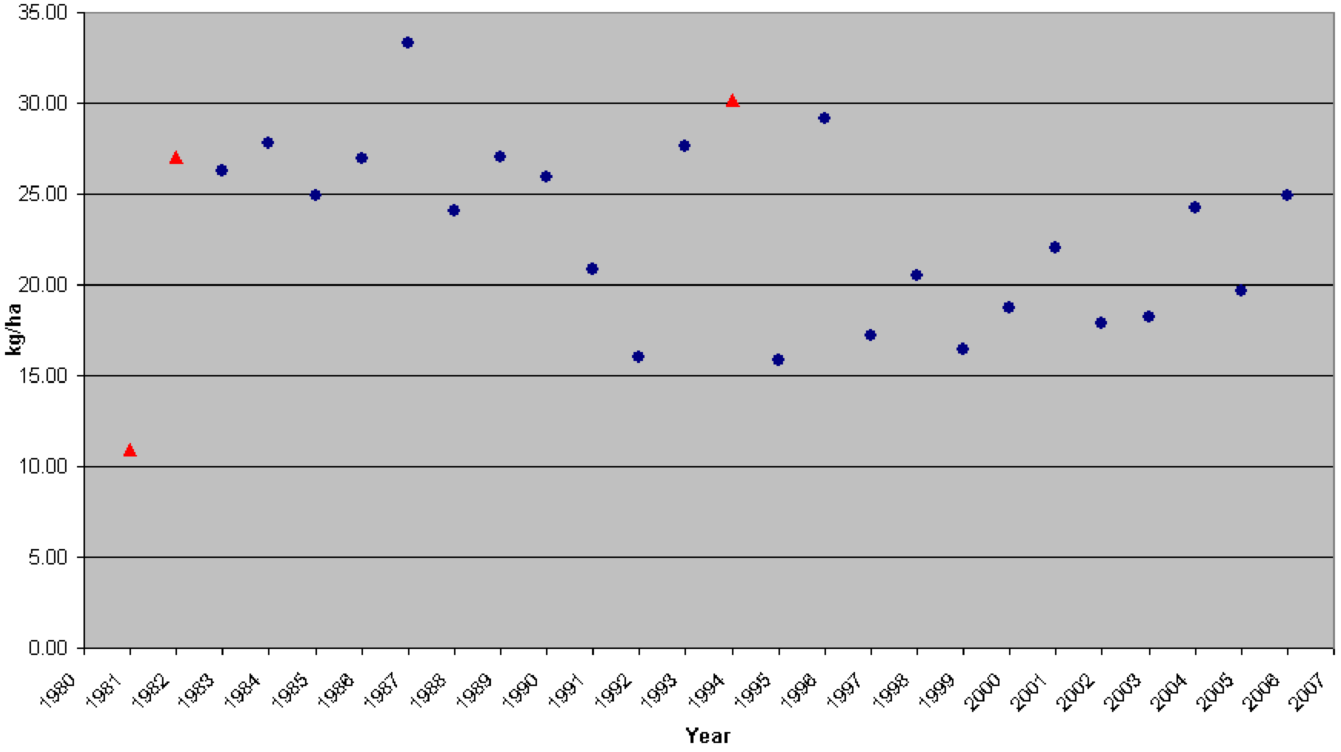


Figure 4
Ammonium (NH4) NADP/NTN Site NJ99 (Washington Crossing State Park)
Annual Wet Depositions (1981 - 2006)
Kilograms Per Hectare (kg/ha)

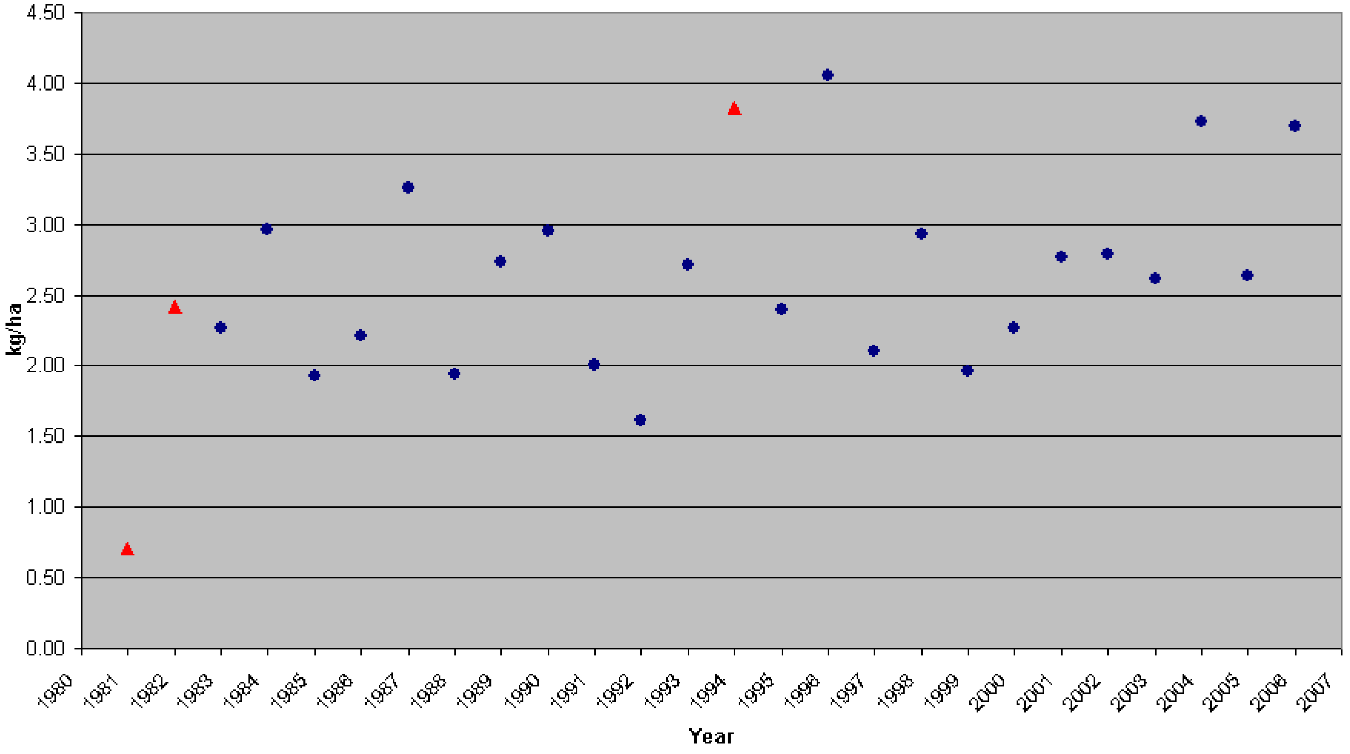


Figure 5
Nitrate (NO3) NADP/NTN Site NJ99 (Washington Crossing State Park)
Annual Wet Depositions (1981 - 2006)
Kilograms Per Hectare (kg/ha)

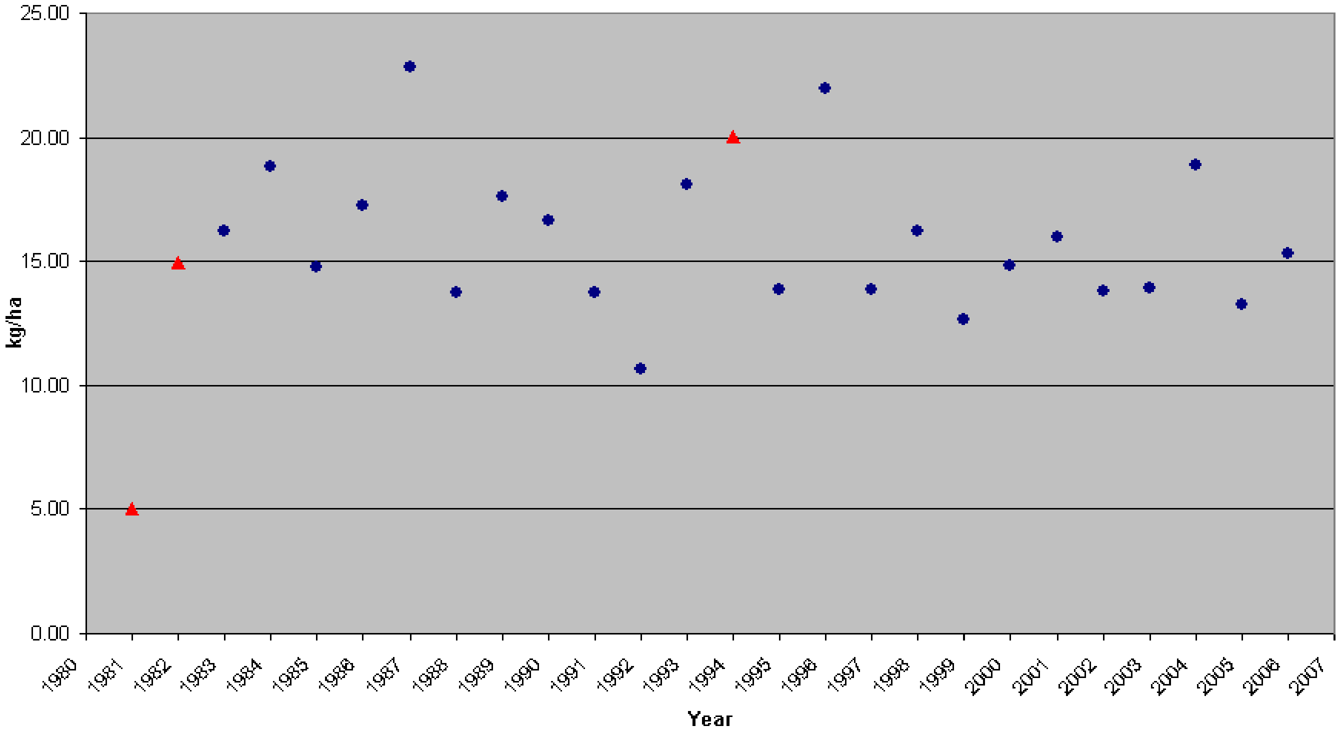


Figure 6
Sulfate (SO4) NADP/NTN Site NJ00 (Edwin B. Forsythe National Wildlife Refuge)
Annual Wet Depositions (1998 - 2006)
Kilograms Per Hectare (kg/ha)

