Annual Report on Air Quality 1996

MAINE
Department of Environmental Protection

1996 ANNUAL REPORT
ON AIR QUALITY
IN THE STATE OF MAINE

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Cover Photo:
McFarland Hill monitoring site at Acadia National Park

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1. INTRODUCTION

1.1 Purpose and Overview

The purpose of this report is to present the air quality monitoring data generated by and for the Maine Department of Environmental Protection, Bureau of Air Quality, and to provide a historical perspective from which the significance of that data can be interpreted. Air Quality monitoring measures the concentrations of various pollutants in the ambient air. The monitoring is in response to State and Federal requirements to determine whether the air we breathe is attaining and maintaining National and State Ambient Air Quality Standards which are designed to protect the health and welfare of the public. Federal Primary Standards are intended to protect public health. Federal Secondary Standards are intended to protect public welfare. The State Standards are at least as strict as Federal Standards and in some cases are more strict. The reasoning behind establishing more stringent standards is that generally air quality in Maine is significantly cleaner than in other areas and should remain cleaner. The current Federal and State Standards are presented in Tables 1-1 and 1-2. Table 1-3 is a summary indicating all the exceedances of ambient air quality standards or health warning levels in the State by counties. Later on in this report those exceedances will be listed by the sites at which they occurred.

A portion of the data collected in the State is collected by industry. The DEP has required industry to establish monitoring programs primarily when there are air quality problems associated with the industry, or when an industry is planning to build or expand causing a potential increase in air emissions. At one time the majority of the data was collected by industry but as air quality problems have been resolved the amount of monitoring has decreased. Currently, only about one third of the data is collected by industry. The State is still collecting monitoring data for long term trends, special studies and for compliance determinations. Ambient air monitoring by both industry and the State will continue in various regions where necessary until such time as standards are being met and background information has been collected.

Included in this section are some figures which depict some of the results of air quality monitoring and control in the State. Figures 1-1 through 1-4 display trends or the lack of a trend which have been occurring at several long term key sites around the State.

Figure 1-1 indicates trends over the last twelve years in the annual arithmetic means for fine particulate. The majority of the sites collecting PM_{10} data are showing either a downward trend or are low enough that they are probably recording regional background concentrations and are not indicating a significant trend in either direction.

Figures 1-2 and 1-3 indicate the sulfur dioxide trends at five sites with a long term history. All of the sites appear to indicate relatively stable long term sulfur dioxide levels since 1983 with no

TABLE 1-1
NATIONAL AMBIENT AIR QUALITY STANDARDS (1996)

POLLUTANT	AVERAGING TIME	CONCENTRATION
Particulates (PM_{10})	Expected Annual Arithmetic Mean:	
	Primary	50 ug/m^3
	Secondary	50 ug/m^3
	Twenty-Four Hour:**	
	Primary	150 ug/m^3
	Secondary	150 ug/m^3
Lead (Pb)	Calendar Quarter	1.5 ug/m^3
Carbon Monoxide (CO)	One Hour*	35 ppm
	Eight Hour*	9 ppm
Ozone (O_3)	One Hour**	0.12 ppm
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	0.05 ppm
Sulfur Dioxide (SO_2)	Annual Arithmetic Mean	0.03 ppm
	Twenty-Four Hour*	0.14 ppm
	Three-Hour Secondary*	0.50 ppm

TABLE 1-2
STATE OF MAINE AMBIENT AIR QUALITY STANDARDS (1996)

POLLUTANT	AVERAGING TIME	CONCENTRATION
Particulates (PM_{10})	Annual Arithmetic Mean	40 ug/m^3
	Twenty-Four Hour**	150 ug/m^3
Particulates (TSP)***	Twenty-Four Hour	150 ug/m^3
Lead (Pb)	Twenty-Four Hour*	1.5 ug/m^3
Carbon Monoxide (CO)	One Hour*	35 ppm (40 mg/m^3)
	Eight Hour*	9 ppm (10 mg/m^3)
Ozone (O_3)	One Hour**	.12 ppm
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	.053 ppm (100 ug/m^3)
Sulfur Dioxide (SO_2)	Annual Arithmetic Mean	.022 ppm (57 ug/m^3)
	Twenty-Four Hour*	.088 ppm (230 ug/m^3)
	Three Hour*	.439 ppm (1150 ug/m^3)
Hydrocarbon	Three Hour*	160 ug/m^3
Chromium (Total)	Twenty-Four Hour*	0.3 ug/m^3
	Annual Geometric Mean	0.05 ug/m^3
Perchloroethylene	Annual Arithmetic Mean	0.01 ug.m^3
Toluene	Instantaneous	15,000 ug/m^3
	Twenty-Four Hour	260 ug/m^3
	Annual Arithmetic Mean	180 ug/m^3

* = Not to be exceeded more than once per year.
** = Statistically estimated number of days with exceedances is not to be more than 1 per year.
*** = Indication of a nuisance condition only.
PPM = Parts of pollutant per million parts of air.
ug/m^3 = Micrograms of pollutant per cubic meter of air.
mg/m^3 = Milligrams of pollutant per cubic meter of air.

TABLE 1-3
NUMBER OF AMBIENT AIR QUALITY STANDARD EXCEEDANCES BY COUNTIES(1996)

POLLUTANT	COUNTIES																
	ANDROSCOGGIN	AROOSTOOK	CUMBERLAND	FRANKLIN	HANCOCK	KENNEBEC	KNOX	LINCOLN	OXFORD	PENOBSCOT	PISCATAQUIS	SAGADAHOC	SOMERSET	WALDO	WASHINGTON	YORK	TOTALS
Fine Particulate(PM10):																	
Annual Arithmetic Mean*																	
State	0	0	0	0	?	0	0	?	0	0	?	?	0	?	0	0	0
Federal	0	0	0	0	?	0	0	?	0	0	?	?	0	?	0	0	0
Twenty-four Hour																	
State	0	0	0	0	?	0	0	?	0	0	?	?	0	?	0	0	0
Federal	0	0	0	0	?	0	0	?	0	0	?	?	0	?	0	0	0
Lead:	No monitoring done for this pollutant during 1996																
Twenty-four Hour																	
State																	
Federal																	
Carbon Monoxide:	No monitoring done for this pollutant during 1996																
One Hour																	
Eight Hour																	
Nitrogen Dioxide:																	
Annual Arithmetic Mean*	?	?	?	?	0	?	?	?	?	?	?	?	?	?	?	0	0
Sulfur Dioxide:																	
Annual Arithmetic Mean*																	
State	0	0	0	?	?	?	?	?	0	0	?	?	?	?	?	?	0
Federal	0	0	0	?	?	?	?	?	0	0	?	?	?	?	?	?	0
Twenty-four Hour																	
State	0	0	0	?	?	?	?	?	0	0	?	?	?	?	?	?	0
Federal	0	0	0	?	?	?	?	?	0	0	?	?	?	?	?	?	0
Three Hour																	
State	0	0	0	?	?	?	?	?	0	0	?	?	?	?	?	?	0
Federal	0	0	0	?	?	?	?	?	0	0	?	?	?	?	?	?	0
Ozone:																	
One Hour																	
State Health Warning Level of .081 ppm	?	?	46	?	68	23	30	?	4	5	0	66	10	?	3	88	343
Days																	
Federal	?	?	0	?	0	0	0	?	0	0	0	0	0	?	0	0	0

* Annual Means generated by only a few samples are not included in this summary.

? No monitoring done for this pollutant within this county during 1996.

FIGURE 1-1
PM10 TRENDS IN MAINE - AAM

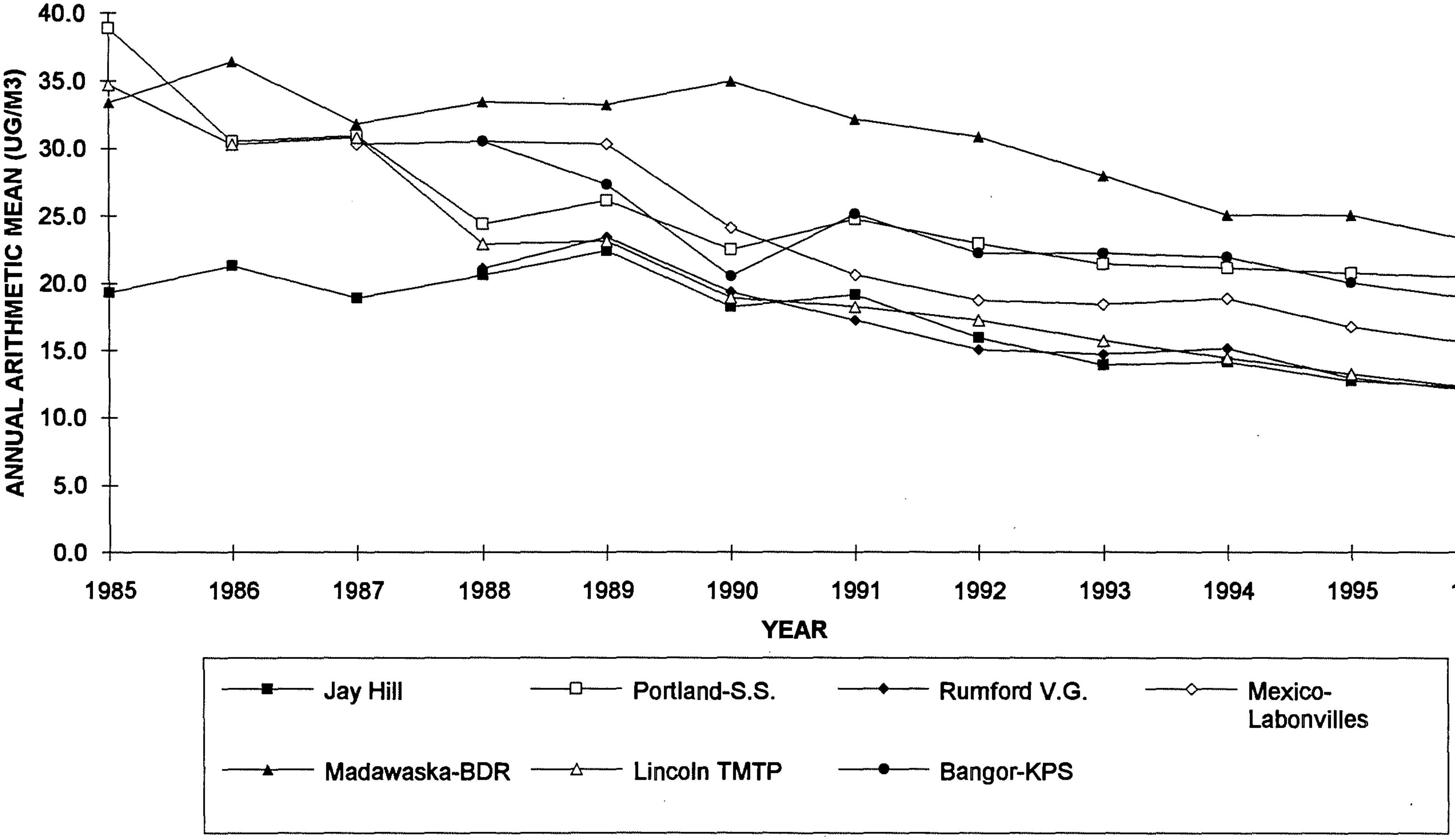


FIGURE 1-2
SULFUR DIOXIDE TRENDS IN MAINE - AAM

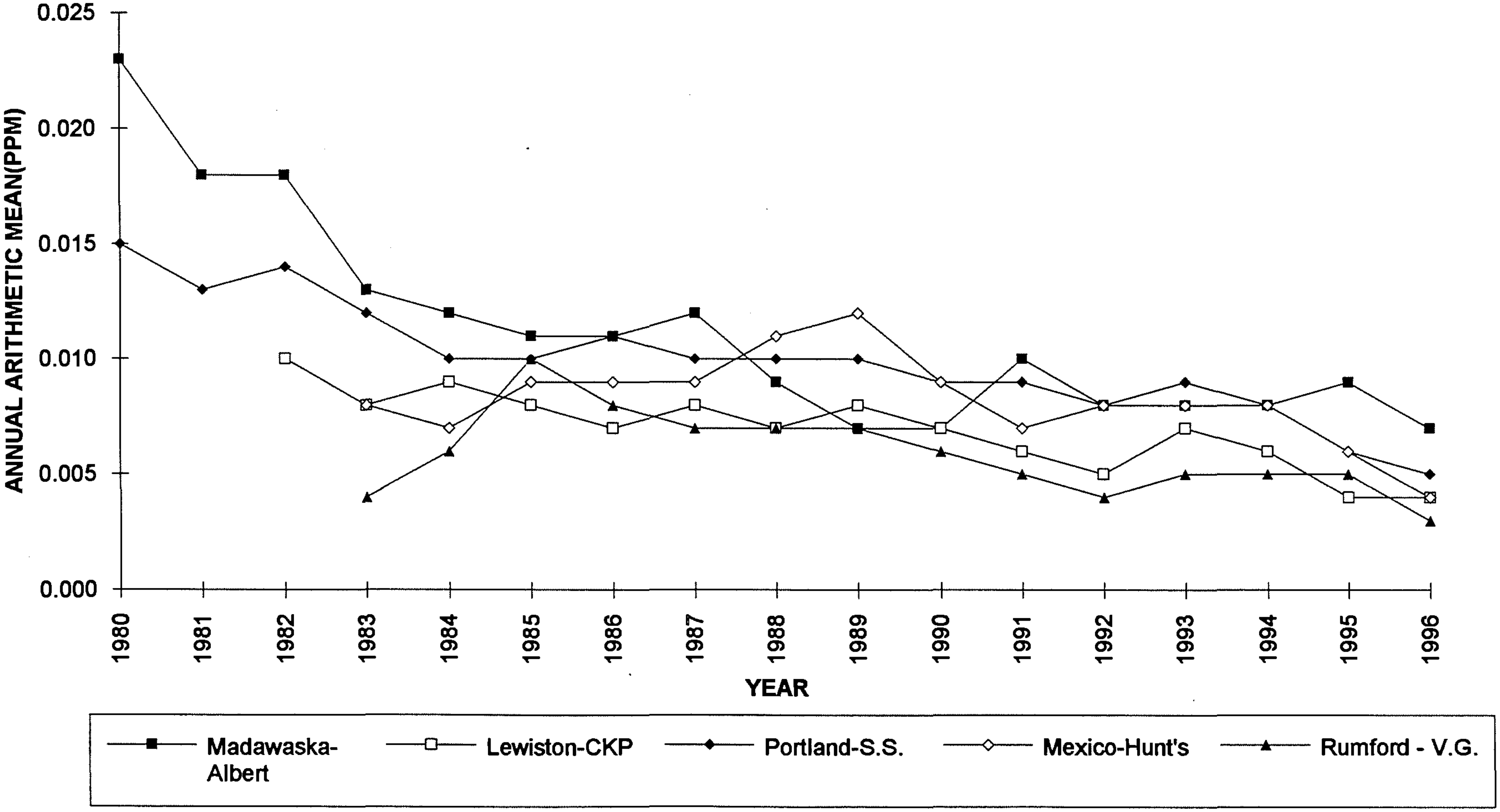
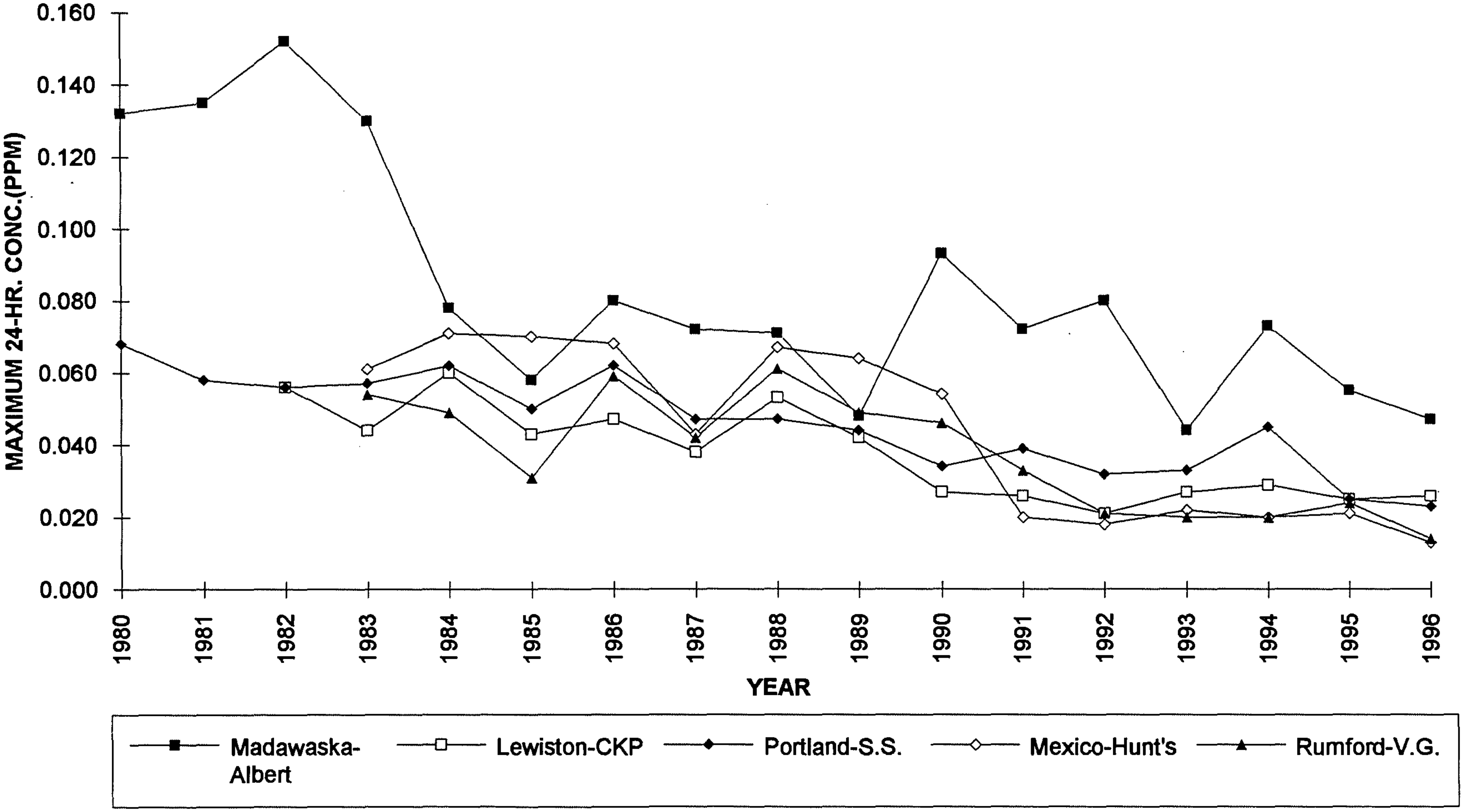


FIGURE 1-3
SULFUR DIOXIDE TRENDS IN MAINE - 24 HOUR



significant trend in either direction or in some cases a slight downward trend. Figure 1-3 indicates the fluctuations in the short term concentrations over the last few years. The site in Madawaska has the highest 24-hour concentrations over the last few years but has not shown any exceedance since 1990. The site is probably being impacted by stack emissions from a large industrial facility with emissions on both sides of the U.S./Canada border.

Figure 1-4 depicts the number of hourly exceedances of the State ozone health warning level. As can be seen from the graphs, the violations vary greatly from year to year, and while showing a very significant increase in the number of violations during 1988 there was a significant decrease during 1989 which carried over to later years at most of the sites. Weather conditions are responsible for a lot of the variability from year to year and the conditions during 1988 were very conducive to the formation of ozone while those of subsequent years were not as conducive. Because of the significant effect weather has on the formation of ozone, Maine, as well as the rest of the northeast, will need to control emissions to such a level that even under ideal weather conditions for the formation of ozone, standards will not be exceeded.

Figure 1-5 highlights some of the decreases that have occurred in air toxics concentrations since reformulated gasoline (RFG) has been in use. The four compounds indicated: benzene, toluene, ethylbenzene and m/p xylene (BTEX) are important compounds that increase the formation of ozone under the right conditions. Reformulated gasoline, which has reduced benzene and aromatic content, was required in severe and extreme ozone nonattainment areas beginning in 1995 as a means of achieving some reduction in ozone levels. Benzene emissions from motor vehicles were expected to drop an estimated 30-40 percent after the introduction of RFG. The BTEX data shown in Figure 1-5 from the Cape Elizabeth monitoring site seems to support this estimate with even greater reductions for toluene and ethylbenzene.

Data summarized in this report is available for review in the DEP headquarters in Augusta and copies can be obtained from that office for a nominal fee.

1.2 Description of Air Monitoring Network

The Maine ambient air monitoring network consists of four types of monitoring sites or stations, which are required by the U.S. Environmental Protection Agency as set forth in Title 40 of the Code of Federal Regulations, Part 58 (40 CFR 58). The types of monitoring sites are distinguished from one another on the basis of the general monitoring objectives they are designed to meet. All of the instruments at a particular monitoring site may not have the same designation. The four types of monitoring sites with their monitoring objectives are as follows:

1. State/Local Air Monitoring Station (SLAMS) Network.

   The SLAMS network is designed to meet a minimum of four basic monitoring objectives:

   a. To determine highest concentrations expected to occur in the area covered by the network.

FIGURE 1-4
OZONE TRENDS - HOURS OF STATE HEALTH WARNING LEVEL EXCEEDANCE

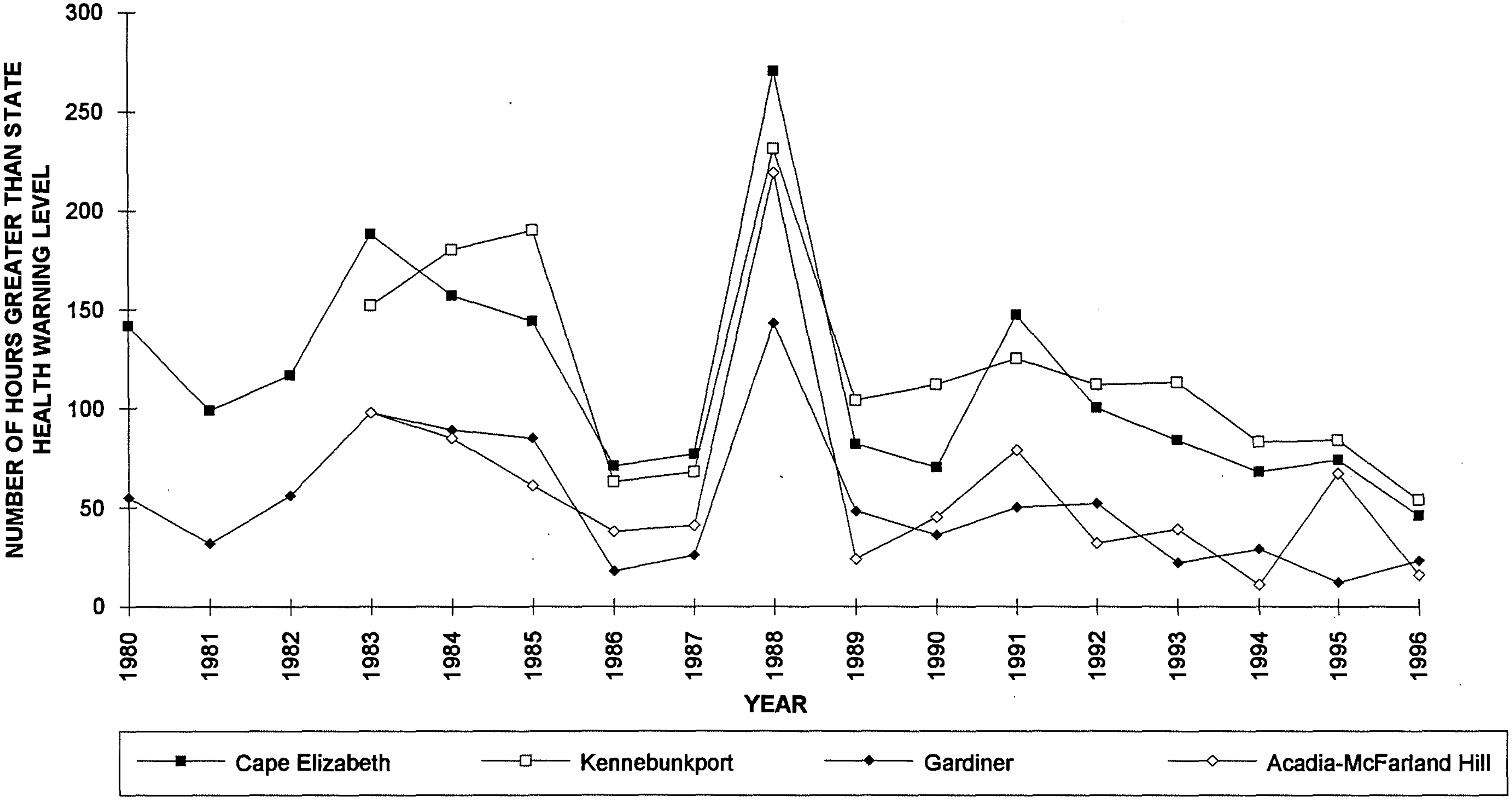
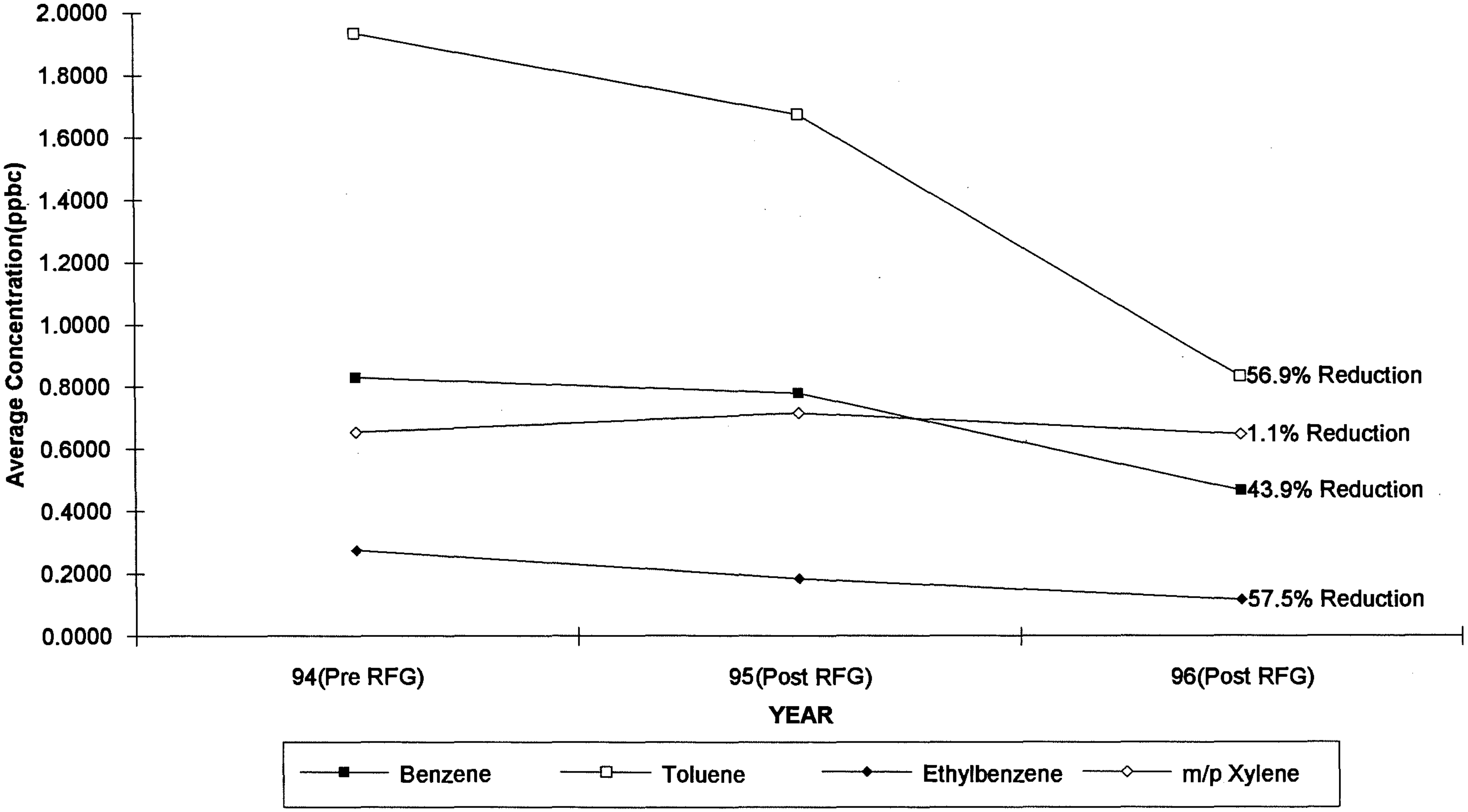


FIGURE 1-5
SEASONAL MEANS OF BTEX COMPOUNDS MONITORED AT CAPE ELIZABETH



b. To determine representative concentrations in areas of high population density.
c. To determine the impact on ambient pollution levels of significant sources or source categories.
d. To determine general background concentrations levels.

