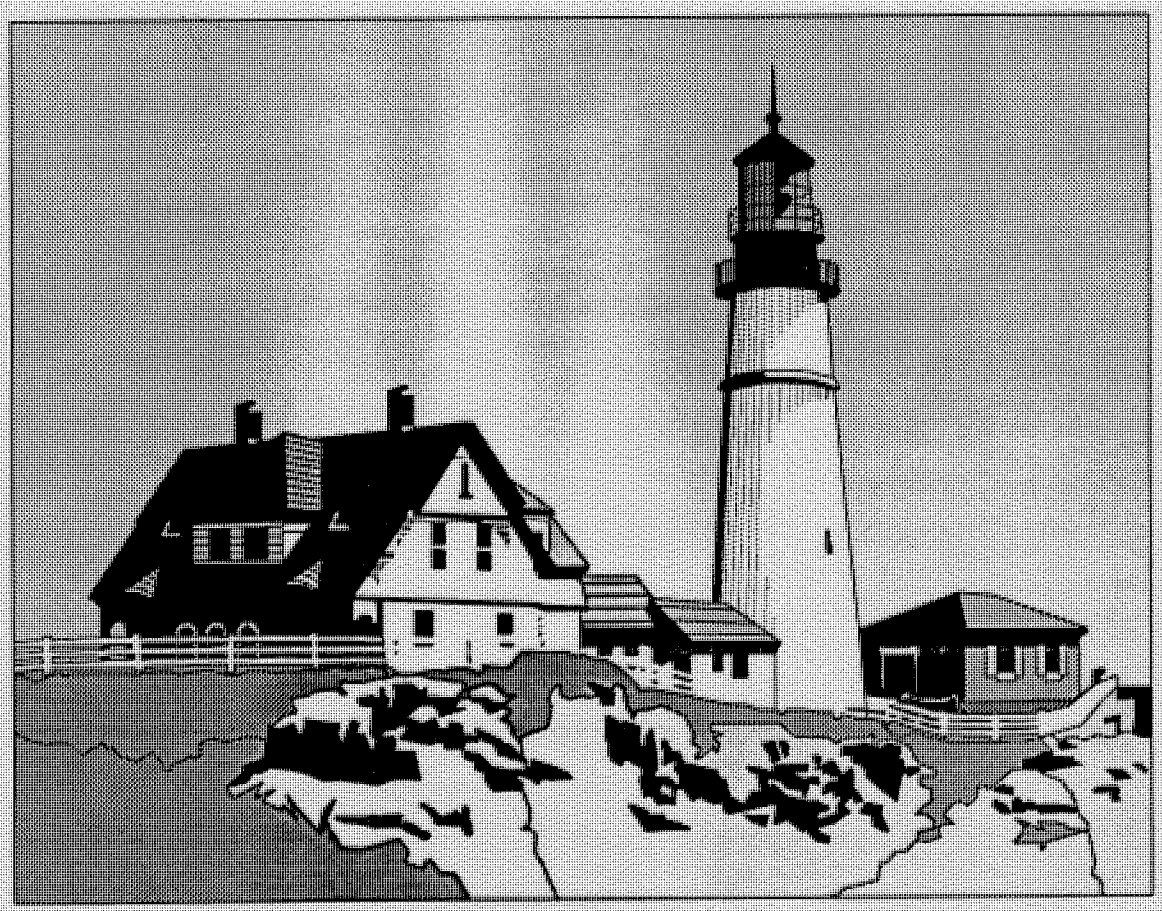
ANNUAL REPORT ON AIR QUALITY 1992



MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

DEPARTMENT OF ENVIRONMENTAL PROTECTION
STATE OF MAINE

1992 ANNUAL REPORT

ON AIR QUALITY

IN THE STATE OF MAINE

Prepared by
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Bureau of Air Quality Control
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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 Control, 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 violations of ambient air quality standards in the State by regions. Later on in this report those violations will be listed by the sites at which they occurred.

A significant 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. 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 1-7 display trends or the lack of a trend which have been occurring at several long term key sites around the State.

Figure 1-1 depicts the annual geometric means for total suspended particulates at several long term sites. The number of sites monitoring for total suspended particulates has significantly decreased since the standard was eliminated and will continue to do so. These sites generally show a downward trend with the exception of the Lincoln Post Office site which has been showing a gradual increase since 1987. The particulate levels will be closely watched in Lincoln to ensure that the increase in TSP levels does not result in an increase in PM10 levels.

Figures 1-2A and 1-2B indicate trends over the last eight years in the annual arithmetic means for fine particulate. The majority of the sites collecting PM10 data over the last five years 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 1-3A, 1-3B, 1-4A and 1-4B indicate the sulfur dioxide trends at seven sites with a long

TABLE 1-1
NATIONAL AMBIENT AIR QUALITY STANDARDS (1992)

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

* = Federal Guideline Only.
** = 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.
ppm = Parts of pollutant per million parts of air.
ug/m^3 = Micrograms of pollutant per cubic meter of air.

TABLE 1-2
STATE OF MAINE AMBIENT AIR QUALITY STANDARDS (1992)

POLLUTANT	AVERAGING TIME	CONCENTRATION
Particulates (PM_{10})	Annual Arithmetic Mean	40 ug/m^3
(Effective 9-30-89)	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*	.081 ppm (160 ug/m^3)
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
Particulates (TSP)***	Twenty-Four Hour	150 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 VIOLATIONS BY REGIONS (1992)

	REGIONS					
POLLUTANT	107	108	109	110	111	TOTALS
FINE PARTICULATE(PM10):						
Annual Arithmetic Mean						
State	0	0	0	0	?	0
Federal	0	0	0	0	?	0
Twenty-four Hour						
State	0	0	0	0	?	0
Federal	0	0	0	0	?	0
LEAD:						
Twenty-four Hour						
State	0	?	0	0	?	0
Federal	0	?	0	0	?	0
CARBON MONOXIDE:						
One Hour	?	?	?	?	?	?
Eight Hour	?	?	?	?	?	?
OZONE:						
One Hour						
State	257	?	153	265	?	675
Days						
Federal	0	?	0	4	?	4
NITROGEN DIOXIDE:						
Annual Arithmetic Mean	?	?	?	0	?	0
SULFUR DIOXIDE:						
Annual Arithmetic Mean						
State	0	0	0	0	?	0
Federal	0	0	0	0	?	0
Twenty-four Hour						
State	0	0	0	0	?	0
Federal	0	0	0	0	?	0
Three Hour						
State	0	0	0	0	?	0
Federal	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 region during 1992.

term history. All of the sites appear to indicate relatively stable long term sulfur dioxide levels since 1984 with no significant trend in either direction or in some cases a slight downward trend. In Figure 1-3B there are three sites that show fluctuations in the short term concentrations over the last few years. All three of these sites are in towns with large industrial sources and probably indicate brief periods of upset conditions or unusual meteorological conditions which resulted in the