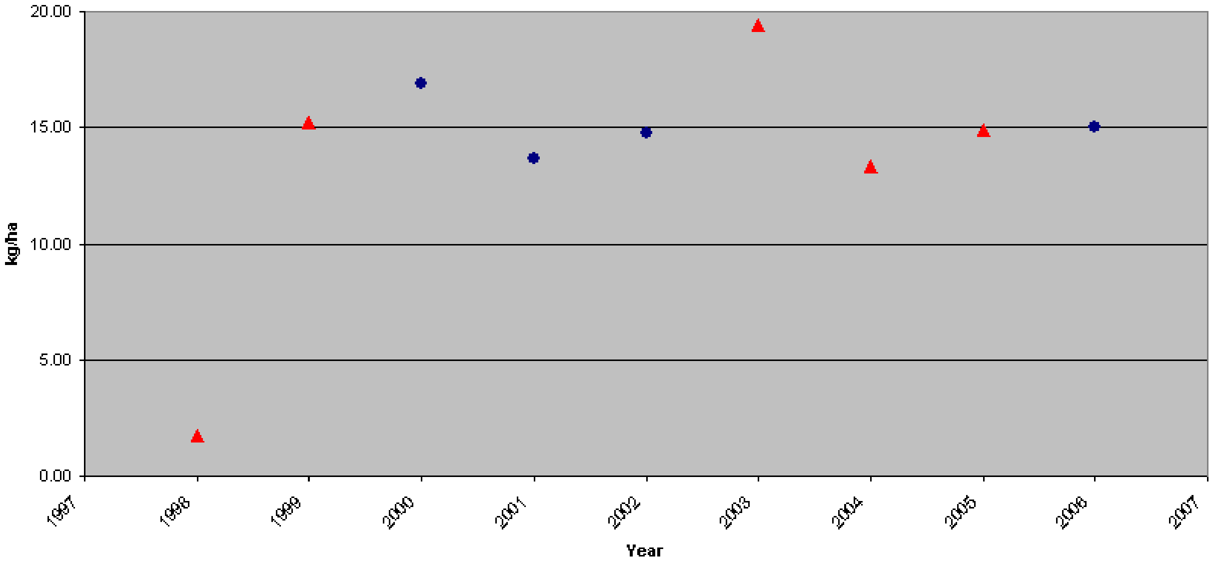


Figure 7
Ammonium (NH4) NADP/NTN Site NJ00 (Edwin B. Forsythe National Wildlife Refuge)
Annual Wet Depositions (1998 - 2006)
Kilograms Per Hectare (kg/ha)

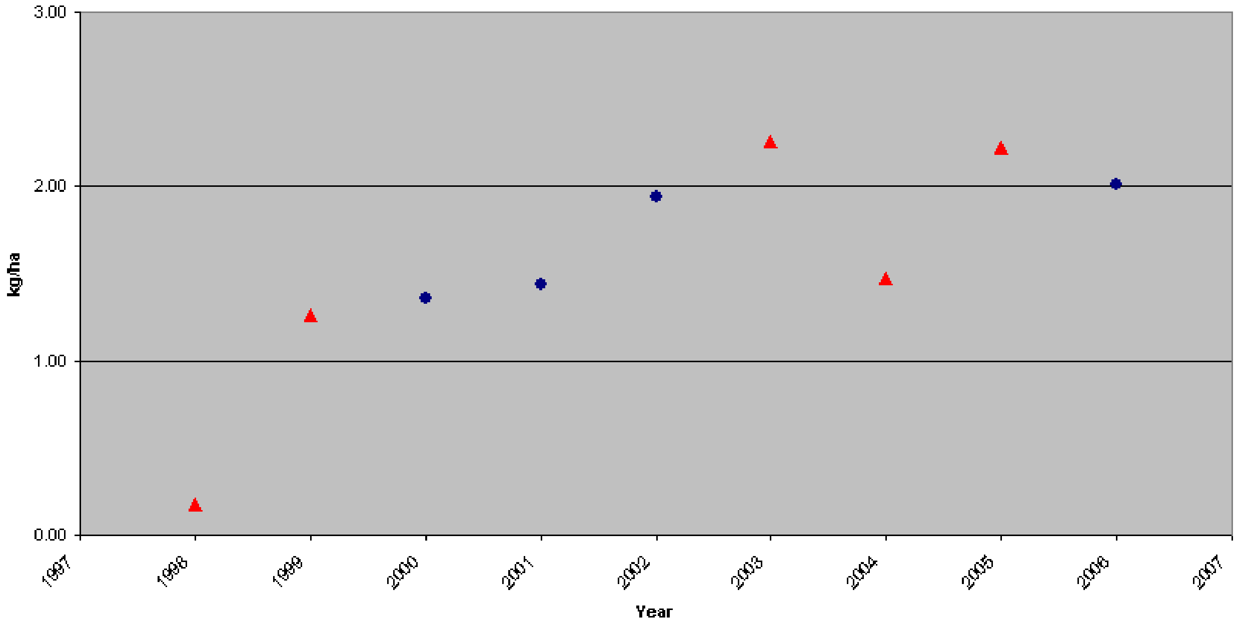
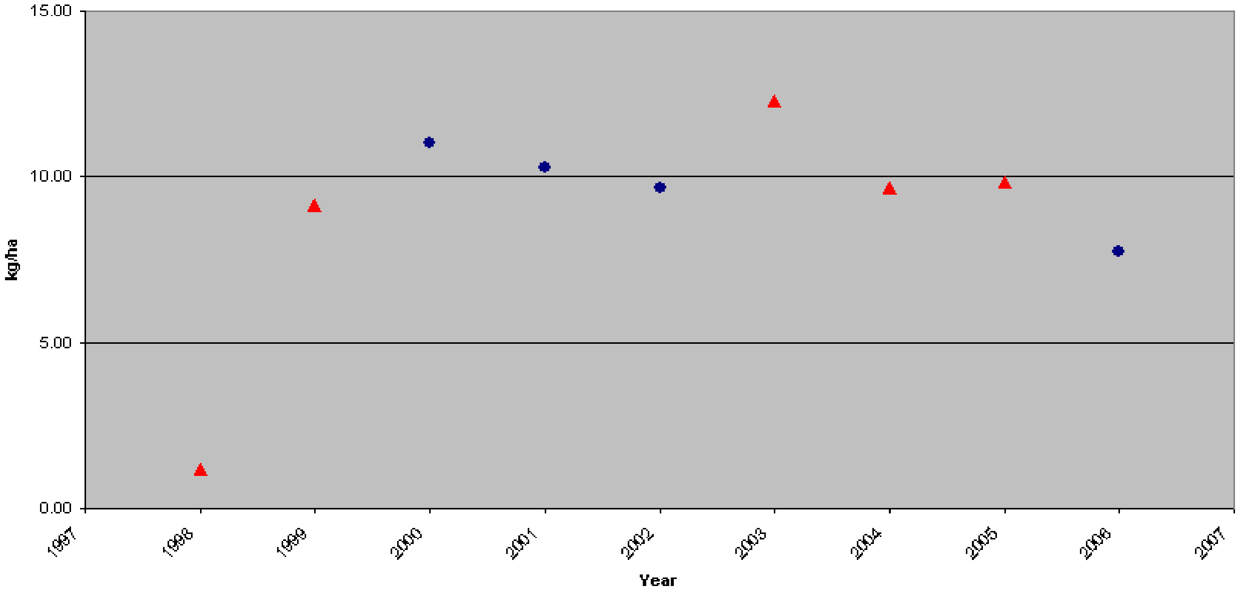


Figure 8
Nitrate (NO3) NADP/NTN Site NJ00 (Edwin B. Forsythe National Wildlife Refuge)
Annual Wet Depositions (1998 - 2006)
Kilograms Per Hectare (kg/ha)