2. National Air Monitoring Station (NAMS) Network.

The NAMS network is a subset of the SLAMS network with the following objectives:

a. To monitor in the areas where the pollutant concentration and the population exposure are expected to be the highest consistent with the averaging time of the NAAQS.
b. To monitor in areas of expected maximum concentrations.
c. To monitor in areas which combine poor air quality with a high population density.
d. To provide data for national policy analysis/trends and for reporting to the public on major metropolitan areas.

3. Photochemical Assessment Monitoring Station (PAMS) Network

The PAMS network is designed for the enhanced monitoring of ozone, oxides of nitrogen (NOx), and volatile organic compounds (VOC) to obtain more comprehensive and representative data on ozone air pollution. The principal reasons for requiring the collection of additional ambient air pollutant and meteorological data are the lack of attainment of the National Ambient Air Quality Standard (NAAQS) for ozone nationwide and the need for a more comprehensive air quality database for ozone and its precursors. The chief objective of the enhanced ozone monitoring is to provide an air quality database that will assist agencies in evaluating, tracking the progress of, and, if necessary, refining control strategies for attaining the ozone NAAQS. Four types of sites may be required.

a. Type 1 sites are located upwind of the non-attainment area and are established to characterize upwind background and transported ozone and its precursor concentrations entering the area and will identify those areas which are subjected to overwhelming incoming transport of ozone.
b. Type 2 sites are located immediately downwind of the area of maximum precursor emissions to obtain neighborhood scale measurements of the precursors.
c. Type 3 sites are located at the area of maximum ozone concentrations.
d. Type 4 sites are established to characterize the extreme downwind transported ozone and its precursor concentrations exiting the area and will identify those areas which are potentially contributing to overwhelming ozone transport into other areas.

4. Special Purpose Monitoring Station (SPMS) Network.

Any monitoring site that is not a designated SLAMS, NAMS or PAMS is considered a special purpose monitoring station. Some of the SPMS network objectives are:

a. To verify the maintenance of ambient air standards in areas not covered by or represented by the SLAMS/NAMS network.
b. To provide additional data for developing local control strategies and to document

their effectiveness.

c. To provide data on noncriteria pollutants.

The number of monitors operated for the various monitoring types are summarized in Table 1-4. This monitoring network has been fairly stable for the last couple of years. The total suspended particulate network was significantly reduced due to the elimination of the standard and the control of fugitive dust problems. Sulfur dioxide and lead monitoring have also been reduced due to sufficient data having been collected documenting the compliance status and low levels of those pollutants in most areas of the State.

Table 1-5 provides a breakdown of who operated the monitors during 1996. The breakdown indicates most point-source oriented pollutant monitors are operated by the sources which contribute to local air quality problems whereas secondary pollutants or population caused pollutant monitors are generally operated by the DEP, or other governmental agencies.

Air quality data are developed using two basic methods: 1) the continuous monitoring of gaseous and particulate pollutants and; 2) the periodic sampling of gaseous and particulate pollutants. In addition to pollutant monitoring, there is also the continuous monitoring of meteorological parameters. Eighty-eight monitors collected data at sixty-three different sites during 1996.

Continuous gaseous monitoring was done at twenty-seven sites in Maine during 1996. Ozone was monitored at fifteen of these stations, nitrogen dioxide at two and sulfur dioxide at eleven. Carbon monoxide and lead were not monitored during 1996. Hazardous air pollutants (HAPS) canister samplers were operated at eight sites during the year.

Particulate sampling was done at twenty-five sites in Maine during 1996. Only one station monitored total suspended particulates. All twenty-five of these sites collected fine particulate fractions. Two sites were analyzed for sulfates. There were also four sites collecting atmospheric deposition data. One site was operated by the State and the others were operated by the National Park Service, the University of Maine and the National Weather Service.

In addition to pollutant monitoring, wind speed and direction were recorded at nineteen sites around the State during 1996. Some of these sites also recorded other meteorological parameters such as sigma (stability) and temperature, precipitation, solar radiation and barometric pressure.

Table l-6 presents all the monitoring sites in Maine that operated during 1996 and indicates which parameters were monitored at each site. The map in Figure 1-6 shows the minor civil divisions within the State.

1.3 Document Organization

This document is divided by pollutant into chapters. Each chapter contains: 1) a description of the nature and sources of that pollutant, 2) its health and welfare effects, 3) a discussion on the standards (current and proposed) for that pollutant, 4) a discussion of the monitoring methods for

TABLE 1-4
DISTRIBUTION OF AIR MONITORING INSTRUMENTS
1996

POLLUTANT	NAMS	SLAMS	SPMS	PAMS	TOTAL
Fine Particulate	2	11	12	0	25
Total Suspended Particulate	0	0	1	0	1
Lead	0	0	0	0	0
Carbon Monoxide	0	0	0	0	0
Sulfur Dioxide	2	3	6	0	11
Nitrogen Dioxide/NOy	0	0 *	0	3	3
Ozone	0	7	6	2	15
Sulfate	0	0	2	0	2
WS/WD	0	0	16	3	19
Atmospheric Deposition	0	0	4	0	4
Hazardous Air Pollutants	0	0	8	0	8
Total	4	21	55	8	88

* The PEOPL site in Portland is a SLAMS site for NOx but was not operated in 1996 and is not included in this summary.

TABLE 1-5
MONITOR OPERATORS DURING 1996

POLLUTANT	DEP*	INDUSTRY**	TOTAL
Fine Particulate	14	11	25
Total Suspended Particulate	0	1	1
Lead	0	0	0
Carbon Monoxide	0	0	0
Sulfur Dioxide	5	6	11
Nitrogen Dioxide/NOy	3	0	3
Ozone	14	1	15
Sulfate	2	0	2
WS/WD	8	11	19
Atmospheric Deposition	4	0	4
Hazardous Air Pollutants	8	0	8
Total	58	30	88

* Includes other governmental agencies.

** Includes industries and their consultants.

TABLE 1-6
1996 AMBIENT AIR MONITORING SITE DIRECTORY

SITE	ADDRESS	OPERATOR	SITE TYPE/PARAMETERS
ANDROSCOGGIN COUNTY			
Auburn 23 001 0005	Lewiston-Auburn Airport Lewiston Junction Road	DEP	SPMS - WS/WD
Lewiston 23 001 0011	Country Kitchen Parking Lot Canal Street	DEP	NAMS - SO2 SLAMS - PM10
Lewiston (NEW) 23 001 3003	Columbia Street	DEP	SPMS - SO2
AROOSTOOK COUNTY			
Madawaska 23 003 0006	Fraser Paper Company Bridge Street	Fraser Paper	SPMS - WS/WD, Temperature
Madawaska 23 003 0009	Albert Street	Fraser Paper	SLAMS - SO2 SPMS - Precipitation
Madawaska 23 003 0012	U. S. Post Office 430 E. Main Street	Fraser Paper	SPMS - SO2, WS/WD
Madawaska 23 003 0013	Big Daddy's Restaurant 395 E. Main Street	DEP	SLAMS - PM10
Madawaska 23 003 1003	Madawaska High School 7th Avenue	Fraser Paper	SPMS - SO2
Presque Isle 23 003 1008	DEP Regional Office 528 Central Drive	DEP DEP/USDA	SPMS - WS/WD, PM10 SPMS - Uv-B
Presque Isle 23 003 1011	Riverside Street	DEP	SLAMS - PM10 SPMS - SO2
Loring AFB (NEW) 23 003 1012	Building 5100 Loring Air Force Base	DEP	SPMS - PM10
Houlton (NEW) 23 003 1013	Houlton Fire Station	DEP	SPMS - SO2, PM10
Ashland 23 003 8001	Loring AFB SOG Site	USEPA	SPMS - Ozone
Caribou 23 003 1002	Caribou Airport	NOAA/NWS	SPMS - Atmospheric Deposition

TABLE 1-6 (Continued)
1996 AMBIENT AIR MONITORING SITE DIRECTORY

SITE	ADDRESS	OPERATOR	SITE TYPE/PARAMETERS
CUMBERLAND COUNTY			
Bridgton 23 005 0002	Upper Ridge Road	DEP	SPMS - PM10, Sulfate, Atmospheric Deposition
Portland 23 005 0014	Shelter Site (P.E.O.P.L.) Elm Street	DEP	NAMS - SO2, PM10 SPMS - Sulfate, HAP Compounds
Portland 23 005 0015	Tukey's Bridge	DEP	NAMS - PM10 SPMS - HAP Compounds
Portland 23 005 0023	Canco Road	DEP	SPMS - HAP Compounds
Portland 23 005 0024	Deering High School Leland Street	DEP	SPMS - HAP Compounds
Portland 23 005 0025	Cumberland County Jail County Way	DEP	SPMS - HAP Compounds
Cape Elizabeth 23 005 2003	Shelter Site Two Lights State Park	DEP	SLAMS - Ozone PAMS - NOx, NOy, Temperature, WS/WD, Relative Humidity, Solar Radiation, Barometric Pressure, VOCs(s), TNMOC(s) SPMS - Uv-B Radiation
FRANKLIN COUNTY			
Jay 23 007 0003	Crash Road Gilbert Jewell Property	International Paper	SPMS - PM10
Jay 23 007 0004	Jay Hill Bomaster Property	International Paper	SLAMS - PM10
Jay 23 007 2001	Weather Level I Lagoon Hill	International Paper	SPMS - WS/WD,Temperature, Solar Radiation, Precipitation
HANCOCK COUNTY			
Acadia National Park 23 009 0003	McFarland Hill Ranger Sta. Route #233	NPS	SPMS - Atmospheric Deposition, Precipitation, Mercury Deposition, Mercury Vapor
Acadia NP 23 009 0101	Acadia NP Route #233	DEP	SLAMS - Ozone SPMS - WS/WD, Temperature, Dewpoint

TABLE 1-6 (Continued)
1996 AMBIENT AIR MONITORING SITE DIRECTORY

SITE	ADDRESS	OPERATOR	SITE TYPE/PARAMETERS
Cadillac Mountain 23 009 0102	23 Cadillac Mountain Acadia National Park	DEP	PAMS - Ozone(s), NO2(n,s), TNMOC(s), WS/WD(s),Temperature(s), Relative Humidity(s)
Ellsworth 23 009 0201	Coastal Carpets 21 Water Street	DEP	SPMS - PM10
Ellsworth 23 009 0202	Triangle Exxon 190 High Street	DEP	SPMS - PM10
KENNEBEC COUNTY			
Augusta 23 011 0008	Governor's Hangar State Airport	DEP	SPMS - WS/WD
Augusta 23 011 0014	Rines Hill Parking Lot Water Street	DEP	SLAMS - PM10
Gardiner 23 011 2005	Pray Street School	DEP	SLAMS - Ozone(s)
KNOX COUNTY			
Port Clyde 23 013 0004	Port Clyde Ozone St. George	DEP	SLAMS - Ozone(s)
Thomaston 23 013 1005	Dragon Cement Weather Route #1	Dragon Products	SPMS - WS/WD
Thomaston 23 013 2001	Mitchell Property 2 Dexter Avenue	Dragon Products	SPMS - TSP SLAMS - PM10
OXFORD COUNTY			
Mexico 23 017 0008	Labonville's Route #2	Boise Cascade	SPMS - PM10, HAP Compounds
Mexico 23 017 0011	Hunt's Property Route #2	Boise Cascade	SPMS - SO2
Rumford 23 017 2002	Boise Cascade Weather II Swift River Pump House	Boise Cascade	SPMS - WS/WD, Temperature, Solar Radiation, HAP Compounds
Rumford 23 017 2007	Village Green Site	Boise Cascade	SLAMS - SO2, PM10
North Lovell 23 017 3001	DOT Garage Route #5	DEP	SPMS - Ozone(s)

TABLE 1-6 (Continued)
1996 AMBIENT AIR MONITORING SITE DIRECTORY

SITE	ADDRESS	OPERATOR	SITE TYPE/PARAMETERS
Dixfield 23 017 2010	Route 2 Maine Dept. of Transportation	DEP	SPMS - HAP Compounds
PENOBSCOT COUNTY			
Bangor 23 019 0002	Kenduskeag Pump Station Washington Street	DEP	SLAMS - PM10
Bangor 23 019 0010	BIA - Building #489 Air National Guard	DEP	SPMS - WS/WD
Lincoln 23 019 1007	Thomas Motel Trailer Park 39 West Broadway	Lincoln Pulp & Paper	SPMS - PM10
Lincoln 23 019 1012	Penobscot River	Lincoln Pulp & Paper	SPMS - PM10
Lincoln 23 019 1013	Lincoln Mill Katahdin Avenue	Lincoln Pulp & Paper	SPMS - WS/WD, Temperature
Lincoln 23 019 2003	Lincoln Post Office Building 50 Fleming Street	Lincoln Pulp & Paper	SLAMS - PM10
Millinocket (DISC) 23 019 2009	York Street	Great Northern Paper	SLAMS - SO2, PM10
Howland 23 019 4007	Seed Orchard Site Meadow Brook Road	USEPA	SPMS - Ozone
Holden 23 019 4008	Summit of Rider Bluff	DEP	SLAMS - Ozone(s)
Old Town 23 019 5004	Woodlands Garage James River Corporation	James River Corp.	SPMS - WS/WD, Temperature
PISCATAQUIS COUNTY			
Greenville 23 021 0001	Squaw Brook Greenville	University of Maine	SPMS - Atmospheric Deposition, Precipitation, Mercury Deposition
Greenville 23 021 0002	Greenville Municipal Airport	DEP	SPMS - Ozone(s), WS/WD
SAGADAHOC COUNTY			
Phippsburg 23 023 0003	Small Point Navy Road	DEP	SLAMS - Ozone(s)

TABLE 1-6 (Continued)
1996 AMBIENT AIR MONITORING SITE DIRECTORY

SITE	ADDRESS	OPERATOR	SITE TYPE/PARAMETERS
SOMERSET COUNTY			
Madison (DISC) 23 025 1004	The Ballfield Main Street	Madison Paper Ind.	SPMS - WS/WD, Temperature
Skowhegan (DISC) 23 025 2001	Hinckley Hinckley Farm School	S. D. Warren	SPMS - PM10
Skowhegan (DISC) 23 025 2002	Eaton Ridge	S. D. Warren	SPMS - PM10
Skowhegan (DISC) 23 025 2003	Somerset Mill S. D. Warren	S. D. Warren	SPMS - WS/WD, Ozone(s), Temperature
WASHINGTON COUNTY			
Woodland 23 029 0020	100 Meter Tower	Georgia Pacific Corp.	SPMS - WS/WD, Temperature, Dewpoint
Campobello Island CC 004 0002	Roosevelt-Campobello Park Campobello Island, N. B.	DEP/RCP	SPMS - Ozone(s)
YORK COUNTY			
Biddeford 23 031 0005	Eagles Aerie 57 Birch Street	DEP	SLAMS - PM10
Kennebunkport 23 031 2002	Parson's Way	DEP	SLAMS - Ozone(s)
Kittery 23 031 3002	Frisbee School Godsoe Road	NH	PAMS - Ozone(s), NO2(s), NO(s) ,NOx(s) Temperature(s), Relative Humidity(s), WS/WD(s), TNMOC(s), VOCs(s)

LEGEND

(AIRS Site #)

NEW - Site established in 1996
DISC - Site discontinued in 1996

TSP - Total Suspended Particulates
SO2 - Sulfur Dioxide
NO - Nitric Oxide
NOx - Nitrogen Oxides(NO+NO2)

n - Instrument installed during 1996
d - Instrument removed during 1996
s - Instrument operated seasonally during 1996
i - Instrument operated intermittently during 1996

TABLE 1-6 (Continued)
1996 AMBIENT AIR MONITORING SITE DIRECTORY

LEGEND

NO2	- Nitrogen Dioxide
NOy	- Total Reactive Nitrogen Oxides(NOx + Organic nitrates + Inorganic nitrates)
CO	- Carbon Monoxide
Pb	- Lead
WS/WD	- Wind Speed and Direction
PM10	- Fine Particulate
VOC	- Volatile Organic Compounds
TNMOC	- Total Nonmethane Organic Compounds
HAP	- Hazardous Air Pollutant
NMHC	- Nonmethane Hydrocarbons
PAMS	- Photochemical Assessment Monitoring Station
NAMS	- National Air Monitoring Station
SLAMS	- State/Local Air Monitoring Station
SPMS	- Special Purpose Monitoring Station

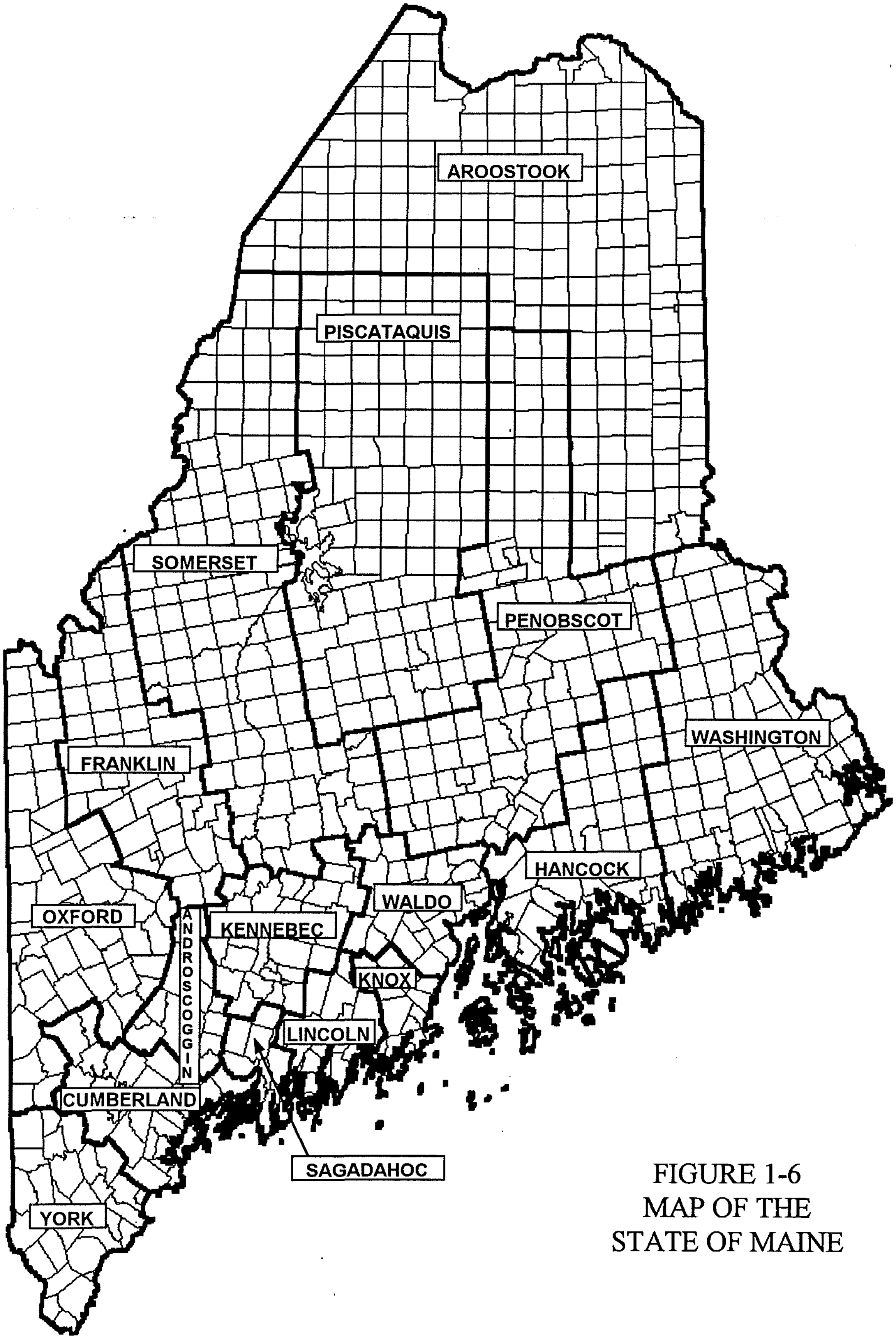


FIGURE 1-6
MAP OF THE
STATE OF MAINE

that pollutant, 5) a table presenting the 1996 monitored data, 6) in the case of some pollutants, historical tables presenting 1996 data along with data for previous years to show trends, effects of control strategy, or change in emission sources.

1.3.1 Explanation of Data Summary Tables

The Data Summary Tables were designed to facilitate comparing 1996 air quality monitoring data with the standards for each pollutant. Therefore, the data are presented for each averaging time for which standards exist for a pollutant.

An annual average concentration is presented for each pollutant that has a long-term, annual standard (NO_2, SO_2, PM_{10}).

For pollutants that have short-term standards, the highest short-term values are presented. Some pollutants are allowed to exceed the standard once during the year so the second highest value would be used to determine whether there was a violation or not.

All of the data collected by the Bureau of Air Quality and for the Bureau during 1996 has been presented in the Data Summary Tables. Some of the data collected by other governmental agencies is only available in a draft form and is not included in the data summaries. In making comparisons of the data, one should be aware that a site with only a few samples will not be a valid indicator of pollutant concentrations in the area.

1.3.2 Explanation of Historical Comparison Tables

The Historical Comparison Tables present air quality data for 1996 and those years prior to 1996 when the same pollutant was monitored at the same site. The purpose of the Tables are to indicate the variations in air quality from year to year. The Tables in some cases represent maximum concentrations for specific time periods and in others the number of days in each year that the standards were violated.

1.3.3 Explanation of Trends Tables

The highest hourly concentration in a year is not the best indicator of long-term air quality trends because it is an erratic value. Therefore, special trend tables are presented for carbon monoxide and ozone when monitoring is conducted. The trend tables present the 10th, 50th, and 90th percentile values to represent the bulk of the air quality data for each year. Percentiles indicate the fraction, or percent, of the value that are below a particular level. For example, if the 90th percentile value for some sets of CO observations is 5.0 ppm, it means that 90% of the time the concentrations of CO are less than 5.0 ppm. Conversely, it also means that 10% of the time the concentrations are above 5.0 ppm. Thus the existence or lack of long-term trends in overall air quality for CO and O3 can be more reliably determined using the Trends Tables, than by looking at just the Historical Comparison Tables.

The ozone data has been incorrectly interpreted in the past and consequently the trends tables have not reported the ozone data in a consistent format. Starting in 1988 data was stored in the AIRS database instead of the old SAROAD system. Under the SAROAD system reports were generated which indicated the percentiles or frequency distribution of all the hourly data values reported. Reports generated under the AIRS system are now based on percentiles calculated based on each day's maximum hourly value. Thus, a 50th percentile of .050 ppm means that 50% of the days monitored had a maximum hourly value during the day of .050 ppm or less. All of the trend information for ozone beginning with the 1991 Annual Report have been revised to reflect this method of calculation based on the AIRs report format. If a report format can be developed that will provide percentiles based on total hourly values then that statistic will be used in future reports as it is a better indicator of total exposure to high ozone levels.

2. CARBON MONOXIDE (CO)

2.1 Description and Sources

Carbon monoxide is colorless, odorless and tasteless gas. Therefore you do not even know you are breathing it until you feel its detrimental effects. It constitutes the largest single fraction of the pollutants found in urban atmospheres. It is produced primarily by the incomplete combustion of organic materials used as fuels for transportation and in the heating of buildings; it also results from industrial processes, refuse burning, and agricultural burning. Several natural sources of CO of both biological and non-biological origin have also been identified, but their contributions to urban atmospheric concentrations are thought to be small. Background levels of CO (resulting from natural and technological sources) found in relatively nonpolluted air range from 0.025 to 1.0 ppm. Urban carbon monoxide is produced primarily by motor vehicles.

Because motor vehicle traffic is the major source of CO, daily concentration peaks coincide with morning and evening rush hours. The worst carbon monoxide problems are found where large numbers of slow moving cars congregate. These problems are further aggravated when they occur in a "street canyon" situation. When there are large amounts of slow moving traffic in a street canyon situation, with the wind blowing perpendicular to the street, carbon monoxide can be trapped in the canyon and build up to unhealthful levels.

CO problems are usually worse in winter because: 1) cold weather makes motor vehicles run dirtier and requires more combustion for space heating; and 2) on winter nights a strong inversion layer develops in the atmosphere, that traps pollution near the ground, preventing it from mixing with cleaner air above.

2.2 Health and Welfare Effects

Carbon monoxide affects the central nervous system by depriving the body of the oxygen it needs. Tests of automobile drivers show exposure to carbon monoxide can impair driver's judgement and ability to respond rapidly in traffic. It can also impair vision and produce headaches.

Carbon monoxide enters the bloodstream by combining with hemoglobin, the substance that carries oxygen to the cells. Hemoglobin that is bound up with CO is called carboxyhemoglobin. This combination occurs 200 times more readily with CO than with oxygen, so the amount of oxygen being distributed throughout the body by the bloodstream is reduced in CO's presence. Blood laden with CO can weaken heart contractions, lowering the volume of blood distributed to various parts of the body. It can also significantly reduce a healthy person's ability to perform manual tasks, such as working, jogging and walking. A life-threatening situation exists in patients with heart disease, who can't compensate for the oxygen loss. The 4.2 million people in the U.S. suffering from angina pectoris (a heart disease characterized by brief spasmodic attacks of chest pain due to insufficient oxygen levels in the heart muscles) are especially susceptible. Carbon monoxide is also harmful to persons who have lung disease, anemia or cerebral-vascular disease. Others sensitive to carbon monoxide include the human fetus, and people exposed to long-term concentrations, such as traffic officers.

People who sit in idling cars over sustained periods risk harmful CO exposure, as do cigarette smokers. Since about two percent of cigarette smoke is carbon monoxide, if you or someone else smokes while driving in heavy traffic, you may both experience the harmful effects of CO from the cigarette smoke and the engine exhaust accumulated in streets. Even three or four hours after you're exposed, half the excess CO still remains in your bloodstream. Because it takes time for CO to build up in the bloodstream, the severity of health effects depends both on the concentration being breathed and the length of time the person is exposed.

2.3 Standards

The existing standards for carbon monoxide are currently set at 9 parts CO per million parts air (ppm), averaged over a period of 8 hours, and 35 ppm averaged over 1 hour, not to be exceeded more than once per year. As a result of a review and revision of the health criteria, EPA had proposed to retain the existing primary 8-hour standard at 9 ppm and to lower the primary 1-hour standard to 25 ppm. However, this change has not occurred and the standards remain the same. The change in the 1-hour standard had been proposed because of the more rapid accumulation of blood carboxyhemoglobin in moderately exercising sensitive persons compared to resting individuals. The impact of exercise, which is greater for short-duration exposures, was not considered in the original standard.

2.4 Monitoring

Carbon monoxide was not monitored in Maine during 1996. The last carbon monoxide data collected was in Dedham during 1990 and 1991 for the determination of a rural background carbon monoxide concentration. The maximum 1-hour concentration was 9 ppm, approximately 25% of the standard. The maximum 8-hour concentration was 2 ppm, approximately 22% of the standard. The most recent urban carbon monoxide monitoring was on Congress Street in Portland from 1984 to 1989. During the last full year of monitoring the maximum 1-hour concentration was 7.8 ppm, approximately 22% of the standard. The maximum 8-hour concentration was 5 ppm, approximately 55% of the standard.

3. OZONE (O3)

3.1 Description and Sources

Ozone is a highly reactive form of oxygen which, at very high concentrations, is a blue unstable gas that has a characteristic pungent odor most commonly identified around an arcing electric motor, lightning storms, or other electrical discharges. However, at normal ambient concentrations, ozone is colorless and odorless. Ozone is the major component of photochemical "smog", but the haziness and odors of smog are primarily caused by other components.