FIGURE 1 - 1
TOTAL SUSPENDED PARTICULATE TRENDS

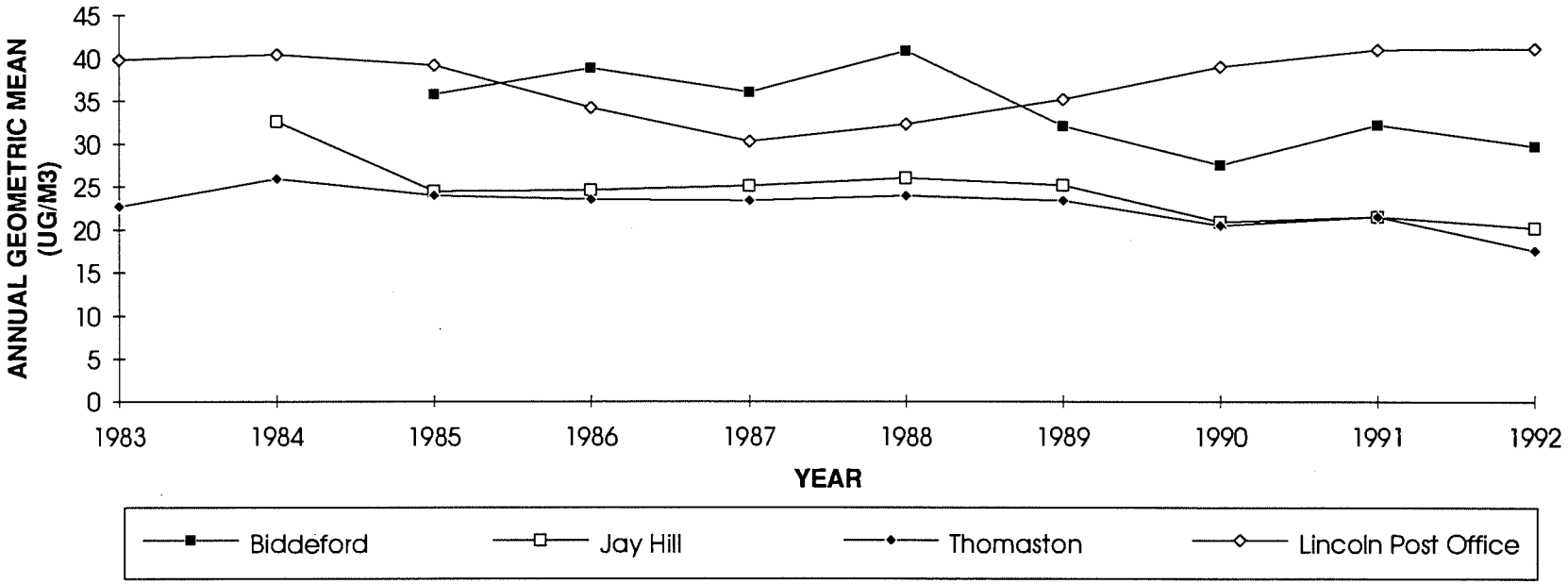


FIGURE 1-2A
PM10 TRENDS - SOUTHERN MAINE

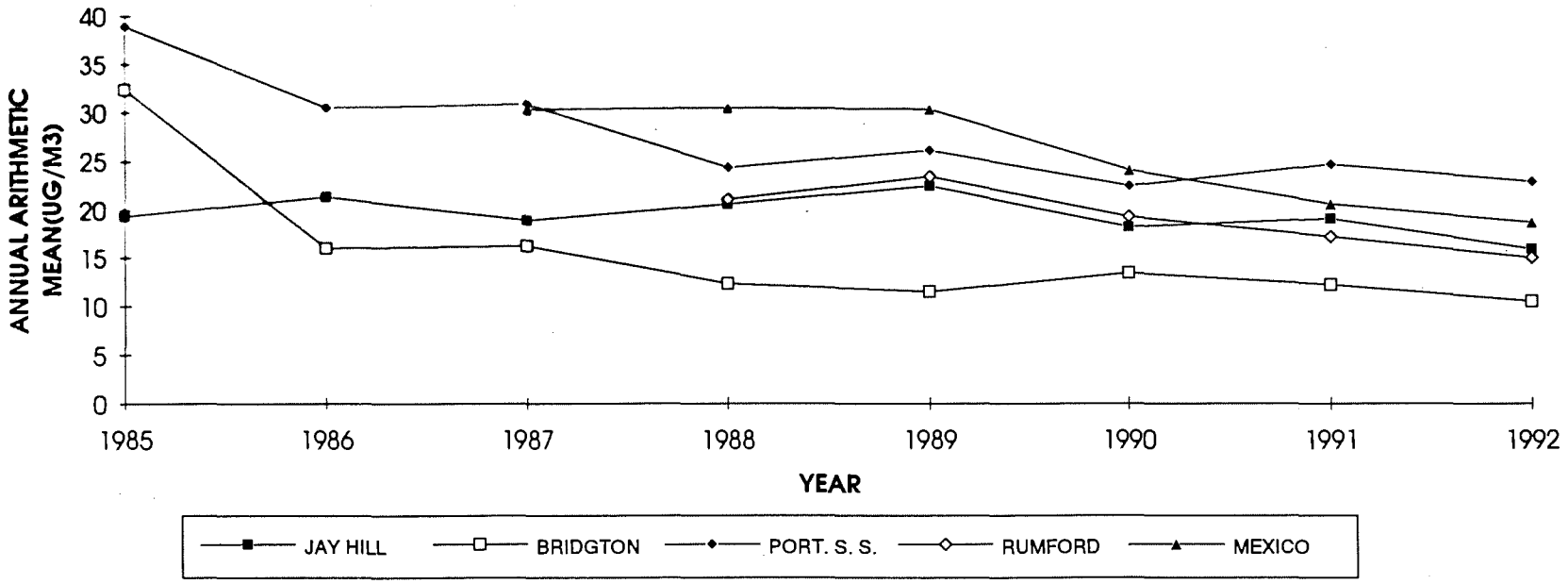


FIGURE 1-2B
PM10 TRENDS - NORTHERN MAINE

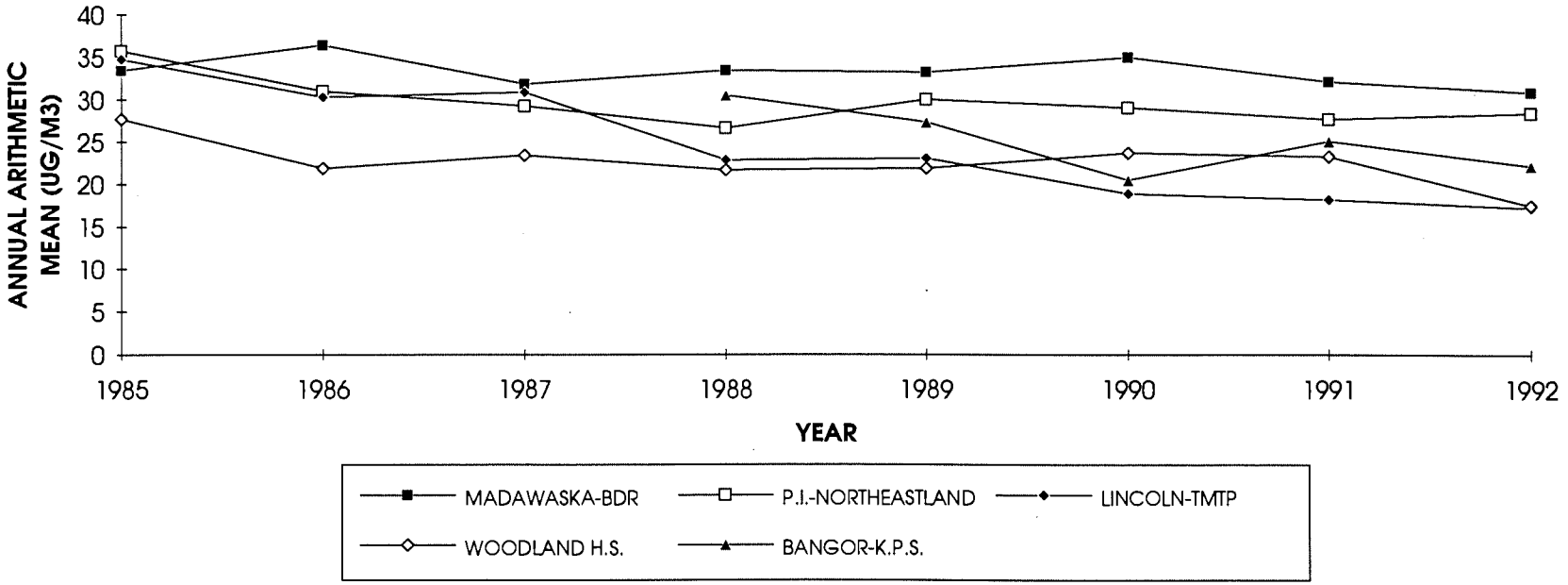


FIGURE 1-3A
SO. MAINE SO2 TRENDS - 24 HOUR

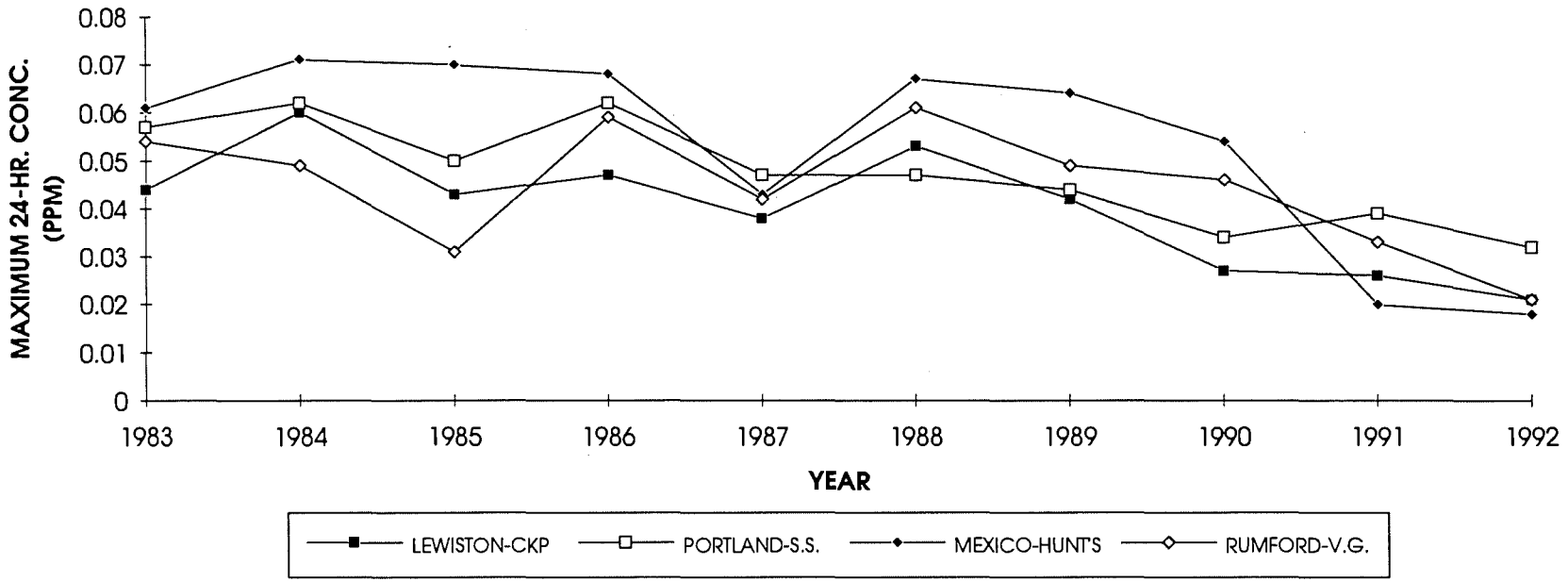


FIGURE 1-3B
NO. MAINE SO2 TRENDS - 24 HOUR

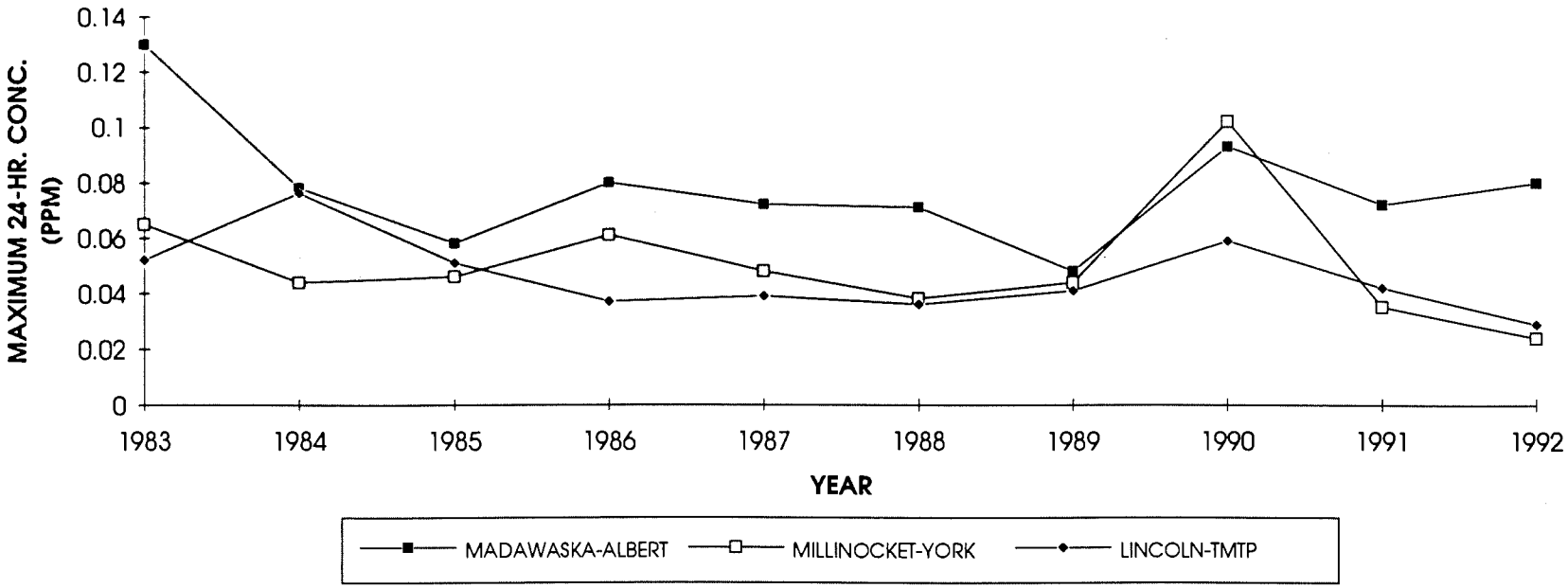


FIGURE 1-4A
SO. MAINE SO2 TRENDS - AAM

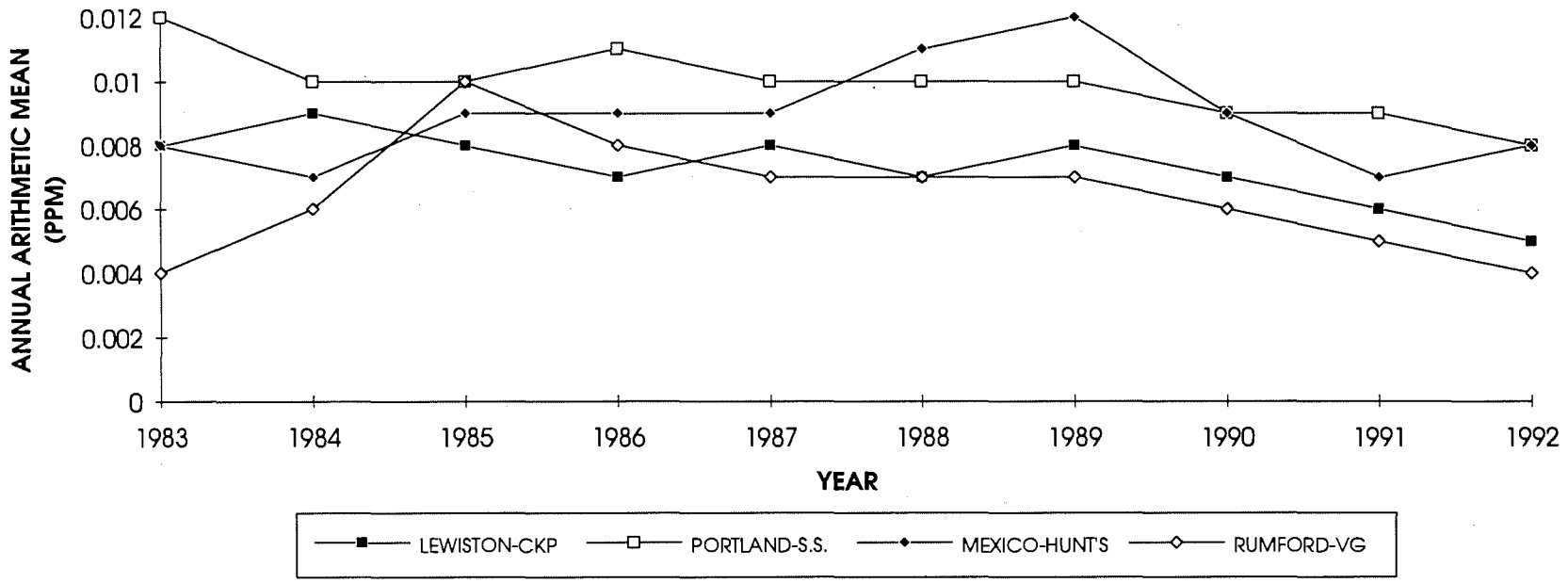
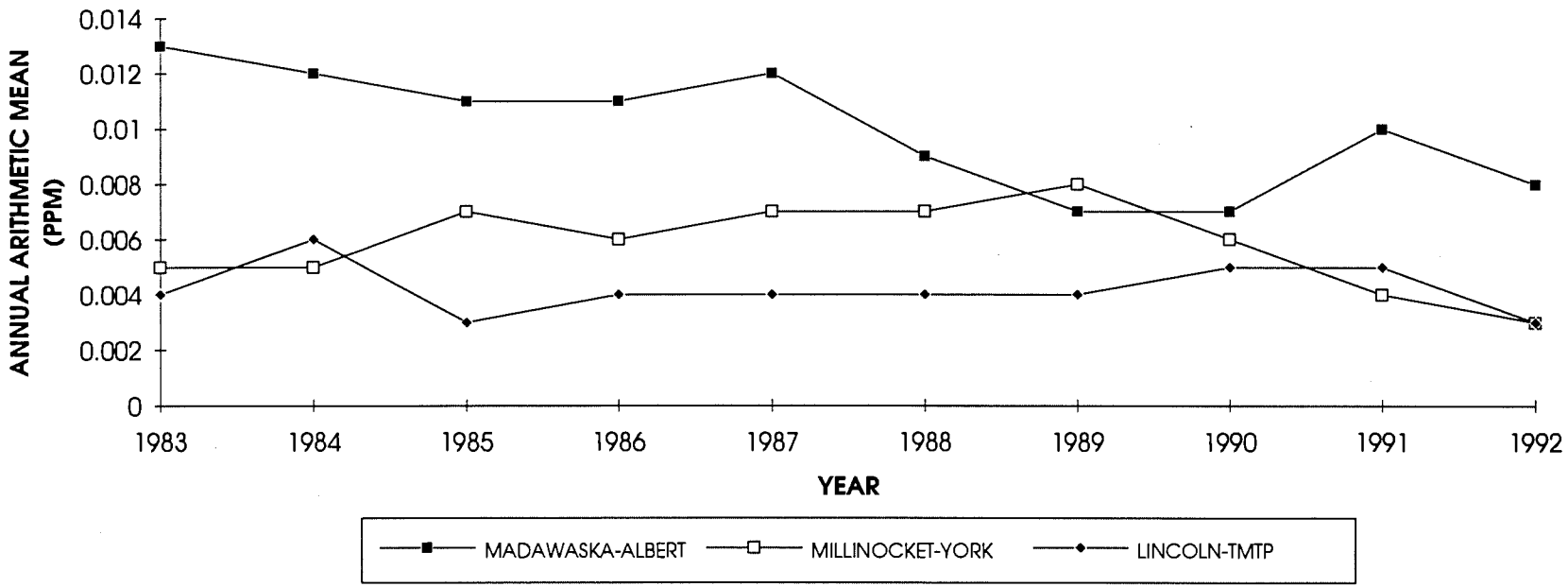


FIGURE 1-4B
NO. MAINE SO2 TRENDS - AAM



higher concentrations.

Figure 1-5 depicts the number of hourly violations of the State ozone standard. 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 ozone levels can be kept below the standards.

Figures 1-6 and 1-7 indicate the very significant reduction that has occurred in lead levels throughout the State in both short term concentrations and in the annual arithmetic means. These significant downward trends are primarily due to the decreased use of lead in gasoline. Current lead levels are less than 20% of the State standard and even less of the Federal standard and are expected to remain at those levels with only minor fluctuations expected in either direction.

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 three 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 three 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.
   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