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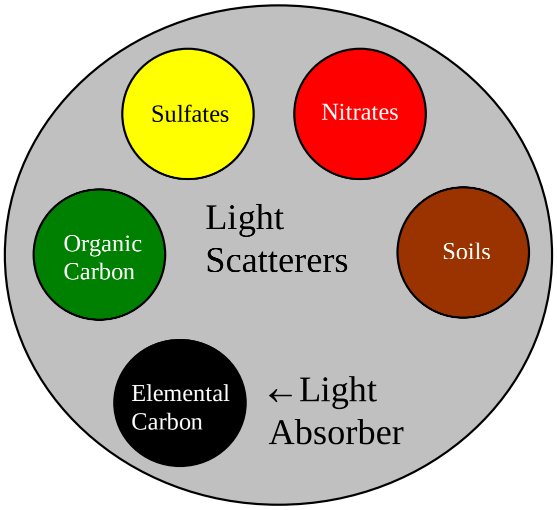
2006 Regional Haze & Visibility Summary

New Jersey Department of Environmental Protection

THE BASICS OF HAZE

Haze is caused when sunlight encounters tiny pollution particles in the air. Some light is absorbed by particles; other light is scattered away before it reaches an observer. Small particles and certain gaseous molecules in the atmosphere cause poor visibility by scattering or absorbing light (see Figure 1). More pollutants mean more absorption and scattering of light, which reduce the clarity and color of what we see. When high concentrations of such pollutants are well mixed in the atmosphere, they form a uniform haze that can obscure distant objects. Some types of particles such as sulfates scatter more light, particularly during humid conditions. Sometimes haze is the result of pollutants that have been transported considerable distances on the prevailing winds. While some visibility impairment occurs even under natural conditions, man-made aerosols are the primary cause. Air pollutants come from a variety of natural and manufactured sources. Natural sources can include windblown dust and soot from wildfires. Man-made sources can include motor vehicles, electric utility and industrial fuel burning, and manufacturing operations.

Figure 1
Contributors to Visibility Impairment



ANATOMY OF REGIONAL HAZE

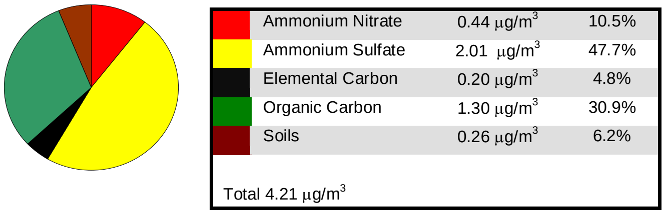
Data collected over the last decade show that fine particle concentrations, and hence visibility impairment, are highest in the industrialized and densely populated areas of the Northeast and Mid-Atlantic. Sulfate (SO_4) is the primary culprit and typically constitutes 40% of the total fine mass in the region even on clear days. It can account for 60-80% of the total fine mass on very hazy days. Organic carbon usually accounts for the next largest portion of total fine particle mass. It can account for 20-30% on the haziest days. The remainder of the mass is made up primarily of nitrate (NO_3), elemental carbon, and fine soil particles.

PARTICLES AND VISIBILITY

Figure 2 shows the makeup of fine particles collected at the IMPROVE (Interagency Monitoring of Protected Visual Environments) site located north of Atlantic City in the Edwin B. Forsythe Wildlife Refuge (Brigantine).

Figure 2
Composition of Fine Particles on Days with Good Visibility Compared to Days with Poor Visibility
Brigantine,
New Jersey, 2006

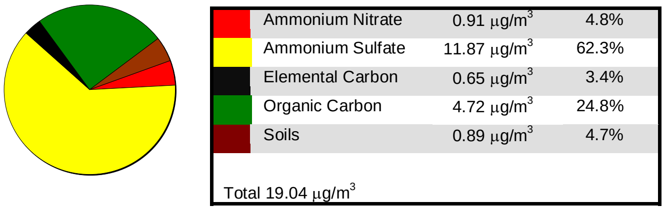
Average Fine Mass Composition on Days with Good Visibility



🟥	Ammonium Nitrate	0.44 $\mu g/m^3$	10.5%
🟨	Ammonium Sulfate	2.01 $\mu g/m^3$	47.7%
⬛	Elemental Carbon	0.20 $\mu g/m^3$	4.8%
🟩	Organic Carbon	1.30 $\mu g/m^3$	30.9%
🟫	Soils	0.26 $\mu g/m^3$	6.2%

Total 4.21 $\mu g/m^3$

Average Fine Mass Composition on Days with Poor Visibility



🟥	Ammonium Nitrate	0.91 $\mu g/m^3$	4.8%
🟨	Ammonium Sulfate	11.87 $\mu g/m^3$	62.3%
⬛	Elemental Carbon	0.65 $\mu g/m^3$	3.4%
🟩	Organic Carbon	4.72 $\mu g/m^3$	24.8%
🟫	Soils	0.89 $\mu g/m^3$	4.7%

Total 19.04 $\mu g/m^3$

Evaluations of the data for 2006 indicate that sulfates accounted for approximately half of the fine particle mass. Most visibility impairment is due to sulfate, which can have a greater effect on light extinction (a measure of visibility impairment) than all other types of fine particles combined. Higher sulfate values in the summer can be attributed to the greater photochemical conversion of sulfur dioxide (SO_2) to SO_4 that results from the increased sunlight during the summertime. (Malm, 1999)

HOW IS HAZE REGULATED?

In 1999, the U.S. Environmental Protection Agency announced a major effort to improve air quality in national parks and wilderness areas aimed at achieving national visibility goals by 2064. The Regional Haze Rule calls for state and federal agencies to work together to improve visibility in 156 National Parks and wilderness areas such as the Grand Canyon, Yosemite, the Great Smokies and Shenandoah. This "regional haze rule" addresses the combined visibility effects of numerous pollution sources over a wide geographic region and how they impact Class I areas. Class I areas as defined by the Clean Air Act, include national parks greater than 6,000 acres, wilderness areas and national memorial parks greater than 5,000 acres, and international parks that existed as of August 1977. The rule requires the states, in coordination with the Environmental Protection Agency, the National Park Service, U.S. Fish and Wildlife Service, the U.S. Forest Service, and other interested parties, to develop and implement air quality protection plans to reduce the pollution that causes visibility impairment. The first State plans for regional haze is due in the 2003-2008 timeframe. Five multi-state regional planning organizations are working together now to develop the technical basis for these plans.

SOURCES OF HAZE CONTRIBUTORS

The following categories of air pollutants are the major contributors to haze.

Sulfate particles form in the air from sulfur dioxide gas. Most of this gas is released from coal-burning power plants and other industrial sources, such as smelters, industrial boilers, and oil refineries. Sulfates are the largest contributor to haze in the eastern U.S., due to the large number of coal-fired power plants that affect the region. In humid environments, sulfate particles grow rapidly to a size that is very efficient at scattering light, thereby exacerbating the problem in the East.

Organic carbon particles are emitted directly into the air and are also formed by the reaction of various gaseous hydrocarbons. Sources of direct and indirect organic carbon particles include vehicle exhaust, vehicle refueling, solvent evaporation (e.g., paints), food cooking, and various commercial and industrial sources. Gaseous hydrocarbons are also emitted naturally from trees and from fires, but these sources usually have only a small or short-term effect on overall visibility.

Nitrate particles form in the air from nitrogen oxide gas. This gas is released from virtually all combustion activities, especially those involving cars, trucks, off-road engines (e.g., construction equipment, lawn mowers, and boats), power plants, and other industrial sources. Like sulfates, nitrates scatter more light in humid environments.

Elemental carbon particles are very similar to soot. They are smaller than most other particles and tend to absorb rather than scatter light. The "brown clouds" often seen in winter over urban areas and in mountain valleys can be largely attributed to elemental carbon. These particles are emitted directly into the air from virtually all combustion activities, but are especially prevalent in diesel exhaust and smoke from the burning of wood and wastes.

Soils are very similar to dust. It enters the air from dirt roads, fields, and other open spaces as a result of wind, traffic, and other surface activities. Whereas other types of particles form from the condensation and growth of microscopic particles and gasses, crustal material results from the crushing and grinding of larger, earth-born material. Because it is difficult to reduce this material to microscopic sizes, crustal material tends to be larger than other particles and tends to fall from the air sooner, contributing less to the overall effect of haze.