Natural ground level ozone occurs in low concentrations (less than .05 ppm) due to natural physical and chemical phenomena. Occasionally, unique meteorological conditions can result in natural levels between .05 and .10 ppm.

Ozone is not emitted directly from a source as are other pollutants. It forms as a secondary pollutant. It's precursors are hydrocarbons and nitrogen oxides, which chemically react in sunlight to form ozone. The hydrocarbons are emitted in automobile exhaust, from gasoline and oil storage and transfer, and from industrial use of paint solvents, degreasing agents, cleaning fluids, ink solvents, incompletely burned coal or wood and many other sources. Plants also give off hydrocarbons such as terpenes from pine trees. Nitrogen oxides are emitted by all combustion sources.

The highest ozone levels generally occur during summer afternoons when the high temperatures and strong sunlight promote photochemical reactions. Stagnant weather may cause smog to remain in an area for several days. The winds may also transport ozone many miles outside of the urban environment. For example, it is estimated that a significant portion of the ozone in the State of Maine is transported into the State from sources located outside the State. In addition a much smaller amount of the ozone is naturally occurring background concentrations, part of which is also transported into the State. The remaining ozone is assumed to be due to local sources within the State. Because of long-range transport, local control of emissions by itself may not solve the ozone problem. An effective national program may be necessary to achieve national compliance.

Ground-level ozone, discussed above, should not be confused with the stratospheric ozone layer, located about seven miles high in the atmosphere, which shields the earth from cancer-causing ultraviolet rays. Concentrations of ozone in this layer may reach as high as 10 ppm. Concern over potential reduction of the necessary levels of ozone in the stratosphere by reactions with fluorocarbons from aerosol cans has resulted in the removal of most of these propellants from the market. However, ozone at ground level, where it is breathed, is a pollutant.

3.2 Health and Welfare Effects

Ozone at low concentrations causes eye irritations and at higher concentrations difficulty in breathing for people with respiratory problems, the elderly, and children. Symptoms associated with exposure to higher concentrations of ozone are shortness of breath, pain when inhaling deeply, wheezing and coughing. Even healthy adults and children may be affected. Many plants, such as white pine, soybeans and alfalfa, are extremely sensitive to ozone, and ozone is known to weaken materials such as rubber and fabrics.

3.3 Standards

The existing National Ambient Air Quality Standard (NAAQS) for ozone is 0.12 ppm and will be attained when "the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is equal to or less than one." This standard was effective February 8, 1979 and replaced a more restrictive 0.08 ppm standard that was established April 10, 1971. The change was the result of a required assessment of existing NAAQS to include a review of new health effects data that have become available since 1970. As a result of this review and national public comments, the standard was changed to a level that is considered to be sufficient to protect the public health and welfare. Since then additional research has concluded that there is in fact damage being caused by ozone levels less than the existing federal standard. Based on recent studies there appears to be significant vegetation damage at levels considerably below the federal standard and some "adverse" health effects at the current federal standard. Proposals have recently been made to add an eight hour average concentration as a new standard. Also under consideration is a new secondary standard. Final decisions on these new standards are expected to occur in 1997. The State standard had been established at the same time the original federal standard was established and had remained the same until 1995. Effective September 29, 1995 the State standard was eliminated and the State adopted whatever the federal standard is for ozone as a state standard. Should the federal standard be changed it will automatically be adopted as the new State standard. The old State standard of .081 ppm is to be retained as a health warning level only. In the past the State standard was interpreted to be .080 ppm but a conversion of the actual 160 ug/m3 standard to ppm yields .081 ppm. Therefore, only hourly averages in excess of .081 ppm are considered exceedances of the State standard or as is the case now the health warning level.

3.4 Monitoring

Ozone was monitored at fourteen sites in Maine and one site in New Brunswick during 1996 using continuous monitoring equipment of two kinds, either chemiluminescence or ultra-violet absorption analyzers. The site in New Brunswick is located at the Roosevelt Campobello International Park on Campobello Island and was operated jointly by Park staff, Environment Canada and the Maine DEP. Data from the two EPA operated sites has not undergone final quality assurance procedures and has not been included in the data tables. Data from the Scotia Prince ferry has not been used because the data is from a moving vessel and cannot be assigned to a unique site and, while extremely useful in examining the ozone plume over the Gulf of Maine, it is not comparable with data from a fixed site. Maine's ozone monitoring season is limited to April through October due to the weather conditions which are not conducive to ozone formation at other times of the year.

Table 3-1 summarizes the 1996 ozone data. Table 3-2 presents ozone historical comparisons and Table 3-3 presents ozone trends. Tables 3-4 and 3-5 summarize the number of days during each

Exceeding the standard does not necessarily mean a violation. The standard allows for an exceedance before a violation is recorded. Table 3-4 is an analysis and summary of the ozone data based on the state health warning level. The state health warning level is an hourly value and consequently the summary deals with hours of data. Theoretically, you can have 24 exceedances of the state health warning level in one day. Data recovery includes total hours during the year in which monitored data is available, total hours during the ozone season of April 1 through October 31 in which monitored data is available and the percent of monitored hours of data during the ozone season. The second, third and fourth high hourly maximums could all have occurred on the same day as the highest hourly value. Hours greater than the state health warning level have been broken down into various concentration ranges to provide an indication of the levels of exposure and those hours greater than .081 ppm have been averaged to provide additional exposure information. The last column in this table lists the separate days on which at least one hourly exceedance of the state health warning level occurred.

Table 3-5 summarizes the ozone data based on the state/federal standard. The state/federal standard only requires one hour of monitored data to exceed .12 ppm to be considered as an exceedance of the state/federal standard. Ozone data is recorded to three decimal places but the state/federal standard is only two decimal places. Therefore, the third decimal place is rounded off and the monitored value must be .125 or greater to exceed the standard of .12 ppm. The percent data recovery in this table is based on the number of valid days of data collected during the ozone season. One hour of data greater than .12 ppm is sufficient to consider a day valid even if it is the only valid hour of data for the entire day. Otherwise, 75% of the data collected between the hours of 9:01 a.m. and 9:00 p.m. local time must be valid for the day to be considered a valid day (See *40 CFR Ch. 1 Pt. 50, Appendix H*). The high, second high, third high and fourth high hourly maximums are all on separate days. The measured exceedances are actual measured values or days that exceeded the standard. The estimated exceedances takes into account missing data which may have been during high periods of ozone. The last two columns are explained in a footnote at the end of the table. Tables 3-6 and 3-7 summarize the data collected over the years at those sites which were in operation during 1996. They include a monthly breakdown of the number of days on which either the state health warning level or state/federal standard was exceeded as well as the number of sites that were in operation.

The ozone data has been incorrectly interpreted in the past and consequently the trends tables have not reported the ozone data in a consistent format. Starting in 1988 data was stored in the AIRS database instead of the old SAROAD system. Under the SAROAD system reports were generated which indicated the percentiles or frequency distribution of all the hourly data values reported. Reports generated under the AIRS system are now based on percentiles calculated based on each days maximum hourly value. Thus, a 50th percentile of .050 ppm means that 50% of the days monitored had a maximum hourly value during the day of .050 ppm or less. All of the trend information for ozone beginning with the 1991 Annual Report have been revised to reflect this method of calculation based on the AIRs report format. If a report format can be developed that will provide percentiles based on total hourly values then that statistic will be used in future reports as it is a better indicator of total exposure to high ozone levels.

TABLE 3 - 1
1996 OZONE DATA SUMMARY
(Parts Per Million)

SITE	ADDRESS	# OF OBS'N	HOURLY CONCENTRATIONS HIGHEST	2ND HIGH	# OF EXCEEDANCES STATE*	FEDERAL**
CUMBERLAND COUNTY						
Cape Elizabeth	Shelter Site	7633	0.107	0.101	46	0
HANCOCK COUNTY						
Acadia Nat'l Pk	McFarland Hill Ranger Sta.	8027	0.102	0.102	16	0
Acadia Nat'l Pk	Cadillac Mountain	3467	0.100	0.096	52	0
KENNEBEC COUNTY						
Gardiner	Pray Street School	4968	0.098	0.098	23	0
KNOX COUNTY						
Port Clyde	Port Clyde Ozone	4153	0.108	0.107	30	0
OXFORD COUNTY						
Lovell	Route #5	4149	0.098	0.095	4	0
PENOBSCOT COUNTY						
Holden	Summit of Rider Bluff	5288	0.087	0.085	5	0
PISCATAQUIS COUNTY						
Greenville	Greenville Mun. Airport	5157	0.080	0.078	0	0
SAGADAHOC COUNTY						
Phippsburg	Navy Road	4137	0.109	0.108	66	0
SOMERSET COUNTY						
Skowhegan	Somerset Mill	5055	0.098	0.096	10	0
WASHINGTON COUNTY						
Campobello Island	Roosevelt-Campobello Park	3643	0.086	0.085	3	0
YORK COUNTY						
Kennebunkport	Parson's Way	4055	0.110	0.104	54	0
Kittery	Frisbee School	5010	0.099	0.096	34	0

* Total number of hours greater than .081 ppm. This is a health warning level only.

** Measured number of days with an hour that exceeds .12 ppm. Not a statistical estimate.

*** Site is located in New Brunswick, Canada.

TABLE 3 - 2
OZONE HISTORICAL COMPARISONS
(1-Hour Concentrations)

CAPE ELIZABETH
Shelter Site

YEAR	SECOND HIGH	# OF STATE EXCEEDANCES*
1978	.160 PPM	202
1979	.155 PPM	116
1980	.178 PPM	141
1981	.122 PPM	98
1982	.140 PPM	117
1983	.163 PPM	187
1984	.146 PPM	156
1985	.165 PPM	143
1986	.128 PPM	70
1987	.152 PPM	76
1988	.168 PPM	269
1989	.136 PPM	81
1990	.144 PPM	69
1991	.141 PPM	146
1992	.125 PPM	99
1993	.116 PPM	83
1994	.135 PPM	67
1995	.138 PPM	73
1996	.101 PPM	46

KENNEBUNKPORT
Parson's Way

YEAR	SECOND HIGH	# OF STATE EXCEEDANCES*
1982	.120 PPM	42
1983	.148 PPM	151
1984	.147 PPM	179
1985	.168 PPM	189
1986	.138 PPM	62
1987	.145 PPM	67
1988	.168 PPM	230
1989	.147 PPM	103
1990	.162 PPM	111
1991	.150 PPM	124
1992	.127 PPM	111
1993	.127 PPM	112
1994	.125 PPM	82
1995	.156 PPM	83
1996	.104 PPM	54

GARDINER
Gardiner H.S./Pray Street School

YEAR	SECOND HIGH	# OF STATE EXCEEDANCES*
1981	.122 PPM	31
1982	.120 PPM	55
1983	.140 PPM	97
1984	.112 PPM	88
1985	.133 PPM	84
1986	.110 PPM	17
1987	.112 PPM	25
1988	.145 PPM	142
1989	.118 PPM	47
1990	.107 PPM	35
1991	.123 PPM	49
1992	.111 PPM	51
1993	.096 PPM	21
1994	.111 PPM	28
1995	.091 PPM	11
1996	.098 PPM	23

ACADIA
McFarland Hill Ranger Station

YEAR	SECOND HIGH	# OF STATE EXCEEDANCES*
1983	.135 PPM	97
1984	.130 PPM	84
1985	.117 PPM	60
1986	.108 PPM	37
1987	.126 PPM	40
1988	.153 PPM	218
1989	.113 PPM	23
1990	.118 PPM	44
1991	.125 PPM	78
1992	.105 PPM	31
1993	.104 PPM	38
1994	.095 PPM	10
1995	.127 PPM	66
1996	.102 PPM	16

* Exceedances of the state health warning level.

TABLE 3 - 3
OZONE TRENDS
(1-Hour Concentrations)

CAPE ELIZABETH
Shelter Site

	PERCENTILES		
YEAR	10%	50%	90%
1978	0.018	0.026	0.054
1979	0.038	0.053	0.106
1980	0.033	0.049	0.097
1981	0.030	0.047	0.086
1982	0.033	0.052	0.082
1983	0.034	0.049	0.095
1984	0.034	0.051	0.100
1985	0.037	0.052	0.092
1986	0.032	0.048	0.075
1987	0.034	0.048	0.074
1988	0.033	0.050	0.106
1989	0.034	0.048	0.070
1990	0.031	0.046	0.077
1991	0.034	0.048	0.089
1992	0.032	0.046	0.079
1993	0.028	0.041	0.077
1994	0.032	0.047	0.076
1995	0.029	0.043	0.072
1996	0.035	0.049	0.073

KENNEBUNKPORT
Parson's Way

	PERCENTILES		
YEAR	10%	50%	90%
1983	0.028	0.460	0.103
1984	0.031	0.049	0.103
1985	0.038	0.056	0.098
1986	0.033	0.048	0.077
1987	0.033	0.046	0.074
1988	0.035	0.052	0.119
1989	0.036	0.052	0.085
1990	0.035	0.050	0.089
1991	0.038	0.050	0.088
1992	0.033	0.047	0.086
1993	0.031	0.047	0.087
1994	0.034	0.052	0.085
1995	0.032	0.046	0.079
1996	0.033	0.049	0.077

Percentiles calculated during 1985 only used 70% of the data.

GARDINER
Gardiner H. S./Pray Street School

	PERCENTILES		
YEAR	10%	50%	90%
1980	0.032	0.046	0.088
1981	0.029	0.045	0.073
1982	0.028	0.047	0.073
1983	0.033	0.047	0.083
1984	0.030	0.046	0.081
1985	0.033	0.049	0.082
1986	0.027	0.043	0.062
1897	0.028	0.041	0.065
1988	0.027	0.049	0.087
1989	0.034	0.047	0.073
1990	0.034	0.048	0.075
1991	0.031	0.044	0.074
1992	0.030	0.044	0.072
1993	0.026	0.039	0.064
1994	0.029	0.044	0.067
1995	0.025	0.038	0.062
1996	0.028	0.040	0.062

Site relocated to the Pray Street School in 1991.

ACADIA
McFarland Hill Ranger Station

	PERCENTILES		
YEAR	10%	50%	90%
1983	0.020	0.045	0.080
1984	0.030	0.045	0.087
1985	0.030	0.043	0.079
1986	0.030	0.042	0.063
1987	0.026	0.044	0.068
1988	0.031	0.049	0.097
1989	0.031	0.047	0.069
1990	0.033	0.044	0.070
1991	0.030	0.043	0.078
1992	0.026	0.038	0.068
1993	0.029	0.042	0.062
1994	0.029	0.045	0.071
1995	0.027	0.043	0.071
1996	0.019	0.036	0.061

TABLE 3 - 4
SUMMARY OF HOURLY OZONE DATA FOR SITES OPERATING DURING 1996

			Hourly Data Recovery			Hourly Maximums				Number of Hours(In PPM Ranges)					Hours >.081PPM		Annual	Days With
Site		Year	Total Hours	Ozone Season	Percent Recovery	Max. Hour	2nd High	3rd High	4th High	>.081 <.091	>.090 <.101	>.100 <.111	>.110 <.121	>.120	Number of Hours	Arith. Mean	Arith. Mean	Hour > .081 PPM
CUMBERLAND COUNTY																		
Cape Elizabeth	Shelter Site	1980	3405	3405	66.3%	0.190	0.178	0.168	0.151	52	43	12	13	22	142	0.102	0.0590	26
		1981	3877	3877	75.5%	0.142	0.136	0.135	0.134	43	24	14	8	10	99	0.097	0.0532	20
		1982	4101	4101	79.8%	0.142	0.140	0.137	0.136	45	25	21	10	16	117	0.100	0.0560	18
		1983	5011	5011	97.6%	0.172	0.163	0.152	0.152	61	51	30	21	25	188	0.101	0.0579	36
		1984	4747	4747	92.4%	0.171	0.166	0.147	0.146	49	49	20	17	22	157	0.102	0.0593	31
		1985	4000	3937	76.7%	0.167	0.165	0.158	0.151	60	40	11	8	25	144	0.099	0.0592	27
		1986	4954	4954	96.5%	0.131	0.128	0.126	0.119	27	27	11	3	3	71	0.096	0.0516	13
		1987	5165	5037	98.1%	0.156	0.152	0.141	0.138	23	19	8	10	17	77	0.104	0.0523	15
		1988	4953	4953	96.4%	0.178	0.168	0.166	0.164	76	86	39	26	43	270	0.103	0.0595	35
		1989	4627	4627	90.1%	0.146	0.136	0.134	0.130	32	22	12	9	7	82	0.098	0.0519	16
		1990	4645	4645	90.4%	0.148	0.144	0.130	0.129	35	16	9	4	6	70	0.096	0.0505	17
		1991	4815	4815	93.8%	0.145	0.141	0.139	0.137	65	27	21	15	19	147	0.099	0.0546	28
		1992	4805	4805	93.6%	0.128	0.125	0.118	0.115	44	27	20	7	2	100	0.095	0.0508	17
		1993	4798	4798	93.4%	0.122	0.116	0.112	0.106	48	24	9	2	1	84	0.090	0.0468	17
		1994	6262	4876	94.9%	0.148	0.135	0.122	0.121	36	21	6	1	4	68	0.093	0.0512	16
		1995	8299	4879	95.0%	0.161	0.138	0.124	0.121	29	24	13	4	4	74	0.096	0.0482	15
		1996	7633	4872	94.9%	0.107	0.101	0.100	0.099	33	11	2	0	0	46	0.086	0.0516	10
HANCOCK COUNTY																		
Bar Harbor	Acadia National Park	1982	2049	609	11.9%	0.055	0.055	0.050	0.050	0	0	0	0	0	0	N/A	0.0313	0
		1983	7560	4800	93.5%	0.138	0.135	0.130	0.128	51	27	10	6	4	98	0.094	0.0521	20
		1984	7902	4529	88.2%	0.140	0.130	0.117	0.117	44	23	12	4	2	85	0.094	0.0510	24
		1985	8550	4967	96.7%	0.120	0.117	0.102	0.101	39	18	2	2	0	61	0.087	0.0486	19
		1986	7861	4977	96.9%	0.109	0.108	0.104	0.104	18	14	6	0	0	38	0.093	0.0442	8
		1987	8000	4923	95.9%	0.130	0.126	0.121	0.118	11	13	8	6	3	41	0.109	0.0477	9
		1988	6701	4485	87.3%	0.179	0.153	0.151	0.144	70	63	48	19	19	219	0.099	0.0563	32
		1989	6374	4585	89.3%	0.130	0.114	0.105	0.104	13	3	6	1	1	24	0.094	0.0492	4
		1990	7043	4532	88.2%	0.123	0.118	0.112	0.108	24	11	7	2	1	45	0.093	0.0478	10
		1991	7138	3877	75.5%	0.128	0.125	0.125	0.122	39	15	14	6	5	79	0.096	0.0502	15
		1992	5808	3314	64.5%	0.108	0.105	0.101	0.101	25	3	4	0	0	32	0.088	0.0434	8
		1993	7645	4836	94.2%	0.112	0.104	0.093	0.093	28	9	1	1	0	39	0.088	0.0449	11
		1994	8200	4723	92.0%	0.102	0.095	0.093	0.092	7	3	1	0	0	11	0.089	0.0475	7
		1995	8407	5067	98.7%	0.128	0.127	0.119	0.115	36	20	6	3	2	67	0.093	0.0461	16
		1996	8027	5085	99.0%	0.102	0.102	0.100	0.100	9	5	2	0	0	16	0.091	0.0395	6
Bar Harbor	Cadillac Mountain	1995	2640	2345	45.7%	0.134	0.121	0.117	0.116	6	4	0	3	2	15	0.099	0.0468	5
		1996	3467	3467	67.5%	0.100	0.096	0.096	0.095	44	8	0	0	0	52	0.086	0.0541	16

TABLE 3 - 4 (Continued)_
SUMMARY OF HOURLY OZONE DATA FOR SITES OPERATING DURING 1996

Site		Year	Hourly Data Recovery			Hourly Maximums				Number of Hours(In PPM Ranges)					Hours >.081PPM		Annual	Days With
			Total Hours	Ozone Season	Percent Recovery	Max. Hour	2nd High	3rd High	4th High	>.081 <.091	>.090 <.101	>.100 <.111	>.110 <.121	>.120	Number of Hours	Arith. Mean	Arith. Mean	Hour > .081 PPM
KENNEBEC COUNTY																		
Gardiner	Gardiner High School	1980	3299	3299	64.2%	0.143	0.143	0.118	0.117	24	18	9	2	2	55	0.082	0.0525	17
		1981	3831	3831	74.6%	0.127	0.122	0.122	0.118	9	12	6	2	3	32	0.098	0.0490	9
		1982	4001	4001	77.9%	0.126	0.122	0.119	0.118	22	16	11	5	2	56	0.096	0.0498	10
		1983	5023	5023	97.8%	0.145	0.140	0.138	0.138	50	21	13	7	7	98	0.096	0.0525	23
		1984	5024	4965	96.7%	0.124	0.112	0.109	0.107	43	35	9	1	1	89	0.092	0.0513	20
		1985	4240	4159	81.0%	0.142	0.133	0.130	0.129	43	21	10	6	5	85	0.095	0.0539	19
		1986	4298	4216	82.1%	0.111	0.110	0.107	0.104	10	4	3	1	0	18	0.093	0.0449	5
		1987	4879	4879	95.0%	0.119	0.112	0.106	0.101	17	5	2	2	0	26	0.090	0.0447	7
		1988	4794	4794	93.3%	0.159	0.145	0.145	0.134	63	39	21	13	7	143	0.097	0.0528	28
		1989	4855	4836	94.2%	0.126	0.118	0.117	0.108	32	8	5	2	1	48	0.092	0.0504	10
		1990	4216	4162	81.0%	0.108	0.107	0.107	0.104	17	13	6	0	0	36	0.092	0.0508	11
	Pray Street School	1991	4789	4778	93.0%	0.132	0.123	0.120	0.119	27	10	7	4	2	50	0.094	0.0487	12
		1992	5112	4860	94.6%	0.115	0.111	0.108	0.104	30	16	4	2	0	52	0.091	0.0474	15
		1993	4878	4825	93.9%	0.098	0.096	0.096	0.096	12	10	0	0	0	22	0.090	0.0426	7
		1994	4537	4140	80.6%	0.120	0.111	0.099	0.098	18	9	0	2	0	29	0.090	0.0481	9
		1995	4829	4829	94.0%	0.102	0.091	0.091	0.090	9	2	1	0	0	12	0.088	0.0410	5
		1996	4968	4867	94.8%	0.098	0.098	0.096	0.094	18	5	0	0	0	23	0.087	0.0430	5
KNOX COUNTY																		
Port Clyde	Marshall Point	1987	3308	3308	64.4%	0.149	0.146	0.142	0.140	21	22	14	15	11	83	0.104	0.0538	13
		1988	4511	4312	84.0%	0.185	0.183	0.167	0.164	75	67	44	20	33	239	0.102	0.0622	34
		1989	4146	4146	80.7%	0.134	0.129	0.127	0.125	21	30	7	8	4	70	0.097	0.0511	12
		1990	3825	3825	74.5%	0.153	0.149	0.140	0.135	41	28	13	5	6	93	0.097	0.0540	16
		1991	4541	4280	83.3%	0.137	0.135	0.134	0.133	53	41	32	23	14	163	0.100	0.0559	29
		1992	4403	4257	82.9%	0.122	0.118	0.118	0.117	43	39	15	6	1	104	0.094	0.0522	16
		1993	4237	4237	82.5%	0.131	0.122	0.116	0.112	18	18	7	5	2	50	0.096	0.0486	13
		1994	4360	4053	78.9%	0.124	0.123	0.111	0.107	35	8	2	1	2	48	0.090	0.0504	12
		1995	4066	4043	78.7%	0.140	0.135	0.123	0.123	40	21	11	5	6	83	0.095	0.0486	12
		1996	4153	4153	80.9%	0.108	0.107	0.104	0.103	17	8	5	0	0	30	0.091	0.0481	8
OXFORD COUNTY																		
North Lovell	Route 5	1992	3144	3144	61.2%	0.097	0.094	0.093	0.091	12	4	0	0	0	16	0.087	0.0410	4
		1993	4051	4051	78.9%	0.083	0.080	0.079	0.076	1	0	0	0	0	1	0.083	0.0408	1
		1994	4219	4219	82.1%	0.102	0.099	0.097	0.095	3	3	1	0	0	7	0.094	0.0449	2
		1995	4305	4305	83.8%	0.105	0.105	0.104	0.093	4	1	3	0	0	8	0.094	0.0440	2
		1996	4149	4149	80.8%	0.098	0.095	0.092	0.082	1	3	0	0	0	4	0.092	0.0414	1

TABLE 3 - 4 (Continued)
SUMMARY OF HOURLY OZONE DATA FOR SITES OPERATING DURING 1996

			Hourly Data Recovery			Hourly Maximums				Number of Hours(In PPM Ranges)					Hours >.081PPM		Annual	Days With
Site		Year	Total Hours	Ozone Season	Percent Recovery	Max. Hour	2nd High	3rd High	4th High	>.081 <.091	>.090 <.101	>.100 <.111	>.110 <.121	>.120	Number of Hours	Arith. Mean	Arith. Mean	Hour > .081 PPM
PENOBSCOT COUNTY																		
Holden	Rider Bluff	1993	3195	3195	62.2%	0.104	0.099	0.097	0.095	24	5	1	0	0	30	0.087	0.0462	8
		1994	3758	3758	73.2%	0.106	0.101	0.090	0.087	7	0	2	0	0	9	0.090	0.0443	3
		1995	4702	4620	90.0%	0.108	0.105	0.105	0.104	13	8	5	0	0	26	0.092	0.0449	7
		1996	5288	4998	97.3%	0.087	0.085	0.082	0.082	5	0	0	0	0	5	0.084	0.0431	4
PISCATAQUIS COUNTY																		
Greenville	Municipal Airport	1993	1430	1430	27.8%	0.067	0.063	0.062	0.061	0	0	0	0	0	0	N/A	0.0316	0
		1994	5732	5047	98.3%	0.084	0.079	0.076	0.076	1	0	0	0	0	1	0.084	0.0391	1
		1995	8595	5019	97.7%	0.091	0.090	0.087	0.086	6	1	0	0	0	7	0.087	0.0430	2
		1996	5157	4948	96.3%	0.080	0.078	0.076	0.073	0	0	0	0	0	0	N/A	0.0453	0
SAGADAHOC COUNTY																		
Phippsburg	Navy Road	1993	2529	2529	49.2%	0.132	0.126	0.125	0.122	29	30	6	4	4	73	0.095	0.0532	16
		1994	4069	4069	79.2%	0.148	0.128	0.124	0.112	58	21	5	2	3	89	0.091	0.0561	18
		1995	3893	3893	75.8%	0.172	0.145	0.139	0.139	61	16	18	4	11	110	0.096	0.0548	20
		1996	4137	4137	80.5%	0.109	0.108	0.108	0.103	47	14	5	0	0	66	0.089	0.0554	17
SOMERSET COUNTY																		
Skowhegan	Somerset Mill	1991	4828	4828	94.0%	0.116	0.112	0.106	0.105	6	1	2	2	0	11	0.095	0.0420	3
		1992	4970	4970	96.8%	0.096	0.090	0.090	0.090	9	1	0	0	0	10	0.088	0.0406	2
		1993	4901	4901	95.4%	0.099	0.098	0.095	0.094	7	8	0	0	0	15	0.090	0.0379	4
		1994	3915	3915	76.2%	0.096	0.095	0.088	0.088	9	2	0	0	0	11	0.087	0.0433	5
		1995	4139	4139	80.6%	0.089	0.088	0.088	0.087	9	0	0	0	0	9	0.086	0.0405	3
		1996	5055	5055	98.4%	0.098	0.096	0.093	0.092	6	4	0	0	0	10	0.089	0.0409	3
YORK COUNTY																		
Kennebunkport	Parson's Way	1983	3873	3873	75.4%	0.149	0.148	0.143	0.137	50	43	28	13	18	152	0.100	0.0554	29
		1984	4006	4006	78.0%	0.149	0.147	0.145	0.140	68	47	20	11	34	180	0.101	0.0601	34
		1985	3992	3931	76.5%	0.170	0.168	0.166	0.165	74	51	20	18	27	190	0.101	0.0639	38
		1986	4089	4089	79.6%	0.142	0.138	0.132	0.126	22	21	11	4	5	63	0.098	0.0524	14
		1987	4168	4168	81.2%	0.152	0.145	0.142	0.142	19	14	15	6	14	68	0.104	0.0511	12
		1988	3898	3898	75.9%	0.177	0.168	0.166	0.154	53	59	39	39	41	231	0.105	0.0650	38
		1989	3784	3784	73.7%	0.154	0.147	0.145	0.140	36	21	23	10	14	104	0.101	0.0576	17
		1990	4067	4067	79.2%	0.162	0.162	0.160	0.152	37	30	17	12	16	112	0.102	0.0570	23
		1991	4074	4074	79.3%	0.158	0.150	0.148	0.143	62	21	17	8	17	125	0.098	0.0582	27
		1992	4180	4180	81.4%	0.133	0.127	0.124	0.122	54	31	16	7	4	112	0.095	0.0536	21
		1993	3822	3822	74.4%	0.134	0.127	0.125	0.121	49	36	19	5	4	113	0.095	0.0537	21
		1994	3820	3820	74.4%	0.141	0.125	0.122	0.116	44	22	12	2	3	83	0.093	0.0560	20
		1995	4169	4169	81.2%	0.159	0.156	0.136	0.129	39	21	10	7	7	84	0.097	0.0516	16

TABLE 3 - 4(Continued)
SUMMARY OF HOURLY OZONE DATA FOR SITES OPERATING DURING 1996

			Hourly Data Recovery			Hourly Maximums				Number of Hours(In PPM Ranges)					Hours >.081PPM		Annual	Days With
Site		Year	Total Hours	Ozone Season	Percent Recovery	Max. Hour	2nd High	3rd High	4th High	>.081 <.091	>.090 <.101	>.100 <.111	>.110 <.121	>.120	Number of Hours	Arith. Mean	Arith. Mean	Hour > .081 PPM
		1996	4055	4055	79.0%	0.110	0.104	0.104	0.104	30	19	5	0	0	54	0.091	0.0518	11
Kittery	Frisbee School	1995	2754	2754	53.6%	0.127	0.127	0.126	0.119	34	18	5	4	3	64	0.093	0.0511	15
		1996	5010	4276	96.5%	0.099	0.096	0.095	0.094	25	9	0	0	0	34	0.088	0.0480	10
NEW BRUNSWICK																		
Campobello	Roosevelt Campobello Park	1995	2252	2252	43.8%	0.073	0.071	0.071	0.071	0	0	0	0	0	0	N/A	0.0413	0
		1996	3643	3643	70.9%	0.086	0.085	0.084	0.081	3	0	0	0	0	3	0.085	0.0441	2

NOTES:

Site	City Name and Site Name
Year	Indicates data for this calendar year.
Total Hours	Total number of hours of data for the calendar year.
Ozone Season	Number of hours of data collected during the ozone season of April 1 to October 31.
Percent Recovery	Percent of hours of data collected during the ozone season.
Max Hour	Maximum hourly concentration recorded during the year.
2nd High	Second highest hourly concentration recorded during theyear. Could be same day as highest.
3rd High	Third highest hourly concentration recorded during the year. Could be same day as the two higher numbers.
4th High	Fourth highest hourly concentration recorded during the year. Could be same day as the three higher numbers.
Number of Hours in ranges	Number of hours of data that fall into each specified range.
Total Hours >.081 PPM	Number of hours that are greater than .081 ppm. Should equal sum of five previous columns.
Annual Arithmetic Mean	AAM of the hourly data collected during the ozone season only.
Days with Hour >.081 PPM	Number of separate days that have at least one hour > .081 ppm during the year.