FIGURE 1-5
OZONE TRENDS - HOURS OF STATE VIOLATION

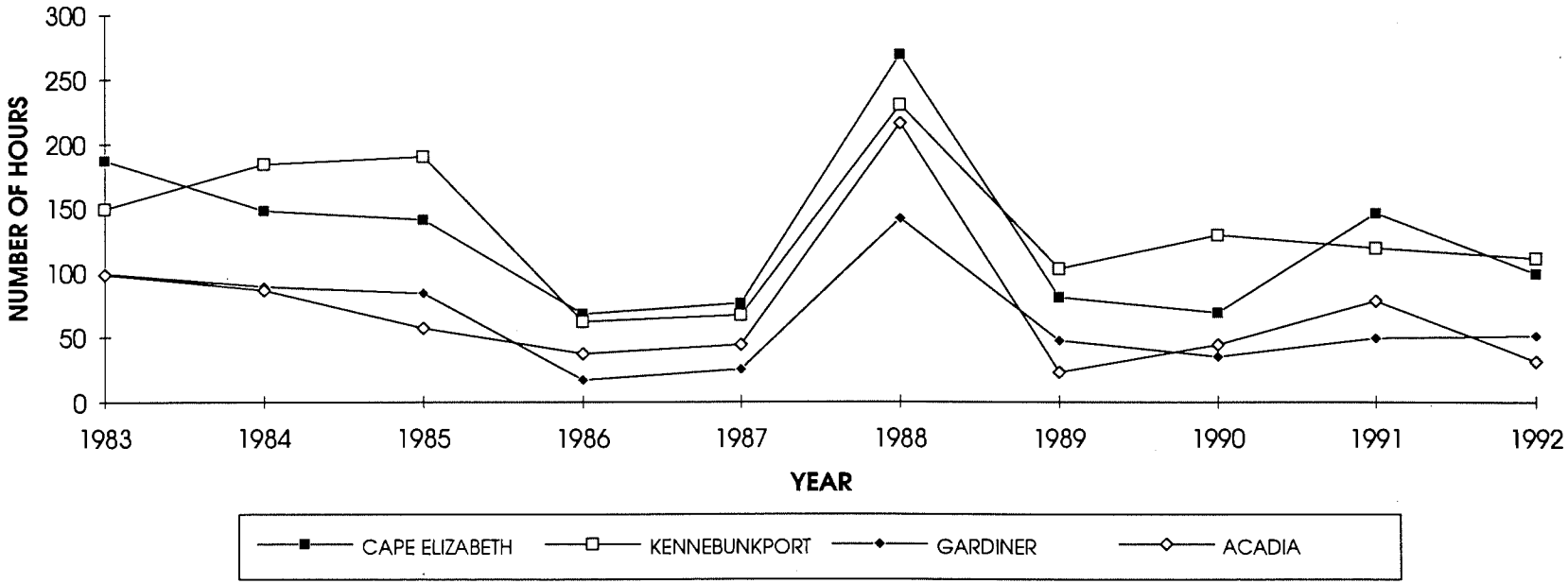


FIGURE 1-6
LEAD TRENDS - SECOND HIGH 24 HOUR

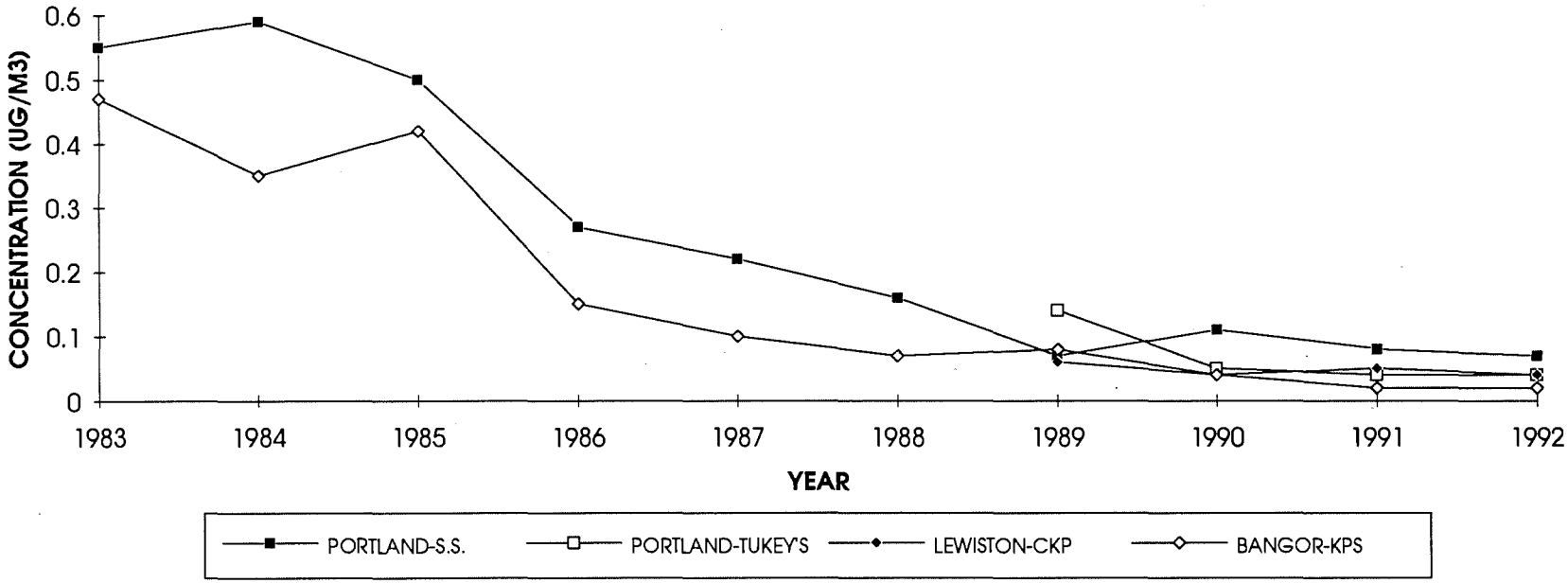
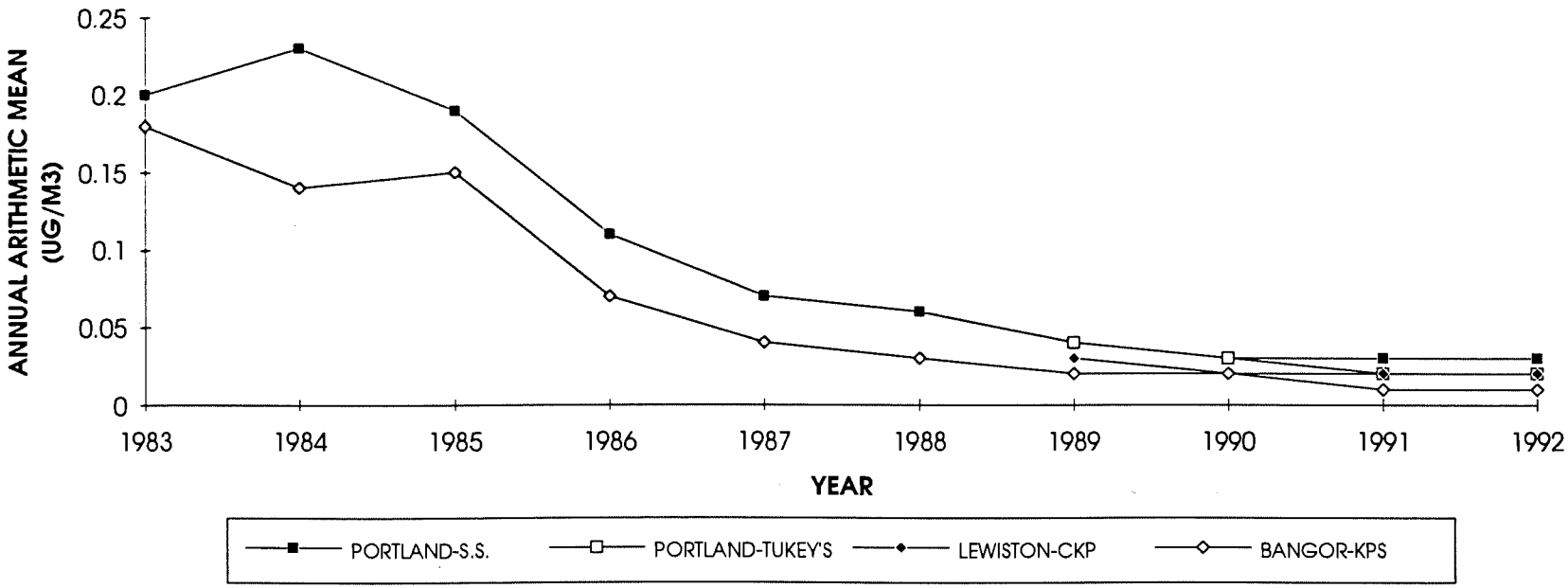


FIGURE 1-7
LEAD HISTORICAL TRENDS - AAM



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. Special Purpose Monitoring Station (SPMS) Network.

Any monitoring site that is not a designated SLAMS or NAMS 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. There were three additional ozone sites established in an effort to document the size of the area affected by high ozone levels. Two additional sites were operated at inland locations and an additional site was operated at an island off the coast. 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 1992. The breakdown indicates most point-source oriented pollutant monitors are operated by the sources which contribute to the problem where as 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 pollutants and; 2) the periodic sampling of particulate and gaseous pollutants. In addition to pollutant monitoring there is also the continuous monitoring of meteorological parameters. One hundred and twenty-one monitors collected data at eighty different sites during 1992.

Continuous gaseous monitoring was done at twenty-nine sites in Maine during 1992. Ozone was monitored at fourteen of these stations, nitrogen dioxide at one and sulfur dioxide at fourteen. Carbon Monoxide was not monitored during 1992.

Particulate sampling was done at forty sites in Maine during 1992. Twenty-one of these stations monitored total suspended particulates. Thirty-six of these sites collected fine particulate fractions. Also, lead monitoring was done at five stations. Three sites were analyzed for sulfates. There were also two sites collecting acid rain data as part of the State monitoring network as well as a University of Maine operated site.

TABLE 1-4
DISTRIBUTION OF AIR MONITORING INSTRUMENTS

POLLUTANT	NAMS	SLAMS	SPMS	TOTAL
Fine Particulate	2	18	16	36
Total Suspended Particulate	0	0	21	21
Lead	0	2	3	5
Carbon Monoxide	0	0	0	0
Sulfur Dioxide	2	6	6	14
Nitrogen Dioxide	0	1	0	1
Ozone	0	5	9	14
Sulfate	0	0	3	3
WS/WD	0	0	24	24
Atmospheric Deposition	0	0	3	3
Total	4	32	85	121

TABLE 1-5
MONITOR OPERATORS DURING 1992

POLLUTANT	DEP*	INDUSTRY**	TOTAL
Fine Particulate	14	22	36
Total suspended Particulate	5	16	21
Lead	5	0	5
Carbon Monoxide	0	0	0
Sulfur Dioxide	4	10	14
Nitrogen Dioxide	1	0	1
Ozone	13	1	14
Sulfate	2	1	3
WS\WD	8	16	24
Atmospheric Deposition	3	0	3
Totals	55	66	121

* Includes other governmental agencies.
** Includes industries and their consultants.

In addition to pollutant monitoring, wind speed and direction was recorded at twenty-four sites around the State during 1992. Some of these sites also recorded other meteorological parameters such as sigma (stability) and temperature, precipitation and solar radiation.

Table 1-6 presents all the monitoring sites in Maine that operated during 1992 and indicates which parameters were monitored at each site. The map in Figure 1-8 shows the Air Quality Control Regions 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 that pollutant, 5) a table presenting the 1992 monitored data, 6) in the case of some pollutants, historical tables presenting 1992 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 1992 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, PM10).

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 during 1992 has been presented in the Data Summary Tables. However, 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 1992 and those years prior to 1992 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.

TABLE 1-6
1992 AMBIENT AIR MONITORING SITE DIRECTORY

SITE	ADDRESS	OPERATOR	PARAMETERS MEASURED
ANDROSCOGGIN COUNTY			
Auburn 23 001 0005	Lewiston-Auburn Airport Lewiston Junction Road	DEP	WS/WD
Lewiston 23 001 0011	Country Kitchen Parking Lot Canal Street	DEP	SO2,TSP,Pb,FP
Livermore Falls 23 001 0013	James River/Otis Mill Route 4	James River Corp.	WS/WD,Temperature
Livermore Falls(DISC) 23 001 2002	10-12 Millett Street	Pine State Power	SO2
AROOSTOOK COUNTY			
Madawaska 23 003 0006	Fraser Paper Company Bridge Street	Fraser Paper	WS/WD,Temperature
Madawaska 23 003 0009	Albert Street	Fraser Paper	SO2,Precipitation
Madawaska 23 003 0012	U. S. Post Office 430 E. Main Street	Fraser Paper	SO2,WS/WD
Madawaska 23 003 0013	Big Daddy's Restaurant 395 E. Main Street	DEP	FP
Madawaska 23 003 1005	Madawaska High School 7th Avenue	Fraser Paper	SO2
Presque Isle 23 003 1005	Northeastland Hotel 436 Main Street	DEP	FP
Presque Isle 23 003 1008	DEP Regional Office 528 Central Drive	DEP	WS/WD,FP
CUMBERLAND COUNTY			
Bridgton 23 005 0002	Upper Ridge Road	DEP	Acid Precipitation,Sulfate,FP, Precipitation
Portland 23 005 0010	Cheverus High School Ocean Avenue	DEP	WS/WD
Portland 23 005 0014	Shelter Site(P.E.O.P.L.) Elm Street	DEP	SO2,Pb,FP,Sulfate,NO,NO2, NOx
Portland 23 005 0015	Tukey's Bridge	DEP	Pb,FP
South Portland(NEW) 23 005 0022	130 Wescott Road	DEP	FP

TABLE 1-6(Continued)
1992 AMBIENT AIR MONITORING SITE DIRECTORY

SITE	ADDRESS	OPERATOR	PARAMETERS MEASURED
Westbrook 23 005 1008	Research Building S. D. Warren	S. D. Warren	TSP,FP
Westbrook 23 005 1009	S. D. Warren Co. Wind S. D. Warren Property	S. D. Warren	WS/WD,Temperature
Cape Elizabeth 23 005 2003	Shelter Site Two Lights State Park	DEP	Ozone(s),WS/WD(s)
Westbrook 23 005 7002	N. E. T. & T. Company Ash Street	S. D. Warren	FP
FRANKLIN COUNTY			
Jay 23 007 0003	Crash Road Gilbert Jewell Property	International Paper	TSP
Jay 23 007 0004	Jay Hill Bomaster Property	International Paper	TSP,FP
Jay 23 007 0008	Burnham Site	International Paper	TSP
Jay 23 007 2001	Weather Level I Lagoon Hill	International Paper	TSP,FP,WS/WD,Temp., Solar Radiation, Precip.
HANCOCK COUNTY			
Acadia National Park 23 009 0003	McFarland Hill Ranger Sta. Route #233	NPS/DEP	Acid Precipitation, Precipitation
Acadia NP 23 009 0101	Acadia NP Route #233	NPS	Ozone,WS/WD,Temperature, Dewpoint
Bucksport 23 009 1005	Waste Disposal Site Route #15	Champion International	WS/WD,Temperature, Precipitation
Dedham(DISC) 23 009 2003	Bald Mountain	DEP	Ozone(s),WS/WD(s)
Mt. Desert Rock 23 009 2004	17894 Lighthouse	DEP/UM	Ozone(s)
KENNEBEC COUNTY			
Augusta 23 011 0008	Governor's Hangar State Airport	DEP	WS/WD
Augusta 23 011 0014	Rines Hill Parking Lot Water Street	DEP	FP
Waterville 23 011 1004	Front Street Municipal Park	DEP	TSP,FP,SO2

TABLE 1-6(Continued)
1992 AMBIENT AIR MONITORING SITE DIRECTORY

SITE	ADDRESS	OPERATOR	PARAMETERS MEASURED
Winslow 23 011 2003	Gulley Hill Road	Scott Paper Company	TSP
Winslow 23 011 2004	Boston Avenue	Scott Paper Company	TSP,FP
Gardiner 23 011 2005	Pray Street School	DEP	Ozone(s)
KNOX COUNTY			
Isle Au Haut 23 013 0003	Isle Au Haut Fire Station	UM/DEP	Ozone(s)
Port Clyde 23 013 0004	Port Clyde Ozone St. George	DEP	Ozone(s)
Thomaston 23 013 1005	Dragon Cement Weather Route #1	Dragon Products	WS/WD
Thomaston 23 013 1007	Marsh Road	Dragon Products	TSP,FP
Thomaston 23 013 2001	Mitchell Property 2 Dexter Avenue	Dragon Products	TSP,FP
OXFORD COUNTY			
Mexico 23 017 0008	Labonville's Route #2	Boise Cascade	TSP,FP
Mexico 23 017 0011	Hunt's Property Route #2	Boise Cascade	SO2
Rumford 23 017 2002	Boise Cascade Weather II Swift River Pump House	Boise Cascade	WS/WD,Temperature,Solar Radiation
Rumford 23 017 2005	Taylor Mountain I	Boise Cascade	TSP,SO2,Sulfate,FP
Rumford 23 017 2006	Taylor Mountain II	Boise Cascade	SO2
Rumford 23 017 2007	Village Green Site	Boise Cascade	TSP,SO2,FP
North Lovell 23 017 3001	DOT Garage Route #5	DEP	Ozone(s)
PENOBSCOT COUNTY			
Bangor 23 019 0002	Kenduskeag Pump Station Washington Street	DEP	TSP,Pb,FP

TABLE 1-6(Continued)
1992 AMBIENT AIR MONITORING SITE DIRECTORY

SITE	ADDRESS	OPERATOR	PARAMETERS MEASURED
Bangor 23 019 0010	BIA - Building #489 Air National Guard	DEP	WS/WD
Brewer 23 019 1002	Brewer Junior High School 5 Somerset Street	DEP	FP
Lincoln 23 019 1007	Thomas Motel Trailer Park 39 West Broadway	Lincoln Pulp & Paper	TSP,SO2,FP
Lincoln 23 019 1011	Lincoln Street	Lincoln Pulp & Paper	FP
Lincoln 23 019 1012	Penobscot River	Lincoln Pulp & Paper	FP
Lincoln 23 019 1013	Lincoln Mill Katahdin Avenue	Lincoln Pulp & Paper	WS/WD,Temperature
Lincoln 23 019 2003	Lincoln Post Office Building 50 Fleming Street	Lincoln Pulp & Paper	TSP,FP
Millinocket 23 019 2009	York Street	Great Northern Paper	TSP,SO2,FP
Millnocket 23 019 2013	Mill Stone Dam	Great Northern Paper	WS/WD,Temperature
Old Town 23 019 4003	Marsh Island Apartments 100 Main Street	DEP	FP
Milford 23 019 4006	Costigan French Settlement Road	DEP	Ozone(s)
Howland(NEW) 23 019 4007	Meadow Brook Road	DEP	Ozone(s)
Old Town 23 019 5004	Woodlands Garage James River Corporation	James River Corp.	WS/WD,Temperature
Orrington 23 019 8001	Center Drive School	Penob. Energy Rec.	FP
Hampden 23 019 8011	McGraw School	Penob. Energy Rec.	FP
PISCATAQUIS COUNTY			
Greenville 23 021 0001	Squaw Brook Greenville	University of Maine	Acid Precipitation,Precipitation

TABLE 1-6(Continued)
1992 AMBIENT AIR MONITORING SITE DIRECTORY

SITE	ADDRESS	OPERATOR	PARAMETERS MEASURED
SOMERSET COUNTY			
Madison 23 025 1004	The Ballfield Main Street	Madison Paper Ind.	WS/WD,Temperature
Skowhegan 23 025 2001	Hinckley Hinckley Farm School	S. D. Warren	FP
Skowhegan 23 025 2002	Eaton Ridge	S. D. Warren	FP
Skowhegan 23 025 2003	Somerset Mill S. D. Warren	S. D. Warren	WS/WD,Ozone,Temperature
WASHINGTON COUNTY			
Woodland 23 029 0007	Secondary Treatment Pipeline	Georgia Pacific Corp.	FP
Woodland 23 029 0008	Woodland High School	Georgia Pacific Corp.	TSP,FP
Woodland 23 029 0017	Woodyard Woodland Mill	Georgia Pacific Corp.	WS/WD
Woodland 23 029 0018	Background	Georgia Pacific Corp.	FP
Jonesport 23 029 0019	Public Landing	DEP	Ozone(s)
Woodland 23 029 0020	100 Meter Tower	Georgia Pacific Corp.	WS/WD,Temperature, Dewpoint
YORK COUNTY			
Biddeford 23 031 0002	Biddeford Treatment Plant Water Street	DEP	TSP,FP,SO2
Biddeford 23 031 0004	Biddeford Rotary Park	DEP	WS/WD
Biddeford 23 031 0005	Eagles Aerie 57 Birch Street	DEP	TSP
Saco 23 031 0006	Saco Island - CMP	DEP	Pb
Kennebunkport 23 031 2002	Parson's Way	DEP	Ozone(s)

TABLE 1-6(Continued)
1992 AMBIENT AIR MONITORING SITE DIRECTORY

SITE	ADDRESS	OPERATOR	PARAMETERS MEASURED
Isle of Shoals 23 031 4753	Appledore Island	EPA/DEP	Ozone(s)