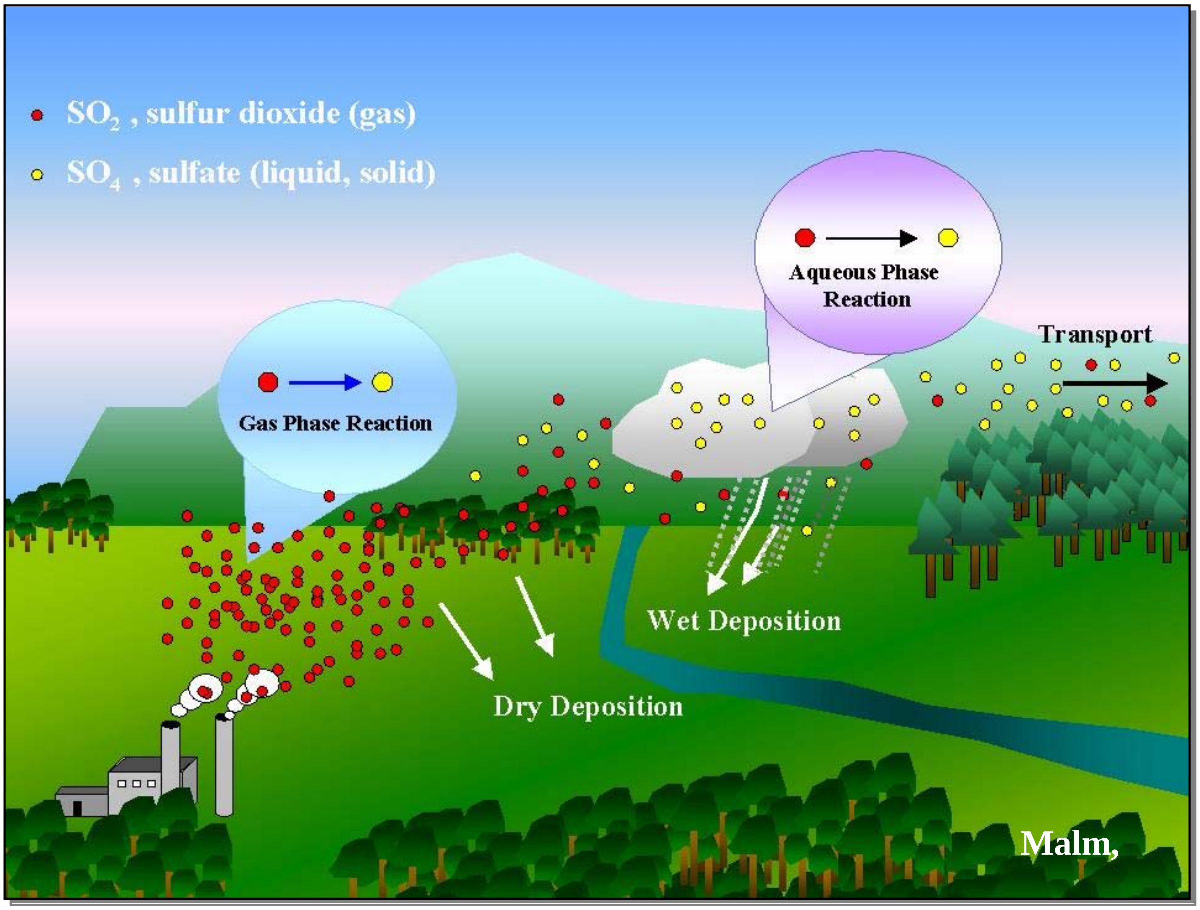
Source – www.hazecam.net

ENVIRONMENTAL EFFECTS

Regional haze is probably most closely associated with its effects on prized vistas such as the Grand Canyon or Acadia National Park. Its impacts may be difficult to quantify but it certainly has a negative overall effect on aesthetics and the outdoors, and how natural areas throughout the nation are enjoyed. But haze also affects urban area and scenes, and can obscure or eclipse the view of an urban skyline (see Figures 4 and 5) or other important urban landmarks such as the Washington Monument.

The pollution that causes regional haze has additional, multifaceted effects on the environment. The most abundant contributor to regional haze, sulfates, eventually make their way into the ecosystem through deposition - that is, they are transferred from the air into the water and soils (see Figure 3). Too much deposition can have adverse environmental effects, upsetting the delicate balance of the ecosystem. Increased sulfates in the atmosphere leads to acid rain while increased nitrates promote eutrophication of streams and lakes by depleting available oxygen (see section on Atmospheric Deposition).

Figure 3
Illustration of How Sulfates Enter the Ecosystem by way of Deposition



MONITORING OF HAZE IN NEW JERSEY

Typical visual range in the eastern U.S. is 15 to 30 miles, or about one-third of what it would be without man-made air pollution. In the West, the typical visual range is 60 to 90 miles, or about one-half of the visual range under natural conditions. Haze diminishes the natural visual range. (www.hazecam.net)

Visiblity and haze are monitored in two locations in New Jersey; Newark and Brigantine. The monitor in Newark measures the impact of haze on visisbility by using a digital camera. The camera is located inside the New Jersey Transit building and is pointed at the New York City skyline. On clear days the entire skyline, as well as each individual building, is easily distinguishable (Figure 4). The Manhattan skyline appears non-existent when conditions conducive to haze formation are in place (Figure 5).

Visibility Camera – New Jersey Transit Building

Figure 4

Figure 5

The IMPROVE site located within the Brigantine National Wildlife Refuge monitors haze and visibility using several types of instruments. Figure 6 below is an example of a clear day in Brigantine as the Atlantic City skyline is easily distinguishable along the horizon. The example of a hazy day in Brigantine is illustrated below in Figure 7 and not only has the skyline disappeared but the water that was visible in the foreground in the clear picture also seems to have vanished in the haze.

Visibility Camera – Brigantine National Wildlife Refuge

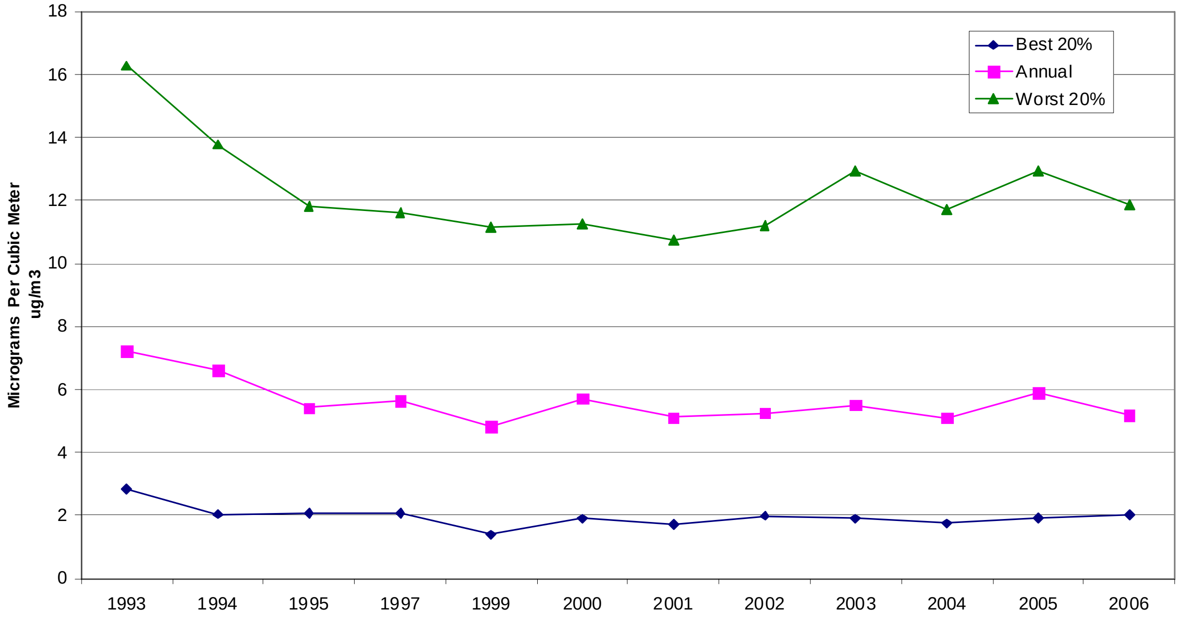
Figure 6

Figure 7

This last graph (Figure 8) represents the annual trend of sulfates expressed in micrograms per cubic meter measured at the Brigantine National Wildlife Refuge.

Besides the trend in annual average sulfate concentrations, the graph illustrates the trend in average sulfate concentrations for the 20 percent worst and 20 percent best visibility days.

Figure 8
Sulfate Trend Summary
Brigantine, NJ
1993-2006



Insufficient data available for 1996 and 1998

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Malm, *William, C., Introduction to Visibility,* Air Resources Division, National Park Service, Cooperative Institute for Research in the Atmosphere (CIRA), NPS Visibility Program, Colorado State University, Fort Collins, CO, May 1999.