TABLE 3 - 5
FEDERAL OZONE EXCEEDANCES IN MAINE LISTED BY COUNTY AND SITE

Site		Year	Percent Data Recovery	Daily Hourly Maximums				Exceedances		3 Year Ave. of Estimated Exceedances	Compliance With Federal Standard*
				High Day	Second High	Third High	Fourth High	Meas. > .12 ppm	Est. > .12 ppm		
CUMBERLAND COUNTY											
Cape Elizabeth	Shelter Site	1980	66.4%	0.190	0.178	0.149	0.145	7	10.4	3.47	No
		1981	76.2%	0.142	0.138	0.136	0.134	5	6.5	5.63	No
		1982	80.8%	0.142	0.137	0.131	0.127	5	6.2	7.70	No
		1983	98.6%	0.172	0.152	0.152	0.133	9	9.1	7.27	No
		1984	93.5%	0.171	0.147	0.140	0.137	6	6.3	7.20	No
		1985	77.6%	0.167	0.158	0.144	0.138	4	5.1	6.83	No
		1986	98.1%	0.131	0.119	0.112	0.107	1	1.0	4.13	No
		1987	99.5%	0.156	0.141	0.138	0.136	4	4.0	3.37	No
		1988	97.7%	0.178	0.168	0.166	0.150	11	11.2	5.40	No
		1989	94.9%	0.146	0.130	0.125	0.113	3	3.2	6.13	No
		1990	94.9%	0.148	0.125	0.123	0.109	2	2.1	5.50	No
		1991	98.6%	0.145	0.141	0.137	0.127	4	4.0	3.10	No
		1992	98.6%	0.128	0.118	0.110	0.109	1	1.0	2.37	No
		1993	98.1%	0.122	0.112	0.103	0.103	0	0.0	1.67	No
		1994	100.0%	0.148	0.122	0.102	0.099	1	1.0	0.67	Yes
		1995	100.0%	0.161	0.116	0.116	0.107	1	1.0	0.67	Yes
		1996	100.0%	0.107	0.100	0.099	0.097	0	0.0	0.67	Yes
HANCOCK COUNTY											
Bar Harbor	Acadia National Park	1982	12.1%	0.055	0.055	0.050	0.040	0	0.0	0.00	?
		1983	93.5%	0.138	0.135	0.128	0.113	3	3.2	1.07	No
		1984	87.9%	0.140	0.117	0.108	0.107	1	1.1	1.43	No
		1985	97.7%	0.120	0.117	0.102	0.100	0	0.0	1.43	No
		1986	95.8%	0.109	0.104	0.101	0.100	0	0.0	0.37	Yes
		1987	95.8%	0.130	0.121	0.117	0.112	1	1.0	0.33	Yes
		1988	91.6%	0.179	0.153	0.135	0.133	6	6.5	2.50	No
		1989	94.4%	0.130	0.104	0.104	0.088	1	1.0	2.83	No
		1990	95.8%	0.123	0.112	0.105	0.096	0	0.0	2.50	No
		1991	75.7%	0.128	0.125	0.111	0.109	2	2.5	1.17	No
		1992	63.6%	0.108	0.095	0.093	0.088	0	0.0	0.83	Yes
		1993	99.1%	0.112	0.094	0.093	0.093	0	0.0	0.83	Yes
		1994	90.2%	0.102	0.092	0.088	0.087	0	0.0	0.00	Yes
		1995	99.1%	0.128	0.119	0.105	0.104	1	1.0	0.33	Yes
		1996	100.0%	0.102	0.100	0.092	0.083	0	0.0	0.33	Yes
Bar Harbor	Cadillac Mountain	1995	45.8%	0.134	0.121	0.115	0.088	1	2.2	0.73	?
		1996	70.6%	0.100	0.096	0.094	0.093	0	0.0	0.73	?

TABLE 3 - 5 (Continued)
FEDERAL OZONE EXCEEDANCES IN MAINE LISTED BY COUNTY AND SITE

Site		Year	Percent Data Recovery	Daily Hourly Maximums				Exceedances		3 Year Ave. of Estimated Exceedances	Compliance With Federal Standard*
				High Day	Second High	Third High	Fourth High	Meas. > .12 ppm	Est. > .12 ppm		
KENNEBEC COUNTY											
Gardiner	Gardiner High School	1980	65.0%	0.143	0.110	0.107	0.105	1	1.5	0.50	?
		1981	74.3%	0.127	0.122	0.118	0.108	1	1.3	0.93	?
		1982	77.6%	0.126	0.122	0.112	0.106	1	1.3	1.37	No
		1983	99.1%	0.145	0.140	0.138	0.118	3	3.0	1.87	No
		1984	97.2%	0.124	0.112	0.107	0.107	0	0.0	1.43	No
		1985	80.8%	0.142	0.129	0.125	0.114	3	3.7	2.23	No
		1986	82.7%	0.111	0.110	0.100	0.087	0	0.0	1.23	No
		1987	95.8%	0.119	0.093	0.092	0.087	0	0.0	1.23	No
		1988	94.9%	0.159	0.134	0.125	0.119	3	3.1	1.03	No
		1989	99.1%	0.126	0.108	0.100	0.098	1	1.0	1.37	No
		1990	85.5%	0.108	0.107	0.102	0.097	0	0.0	1.37	No
	Pray Street	1991	98.6%	0.132	0.111	0.106	0.102	1	1.0	0.67	Yes
		1992	100.0%	0.115	0.104	0.103	0.096	0	0.0	0.33	Yes
		1993	99.5%	0.098	0.096	0.096	0.095	0	0.0	0.33	Yes
		1994	84.1%	0.120	0.098	0.094	0.093	0	0.0	0.00	Yes
		1995	99.1%	0.102	0.091	0.088	0.084	0	0.0	0.00	Yes
		1996	100.0%	0.098	0.096	0.094	0.091	0	0.0	0.00	Yes
KNOX COUNTY											
Port Clyde	Marshall Point	1987	64.5%	0.149	0.142	0.129	0.120	3	4.7	1.57	No
		1988	84.1%	0.185	0.149	0.143	0.141	9	10.7	5.13	No
		1989	85.0%	0.134	0.120	0.120	0.119	1	1.2	5.53	No
		1990	72.9%	0.153	0.121	0.118	0.116	1	1.3	4.40	No
		1991	87.9%	0.137	0.135	0.129	0.128	4	4.5	2.33	No
		1992	87.4%	0.122	0.118	0.108	0.106	0	0.0	1.93	No
		1993	86.9%	0.131	0.122	0.112	0.101	1	1.2	1.90	No
		1994	82.2%	0.124	0.111	0.103	0.091	0	0.0	0.40	Yes
		1995	82.2%	0.140	0.123	0.108	0.104	1	1.2	0.80	Yes
		1996	85.0%	0.108	0.104	0.096	0.095	0	0.0	0.40	Yes
OXFORD COUNTY											
North Lovell	Route 5	1992	61.7%	0.097	0.087	0.083	0.082	0	0.0	0.00	?
		1993	79.4%	0.083	0.080	0.079	0.071	0	0.0	0.00	?
		1994	83.2%	0.102	0.097	0.079	0.077	0	0.0	0.00	Yes
		1995	84.6%	0.105	0.093	0.071	0.071	0	0.0	0.00	Yes
		1996	84.1%	0.098	0.079	0.071	0.070	0	0.0	0.00	Yes

TABLE 3 - 5 (Continued)
FEDERAL OZONE EXCEEDANCES IN MAINE LISTED BY COUNTY AND SITE

			Percent	Daily Hourly Maximums				Exceedances		3 Year Ave.	Compliance
Site		Year	Data Recovery	High Day	Second High	Third High	Fourth High	Meas. > .12 ppm	Est. > .12 ppm	of Estimated Exceedances	With Federal Standard*
PENOBSCOT COUNTY											
Holden	Rider Bluff	1993	62.1%	0.104	0.097	0.095	0.088	0	0.0	0.00	?
		1994	72.9%	0.106	0.083	0.082	0.081	0	0.0	0.00	?
		1995	91.6%	0.108	0.100	0.095	0.095	0	0.0	0.00	Yes
		1996	99.5%	0.087	0.082	0.082	0.082	0	0.0	0.00	Yes
PISCATAQUIS COUNTY											
Greenville	Municipal Airport	1993	28.0%	0.067	0.054	0.053	0.050	0	0.0	0.00	?
		1994	99.1%	0.084	0.076	0.072	0.066	0	0.0	0.00	?
		1995	99.1%	0.091	0.087	0.079	0.075	0	0.0	0.00	Yes
		1996	98.1%	0.080	0.070	0.069	0.068	0	0.0	0.00	Yes
SAGADAHOC COUNTY											
Phippsburg	Navy Road	1993	52.3%	0.132	0.125	0.104	0.102	2	3.8	1.27	No
		1994	83.6%	0.148	0.124	0.111	0.106	1	1.2	1.67	No
		1995	79.9%	0.172	0.139	0.110	0.107	2	2.5	2.50	No
		1996	84.6%	0.109	0.108	0.098	0.098	0	0.0	1.23	No
SOMERSET COUNTY											
Skowhegan	Somerset Mill	1991	95.3%	0.116	0.085	0.083	0.081	0	0.0	0.00	?
		1992	98.1%	0.096	0.090	0.081	0.079	0	0.0	0.00	?
		1993	97.7%	0.099	0.094	0.093	0.091	0	0.0	0.00	Yes
		1994	77.1%	0.096	0.088	0.088	0.086	0	0.0	0.00	Yes
		1995	81.8%	0.089	0.088	0.088	0.078	0	0.0	0.00	Yes
		1996	98.6%	0.098	0.093	0.092	0.077	0	0.0	0.00	Yes
YORK COUNTY											
Kennebunkport	Parson's Way	1983	75.7%	0.149	0.143	0.137	0.135	7	9.2	3.07	No
		1984	78.5%	0.149	0.147	0.145	0.140	11	14.0	7.73	No
		1985	76.2%	0.170	0.165	0.152	0.145	4	5.2	9.47	No
		1986	80.4%	0.142	0.126	0.117	0.115	2	2.5	7.23	No
		1987	81.8%	0.152	0.142	0.135	0.131	4	4.9	4.20	No
		1988	74.8%	0.177	0.154	0.152	0.152	13	17.1	8.17	No
		1989	74.3%	0.154	0.147	0.140	0.122	3	4.0	8.67	No
		1990	79.0%	0.162	0.152	0.144	0.142	5	6.3	9.13	No
		1991	83.2%	0.158	0.148	0.141	0.126	4	4.8	5.03	No
		1992	85.5%	0.133	0.127	0.118	0.109	2	2.3	4.47	No
		1993	78.5%	0.134	0.125	0.117	0.116	2	2.5	3.20	No
		1994	78.5%	0.141	0.116	0.104	0.103	1	1.3	2.03	No
		1995	85.0%	0.159	0.129	0.118	0.117	2	2.3	2.03	No
		1996	82.7%	0.110	0.104	0.104	0.096	0	0.0	1.20	No

TABLE 3 - 5 (Continued)
FEDERAL OZONE EXCEEDANCES IN MAINE LISTED BY COUNTY AND SITE

				Daily Hourly Maximums				Exceedances			
Site		Year	Percent Data Recovery	High Day	Second High	Third High	Fourth High	Meas. > .12 ppm	Est. > .12 ppm	3 Year Ave. of Estimated Exceedances	Compliance With Federal Standard*
Kittery	Frisbee School	1995	54.2%	0.127	0.127	0.126	0.103	3	5.5	1.83	No
		1996	97.2%	0.099	0.096	0.094	0.094	0	0.0	1.83	No
NEW BRUNSWICK											
Campobello	Roosevelt Campobello Park	1995	43.9%	0.073	0.071	0.066	0.065	0	0.0	0.00	?
		1996	70.1%	0.086	0.085	0.081	0.079	0	0.0	0.00	?

* Based on the federal ozone standard of .12 ppm. The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above .12 part per million is equal to or less than 1, as determined by Part 50 Appendix H. Appendix H says that this is a 3 year average of exceedances or if the data is not complete it is a 3 year average of the estimated number of exceedances.

NOTE:

Site	City Name and Site Name
Year	Indicates data for this calendar year.
Percent Data Recovery	Percent of valid days during the ozone season. (n/214)
High Day	Highest hourly value during the ozone season.
Second High	Separate day with the second highest hourly value.
Third High	Separate day with the third highest hourly value.
Fourth High	Separate day with the fourth highest hourly value.
Exceedances Meas. > .12 ppm	Number of days that recorded an hourly concentration greater than .12 ppm.
Exceedances Est. > .12 ppm.	Estimated number of days with an hourly value > .12 ppm taking into account missing data.
3 Year Ave. of Est. Exceedances	Average of estimated exceedances based on the year indicated plus the two previous years. If less than three years of data , the average is for two years or is the estimate for the year if only one year of data exists.
Compliance with Fed. Std.	If the estimated exceedances average is greater than one then the site is not in compliance with the federal standard. A question mark means not enough information is available to make that decision.

TABLE 3-6
YEARLY STATE OZONE HEALTH WARNING LEVEL EXCEEDANCE DAYS COMPARISON*
STATE OF MAINE

	YEAR																	
MONTH	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	AVERAGE
APRIL	1	0	5	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0.59
MAY	3	4	5	2	3	6	2	3	6	2	1	5	6	1	2	2	1	3.18
JUNE	10	4	2	9	11	9	7	7	12	4	8	7	8	6	2	7	8	7.12
JULY	15	4	12	15	16	19	6	5	18	6	8	12	4	7	16	12	9	10.82
AUGUST	7	9	7	9	11	10	3	8	12	8	6	11	7	8	9	6	9	8.24
SEPTEMBER	2	1	2	12	5	6	2	3	3	6	4	2	4	3	1	2	0	3.41
OCTOBER	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0.12
TOTALS	38	22	33	48	47	50	20	26	51	26	29	38	29	25	30	30	27	33.47
# OF SITES	7	6	8	6	6	8	9	10	9	9	9	11	14	13	12	14	13	

TABLE 3-7
YEARLY FEDERAL OZONE STANDARD EXCEEDANCE DAYS COMPARISON*
STATE OF MAINE

	YEAR																	
MONTH	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	AVERAGE
APRIL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
MAY	0	3	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0	0.35
JUNE	1	1	0	1	2	0	0	1	5	0	1	3	0	0	0	1	0	0.94
JULY	4	0	4	3	6	2	1	1	6	3	1	3	0	3	1	1	0	2.29
AUGUST	2	2	0	3	4	3	1	3	7	0	3	1	1	1	0	2	0	1.94
SEPTEMBER	0	0	1	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0.29
OCTOBER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
TOTALS	7	6	5	10	12	6	2	5	19	4	5	7	2	4	1	4	0	5.82
# OF SITES	7	6	8	6	6	8	9	10	9	9	9	11	14	13	12	14	13	

* Separate days on which either the federal or state standard was exceeded.

4. NITROGEN DIOXIDE (NO2)

4.1 Description and Sources

In its pure state, nitrogen dioxide is a reddish-orange-brown gas with a characteristic pungent odor. It is corrosive and a strong oxidizing agent. Nitrogen dioxide comprises about 10% of the oxides of nitrogen (NOx) that are formed when nitrogen in the air combines with oxygen during high temperature combustion. Most of the rest of the NOx emitted by combustion sources is nitric oxide (NO). However, during the day most of the NO is photochemically transformed into NO_2. Thus, essentially all the NOx emitted can be assumed to eventually become NO_2.

4.2 Health and Welfare Effects

Exposure to NO_2 affects the delicate structure of lung tissue. High levels cause lung irritation and potential lung damage. Lower levels have been associated with increased respiratory disease. Oxides of nitrogen can cause serious injury to vegetation, including bleaching or death of plant tissue, loss of leaves, and reduced growth rate. NOx also deteriorates fabrics and fades fabric dyes. Nitrate salts formed from nitrogen oxides have been associated with the corrosion of metals. Nitrogen oxides can also reduce visibility.

4.3 Standards

The current standard for NO_2 is an annual arithmetic mean (average) value not to exceed .05 ppm. NO_2 is the only gaseous pollutant for which only a long-term (annual average) standard has been established.

4.4 Monitoring

Nitrogen Dioxide was monitored at two sites in Maine during 1996 using continuous monitoring equipment. The site in Kittery was operated and maintained by the New Hampshire Department of Environmental Resources as a required downwind PAMS(Photochemical Assessment Monitoring Station) site for the Portsmouth/Dover/Rochester MSA(Metropolitan Statistical Area). Table 4-1 presents the data collected during 1996.

TABLE 4 - 1
1996 NITROGEN DIOXIDE DATA SUMMARY
(Parts Per Million)

SITE	ADDRESS	OBSERVATIONS	ARITHMETIC MEAN
HANCOCK COUNTY			
Bar Harbor	Cadillac Mountain	3295	0.001*
YORK COUNTY			
Kittery	Frisbee School	8471	0.011

* Insufficient data collected for a valid annual arithmetic mean.

5. SULFUR DIOXIDE (SO2)

5.1 Description and Sources

Sulfur dioxide is a colorless irritating gas having the same pungent odor as a struck match. Most people can detect its taste at a level of about 0.3 to 1 part per million. SO_2 is highly soluble in water, forming sulfurous acid. On a worldwide basis, SO_2 is considered to be one of the major pollution problems. It is emitted mainly from stationary sources that utilize fossil fuels (coal, oil) such as power plants, ore smelters, and refineries.

5.2 Health and Welfare Effects

The health effects of sulfur dioxide appear to be always associated with high levels of particulates or other pollutants. The world's major recorded air pollution disasters have been associated with high levels of sulfur dioxide and particulates. The excess deaths attributed to these pollutants were due to respiratory failures and occurred predominantly, but not exclusively, in the elderly and infirm. Atmospheres containing high levels of sulfur dioxide are associated with elevated concentrations of other sulfur compounds such as sulfates and sulfuric acid mists, which are corrosive and potentially carcinogenic.

The corrosiveness of SO_2 and its derivatives also causes crop and material damage. Its transport and transformation into sulfurous and sulfuric acids contribute to acid precipitation, causing soils and lakes to become seriously acidified.

5.3 Standards

There are two existing Primary National Ambient Air Quality Standards for sulfur dioxide. The first is a long-term one year arithmetic average of 0.03 parts per million (ppm). The second is a short-term 24-hour average standard where concentrations are not to exceed 0.14 ppm more than once per year. The current Secondary NAAQS for SO_2 is a 3-hour average concentration of 0.5 ppm not to be exceeded more than once per year.

In addition there are three State standards for sulfur dioxide. The first is a long-term one-year arithmetic average of .022 parts per million. The second was a short-term 24-hour average standard of .088 ppm not to be exceeded. The third was a short-term 3-hour average concentration of .439 ppm not to be exceeded. During 1987 both of the short-term standards were amended to allow for one exceedance per year.

5.4 Monitoring

Sulfur dioxide was monitored at eleven sites in Maine during 1996 using continuous monitoring equipment utilizing the pulsed fluorescent method. Two of those sites were shut down during the

Table 5-1 is a summary of the 1996 sulfur dioxide data. Tables 5-2 and 5-3 present SO_2 historical comparison data. Table 5-3 in past years had indicated violations but because one exceedance was allowed per year beginning in 1987 this table now indicates exceedances of the standards rather than violations to maintain continuity for comparisons.

TABLE 5 - 1
1996 SULFUR DIOXIDE DATA SUMMARY
(Parts Per Million)

SITE	ADDRESS	# OF OBS'NS	3 - HOUR AVERAGE HIGH	3 - HOUR AVERAGE 2ND HIGH	24 - HOUR AVERAGE HIGH	24 - HOUR AVERAGE 2ND HIGH	ANNUAL ARITH. MEAN
ANDROSCOGGIN COUNTY							
Lewiston	Country Kitchen Parking Lot	8,322	0.044	0.041	0.026	0.019	0.004
Lewiston	Columbia Street	744	0.047	0.043	0.020	0.012	0.006*
AROOSTOOK COUNTY							
Madawaska	Albert Street	8,344	0.155	0.127	0.047	0.047	0.007
Madawaska	U. S. Post Office	8,341	0.091	0.088	0.042	0.038	0.008
Madawaska	Madawaska High School	8,339	0.080	0.071	0.027	0.025	0.003
Presque Isle	Riverside Street	4,294	0.030	0.022	0.010	0.010	0.003*
Houlton	Houlton Fire Station	120	0.011	0.009	0.007	0.003	0.004*
CUMBERLAND COUNTY							
Portland	Shelter Site	8,359	0.061	0.055	0.023	0.021	0.005
OXFORD COUNTY							
Mexico	Hunt's Property	8,202	0.026	0.020	0.013	0.013	0.004
Rumford	Village Green	8,250	0.027	0.026	0.014	0.014	0.003
PENOBSCOT COUNTY							
Millinocket	York Street	1,429	0.050	0.041	0.023	0.019	0.005*

* Insufficient data collected for a valid annual arithmetic mean.

TABLE 5 - 2
SULFUR DIOXIDE HISTORICAL COMPARISONS
(Maximum 24 - Hour Concentrations of Sulfur Dioxide)

SITE	ADDRESS	Maximum 24 - Hour Concentration (PPM) 1990	1991	1992	1993	1994	1995	1996
ANDROSCOGGIN COUNTY								
Lewiston	Country Kitchen Parking Lot	0.027	0.026	0.021	0.027	0.029	0.025	0.026
AROOSTOOK COUNTY								
Madawaska	Albert Street	0.093	0.072	0.080	0.044	0.073	0.055	0.047
Madawaska	U. S. Post Office	0.042	0.048	0.088	0.070	0.060	0.054	0.042
Madawaska	Madawaska High School	0.027	0.045	0.040	0.045	0.050	0.078	0.027
Presque Isle	Riverside Street	-----	-----	-----	-----	0.008	0.009	0.010
CUMBERLAND COUNTY								
Portland	Shelter Site	0.034	0.039	0.032	0.033	0.045	0.025	0.023
OXFORD COUNTY								
Mexico	Hunt's Property	0.054	0.020	0.018	0.022	0.020	0.021	0.013
Rumford	Village Green	0.046	0.033	0.021	0.020	0.020	0.024	0.014
PENOBSCOT COUNTY								
Millinocket	York Street	0.102	0.035	0.024	0.027	0.031	0.029	0.023

TABLE 5 - 3
SULFUR DIOXIDE HISTORICAL COMPARISONS
(Sites with exceedances of the standards in the past seven years)

SITE	ADDRESS	NUMBER OF EXCEEDANCES* 1990	1991	1992	1993	1994	1995	1996
PENOBSCOT COUNTY								
Millinocket	York Street	1	0	0	0	0	0	0

* Includes 3-Hour and 24-hour Exceedances

6. PARTICULATES (TSP and PM10)

6.1 Description and Sources

Particulates is the term given to the tiny particles of solid or semi-solid material found in the atmosphere. It is this "dirt" in the air that is visible as a "Brown Cloud", haze or smog. The sources of particulates are many: wind-blown dust and sand from roadways, fields, and construction; coal dust, fly ash, and carbon black from various combustion sources; and automobile exhaust, to name a few. Particulates that range in size from less than 0.1 micrometer up to approximately 45 micrometers are called "total suspended particulates." Particles larger than that range tend to settle out of the air and not remain suspended, except in high winds.

6.2 Health and Welfare Effects

The human nose filters out 99 percent of the large and medium-sized particles. The rest enter the windpipe and lungs, where some, known as inhalable particulates, cling to protective mucous and are removed. Some of the smallest, called respirable particulates, are deposited in the lungs' tiny air sacs (alveoli).

In the lungs particulates slow down the exchange of oxygen with carbon dioxide in the blood, causing shortness of breath. The heart may be strained because it must work harder to compensate for oxygen loss. Usually the people most sensitive to these conditions have respiratory diseases like emphysema, bronchitis, asthma, or heart problems. The elderly and children are also sensitive.

Particles themselves may be poisonous if inhaled or absorbed, damaging remote organs like the kidneys or liver. Swallowed mucous that is laden with poisonous particulate matter may damage the stomach.

In addition, particulates may be carriers of poisonous liquid or gaseous substances. Sulfur dioxide, a major air pollutant in its own right, is frequently absorbed by particulates and can react with them to form sulfates. Sulfates react with moisture in the air or in the respiratory tract to form a corrosive liquid (sulfuric acid) that irritates delicate membranes and slows down the cleansing action of mucous. This effect can reduce the body's ability to remove harmful bacteria, increasing the possibility of infection.

Adverse health effects from particulate matter aren't always seen immediately. Particulates can accumulate in the lungs after repeated, long-term exposure, causing respiratory distress and other health problems that may be manifested later.

Particles in the air block out and scatter sunlight, reducing visibility. Particulates soil and corrode metals, masonry, and textiles. Irritating odors are often associated with particulates, also.