(AIRS Site #)

NEW -Site established in 1992
DISC -Site discontinued in 1992

TSP -Total Suspended Particulates
SO2 -Sulfur Dioxide
NO -Nitric Oxide
NOx -Oxides of Nitrogen
NO2 -Nitrogen Dioxide
CO -Carbon Monoxide
Pb -Lead
WS/WD -Wind Speed and Direction
FP -Fine Particulate
NMHC -Nonmethane Hydrocarbons

n -Instrument installed during 1992
d -Instrument removed during 1992
s -Instrument operated seasonally during 1992
i -Instrument operated intermittently during 1992

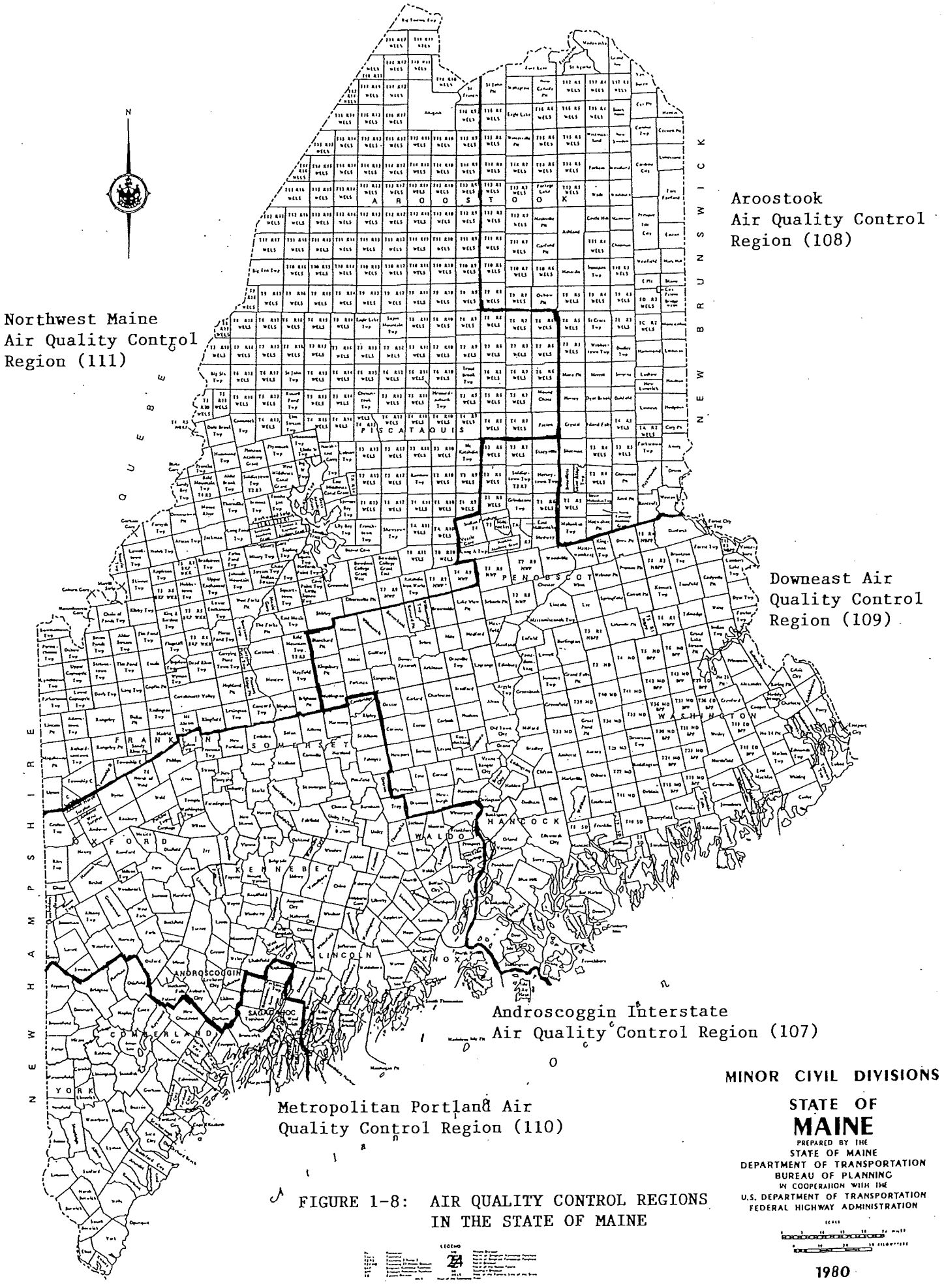


FIGURE 1-8: AIR QUALITY CONTROL REGIONS IN THE STATE OF MAINE

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. 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 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.

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 1992.

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 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 the majority 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. 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. As of the date this report was compiled no proposals have been made for changing the Federal standard. The current State Standard is .081 ppm. It was established at the same time the original Federal Standard was established and has not been changed. 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. Therefore, only hourly averages in excess of .081 ppm are considered exceedances of the State standard.

3.4 Monitoring

Ozone was monitored at fourteen sites in Maine during 1992 using continuous monitoring equipment of two kinds, either chemiluminescence or ultra-violet absorption analyzers. 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 is the 1992 Data Summary for Ozone. Table 3-2 presents the Ozone Historical Comparisons and Table 3-3 presents the Ozone Trends.

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
1992 OZONE DATA SUMMARY
(Parts Per Million)

SITE	ADDRESS	NUMBER OF OBSERVATIONS	HIGHEST CONCENTRATION	NUMBER OF VIOLATIONS STATE*	FEDERAL**
CUMBERLAND COUNTY					
Cape Elizabeth	Shelter Site	4806	0.128	99	2
HANCOCK COUNTY					
Acadia National Park	McFarland Hill Ranger Station	5808	0.108	31	0
Dedham	Bald Mountain	5272	0.115	52	0
Mt. Desert Rock	17894 Lighthouse	1509	0.097	16	0
KENNEBEC COUNTY					
Gardiner	Pray Street School	5112	0.115	51	0
KNOX COUNTY					
Isle Au Haut	Isle Au Haut Fire Station	4466	0.110	79	0
Port Clyde	Port Clyde Ozone	4403	0.122	103	0
OXFORD COUNTY					
Lovell	Route #5	3144	0.097	15	0
PENOBSCOT COUNTY					
Milford	French Settlement Road	4360	0.097	14	0
Howland	Meadow Brook Road	2127	0.088	3	0
SOMERSET COUNTY					
Skowhegan	Somerset Mill	4970	0.096	9	0
WASHINGTON COUNTY					
Jonesport	Public Landing	4267	0.104	37	0
YORK COUNTY					
Kennebunkport	Parson's Way	4180	0.133	111	2
Isle of Shoals	Appledore Island	2669	0.118	55	0

* Total number of hours minus one greater than .081 ppm.
** Number of days in violation. Not a statistical estimate.

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

CAPE ELIZABETH
Shelter Site

YEAR	SECOND HIGH	# OF STATE VIOLATIONS
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	148
1985	.165 PPM	141
1986	.128 PPM	68
1987	.152 PPM	76
1988	.168 PPM	269
1989	.136 PPM	81
1990	.144 PPM	69
1991	.141 PPM	146
1992	.125 PPM	99

KENNEBUNKPORT
Parson's Way

YEAR	SECOND HIGH	# OF STATE VIOLATIONS
1982	.120 PPM	42
1983	.148 PPM	149
1984	.147 PPM	184
1985	.168 PPM	190
1986	.138 PPM	62
1987	.145 PPM	67
1988	.168 PPM	230
1989	.147 PPM	103
1990	.162 PPM	111
1991	.150 PPM	119
1992	.127 PPM	111

DEDHAM
Bald Mountain

YEAR	SECOND HIGH	# OF STATE VIOLATIONS
1985	.123 PPM	72
1986	.106 PPM	34
1987	.117 PPM	35
1988	.185 PPM	241
1989	.105 PPM	41
1990	.119 PPM	68
1991	.113 PPM	30
1992	.112 PPM	52

GARDINER
Gardiner H.S./Pray Street School

YEAR	SECOND HIGH	# OF STATE VIOLATIONS
1980	.117 PPM	54
1981	.122 PPM	31
1982	.120 PPM	56
1983	.140 PPM	99
1984	.112 PPM	89
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

ACADIA
McFarland Hill Ranger Station

YEAR	SECOND HIGH	# OF STATE VIOLATIONS
1983	.135 PPM	98
1984	.130 PPM	86
1985	.117 PPM	57
1986	.108 PPM	37
1987	.126 PPM	44
1988	.153 PPM	216
1989	.113 PPM	23
1990	.118 PPM	44
1991	.125 PPM	78
1992	.105 PPM	31

ISLE AU HAUT
Isle Au Haut Fire Station

YEAR	SECOND HIGH	# OF STATE VIOLATIONS
1986	.107 PPM	26
1987	.151 PPM	87
1988	.185 PPM	111
1989	.115 PPM	35
1990	.131 PPM	55
1991	.136 PPM	123
1992	.109 PPM	79

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

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

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

DEDHAM
Bald Mountain

	PERCENTILES		
YEAR	10%	50%	90%
1985	0.030	0.050	0.083
1986	0.028	0.043	0.068
1987	0.030	0.044	0.065
1988	0.030	0.047	0.083
1989	0.031	0.045	0.070
1990	0.030	0.046	0.071
1991	0.025	0.043	0.070
1992	0.030	0.042	0.070

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
1987	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

Site relocated to the Pray Street School at the start of the 1991 monitoring season.

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

ISLE AU HAUT
Isle Au Haut Fire Station

	PERCENTILES		
YEAR	10%	50%	90%
1986	0.024	0.040	0.077
1987	0.033	0.045	0.078
1988	0.028	0.058	0.122
1989	0.025	0.036	0.069
1990	0.028	0.048	0.076
1991	0.033	0.048	0.088
1992	0.029	0.044	0.075

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 one site in Maine during 1992 using continuous monitoring equipment. Table 4-1 presents the data collected during 1992.

TABLE 4 - 1
1992 NITROGEN DIOXIDE DATA SUMMARY
(Parts Per Million)

SITE	ADDRESS	OBSERVATIONS	ARITHMETIC MEAN
CUMBERLAND COUNTY			
Portland	Shelter site	6723	0.014

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 fourteen sites in Maine during 1992 using continuous monitoring equipment utilizing either the pulsed fluorescent or coulometric methods.

Table 5-1 is the 1992 Data Summary for SO_2. Tables 5-2 and 5-3 present the 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
1992 SULFUR DIOXIDE DATA SUMMARY
(Parts Per Million)

SITE	ADDRESS	NUMBER OF OBSERVATIONS	HIGHEST 3-HOUR AVE.	SECOND HIGHEST 3-HOUR AVE.	HIGHEST 24-HOUR AVE.	SECOND HIGHEST 24-HOUR AVE.	ANNUAL ARITH. MEAN
ANDROSCOGGIN COUNTY							
Lewiston	Country Kitchen Parking Lot	8192	0.064	0.056	0.021	0.021	0.005
Livermore Falls	Pine State Power	738	0.050	0.045	0.032	0.023	0.013
AROOSTOOK COUNTY							
Madawaska	Albert Street	8281	0.170	0.131	0.080	0.042	0.008
Madawaska	U. S. Post Office	8288	0.255	0.182	0.088	0.080	0.009
Madawaska	Madawaska High School	8342	0.106	0.094	0.040	0.031	0.004
CUMBERLAND COUNTY							
Portland	Shelter Site	7870	0.092	0.054	0.032	0.029	0.008
KENNEBEC COUNTY							
Waterville	Front Street	8311	0.067	0.066	0.038	0.033	0.007
OXFORD COUNTY							
Mexico	Hunt's Property	8277	0.037	0.035	0.018	0.018	0.008
Rumford	Taylor Mountain 1	8156	0.047	0.040	0.021	0.020	0.005
Rumford	Taylor Mountain 2	8283	0.043	0.041	0.024	0.023	0.007
Rumford	Village Green Site	8187	0.054	0.047	0.021	0.020	0.004
PENOBSCOT COUNTY							
Lincoln	Thomas Motel Trailer Park	8055	0.069	0.038	0.029	0.020	0.003
Millinocket	York Street	8692	0.050	0.044	0.024	0.019	0.003
YORK COUNTY							
Biddeford	Biddeford Treatment Plant	6839	0.042	0.042	0.028	0.026	0.006

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

		MAXIMUM 24 - HOUR CONCENTRATION (PPM)						
SITE	ADDRESS	1986	1987	1988	1989	1990	1991	1992
ANDROSCOGGIN COUNTY								
Lewiston	Country Kitchen Parking Lot	0.047	0.038	0.053	0.042	0.027	0.026	0.021
Livermore Falls	Pine State Power	N/A	N/A	N/A	N/A	N/A	0.053	0.032
AROOSTOOK COUNTY								
Madawaska	Albert Street	0.080	0.072	0.071	0.048	0.093	0.072	0.080
Madawaska	U. S. Post Office	0.068	0.084	0.073	0.069	0.042	0.048	0.088
Madawaska	Madawaska High School	0.046	0.076	0.057	0.032	0.027	0.045	0.040
CUMBERLAND COUNTY								
Portland	Shelter Site	0.062	0.047	0.047	0.044	0.034	0.039	0.032
KENNEBEC COUNTY								
Waterville	Front Street	N/A	N/A	N/A	N/A	0.029	0.042	0.038
OXFORD COUNTY								
Mexico	Hunt's Property	0.068	0.043	0.067	0.064	0.054	0.020	0.018
Rumford	Taylor Mountain 1	0.086	0.098	0.125	0.044	0.066	0.022	0.021
Rumford	Taylor Mountain 2	0.067	0.065	0.074	0.053	0.063	0.027	0.024
Rumford	Village Green Site	0.059	0.042	0.061	0.049	0.046	0.033	0.021
PENOBSCOT COUNTY								
Lincoln	Thomas Motel Trailer Park	0.037	0.039	0.036	0.041	0.059	0.042	0.029
Millinocket	York Street	0.061	0.048	0.038	0.044	0.102	0.035	0.024
YORK COUNTY								
Biddeford	Biddeford Treatment Plant	N/A	N/A	0.044	0.032	0.024	0.028	0.028

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

SITES	ADDRESS	TOTAL NUMBER OF EXCEEDANCES* 1986	1987	1988	1989	1990	1991	1992
AROOSTOOK COUNTY								
Madawaska	Albert Street	0	0	0	0	1	0	0
OXFORD COUNTY								
Rumford	Taylor Mountain 1	0	1	1	0	0	0	0
PENOBSCOT COUNTY								
Millinocket	York Street	0	0	0	0	1	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.

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.

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 21 sites in Maine during 1992 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 1992. Table 6-2 is a historical comparison of the TSP Annual Geometric Means at sites which have been in existence over the last two years. Table 6-3 summarizes the number of exceedances of the TSP nuisance standard which have occurred over the last seven years and the sites at which they occurred.

Fine particulates were monitored at 42 sites during 1992 using PM10 samplers. The sampling is conducted with size-selective inlets and flow controlling devices designed to meet EPA's monitor specifications.

Table 6-4 is a summary of the fine particulate data collected in Maine during 1992. Tables 6-5 and 6-6 provide some historical comparison data over the last few years these monitors have been in operation.

TABLE 6 - 1
1992 TOTAL SUSPENDED PARTICULATES DATA SUMMARY
(Micrograms Per Cubic Meter)

SITE	ADDRESS	NUMBER OF OBSERVATIONS	HIGHEST 24-HOUR	SECOND HIGHEST	THIRD HIGHEST	ANNUAL GEOMETRIC MEAN
ANDROSCOGGIN COUNTY						
Lewiston	Country Kitchen Parking Lot	56	175	151	145	52.1
CUMBERLAND COUNTY						
Westbrook	Research Building	18	125	118	116	70.3 *
FRANKLIN COUNTY						
Jay	Crash Road	181	73	68	64	16.7
Jay	Jay Hill	183	102	77	77	20.2
Jay	Burnham	183	158	106	104	29.6
Jay	Weather Level 1	180	117	109	93	28.1
KENNEBEC COUNTY						
Waterville	Front Street	58	159	159	144	46.3
Winslow	Gulley Hill Road	182	175	165	160	40.5
Winslow	Boston Avenue	187	201	122	117	35.2
KNOX COUNTY						
Thomaston	Marsh Road	49	78	48	45	17.6
Thomaston	Mitchell Property	122	93	83	78	21.7
OXFORD COUNTY						
Mexico	Labonville's	9	98	94	56	45.7 *
Rumford	Taylor Mountain 1	9	68	31	31	21.1 *
Rumford	Village Green Site	9	92	71	38	34.6 *
PENOBSCOT COUNTY						
Bangor	Kenduskeag Pump Station	53	162	154	128	46.0 *
Lincoln	Thomas Motel Trailer Park	160	259	159	132	32.9
Lincoln	Lincoln Post Office Building	77	179	176	170	41.1
Millinocket	York Street	55	95	95	88	33.5 *
WASHINGTON COUNTY						
Woodland	Woodland High School	41	154	113	96	28.1 *
YORK COUNTY						
Biddeford	Biddeford Treatment Plant	58	67	64	57	29.7
Biddeford	57 Birch Street	55	79	74	67	36.8

* Insufficient data collected for valid annual geometric mean.