Regional Haze and Visibility in the Northeast and Mid-Atlantic States, Northeast States for Coordinated Air Use Management, January, 2001

vista.cira.colostate.edu/views

www.hazecam.net

Appendix A

2006 Air Monitoring Sites

New Jersey Department of Environmental Protection

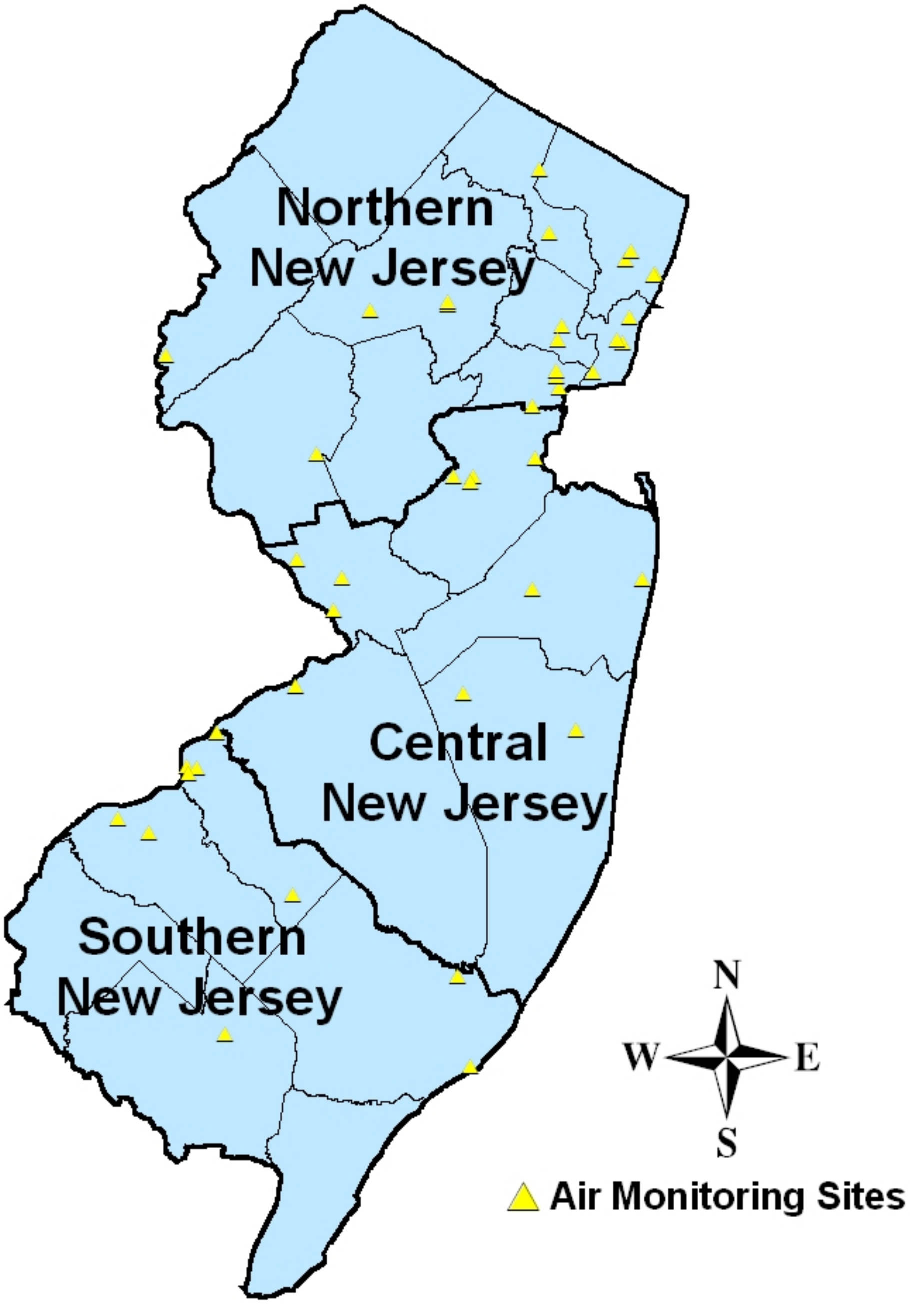

Figure 1
Northern New Jersey
Air Monitoring Sites

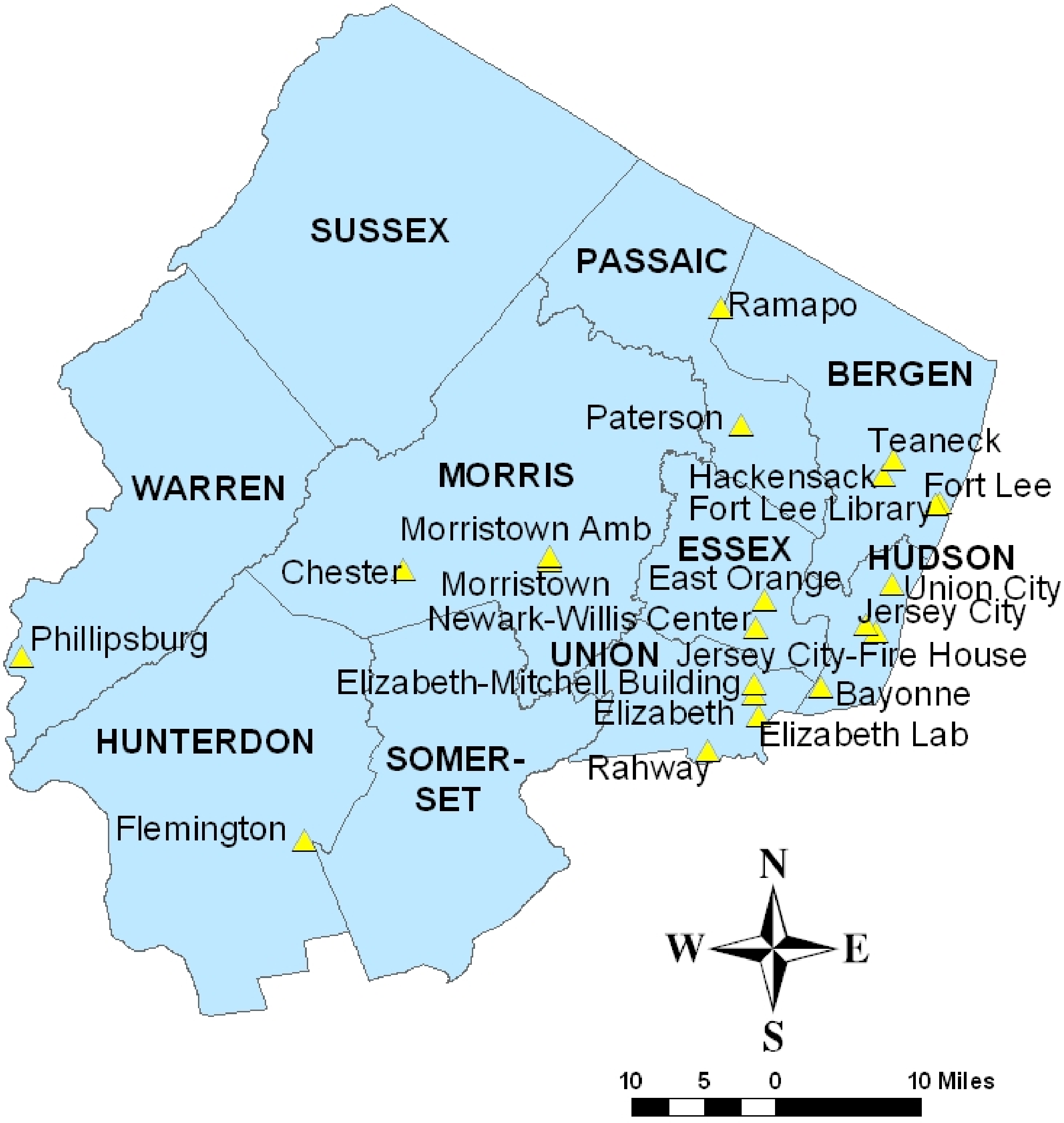

Table 1
Northern New Jersey Air Monitoring Sites

County	Monitoring Site	AIRS Code	Parameter(s) Measured[1]	Coordinates (Decimal degrees)		Address
				Latitude	Longitude	
BERGEN	Fort Lee	34 003 0004	CO, TEOM, PM_{10}	40.854551	- 73.967797	Lemoine Avenue Overpass over I-95
	Fort Lee-Library	34 003 0003	$PM_{2.5}$	40.852256	- 73.973314	Fort Lee Public Library, 320 Main Street
	Hackensack	34 003 5001	CO, SO_2, SS	40.882373	- 74.042172	133 River St. near Moore & Mercer Streets
	Teaneck	34 003 0005	NO_x, O_3	40.898583	- 74.029889	1000 River Road, Fairleigh Dickinson University
ESSEX	East Orange	34 013 1003	CO, NO_x, MET	40.757501	- 74.200500	Engine No. 2, Dr. Martin Luther King Blvd. (Main Street) & Greenwood Ave.
	Newark-Willis Center	34 013 0015	$PM_{2.5}$	40.730286	- 74.212738	Mary Willis Cultural Center 447 18th Ave.
HUDSON	Bayonne	34 017 0006	NO_x, O_3, SO_2	40.670250	- 74.126081	Veterans Park, 25th St. near Park Road
	Jersey City	34 017 1002	CO, SO_2, SS	40.731690	- 74.066566	2828 Kennedy Blvd.
	Jersey City-Firehouse	34 017 1003	$PM_{2.5}$, PM_{10}, TEOM	40.725454	- 74.052290	Firehouse, 355 Newark Ave.
	Union City	34 017 2002	$PM_{2.5}$	40.772793	-74.031718	Health Department, 714 31st Street
HUNTERDON	Flemington	34 019 0001	O_3, SS, MET, TEOM	40.515270	- 74.806659	Raritan Twp. MUA, 365 Old York Road
MORRIS	Chester	34 027 3001	NO_x, O_3, SO_2, MET, $PM_{2.5}$, TOXICS	40.787628	- 74.676301	Bldg. #1, Lucent Tech., Route 513
	Morristown	34 027 0003	CO, SS	40.797342	-74.482494	11 Washington St.
	Morristown-Ambulance Squad	34 027 0004	$PM_{2.5}$	40.801584	- 74.483817	Ambulance Squad, 16 Early St.
PASSAIC	Paterson	34 031 0005	$PM_{2.5}$	40.918381	-74.168092	Health Department, 176 Broadway Ave.
	Ramapo	34 031 5001	O_3	41.052195	- 74.256338	Access Road, off Skyline Drive, Wanaque Borough
UNION	Elizabeth	34 039 0003	CO, SO_2, SS	40.662451	- 74.214745	7 Broad St.
	Elizabeth Lab	34 039 0004	CO, NO_x, SO_2, SS, TEOM, MET, $PM_{2.5}$, TOXICS	40.641440	- 74.208365	Interchange 13, NJTP
	Elizabeth-Mitchell Building	34 039 0006	$PM_{2.5}$	40.673406	-74.213889	Mitchell Bldg., 500 North Broad Street
	Rahway	34 039 2003	$PM_{2.5}$, TEOM	40.603943	- 74.276174	Fire Dept. Bldg., 1300 Main Street
WARREN	Phillipsburg	34 041 0006	$PM_{2.5}$	40.699207	- 75.180525	Municipal Bldg., 675 Corliss Avenue