6.3 Standards

Primary:

At the beginning of 1987 the primary particulate standards were for total suspended particulates (TSP), independent of particle size or chemical composition. The long-term standard was an annual geometric mean not to exceed 75 micrograms of particulates per cubic meter of air (ug/m^3). The short-term standard was a 24-hour average of 260 ug/m^3 not to be exceeded more than once per year.

In July of 1987 EPA published revised particulate standards to account for the deeper inhalability of small particles and eliminated the total suspended particulate standards. The new standards, rather than applying to TSP, apply to inhalable or fine particulates. A particle size of 10 micrometers was selected as the upper size limit with a 24-hour concentration of 150 ug/m^3 and an annual standard of 50 ug/m^3 expressed as an expected annual arithmetic mean (AAM). The short term standard is attained when the expected number of exceedances is no more than one per year. The expected AAM is determined by averaging the annual arithmetic averages from three successive years of data. EPA has recently proposed new fine particulate standards for those particles that are 2.5 microns or less. These proposals will be reviewed with a final promulgation expected in 1997.

Secondary:

The secondary TSP standard was a 24-hour average of 150 ug/m^3 not to be exceeded more than once per year, designed to protect from soiling, corrosion, etc.

When EPA adopted the fine particulate standards they eliminated the secondary TSP standards and made the secondary fine particulate standards equal to the primary fine particulate standards. In the recent proposals EPA is again proposing to use the primary standards as the secondary standards also.

State Standards:

As of the end of 1988 the State Standards for total suspended particulates still included an annual geometric mean of 60 micrograms per cubic meter and a 24-hour standard of 150 micrograms per cubic meter not to be exceeded. In addition, the Board of Environmental Protection adopted the Federal fine particulate standards for both the short term twenty-four hour and the annual arithmetic mean.

In 1989 the State Legislature passed a more restrictive annual standard for fine particulates of 40 ug/m^3. In addition, the TSP annual State standard was eliminated and the 24 hour standard was changed to be an indicator of a nuisance condition.

6.4 Monitoring

Total Suspended Particulates were monitored at only one site in Maine during 1996 using High-

Volume Particulate Air Samplers (Hi-Vols).

Hi-Vols operate on the same principle as a vacuum cleaner in that the air is drawn through a filter to "catch the dust". The difference is that a Hi-Vol draws a calibrated volume of air through a pre-weighed filter pad (rather than a bag) for a twenty-four hour period. The change in weight of the filter pad is recorded as total suspended particulate or TSP in micrograms of particulates per cubic meter of air.

Table 6-1 is a summary of the TSP data collected in Maine during 1996. Table 6-2 is a historical comparison of the TSP annual geometric means. There have been no exceedances of the TSP nuisance standard at this site over the last seven years that it has been in operation.

Fine particulates were monitored at twenty-five sites during 1996 using PM_{10} samplers. The sampling is conducted with size-selective inlets and flow controlling devices designed to meet EPA's monitor specifications.

Table 6-3 is a summary of the PM_{10} particulate data collected in Maine during 1996. Tables 6-4 and 6-5 provide some historical comparison data over the last few years these monitors have been in operation.

TABLE 6 - 1
1996 TOTAL SUSPENDED PARTICULATES DATA SUMMARY
(Micrograms Per Cubic Meter)

SITE	ADDRESS	# OF OBS'NS	HIGHEST 24-HOUR	SECOND HIGHEST	THIRD HIGHEST	ANNUAL GEOMETRIC MEAN
KNOX COUNTY						
Thomaston	Mitchell Property	117	103	100	87	21.1

TABLE 6 - 2
TOTAL SUSPENDED PARTICULATES HISTORICAL COMPARISON
ANNUAL GEOMETRIC MEANS (UG/M3)

		ANNUAL GEOMETRIC MEANS (UG/M3)						
SITE	ADDRESS	1990	1991	1992	1993	1994	1995	1996
KNOX COUNTY								
Thomaston	Mitchell Property	21.3	20.5	21.7	21	21.2	21.4	21.1

TABLE 6 - 3
1996 PM10 PARTICULATE DATA SUMMARY
(Micrograms Per Cubic Meter)

SITE	ADDRESS	# OF OBS'NS	HIGHEST 24-HOUR	SECOND HIGHEST	THIRD HIGHEST	ANNUAL ARITH. MEAN	ANNUAL GEOM. MEAN
ANDROSCOGGIN COUNTY							
Lewiston	Country Kitchen Parking Lot	62	52	37	35	20.0	18.5
AROOSTOOK COUNTY							
Madawaska	Big Daddy's Restaurant	59	58	52	46	23.1	20.5
Presque Isle	Regional Office	58	27	24	20	11.8	10.8
Presque Isle	Riverside Street	54	44	43	31	17.7	15.6
Presque Isle	Riverside Street(Continuous)	346	109	104	94	23.6	17.1
Loring AFB	Building 5100	159	40	30	30	9.7	8.2
Houlton	Houlton Fire Station	2	25	13	----	19.0*	18.0*
CUMBERLAND COUNTY							
Bridgton	Upper Ridge Road	54	28	24	19	7.9	6.6
Portland	Shelter Site	60	42	37	32	20.4	18.7
Portland	Tukey's Bridge	59	64	61	51	27.1	23.6
FRANKLIN COUNTY							
Jay	Crash Road	118	40	39	27	13.2	11.8
Jay	Jay hill	118	46	29	28	12.2	10.2
HANCOCK COUNTY							
Ellsworth	Coastal Carpets	57	53	48	42	19.8	17.4
Ellsworth	Triangle Exxon	52	53	51	50	19.6	16.3
KENNEBEC COUNTY							
Augusta	Rines Hill Parking Lot	65	78	64	54	23.6	20.4
KNOX COUNTY							
Thomaston	Mitchell Property	114	45	39	38	15.2	12.9
OXFORD COUNTY							
Mexico	Labonville's	182	55	41	37	15.5	13.8
Rumford	Village Green	165	34	33	30	12.0	10.6
PENOBSCOT COUNTY							
Bangor	Kenduskeag Pump Station	61	41	34	31	18.8	17.4
Lincoln	Thomas Motel Trailer Park	62	31	27	27	12.2	10.7
Lincoln	Penobscot River	61	41	35	17	8.3	6.3
Lincoln	Lincoln Post Office Building	159	81	70	65	20.4	16.7
Millinocket	York Street	10	24	23	20	14.1*	12.4*
SOMERSET COUNTY							
Skowhegan	Hinckley	51	39	26	22	10.4	9.6
Skowhegan	Eaton Ridge	48	40	26	23	10.4	9.5
YORK COUNTY							
Biddeford	Eagles Aerie	57	38	37	35	17.5	15.9

* Insufficient data collected for a valid annual mean.

TABLE 6 - 4
PM10 PARTICULATE HISTORICAL COMPARISON
ANNUAL ARITHMETIC MEANS(UG/M3)

		ANNUAL ARITHMETIC MEANS(UG/M3)						
SITE	ADDRESS	1990	1991	1992	1993	1994	1995	1996
ANDROSCOGGIN COUNTY								
Lewiston	Country Kitchen Parking Lot	24.7	28.5	24.4	24.3	20.2	19.8	20.0
AROOSTOOK COUNTY								
Madawaska	Big Daddy's Restaurant	34.9	32.1	30.8	27.9	25.0	25.0	23.1
Presque Isle	Regional Office	14.1	16.3	14.9	13.5	13.5	12.4	11.8
Presque Isle	Riverside Street	N/A	N/A	N/A	N/A	20.3	17.9	17.7
Presque Isle	Riverside Street(Continuous)	N/A	N/A	N/A	N/A	N/A	14.8	23.6
CUMBERLAND COUNTY								
Bridgton	Upper Ridge Road	13.4	12.2	10.5	8.7	8.9	9.0	7.9
Portland	Shelter Site	22.5	24.7	22.9	21.4	21.1	20.7	20.4
Portland	Tukey's Bridge	N/A	27.6	24.1*	29.0	26.5	34.3	27.1
FRANKLIN COUNTY								
Jay	Crash Road	N/A	N/A	N/A	13.7*	15.2	14.3	13.2
Jay	Jay Hill	18.2	19.1	15.9	13.9	14.1	12.7	12.2
HANCOCK COUNTY								
Ellsworth	Coastal Carpets	N/A	N/A	N/A	N/A	N/A	25.2	19.8
Ellsworth	Triangle Exxon	N/A	N/A	N/A	N/A	N/A	17.4	19.6
KENNEBEC COUNTY								
Augusta	Rines Hill Parking Lot	N/A	26.3	24.9	24.8	20.2	20.5	23.6
KNOX COUNTY								
Thomaston	Mitchell Property	15.3	15.2	14.2	14.1	13.9	14.8	15.2
OXFORD COUNTY								
Mexico	Labonville's	24.1	20.6	18.7	18.4	18.8	16.7	15.5
Rumford	Village Green	19.3	17.2	15.0	14.7	15.1	12.9	12.0
PENOBSCOT COUNTY								
Bangor	Kenduskeag Pump Station	20.5	25.1	22.2	22.2	21.9	20.0	18.8
Lincoln	Thomas Motel Trailer Park	18.9	18.2	17.2	15.7	14.4	13.2	12.2
Lincoln	Penobscot River	11.7	11.5	11.4	10.6	10.0	9.3	8.3
Lincoln	Lincoln Post Office Building	22.5	26.8	25.8	25.9	23.0	22.4	20.4
Millinocket	York Street	16.2	15.5	16.7	19.0	18.5	15.8	14.1*
SOMERSET COUNTY								
Skowhegan	Hinckley	13.8	14.2	13.4	11.5	11.7	11.1	10.4
Skowhegan	Eaton Ridge	13.6	14.0	11.9	11.5	11.9	10.7	10.4
YORK COUNTY								
Biddeford	Eagles Aerie	N/A	N/A	N/A	18.3	19.0	18.0	17.5

* Insufficient data collected for a valid annual mean.

7. LEAD (Pb)

7.1 Description and Sources

Lead in the ambient air exists primarily as particulate matter in the inhalable size range. The predominant source of atmospheric lead is from motor vehicles and incineration of solid wastes. Trace amounts of lead are still present in "unleaded" gasoline and are emitted in motor vehicle exhaust. Other major sources of atmospheric lead are the extraction and processing of metallic ores.

7.2 Health and Welfare Effects

When atmospheric lead is breathed in, it is absorbed into the bloodstream and distributed throughout the body along with lead from contaminated food and drinking water. Lead accumulation in the body can impair the production of hemoglobin. Clinical lead poisoning occurs when the body's accumulation of lead becomes too high. Symptoms of lead poisoning range from loss of appetite, fatigue, cramps and constipation, and pains in the ankles and wrists to loss of power in the arms and legs, anemia, kidney disease, mental retardation, blindness and death. Lead concentrations in the ambient air are not sufficient to produce lead poisoning but they do increase the risk of harm when other sources of lead are present. And, indirectly, lead fallout from automotive exhaust onto soil and street surfaces can be ingested in considerable amounts by infants and young children.

7.3 Standards

The current National Ambient Air Quality Standard for lead is a 3-month (calendar quarter) average concentration not to exceed 1.5 micrograms of lead per cubic meter of air.

The current State Standard for lead is a 24-hour average concentration of 1.5 micrograms of lead per cubic meter of air not to be exceeded more than once per year.

7.4 Monitoring

Lead was not monitored in Maine during 1996 due to the extremely low concentrations recorded in previous years. The last monitoring occurred in 1993 in Portland and Lewiston. The maximum 24-hour average concentration was .14 micrograms per cubic meter, less than 10 percent of the State standard. The maximum calendar quarter average was .03 micrograms per cubic meter, only 2 percent of the National Ambient Air Quality Standard.

8. SULFATES (SO4) AND NITRATES (NO3)

8.1 Description and Sources

Sulfates and Nitrates are compounds of varying harmfulness found everywhere in the atmosphere. They are produced by nature as well as man. Man-made sulfates have their origin in sulfur dioxide while nitrates have theirs in nitrogen oxides. Fine particulate compounds, including sulfates and nitrates are formed from chemical reactions between sulfur dioxide or nitrogen dioxide emitted into the air and other substances present there. These fine particulate compounds have a long atmospheric residence time, can be transported in the air for long distances, and are capable of penetrating deeply into the human respiratory tract.

8.2 Health and Welfare Effects

Epidemiological studies of populations exposed to particulate sulfates have shown that atmospheric sulfates, more than sulfur dioxide gas or total suspended particulates, are related to aggravation of asthma, aggravation of heart and lung disease in the elderly, and impairment of lung function in school children. This evidence was obtained from EPA's Community Health and Environmental Surveillance System (CHESS). From these studies, estimates of the sulfate threshold for adverse health effects have been derived, as shown in Table 8-1. However, these epidemiological studies have not been substantiated by laboratory studies.

Both sulfates and nitrates are considered to be contributors to the acid deposition problem.

8.3 Standards

There are currently no standards for levels of sulfates in ambient air. EPA has been working on a standard and is expected to make a proposal in the future.

There are no standards for nitrates nor are there any proposed.

8.4 Monitoring

Sulfate levels were measured at two sites in Maine during 1996 by taking samples of the PM_{10} filters from those sites and analyzing the samples for sulfates using the Methylthymol Blue Procedure. There is no standard yet and the monitoring methodology is questionable but the data is being included in this report as an aid to those interested in further information about Maine's air quality. Table 8-2 summarizes the sulfate data collected during 1996.

Nitrate levels were not measured in Maine during 1996.

TABLE 8-1
SULFATE THRESHOLDS FOR ADVERSE HEALTH EFFECTS

Threshold Concentration For Adverse Health Effect	Suspended Sulfates
Aggravation of Asthma	6 to 10 Micrograms Per Cubic Meter for 24 Hours.
Aggravation of Heart and Lung	9 Micrograms Per Cubic Meter for Disease in the Elderly for 24 Hours
Subtle Decreases in Childhood	9 to 13 Micrograms Per Cubic Meter Lung Function for 1 Year.
Increase in Acute Respiratory	13 Micrograms Per Cubic Meter for Disease in Children for 1 Year.

TABLE 8-2
1996 SULFATE DATA SUMMARY
(Micrograms Per Cubic Meter)

SITE	ADDRESS	NUMBER OF OBSERVATIONS	HIGHEST 24-HOUR	SECOND HIGHEST	THIRD HIGHEST	ANNUAL ARITHMETIC MEAN
CUMBERLAND COUNTY						
Bridgton	Upper Ridge Road	54	10.6	8.2	6.2	2.1
Portland	Shelter Site	58	11.7	11.1	7.9	3.2

TABLE 8-3
HISTORICAL SUMMARY OF SULFATE DATA - AAM
(Micrograms Per Cubic Meter)

SITE	ADDRESS	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
CUMBERLAND COUNTY													
Bridgton	Upper Ridge Road	5.6	5.8	5.4	5.1	3.2	3.4	3.6	3.2	2.8	2.9	2.2	2.1
Portland	Shelter Site	8.1	--	--	5.3	5.3	3.4	3.6	4.0	3.7	3.9	3.1	3.2

TABLE 8-4
HISTORICAL SUMMARY OF SULFATE DATA - 24 HOUR
(Micrograms Per Cubic Meter)

SITE	ADDRESS	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
CUMBERLAND COUNTY													
Bridgton	Upper Ridge Road	19.5	20.1	31.9	17.2	12.2	11.8	21.3	25.6	15.6	16.6	8.5	10.6
Portland	Shelter Site	17.2	--	--	19.4	22.2	13.4	22.1	29.3	14.8	23.5	12.4	11.7

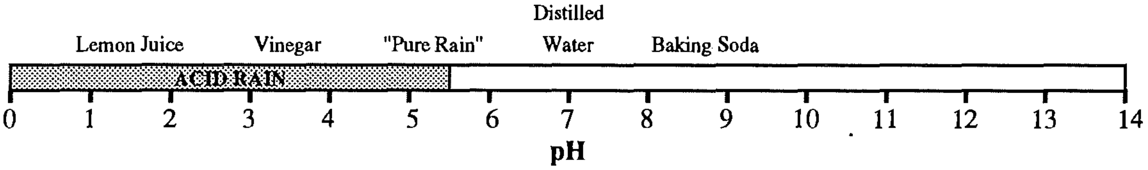
9. ATMOSPHERIC DEPOSITION

9.1 Description and Sources

As a result of the combustion of tremendous quantities of fossil fuels such as coal and oil, the United States annually discharges nearly 50 million tons of sulfur and nitrogen oxides into the atmosphere. These pollutants are then transported hundreds of miles from their origin. Through a series of chemical reactions with other substances in the atmosphere these pollutants can be converted into weak acids, which may return to earth as components of rain, fog, snow or dry particles. This atmospheric deposition, more commonly known as acid rain, may have severe ecological impacts on widespread areas of the environment. Acid rain has caused lakes and streams to become acidic and unsuitable for many fish, damaged forests and caused deterioration of many man-made structures. Power plants burning coal, oil and natural gas account for about 70 percent of the sulfur dioxide emissions in the United States. Cars and trucks, coal-burning power plants and industrial boilers and heaters account for most of the nitrogen oxide emissions.

The acidity of water is measured in the pH scale, which ranges from 0 to 14. A pH of 7.0 is defined as neutral, and pH above and below 7.0 are considered basic and acidic, respectively. The pH is the logarithmic inverse of the hydrogen ion concentration, thus, a unit decrease in pH represents a tenfold increase in acidity. Natural, unpolluted rain contains carbonic acid, which contributes to rainwater being slightly acidic (typically being around 5.6).

Figure 9-1
pH Levels of Common Substances



9.2 Health and Welfare Effects

There are direct and indirect health effects associated with acid deposition. Inhalation exposures to acid deposition precursors may exacerbate existing respiratory conditions. Research has also indicated decreased lung function and increased cardiopulmonary mortality associated with long-term exposure to the fine sulfate and nitrate aerosols. Atmospheric deposition is known to leach heavy metals such as mercury from rocks causing possible contamination of water supplies and increased exposure to humans through the consumption of fish. Exposure to heavy metals can damage the kidneys and nervous system. Hundreds of lakes in North America and Scandinavia have become so acidic that they can no longer support fish life. The rain falling on forests and other non-farmlands could, in time, cause extensive changes in the soil chemistry. There is not enough information yet to make it possible to say exactly what the results might be, but there is no reason to think the changes will be beneficial.

9.3 Standards

There are no standards in effect or proposed for atmospheric deposition. Standards or controls will be applied to emission sources to control the amount of emissions and reduce the amount of acid precipitation. Title IV of the Clean Air Act Amendments of 1990 established the Acid Deposition Control Program. Title IV is intended to reduce the adverse effects of acidic deposition, primarily through reductions in SO_2 and NO_x emissions. The CAAA mandates a reduction in annual SO2 emissions of 10 million tons from 1980 levels. These emissions are to be achieved through a two-phase process. Phase 1 began in 1995 and involves 263 units for 110 electric utility facilities listed in the law. An additional 182 units voluntarily entered into Phase 1, bringing the total units involved under Phase 1 to 445. Phase 2 begins in the year 2000 and involves all utility facilities greater than 25 megawatts. The CAAA also mandates a reduction in annual NOx emissions of 2.0 million tons from the 1980 levels by the year 2000. Most of this reduction will be achieved through the installation of low NOx combustion technologies for coal-fired boilers.

9.4 Monitoring

During 1996 there were four sites collecting data on atmospheric deposition. Those four sites included a Bureau maintained site in Bridgton, a National Park Service maintained site at Acadia National Park, a University of Maine maintained site in Greenville and a National Weather Service maintained site in Caribou. The samples from these four sites are normally collected every Tuesday morning at 9:00 a.m. Consequently, the samples are not necessarily a single storm event but are more likely to be a composite of all storm events during the previous week. The samples, if there was a significant storm, are used for field measurements of pH and conductivity and are then packaged up for shipment to the National Atmospheric Deposition Program central laboratory in Illinois. In the central laboratory they are also tested for pH and conductivity as well as additional components. Table 9-1 is a summary of the measurements taken at the central laboratory in Illinois from the four sites for the year 1996. The sulfate deposition figures were corrected for marine aerosol contribution. Table 9-2 is a historical summary of the atmospheric deposition data. Some of the data has been reviewed and revised slightly by the NADP lab as a result of some of their quality assurance activities. The data listed in Table 9-2 is data retrieved this year from the NADP database and does contain some minor changes in the data that has been reported in the past.

TABLE 9-1
1996 ATMOSPHERIC DEPOSITION DATA SUMMARY

SITE	ADDRESS	pH MAXIMUM*	pH MINIMUM*	pH MEAN**	DEPOSITION (Kg/ha) SO4***	NO3
AROOSTOOK COUNTY						
Caribou	Airport	5.39	3.64	4.68	8.7	8.1
CUMBERLAND COUNTY						
Bridgton	Upper Ridge Road	6.04	3.94	4.51	13.4	12.6
HANCOCK COUNTY						
Acadia National Park	McFarland Hill Ranger Station	5.85	4.03	4.64	13.1	10.9
PISCATAQUIS COUNTY						
Greenville	Squaw Brook	5.43	4.11	4.74	8.7	9.3

* Lab measurements.

** Precipitation weighted mean.

*** Corrected for marine aerosol and normalized to 52 weeks.

TABLE 9-2
HISTORICAL SUMMARY OF ATMOSPHERIC DEPOSITION DATA

SITE	ADDRESS	PARAMETER	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Ave.
AROOSTOOK COUNTY																		
Caribou	Airport	Maximum pH	6.09	6.20	6.10	5.46	5.84	6.55	6.04	7.19	6.80	6.54	6.77	6.83	5.30	5.47	5.39	6.17
		Minimum pH	4.11	4.02	4.01	3.72	3.82	3.82	3.95	3.85	4.05	4.13	3.99	3.97	3.94	3.81	3.64	3.92
		Mean pH	4.67	4.65	4.60	4.47	4.62	4.53	4.46	4.62	4.58	4.60	4.65	4.74	4.55	4.68	4.68	4.61
		Sulfate(Kg/ha)	11.20	15.20	12.90	12.70	11.40	10.70	13.70	9.70	15.30	11.60	11.30	11.60	13.30	7.00	8.70	11.75
		Nitrate(Kg/ha)	6.50	7.10	7.20	7.60	6.90	7.10	8.20	8.10	10.80	7.40	7.30	8.20	9.10	7.60	8.10	7.81
		Precipitation(cm)	94.61	117.25	88.76	73.40	87.62	71.30	79.34	82.63	117.62	89.91	89.57	103.34	97.71	88.44	102.53	92.27
		Precipitation(in)	37.25	46.16	34.94	28.90	34.50	28.07	31.24	32.53	46.31	35.40	35.26	40.69	38.47	34.82	40.37	36.33
CUMBERLAND COUNTY																		
Bridgton	Upper Ridge Road	Maximum pH	7.53	6.30	4.90	5.30	5.70	6.20	5.60	6.20	5.80	5.70	6.95	6.66	5.55	5.26	6.92	6.04
		Minimum pH	3.75	3.80	3.40	3.80	3.80	3.90	3.70	4.00	3.70	3.90	3.91	3.96	3.91	4.00	3.94	3.83
		Mean pH	4.38	4.63	4.49	4.38	4.44	4.56	4.45	4.51	4.46	4.56	4.51	4.52	4.47	4.62	4.63	4.51
		Sulfate(Kg/ha)	17.10	16.00	17.00	16.40	15.90	10.60	15.50	15.10	16.00	12.90	13.90	11.40	13.30	8.50	13.40	14.20
		Nitrate(Kg/ha)	10.80	8.50	10.20	10.00	10.00	6.40	8.70	9.30	11.80	9.00	9.50	9.10	10.80	8.00	12.60	9.65
		Precipitation(cm)	84.16	134.21	109.44	76.45	99.92	85.78	92.50	102.09	108.84	107.58	90.32	92.42	94.02	93.23	133.73	100.31
		Precipitation(in)	33.13	52.84	43.09	30.10	39.34	33.77	36.42	40.19	42.85	42.35	35.56	36.39	37.02	36.70	52.65	39.49
HANCOCK COUNTY																		
Acadia National Park	McFarland Hill Ranger Station	Maximum pH	6.14	5.90	5.40	5.60	5.30	5.50	5.80	5.50	5.20	5.50	7.50	6.19	5.28	5.42	5.85	5.74
		Minimum pH	3.58	3.70	3.20	3.80	3.80	3.50	3.40	3.60	3.70	4.00	3.78	3.95	3.90	3.86	4.03	3.72
		Mean pH	4.49	4.71	4.59	4.39	4.49	4.60	4.56	4.54	4.51	4.62	4.50	4.62	4.66	4.66	4.64	4.57
		Sulfate(Kg/ha)	20.00	18.00	18.00	18.80	21.00	15.30	16.90	18.80	20.40	14.60	16.60	14.50	13.80	13.40	13.10	16.88
		Nitrate(Kg/ha)	10.90	10.50	11.00	11.40	12.20	8.70	9.80	12.30	14.60	9.60	12.20	11.10	9.10	11.00	10.90	11.02
		Precipitation(cm)	122.39	193.56	142.94	111.16	139.79	128.53	133.32	142.44	153.16	142.29	121.88	148.81	144.41	148.70	153.32	141.78
		Precipitation(in)	48.19	76.20	56.28	43.76	55.04	50.60	52.49	56.08	60.30	56.02	47.98	58.59	56.85	58.54	60.36	55.82
PISCATAQUIS COUNTY																		
Greenville	Squaw Brook	Maximum pH	6.19	5.80	6.80	5.09	6.01	6.40	6.60	6.60	6.50	5.60	6.77	6.16	5.28	5.58	5.43	6.05
		Minimum pH	4.00	4.14	3.98	3.91	4.03	3.70	4.20	4.00	3.90	4.00	4.02	4.21	3.99	4.06	4.11	4.02
		Mean pH	4.54	4.74	4.61	4.50	4.55	4.71	4.54	4.55	4.62	4.67	4.59	4.64	4.48	4.70	4.74	4.61
		Sulfate(Kg/ha)	13.10	14.20	14.70	13.40	14.80	8.50	12.40	12.90	13.50	9.80	11.30	11.70	12.50	8.20	8.70	11.98
		Nitrate(Kg/ha)	8.10	7.80	10.50	8.60	7.80	5.90	7.40	10.70	10.90	7.50	8.50	10.20	10.50	8.40	9.30	8.81
		Precipitation(cm)	85.58	145.22	118.07	92.15	101.09	101.10	90.35	103.72	125.67	107.93	96.16	121.45	99.16	116.37	138.31	109.49
		Precipitation(in)	33.69	57.17	46.48	36.28	39.80	39.80	35.57	40.83	49.48	42.49	37.86	47.81	39.04	45.81	54.45	43.11