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

SITE	ADDRESS	1986	1987	1988	1989	1990	1991	1992
ANDROSCOGGIN COUNTY								
Lewiston	Country Kitchen Parking Lot	N/A	N/A	N/A	50.5	47.1	55.0	52.1
CUMBERLAND COUNTY								
Westbrook	Research Building	67.4	71.2	62.1 *	62.0	51.9	51.0	70.3 *
FRANKLIN COUNTY								
Jay	Crash Road	18.9	19.4	20.7	19.6	16.0	18.0	16.7
Jay	Jay Hill	24.6	25.1	26.0	25.2	20.9	21.5	20.2
Jay	Burnham	N/A	N/A	36.0	32.9	28.1	28.8	29.6
Jay	Weather Level 1	33.5	34.1	38.3	35.0	27.5	26.0	28.1
KENNEBEC COUNTY								
Waterville	Front Street	N/A	N/A	N/A	N/A	39.9	48.7	46.3
Winslow	Gulley Hill Road	N/A	43.6	44.1	51.9 *	41.1	42.0	40.5
Winslow	Boston Avenue	N/A	N/A	N/A	N/A	33.3	32.7	35.2
KNOX COUNTY								
Thomaston	Marsh Road	23 5	23.4	23.9	23.4	20.5	21.5	17.6
Thomaston	Mitchell Property	22.0	21.9	24.5	25.1	21.3	20.5	21.7
OXFORD COUNTY								
Mexico	Labonville's	46.6	40.8	43.3	46.5	39.7	35.9	45.7 *
Rumford	Taylor Mountain 1	33.0	30.0	30.7	33.8	26.5	21.7	21.1 *
Rumford	Village Green Site	29.7	27.2	27.7	29.7	28.8	24.3	34.6 *
PENOBSCOT COUNTY								
Bangor	Kenduskeag Pump Station	59.4	53.0	56.3	56.2	45.3	47.8	46.0 *
Lincoln	Thomas Motel Trailer Park	34.9	33.9	34.1	33.9	32.8	37.9	32.9
Lincoln	Lincoln Post Office Building	34.2	30.3	32.3	35.2	39.0	41.0	41.1
Millinocket	York Street	37.3	34.4	33.8	32.1	29.0	29.5	33.5 *
WASHINGTON COUNTY								
Woodland	Woodland High School	33.2	29.0	26.5	26.4	34.2 *	26.2	28.1 *
YORK COUNTY								
Biddeford	Biddeford Treatment Plant	38.8	36.0	40.8	32.1	27.5	32.2	29.7
Biddeford	57 Birch Street	N/A	N/A	N/A	N/A	34.2	36.2	36.8

* Insufficient data collected for valid annual geometric mean.

TABLE 6 - 3
TOTAL SUSPENDED PARTICULATES HISTORICAL COMPARISON
(Sites with samples greater than 150 ug/m3)

SITE	ADDRESS	TOTAL NUMBER OF SHORT TERM EXCEEDANCES 1986	1987	1988	1989	1990	1991	1992
ANDROSCOGGIN COUNTY								
Lewiston	Country Kitchen Parking Lot	0	0	0	0	0	3	2
CUMBERLAND COUNTY								
Westbrook	Research Building	15	11	0	4	1	0	0
FRANKLIN COUNTY								
Jay	Burnham	0	1	1	0	0	0	2
Jay	Weather Level 1	0	1	0	0	0	0	0
KENNEBEC COUNTY								
Waterville	Front Street	N/A	N/A	N/A	N/A	3	3	2
Winslow	Gulley Hill Road	N/A	2	1	6	2	1	3
Winslow	Boston Avenue	N/A	N/A	N/A	N/A	N/A	0	1
KNOX COUNTY								
Thomaston	Mitchell Property	0	2	3	0	0	0	0
OXFORD COUNTY								
Mexico	Labonville's	0	0	0	2	0	0	0
PENOBSCOT COUNTY								
Bangor	Kenduskeag Pump Station	6	2	1	2	0	2	2
Lincoln	Lincoln Post Office Building	1	2	0	2	3	3	4
Lincoln	Thomas Motel Trailer Park	0	0	2	4	0	2	2
Millinocket	York Street	1	4	0	0	0	0	0
WASHINGTON COUNTY								
Woodland	Woodland High School	8	5	0	0	2	0	1

TABLE 6 - 4
1992 FINE PARTICULATE DATA SUMMARY
(Micrograms Per Cubic Meter)

SITE	ADDRESS	NUMBER OF OBSERVATIONS	HIGHEST 24-HOUR	SECOND HIGHEST	THIRD HIGHEST	ANNUAL ARITH. MEAN	ANNUAL GEOM. MEAN
ANDROSCOGGIN COUNTY							
Lewiston	Country Kitchen Parking Lot	59	81	58	56	24.4	21.6
AROOSTOOK COUNTY							
Madawaska	Big Daddy's Restaurant	57	101	92	79	30.8	26.9
Presque Isle	Northeastland Hotel	190	108	102	92	28.4 *	23.5 *
Presque Isle	Northeastland Hotel(Continuous)	292	99	89	89	25.8	18.6
Presque Isle	Regional Office	118	62	45	41	14.9	13.2
CUMBERLAND COUNTY							
Bridgton	Upper Ridge Road	56	54	28	27	10.5	9.0
Portland	Shelter Site	60	60	57	56	22.9	20.8
Portland	Tukey's Bridge	54	59	53	52	24.1 *	21.9 *
South Portland	130 Wescott Road	32	64	38	30	19.5 *	17.8 *
Westbrook	Research Building	119	71	63	60	19.4	17.3
Westbrook	N. E. T. & T. Company	56	64	48	42	16.6	14.4
FRANKLIN COUNTY							
Jay	Jay Hill	179	68	59	47	15.9	13.6
Jay	Weather Level 1	179	48	46	45	14.9	13.5
KENNEBEC COUNTY							
Augusta	Rines Hill Parking Lot	59	108	59	51	24.9	21.6
Waterville	Front Street	59	97	77	51	24.5	21.5
Winslow	Boston Avenue	182	73	65	61	20.1	17.8
KNOX COUNTY							
Thomaston	Marsh Road	50	37	27	25	11.7 *	10.4 *
Thomaston	Mitchell Property	118	45	39	39	14.2	12.0
OXFORD COUNTY							
Mexico	Labonville's	182	62	52	49	18.7	16.6
Rumford	Taylor Mountain 1	180	62	49	44	14.3	11.5
Rumford	Village Green	181	56	56	47	15.0	12.9

TABLE 6 - 4(Continued)
1992 FINE PARTICULATE DATA SUMMARY
(Micrograms Per Cubic Meter)

SITE	ADDRESS	NUMBER OF OBSERVATIONS	HIGHEST 24-HOUR	SECOND HIGHEST	THIRD HIGHEST	ANNUAL ARITH. MEAN	ANNUAL GEOM. MEAN
PENOBSCOT COUNTY							
Bangor	Kenduskeag Pump Station	59	76	70	57	22.2	19.8
Brewer	Brewer Junior High School	55	76	58	54	20.6	18.0
Lincoln	Thomas Motel Trailer Park	160	58	47	45	17.2	14.7
Lincoln	Lincoln Street	160	57	50	47	13.9	12.1
Lincoln	Penobscot River	155	62	48	42	11.4	9.2
Lincoln	Lincoln Post Office Building	153	77	72	72	25.8	22.0
Millinocket	York Street	60	47	41	39	16.7	14.4
Old Town	Marsh Island Apartments	58	88	78	60	20.6	17.6
Orrington	Center Drive School	59	29	24	19	10.7	9.6
Hampden	McGraw School	58	53	44	36	13.9	11.7
SOMERSET COUNTY							
Skowhegan	Hinckley	60	40	35	33	13.4	11.5
Skowhegan	Eaton Ridge	48	34	23	22	11.9	10.5
WASHINGTON COUNTY							
Woodland	Secondary Treatment Pipeline	60	67	35	33	14.4	12.3
Woodland	Woodland High School	120	78	61	51	17.5	14.4
Woodland	Background	59	27	18	17	9.8	8.9
YORK COUNTY							
Biddeford	Biddeford Treatment Plant	55	68	42	34	18.3	16.5

* Insufficient data collected for valid annual mean.

TABLE 6 - 5
FINE PARTICULATE HISTORICAL COMPARISON
ANNUAL ARITHMETIC MEANS (ug/m3)

SITE	ADDRESS	ANNUAL ARITHMETIC MEANS (ug/m3) 1987	1988	1989	1990	1991	1992
ANDROSCOGGIN COUNTY							
Lewiston	Country Kitchen Parking Lot	N/A	N/A	N/A	24.7	28.5	24.4
AROOSTOOK COUNTY							
Madawaska	Big Daddy's Restaurant	31.8	33.4	33.2	34.9	32.1	30.8
Presque Isle	Northeastland Hotel	29.2	26.4	30.0	29.0	27.7	28.4 *
Presque Isle	Regional Office	N/A	N/A	15.8	14.1	16.3	14.9
CUMBERLAND COUNTY							
Bridgton	Upper Ridge Road	16.2	12.3	11.5	13.4	12.2	10.5
Portland	Shelter Site	30.9	24.4	26.1	22.5	24.7	22.9
Portland	Tukey's Bridge	N/A	N/A	N/A	N/A	27.6	24.1 *
Westbrook	Research Building	N/A	25.0	24.0	21.5	22.1	19.4
Westbrook	N. E. T. & T. Company	N/A	21.0	20.7	17.3	19.1	16.6
FRANKLIN COUNTY							
Jay	Jay Hill	18.9	20.6	22.4	18.2	19.1	15.9
Jay	Weather Level 1	N/A	17.7	18.1	15.6	16.4	14.9
KENNEBEC COUNTY							
Augusta	Rines Hill Parking Lot	N/A	N/A	N/A	N/A	26.3	24.9
Waterville	Front Street	N/A	N/A	N/A	25.8	28.0	24.5
Winslow	Boston Avenue	N/A	N/A	N/A	27.8	21.6	20.1
KNOX COUNTY							
Thomaston	Marsh Road	N/A	20.9	17.5	16.3	15.3	11.7 *
Thomaston	Mitchell Property	N/A	22.5	18.2	15.3	15.2	14.2
OXFORD COUNTY							
Mexico	Labonville's	30.3	30.5	30.3	24.1	20.6	18.7
Rumford	Taylor Mountain 1	N/A	N/A	N/A	N/A	17.8	14.3
Rumford	Village Green	N/A	21.1	23.4	19.3	17.2	15.0
PENOBSCOT COUNTY							
Bangor	Kenduskeag Pump Station	N/A	30.5	26.2	20.5	25.1	22.2
Brewer	Brewer Junior High School	N/A	N/A	N/A	N/A	21.4	20.6

TABLE 6 - 5(Continued)
FINE PARTICULATE HISTORICAL COMPARISON
ANNUAL ARITHMETIC MEANS (ug/m3)

SITE	ADDRESS	ANNUAL ARITHMETIC MEANS (ug/m3) 1987	1988	1989	1990	1991	1992
Lincoln	Thomas Motel Trailer Park	30.8	22.9	23.1	18.9	18.2	17.2
Lincoln	Lincoln Street	N/A	N/A	N/A	12.7	13.1	13.9
Lincoln	Penobscot River	N/A	N/A	N/A	11.7	11.5	11.4
Lincoln	Lincoln Post Office Building	N/A	N/A	N/A	22.5	26.8	25.8
Millinocket	York Street	N/A	16.0	18.9	16.2	15.5	16.7
Old Town	Marsh Island Apartments	N/A	N/A	N/A	N/A	21.0	20.6
Orrington	Center Drive School	13.9	14.0	13.2	11.5	12.8	10.7
Hampden	McGraw School	15.3	15.7	15.1	12.9	14.4	13.9
SOMERSET COUNTY							
Skowhegan	Hinckley	N/A	22.3	21.9	13.8	14.2	13.4
Skowhegan	Eaton Ridge	N/A	14.5	15.5	13.6	14.0	11.9
WASHINGTON COUNTY							
Woodland	Secondary Treatment Pipeline	N/A	16.1	17.7	18.5	19.2	14.4
Woodland	Woodland High School	23.4	21.7	21.9	23.7	23.3	17.5
Woodland	Background	N/A	10.7	12.7	13.2	13.4	9.8
YORK COUNTY							
Biddeford	Biddeford Treatment Plant	N/A	N/A	26.9	22.0	22.1	18.3

* Insufficient data collected for valid annual geometric mean.

TABLE 6-6
FINE PARTICULATE HISTORICAL COMPARISON
(Sites with samples greater than 150 ug/m3)

SITE	ADDRESS	TOTAL NUMBER OF SAMPLES GREATER THAN 150 UG/M3 1986	1987	1988	1989	1990	1991	1992
AROOSTOOK COUNTY								
Madawaska	Big Daddy's Restaurant	0	1	1	0	0	0	0
Presque Isle	Northeastland Hotel	1	3	0	0	1	0	0

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 that burn "leaded" gasoline. The lead in gasoline is in the form of tetraethyl lead, an "anti-knock" compound. 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 monitored at five sites in Maine during 1992 by taking samples of the Hi-Vol filters from those sites and analyzing the samples for lead content using an atomic absorption analyzer.

Tables 7-1 and 7-2 are the 1992 Data Summaries for Lead. Table 7-3 presents the Lead Historical Comparison Data.

TABLE 7-1
1992 LEAD DATA SUMMARY
(Micrograms Per Cubic Meter)

SITE	ADDRESS	NUMBER OF OBSERVATIONS	HIGHEST 24-HOUR	SECOND HIGHEST	THRD HIGHEST	ANNUAL GEOMETRIC MEAN
ANDROSCOGGIN COUNTY						
Lewiston	Country Kitchen Parking Lot	56	0.04	0.04	0.03	0.01
CUMBERLAND COUNTY						
Portland	Shelter Site	46	0.07	0.07	0.06	0.02 *
Portland	Tukey's Bridge	55	0.04	0.04	0.04	0.02
PENOBSCOT COUNTY						
Bangor	Kenduskeag Pump Station	46	0.04	0.02	0.02	0.01 *
YORK COUNTY						
Saco	Saco Island - CMP	114	0.46	0.20	0.06	0.02

* Insufficient data collected for valid annual geometric mean.

TABLE 7-2
1992 LEAD DATA SUMMARY BY QUARTERS
(Micrograms Per Cubic Meter)

SITE	ADDRESS	1992 QUARTERLY AVERAGES 1ST	2ND	3RD	4TH
ANDROSCOGGIN COUNTY					
Lewiston	Country Kitchen Parking Lot	0.02	0.01	0.01	0.02
CUMBERLAND COUNTY					
Portland	Shelter Site	0.03	0.03	0.02	0.02
Portland	Tukey's Bridge	0.02	0.02	0.02	0.02
PENOBSCOT COUNTY					
Bangor	Kenduskeag Pump Station	0.01	0.01	0.01	N/A
YORK COUNTY					
Saco	Saco Island - CMP	0.02	0.03	0.02	0.04

TABLE 7-3
LEAD HISTORICAL COMPARISONS
(Micrograms Per Cubic Meter)

SITE	ADDRESS	MAXIMUM 24-HOUR CONCENTRATION / AAM 1986	1987	1988	1989	1990	1991	1992
ANDROSCOGGIN COUNTY								
Lewiston	Country Kitchen Parking Lot	N/A	N/A	N/A	0.12/0.03	0.04/0.02	0.05/0.02	0.04/0.02
CUMBERLAND COUNTY								
Portland	Shelter Site	0.33/0.11	0.27/0.07	0.17/0.06	0.10/0.04	0.12/0.03	0.08/0.03	0.07/0.03
Portland	Tukey's Bridge	0.87/0.35	N/A	N/A	0.08/0.04	0.08/0.03	0.06/0.02	0.04/0.02
PENOBSCOT COUNTY								
Bangor	Kenduskeag Pump Station	0.18/0.07	0.12/0.04	0.08/0.03	0.09/0.02	0.10/0.02	0.03/0.01	0.04/0.01
YORK COUNTY								
Saco	Saco Island - CMP	N/A	N/A	N/A	N/A	0.70/0.03	0.10/0.02	0.46/0.03

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 three sites in Maine during 1992 by taking samples of the Hi-Vol filters from those sites and analyzing the samples for sulfates using the Automated Technicon II 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 1992.