[1] See Parameter Codes, Table 4 (page Appendix A-8)

Figure 2
Central New Jersey Air Monitoring Sites

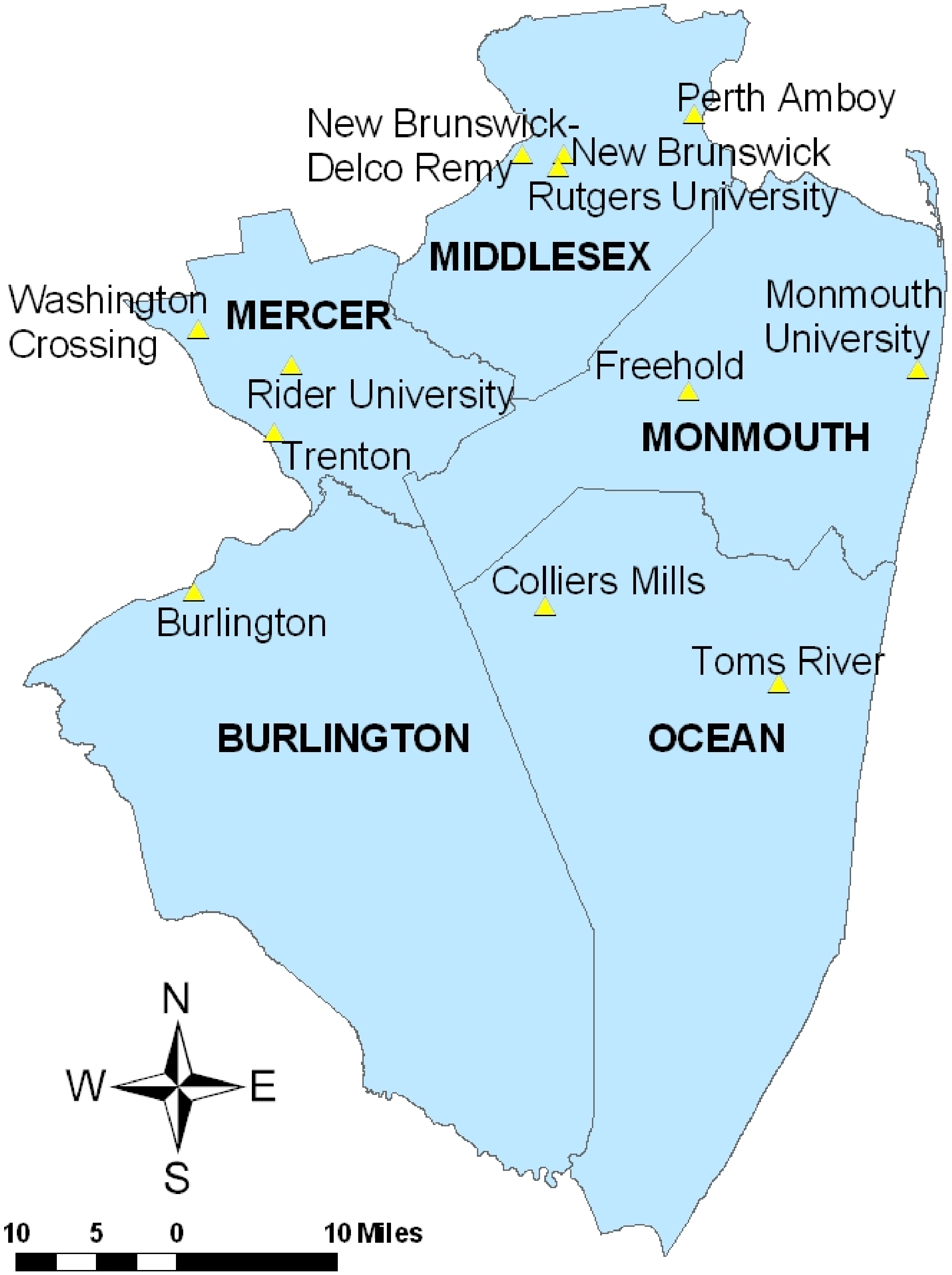

Table 2
Central New Jersey Air Monitoring Sites

County	Monitoring Site	AIRS Code	Parameter(s) Measured[1]	Coordinates (Decimal degrees)		Address
				Latitude	Longitude	
BURLINGTON	Burlington	34 005 1001	CO, SO_2, SS	40.078062	- 74.857717	1 East Broad Street
MERCER	Rider University	34 021 0005	NO_x, O_3, PAMS, MET	40.283188	- 74.742245	Athletic Fields, Route 206 South, Lawrenceville
	Trenton	34 021 0008	$PM_{2.5}$, PM_{10}	40.222285	- 74.763147	Trenton Library, 120 Academy Street
	Washington Crossing	34 021 8001	$PM_{2.5}$, ACID	40.673406	-74.853617	Washington Crossing State Park, off Church Road, Titusville
MIDDLESEX	New Brunswick	34 023 0006	TEOM, $PM_{2.5}$, TOXICS	40.472786	- 74.422515	Cook College, Log Cabin Road
	New Brunswick-Delco Remy	34 023 1003	Pb, TSP	40.472944	- 74.470833	End of 12th Street, West of Joyce Kilmer Avenue
	Perth Amboy	34 023 2003	CO, SO_2, SS	40.508764	-74.268083	130 Smith Street, Perth Amboy
	Rutgers University	34 023 0011	NO_x, O_3, MET, PAMS	40.462182	- 74.429439	Horticultural Farm #3, off Ryder's Lane, New Brunswick
MONMOUTH	Freehold	34 025 2001	CO, SS	40.259895	- 74.274689	5 West Main Street
	Monmouth University	34 025 0005	O_3	40.278461	- 74.005343	Edison Science Bldg., 400 Cedar Ave., West Long Branch
OCEAN	Colliers Mills	34 029 0006	O_3	40.064847	-74.444058	Colliers Mills Wildlife Management Area
	Toms River	34 029 2002	$PM_{2.5}$	39.994908	-74.170447	Elementary School, 1517 Hooper Avenue

[1] See Parameter Codes, Table 4 (page Appendix A-8)