FIGURE 9-2
CARIBOU AIRPORT ACID DEPOSITION TRENDS

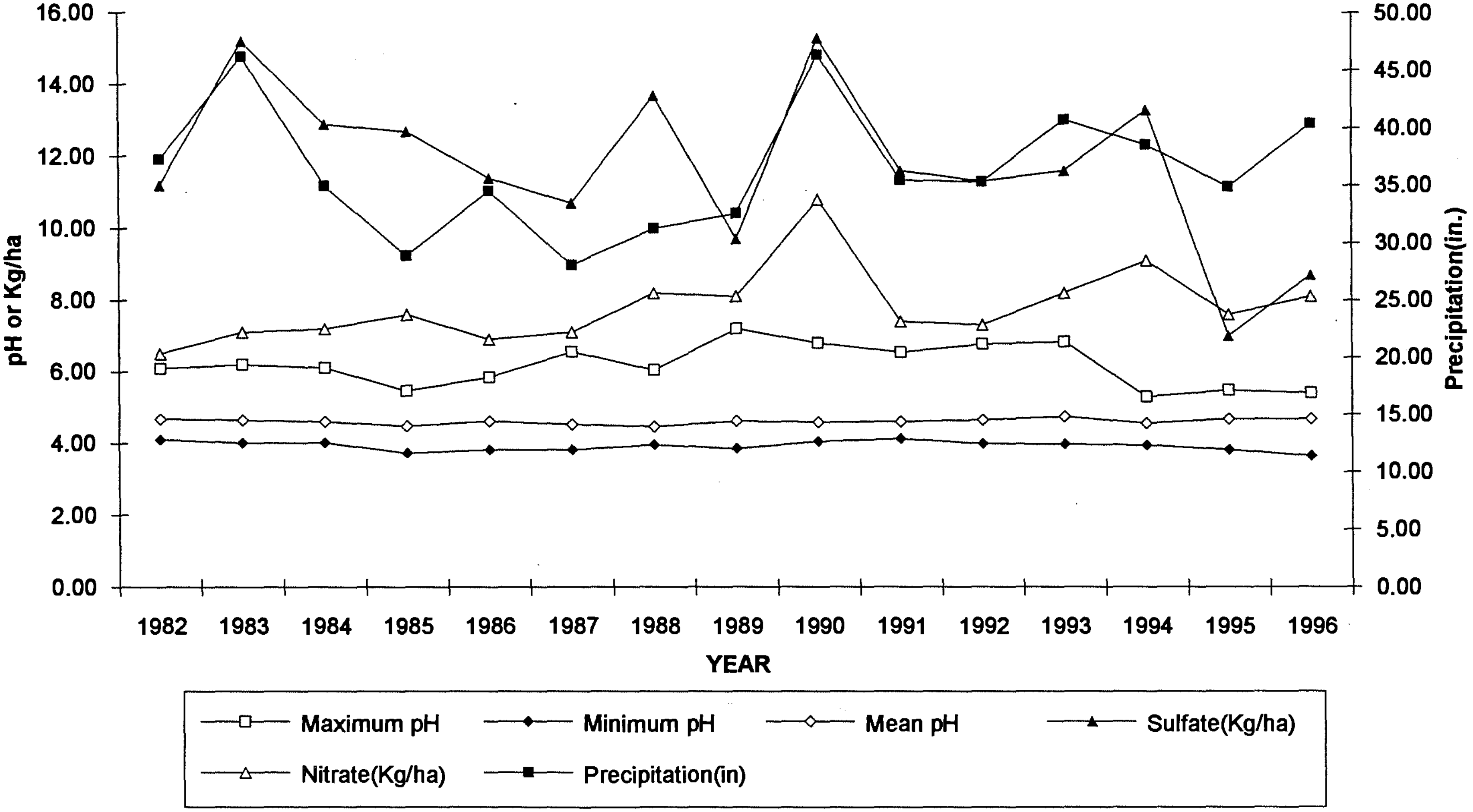


FIGURE 9-3
BRIDGTON ACID DEPOSITION TRENDS

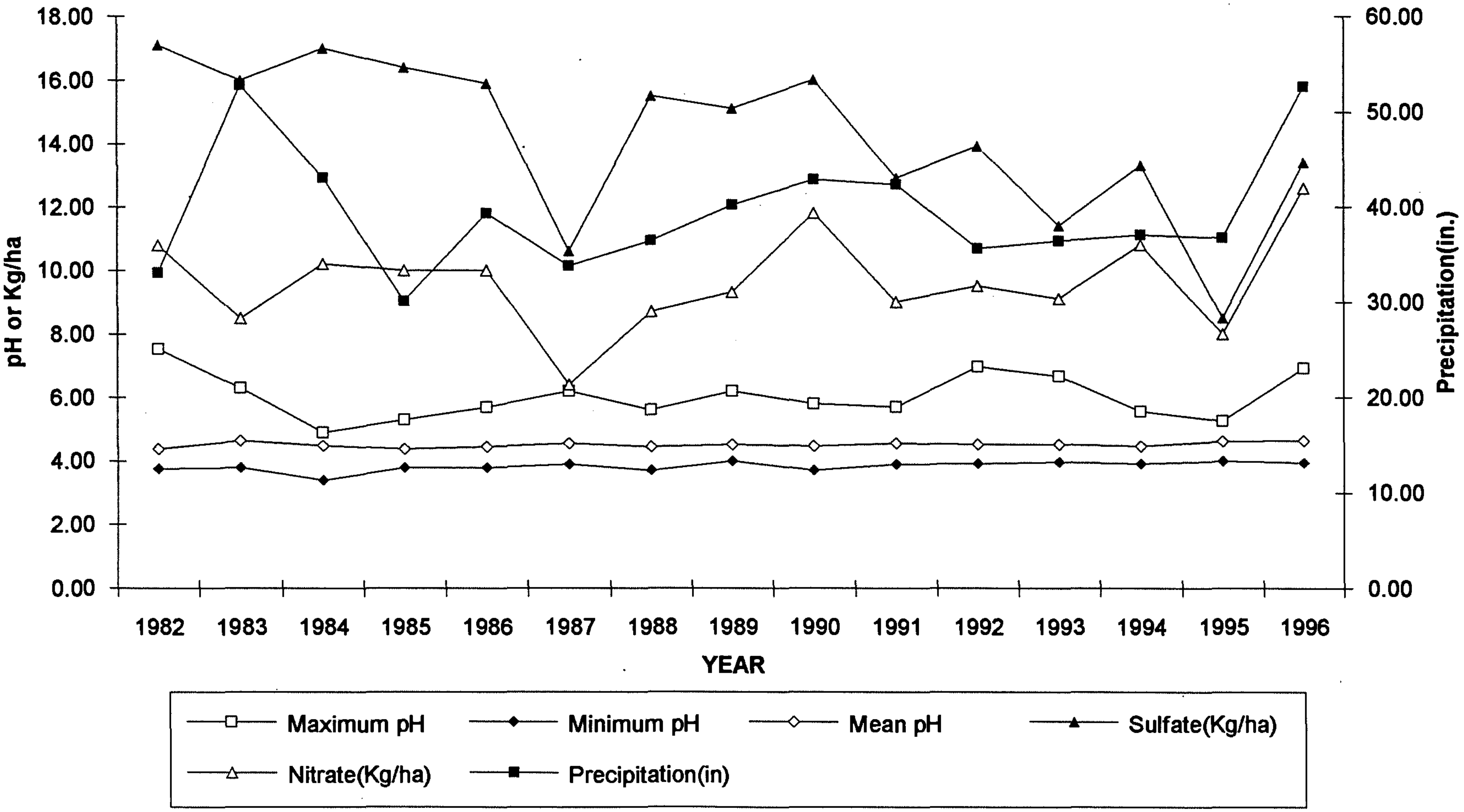


FIGURE 9-4
ACADIA NATIONAL PARK ACID DEPOSITION TRENDS

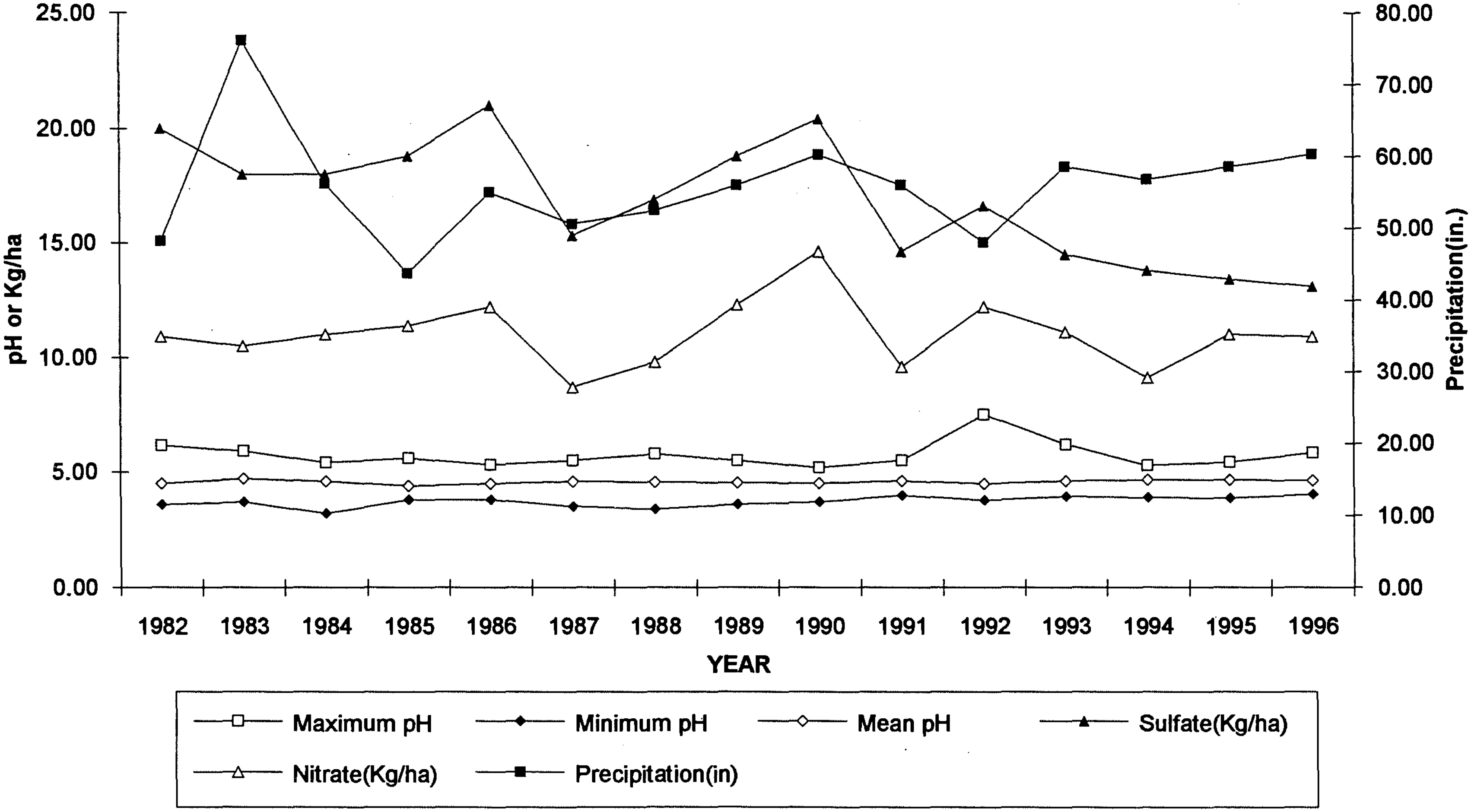
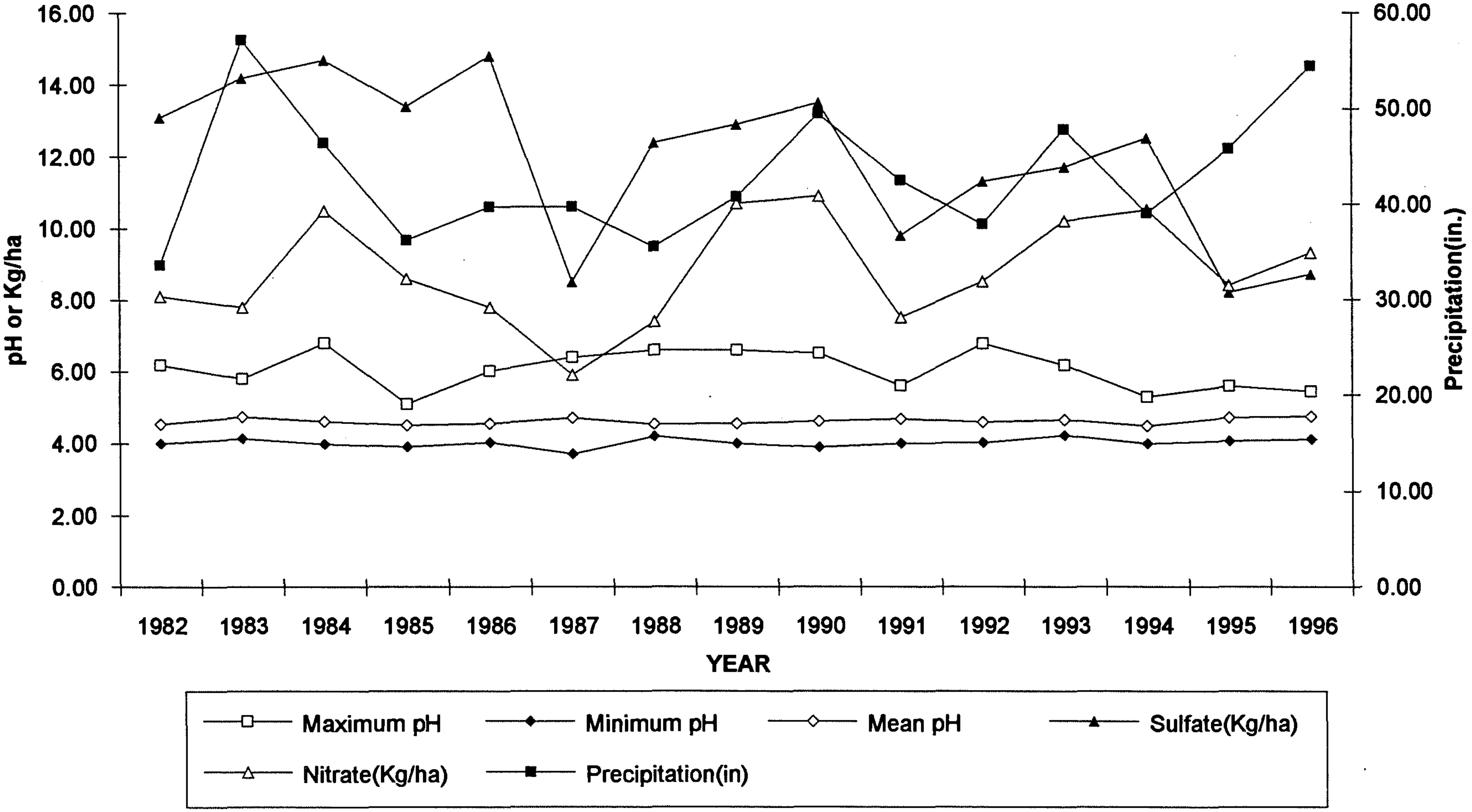


FIGURE 9-5
GREENVILLE ACID DEPOSITION TRENDS



10. HYDROCARBONS (HC)

10.1 Description and Sources

Hydrocarbons are a class of compounds containing carbon and hydrogen in various combinations. They are found especially in petroleum, natural gas and coal. Some are gaseous, some liquid and some are solid. There are in fact over a thousand hydrocarbon compounds. Many of the polluting hydrocarbons are discharged into the air by incomplete combustion of organic materials. A major source of this kind of hydrocarbon emission is the burning of gasoline in automobiles. Other major contributors are organic solvent evaporation, industrial processes, solid waste disposal and fuel combustion in stationary sources. The control of hydrocarbon emissions are accomplished by combustion process optimization, recovery by mass transfer principles, restriction of evaporative loss and process material and fuel substitution.

10.2 Health and Welfare Effects

Hydrocarbon air pollutants enter into and promote the formation of photochemical smog (ozone) and thus contribute to the development of eye irritation and respiratory tract problems. By themselves, hydrocarbons may induce adverse health effects, although there is relatively little quantitative data to relate individual hydrocarbons to the risk of human disease.

10.3 Standards

The hydrocarbon standard in the State Statutes was repealed in 1995. The DEP Regulations still include a hydrocarbon standard for a three hour average concentration of 160 micrograms per cubic meter, which may be exceeded once per year.

10.4 Monitoring

Hydrocarbons, as defined in the DEP Regulations, were not monitored as part of the State's continuous air monitoring program during 1996.

11. PRECISION AND ACCURACY

The U.S. Environmental Protection Agency regulations governing the SLAMS/NAMS network were published in 40 CFR Part 58. These regulations specify the minimum necessary requirements for the control and assessment of the quality of the ambient air monitoring data submitted to EPA. The State of Maine in its Quality Assurance Plan has required the same checks as the EPA program but has increased the number of checks required in some cases. Each organization that reports data to the State of Maine has their own reporting organization number and the precision and accuracy results are made available for each of those organizations as well as the DEP.

Precision and accuracy are two fundamental measures of the quality of data from a measurement process. Simply stated, "precision" is a measure of repeatability of the measurement process when measuring the same thing, and "accuracy" is a measure of closeness of an observed measurement value to the truth. Precision and accuracy of air monitoring or measurement data cannot be ascertained from the data themselves, but require the use of specially planned checks from which precision and accuracy can be estimated. The results are used to assess the quality of the monitoring data being reported to EPA by an agency.

The U.S. EPA has established guidelines for evaluating the upper and lower 95% probability limits. The quarterly probability limits for precision data should fall within a range of -15% to +15% and the quarterly probability limits for accuracy data should fall within a range of -20% to +20% (±15% for TSP and PM_{10}). These ranges are only guidelines, but when they are exceeded, procedures should be reviewed to determine the reason for the wide variation in the data.

11.1 Precision

For automated methods, this requirement is met by challenging the analyzer to a one point precision check gas of known concentration. The concentration of the precision check gas and the concentration indicated by the analyzer are used to assess the precision of the monitoring data. Data from all the monitors operated for a particular pollutant by a reporting organization are then combined to give overall precision data for that pollutant and that reporting organization. Precision checks for manual methods are obtained by operating co-located samplers at selected sites (specific requirements must be met for these sites). For each pair of co-located samplers, one is designated as the sampler which will be used to report air quality for the site and the other is designated as the duplicate sampler. The differences in the measured concentration (ug/m^3) between the two co-located samplers are used to calculate and assess the precision of the monitoring data.

11.2 Accuracy

To measure the closeness of an observed measurement value to the truth, some material or condition of known (true) property must be measured by the measurement system being checked. The measurement system is "challenged" with the "known" to obtain the observed measurement. For automated analyzers, "known" gaseous pollutant concentrations determined using different standards and different equipment from those used for routine calibration and spanning are introduced into the measurement instruments. In this way, two different calibration systems are involved: the one used for routine monitoring and the one used to assess the "known." For manual methods, it is difficult to challenge the total measurement system with "knowns." Therefore, an accuracy audit is made of only a portion of the measurement system. The two major portions of manual measurement systems are the flow and the analytical measurements. The flow measurement portion of the particulate methods are audited for accuracy. Blind samples are provided by EPA for analysis to determine the bad accuracy results.

The precision and accuracy results are reported in Tables 11-1 and 11-2. When reviewing this data, it is important to note that not all precision data collected is used in the analysis. The particulate precision data, especially PM10 data, because of the low concentrations recorded at most sites, is most affected by this. Typically only a small percent of the valid pairs are utilized in the analysis and because of that the probability limits can be much larger than might be expected. Additional review of the data will document those cases.

In a number of instances accuracy probability limits are not calculated even though audits were conducted. Apparently, the program used to calculate accuracy does not calculate it when there is only one monitor or one site in operation. Hopefully, the program will be revised in the future to account for all the data.

TABLE 11-1
1996 PRECISION DATA SUMMARY

PARAMETER	SUMMARY PERIOD	NUMBER OF SITES	PRECISION CHECKS	PROBABILITY LIMITS	
				LOWER 95%	UPPER 95%
Sites operated by Maine DEP					
Sulfur Dioxide	Q1	2	25	-3	4
	Q2	2	24	-6	3
	Q3	2	25	-8	1
	Q4	3	27	-7	4
	Year	3	101	-7	4
Nitrogen Dioxide	Q2	7	1	-19	37
	Q3	2	1	-18	-8
	Q4	0	0		
	Year	9	1	-27	35
Ozone	Q1	2	22	-7	5
	Q2	9	105	-5	7
	Q3	10	110	-2	5
	Q4	5	24	-4	4
	Year	11	261	-5	7
PM-10*	Q1	4	49	-9	14
	Q2	4	56	-8	4
	Q3	3	45	-16	10
	Q4	3	39	-10	3
	Year	4	189	-11	8
Sites operated by S. D. Warren Company, Skowhegan					
Ozone	Q1	0	0		
	Q2	1	13	-4	0
	Q3	1	13	-3	0
	Q4	1	5	-4	0
	Year	1	31	-4	0
PM-10*	Q1	1	14	**	**
	Q2	1	15	**	**
	Q3	1	13	**	**
	Q4	1	5	**	**
	Year	1	47	**	**
Sites operated by International Paper Company, Jay					
PM-10*	Q1	1	12	**	**
	Q2	1	15	**	**
	Q3	1	16	-8	-3
	Q4	1	14	**	**
	Year	1	57	-7	-3

TABLE 11-1(Continued)
1996 PRECISION DATA SUMMARY

PARAMETER	SUMMARY PERIOD	NUMBER OF SITES	PRECISION CHECKS	PROBABILITY LIMITS LOWER 95%	PROBABILITY LIMITS UPPER 95%
Sites operated by Boise Cascade Paper Group, Rumford					
Sulfur Dioxide	Q1	2	26	-3	4
	Q2	2	25	-6	8
	Q3	2	31	-6	5
	Q4	2	26	-12	8
	Year	2	108	-8	7
PM-10*	Q1	1	15	-5	2
	Q2	1	15	-1	3
	Q3	1	14	-5	5
	Q4	1	15	-13	4
	Year	1	59	-6	4
Sites operated by Dragon Products, Thomaston					
Total Suspended Particulates*	Q1	1	14	3	19
	Q2	1	15	-2	10
	Q3	1	14	-47	31
	Q4	1	15	-13	2
	Year	1	58	-21	21
PM-10*	Q1	1	11	**	**
	Q2	1	13	-36	24
	Q3	1	13	-7	1
	Q4	1	9	**	**
	Year	1	46	-23	14
Sites operated by Lincoln Pulp & Paper Company, Lincoln					
PM-10*	Q1	1	14	**	**
	Q2	1	15	**	**
	Q3	1	15	0	16
	Q4	1	14	10	14
	Year	1	58	5	16
Sites operated by Great Northern Paper Company, Millinocket					
Sulfur Dioxide	Q1	1	6	-5	4
	Year	1	6	-5	4
PM-10*	Q1	1	15	-16	14
	Year	1	15	-16	14

TABLE 11-1(Continued)
1996 PRECISION DATA SUMMARY

PARAMETER	SUMMARY PERIOD	NUMBER OF SITES	PRECISION CHECKS	PROBABILITY LIMITS LOWER 95%	PROBABILITY LIMITS UPPER 95%
Sites operated by Great Northern Paper Company, Millinocket					
Sulfur Dioxide	Q1	1	6	-5	4
	Year	1	6	-5	4
PM-10*	Q1	1	15	-16	14
	Year	1	15	-16	14
Sites operated by Fraser Paper Company, Madawaska					
Sulfur Dioxide	Q1	3	39	-2	3
	Q2	3	39	-3	2
	Q3	0	0		
	Q4	0	0		
	Year	3	78	-3	2
Site operated by New Hampshire Department of Natural Resources					
Nitrogen Dioxide	Q1	1	18	-10	8
	Q2	1	26	-14	6
	Q3	1	27	-11	5
	Q4	1	26	-8	7
	Year	1	97	-11	7
Ozone	Q1	0	0		
	Q2	1	26	-3	7
	Q3	1	27	-8	4
	Q4	1	7	-5	5
	Year	1	60	-6	7

* The total number of precision checks collected is listed for this parameter but not all of the pairs are used in the calculation of probability limits.

** Insufficient data was available to calculate the probability limits.

TABLE 11-2
1996 ACCURACY DATA SUMMARY

			PROBABILITY LIMITS					
	SUMMARY	NO. OF	LEVEL 1		LEVEL 2		LEVEL 3	
PARAMETER	PERIOD	AUDITS	-95%	95%	-95%	95%	-95%	95%
Sites operated by Maine DEP								
Sulfur Dioxide	Q1	0						
	Q2	2	*	*	*	*	*	*
	Q3	0						
	Q4	3	-5	3	-6	10	-7	11
	Year	5	-1	0	-5	9	-6	10
Nitrogen Dioxide	Q2	1	*	*	*	*	*	*
	Q3	0						
	Q4	0						
	Year	1	*	*	*	*	*	*
Ozone	Q1	2	-2	4	-1	2	-1	3
	Q2	5	-10	7	-8	5	-2	5
	Q3	0						
	Q4	8	-12	8	-1	4	0	5
	Year	15	-6	5	-2	3	0	3
PM-10	Q1	15			-5	7		
	Q2	12			-9	8		
	Q3	6			-8	1		
	Q4	11			-5	3		
	Year	44			-6	6		
Sites operated by S. D. Warren Company, Skowhegan								
Ozone	Q1	0						
	Q2	1	*	*	*	*	*	*
	Q3	1	*	*	*	*	*	*
	Q4	0						
	Year	2	*	*	*	*	*	*
PM-10	Q1	3			2	2		
	Q2	3			-1	1		
	Q3	3			0	1		
	Q4	0						
	Year	9			0	1		

TABLE 11-2 (Continued)
1996 ACCURACY DATA SUMMARY

			PROBABILITY LIMITS					
	SUMMARY	NO. OF	LEVEL 1		LEVEL 2		LEVEL 3	
PARAMETER	PERIOD	AUDITS	-95%	95%	-95%	95%	-95%	95%
Sites operated by International Paper Company, Jay								
PM-10	Q1	3			-4	-1		
	Q2	3			-1	0		
	Q3	3			0	0		
	Q4	3			-1	1		
	Year	12			-1	0		
Sites operated by Boise Cascade Paper Group, Rumford								
Sulfur Dioxide	Q1	2	1	19	-6	10	-4	7
	Q2	2	-10	-2	-5	-3	-4	-3
	Q3	2	-3	1	-3	2	-2	1
	Q4	2	-8	-4	-7	1	-3	1
	Year	8	-3	2	-5	2	-3	1
PM-10	Q1	3			1	4		
	Q2	3			-7	19		
	Q3	3			-2	-1		
	Q4	3			-5	0		
	Year	12			-2	3		
Sites operated by Dragon Products, Thomaston								
Total Suspended Particulates	Q1	0						
	Q2	6			*	*		
	Q3	0						
	Q4	6			*	*		
	Year	12			*	*		
PM-10	Q1	0						
	Q2	6			*	*		
	Q3	0						
	Q4	6			*	*		
	Year	12			*	*		
Sites operated by Lincoln Pulp & Paper Company, Lincoln								
PM-10	Q1	4			-11	18		
	Q2	4			-6	9		
	Q3	4			-2	3		
	Q4	4			3	9		
	Year	16			0	6		

TABLE 11-2 (Continued)
1996 ACCURACY DATA SUMMARY

			PROBABILITY LIMITS					
	SUMMARY	NO. OF	LEVEL 1		LEVEL 2		LEVEL 3	
PARAMETER	PERIOD	AUDITS	-95%	95%	-95%	95%	-95%	95%
Sites operated by Lincoln Pulp & Paper Company, Lincoln								
PM-10	Q1	4			-11	18		
	Q2	4			-6	9		
	Q3	4			-2	3		
	Q4	4			3	9		
	Year	16			0	6		
Sites operated by Great Northern Paper Company, Millinocket								
Sulfur Dioxide	Q1	1	*	*	*	*	*	*
	Year	1	*	*	*	*	*	*
PM-10	Q1	2			*	*		
	Year	2			*	*		
Sites operated by Fraser Paper Company, Madawaska								
Sulfur Dioxide	Q1	3	7	9	-1	8	-6	7
	Q2	3	-2	1	-2	1	-4	4
	Q3	0						
	Q4	0						
	Year	6	3	5	-1	4	-2	3
Site operated by New Hampshire Department of Environmental Resources								
Nitrogen Dioxide	Q1	0						
	Q2	2	*	*	*	*	*	*
	Q3	1	*	*	*	*	*	*
	Q4	0						
	Year	3	*	*	*	*	*	*
Ozone	Q1	0						
	Q2	1	*	*	*	*	*	*
	Q3	1	*	*	*	*	*	*
	Q4	0						
	Year	2	*	*	*	*	*	*

* Insufficient data was available to calculate the probability limits.

12. AIR TOXICS

12.1 Compound-specific Background

Chlorine/Chloroform:

Chlorine is principally used by the chemical manufacturers' industry to produce chemicals (principally chlorinated organics), by the pulp and paper industry for bleaching pulp to produce white paper, in water and waste treatment processes for disinfection, and in cooling towers to curb biofouling in heat transfer systems (1) (2). It is known that the presence of chlorine and hydrocarbons in water can form such chlorinated compounds as chloroform, dioxin, chlorinated phenols, and other chlorinated hydrocarbons. Since there are no major organic chemical production facilities in Maine, the primary sources of chloroform in Maine are water and wastewater treatment facilities, cooling towers, and the pulp and paper industry.

Theoretically, we expect to see levels of chloroform that are higher than normal around pulp mills. The Toxic Release Inventory developed by the U.S. Environmental Protection Agency (EPA) requires that certain manufacturing facilities submit chemical emissions data. These data indicate that pulp mills are one of the major industrial sources of chloroform in Maine.