Nitrate levels were not measured in Maine during 1992.

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
1992 SULFATE DATA SUMMARY
(Micrograms Per Cubic Meter)

SITE	ADDRESS	NUMBER OF OBSERVATIONS	HIGHEST 24-HOUR	SECOND HIGHEST	THRD HIGHEST	ANNUAL ARITHMETIC MEAN
CUMBERLAND COUNTY						
Bridgton	Upper Ridge Road	56	25.6	10.9	10.1	3.2
Portland	Shelter Site	60	29.3	9.5	8.9	4.0
OXFORD COUNTY						
Rumford	Taylor Mountain I	59	20.8	12.7	9.7	3.9

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 approximately 50 million metric tons of sulfur and nitrogen oxides into the atmosphere. Through a series of complex chemical reactions these pollutants can be converted into acids, which may return to earth as components of either rain or snow. This atmospheric deposition, more commonly known as acid rain, may have severe ecological impacts on widespread areas of the environment.

9.2 Health and Welfare Effects

While direct health effects from acid rain have not been documented there are numerous indirect effects which could have definite effect on mankind. Atmospheric deposition is known to leach heavy metals such as mercury from rocks causing possible contamination of water supplies. Hundreds of lakes in North America and Scandanavia 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. The only permanent solution to the acid rain problem is to keep the acid levels low. The only practical way of achieving this is by reducing emissions at their sources.

9.4 Monitoring

During 1992 there were four sites collecting data on atmospheric deposition. Those four sites included two Bureau maintained sites in Bridgton and 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 DEP and the University of Maine sites for the year 1992. The sulfate deposition figures were corrected for marine aerosol contribution.

TABLE 9-1
1992 ATMOSPHERIC DEPOSITION DATA SUMMARY

SITE	ADDRESS	pH MAXIMUM*	pH MINIMUM*	pH MEAN**	DEPOSITION (Kg/ha) SO4***	NO3
CUMBERLAND COUNTY						
Bridgton	Upper Ridge Road	6.95	3.91	4.44	14	9
HANCOCK COUNTY						
Acadia National Park	McFarland Hill Ranger Station	7.50	3.78	4.47	18	12
PISCATAQUIS COUNTY						
Greenville	Squaw Brook	6.77	4.02	4.50	11	8

* Lab measurements.
** Precipitation weighted mean.
*** Corrected for marine aerosol and normalized to 52 weeks.

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 present State Standard for non-methane hydrocarbons is a three hour average concentration of 160 ug/m^3.

10.4 Monitoring

Hydrocarbons were not monitored as part of the State's continuous air monitoring program during 1992.

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 PM10). 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 of the precision check gas and the concentration indicated by the analyzer is 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
1992 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	4	48	-2	4
	Q2	4	50	-6	2
	Q3	4	38	-7	0
	Q4	4	55	-3	5
	Year	4	191	-6	5
Ozone	Q1	2	3	-2	4
	Q2	11	87	-3	5
	Q3	11	97	-6	6
	Q4	7	16	-5	4
	Year	11	203	-5	5
Nitrogen Dioxide	Q1	1	7	-2	9
	Q2	1	8	-7	10
	Q3	1	8	-15	17
	Q4	1	9	-9	18
	Year	1	32	-9	14
Total Suspended Particulate*	Q1	1	13	-5	8
	Q2	1	11	-5	10
	Q3	1	14	-9	5
	Q4	1	7	-12	9
	Year	1	45	-7	8
Lead*	Q1	2	31	**	**
	Q2	2	28	**	**
	Q3	2	23	**	**
	Q4	2	20	**	**
	Year	2	102	**	**
Fine Particulate*	Q1	4	45	-17	12
	Q2	4	47	-19	15
	Q3	4	55	-2	5
	Q4	4	53	-5	5
	Year	4	200	-13	12

TABLE 11-1(Cont.)
1992 PRECISION DATA SUMMARY

PARAMETER	SUMMARY PERIOD	NUMBER OF SITES	PRECISION CHECKS	PROBABILITY LIMITS LOWER 95%	UPPER 95%
Sites operated by Penobscot Energy Recovery Company, Orrington					
Fine Particulate*	Q1	1	14	-20	-1
	Q2	1	15	**	**
	Q3	1	13	-21	1
	Q4	1	15	**	**
	Year	1	57	-18	1
Sites operated by S. D. Warren Company, Westbrook					
Total Suspended Particulate*	Q1	1	7	-4	8
	Q2	0	0		
	Q3	0	0		
	Q4	0	0		
	Year	1	7	-4	8
Fine Particulate*	Q1	1	13	-4	5
	Q2	1	13	**	**
	Q3	1	14	-2	1
	Q4	1	15	0	0
	Year	1	55	-3	3
Sites operated by S. D. Warren Company, Skowhegan					
Ozone	Q1	0	0		
	Q2	1	11	-4	-1
	Q3	1	7	-4	-1
	Q4	1	4	-4	0
	Year	1	22	-4	-1
Fine Particulate*	Q1	1	11	3	11
	Q2	1	15	**	**
	Q3	1	15	-1	23
	Q4	1	15	**	**
	Year	1	56	-2	18
Sites operated by International Paper Company, Jay					
Total Suspended Particulate*	Q1	1	16	-7	1
	Q2	1	15	-7	1
	Q3	1	15	-6	4
	Q4	1	15	-2	3
	Year	1	61	-6	2

TABLE 11-1(Cont.)
1992 PRECISION DATA SUMMARY

PARAMETER	SUMMARY PERIOD	NUMBER OF SITES	PRECISION CHECKS	PROBABILITY LIMITS LOWER 95%	UPPER 95%
Fine Particulate*	Q1	1	14	3	5
	Q2	1	15	**	**
	Q3	1	15	-1	2
	Q4	1	14	**	**
	Year	1	58	0	5
Sites operated by Boise Cascade Paper Group, Rumford					
Sulfur Dioxide	Q1	4	50	-7	7
	Q2	4	52	-7	7
	Q3	4	52	-6	2
	Q4	4	53	-6	3
	Year	4	207	-7	5
Total Suspended	Q1	1	9	-3	6
Particulate*	Q2	0	0		
	Q3	0	0		
	Q4	0	0		
	Year	1	9	-3	6
Fine Particulate*	Q1	1	15	-4	1
	Q2	1	14	-10	15
	Q3	1	15	-2	4
	Q4	1	15	-1	5
	Year	1	59	-6	8
Sites operated by Dragon Products, Thomaston					
Total Suspended	Q1	1	15	-26	16
Particulates*	Q2	1	15	-13	6
	Q3	1	15	-6	8
	Q4	1	15	-12	12
	Year	1	60	-13	10
Fine Particulate*	Q1	1	15	-17	0
	Q2	1	15	-25	-2
	Q3	1	14	-67	22
	Q4	1	11	-7	-3
	Year	1	55	-38	10

TABLE 11-1(Cont.)
1992 PRECISION DATA SUMMARY

PARAMETER	SUMMARY PERIOD	NUMBER OF SITES	PRECISION CHECKS	PROBABILITY LIMITS LOWER 95%	UPPER 95%
Sites operated by Scott Paper Company, Winslow					
Total Suspended Particulate*	Q1	1	17	-11	22
	Q2	1	18	-16	9
	Q3	1	17	-14	15
	Q4	1	17	-18	11
	Year	1	69	-15	15
Fine Particulate	Q1	1	16	-5	11
	Q2	1	18	-9	13
	Q3	1	17	-5	-2
	Q4	1	17	3	17
	Year	1	68	-6	14
Sites operated by Lincoln Pulp & Paper Company, Lincoln					
Sulfur Dioxide	Q1	1	13	-3	4
	Q2	1	13	-5	6
	Q3	1	13	-7	6
	Q4	1	13	-3	5
	Year	1	52	-5	5
Total Suspended Particulate*	Q1	1	24	-16	8
	Q2	1	26	-12	10
	Q3	1	18	-20	-2
	Q4	1	13	-17	13
	Year	1	81	-16	8
Fine Particulate*	Q1	1	19	-5	4
	Q2	1	24	-37	14
	Q3	1	17	-5	6
	Q4	1	17	-4	12
	Year	1	77	-20	14
Sites operated by Great Northern Paper Company, Millinocket					
Sulfur Dioxide	Q1	1	6	-8	1
	Q2	1	8	-8	3
	Q3	1	6	-4	4
	Q4	1	7	-8	3
	Year	1	27	-8	3

TABLE 11-1(Cont.)
1992 PRECISION DATA SUMMARY

PARAMETER	SUMMARY PERIOD	NUMBER OF SITES	PRECISION CHECKS	PROBABILITY LIMITS LOWER 95%	UPPER 95%
Total Suspended Particulate*	Q1	1	16	-13	11
	Q2	1	14	-7	8
	Q3	1	14	-14	3
	Q4	1	10	-14	3
	Year	1	54	-12	7
Fine Particulate*	Q1	1	15	-8	2
	Q2	1	13	3	4
	Q3	1	15	**	**
	Q4	1	15	-4	11
	Year	1	58	-6	10
Sites operated by Georgia Pacific Company, Woodland					
Total Suspended Particulate*	Q1	0	0		
	Q2	0	0		
	Q3	1	9	**	**
	Q4	0	0		
	Year	1	9	**	**
Fine Particulate*	Q1	0			
	Q2	0			
	Q3	1	15	**	**
	Q4	1	15	-4	9
	Year	1	30	-4	9
Sites operated by Fraser Paper Company, Madawaska					
Sulfur Dioxide	Q1	3	39	-2	3
	Q2	3	37	-3	2
	Q3	3	43	-5	2
	Q4	3	39	-2	4
	Year	3	158	-4	4
Sites operated by Pine State Power, Livermore Falls					
Sulfur Dioxide	Q1	1	5	0	5
	Q2	0	0		
	Q3	0	0		
	Q4	0	0		
	Year	1	5	0	5

TABLE 11-1(Cont.)
1992 PRECISION DATA SUMMARY

PARAMETER	SUMMARY PERIOD	NUMBER OF SITES	PRECISION CHECKS	PROBABILITY LIMITS LOWER 95%	UPPER 95%
Sites operated by National Park Service					
Ozone	Q1	0	0		
	Q2	1	13	-28	49
	Q3	1	13	-4	8
	Q4	1	14	-11	8
	Year	1	40	-21	28

* 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
1992 ACCURACY DATA SUMMARY

PARAMETER	SUMMARY PERIOD	NO. OF AUDITS	PROBABILITY LIMITS LEVEL 1 -95%	LEVEL 1 95%	LEVEL 2 -95%	LEVEL 2 95%	LEVEL 3 -95%	LEVEL 3 95%
Sites operated by Maine DEP								
Sulfur Dioxide	Q1	2	-4	8	-1	5	0	3
	Q2	2	-25	26	-12	15	-6	7
	Q3	2	-3	1	-1	5	-1	6
	Q4	2	-8	4	-3	5	-3	7
	Year	8	-7	7	-1	4	1	1
Ozone	Q1	0						
	Q2	7	-7	6	-5	4	-4	5
	Q3	7	-10	7	-5	5	-3	4
	Q4	0						
	Year	14	-8	6	-5	5	-3	4
Nitrogen Dioxide	Q1	0						
	Q2	0						
	Q3	0						
	Q4	0						
	Year	0						
Total Suspended Particulate*	Q1	4			-1	1		
	Q2	2			-3	-3		
	Q3	2			-8	1		
	Q4	2			-12	11		
	Year	10			-4	2		
Lead*	Q1	7	-4	9	3	3		
	Q2	9	-10	2	-9	9		
	Q3	3	-4	1	-12	15		
	Q4	7	-10	5	-6	7		
	Year	26	-6	8	-7	8		
Fine Particulate*	Q1	16			-5	4		
	Q2	20			-4	5		
	Q3	8			-3	5		
	Q4	18			-4	3		
	Year	62			-4	4		

TABLE 11-2(Cont.)
1992 ACCURACY DATA SUMMARY

PARAMETER	SUMMARY PERIOD	NO. OF AUDITS	PROBABILITY LIMITS LEVEL 1 -95%	LEVEL 1 95%	LEVEL 2 -95%	LEVEL 2 95%	LEVEL 3 -95%	LEVEL 3 95%
Sites operated by Penobscot Energy Recovery Company, Orrington								
Fine Particulate*	Q1	3			4	7		
	Q2	3			2	10		
	Q3	3			1	11		
	Q4	3			0	3		
	Year	12			3	7		
Sites operated by S. D. Warren Company, Westbrook								
Total Suspended Particulate*	Q1	3						
	Q2	0						
	Q3	0						
	Q4	0						
	Year	3						
Fine Particulate*	Q1	4			-6	1		
	Q2	0						
	Q3	8			0	1		
	Q4	4			-5	0		
	Year	16			-3	1		
Sites operated by S. D. Warren Company, Skowhegan								
Ozone	Q1	0						
	Q2	1						
	Q3	1						
	Q4	0						
	Year	2						
Fine Particulate*	Q1	3			-21	23		
	Q2	3			0	0		
	Q3	3			-1	0		
	Q4	3			-2	4		
	Year	12			-4	5		
Sites operated by International Paper Company, Jay								
Total Suspended Particulate*	Q1	9			0	4		
	Q2	9			0	1		
	Q3	9			-2	1		
	Q4	9			-7	3		
	Year	36			-1	1		

TABLE 11-2(Cont.)
1992 ACCURACY DATA SUMMARY

PARAMETER	SUMMARY PERIOD	NO. OF AUDITS	PROBABILITY LIMITS LEVEL 1 -95%	LEVEL 1 95%	LEVEL 2 -95%	LEVEL 2 95%	LEVEL 3 -95%	LEVEL 3 95%
Fine Particulate*	Q1	3			-2	5		
	Q2	3			-12	13		
	Q3	3			3	4		
	Q4	3			-1	7		
	Year	12			-1	5		
Sites operated by Boise Cascade Paper Group, Rumford								
Sulfur Dioxide	Q1	4	-6	4	-7	2	-7	1
	Q2	4	-15	13	-8	0	-10	0
	Q3	4	-20	17	-17	10	-19	7
	Q4	4	-9	-3	-13	-3	-15	-3
	Year	16	-12	7	-11	2	-12	1
Total Suspended Particulate*	Q1	4			-6	8		
	Q2	0						
	Q3	0						
	Q4	0						
	Year	4			-6	8		
Fine Particulate*	Q1	5			-1	7		
	Q2	5			1	6		
	Q3	5			2	4		
	Q4	4			-2	4		
	Year	19			0	5		
Sites operated by Dragon Products, Thomaston								
Total Suspended Particulates*	Q1							
	Q2							
	Q3							
	Q4							
	Year							
Fine Particulate*	Q1	5			-5	1		
	Q2	5			-3	2		
	Q3	0						
	Q4	6						
	Year	16			-5	-2		

TABLE 11-2(Cont.)
1992 ACCURACY DATA SUMMARY

PARAMETER	SUMMARY PERIOD	NO. OF AUDITS	PROBABILITY LIMITS LEVEL 1 -95%	LEVEL 1 95%	LEVEL 2 -95%	LEVEL 2 95%	LEVEL 3 -95%	LEVEL 3 95%
Sites operated by Scott Paper Company, Winslow								
Total Suspended Particulate*	Q1	3			-4	7		
	Q2	3			-7	5		
	Q3	3			-2	1		
	Q4	3			1	2		
	Year	12			-3	4		
Fine Particulate	Q1	0						
	Q2	4						
	Q3	0						
	Q4	4						
	Year	8						
Sites operated by Lincoln Pulp & Paper Company, Lincoln								
Sulfur Dioxide	Q1	0						
	Q2	1						
	Q3	0						
	Q4	2						
	Year	3						
Total Suspended Particulate*	Q1	3			-10	7		
	Q2	3			-9	-1		
	Q3	3			-4	-3		
	Q4	3			2	2		
	Year	12			-3	-1		
Fine Particulate*	Q1	4			-17	15		
	Q2	5			-8	6		
	Q3	5			-7	11		
	Q4	5			-3	8		
	Year	19			-3	6		
Sites operated by Great Northern Paper Company, Millinocket								
Sulfur Dioxide	Q1	0						
	Q2	2						
	Q3	0						
	Q4	2						
	Year	4						

TABLE 11-2(Cont.)
1992 ACCURACY DATA SUMMARY

PARAMETER	SUMMARY PERIOD	NO. OF AUDITS	PROBABILITY LIMITS LEVEL 1 -95%	LEVEL 1 95%	LEVEL 2 -95%	LEVEL 2 95%	LEVEL 3 -95%	LEVEL 3 95%
Total Suspended Particulate*	Q1	0						
	Q2	4						
	Q3	0						
	Q4	4						
	Year	8						
Fine Particulate*	Q1	0						
	Q2	4						
	Q3	0						
	Q4	4						
	Year	8						
Sites operated by Georgia Pacific Company, Woodland								
Total Suspended Particulate*	Q1	0						
	Q2	0						
	Q3	2						
	Q4	0						
	Year	2						
Fine Particulate*	Q1	0						
	Q2	0						
	Q3	4			-4	3		
	Q4	4			-4	6		
	Year	8			-1	2		
Sites operated by Fraser Paper Company, Madawaska								
Sulfur Dioxide	Q1	3	-4	-1	-7	-1	-8	2
	Q2	3	-8	-3	-10	-3	-7	-3
	Q3	3	-11	7	-9	4	-8	4
	Q4	3	-10	-1	-9	-1	-12	4
	Year	12	-7	-1	-7	-2	-8	1
Sites operated by Pine State Power, Livermore Falls								
Sulfur Dioxide	Q1	1						
	Q2	0						
	Q3	0						
	Q4	0						
	Year	1						

TABLE 11-2(Cont.)
1992 ACCURACY DATA SUMMARY

PARAMETER	SUMMARY PERIOD	NO. OF AUDITS	PROBABILITY LIMITS LEVEL 1 -95%	LEVEL 1 95%	LEVEL 2 -95%	LEVEL 2 95%	LEVEL 3 -95%	LEVEL 3 95%
Sites operated by National Park Service								
Ozone	Q1	0						
	Q2	0						
	Q3	0						
	Q4	3						
	Year	3						

12. 1992 AIR TOXICS 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.