Figure 3
Southern New Jersey
Air Monitoring Sites

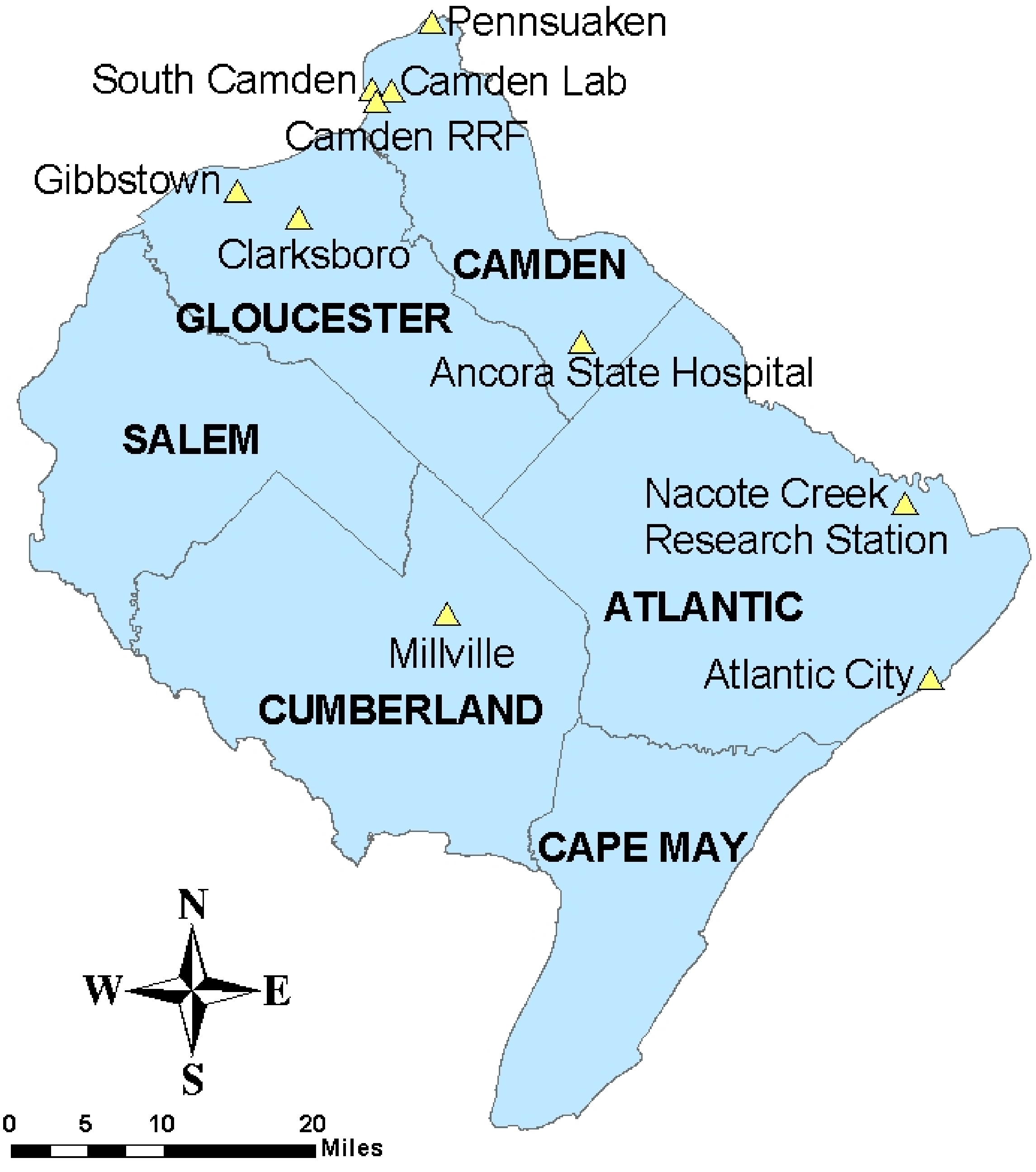

Table 3
Southern New Jersey Air Monitoring Sites

County	Monitoring Site	AIRS Code	Parameter(s) Measured[1]	Coordinates (Decimal degrees)		Address
				Latitude	Longitude	
ATLANTIC	Atlantic City	34 001 1006	PM$_{2.5}$, PM$_{10}$	39.363528	-74.431219	Atlantic-Cape May Community College, 1535 Bacharach Blvd., Atlantic City
	Nacote Creek Research Station	34 001 0005	O$_3$, SO$_2$	39.530250	- 74.460694	Brigantine National Wildlife Refuge near Smithville
CAMDEN	Ancora State Hospital	34 007 1001	CO, O$_3$, SO$_2$, ACID	39.684250	- 74.861491	Ancora State Hospital, 202 Spring Garden Road, Hammonton
	South Camden	34 007 0010	TEOM	39.923995	- 75.122382	Camden County Sewage Treatment Plant, 1645 Ferry Avenue
	Camden Lab	34 007 0003	CO, NO$_x$, O$_3$, SO$_2$, SS, TEOM, MET, PAMS, PM$_{2.5}$, TOXICS	39.923042	- 75.097617	1667 Davis Street, corner of Copewood St.
	Camden-RRF	34 007 0009	PM$_{10}$	39.912431	- 75.116864	Camden RRF, Morgan Blvd. & I-676
	Pennsauken	34 007 1007	PM$_{2.5}$	39.989036	-75.050008	Morris-Delair WTP, near Griffith Morgan Lane
CUMBERLAND	Millville	34 011 0007	NO$_x$, O$_3$, SO$_2$,TEOM	39.422273	- 75.025204	Lincoln Avenue & Route 55
GLOUCESTER	Clarksboro	34 015 0002	O$_3$, SO$_2$	39.800317	-74.212131	Clarksboro Shady Lane Rest Home, County House Road
	Gibbstown	34 015 5001	PM$_{2.5}$	39.825720	- 75.289390	Municipal Building, 420 Washington Street

[1] See Parameter Codes, Table 4 (page Appendix A-8)

Table 4
Parameter Codes

ACID	Acid Deposition	$PM_{2.5}$	Fine Particles (2.5 Microns or less) collected by a Federal Reference Method $PM_{2.5}$ Sampler
CO	Carbon Monoxide	TEOM	Continuous $PM_{2.5}$ Analyzer
MET	Meteorological Parameters	SO_2	Sulfur Dioxide
NO_x	Nitrogen Dioxide and Nitric Oxide	SS	Smoke Shade
O_3	Ozone	Pb	Lead
PAMS	Photochemical Assessment Monitoring Station	TOXICS	Air Toxics
PM_{10}	Coarse Particles (10 Microns or less) collected by a Federal Reference Method PM_{10} Sampler	TSP	Total Suspended Particulates

Appendix B

Fine Particulate Speciation Summary- 2006

New Jersey Department of Environmental Protection

Table 1
Fine Particulate Speciation Data – 2006
Camden Lab, New Jersey

Concentrations in Micrograms Per Cubic Meter ($\mu g/m^3$)

Pollutant	Annual Average Concentration	Daily Average Maximum Concentration	Daily Average 2nd Highest Concentration
Aluminum	0.0717	0.5320	0.4127
Ammonium	1.4736	4.5909	4.0725
Antimony	0.0020	0.0431	0.0268
Arsenic	0.0009	0.0034	0.0029
Barium	0.0072	0.3303	0.0176
Bromine	0.0029	0.0087	0.0079
Cadmium	0.0015	0.0142	0.0141
Calcium	0.0733	0.3354	0.2990
Cerium	0.0015	0.0647	0.0070
Cesium	0.0000	0.0007	0.0006
Chlorine	0.0272	0.3246	0.2456
Chromium	0.0056	0.0684	0.0262
Cobalt	0.0001	0.0013	0.0011
Copper	0.0066	0.0208	0.0192
Elemental carbon	0.6563	3.2603	1.3928
Europium	0.0000	0.0000	0.0000
Gallium	0.0005	0.0033	0.0027
Gold	0.0003	0.0029	0.0023
Hafnium	0.0001	0.0021	0.0012
Indium	0.0015	0.0212	0.0186
Iridium	0.0006	0.0058	0.0036
Iron	0.1606	0.9613	0.5927
Lanthanum	0.0004	0.0082	0.0076
Lead	0.0035	0.0111	0.0095
Magnesium	0.0103	0.0716	0.0625
Manganese	0.0023	0.0099	0.0075
Mercury	0.0009	0.0062	0.0058
Molybdenum	0.0001	0.0036	0.0000
Nickel	0.0038	0.0225	0.0154
Niobium	0.0006	0.0043	0.0040
Nitrate	1.1704	6.8156	3.9037

Table 1 (Continued)
Fine Particulate Speciation Data – 2006
Camden Lab, New Jersey

Concentrations in Micrograms Per Cubic Meter ($\mu g/m^3$)

Pollutant	Annual Average Concentration	Daily Average Maximum Concentration	Daily Average 2nd Highest Concentration
Organic carbon	3.8258	8.8649	6.8875
Phosphorus	0.0010	0.0325	0.0149
Potassium	0.0667	0.2910	0.2574
Rubidium	0.0004	0.0032	0.0025
Samarium	0.0007	0.0126	0.0052
Scandium	0.0001	0.0034	0.0000
Selenium	0.0011	0.0046	0.0043
Silicon	0.1633	1.2798	0.8556
Silver	0.0026	0.0178	0.0148
Sodium	0.1290	0.8686	0.5073
Strontium	0.0013	0.0056	0.0051
Sulfate	3.6277	13.0286	10.1109
Sulfur	1.2993	5.5455	3.6107
Tantalum	0.0004	0.0124	0.0022
Terbium	0.0000	0.0010	0.0000
Tin	0.0022	0.0230	0.0124
Titanium	0.0038	0.0477	0.0267
Total mass	14.6915	45.4592	44.4743
Vanadium	0.0085	0.0611	0.0442
Wolfram	0.0013	0.0103	0.0078
Yttrium	0.0005	0.0041	0.0021
Zinc	0.0123	0.0378	0.0308
Zirconium	0.0024	0.0298	0.0115

Table 2
Fine Particulate Speciation Data – 2006
Chester, New Jersey

Concentrations in Micrograms Per Cubic Meter ($\mu g/m^3$)