Other sources of chloroform are waste water treatment facilities. DEP's Volatile Organic Compound (VOC) emissions inventory for the towns in the 1992 air toxics monitoring study indicate VOCs from these facilities (chloroform is one of many VOCs) are substantially less than pulp mill chloroform emissions alone. For example, based on EPA emission factors, the DEP has estimated that Westbrook's wastewater treatment works had VOC releases in 1990 of 5.5 tons; the S.D. Warren facility in Westbrook had chloroform releases of approximately 27 tons in 1990. Similarly, in Woodland, the emissions of VOCs from the sewage treatment facility were less than 1 ton, whereas Georgia Pacific emitted 177 tons of chloroform. According to the Agency for Toxic Substances and Disease Registry (ATSDR) Draft Toxicological Profile for chloroform (3), most of the chloroform in the environment originates from industrial processes.

Cooling tower emissions of chloroform in Maine, primarily associated with electric generators, is currently unknown.

Due to chloroform's volatility, it eventually is released to the air, where it breaks down slowly (in approximately 5 - 6 months). Since chloroform is persistent in the atmosphere, it can be transported for long distances depending on the meteorological conditions. Those areas with no major known sources of chloroform, but where chloroform is found, may be experiencing this phenomenon.

DHS guideline is: 210 micrograms per cubic meter averaged over 24 hours
0.43 micrograms per cubic meter averaged over 1 year
(1 in 100,000 excess cancer risk)
0.043 micrograms per cubic meter averaged over 1 year

(1 in 1,000,000 excess cancer risk)

Tetrachloroethylene (Perchloroethylene):

The majority of tetrachloroethylene (PCE) releases are from the dry cleaning industry (4). Other emissions to the air are from processes that use PCE as a solvent, such as in metal degreasing operations. This use of PCE is being phased out as less toxic metal degreasing solvents enter the market. In general, PCE levels in the air are higher in urban/suburban areas than in more remote areas. PCE persists several months in the atmosphere.

DEP standard is: 0.01 micrograms per cubic meter average over 1 year
(1 in 1,000,000 excess cancer risk).

Benzene:

Nationally, petroleum refining operations and petrochemical manufacturing sites are the main sources of benzene in the environment (5). Emissions from burning coal and oil, benzene waste and storage operations, motor vehicle exhaust, evaporation from gasoline service stations, and use of industrial solvents also contribute to benzene levels in air. According to the Toxic Release Inventory - 1990 database, there are no major industrial users or sources of benzene at or above the TRI reporting thresholds in Maine. This suggests that in Maine, the primary sources of benzene are most likely combustion of fossil fuel, and evaporation from gasoline service stations. Once released to the atmosphere, benzene breaks down (photooxidizes) within a few days.

DHS guideline is: 450 micrograms per cubic meter averaged over 24 hours
1.2 micrograms per cubic meter averaged over 1 year
(1 in 100,000 excess cancer risk)
0.12 micrograms per cubic meter averaged over 1 year
(1 in 1,000,000 excess cancer risk)

Toluene:

Toluene is a solvent, and is also a component of gasoline. Nationally, marketing and combustion of gasoline represent the major sources of toluene emissions (6). Toluene releases will end up in the atmosphere, due to its volatility, where it will photooxidize within a few hours to a few days (6). In 1985, the DEP estimated that approximately 855 tons of toluene were emitted from the marketing of gasoline and its combustion. According to the 1990 TRI database only 234 tons of toluene were released from stationary sources. Toluene is used by some of the sources potentially impacting the monitors.

DEP standard is: 15,000 micrograms per cubic meter (instantaneous)
260 micrograms per cubic meter averaged over 24 hours
180 micrograms per cubic meter averaged over 1 year

Xylenes:

Solvents and thinners for paints and varnishes often contain xylenes. Xylenes are used as a solvent in the printing, rubber, and leather industries, and also as cleaning agents. They are also found in gasoline. Xylenes photooxidize in the atmosphere fairly rapidly, within 1 to 2 days. A total of 169 tons of xylenes were released to the air in 1990, based on TRI data. (7).

DHS guideline is: 65,000 micrograms per cubic meter (instantaneous)
300 micrograms per cubic meter averaged over 24 hours
300 micrograms per cubic meter averaged over 1 year

1,3-butadiene:

1,3-butadiene is associated with fossil fuel combustion. It is primarily released to the atmosphere during manufacture, use, transport, and storage of gasoline, but other sources exist, such as wood smoke (8). 1,3-butadiene breaks down rapidly in air, especially in the presence of sunlight. The total expected life of 1,3-butadiene is short; approximately 0.48 hrs (10) to 2 hours (8).

DHS guideline is: 370 micrograms per cubic meter averaged over 24 hours
0.036 micrograms per cubic meter averaged over 1 year
(1 in 100,000 excess cancer risk)
0.0036 micrograms per cubic meter averaged over 1 year
(1 in 1,000,000 excess cancer risk)

Carbon tetrachloride:

Carbon tetrachloride (CCl4) has been widely used as a refrigerant and aerosol propellant, although its use for these purposes is being phased out due to its effect on the stratospheric ozone layer. CCl4 was once used as a cleaning fluid, but this use was stopped in the mid-1960's. However, it is a very stable and persistent compound in the environment; it takes 30-100 years for half of the carbon tetrachloride that is released to be broken down into other components in the air (9).

DHS guideline is: 860 micrograms per cubic meter averaged over 24 hours
0.7 micrograms per cubic meter averaged over 1 year
(1 in 100,000 excess cancer risk)
0.07 micrograms per cubic meter averaged over 1 year
(1 in 1,000,000 excess cancer risk)

12.2 Monitoring

Air toxics monitoring was conducted in the Fall of 1991 at two sites in the Rumford/Mexico area, as a pilot study. The Department of Environmental Protection (DEP) then conducted an expanded monitoring effort in 1992 for four towns (10 sites) in southern Maine, two towns (five sites) Downeast, and one town (5 sites) in central Maine. The samples were collected for a 24-hour period, and analyzed for a suite of compounds commonly examined in laboratories doing air toxics work. The Department of Human Services (DHS) evaluated the data for potential health risks.

Very little is known about air toxics in Maine and the concentrations to which people are being exposed; an enhanced inventory is necessary to define all sources of hazardous air pollutants. DEP believes that the 1992 monitoring program was a start in understanding ambient air quality in Maine regarding toxics; in particular, in understanding the relationship between emissions and exposure.

During 1993 a limited number of canister samples were collected in the Rumford/Mexico area to provide additional information and to verify some of the previous data collected in that area. The canisters were analyzed late in 1995 and preliminary findings appear to confirm earlier sampling results. A follow up study for the Rumford/Mexico area was also initiated in late summer 1995 and ran through late summer 1996. Three sampling sites were set up with the intention of collecting a 24 hour sample every six days. Unfortunately, numerous problems resulted in significant sample loss. The data from the samples collected indicated some elevated levels of chlorine and benzene were present in the area. However, the data can only indicate the potential for problems as there was insufficient data to determine valid annual averages for comparison with the annual guidelines.

Five monitoring sites targeting hazardous air pollutants were established in November and December, 1995 in the greater Portland area. The sites encircle a roughly 4 square mile area, and are located in both heavily urbanized and residential sections of the city. More detailed information on site locations may be found in Table 1-6.

The Portland area study will survey levels of 36 separate hazardous air pollutants over a one year period, focusing on March 1, 1996 through March 1, 1997. The hazardous air pollutants being targeted for the Portland study are outlined in Table 12-1. Canister samples are collected for a 24 hour period every six days. In addition to the hazardous air pollutants, each sample is analyzed for target VOC ozone precursors as discussed in Section 13. A number of problems in the processing of the data from the Portland area study has limited the availability of the final results. All of the analyses have been completed and some of the VOC ozone precursor data has been made available. Seven of the compounds that are included as VOC ozone precursors are also on the list of hazardous air pollutants. The data for those seven compounds have been summarized in Table 12-2. Additional data should be available later and will be summarized in a separate report.

TABLE 12 - 1
HAZARDOUS AIR POLLUTANTS FOR PORTLAND MONITORING STUDY

AIRS CODE	COMPOUND NAME	AIRS CODE	COMPOUND NAME
16916	FREON 12	43818	1,1,2,2-TETRACHLOROETHANE
43841	1,3- DICHLOROPROPENE	43819	METHYL BROMIDE
45201	BENZENE	43820	1,1,2-TRICHLOROETHANE
45202	TOLUENE	43824	TRICHLOROETHYLENE
45203	ETHYL BENZENE	43829	PROPYLENE DICHLORIDE
45102	TOTAL XYLENES	43843	ETHYLENE DIBROMIDE
45207	1,3,5-TRIMETHYLBENZENE	43844	HEXACHLOROBUTADIENE
45220	STYRENE	43860	VINYL CHLORIDE
43207	FREON 113	45208	1,2,4-TRIMETHYLBENZENE
43208	FREON 114	45801	CHLOROBENZENE
43218	1,3-BUTADIENE	45805	1,2-DICHLOROBENZENE
43801	METHYL CHLORIDE	45806	1,3-DICHLOROBENZENE
43802	METHYLENE CHLORIDE	45807	1,4-DICHLOROBENZENE
43803	CHLOROFORM	45810	1,2,4-TRICHLOROBENZENE
43804	CARBON TETRACHLORIDE	43817	TETRACHLOROETHYLENE
43811	FREON 11	43816	cis-1,2-DICHLOROETHYLENE
43812	ETHYL CHLORIDE	43815	1,2-DICHLOROETHANE
43813	1,1-DICHLOROETHANE	43814	1,1,1-TRICHLOROETHANE

TABLE 12 - 2
1996 PORTLAND AREA HAP COMPOUNDS/VOC OZONE PRECURSORS
(PPBC)

BENZENE

Site	# Samples	High	2nd High	3rd High	Average
Shelter Site	25	5.95	5.75	5.36	3.52
Tukey's Bridge	25	15.08	8.83	8.49	5.92
Deering H. S.	27	4.94	4.67	4.08	2.35
Canco Road	22	5.11	5.05	4.36	2.77
Cumberland Cty. Jail	18	18.44	12.11	11.38	5.40

TOLUENE

Site	# Samples	High	2nd High	3rd High	Average
Shelter Site	25	111.36	17.29	15.20	10.08
Tukey's Bridge	25	14.77	12.67	12.23	8.07
Deering H. S.	27	11.39	10.61	10.22	6.02
Canco Road	22	12.53	11.73	11.17	7.21
Cumberland Cty. Jail	18	17.67	11.38	11.13	8.06

ETHYL BENZENE

Site	# Samples	High	2nd High	3rd High	Average
Shelter Site	25	5.66	5.44	3.45	2.39
Tukey's Bridge	25	3.18	3.05	2.99	1.93
Deering H. S.	27	3.52	2.49	2.21	1.35
Canco Road	22	2.72	2.58	2.51	1.47
Cumberland Cty. Jail	18	3.96	2.27	2.34	1.70

O-XYLENE

Site	# Samples	High	2nd High	3rd High	Average
Shelter Site	25	10.64	5.72	4.87	3.40
Tukey's Bridge	25	9.82	4.30	4.02	2.84
Deering H. S.	27	6.04	5.39	4.07	2.08
Canco Road	22	5.15	4.69	3.92	2.31
Cumberland Cty. Jail	18	5.49	3.72	3.69	2.44

1,3,5-TRIMETHYLBENZENE

Site	# Samples	High	2nd High	3rd High	Average
Shelter Site	25	5.54	4.85	3.15	1.39
Tukey's Bridge	25	6.71	4.70	1.53	1.18
Deering H. S.	27	3.06	2.79	1.91	0.68
Canco Road	22	12.84	2.46	1.96	1.59
Cumberland Cty. Jail	18	6.56	1.47	1.36	1.15

TABLE 12 - 2(Continued)
1996 PORTLAND AREA HAP COMPOUNDS/VOC OZONE PRECURSORS
(PPBC)

1,2,4-TRIMETHYLBENZENE

Site	# Samples	High	2nd High	3rd High	Average
Shelter Site	25	14.20	7.62	4.31	2.46
Tukey's Bridge	25	5.73	4.06	2.71	1.62
Deering H. S.	27	7.37	4.66	3.84	1.55
Canco Road	22	4.92	4.60	3.77	1.63
Cumberland Cty. Jail	18	21.37	4.18	3.95	3.40

STYRENE

Site	# Samples	High	2nd High	3rd High	Average
Shelter Site	25	12.20	8.88	7.82	3.45
Tukey's Bridge	25	19.17	14.09	7.18	3.40
Deering H. S.	27	12.87	10.94	8.09	2.88
Canco Road	22	14.96	10.44	8.24	4.13
Cumberland Cty. Jail	18	14.92	7.03	3.76	2.94

12.3 References

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December, 1989

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Karel Verschueren
1983

13. PHOTOCHEMICAL ASSESSMENT MONITORING

13.1 Background and History

The Clean Air Act Amendments of 1990 required EPA to promulgate regulations for the "enhanced" monitoring of ozone and its precursors for ozone nonattainment areas classified as serious, severe or extreme. Both Congress and EPA recognized the need for an improved understanding of the ozone problem, and better feedback mechanisms for evaluating the effectiveness of ozone control strategies. In 1993, EPA published the final rule detailing the minimum requirements for Photochemical Assessment Monitoring Stations (PAMS), which includes measurements of nitrogen oxides (NOx), speciated volatile organic compounds (VOCs), and meteorological parameters. These monitoring regulations provide for the collection of an "enhanced" ambient air quality database which can be used to better characterize the nature and extent of the ozone problem, aid in tracking VOC and NOx emission inventory reductions, assess air quality trends, make attainment/nonattainment decisions, and evaluate photochemical grid-model performance.

13.2 Monitoring Network

The size and design of a PAMS network for a serious, severe or extreme ozone nonattainment area can vary from just 2 to as many as 4 - 5 sites, depending on the area's population size. There are four different types of PAMS sites, each serving a specific monitoring purpose: a Type 1 is upwind of the urban area and represents background concentrations coming into the area; a Type 2 is on the downwind fringe of the urban area and represents maximum precursor concentrations from the area; a Type 3 is located downwind to represent the maximum ozone concentration generated from the area; and a Type 4 is at an extreme downwind location to represent long-range transport from the area. Therefore, PAMS sites required for an area will not necessarily all be located within the boundaries of the nonattainment area. This is how Maine, with no serious, severe or extreme nonattainment areas itself, can end up having two PAMS sites in operation during 1995.

A Type 4 PAMS site was established at Two Lights State Park in Cape Elizabeth in the spring of 1993 to represent extreme downwind impacts from the Greater Connecticut nonattainment area. This site operated in 1996 with an ozone (O_3) monitor, a low-level nitrogen oxides (NO/NOy) monitor, a meteorological system and an automated gas chromatograph (GC) analytical system. A new Type 2 PAMS site was established in the spring of 1995 at the Frisbee School in Kittery to represent maximum precursor emissions coming from the Portsmouth-Dover-Rochester NH nonattainment area. This site is operated by the State of New Hampshire, and during 1996 had an ozone monitor, a NOx monitor, a meteorological system, and an auto-GC as well.

13.3 Photochemistry

The distinguishing features that make PAMS sites truly "enhanced" ozone monitoring stations is that they collect data simultaneously on the essential ingredients (NOy and VOCs) and factors (meteorology) that produce ground-level ozone through photochemical reactions in the atmosphere. Gaining a better understanding of how these variables interplay with each other in actual real-world instances is absolutely necessary in order to effectively address Maine's and the nation's continuing ozone problem.

The compounds and their concentrations listed in Table 13-1 are the hydrocarbons which are of particular interest to EPA and the DEP regarding ground-level ozone formation. A majority of these hydrocarbons are associated with gasoline, before and after combustion, and are dominant in urban atmospheres due to mobile source emissions. These hydrocarbon compounds contain two to eleven carbon atoms and are known to be photochemically reactive. Obtaining hourly speciated VOC data via a GC operated in the field compared to operating one in the laboratory, to be certain, is a technically demanding challenge. A 40-minute integrated ambient air sample is taken at the start of each hour, then during the remaining 20 minutes, it is analyzed for 55 separate VOCs. This is done 24 hours a day between June 1st and September 30th. Effectively handling and managing the tremendous volume of VOC data generated by these auto-GC systems is an equally challenging task. Table 13-1 lists the highest and second highest hourly concentrations recorded at the two sites as well as the arithmetic mean for each compound.

The two chromatograms in Figure 13-1 illustrate the actual presence and concentration of 55 compounds contained in the calibration standard which was used at the PAMS sites in 1996. Each large peak is identified using its corresponding AIRS code as a specific compound on the Target VOC Ozone Precursor List (except for TNMOC which is the total of all of the compounds analyzed). The order in which these compounds appear on the chromatogram is determined by their carbon content, molecular weight and boiling point. Compounds with lower boiling points elute first from the analytical column followed by the heavier higher molecular weight components with higher boiling points.

13.4 Relationships Between Ground-level Ozone (O3), Nitrogen Oxides (NOy) and Volatile Organic Compounds (VOCs)

Figures 13-2 and 13-3 show the relationship between four important parameters during an ozone event: ground level ozone(O_3), its two precursors - nitrogen oxides (NOy) and total non-methane organic compounds (TNMOC), and a description of the wind direction. Figure 13-2 illustrates a summer day with a predominant northwest to southwest wind direction where ground-level ozone readings reached a high of .044 ppm. This is a typical example of a summer day when these winds prevail. Figure 13-3 illustrates a two day period when ozone reached a maximum hourly value of .107 ppm on the first day and .094 ppm the second day. These values are over the Maine health advisory warning level of .081 ppm and are considered to be in the unhealthy category. The wind was predominantly southwest throughout this 2-day period, which is typical for a high ozone day. This chart illustrates just one example of how these parameters are related during a ground-level ozone event. Each event seems to have its own "personality", depending on when, where, how it was formed, and the age of the air parcel. The continuous analysis of all the important photochemical parameters helps us to better understand the formation of ground-level ozone.

TABLE 13 - 1
TARGET VOC OZONE PRECURSOR DATA - 1996
(Part Per Billion Carbon)

	CAPE ELIZABETH*			KITTERY**		
COMPOUND	MAX. HOUR	Second HIGH	ARITH. MEAN***	MAX. HOUR	Second HIGH	ARITH. MEAN***
Total NMOC	408.40	393.10	24.09	535.50	275.80	34.16
Ethane	8.69	8.64	.29	7.10	6.93	.27
Ethylene	6.56	5.69	.64	13.06	12.45	1.12
Propane	29.22	29.18	2.39	40.33	34.83	4.61
Propylene	4.09	3.27	.56	7.59	5.51	.51
Acetylene	1.85	1.85	.44	58.83	12.00	1.29
N-Butane	51.56	45.59	1.23	32.28	20.93	1.55
Isobutane	18.15	11.80	.57	10.63	9.06	.71
Trans-2-Butene	1.63	.88	.13	2.45	1.55	.08
CIS-2-Butene	1.45	.85	.02	2.17	1.48	.08
N-Pentane	22.48	22.26	.79	15.31	12.00	1.37
Isopentane	76.35	70.97	2.03	54.75	41.94	3.33
1-Pentene	2.33	1.90	.05	2.02	1.67	.09
Trans-2-Pentene	3.24	3.17	.03	3.67	2.89	.12
CIS-2-Pentene	1.72	1.67	.02	2.05	1.61	.08
3-Methylpentane	12.58	7.01	.35	6.57	4.62	.62
N-Hexane	10.94	7.3	.33	5.33	3.93	.54
N-Heptane	5.06	2.95	.11	3.50	3.14	.26
N-Octane	4.20	2.15	.09	30.92	17.79	.18
N-Nonane	1.93	1.82	.05	6.97	3.09	.12
N-Decane	3.10	1.42	.04	2.4	1.8	.12
Cyclopentane	3.47	1.97	.06	1.48	1.35	.11
Isoprene	12.2	11.06	.66	35.82	19.06	2.16
2,2-Dimethylbutane	7.80	3.54	.23	2.88	2.71	.26
2-Methyl-1-Pentene	1.48	1.12	.03	7.32	7.15	.12
2,4-Dimethylpentane	2.10	1.77	.03	1.98	1.39	.08
Cyclohexane	5.65	2.03	.05	1.62	1.43	.12
3-Methylhexane	7.59	2.95	.18	3.55	2.88	.29
2,2,4-Trimethylpentane	7.10	6.06	.43	7.53	5.10	.76
2,3,4-Trimethylpentane	2.34	2.18	.11	2.85	2.12	.20
3-Methylheptane	5.43	1.47	.05	7.67	6.51	.12
Methylcyclohexane	5.90	2.33	.08	2.65	2.02	.18
Methylcyclopentane	11.55	4.90	.16	4.09	3.26	.29
2-Methylhexane	7.18	2.61	.12	3.39	2.73	.23
1-Butene	1.14	.70	.05	1.68	1.30	.10
2,3-Dimethylbutane	5.57	4.45	.17	3.41	3.17	.29
2-Methylpentane	20.55	11.74	.52	10.62	7.56	.98
2,3-Dimethylpentane	2.66	2.42	.09	2.12	2.11	.16
N-Undecane	5.67	5.54	.07	2.5	1.9	.08
2-Methylheptane	3.97	1.29	.05	5.55	3.61	.10
M/P Xylene	24.29	7.79	.49	16.55	13.36	1.40
Benzene	5.09	4.99	.46	7.40	5.85	.69
Toluene	26.20	15.33	.75	291.8	127.60	2.79
Ethylbenzene	5.95	2.30	.09	5.36	4.80	.39
O-Xylene	8.00	3.15	.18	5.50	4.27	.36

TABLE 13 - 1 (Continued)
TARGET VOC OZONE PRECURSOR DATA - 1996
(Part Per Billion Carbon)

COMPOUND	CAPE ELIZABETH*			KITTERY**		
	MAX. HOUR	Second HIGH	ARITH. MEAN***	MAX.. HOUR	Second HIGH	ARITH. MEAN***
1,3,5-Trimethylbenzene	2.32	1.54	.02	2.22	1.83	.12
1,2,4-Trimethylbenzene	6.04	4.65	.07	27.42	7.63	.54
N-Propylbenzene	1.60	.69	.01	1.34	1.11	.08
Isopropylbenzene	.84	.68	.02	.69	.56	.07
O-Ethyltoluene	1.70	1.18	.04	4.35	4.03	.09
M-Ethyltoluene	5.18	5.02	.20	8.41	6.34	.21
P-Ethyltoluene	2.80	1.92	.01	7.60	7.56	.99
M-Diethylbenzene	.75	.68	.01	.66	.05	.05
P-Diethylbenzene	1.23	1.10	.02	1.56	1.51	.07
Styrene	.56	.26	.01	8.33	3.85	.09
1,2,3-Trimethylbenzene	7.01	6.80	.24	14.17	11.30	1.67

* Data consists of 3120 hours of sampling.