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. Although chlorine was not monitored, one of its by-products, chloroform, was monitored. Since there are no major organic chemical production facilities in Maine, the primary sources of chloroform in Maine are water and waste-water 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.

DEP monitoring results indicated site averages for chloroform to range from 0.06 to 7.28 micrograms per cubic meter (Table 12-1).

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:

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. Tetrachloroethylene levels measured by DEP, on a site-average basis, ranged from 0.07 to 0.89 micrograms per cubic meter (Table 12-2).

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. Measured benzene levels in 1992 ranged from a site-average of 0.53 to 9.20 micrograms per cubic meter (Table 12-3).

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

TABLE 12 - 1

MONITORING RESULTS FOR CHLOROFORM (UG/M3)

1991 Monitoring Data

	11/12/91	11/14/91	11/18/91	11/21/91	11/24/91	11/26/91	11/30/91	12/7/91	12/14/91		AVERAGE	MAXIMUM
Garage (Mexico - north of mill)	0.15	1.03	0.34	0.05	None taken	0.10	0.69	0.69	0.88		0.49	1.03
School (Mexico - east of mill)	None taken	None taken	0.20	0.29	0.25	0.10	1.47	0.64	2.74		0.81	2.74

1992 Monitoring Data

	8/20/92	8/23/92	9/1/92	9/3/92	9/12/92	9/24/92	9/26/92	9/30/92	10/2/92	10/6/92		
MALT-Mt. Agamenticus, York	0 04	0 03	Malfunction	Malfunction	0.14						0.07	0.14
BAF-Athletic Field, Berwick	0.25	0.20	0.12	0.18	0.05						0.16	0.25
WNET-New Eng. Tel., Westbrook	0.06	0.22	0.13	0.55	0.15						0.22	0.55
BES-Elementary School, Berwick	0.16	0.25	Not Detected	1.83	0.08						0.58	1.83
KPW-Parson's Way, Kennebunkport	0.08	0.24	0.63	0.07	0.06						0.22	0.63
BFS-Fire Station, Berwick	0.40	0.07	0.26	0.46	0.17						0.27	0.46
WRB-Research Bld., Westbrook	6.66	1.30	1.84	0.83	16.84						5.49	16.84
WCH-Community Hospital, Westbrook	0.23	0.98	Not Detected	None taken	0.07						0.43	0.98
KOGM-Old Grist Mill, Kennebunkport	None taken	0.06	Not Detected	0.33	0.59						0.33	0.33
KCS-Cons. School, Kennebunkport	None taken	0.06	None taken	None taken	None taken						0.06	0.06
GPRR - GP Ryan Rd						None taken	Not Detected	Unanalyzed	Unanalyzed	Unanalyzed	Unanalyzed	Unanalyzed
GPSTP - GP Sewerage Treat. Plt.						1.28	7.80	19.91	0.13	Unanalyzed	7.28	19.91
JOS - Jonesport Ozone shelter						0.02	0.21	0.07	0.02	0.02	0.07	0.21
NPP - Norma Polk Property						0.05	2.52	Not Detected	0.07	Unanalyzed	0.88	2.52
WHS Woodland High school						1.08	7.71	0.12	0.04	0.30	1.85	7.17

Our guideline for Chloroform is 0.043 ug/M3 on an annual average

The values that are shaded indicate areas that may be in violation of this guideline

TABLE 12 - 2

MONITORING RESULTS FOR TETRACHLOROETHYLENE (Perc)(UG/M3)

1991 Monitoring Data

	11/12/91	11/14/91	11/18/91	11/21/91	11/24/91	11/26/91	11/30/91	12/7/91	12/14/91		AVERAGE	MAXIMUM
Garage (Mexico - north of mill)	1.29	1.56	0.88	0.75	None Taken	0.41	0.68	0.68	1.22		0.93	1.56
School (Mexico - east of mill	None Taken	None Taken	1.36	4.27	1.7	0.68	1.29	1.22	0.54		1.58	4.27

1992 Monitoring Data

	8/20/92	8/23/92	9/1/92	9/3/92	9/12/92	9/24/92	9/26/92	9/30/92	10/2/92	10/6/92		
MALT-Mt. Agamenticus, York	0.35	0.07	Malfunction	Malfunction	0.07						0.16	0.35
BAF-Athletic Field, Berwick	0.20	0.16	0.07	0.20	0.14						0.15	0.20
WNET-New Eng. Tel., Westbrook	0.66	0.07	0.54	0.34	0.18						0.36	0.66
BES-Elementary School, Berwick	0.39	0.07	0.17	0.14	0.08						0.17	0.39
KPW-Parson's Way, Kennebunkport	0.12	0.07	0.14	0.07	0.14						0.11	0.14
BFS-Fire Station, Berwick	1.70	0.44	0.95	0.58	0.51						0.83	1.70
WRB-Research Bld., Westbrook	0.20	3.85	0.14	0.14	0.15						0.89	3.85
WCH-Community Hospital, Westbrook	0.07	0.07	Not Detected	None Taken	0.07						0.07	0.07
KOGM-Old Grist Mill, Kennebunkport	None Taken	DIRTY HC	0.10	0.07	0.07						0.08	0.10
KCS-Cons. School, Kennebunkport	None Taken	0.12	None Taken	None Taken	None Taken						0.12	0.12
GPRR - GP Ryan Rd						None Taken	Not Detected	Unanalyzed	Unanalyzed	Unanalyzed	Unanalyzed	Unanalyzed
GPSTP - GP Sewarage Treat. Plant						0.07	0.03	0.07	0.24	Unanalyzed	0.10	0.24
JOS - Jonesport Ozone shelter						0.10	0.03	0.14	0.14	0.00	0.10	0.14
NPP - Norma Polk Property						Not Detected	Not Detected	Not Detected	Not Detected	Unanalyzed	Not Detected	Not Detected
WHS Woodland High school						0.41	0.07	0.07	0.17	Unanalyzed	0.18	0.41

Our annual ambient standard for Tetrachloroethylene is 0.01 ug/M3

The values that are shaded indicate areas that may be in violation of the perc standard

TABLE 12 - 3

MONITORING RESULTS FOR BENZENE(UG/M3)

1991 Monitoring Data

	11/12/91	11/14/91	11/18/91	11/21/91	11/24/91	11/26/91	11/30/91	12/7/91	12/14/91		AVERAGE	MAXIMUM
Garage (Rumford - north of mill)	3.97	18.21	10.56	7.04	None taken	3.42	7.42	9.82	4.77		8.15	18.21
School (Mexico - east of mill)	None taken	None taken	0.80	0.99	1.06	0.51	1.95	2.43	2.18		1.42	2.43

1992 Monitoring Data

	8/20/92	8/23/92	9/1/92	9/3/92	9/12/92	9/24/92	9/26/92	9/30/92	10/2/92	10/6/92		
MALT-Mt. Agamenticus, York	0.5	0.6	Malfunction	Malfunction	0.5						0.53	0.60
BAF-Athletic Field, Berwick	0.8	1.1	0.5	0.9	1.0						0.86	1.10
WNET-New Eng. Tel., Westbrook	1.6	1.7	1.3	2.6	1.2						1.68	2.60
BES-Elementary School, Berwick	1.0	1.4	0.8	0.8	0.8						0.96	1.40
KPW-Parson's Way, Kennebunkport	0.7	1.1	0.6	0.6	0.7						0.74	1.10
BFS-Fire Station, Berwick	1.7	1.7	1.3	1.5	2.0						1.64	2.00
WRB-Research Bld., Westbrook	2.0	4.9	1.6	2.3	1.4						2.44	4.90
WCH-Community Hospital, Westbrook	1.3	1.4	0.5	No sample taken	1.1						1.08	1.40
KOGM-Old Grist Mill, Kennebunkport	No sample taken	1.4	0.5	1.2	0.7						0.95	1.40
KCS-Cons. School, Kennebunkport	No sample taken	0.9	No sample taken	No sample taken	No sample taken						0.90	0.90
NPP - Norma Polk Property						0.7	0.8	0.3	0.7	No analysis	0.63	0.80
JOS - Jonesport Ozone shelter						1.3	2.1	0.4	0.7	No analysis	1.13	2.10
GPSTP - GP Sewarage Treat. Plt.						1.0	0.8	0.8	0.7	No analysis	0.83	1.00
WHS Woodland High school						1.4	1.0	0.6	0.8	1.4	0.95	1.40
GPRR - GP Ryan Rd						No analysis	9.2	No analysis	No analysis	No analysis	9.20	9.20

The Bureau of Health guideline value for Benzene to protect public health is 0.12 ug/m3 averaged over a year.
All 24 hr samples taken exceed 0.12 ug/m3

(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.

Toluene site-average levels ranged from 0.9 to 36.8 micrograms per cubic meter, in the 1992 monitoring study (Table 12-4).

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 - 2 days. A total of 169 tons of xylenes were released to the air in 1990, based on TRI data. (7).

The site-average values measured in Maine ranged from 0.5 to 20.6 micrograms per cubic meter(Table 12-5).

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).

The levels of 1,3-butadiene found in DEP samples ranged on a site-average basis from not detected to 0.7 micrograms per cubic meter (Table 12-6).

DHS guideline is: 370 micrograms per cubic meter averaged over 24 hours

TABLE 12 - 4

MONITORING RESULTS FOR TOLUENE(UG/M3)

1991 Monitoring Data

	11/12/91	11/14/91	11/18/91	11/21/91	11/24/91	11/26/91	11/30/91	12/7/91	12/14/91		AVERAGE	MAXIMUM
Garage (Rumford - north of mill)	12.7	51.9	31.4	30.7	No sample taken	16.6	25.8	34.3	13.9		27.2	51.9
School (Mexico - east of mill)	No sample taken	No sample taken	1.2	2.0	1.2	0.6	2.9	3.6	4.5		2.3	4.5

1992 Monitoring Data

	8/20/92	8/23/92	9/1/92	9/3/92	9/12/92	9/24/92	9/26/92	9/30/92	10/2/92	10/6/92		
MALT-Mt. Agamenticus, York	0.9	0.9	Malfunction	Malfunction	0.8						0.9	0.9
BAF-Athletic Field, Berwick	1.6	3.1	3.4	2.3	1.6						2.4	3.4
WNET-New Eng. Tel., Westbrook	10.1	5.1	7.4	8.4	3.5						6.9	10.1
BES-Elementary School, Berwick	2.4	2.9	5.3	3.1	1.4						3.0	5.3
KPW-Parson's Way, Kennebunkport	1.7	2.3	1.4	1.5	1.7						1.7	2.3
BFS-Fire Station, Berwick	86.4	62.2	14.0	10.2	11.4						36.8	86.4
WRB-Research Bld., Westbrook	6.3	19.9	4.0	13.5	13.7						11.5	19.9
WCH-Community Hospital, Westbrook	2.7	3.8	1.3	No sample taken	1.9						2.4	3.8
KOGM-Old Grist Mill, Kennebunkport	No sample taken	3.1	0.7	2.5	1.6						2.0	3.1
KCS-Cons. School, Kennebunkport	No sample taken	4.1	No sample taken	No sample taken	No sample taken						4.1	4.1
NPP - Norma Polk Property						0.8	1.5	0.2	1.5	No Analysis	1.0	1.5
JOS - Jonesport Ozone shelter						2.9	5.2	0.7	1.3	No Analysis	2.5	5.2
GPSTP - GP Sewarage Treat. Plt.						1.6	1.1	0.4	1.3	No Analysis	1.1	1.6
WHS Woodland High school						1.9	1.5	1.0	1.6	2.0	1.5	1.9
GPRR - GP Ryan Rd						No Analysis	3.2	No Analysis	No Analysis	No Analysis	3.2	3.2

Our ambient standard for Toluene is 260 ug/m3 averaged over 24 hours and 180 ug/m3 averaged over a year

TABLE 12 - 5

MONITORING RESULTS FOR XYLENE(UG/M3)

1991 Monitoring Data

	11/12/91	11/14/91	11/18/91	11/21/91	11/24/91	11/26/91	11/30/91	12/7/91	12/14/91		AVERAGE	MAXIMUM
Garage (Rumford - north of mill)	16.4	88.8	53.3	35.4	No sample taken	23.4	35.0	49.9	14.3		39.6	88.8
School (Mexico - east of school)	No sample taken	No sample taken	1.2	2.1	1.3	0.4	2.8	3.6	3.2		2.1	3.6

1992 Monitoring Data

	8/20/92	8/23/92	9/1/92	9/3/92	9/12/92	9/24/92	9/26/92	9/30/92	10/2/92	10/6/92		
MALT-Mt. Agamenticus, York	0.5	0.7	Malfunction	Malfunction	0.3						0.5	0.7
BAF-Athletic Field, Berwick	1.1	2.1	0.7	1.2	1.1						1.2	2.1
WNET-New Eng. Tel., Westbrook	3.7	2.6	3.0	4.7	2.4						3.3	4.7
BES-Elementary School, Berwick	1.9	2.1	1.1	1.6	1.0						1.5	2.1
KPW-Parson's Way, Kennebunkport	1.1	1.4	0.6	0.8	1.3						1.0	1.4
BFS-Fire Station, Berwick	51.8	5.5	33.4	7.3	4.8						20.6	51.8
WRB-Research Bld., Westbrook	4.0	11.1	2.8	3.5	2.8						4.8	11.1
WCH-Community Hospital, Westbrook	2.2	2.3	1.0	No sample taken	1.6						1.8	2.3
KOGM-Old Grist Mill, Kennebunkport	No sample taken	1.9	0.5	1.9	1.1						1.4	1.9
KCS-Cons. School, Kennebunkport	No sample taken	1.3	No sample taken	No sample taken	No sample taken						1.3	1.3
NPP - Norma Polk Property						0.4	1.1	0.4	0.7	No analysis	0.7	1.1
JOS - Jonesport Ozone shelter						2.1	4.3	0.5	1.2	No analysis	2.0	4.3
GPSTP - GP Sewarage Treat. Plt.						1.4	0.9	0.5	0.7	No analysis	0.9	1.4
WHS Woodland High school						1.5	1.2	0.7	1.4	1.7	1.2	1.5
GPRR - GP Ryan Rd						No analysis	2.1	No analysis	No analysis	No analysis	2.1	2.1