Pollutant	Annual Average Concentration	Daily Average Maximum Concentration	Daily Average 2nd Highest Concentration
Aluminum	0.0167	0.0759	0.0619
Ammonium	1.0110	3.7009	3.1374
Antimony	0.0031	0.0315	0.0291
Arsenic	0.0009	0.0035	0.0034
Barium	0.0007	0.0151	0.0078
Bromine	0.0019	0.0108	0.0041
Cadmium	0.0017	0.0254	0.0202
Calcium	0.0117	0.0642	0.0446
Cerium	0.0000	0.0002	0.0000
Cesium	0.0002	0.0079	0.0029
Chlorine	0.0026	0.0431	0.0294
Chromium	0.0056	0.0895	0.0635
Cobalt	0.0001	0.0010	0.0008
Copper	0.0017	0.0126	0.0112
Elemental carbon	0.3187	1.4590	1.0928
Europium	0.0003	0.0042	0.0040
Gallium	0.0005	0.0027	0.0022
Gold	0.0006	0.0040	0.0033
Hafnium	0.0000	0.0000	0.0000
Indium	0.0017	0.0210	0.0181
Iridium	0.0003	0.0040	0.0023
Iron	0.0445	0.2798	0.2651
Lanthanum	0.0003	0.0055	0.0051
Lead	0.0021	0.0099	0.0079
Magnesium	0.0082	0.0859	0.0825
Manganese	0.0011	0.0041	0.0037
Mercury	0.0007	0.0102	0.0045
Molybdenum	0.0002	0.0052	0.0040
Nickel	0.0024	0.0235	0.0227
Niobium	0.0006	0.0054	0.0049
Nitrate	0.6715	3.5438	3.1741
Organic carbon	2.7419	8.0902	5.8824
Phosphorus	0.0004	0.0069	0.0056
Potassium	0.0294	0.1022	0.0923
Rubidium	0.0003	0.0020	0.0015
Samarium	0.0004	0.0058	0.0035
Scandium	0.0000	0.0000	0.0000
Selenium	0.0010	0.0057	0.0040

Table 2 (Continued)
Fine Particulate Speciation Data – 2006
Chester, New Jersey

Concentrations in Micrograms Per Cubic Meter ($\mu g/m^3$)

Pollutant	Annual Average Concentration	Daily Average Maximum Concentration	Daily Average 2nd Highest Concentration
Silicon	0.0322	0.3759	0.1916
Silver	0.0014	0.0136	0.0077
Sodium	0.0694	0.3347	0.2497
Strontium	0.0009	0.0118	0.0023
Sulfate	2.8660	12.9839	9.8457
Sulfur	0.9734	4.1826	3.2608
Tantalum	0.0004	0.0078	0.0048
Terbium	0.0000	0.0019	0.0000
Tin	0.0019	0.0309	0.0182
Titanium	0.0006	0.0085	0.0058
Total mass	9.8670	30.3970	25.0541
Vanadium	0.0012	0.0059	0.0051
Wolfram	0.0005	0.0051	0.0049
Yttrium	0.0006	0.0035	0.0032
Zinc	0.0065	0.0191	0.0160
Zirconium	0.0009	0.0200	0.0045

Table 3
Fine Particulate Speciation Data – 2006
Elizabeth Lab, New Jersey

Concentrations in Micrograms Per Cubic Meter ($\mu g/m^3$)

Pollutant	Annual Average Concentration	Daily Average Maximum Concentration	Daily Average 2nd Highest Concentration
Aluminum	0.0377	0.3314	0.2117
Ammonium	1.4764	5.3743	4.5026
Antimony	0.0010	0.0174	0.0163
Arsenic	0.0008	0.0037	0.0030
Barium	0.0012	0.0123	0.0115
Bromine	0.0032	0.0146	0.0114
Cadmium	0.0019	0.0162	0.0127
Calcium	0.0305	0.1050	0.0785
Cerium	0.0001	0.0027	0.0007
Cesium	0.0000	0.0006	0.0001
Chlorine	0.0216	0.2839	0.2041
Chromium	0.0056	0.0275	0.0266
Cobalt	0.0001	0.0012	0.0011
Copper	0.0089	0.1428	0.0204
Elemental carbon	1.6362	5.5110	3.5755
Europium	0.0001	0.0038	0.0035
Gallium	0.0006	0.0029	0.0025
Gold	0.0005	0.0036	0.0031
Hafnium	0.0001	0.0036	0.0002
Indium	0.0016	0.0221	0.0176
Iridium	0.0005	0.0040	0.0040
Iron	0.1365	0.4282	0.3020
Lanthanum	0.0000	0.0007	0.0000
Lead	0.0039	0.0234	0.0187
Magnesium	0.0103	0.1034	0.0871
Manganese	0.0022	0.0061	0.0050
Mercury	0.0005	0.0081	0.0042
Molybdenum	0.0000	0.0018	0.0000
Nickel	0.0048	0.0191	0.0141
Niobium	0.0005	0.0070	0.0052
Nitrate	1.2121	5.9872	4.5715
Organic carbon	4.4170	11.6643	8.6050
Phosphorus	0.0015	0.0412	0.0182
Potassium	0.0422	0.2106	0.1671
Rubidium	0.0005	0.0033	0.0020
Samarium	0.0003	0.0049	0.0036
Scandium	0.0000	0.0000	0.0000
Selenium	0.0009	0.0037	0.0035

Table 3 (Continued)
Fine Particulate Speciation Data – 2006
Elizabeth Lab, New Jersey

Concentrations in Micrograms Per Cubic Meter ($\mu g/m^3$)

Pollutant	Annual Average Concentration	Daily Average Maximum Concentration	Daily Average 2nd Highest Concentration
Silicon	0.0623	0.6491	0.2798
Silver	0.0010	0.0105	0.0088
Sodium	0.1118	0.5156	0.4239
Strontium	0.0019	0.0254	0.0168
Sulfate	3.4157	15.1530	10.4869
Sulfur	1.1633	4.8626	3.6647
Tantalum	0.0001	0.0043	0.0020
Terbium	0.0000	0.0000	0.0000
Tin	0.0055	0.0756	0.0349
Titanium	0.0017	0.0192	0.0116
Total mass	14.0938	42.3493	36.8464
Vanadium	0.0071	0.0581	0.0423
Wolfram	0.0014	0.0112	0.0111
Yttrium	0.0005	0.0041	0.0038
Zinc	0.0134	0.0597	0.0315
Zirconium	0.0015	0.0126	0.0119

Table 4
Fine Particulate Speciation Data – 2006
New Brunswick, New Jersey

Concentrations in Micrograms Per Cubic Meter (μg/m^3)

Pollutant	Annual Average Concentration	Daily Average Maximum Concentration	Daily Average 2nd Highest Concentration
Aluminum	0.0290	0.1947	0.1840
Ammonium	1.2296	4.7168	4.1810
Antimony	0.0029	0.0397	0.0222
Arsenic	0.0006	0.0036	0.0025
Barium	0.0014	0.0166	0.0117
Bromine	0.0026	0.0150	0.0070
Cadmium	0.0004	0.0118	0.0058
Calcium	0.0146	0.0546	0.0536
Cerium	0.0001	0.0052	0.0027
Cesium	0.0000	0.0009	0.0000
Chlorine	0.0223	0.3173	0.2722
Chromium	0.0073	0.0891	0.0474
Cobalt	0.0001	0.0014	0.0012
Copper	0.0045	0.0199	0.0137
Elemental carbon	0.5945	2.2229	1.9354
Europium	0.0001	0.0025	0.0020
Gallium	0.0004	0.0021	0.0021
Gold	0.0004	0.0036	0.0028
Hafnium	0.0000	0.0011	0.0000
Indium	0.0013	0.0233	0.0189
Iridium	0.0007	0.0069	0.0058
Iron	0.0789	0.2774	0.2113
Lanthanum	0.0005	0.0072	0.0058
Lead	0.0034	0.0131	0.0126
Magnesium	0.0052	0.0539	0.0379
Manganese	0.0024	0.0155	0.0099
Mercury	0.0007	0.0072	0.0064
Molybdenum	0.0001	0.0031	0.0000
Nickel	0.0030	0.0260	0.0149
Niobium	0.0004	0.0058	0.0029
Nitrate	0.8371	5.4820	3.5748
Organic carbon	3.3441	6.6110	6.2375
Phosphorus	0.0009	0.0366	0.0078
Potassium	0.0370	0.1232	0.1167
Rubidium	0.0004	0.0021	0.0020
Samarium	0.0009	0.0073	0.0048
Scandium	0.0001	0.0022	0.0006
Selenium	0.0008	0.0039	0.0027

Table 4 (Continued)
Fine Particulate Speciation Data – 2006
New Brunswick, New Jersey

Concentrations in Micrograms Per Cubic Meter (μg/m^3)

Pollutant	Annual Average Concentration	Daily Average Maximum Concentration	Daily Average 2nd Highest Concentration
Silicon	0.0342	0.3278	0.1089
Silver	0.0013	0.0143	0.0085
Sodium	0.1028	0.5487	0.4999
Strontium	0.0008	0.0035	0.0033
Sulfate	3.2444	15.5319	10.5496
Sulfur	1.0946	5.1777	3.8168
Tantalum	0.0005	0.0094	0.0054
Terbium	0.0000	0.0000	0.0000
Tin	0.0027	0.0376	0.0268
Titanium	0.0020	0.0399	0.0134
Total mass	11.7387	33.3919	33.2301
Vanadium	0.0019	0.0138	0.0071
Wolfram	0.0007	0.0082	0.0043
Yttrium	0.0006	0.0031	0.0028
Zinc	0.0107	0.0436	0.0371
Zirconium	0.0012	0.0125	0.0120