** Data consists of 2086 hours of sampling.

*** Insuffcient data available for a valid annual mean.

FIGURE 13-1
CHROMATOGRAPH OF CALIBRATION COMPOUNDS FOR 1996

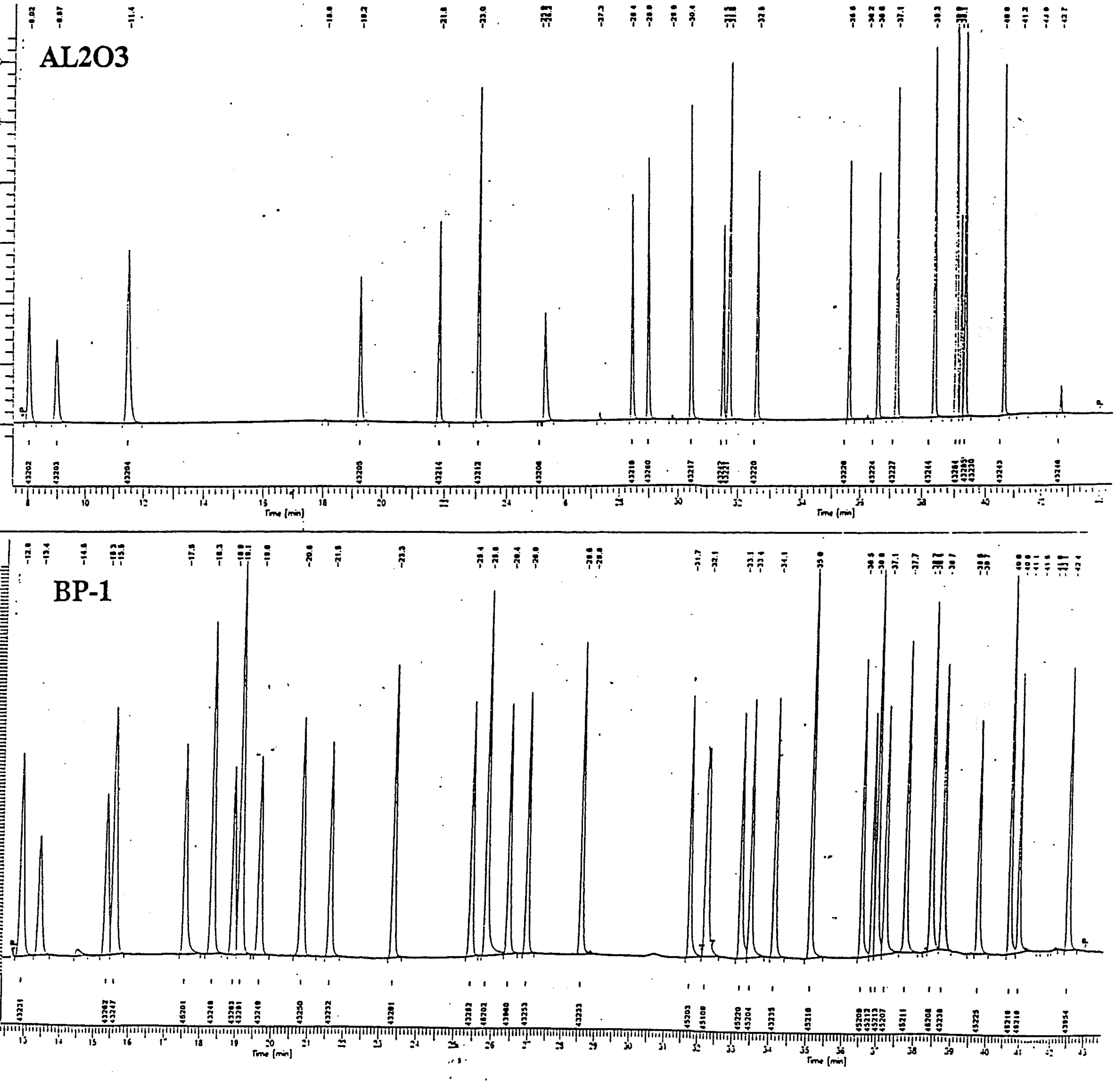


FIGURE 13-2
CAPE ELIZABETH TWO LIGHTS STATE PARK - JULY 28, 1996

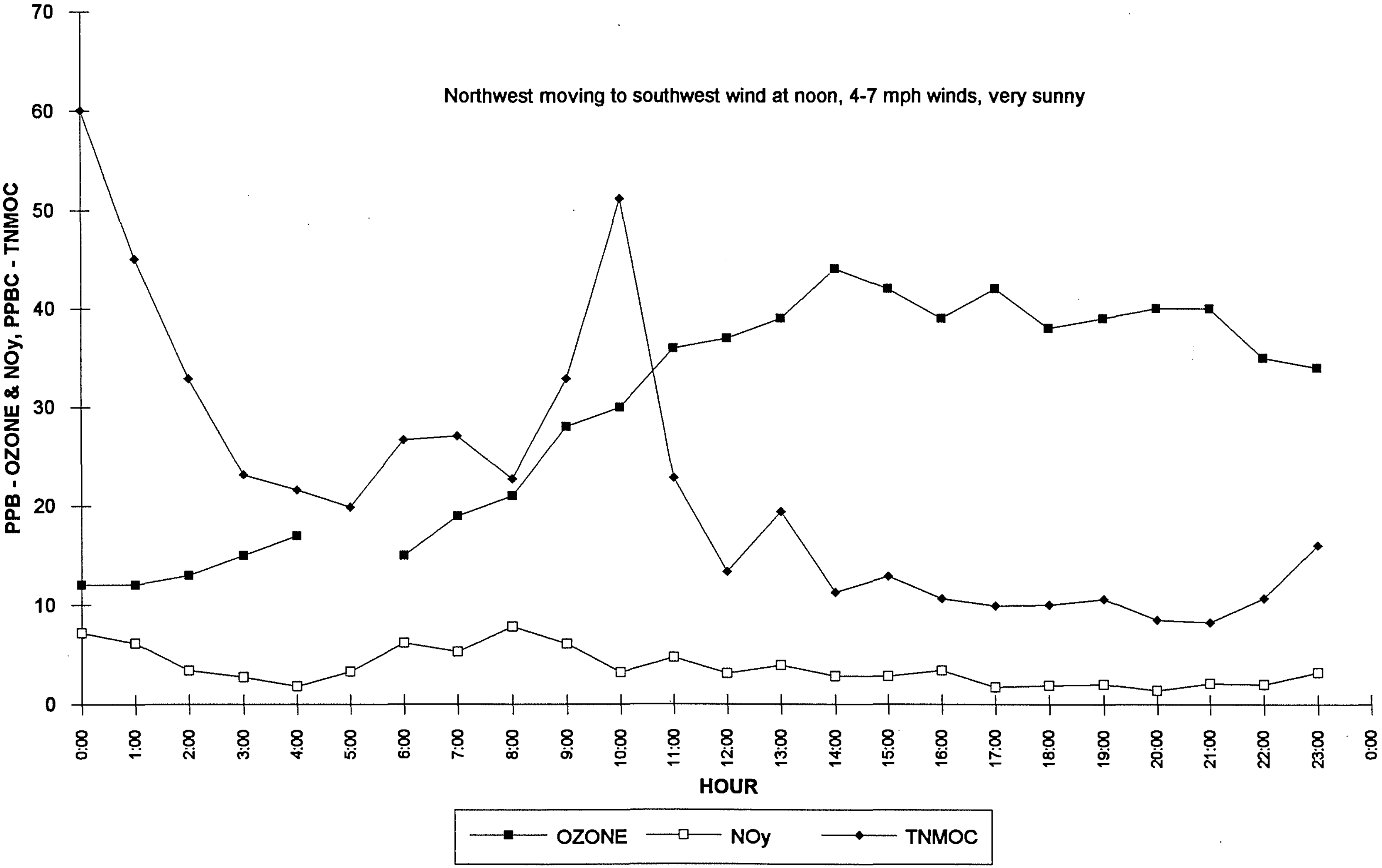
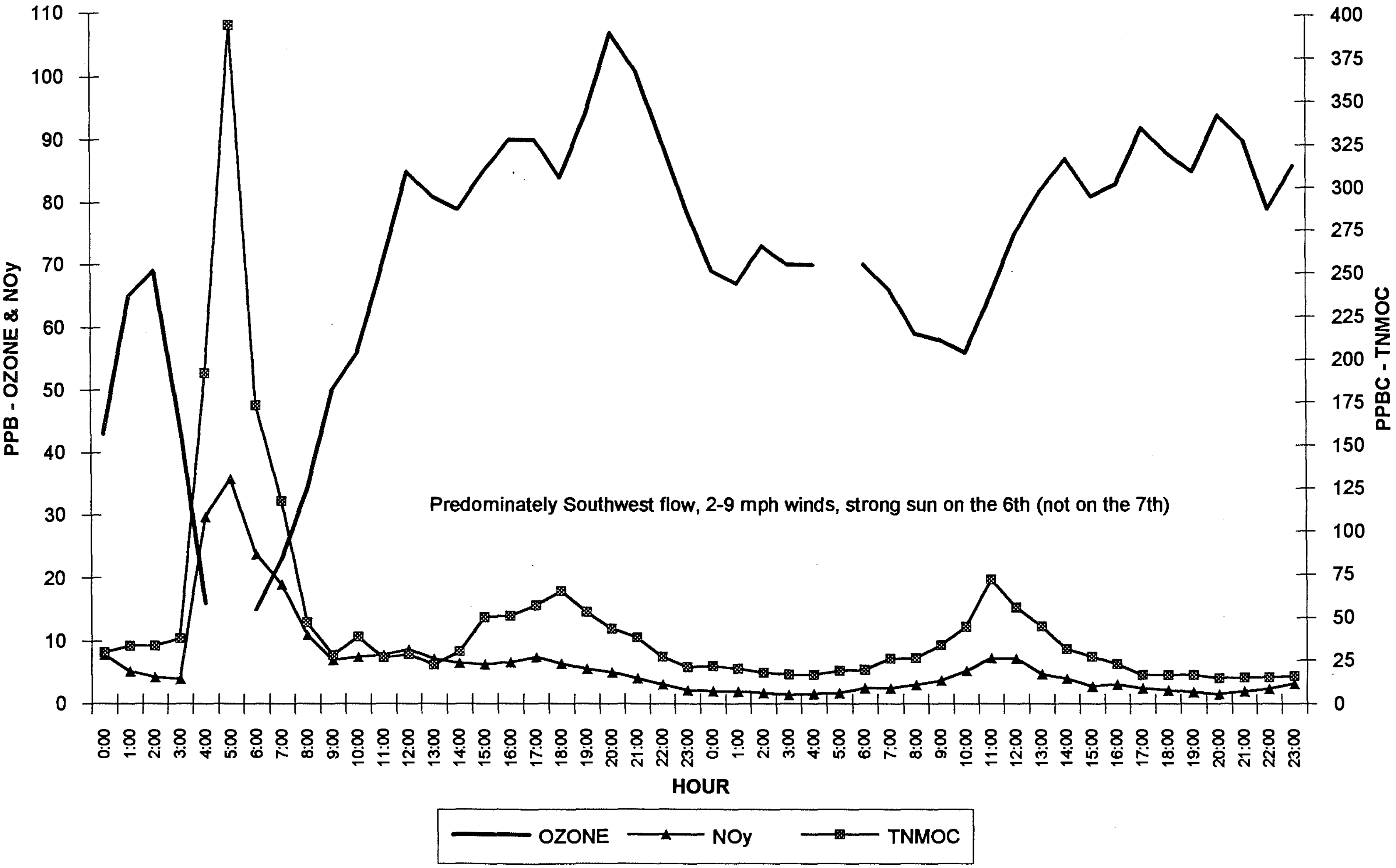

Northwest moving to southwest wind at noon, 4-7 mph winds, very sunny

FIGURE 13-3
CAPE ELIZABETH TWO LIGHTS STATE PARK - AUGUST 6 & 7, 1996



Predominately Southwest flow, 2-9 mph winds, strong sun on the 6th (not on the 7th)

14. ULTRAVIOLET-B (UV-b)

14.1 Description and Sources

Ultraviolet-b is part of the radiation reaching the earth's surface from the sun. Solar UV radiation is divided into three regions; UV-a (400-315 nanometers (nm)), UV-b (315-280nm) and UV-c (280nm to x-ray region). Because of the absorption by the upper atmosphere no light with a wavelength shorter than 280nm reaches the earth's surface. The majority of the UV-b is also absorbed by the ozone layer and the atmosphere. The amount of UV-b that actually reaches the earth's surface is further affected by ground level ozone, particulates and other pollutants, clouds and the elevation of the surface. In addition, the effects of the UV-b reaching the earth's surface are magnified by a reflective ground cover such as snow or water.

14.2 Health and Welfare Effects

Light in the UV-b wavelength region has been shown to be responsible for many biologically harmful effects in both plants and animals. In plants overexposure to UV-b is known to cause DNA damage and decreased agriculture yields. In animals overexposure to UV-b is known to cause skin cancer, eye damage, suppression of the immune response system, sunburns and premature wrinkling of the skin.

14.3 Standards

There are currently no standards for UV-b. Data from UV-b monitoring is reported as MED (Minimum Erythemal Dose) units. MED is a measurement based on the dose of effective radiation received and its ability to cause damage, such as sunburn, to the human skin. MED units are based on the time it took to cause erythemia (reddening) of the skin of the average Caucasian using differing wavelengths of UV-b. Data is reported as the number of MED's received that hour. For example, if for a particular hour 4 MED's were reported then that means a person would have received four times the amount of sunlight it takes to cause sunburn in the average Caucasian. Various agencies around the world have developed indices for rating the amount of exposure to UV-b that individuals receive. For example less than 2 MED's/hour might be considered low whereas 6 or more MED's/hour might be considered very high exposure.

14.4 Monitoring

During 1993 a monitoring site in Howland was equipped with a UV-b monitor and a total solar monitor. This site was chosen because of its rural location, stable land use, freedom from obstructions and the availability of other data from instruments already installed at the site. Some problems were experienced during this first year of operation, most notably frost forming on the dome of the total solar monitor. The lack of a Quality Assurance plan has also caused minor problems. Quality assurance checks currently performed are based on our present knowledge of this methodology. On June 1, 1995 the monitoring equipment was removed from Howland and set up the next day at a site in Cape Elizabeth. The Howland site was difficult to maintain due to telecommunications problems and winter access to the site. The Cape Elizabeth site is located in the major population center of the State and the issuance of public advisories during high UV episodes will be more accurate for the majority of the people in the State. Table 14-1 is a summary of the top twenty hourly values collected during 1996 for each of the parameters indicated.

TABLE 14 - 1
1996 MAXIMUM HOURLY VALUES FOR TOTAL SOLAR, UV-B AND MED UNITS

TOTAL SOLAR			ULTRAVIOLET-B			MED UNITS		
Date	Time	Tot. Solar w/m2	Date	Time	Ave. UV-b 280-315nm	Date	Time	Med Units
07/10/96	13:00	964.71	07/07/96	12:00	1.837	07/07/96	12:00	4.47
06/26/96	12:00	957.67	07/01/96	12:00	1.821	07/01/96	12:00	4.43
06/02/96	12:00	953.11	07/14/96	12:00	1.800	07/14/96	12:00	4.38
06/29/96	12:00	948.50	07/01/96	13:00	1.796	06/24/96	12:00	4.31
06/06/96	12:00	947.52	07/14/96	13:00	1.793	07/01/96	13:00	4.27
07/11/96	12:00	947.30	07/07/96	13:00	1.789	07/14/96	13:00	4.26
07/12/96	12:00	946.39	06/24/96	12:00	1.769	07/07/96	13:00	4.25
06/26/96	13:00	944.34	07/22/96	12:00	1.736	07/02/96	12:00	4.19
06/16/96	12:00	944.10	07/02/96	13:00	1.735	06/11/96	12:00	4.17
06/28/96	12:00	940.94	07/02/96	12:00	1.721	06/18/96	12:00	4.13
06/01/96	12:00	939.41	06/11/96	12:00	1.715	07/22/96	12:00	4.13
06/24/96	12:00	939.31	07/22/96	13:00	1.712	07/02/96	13:00	4.12
07/01/96	12:00	938.38	07/07/96	11:00	1.698	06/12/96	12:00	4.11
06/18/96	12:00	937.02	06/18/96	12:00	1.697	07/12/96	12:00	4.10
07/02/96	13:00	936.99	06/12/96	12:00	1.691	06/16/96	12:00	4.07
06/18/96	13:00	935.85	07/12/96	12:00	1.684	06/24/96	11:00	4.04
07/12/96	13:00	934.89	07/21/96	12:00	1.678	06/29/96	12:00	4.04
06/29/96	13:00	933.68	06/16/96	12:00	1.672	06/06/96	12:00	4.03
05/14/96	12:00	932.52	07/10/96	13:00	1.671	07/07/96	11:00	4.03
06/28/96	13:00	931.01	06/18/96	13:00	1.669	07/21/96	12:00	3.99

15. ERRATA SHEETS

During reviews of previous Annual Reports on Air Quality, a number of errors were discovered As a result some of the statistics reported were incorrect. For the benefit of the reader, all of the known corrections are presented below.

1995 Annual Report on Air Quality

Page 11	Third paragraph down begins "Table 1-5 presents..." should be "Table 1-6 presents..."
Page 53	Table 9-1 First asterisk should be "Field measurements." Two asterisks should be "Precipitation weighted mean based on lab measurements."
Page 57	Figure 9-3 Title should read "Acadia National Park Acid Deposition Trends"
Page 69	Benzene section - DHS Guidelines should be... 1.2 micrograms per cubic meter averaged over 1 year (1 in 100,000 excess cancer risk) .12 micrograms per cubic meter averaged over 1 year (1 in 1,000,000 excess cancer risk)
Page 82	Midway through paragraph "Table 13-1 is a summary... "should be "Table 14-1 is a summary..."

1994 Annual Report on Air Quality

Page iii	Title of Table 1-3 should be "Number of Ambient Air Quality Exceedances by Counties (1994)"
Page 20	Notes at bottom of Table 1-6 should refer to 1994 not 1993.
Page 76	Benzene section - DHS Guidelines should be... 1.2 micrograms per cubic meter averaged over 1 year (1 in 100,000 excess cancer risk) .12 micrograms per cubic meter averaged over 1 year (1 in 1,000,000 excess cancer risk)
Page 81	Section 13.1 "...was established at Two Lights State Park in Cape Elizabeth in the spring of 1994" should read "...in the spring of 1993." Section 13.2 The last two sentences should read, "At the Two Lights State Park site, a 40 minute integrated ambient sample was taken and analyzed each hour, 24 hours a day between June first and September thirtieth. Analysis for these compounds did occur during all ground level ozone exceedances throughout the season of 1994." Section 13.3 First sentence should read, "The two chromatograms in Figure 13.1 are the actual 55 calibration compounds which were analyzed for at the

Two Lights State Park site in 1994."
Section 13.4 should be replaced with the following:
The two charts which follow show the relationship between four important parameters during an ozone event, ground level ozone (O_3), its two precursors: nitrogen oxides (NOx), and total non-methane organic compounds (TNMOC) and wind direction. When looking at these charts, the scale for wind direction is on the right hand side of the chart and the three other parameters use the scale on the left side of the chart. The first chart (Figure 13.2) represents a summer day with easterly, southeasterly winds. Ozone and its precursors are usually low with these winds. The maximum hourly value for ozone was .035 ppm. The second chart (Figure 13.3) illustrates a day when the ozone reached an hourly value of .148 ppm . This is over the Maine health standard of .081 ppm and the Federal standard of .12 ppm and is considered to be in the unhealthful category. The wind was predominantly southwest throughout the day. This chart illustrates just one example of how these parameters are related during a ground level ozone event. Each event seems to have its own "personality", depending on when, where, and how it was formed. The continuous analysis of the photo-reactive volatile organic compounds help us to understand the formation of ground level ozone. VOCs are an integral piece of the ground level ozone puzzle.

1993 Annual Report on Air Quality

Page 3 Table 1-3. Federal days of ozone violation in Region 110 should be 2 instead of 4. Totals column should be 2 also.

Page 18 Table 1-6. Madawaska site number should be 23 003 1003.

Page 19 Table 1-6. TSP sites in Franklin county were all discontinued in 1995.

Page 30 Table 3-1. Last two columns are Number of Exceedances rather than Violations. Table should indicate 1 federal exceedance at Port Clyde.

Page 31 Table 3-2. Isle Au Haut site for 1988 should indicate 241 hours of violation. This table was redone in the 1995 Report to indicate number of state exceedances. A complete review of the data was done and other minor discrepancies in the number of hours of exceedance were discovered. Please refer to Table 3-2 in the 1995 Report for the corrected numbers.

Page 32 Table 3-3. Kennebunkport site 50th percentile for 1983 should be .046 ppm.

Page 75 Benzene section - DHS Guidelines should be...
1.2 micrograms per cubic meter averaged over 1 year
(1 in 100,000 excess cancer risk)
.12 micrograms per cubic meter averaged over 1 year
(1 in 1,000,000 excess cancer risk)

1992 Annual Report on Air Quality

Page 3 Table 1-3. Federal ozone violations for Region 110 should be 3. Totals column should also be 3.

Page 18 Table 1-6. Madawaska site number should be 23 003 1003.

Page 30 Table 3-1. Federal ozone violations for the Cape Elizabeth site should be 1.

Page 31 Table 3-2. Number of violations at the Dedham and Isle Au Haut sites for 1988 were switched. Dedham should be 111 and Isle Au Haut should be 241.

Page 45 Table 6-3. Number of exceedances at the Burnham site in Jay for 1992 should be 1.

Page 76 Benzene section - DHS Guidelines should be...
1.2 micrograms per cubic meter averaged over 1 year
(1 in 100,000 excess cancer risk)
.12 micrograms per cubic meter averaged over 1 year
(1 in 1,000,000 excess cancer risk)

1991 Annual Report on Air Quality

Page 33 Table 3-2. Number of violations at the Dedham and Isle Au Haut sites for 1988 were switched. Dedham should be 111 and Isle Au Haut should be 241.

Page 63 Table 9-1. Title should read "1991 Atmospheric Deposition Data Summary."

1990 Annual Report on Air Quality

Page 22 Table 1-4. References to year should all be 1990.

1989 Annual Report on Air Quality

Page 2 Table 1-1. Hydrocarbons should not be listed on this table.

Page 49 Table 6-4. Data for Bangor-Kenduskeag Pump Station should read 61, 59, 54, 53, 26.2 and 23.5.

Page 51 Table 6-5. Annual arithmetic mean for 1989 at the Bangor-Kenduskeag Pump Station site should be 26.2.

Page 64 Sec. 10.3 Standards "and Federal" should be eliminated.

1988 Annual Report on Air Quality

Page 2 Table 1-1. Hydrocarbon should not be listed on this table.

Page 10	Figure 1-3. Two sites used the same symbol. The Madawaska site is the higher of the two.
Page 51	Table 6-5. Gulley Hill Road site: 1988 AAM should be 24.9 and the Northeastland Hotel site 1988 AAM should be 26.4.
Page 59	Table 8-2. Madawaska-St. Jarres data should be 57, 9.3, 9.2, 9.0, 4.4.
Page 63	Sec. 10.3 Standards "and Federal" should be eliminated.

1987 Annual Report on Air Quality

Page 2	Table 1-1. Hydrocarbon should not be listed on this table.
Page 55	Sec. 10.3 Standards "and Federal" should be eliminated.

1986 Annual Report on Air Quality

Page 2	Table 1-1. Hydrocarbon should not be listed on this table.
Page 53	Sec. 10.3 Standards "and Federal" should be eliminated.

1985 Annual Report on Air Quality

Page 2	Table 1-1. Hydrocarbon should not be listed on this table.
Page 53	Sec. 10.3 Standards "and Federal" should be eliminated.

1984 Annual Report on Air Quality

Page 2	Table 1-1. Hydrocarbon should not be listed on this table.
Page 18	Table 2-1. Concentrations are in mg/m^3. Bangor data should read 58, 4.4, 3.2, 1.9, 0.9, 0.6 Portland data should read 5543, 12.2, 11.4, 7.9, 7.9, 3.8
Page 22	Table 3-2. Cape Elizabeth second high for 1984 should be .146 ppm. Acadia second high for 1984 should be .130 ppm.
Page 27	Table 5-1. Dexter Avenue-Thomaston number of observations should be 7877. Greenfield Drive-Kittery number of observations should be 5221. Masonic Temple-Kittery number of observations should be 7723.
Page 33	Table 6-1. Reilly Property-South Paris should read 12, 160, 152, 120, 93.4. Hinckley-Skowhegan should read 118, 68, 64, 61, 20.8.
Page 40	Table 7-1. Presque Isle-Northeastland Hotel had 48 observations and Creasey Ridge Road had 41.

Page 46 Sec. 10.3 Standards "and Federal" should be eliminated.

1983 Annual Report on Air Quality

Page 2 Table 1-1. Hydrocarbon should not be listed on this table.

Page 48 Sec. 10.3 Standards "and Federal" should be eliminated.

1982 Annual Report on Air Quality

Page 2 Table 1-1. Hydrocarbon should not be listed on this table.

Page 48 Sec. 10.3 Standards "and Federal" should be eliminated.

1981 Annual Report on Air Quality

Page 44 Sec. 10.3 Standards "and Federal" should be eliminated.

1980 Annual Report on Air Quality

Page 27 Table 5-1. East Millinocket-Katahdin School % Data Recovery should be 96.8%.

Page 29 Table 5-2. Millinocket-York Street maximum 24-hr for 1980 should be .195.

Page 32 Table 6-1. Augusta-Cony High School Annual Geometric Mean should be 62.1.

16. ADDITIONAL INFORMATION

For additional information on air quality and the environment contact some of the following web sites:

http://capita.wustl.edu/neardat/

NorthEast Airshed Regional Data Analysis Toolshed - NEARDAT
This web site is a forum for the exchange of air quality related data and information in support of more efficient Air Resources Management in the Northeastern United States and Eastern Canada. The main function of this web site is to illustrate it's potential and to solicit input from the stakeholders. It will be re-designed based on user feedback and web-developments.

http://www.cnie.org/

The Committee for the National Institute for the Environment is a national, non-profit organization working to improve the scientific basis for making decisions on environmental issues through creation of a new, non-regulatory environmental science and education entity, the National Institute for the Environment (NIE).

http://nadp.nrel.colostate.edu/NADP/

The National Atmospheric Deposition Program/National Trends Network (NADP/NTN) is a nationwide network of precipitation monitoring sites. The network is a cooperative effort between many different groups, including the State Agricultural Experiment Stations, U.S. Geological Survey, U.S. Department of Agriculture, and numerous other governmental and private entities. Through this web site, one can access NADP data products, which include:

- Weekly and daily precipitation chemistry data
- Monthly, seasonal, and annual precipitation-weighted mean concentrations
- Annual and seasonal deposition totals
- Mercury deposition data
- Daily precipitation totals
- Color isopleth maps of precipitation concentrations and wet deposition
- Site photos, maps, and information
- Quality Assurance data and information

http://uvb.nrel.colostate.edu/UVB/

The USDA UV-B Radiation Monitoring Program is a program of the US Department of Agriculture's Cooperative State Research, Education and Extension Service (CSREES). The program was initiated in 1992, through a grant to Colorado State University, to provide information on the geographical distribution and temporal trends of UV-B (ultraviolet -B) radiation in the United States. This information is critical to the assessment of the potential impacts of increasing ultraviolet radiation levels on agricultural crops and forests. Specifically the monitoring program:

- Provides information to the agricultural community and others about the climatological and geographical distribution of UV-B irradiance;
- Provides the basic information necessary to support evaluations of the potential damage effects of UV-B to agricultural crops and forests;
- Provides ground truth for satellite measurements and basic information for radiation transfer model calculations;
- Provides long-term records of UV-B irradiance necessary to assess trends;

In a broader sense, the monitoring program supports research that increases our understanding of the factors controlling surface UV-B irradiance and provides the data necessary for assessing the impact of UV-B radiation on human health, ecosystems and materials.
The program consists of both a research and climatological network. The research network, which is still in a planning phase, will deploy high resolution spectroradiometers at 6-10 locations throughout the United States. The climatological network requires less sophisticated instrumentation and will eventually total between 30-40 monitoring stations.
Additional Information:

- Data Availability
- Network Documentation - This link is not yet active
- Instruments & Intercomparisons
- Funding Opportunities Through the USDA
- Project Personnel

- Additional External Resources

http://www.ns.ec.gc.ca/
Home page for the Atlantic Region of Environment Canada. Contains information on environmental issues in the Atlantic Region.

http://gcmd.gsfc.nasa.gov/
The GCMD Mission: The mission of the Global Change Master Directory (GCMD) is to assist the scientific community in the discovery of and linkage to Earth science data, as well as to provide data holders with a means to advertise their data to the Earth Science Community.
The GCMD offers data set descriptions in a standard format, the Directory Interchange Format (DIF). The DIF holds a specific set of information fields in a database to assist in normalizing the search for data set information. The GCMD philosophy for use of the Directory Interchange Format and thus the specific set of attributes, metadata, is that the predetermined set of fields is the critical set needed for a user to determine if the datasets returned from a database query are those that define viable alternative data sets for the user's needs.

http://ttnwww.rtpnc.epa.gov/naaqsfin/index.htm
EPA'S UPDATED AIR QUALITY STANDARDS FOR SMOG (OZONE) AND PARTICULATE MATTER
Updated Air Quality Standards
EPA issued final air quality standards for particulate matter and ozone (otherwise known as soot and smog) on July 16, 1997. This page provides access to plain English fact sheets and the complete text of the rules. There are also several fact sheets related to President Clinton's June 25, 1997 announcement of the decision on the new standards.

http://www.epa.gov/region01/eco/dailyozone/ozone_list.html
Maps of High Ozone Days
The map generation software can be used to create still-frame ozone maps representing the peak ozone values measured at each monitoring site during the day. Peak ozone maps are based on the highest 1-hr ozone concentrations measured at each ozone monitoring station. Peak ozone concentrations typically occur at different times at different monitors. Thus, peak maps do not represent a "snapshot" of air quality at any one moment. Rather, they are more like maps depicting cumulative rainfall, providing the viewer with an immediate indication of how the air quality may have been at worst in his or her area during the course of the day. Peak ozone maps of high ozone days this summer for the New England states, New York and New Jersey can be viewed below.

http://www.epa.gov/ttn/oarpg
The OAR Policy and Guidance Web site is designed to provide access to information on the Clean Air Act amendments of 1990. Through this electronic information dissemination vehicle, the site allows regulators, the regulated community and members of the general public to easily obtain access to that information that is relevant to the Clean Air Act (CAA) amendments of 1990. In this manner, the task of understanding, implementing and complying with the requirements of the new law will be made easier.

http://www.epa.gov/airs/airs2.html
AIRS General Information: AIRS (Aerometric Information Retrieval System) is a computer-based repository of information about airborne pollution in the United States and various World Health Organization (WHO) member countries. The system is administered by the U.S. Environmental Protection Agency (EPA), Office of Air Quality Planning and Standards (OAQPS), Information Transfer and Program Integration Division (ITPID), located in Research Triangle Park, North Carolina. AIRS is installed on the IBM computer system at the EPA's National Computer Center (NCC) in Research Triangle Park, North Carolina. Any organization or individual with access to the EPA computer system may use AIRS to retrieve air pollution data.

http://www.epa.gov/ttn/
The Technology Transfer Network (TTN) is a collection of related Web sites containing information about many areas of air pollution science, technology, regulation, measurement, and prevention. In addition, the TTN serves as a public forum for the exchange of technical information and ideas among participants and EPA staff.

For many years the TTN was an electronic bulletin board system accessible only by modem. In 1996, EPA added Internet access methods, giving people the ability to access the information via the Web. Some TTNWeb pages may temporarily point to TTN2000 Web site pages. This is an interim Web site as documents are transitioned to the TTNWeb.

Why use it?

It's easy! You use your Web browser to point and click your way around the site. It's useful! You'll discover all kinds of information and tools that you can use in your job. It saves time! It saves money! It saves paper! It saves headaches! Say good-bye to phone tag. It's always available! Nineteen different Web sites are up and running. It's readily accessible! Access the latest information whenever you need it.

Who can use it?

Anyone in the world wanting to exchange information about air pollution, including people in EPA, state and local agencies, the private sector, and foreign countries.

How does it work?

You access the TTN directly from the Internet via the World Wide Web. Once you're on the network, you've got all the tools, technology, and information in any of the Web sites available at your fingertips. You can find tools to estimate air pollutant emissions, download computer code for regulatory air models, read a summary of the Clean Air Act (or all the gory details), find a course offered by the Air Pollution Training Institute, or request technical support in implementing an air pollution control program.

What if I'm having problems accessing the TTN?

If you need help accessing the system, call the help desk at (919) 541-5384 in Research Triangle Park, North Carolina.

http://www.epa.gov/oar/

EPA's Office of Air and Radiation is involved with a wide variety of issues that affect the quality of our air. Our office is concerned with the outdoor air that we all breathe and which can cause health and other environmental concerns. We have informational material on indoor air pollution problems, including radon. We have programs that are primarily concerned with motor vehicles and others that focus on stationary sources such as factories and power plants. We have programs related to topics that you may have read about in your local newspapers such as acid rain, global warming (pollution prevention), and the hole in the ozone layer.

This wide range of activities can appear overwhelming at first but we hope that these pages will help you find the information you need. If not, please let us know how we could make it easier for you in the future.

http://www.epa.gov/airs/

AIRS -- the Aerometric Information Retrieval System -- is a computer-based repository of information about airborne pollution. AIRS is administered by the Office of Air Quality Planning and Standards, which is part of the US EPA Office of Air & Radiation. The AIRS General Information page has additional information concerning the organization and purpose of AIRS.