The ambient guideline for Xylenes (mixed isomers) is 65,000 ug/m3 averaged over 15 minutes,
300 ug/m3 averaged over 24 hours and 300 ug/m3 averaged over a year

TABLE 12 - 6

MONITORING RESULTS FOR 1,3-BUTADIENE(UG/M3)

1991 Monitoring Data

	11/12/91	11/14/91	11/18/91	11/21/91	11/24/91	11/26/91	11/30/91	12/7/91	12/14/91		AVERAGE	MAXIMUM
Garage (Rumford - north of mill)	0.20	2.05	1.32	0.46	No sample taken	0.46	0.31	0.55	0.59		0.7	2.1
School (Mexico - east of school)	No sample taken	No sample taken	Not detected	Not detected	Not detected	Not detected	0.20	0.22	0.22		0.2	0.2

1992 Monitoring Data

	8/20/92	8/23/92	9/1/92	9/3/92	9/12/92	9/24/92	9/26/92	9/30/92	10/2/92	10/6/92		
MALT-Mt. Agamenticus, York	Not detected	Not detected	Malfunction	Malfunction	Not detected						Not detected	Not detected
BAF-Athletic Field, Berwick	Not detected	0.10	Not detected	Not detected	Not detected						0.1	0.1
WNET-New Eng. Tel., Westbrook	0.20	0.20	0.10	0.20	0.20						0.2	0.2
BES-Elementary School, Berwick	0.20	0.10	0.20	Not detected	Not detected						0.2	0.2
KPW-Parson's Way, Kennebunkport	Not detected	Not detected	Not detected	Not detected	Not detected						Not detected	Not detected
BFS-Fire Station, Berwick	0.30	0.40	0.20	0.10	0.20						0.2	0.4
WRB-Research Bld., Westbrook	0.10	0.10	0.10	0.30	0.20						0.2	0.3
WCH-Community Hospital, Westbrook	Not detected	Not detected	Not detected	No sample taken	Not detected						Not detected	Not detected
KOGM-Old Grist Mill, Kennebunkport	No sample taken	0.10	Not detected	Not detected	Not detected						0.1	0.1
KCS-Cons. School, Kennebunkport	No sample taken	Not detected	No sample taken	No sample taken	No sample taken						Not detected	Not detected
NPP - Norma Polk Property						Not Detected	Not Detected	Not Detected	Not Detected	No analysis	No analysis	No analysis
JOS - Jonesport Ozone shelter						0.1	0.2	Not Detected	Not Detected	No analysis	0.2	0.2
GPSTP - GP Sewarage Treat. Plt.						0.1	0.1	Not Detected	Not Detected	No analysis	0.1	0.1
WHS Woodland High school						0.1	Not Detected	Not Detected	Not Detected	0.1	0.1	0.1
GPRR - GP Ryan Rd						No analysis	0.7	No analysis	No analysis	No analysis	0.7	0.7

The guideline value for 1,3-Butadiene is 370 ug/m3 averaged over 24 hours and .0036 ug/m3 averaged over a year. The shaded areas indicate areas that appear to exceed the annual ambient guideline

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). The site-average levels measured by DEP range from 0.27 to 0.69 micrograms per cubic meter (Table 12-7).

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 Air Toxics Monitoring - 1992

Due to the data collected and concerns found in 1991, the DEP wanted to collect ambient samples from different areas around the State. DEP planned a study which was believed to provide a representation of the ambient air quality in Maine. Funds were allocated from the Federal grant to allow us to conduct such a study; however, only limited funds were available so many of the same resource constraints and thus the limitations of last year's study are applicable.

This summer included monitoring in 3 phases.

PHASE I

Mt. Agamenticus (1 site)	
Lookout tower	(MALT)
Berwick (3 sites)	
Athletic field	(BAF)
Elementary school	(BES)
Fire Station	(BFS)
Kennebunkport (3 sites)	
Olde Grist Mill restaurant	(KOGM)
Consolidated school	(KCS)
Parsons' Way (ozone monitoring station)	(KPW)
Westbrook (3 sites)	
Community hospital	(WCH)
New England Telephone	(WNET)

TABLE 12 - 7

MONITORING RESULTS FOR CARBON TETRACHLORIDE(UG/M3)

1991 Monitoring Data

	11/12/91	11/14/91	11/18/91	11/21/91	11/24/91	11/26/91	11/30/91	12/7/91	12/14/91		AVERAGE	MAXIMUM
Garage (Rumford - north of mill)	0.87	0.81	0.87	0.81	None taken	0.74	0.87	0.74	1.12		0.85	1.12
School (Mexico - east of mill)	None taken	None taken	0.99	0.99	0.99	0.93	1.05	1.12	1.12		1.03	1.12

1992 Monitoring Data

	8/20/92	8/23/92	9/1/92	9/3/92	9/12/92	9/24/92	9/26/92	9/30/92	10/2/92	10/6/92		
MALT-Mt. Agamenticus, York	0.69	Not Detected	Malfunction	Malfunction	0.67						0.68	0.69
BAF-Athletic Field, Berwick	0.73	0.68	0.68	0.68	0.66						0.68	0.73
WNET-New Eng. Tel., Westbrook	0.69	0.69	0.69	0.68	0.08						0.57	0.69
BES-Elementary School, Berwick	0.68	0.70	0.67	0.66	0.07						0.56	0.70
KPW-Parson's Way, Kennebunkport	0.68	0.71	0.66	0.67	0.07						0.56	0.71
BFS-Fire Station, Berwick	0.69	0.69	0.64	0.66	0.04						0.54	0.69
WRB-Research Bld., Westbrook	0.68	0.61	0.68	0.68	0.66						0.66	0.68
WCH-Community Hospital, Westbrook	0.69	0.69	0.67	NA	0.69						0.69	0.69
KOGM-Old Grist Mill, Kennebunkport	No sample taken	0.70	0.64	0.68	0.03						0.51	0.70
KCS-Cons. School, Kennebunkport	No sample taken	0.27	No sample taken	No sample taken	No sample taken						0.27	0.27
GPRR - GP Ryan Rd						None Taken	Not Detect	Unanalyzed	Unanalyzed	Unanalyzed	Unanalyzed	Unanalyzed
GPSTP - GP Sewerage Treat. Plt.						0.68	0.67	0.66	0.69	Unanalyzed	0.68	0.69
JOS - Jonesport Ozone shelter						0.62	0.66	0.67	0.63	0.67	0.64	0.67
NPP - Norma Polk Property						0.63	0.68	0.67	0.68	Unanalyzed	0.66	0.68
WHS Woodland High school						0.66	0.69	0.69	0.69	Unanalyzed	0.68	0.69

The guideline value for Carbon tetrachloride is 860 ug/m3 averaged over 24 hours and 0.07 ug/m3 averaged over a year. The shadede area indicate areas that may have exceeded the annual ambient guideline

Research building (WRB)

- each location was sampled on five different days
- each location was run from midnight to midnight

PHASE II

Woodland (4 sites)

Ryan Road (GPRR)
Norma Polk property (NPP)
Woodland high school (WHS)
Sewage treatment plant (GPSTP)

Jonesport (1 site)

Ozone shelter (JOS)

- each location was sampled on five different days
- each location was run from midnight to midnight

PHASE III

Waterville

- these samples have been analyzed, but have not undergone quality assurance/quality control yet.

These locations were chosen for a variety of reasons, but the actual sample sites were all based on historical wind-rose data. The Berwick sites were chosen to give us some data in an industrial town. Mt. Agamenticus was chosen as a background site in southern Maine. Kennebunkport is a coastal town with no major industry. It was chosen to give a toxic profile of a town that is located in a non-attainment area for ozone. Since many of the toxics scanned for in our study are ozone precursors, it is important to get baseline data for these pollutants. Jonesport was chosen for similar reasons. It also has ozone problems and is located further Downeast. Toxic transport is a potential problem that has not been addressed thus far, but about which we wanted to obtain a preliminary understanding, which is why we chose two coastal sites that were distant from each other. Woodland (Georgia Pacific) and Westbrook (S. D. Warren) are two towns with pulp mills. The third phase of our study, Waterville, is on-going and the data from those sites has been received, but is still undergoing quality control/quality assurance. Waterville was chosen to be indicative of semi-industrial towns in Maine.

12.3 Analysis and Discussion

Meteorological data were obtained for Westbrook and Woodland; other meteorological data were not readily available. Attempts were made to correlate qualitatively daily wind patterns with monitored toxics data for that day.

CHLOROFORM:

The following analysis and discussion of chloroform references data found in Table 12-1.

1. On almost every sampling day, the Westbrook New England Telephone (WNET) site was

upwind of S.D. Warren. Relatively low chloroform levels were detected at this site on the sampling days. The only day that the wind data indicated that the WNET site was downwind of the pulp mill, the highest chloroform levels at that site were observed.

2. Three of the five days sampled indicate that the Westbrook Community Hospital (WCH) site was upwind of the mill. WCH was downwind of the mill on August 23, 1992 and September 3, 1992. The highest levels of chloroform at WCH occurred on August 23.

3. The Westbrook Research Building (WRB) is located closest to the mill and had the highest chloroform levels in the Westbrook area. On September 3, 1992 WRB was upwind of the mill. The chloroform levels seen on that day were almost as high as those found at the Community Hospital on August 23, 1992 (the day when the wind data indicated this site was downwind of the mill). The highest chloroform measurement at WRB, 16.84 micrograms per cubic meter, was on September 12, 1992, when the winds were from the north/northwest for almost the entire day; WRB is south/southeast from the pulping process.

4. A malfunction prohibited DEP from collecting samples at the Ryan Road site (GPRR) on any of the sample days with the exception of September 26, 1992. No chloroform was detected. On that day, the winds were variable for approximately half of the day, with 14 hours of southerly winds. The GPRR site was west/northwest of the mill and the furthest from the mill of any of the sites, at approximately two-thirds of a mile away.

5. The wind data indicate that the Norma Polk Property (NPP) site was upwind of the pulp mill most of the time. On September 26, 1992, winds were from the south/southeast, the same direction of the mill, for 8 hours. The highest 24-hour value (2.52 micrograms per cubic meter) for NPP was measured that day.

6. The highest level of chloroform at the Woodland High School site (WHS) was observed on September 26, 1992 (7.71 micrograms per cubic meter). The wind-rose data indicate that the winds were southerly for 14 hours. The mill is located approximately 100 yards northeast of the site. It should also be noted that the sewage treatment plant site (known as GPSTP, but is Woodland's wastewater treatment plant), is also located less than 100 yards from the pulping operation and chloroform levels observed on that day at GPSTP were also elevated, and of the same order of magnitude.

7. The highest 24-hour chloroform levels (19.91 micrograms per cubic meter) collected during the entire study were observed at the sewage treatment plant (GPSTP) on September 30, 1992. The sampler was located directly downwind of the mill that day. For other sampling days, GPSTP had the highest chloroform levels. The only day on which the wind data indicates that the GPSTP site was not downwind of the mill was October 2, 1992. The chloroform levels on that day were the lowest observed at that site.

TETRACHLOROETHYLENE:

Berwick and Westbrook, two communities with industry and commercial businesses, had the highest tetrachloroethylene levels (see Table 12-2).

BENZENE:

The Toxic Release Inventory - 1990 database, indicates that there are no major industrial users or sources of benzene at or above the TRI reporting thresholds in Maine. Highest levels of benzene were found in Westbrook and Berwick (see Table 12-3).

TOLUENE:

S.D. Warren reported 1990 TRI emissions of toluene of 105 tons. Examination of the daily wind patterns and measured concentrations revealed no consistent patterns that toluene levels were due to point sources. A qualitative assessment, using information obtained from the Maine DOT's database (TINIS) and EPA's mobile source model (MOBILE5), indicated that volatile organic compound emissions were approximately 420 tons. If the gasoline-related contribution to observed toluene levels was larger, it may have obfuscated the point-source contribution. No exceedances of the 24 hour standard occurred at any of the sampling sites, for any of the days sampled (see Table 12-4).

XYLENES:

S.D. Warren emitted 3,200 pounds of xylenes in 1990 (TRI data), but Berwick averaged five times that amount; TRI data indicated no other xylene sources in Berwick, or in other towns monitored in the study.

High values of xylenes (see Table 12-5) appear to be related with high levels of both toluene and benzene (see Tables 12-3 and 12-4). DEP therefore believes that the measured concentrations of all three of these compounds are influenced by vehicular use. While fossil fuel related xylene, like toluene, seems more important overall, industrial or commercial use may be locally significant.

1,3-BUTADIENE:

The highest values of 1,3-butadiene (see Table 12-6) occurred in Berwick and at the Ryan Road site in Woodland. Often, it was not detected, possibly due to the fact that it breaks down so quickly in the atmosphere, although Berwick and Westbrook had locations where it was always detected (WNET, BFS, WRB). As it is associated with fossil fuel combustion, DEP believes the primary source is vehicle exhaust.

CARBON TETRACHLORIDE:

Because carbon tetrachloride is so persistent in the atmosphere, and the levels relatively consistent with Canadian and NESCAUM states monitoring results, the DEP believes that residual effects from CCl4 use several decades ago are being seen. However, unknown sources could also be contributing to the level we monitored (see Table 12-7).

12.4 Conclusions

Before discussing some of the conclusions DEP and DHS made concerning these data, it is important to keep in mind the limitations both agencies faced in interpreting the data. DEP initiated this effort knowing its limitations, but believing that some preliminary data could begin to provide some understanding of the relationship between emissions of air toxics and ambient air concentrations.

With last year's pilot study, it was apparent that more sites were necessary to characterize an area, as well as more days of sampling, to better ascertain chronic health effects. Due to limited resources, DEP was only able to partially correct the first issue, by placing three monitors at several locations.

Further, DEP did not have the resources to sample for all the air toxics that are possibly present at the various locations chosen for the study, which would have entailed using multiple analytical methods. Instead, a widely-used, and therefore relatively inexpensive, method was chosen that scans for a number of organic compounds, many of which react in the troposphere to create ozone. While not as complete as would be desired, the compounds that were looked for are among the largest amounts of air toxics emitted in Maine.

Difficulty can arise in determining the source of toxics detected at the monitors for certain chemicals. Air toxics are derived not just from industrial point sources, but also from commercial businesses, as well as fuel combustion sources (e.g. furnaces, boilers, and vehicles). For these certain ubiquitous chemicals, such as toluene, xylenes, benzene, and perchloroethylene, determining the percentage of each source's contribution to the levels observed was problematic. At this time insufficient data is available to quantify such contribution, although attempts were made to make a qualitative assessment.

The health assessment that DHS developed regarding the data DEP collected in this study is summarized in their report, "Evaluation of Potential Health Risks from Selected Hazardous Air Pollutants Detected at Sites in Maine During Monitoring in 1991 and 1992." Non-cancer health effects of the pollutants were generally not expected to result from exposure to the measured concentrations, except at two locations for sensitive members of the population. Certain carcinogens were of concern. Localized areas of unacceptably high risk exist in areas dominated by point sources (e.g. chloroform). Some of the pollutants exist state-wide (e.g. carbon tetrachloride, benzene, and 1,3-butadiene) are present at lower levels, but still pose an unacceptable individual risk. Two of these compounds, benzene and 1,3-butadiene, are related to vehicle emissions and not to prevailing industrial processes in Maine.

DEP has already in place a three-pronged approach for reducing the risks due to these air toxic, and that will help Maine to reach compliance with ozone standards. This approach includes developing standards for low-emission vehicles (LEV), controlling gasoline emissions and using reformulated gasoline, and establishing a vehicle inspection and maintenance (I/M) program. According to a September 1991 report published by the Northeast States for Coordinated Air Use

Management (NESCAUM), by the year 2015, toxic emissions will be reduced up to 66% from mobile sources, under the LEV and I/M programs.

Concerning chloroform emissions, DEP is aware that some of the pulp and paper mills are taking steps to reduce those emissions by substituting chlorine dioxide for hypochlorite. What the percentage reductions would be is not yet established, and would probably vary depending on the particular bleaching sequence used at a particular mill. EPA is currently drafting proposed regulations for the pulp and paper industry (known as the Integrated Rule for the Pulp and Paper Industry), which will control emissions from the industry.

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 is a start in understanding ambient air quality in Maine regarding toxics; in particular, in understanding the relationship between emissions and exposure. These findings and planned future studies are expected to have a large impact on the DEP's priorities in the coming years.

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